



Five Fords WwTW Advanced Anaerobic Digestion

Preliminary Ecological Appraisal

April 2016

Dŵr Cymru Welsh Water Limited

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Tŷ Awen
Celtic Springs Business Park
Coedkernew, Newport
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Executive Summary

Dŵr Cymru Welsh Water Limited (DCWW) has commissioned Mott MacDonald Bentley (MMB) to design and build an Advanced Anaerobic Digestion facility at the Five Fords Wastewater Treatment Works, Wrexham. To facilitate the design and planning of this facility a Preliminary Ecological Appraisal of the site has been undertaken. An Extended Phase 1 Habitat Survey of the proposed construction footprint and surrounding habitat was carried out in December 2014 in order to identify any potential ecological issues arising from the construction and operation of the proposed scheme.

The findings of this survey were collated with information obtained from previous ecological assessments of the site, conducted on behalf of DCWW and current data acquired from a desk-based study. This report assesses the ecological importance of the habitats present and the potential of the site to support protected species. This information has been used to provide recommendations for further surveys and mitigation.

The collated information indicates the potential for a number of protected species (and their habitats) which include great crested newt (GCN) (*Triturus cristatus*), bats and breeding birds. The site contains a range of habitats typical to rural North Wales, including those suitable to support badger (*Meles meles*), otter (*Lutra lutra*), water vole (*Arvicola amphibius*) and reptiles.

The current scope of works is deemed unlikely to have a significant impact on these habitats and species providing that sensitive working methodologies are adopted and mitigation is implemented. Changes to the scope of works may present the need to carry out further surveys and / or more extensive mitigation to offset the potential risks.

1 Introduction

1.1 Project Background

Dŵr Cymru Welsh Water Limited (DCWW) has commissioned Mott MacDonald Bentley (MMB) to design and build an Advanced Anaerobic Digestion (AAD) facility at the Five Fords Wastewater Treatment Works (WwTW), near Wrexham. To facilitate the design and planning of this facility a Preliminary Ecological Appraisal (PEA) of the site has been undertaken. An Extended Phase 1 Habitat Survey of the proposed construction footprint and surrounding habitat was carried out on the 9th, 10th and 11th of December 2014. The survey was conducted to identify any potential ecological issues arising from the construction and operation of the proposed scheme.

Five Fords WwTW is located, centred on Ordnance Survey Grid Reference SJ 36054 48054. The WwTW is situated in a predominantly rural area with the surrounding areas consisting of agricultural land, within the village and (ancient) parish of Marchwiell, approximately two kilometres to the south west of Wrexham. The WwTW is immediately bordered by areas of woodland, arable and pastoral fields and their associated hedgerows. The River Clywedog is on the northern boundary of the WwTW and the town of Marchwiell is located just south of the WwTW.

The boundary of the Five Fords WwTW is provided in Figure 1.1 below including surrounding land in the ownership of DCWW.

Figure 1.1: Survey Area Location Plan



Source:

The main proposed works at Five Fords WwTW consist of:

- The installation of a Thermal Hydrolysis Plant (THP);
- Provision of new hot water boiler to provide heat for the THP;
- Provision of a cake import facility;
- Provision of sludge storage silos;
- Provision of a dewatering facility (centrifuges or equivalent) for on-site sludge and liquid imports;
- Installation of a new polymer system for dewatering of on-site and liquid imports sludge;
- Construction of new post digestion storage tank, including installation of a coarse bubble diffusion system;
- Decommissioning of lime treatment plant, and post-digestion tank;
- Replacement centrifuges for dewatering of treated sludge cake;
- Modification / extension of treated sludge cake building; and
- Provision of a liquor treatment facility to reduce the liquors to an acceptable level, to be passed through the main works treatment process.

1.2 Scope of the Report

The purpose of this report is to provide an initial assessment of the ecological importance of the habitats in the areas relevant to the proposed works at the site and the potential for these areas to support protected ecological features and species.

This PEA report follows the Planning Policy Wales in relation to Biodiversity and Conservation. All relevant areas within the red line survey area covering an area of approximately 77ha were assessed and, where visible, habitats and features immediately outside of the boundary were surveyed.

This report includes reference to former ecological reports produced for Five Fords WwTW on behalf of DCWW since 2008 (AECOM 2008/9, Imtech Processes Ltd 2010, AMEC 2012 and Avian Ecology 2014).

The aims of this assessment are to:

- Identify and assess the nature conservation value of the habitats and species near and adjacent to the site; and to
- Provide recommendations on mitigation and compensation measures and, as appropriate, for more detailed ecological investigations.

The structure of this report is as follows:

- Section 1 – Introduction including background to the report;
- Section 2 – Results, interpretation and assessment; and
- Section 3 – Conclusion and recommendations.

1.3 Legislative Context and Policy Framework

The proposals must comply with the following international, European and domestic nature conservation legislation, relevant to ecological assessment:

- European Community (EC) Directive on the Conservation of Natural Habitats and of Wild Fauna and Flora (Habitats Directive, 1992) as amended (92/43/EEC);
- EC Directive on the Conservation of Wild Birds (Birds Directive, 1979) as amended (79/409/EEC);
- Bern Convention on the Conservation of European Wildlife and Natural Habitats (1979); and
- Convention on Biological Diversity (1992).

The Wildlife and Countryside Act 1981 (WCA) implements the Convention on the Conservation of European Wildlife and Natural Habitats (Bern Convention) and Council Directive 79/409/EEC, the Birds Directive. It is complemented by The Conservation of Habitats and Species Regulations 2010 (as amended) which consolidates all the various amendments made to the Conservation (Natural Habitats, &c.) Regulations 1994.

The Conservation of Habitats and Species Regulations provide for the designation and protection of 'European Sites' known as Special Protection Areas (SPA) for Birds and Special Areas of Conservation, and the protection of 'European Protected Species'. Under the Regulations, Competent Authorities, have a general duty, in the exercise of any of their functions, to have regard to the EC Habitats Directive. The Habitats Regulations define a "Competent Authority", as a Minister, a government office, a statutory undertaker or public body. Appendix A outlines species specific legislation.

Under Section 40(1) of the Natural Environment and Rural Communities (NERC) Act 2006 public bodies, including Local Authorities are required, 'to have regard to the conservation of biodiversity in Wales' when carrying out their normal functions. Under Section 42 of the Act a list of species of 'principal importance to the conservation of biodiversity in Wales' (commonly known as Section 42 species and habitats) was drawn up which acts as an aid to guide public bodies in implementing their duty. The Local Authority must consider the impact of the proposed development on protected habitats and species.

Planning Policy Wales outlines the land use planning policy for Wales set out by the Welsh Government. It provides a framework for the effective preparation of Local Planning Authorities' development plans. This is supplemented by twenty one topic based Technical Advice Notes (TAN). In particular TAN 5 - Nature Conservation and Planning provides advice about how the land use planning system should underwrite the protection and enhancement of biodiversity and geological conservation.

The Countryside Rights of Way Act 2000 (CRoW) increases measures for the management and protection for Sites of Special Scientific Interest (SSSI) and allows the relevant authorities to have regard to conserving and enhancing Areas of Outstanding Natural Beauty when performing their duties.

1.4 Methodology

In accordance with PEA guidance provided by Chartered Institute of Ecology and Environmental Management (CIEEM) the following methods have been adopted in this assessment.

1.5 Zone of Influence

The current guidance on ecological assessments (Institute for Ecology and Environmental Management, 2006) recommends that all ecological features that occur within a 'zone of influence' (Zol) for a proposed development are investigated. The Zol includes:

- Areas directly within the land take for the proposed development and access;
- Areas which will be temporarily affected during construction;
- Areas likely to be impacted by hydrological disruption; and
- Areas where there is a risk of pollution and noise disturbance during construction and/or operation.

The Zol is variable depending on the ecological receptors impacted by the proposed works.

1.6 Desk Study

A desk based study was undertaken to highlight existing data on designated sites, and protected and notable habitats and species within 2km of the site. This search radius was extended to 10km for Special Areas of Conservation (SAC) designated primarily for bat species. Records have been limited to those collected within the last ten years to regulate the validity of the data being reviewed. Areas of Ancient and Semi-Natural Woodland (ASNW) within 500m were also identified. Information was gathered from the following sources:

- Multi Agency Geographical Information for the Countryside (MAGIC) website (<http://www.natureonthemap.naturalengland.org.uk/MagicMap>);
- Cofnod North Wales Environmental Information Service(<http://www.cofnod.org.uk>);
- Five Fords Solar Array Report (Avian Ecology 2014);
- Five Fords Link Road Ecology Report (AMEC 2012);
- Access Bridge Improvements Ecological Report (Imtech Process Ltd. 2010);
- Five Fords Enhanced Digestion Facility Ecological Assessment (AECOM 2008);
- Biodiversity Action Reporting System (BARS) (<http://ukbars.defra.gov.uk/>); and
- Natural Resources Wales (formally the Countryside Council for Wales (<http://www.ccw.gov.uk/>)).

Biological records are summarised in Section 3.1 and provided in detail within Appendix B. Due to the large number of records, the raw data obtained from Cofnod is not included in this report.

1.7 Site Visit

1.7.1 Phase 1 Habitat Survey

A field survey, in the form of an Extended Phase 1 Habitat Survey was undertaken by an ecologist on 10th December 2014. All habitats within the site were identified and mapped in compliance with the 'Handbook for Phase 1 habitat survey: a technique for environmental audit' (Joint Nature Conservation Committee, 2010). Dominant plant species were noted, as were any protected, uncommon or invasive species listed on Schedule 9 of the WCA.

A Phase 1 Habitat Map was created for the site and is provided in Appendix C. Features of particular note were mapped as Target Notes (TN) and photographed. Target Notes are detailed in Appendix D in the format TN.1, TN.2 etc. Photographs can be found in Appendix E in the format E.1, E.2 etc.

1.7.2 Protected or Notable Species within the Zol

An assessment was also undertaken of the likely presence or absence of protected and notable animal species within the Zol of the proposed development. This was based on the known distribution of species, habitat suitability and/or direct evidence such as field signs or observations. The methodologies and assessment criteria used were based on current published guidance where available.

Any protected or notable species present within the survey area were recorded either by direct observation or indirectly from the presence of their field signs. For specific species the following methodologies were followed:

Badgers

The survey followed good practice guidelines as set out in Harris *et al.* (1989). Evidence of badger presence was searched for within the development area including: footprints; setts; latrines; paths; scratch posts at the base of tree trunks; snuffle holes; day nests and hair traces.

Otter

The otter survey was conducted on the River Clywedog in accordance with best practice outlined in '*The New Rivers and Wildlife Handbook*' (Ward *et al.* 1994, RSPB) and following guidance from 'Monitoring the Otter *Lutra lutra* Conserving Natura 2000 Rivers Monitoring Series No. 10' (Chanin, P., 2003).

Suitable otter habitats within the River Clywedog were searched for including resting sites such as holts (underground cavities in a river bank, often within a hollow tree between roots, rocky crevices, rabbit burrows etc.) and couches (nest-like structures formed in patches of vegetation above ground). Evidence of otter presence such as footprints, otter spraint (faeces), feeding remains (e.g. fish carcasses) and slides were also investigated.

Water Vole

The survey was conducted on the River Clywedog in accordance with best practice guidance outlined within '*Water vole guidance for planners and developers*' (English Nature, 2001).

The River Clywedog was surveyed for suitable water vole habitat, which includes slow moving water bodies and vertical embankments with grass as a suitable food source. Evidence of use such as burrows, latrines, footprints, pathways in vegetation, feeding remains, cropped grass and tunnel entrances were also sought.

Bats

The survey followed good practice guidelines as set out in the *Bat Mitigation Guidelines* (Mitchell-Jones, 2004) and *Bat Surveys: Good Practice Guidelines 2nd Edition* (Hundt, 2012). Trees on site were surveyed for evidence of, or potential for, roosting bats. The trees were categorised according to the criteria detailed in Table 1.2 below, based upon the features of trees commonly used by roosting bats, as identified in Table 1.3.

Table 1.2: Visual inspection criteria for the suitability of trees for roosting bats.

Tree Category	Description
Known or confirmed roost	-
Category 1*	Trees with multiple, highly suitable features capable of supporting larger roosts.
Category 1	Trees with definite bat potential, supporting less features than Category 1* trees or with potential for use by single bats.
Category 2	Trees with no obvious potential, although the tree is of a size and age that elevated surveys may result in cracks or crevices being found; or the tree supports some features which may have limited potential to support bats.
Category 3	Trees with no potential to support bats.

Table 1.3: Features of trees commonly used by bats for roosting and shelter, and field signs that may include use of trees by bats.

Features of Trees Used as Bat Roosts	Signs Indicating Possible Use by Bats
Natural holes	Tiny scratches around entry point.
Woodpecker holes	Staining around entry point.
Cracks / splits in major limbs	Bat droppings in, around or below entrance.
Loose bark	Audible squeaking at dawn or in warm weather.
Hollows / cavities	Flies around entry point.
Dense epicormic growth (bats may roost within it)	Distinctive smell of bats.
Bird and bat boxes	Smoothing of surfaces around cavity.

Great Crested Newt (GCN) Habitat Suitability Index

The habitat suitability index (HSI) of ponds is calculated as a means of evaluating habitat quality and quantity (Oldham *et al*, 2000). A HSI is a numerical index between 0 and 1. 0 indicates unsuitable habitat, 1 represents optimal habitat. It incorporates ten suitability indices, all of which are factors that affect GCNs.

$$HSI = (SI1 \times SI2 \times SI3 \times SI4 \times SI5 \times SI6 \times SI7 \times SI8 \times SI9 \times SI10)^{1/10} \text{ or}$$

$$HSI = (\text{location} \times \text{pond area} \times \text{pond drying} \times \text{water quality} \times \text{shade} \times \text{fowl} \times \text{fish} \times \text{ponds} \times \text{terrestrial habitat} \times \text{macrophytes})^{1/10}$$

The ten suitability indices (SI) are scored for a pond, in the field and from map work using Oldham *et al*. (2000) as a guideline to give each index a value. The ten field scores are then converted to SI scores, on a scale from 0.01 to 1. The ten SI scores are then multiplied together. The tenth root of this number is then calculated $(X)^{1/10}$

Table 1.4: Categorisation of HSI scores

HSI	Pond Suitability
<0.5	Poor
0.5- 0.59	Below average
0.6- 0.69	Average
0.7- 0.79	Good
>0.8	Excellent

Source: Oldham *et al*, 2000

1.8 Limitations

Biological records obtained from third parties and presented in the desk study do not represent a full and complete species list for the area. They are mostly given by individuals on an *ad hoc* basis, often meaning there are areas of deficiency in the data.

Ecological surveys are limited to factors which affect the presence of plants and animals, such as time of year, migration patterns and behaviour. With a single site visit it is possible that certain species may have been overlooked or under-recorded during the assessment as optimal survey periods vary from species to species.

The survey was conducted in December during which season, the growth of plants and the activity of animals is greatly reduced. Additionally, due to access restrictions for the adjacent farmland, some features could not be fully assessed.

This PEA therefore cannot be considered to provide a wholly comprehensive account of the ecological interest of the WwTW and it should be noted that this report does not constitute an Ecological Impact Assessment (EclA). The survey does, however, provide a 'snapshot' of the ecological interest present on the day of the survey visit.

2 Results, Interpretation and Assessment

2.1 Results

2.1.1 Desk Study

A desk study was undertaken to identify key species and habitats near and adjacent to the site. The results are presented in the following sections.

2.1.1.1 Designated Sites

Statutory Designated Sites

One statutory designated sites was identified with a 2km radius of the site was identified and details of the site name and its designation are provided in Table 2.1 below.

Table 2.1: Statutory Designated Sites located within 2km of the site.

Site name	Designation	Description	Proximity to WwTW
Sontley Marsh	Site of Special Scientific Interest	Mosaic of fen, swamp, and marshy grassland with damp neutral grassland, scrub, broadleaved woodland, hedges, ditches and streams. This mixture of habitats is important for wildlife including birds and mammals such as badgers and otter. Contains an important assemblage of peatland invertebrates as well as dragonflies and damselflies.	2km W

Source: MAGIC and CCW

Non-Statutory Designated Sites

There are 3 Local Wildlife Sites (LWS) located within 2km of the WwTW as detailed in Table 2.2.

Table 2.2: Non-statutory Sites

Site name	Designation	Description	Proximity to WwTW
Marchwiell Marsh	LWS	Marshy field between school and disused railway line. Past improvement has led to it being dominated by rushes; hard rush, soft rush and jointed rush are all abundant.	S, immediately adjacent to WwTW
Cefn Park	LWS	This site is a series of broadleaved woodlands within Cefn Park Estate. Part of the wood has been under planted with conifers which are not thriving.	1.5 km N
Erddig Estate	LWS	National Trust estate with woodlands, semi-improved neutral grasslands and marshes. The woodlands have a lot of planted beech but there is also much oak, sycamore and ash. There are also areas of wet alder woodland. The amount of mature trees in the park is exceptional and these have correspondingly excellent insect communities with 12 notable species and 1 red data species discovered.	1.7km W

Source: COFNOD

There are 26 Ancient Semi Natural Woodlands and Restored Ancient Woodlands within 2km of the WwTW, the closest of which are Marchwiell Covert, located within the WwTW boundaries and Black Wood, located within 100m north of the WwTW.

2.1.1.2 Protected Species Records

Cofnod North Wales Environmental Information Service provided records of protected species that occur within 2km of the proposed development. Current records that were received (identified as being after the year 2005) can be found in Appendix B, a summary of species are listed in Table 2.3 below including records from Sites of Special Scientific Interest (SSSI) sites within 2km.

Table 2.3: Recent protected species found within 2 km of this development (species highlighted in red is sensitive information and should not be released into the public domain).

Table Heading Left	Location	Source
GCN	Confirmed presence on DCWW land	Cofnod
Badger	1.50km NW	Cofnod
Bat species	0.45km SW	Cofnod
Grass snake	0.98km E	Cofnod
Skylark	2.00km NE	Cofnod
Lapwing	0.60km S	Cofnod
Water vole	1.40km SE	Cofnod
Otter	2.00km W	MAGIC and NRW (within Sontley Marsh SSSI)

Source: Cofnod North Wales Environmental Information Service, MAGIC and CCW

Mammals

A small number of mammals were recorded within 2km of the site. European protected species include whiskered bat (*Myotis mystacinus*), and records of WCA Schedule 5 species include water vole (*Arvicola amphibius*).

In addition badger (*Meles meles*), brown hare (*Lepus europaeus*) and European hedgehog (*Erinaceus europaeus*) were also recorded.

Birds

A number of bird species were recorded within 2km of the site. A large proportion of the species recorded were passerine species (suited to grasping branches and similar structures).

Protected species records returned include the WCA Schedule 1 species redwing (*Turdus iliacus*), fieldfare (*Turdus pilaris*) and goldeneye (*Bucephala clangula*). Notable species recorded include UK BAP, Birds of Conservation Concern (BoCC) and Schedule 42 species such as the spotted flycatcher (*Muscicapa striata*).

2.1.1.3 Conservation Area and Tree Preservation Order Records

Wrexham County Borough Council (WCBC) was contacted regarding potential conservation areas and Tree Preservation Orders (TPOs) within the proposed construction footprint or in the near vicinity. They advised that there are no TPOs within the search area.

2.1.2 Site Visit

2.1.2.1 Protected or Notable Species

Mammals

No evidence of mammals were observed during the survey.

Birds

Several bird species were observed during the survey including pied wagtail (*Motacilla alba yarrellii*) and carrion crows (*Corvus corone*). These were found around the sewerage structures. Lapwings have been confirmed to nest within an area of bare ground in the WwTW, outside of the proposed works area (Avian Ecology, 2014) and have been observed around the old sludge lagoons during previous surveys (AECOM, 2008) (TN.3, E.10, E.11, E.13 and E.14).

A flock of male European goldfinches (*Carduelis carduelis*) and a grey heron (*Ardea cinerea*) were observed along the Clywedog River, northeast of the sewerage treatment works.

Reptiles and Amphibians

No visual evidence of reptiles or amphibians was observed during the survey.

Invasive species

No invasive species were observed on site. However, a previous study carried out by AECOM (2008) observed Himalayan balsam (*Impatiens glandulifera*) and Japanese knotweed (*Fallopia japonica*) on the banks of the River Clywedog.

2.1.2.2 Habitats

The following habitat types, described below, were noted within the WwTW land ownership boundary during the survey that may be impacted by the development.

Amenity grassland

There were three large areas and a number of smaller areas of amenity grassland within the WwTW land ownership boundary (E.1, E.2, E.3, E.23, E.24 and E.32). There was also a playing field within the southwest corner, adjacent to the Marchwiel Marsh Community Nature Reserve (E.48).

Arable

There were six arable fields within the WwTW land ownership boundary, three to the east and three in the west (E.28 and E.44).

Bare ground

There were two areas of bare ground within the WwTW land ownership boundary. The larger area was being used as a car park for a site compound.

Broadleaved woodland

There were two areas of broadleaved woodland within the WwTW land ownership boundary. The largest area (approximately 38ha), Marchwiell Covert, was an unmanaged ancient broadleaved woodland with a slow flowing wet ditch running through the centre. Tree species included oak (*Quercus* sp.), sycamore (*Acer pseudoplatanus*), common ash (*Fraxinus excelsior*), ivy (*Hedera helix*) and bramble (*Rubus fruticosus* agg.) (TN.31, E.62, E.63, E.64, E.65 and E.66).

The area of woodland located in the north of the WwTW land ownership boundary forms part of a river corridor as well as bordering the current WwTW.

Buildings and infrastructure

The Five Fords WwTW infrastructure comprises reservoirs, sludge lagoons, pumping stations, storage areas, offices and clarifiers (E1 to E.9, E.13, E.18, E.20, E.22 to E.31, E.34 to E.41 and E.43 to E.45).

Within the northeast corner of the WwTW land ownership boundary there was an old farm building located within 50m west of the current access road. The building was single story, constructed from brick with a slate pitched roof. The main entrances have been boarded up (TN.1, E.77) and had previously been modified to function as a bat roost (Avian Ecology, 2014).

Ephemeral

There was an area of ephemeral habitat located around the old sludge lagoon (TN.4, E.10, E.11, E.13 and E.14). The ground comprised of stones of various size with vegetation growing through. The vegetation comprised of dock species (*Rumex* sp.), stinging nettle (*Urtica dioica*), teasel species (*Disacus* sp.) and rosebay willow-herb (*Chamerion angustifolium*).

Hedgerows

Several of the hedgerows within the WwTW land ownership boundary located west of the sewage works active area, were species poor.

There were also several species rich hedgerows, the majority of which were located immediately south of the dismantled railway line bordering the nature reserve and its connecting fields (E.47 and E.58). One species rich hedgerow bordered the western section of the current construction area, southeast of the site (TN.6 and E.21). This hedgerow comprised of oak, willow species (*Salix* sp.), hawthorn (*Crataegus monogyna*), hazel (*Corylus avellana*), elder (*Sambucus nigra*) and bramble.

Hard standing

The majority of the open area surrounding the buildings and infrastructure of the WwTW comprised of roads, footpaths and a car park area (E.1, E.3 to E.9, E.20, E.22, E.25, E.26, E.29 and E.31 to E.41).

Improved grassland

An improved grassland field was found in the northeast corner of the WwTW land ownership boundary, bordering the western access road. An old farm building was situated within it (TN.1 and E.77).

Marshy grassland

One area of marshy grassland was identified within the nature reserve just south of the dismantled railway line (TN.11, TN.13, E.47 to E.60). Species composition includes rosebay willow-herb, bramble, common bulrush (*Typha latifolia*), common hogweed (*Heracleum sphondylium*) and rush species (*Juncus* spp.). There were also five ponds located within the marshy grassland.

Semi-improved grassland

Within the WwTW land ownership boundary there were three semi-improved grassland fields, one of which was directly southeast of the woodland (E.69). There were also two semi improved fields adjacent to the main road north of Marchiwiel village (T.21). Both were being used as paddocks for grazing horses. The field furthest east had previously been furrowed. Rushes were observed within the semi-improved grassland patch adjacent to the marshy grassland. Seasonality limited the identification of further species.

Running water

The River Clywedog borders the WwTW in the north of the site. The majority of the river (flowing west to east) was fast flowing with a slow section located immediately west of the Five Fords Bridge and ranged from 1.0 to 5.0m in width and 0.5 to 1.0m in depth. The river substrate was comprised primarily of stones, gravel and silt with occasional boulders. The banks had a relatively vertical profile and were comprised of earth with sections constructed from man-made reinforcements, particularly on the northern section bordering a residential property. The bank vegetation was dominated by short grasses with frequent bankside trees and occasional scattered scrub. No disturbance of the river was noted.

A few slow flowing wet ditches were observed around the WwTW footprint (D.65, D.66 and D.75).

Scattered broadleaved trees

A number of scattered trees (oak) are found within the WwTW land ownership boundary with the majority situated within the hedgerows (TN.9, TN.7, D.19 and D.41). Mature and semi-mature trees lined the banks of the River Clywedog (TN.28).

Scrub

There were areas of dense continuous scrub mainly comprising of bramble, along the southern edge of WwTW land ownership boundary bordering the dismantled railway line. Other areas of dense scrub were located in southeast corner surrounding the retention pond and also in the northern area of the site bordering the River Clywedog.

Standing water

There were thirteen ponds within the WwTW land ownership boundary (E.16, E.51, E.52, E.55, E.59, E.60, E.71, E.72, E.73 and E.74) and more than thirty ponds located in a 500m area within and surrounding the WwTW land ownership boundary.

Tall ruderal

Two large areas of tall ruderal were located within the WwTW land ownership boundary. The largest area was located along the River Clywedog, also bordering an area of amenity grassland. Another area of tall

ruderal was located along the edge of the dismantled railway line. A third patch was located adjacent to the active construction area (E.1 and E.16). The tall ruderal species observed primarily comprised of rosebay willow herb, teasel and dock species.

2.2 Interpretation

The results of the desk study and site visits are discussed under the appropriate headings below.

2.2.1 Designated Sites

The Sontley Marsh SSSI is unlikely to be affected by the proposed scheme due to the scale, nature and distance from the development.

2.2.2 Protected or Notable Species

Badger

The grasslands, woodland, tall ruderal and scrub all provide suitable habitat for badgers. Badger footprints were observed along a track within a semi-improved grassland area (E.78). A potential old badger sett was observed within the broadleaved woodland (TN.32, E.67 and E.68). This appears to be currently used by rabbits but indicates that the habitat is suitable for badgers.

Otter

The River offered suitable otter commuting habitat (TN.27) and previous studies found evidence of otter along the river (Imtech Process Ltd, 2010). The ponds and marshy grassland may also provide suitable food sources (fish and/or amphibians). Otters may use the grassland habitats as commuting sites to gain access to these suitable foraging areas around the site.

Water Vole

The river habitat was deemed unsuitable for water vole due to the fast flowing and frequent flooding nature of the river. As no evidence of water voles was observed and the site does not contain suitable habitat for this species, this species is no longer considered within this assessment.

Dormouse

No records of dormice were returned within the biodiversity records search and no suitable habitat was observed on site, as such this species is no longer considered within this assessment.

Bats

The scattered trees near the THP development area were assessed for their potential to support roosting bats, the results of which can be found below in Table 2.4.

Table 2.4: Scattered tree survey results

Tree No.	Species	Condition	Features Suitable for Roosting Bats	Evidence of Roosting Bats	BCT Tree Category (Hundt, 2012)	Photo No.
T1 (TN.9)	Oak	Mature, single stemmed tree (immediately east of the southern section of the woodland) with dense ivy cover	Dense ivy cover may support bats and hide suitable features	None	2	E.41
T2 (TN.7)	Oak	Mature, single stemmed tree (south of the earth bank)	Tree is of a size and age that elevated surveys may result in cracks or crevices being found	None	2	E.19
T3 (TN.7)	Unidentified	Mature tree	-	-	-	-
T4 (TN.8)	Sycamore	A young sycamore tree with a damaged branch	None	None	3	-
T5 (TN.8)	Unidentified	A young tree	None	None	3	-

The old barn building on the western side of the access road (TN.1 and E.77) is a confirmed bat roost.

There is suitable foraging habitat for bats around the river corridor, ponds, hedgerows, woodland, marshy grassland and around the semi-improved grassland, where there is likely to be an abundance of their invertebrate prey (E.64, E.69, E.71, E.74, E.79).

Birds

Habitats holding breeding bird suitability include hedgerows (TN.6, E.21 and E.58), scrub, woodland trees and scattered trees (TN.7, TN.31, E.58, E.63 and E.64). Lapwings and other ground nesting birds could nest within the grassland and tall ruderal areas within and around the development area (E10, E.11, E.13, E.14, E.16, E.44, E.57 and E.69).

Several species were observed on site including crows and wagtails. Non-breeding lapwings have been spotted within the habitats adjacent to the previous sludge lagoon structures (TN.3) (AECOM, 2008). A flock of male European goldfinches and a grey heron were spotted within nearby habitats on DCWW land and could potentially utilise other suitable habitats within and/or near the development area of the Thermal Hydrolysis Plant.

Great Crested Newts

Some areas within the boundary surveyed provide suitable habitat for GCNs. These include several ponds within 500m of the proposed works, the marshy grassland, under the hedgerows, within the broadleaved woodland and the areas of tall ruderal, and dense scrub. The hedgerows provide suitable connecting habitat for commuting between ponds.

Each of the ponds was assessed to generate a habitat suitability index (HSI) (Oldham, 2000) to determine whether further surveys are required. The summary of which can be found in Table 2.5.

Table 2.5: Habitat Suitability Index for each of the ponds located within the DCWW boundary and 500m of the proposed development

Pond/ Target Note number	Habitat Suitability Index	Pond Suitability for GCNs	GCN Survey Required?
35	0.37	Poor	No
36	0.37	Poor	No
37	0.60	Average	Yes
38	0.68	Average	Yes
34	0.00	Poor	No
13	0.40	Poor	No
12	0.70	Good	Yes
14	0.76	Good	Yes
15	0.52	Below Average	No
16	0.38	Poor	No
17	0.37	Poor	No
18	0.64	Average	Yes
19	0.55	Below Average	No
20	0.43	Poor	No

The biodiversity records indicate that this species has been previously found within DCWW owned land (Cofnod, 2015) and prior surveys have confirmed their presence (Imtech Process Ltd, 2010).

Reptiles

As common reptile species were recorded in the biodiversity records search and the site offers some potential habitat; the site is considered to be a suitable site to support a number of species.

Habitats suitable for reptile foraging include the semi-improved grassland and tall ruderal vegetation. The vegetation piles on site provide potential hibernacula (TN.25). The species rich hedgerow, located along the eastern section of the access road, also provides potential hibernation habitat within the root system.

Invasive Species

No invasive species were observed on site. However, a previous study carried out by AECOM (2008) observed Himalayan balsam and Japanese knotweed on the banks of the River Clywedog.

Rabbits have been seen on site by the site operatives and mole hills were observed within the amenity grassland around the site.

2.2.3 Notable Habitats

Hedgerows

Several hedgerows observed during the survey were considered to be species rich in accordance with the hedgerow survey handbook (the minimum number of species to comprise a species rich hedgerow is five) (Defra, 2007). One hedgerow surveyed was of particular interest due to its location. It was observed west of the current active construction site and comprised of six different species (TN.6 and E.21).

All hedgerows are potential breeding bird habitats during the breeding season (March- September) and their roots are potential hibernation spots for reptiles (November to March). They also provide linear structures that could be utilised by commuting bats and GCN.

2.3 Assessment

The proposed works have the potential to cause impacts on protected or notable species and habitats as indicated in Table 2.6 below:

Table 2.6: Assessment Summary

Feature	Location	Level of Protection	Assessment
Notable Habitats			
Hedgerow	Along the western bund that surrounds the area of active construction (TN.6)	Important hedgerows are protected under the Hedgerow Regulations 1997. All native hedgerows are listed under Section 42 species of principal importance under the NERC Act in Wales.	The proposed works will not impact on this habitat.
Protected or Notable Species			
Badger	Within the woodland, grasslands, ephemeral, tall ruderal and scrub.	Fully protected under the Protection of Badgers Act 1992.	The survey area contains suitable foraging habitat for this species.
Otter	On the River Clywedog, within the ponds, the marshy grassland and the habitats surrounding the current active site	Otters are fully protected under the Conservation of Habitats and Species Regulations 2010 and the WCA. Otters are listed under Section 42 species of principal importance under the NERC Act in Wales.	The survey area contains suitable habitat for this species. Otter may forage around the site and are not limited to the river corridor.
Bats	The most easterly point of the woodland (TN.9) and south of the earth bank lining the sewage works (TN.7)	Bat species and their roosts are fully protected under the Conservation of Habitats and Species Regulations 2010 and the WCA. Various bat species are also listed under Section 42 species of principal importance under the NERC Act in Wales.	The survey area contains suitable roosting and foraging habitat for this species group. The proposed works will not impact on this habitat.
Breeding Birds	Within the hedgerows, trees, ephemeral, tall ruderal, scrub and grasslands around the active site	All breeding birds are fully protected under the Conservation of Habitats and Species Regulations 2010 and the WCA.	The survey area contains suitable foraging and nesting habitat for this species group.
Great Crested Newts	The standing water bodies, ephemeral, tall ruderal, scrub, grasslands and hedgerows surrounding the site.	Great Crested Newts are fully protected under the Conservation of Habitats and Species Regulations 2010 and the WCA. Great Crested Newts are listed under Section 42 species of principal importance under the NERC Act in Wales	The survey area contains suitable breeding ponds and foraging habitat for this species
Reptiles	Within the different grasslands, tall ruderal,	Reptiles are afforded varying degrees of protection under	The survey area contains suitable habitat for this species

Feature	Location	Level of Protection	Assessment
	ephemeral, scrub, earth bank, dismantled railway, woodland and hedgerows that surround the site.	WCA. All reptiles are listed under Section 42 species of principal importance under the NERC Act in Wales.	
Invasive species			
Invasive species: Himalayan balsam and Japanese knotweed	On site, particularly along running water	Himalayan balsam and Japanese knotweed are listed on Schedule 9 of the Wildlife and Countryside Act; it is an offence to plant or otherwise cause to grow these species in the wild.	These species have been previously recorded on site during the 2008 surveys by AECOM.

3 Conclusions & Recommendations

3.1 Conclusions

A PEA survey was undertaken to assess the potential impact on protected and notable habitats and species relating to the proposed works at Five Fords WwTW near Wrexham. The WwTW is situated in a predominantly rural area with the surrounding areas consisting of agricultural land, within the village and (ancient) parish of Marchwiell. Desk top studies and field survey work have identified that the active site has low ecological value but the surrounding habitat has medium to high value. The site is deemed to have suitable habitats to support badger, otter, water vole, bats, breeding birds, great crested newts and reptiles. Based on the proposed works, appropriate construction actions in relation to species have also been provided in the form of further surveys and mitigation.

Designated sites do not present ecological constraints to the proposed works. Sontley Marsh SSSI is located 2km west of the site and primarily designated for the mosaic of wetland habitats. It is deemed outside of the Zone of Influence of the development. However, there are three non- statutory designated sites located within 2km. These are local wildlife sites including Marchwiell Marsh which is located immediately south of the WwTW and was surveyed during the site visit. If the advice provided within this report is adhered to, the development will have negligible ecological impact on these sites.

The main habitat types in the active area of the WwTW include amenity grassland, hardstanding and wastewater treatment infrastructure which provide limited ecological value. The arable land surrounding the west and eastern sections of the site also offer negligible ecological value. However, the mosaic of the following habitats: broadleaved woodland, ephemeral vegetation, hedgerows, semi-improved grassland, marshy grassland, wet ditches, ponds, scattered trees and tall ruderal offers medium to high ecological value which may be impacted by the development.

There is potential for a number of protected or notable species to be present either within or adjacent to the WwTW. These species include reptiles, great crested newts, breeding birds, badgers, bats, otters, invasive and pest species. These put ecological constraints on the development. Therefore, further surveys are required and mitigation must be implemented in order to comply with planning and legislative requirements. The surveys and mitigation methods are highlighted within Table 3.1 below.

Table 3.1: Summary of Recommendations

Feature	Location	Implications and Recommendations
Hedgerow	Lining the western bund that surrounds the area of active construction (TN.6)	Several hedgerows were classified as a species rich hedgerow and have potential to be classed as important hedgerows according to the Hedgerow Regulations. Avoidance of any hedgerows is therefore recommended. However, if avoidance is not possible, a hedgerow removal notification will need to be submitted to the Council 6 weeks before removal is due to begin. If removal is approved sensitive clearance methods will be required due to the potential for breeding birds, hibernating reptiles and great crested newts. The vegetation clearance should be undertaken outside of the bird breeding season and before reptiles go into hibernation, i.e. between the end of August and the end of October. If it is not possible to avoid breeding bird season, a pre-works check will be required. This will identify any nesting birds within the hedgerow to inform further action. It is also recommended that replacement planting is undertaken to offset any removal of this habitat type. Whilst it is not anticipated that the construction works will have any impact on this hedgerow the sensitivity of this feature is noted. Tool box talks should be given to all those working on site. If any evidence of breeding birds is observed works should

Feature	Location	Implications and Recommendations
cease and advice should be sought from a suitably qualified ecologist.		
Protected Species		
Badger	Within the woodland, grasslands, ephemeral, tall ruderal and scrub.	No active setts were observed on site. However, as footprints were found, there is the potential that badgers could create setts during the interval between this survey and the start of works. Therefore, as a precautionary measure, a badger sett pre-works check should be performed 6 weeks in advance of the works. If setts are found near the work area during this survey, a licence could be required. As a general guideline: using very heavy machinery within 30 meters of any entrance to an active sett, and lighter machinery (particularly and digging operations) within 20 meters, or light work such as hand digging or scrub clearance within 10 meters, all require a licence. Licences to close setts are not normally granted between December and June inclusive. It should be noted that badgers are curious and will enter construction sites. Any excavations left open should be covered at night to prevent badgers falling in, or a plank of wood should be left resting on the side, to allow any trapped animals to climb out. Tool box talks should be provided to all those working on site. If any evidence of badger activity is found, work should cease immediately until advice has been obtained from a suitably qualified ecologist.
Otter	On the River Clywedog, within the ponds, the marshy grassland and the habitats surrounding the current active site	Otters may utilise the habitat around the current active site to gain access to suitable foraging areas. Otters are curious and will enter construction sites. Any open excavations should be covered at night to prevent otters falling in, or a plank of wood should be left resting on the side, to allow trapped animals to climb out. A tool box talk should be provided to all those working on site. If any evidence of otter activity is observed, work should cease immediately until advice has been obtained from a suitably qualified ecologist.
Bats	The most easterly point of the woodland (TN.9) and south of the earth bank lining the sewage works (TN.7)	Three mature trees on site potentially offer bat roosting suitability. They are currently classified as category 2 trees as further surveys may result in cracks or crevices being found. Where avoidance is not possible it is recommended that further inspections are made to fully assess the bat potential of these trees. It is not anticipated that these trees will be adversely affected by the construction. The collection of structures comprising the liming tanks may be made redundant under the new development scheme. These structures may therefore be dismantled. Should this occur an assessment of the structures for bat roosting suitability will be required prior to the dismantling. Tool box talks should be given to all those working on site. If any evidence of bat activity is found, work should cease immediately until advice has been obtained from a licenced and experienced bat ecologist or Natural Resources Wales.
Breeding birds	Within the hedgerows, trees, ephemeral, tall ruderal, scrub and grasslands around the active site	To minimise any potential impact or disturbance on protected breeding birds, any vegetation clearance should be undertaken outside the bird breeding season, from September to late February. This will be performed under ecological supervision (to minimise impacts on any other species). If vegetation clearance is unavoidable during the breeding bird season, a pre-works check by a suitably experienced ecologist will be required. Nests of species other than pest species found to be active within the area of proposed works will be marked out with a buffer zone of 5m (species dependent) from the nest until chicks have fledged. This can take three to four weeks. A general licence can be used to remove the nest of 'pest species' (i.e. pigeon) for reasons of health and safety if non-lethal control methods are deemed ineffective or impractical by an authorised person.

Feature	Location	Implications and Recommendations
		Tool box talks should be provided to all those working on site. If any evidence of nesting birds is found, work should cease until advice has been obtained from a suitably qualified ecologist.
Great crested newt	The standing water bodies, ephemeral, tall ruderal, scrub, grasslands and hedgerows surrounding the site.	GCN surveys of ponds 37, 38, 12, 14 and 18 will be required. These will incorporate three of the following methods: egg searching, netting, torching and bottle trapping. If GCNs are present then it may be necessary to apply for a mitigation licence dependent on the final design. A newt survey was undertaken over the summer of 2015 (Mott MacDonald, 2016) which has determined that the works has the potential to adversely affect GCN in the area. A derogation licence will need to be obtained from Natural Resources Wales to ensure all GCN are removed from the construction area prior to works commencing. In areas where the likelihood of encountering GCN is low such as the compound area a Reasonable Avoidance Method Statement will be used. Any vegetation removal, such as hedgerows, will require a method statement to cover great crested newts (as well as breeding birds and reptiles). A tool box talk should be provided to all those working on site. If any evidence of GCN activity is observed, work should cease immediately until advice has been obtained from a suitably qualified ecologist.
Reptiles	Within the different grasslands, tall ruderal, ephemeral, scrub, earth bank, dismantled railway, woodland and hedgerows that surround the site.	The development has the potential to damage suitable reptile habitat. Should this occur mitigation will be required. Fencing will be installed around the development area with mats placed within the area which will enable the capture any reptiles which will be released outside of the development area. This mitigation will also need to incorporate GCNs if GCNs are found within the ponds (as a result of further surveys). If GCNs aren't found then a habitat management plan is recommended. This will make the habitat unsuitable for reptiles to avoid harming or killing any reptiles during the works. The method will involve a phased vegetation clearance under ecological supervision. It will be required to be performed during the active reptile season and the new vegetation height will then need to be maintained throughout the works. This habitat management plan will also incorporate ground breeding birds and GCN. Tool box talks should be given to all those working on site. If any evidence of reptile activity is found on site advice should be immediately obtained from a suitably qualified ecologist.
Invasive and Pest species		
Invasive species: Himalayan balsam and Japanese knotweed	On site, particularly along running water	No invasive species were observed on site within the construction area but due to seasonal constraints these could have been missed. Also, Japanese knotweed and Himalayan balsam have been previously recorded along the river. An opportunity to inspect the construction area Tool box talks for each species should be provided to all those working on site. If any evidence of invasive species is observed, works should cease immediately until advice has been obtained from a suitably qualified ecologist.
Rabbits and moles		If construction is to take place within an area of rabbit holes or mole hills, it is recommended that any excavations are formed slowly enough to allow rabbits and moles to escape. Causing unnecessary harm to any mammal species is prohibited under the Wild Mammals (Protection) Act 1996.

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Appendices

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Appendix A. Species Specific Legislation

Badger

Badgers (*Meles meles*) and their setts are protected under the Protection of Badgers Act 1992. It is an offence to destroy a sett, or to kill, injure or disturb a badger.

Otter

Otters (*Lutra lutra*) are fully protected under the EU Habitats Directive and the Wildlife & Countryside Act 1981 (as amended), and are listed under Section 42 of the Natural Environment and Rural Communities Act (NERC) Act (2006) as a species of principal importance for conservation of biological diversity in Wales. It is an offence to destroy otter resting places, kill, injure or disturb otters whilst in their resting places.

Water Vole

Water voles are fully protected under the Wildlife and Countryside Act 1981 (as amended). In summary it is an offence to intentionally kill, injure or capture a water vole; intentionally or recklessly damage, destroy or obstruct access to any structure which water voles use for shelter or protection; or disturb water vole while they are using such a place. Water voles are also listed on Section 41 of the NERC Act 2006.

Dormouse

Dormice are protected under the Wildlife and Countryside Act (1981, as amended) and are listed in Schedule 2 of the Conservation of Habitats and Species Regulations 2010. Under the current legislation it is illegal to intentionally or deliberately kill, injure or capture dormice, deliberately disturb dormice (whether in a nest or not); or to damage, or destroy dormouse breeding sites or resting places. Any activity that would result in a contravention of the above legislation would likely require an EPS licence from the relevant statutory body.

Bats

All UK bat species and their roosts are fully protected under the EU Habitats Directive and the Wildlife & Countryside Act 1981 (as amended) and several species are listed under Section 42 of the Natural Environment and Rural Communities Act (NERC) Act (2006) as species of principal importance for conservation of biological diversity in Wales. Bats are protected from being killed, injured or disturbed. All bat roost/resting sites are protected from damage and destruction.

Birds

All breeding birds, their eggs and nests are fully protected under the EC Birds Directive and the Wildlife & Countryside Act 1981 (as amended). This means it is an offence to disturb birds from the point they begin building a nest, to when the young have fledged. Bird species listed under Schedule 1 of the WCA such as Barn owl (*Tyto alba*) are afforded greater protection under The Act. In addition it is an offence to disturb Schedule 1 birds at the nest or the dependant young of Schedule 1 birds.

Great Crested Newts and Natterjack Toads

Great crested newts (GCN) and natterjack toads (*Bufo calamita*) are fully protected under Schedule 5 of the Wildlife and Countryside Act (1981, as amended) and the Conservation of Habitats and Species Regulations 2010. It is illegal to possess a protected species (alive or dead), deliberately capture, injure or kill, to intentionally or recklessly disturb, or to deliberately take or destroy the eggs of these protected species. It is also illegal to damage, destroy or intentionally or recklessly obstruct access to a breeding or resting place used by these protected species. All life stages of great crested newts and natterjack toads are afforded the same level of protection. In order to undertake any activity which would otherwise result in any of the above offences being committed, it may be necessary to obtain a European Protected Species (EPS) licence from the relevant statutory body. It is possible to undertake surveys which would otherwise involve unlawful acts, such as disturbance, by obtaining a survey license which provides authorisation for scientific and educational purposes

Reptiles

Widespread reptiles are protected under the Wildlife and Countryside Act 1981 (as amended). It is an offence to intentionally kill, injure or trade common lizard (*Lacerta vivipara*), slow-worm (*Anguis fragilis*), grass snake (*Natrix natrix*) and adder (*Vipera berus*).

Wild mammals

All wild mammals are protected under the Wild Mammals (Protection) Act (1996). It is an offence to kick, beat, nail or otherwise impale, stab, burn, stone, crush, drown, drag or asphyxiate any wild mammal with intent to inflict unnecessary suffering.

Hedgerow

The Hedgerow Regulations (1997) prohibit the removal of countryside hedgerows (excluding garden hedges) without first submitting a hedgerow removal notice to the LPA. In considering the removal notice, the LPA can order the retention of 'important' hedgerows. The regulations set out the criteria under which hedgerows are considered important. Important hedgerows are protected from removal by the Hedgerow Regulations 1997.

For the purposes of the Hedgerow Regulations (1997), a hedgerow is classified as 'important' if it, or the hedgerow of which it is a stretch:

- Has existed for 30 years or more; and
- Satisfies at least one of the criteria listed in Part II of Schedule 1.

All native hedgerows (including species-poor ones) are listed under Section 41 of the NERC Act (2006) and are a Local Biodiversity Action Plan (LBAP) habitat. All native hedgerows are considered to be of high conservation value.

Section 42 list

Section 42 is a list of habitats and species of principal importance for the conservation of biodiversity in Wales. The list contains all UK Biodiversity Action Plan (BAP) priority habitats and species known to occur in Wales in addition to species of particular conservation significance in Wales. The production of the list is a requirement of the Natural Environment and Rural Communities Act 2006, and it will be used to guide

and prioritise future conservation action in Wales. It supersedes the Section 74 list ('Going Wild in Wales 2003').

Invasive Species

Giant hogweed, Himalayan balsam and Japanese knotweed are listed on Schedule 9 of the Wildlife and Countryside Act 1981, which makes it an offence to plant or cause to grow (spread) these species in the wild. Anyone convicted of an offence under the above legislation may face a fine of £5,000 or six months' imprisonment for a summary conviction or an unlimited fine or two years' imprisonment on indictment.

Inappropriate disposal of these species may lead to prosecution under the Environmental Protection Act 1990.

Appendix B. Protected Species Records

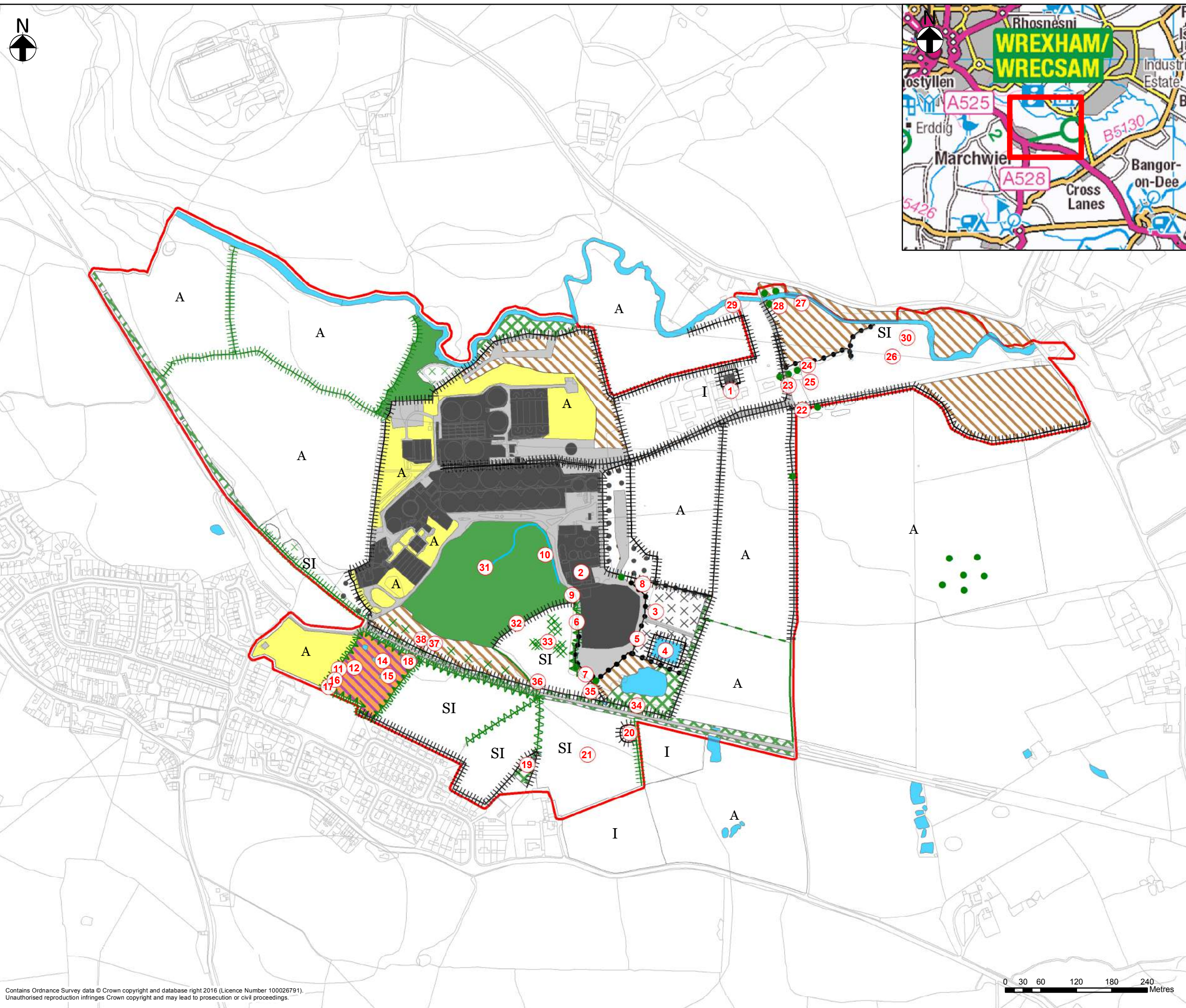
Table B.1: Protected species found within 2 km of this development (recorded after 2005)

Species	Latin Name	Approximate distance and direction to site
Reptiles and Amphibians		
Great crested newt	<i>Triturus cristatus</i>	0m
Smooth newt	<i>Lissotriton vulgaris</i>	0.3km SW
Grass snake	<i>Natrix natrix</i>	1.0km E
Common toad	<i>Bufo bufo</i>	1.2km SE
Common frog	<i>Rana temporaria</i>	1.2km SE
Slow worm	<i>Anguis fragilis</i>	2.1km NE
Adder	<i>Vipera berus</i>	2.1km NE
Mammals		
Bat species	<i>Chiroptera</i>	0.4km SW
Hedgehog	<i>Erinaceus europaeus</i>	0.5km S
Polecat	<i>Mustela putorius</i>	0.7km SW
Whiskered bat	<i>Myotis mystacinus</i>	1.3km NE
Water vole	<i>Arvicola amphibius</i>	1.4km SE
Badger	<i>Meles meles</i>	1.5km NW
Brown hare	<i>Lepus europaeus</i>	0.9km SW
Birds		
Skylark	<i>Alauda arvensis</i>	2.0km NE
Bullfinch	<i>Pyrrhula pyrrhula</i>	0.5km SW
Black-headed gull	<i>Chroicocephalus ridibundus</i>	0.6km S
Curlew	<i>Numenius arquata</i>	0.6km S
House sparrow	<i>Passer domesticus</i>	0.6km S
Dunnock	<i>Prunella modularis</i>	0.6km S
Starling	<i>Sturnus vulgaris</i>	0.6km S
Redwing	<i>Turdus iliacus</i>	0.6km S
Song thrush	<i>Turdus philomelos</i>	0.6km S
Fieldfare	<i>Turdus pilaris</i>	0.6km S
Lapwing	<i>Vanellus vanellus</i>	0.6km S
Linnet	<i>Linaria cannabina</i>	0.9km W
Reed bunting	<i>Emberiza schoeniclus</i>	1.5km N
Herring gull	<i>Larus argentatus</i>	1.5km N
Goldeneye	<i>Bucephala clangula</i>	1.8km W
Marsh tit	<i>Poecile palustris</i>	1.8km W
Willow tit	<i>Poecile montana</i>	1.8km SW
Grasshopper warbler	<i>Locustella naevia</i>	1.9km NE
Spotted flycatcher	<i>Muscicapa striata</i>	1.9km NE
Invertebrates		
Grizzled skipper	<i>Pyrgus malvae</i>	1.5km NE
Shaded broad-bar	<i>Scotopteryx chenopodiata</i>	1.7km NE
Small heath	<i>Coenonympha pamphilus</i>	1.7km NE

Species	Latin Name	Approximate distance and direction to site
Dingy skipper	<i>Erynnis tages</i>	1.7km NE
White-letter hairstreak	<i>Satyrus w-album</i>	1.7km NE
Ghost moth	<i>Hepialus humuli</i>	1.9km NE
Latticed heath	<i>Chiasmia clathrata</i>	1.9km NE
Cinnabar	<i>Tyria jacobaeae</i>	1.9km NE
Wall	<i>Lasiommata megera</i>	2.1km NE

Source: Cofnod North Wales Environmental Information Service

Appendix C. Phase 1 Habitat Map



Target_Note

Site_Extent

A2.2 - Scrub - scattered

A3.1 - Broadleaved parkland/scattered trees

G2 - Running water

J2.1.1 - Intact hedge - native species-rich

J2.1.2 - Intact hedge - species-poor

J2.2.2 - Defunct hedge - species-poor

J2.3.1 - Hedge with trees - native species-rich

J2.3.2 - Hedge with trees - species-poor

J2.4 - Fence

J2.8 - Earth bank

A1.1.1 - Broadleaved woodland - semi-natural

A2.1 - Scrub - dense/continuous

A2.2 - Scrub - scattered

B4 - Improved grassland

B5 - Marsh/marshy grassland

B6 - Poor semi-improved grassland

C3.1 - Other tall herb and fern - ruderal

G1 - Standing water

G2 - Running water

J1.1 - Cultivated/disturbed land - arable

J1.2 - Cultivated/disturbed land - amenity grassland

J1.3 - Cultivated/disturbed land - ephemeral/short perennial

J3.6 - Buildings & infrastructure

J4 - Bare ground

J5 - Hardstanding

Phase 1 Habitat Survey carried out 10 Dec 2014

P1	11/02/2016	TC	For Information	PB	ECP	11/02/2016
Rev.	Date.	Drawn	Description.	Chkd.	Appd.	Date.

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Project Name.

Welsh Water Capital Delivery Alliance AMP6

Drawing Title.

Five Fords Hydrolysis Plant Phase 1 Habitat Map

Suitability.

Preliminary

Suitability Code.

PRE

Originator

TC

Designer

PB

Date.

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Appendix D. Target Notes

Table D.1: Phase 1 target notes

TN	Details	Photos
1	Confirmed bat roost within old farm building	E.77
2	Asbestos building, negligible bat roosting potential	E.6, E.8 and E.9
3	Confirmed lapwing habitat	E.11
4	Wet lagoon	E.12 and E.15
5	Earth bank with tree saplings growing	E.17
6	Mature species rich hedgerow	E.21
7	Scrub with mature trees	E.19
8	Sycamore tree	-
9	Mature oak tree with birds nest	E.8 and E.41
10	Wet ditch flowing around the woodland	E.75
11	Boardwalk into nature reserve, flanked by species rich hedgerows over a wet ditch	E.49
12	Pond 12	E.51 and E.52
13	N/A	N/A
14	Pond 14	E.55
15	Dry pond (Pond 15)	-
16	Pond 16	-
17	Pond 17	E.59
18	Pond 18	E.60
19	Pond 19	-
20	Pond 20	-
21	Poor semi-improved grassland that's been furrowed	-
22	Mature tree	-
23	Mature oak	-
24	Mature oak	-
25	Vegetation pile with hibernacula suitability	-
26	Poor semi-improved grassland	-
27	Potential otter commuting corridor	-
28	Mature and semi-mature trees lining the bank of the River Clywedog, some with bat potential	-
29	Rat burrows	-

TN	Details	Photos
30	Dried up pond	-
31	Semi-natural broadleaved woodland which appeared to not be actively managed	E.62, E.63, E.64, E.65 and E.69
32	Potential unused badger set	E.67 and E.68
33	Young planted tree saplings	E.69
34	Pond 34 - large	E.15, E.16 and E.71
35	Pond 35- small and shallow	E.72
36	Pond 36- small pond	-
37	Pond 37	E.73
38	Pond 38	E.74

Appendix E. Photographs

Photo E.1: Car Park and site office



Photo E.2: Looking south, sewage structures including the lime silo, lime consolidation tanks, and digesters.



Photo E.3: Sewage structures including the existing digesters, looking south



Photo E.4: Sludge Pump House building



Photo E.5: Lime silo with the lime plant building adjacent



Photo E.6: Treated cake storage building containing asbestos



Photo E.7: Existing digesters, looking south



Photo E.8: Existing digester, gas holder, treated cake storage building and the northeast edge of the woodland



Photo E.9: Treated cake storage building containing asbestos



Photo E.10: Old northern sludge lagoon that has been filled, looking east



Photo E.11: Old northern sludge lagoon that has been filled, looking southeast



Photo E.12: Old southern sludge lagoon that has been partially filled, looking southeast



Photo E.13: Old sludge lagoon, looking west towards the sewage treatment works (including the screened sludge storage tank, digesters and the existing gas holder)



Photo E.14: Old sludge lagoons, looking northwest towards the screened sludge storage tank



Photo E.15: Partially filled old sludge lagoon to the north (left of picture) and pond 34 to the south



Photo E.16: Pond 34 located south of the old sludge lagoons, looking east



Photo E.17: Earth bank surrounding the southern section of the sewage works with sapling trees



Photo E.18: Gas-to-grid plant construction taking place in the southern section of the treatment works (December 2014)



Photo E.19: A mature oak tree located south of the earth bank surrounding the southern section of the treatment works



Photo E.20: Gas-to-grid plant construction taking place in the southern section of the treatment works (December 2014)



Photo E.21: The earth bund adjacent to the southern section of the sewage works with a species rich hedgerow growing to the west



Photo E.22: Gas-to-grid plant construction taking place in the southern section of the treatment works (December 2014)



Photo E.23: An area of woodland and a final settlement tank on the A stream



Photo E.24: Small tree located on an area of amenity grassland



Photo E.25: Inlet channel for the F stream



Photo E.26: Metal works structure adjacent to the inlet channel



Photo E.27: View of the sewage works from the road, looking west



Photo E.28: View of the sewage works from the road, looking west



Photo E.29: Sewage treatment works looking northwest from the current access road



Photo E.30: Sewage treatment works, looking from an area of semi-improved grassland, located south of the broadleaved woodland



Photo E.31: Existing flare stack, gas holder and digesters, looking north from the earth bank



Photo E.32: An area of amenity grassland located west of the broadleaved woodland



Photo E.33: Earth bank adjacent to the woodland, looking northeast



Photo E.34: Hardstanding path running around the unmanaged ancient woodland and sewage structures



Photo E.35: Looking southeast towards the woodland from the path around the sewage plant



Photo E.36: Workshop/ shed



Photo E.37: Hardstanding area surrounding the sewage structures including the lime consolidation tanks, sludge holding tank, lime silo and treated cake storage building



Photo E.38: Post digestion tank, disused sludge tank and the treated cake storage building adjacent to the ancient woodland



Photo E.39: Looking south towards the path east of the woodland and west of the disused sludge tank



Photo E.40: Post digestion tank



Photo E.41: Existing digesters and scattered oak tree with bat and breeding bird potential



Photo E.42: Grassland providing access to the disused sludge lagoons



Photo E.43: Sewage treatment works from the public right of way footpath, looking west



Photo E.44: Sewage treatment works and arable field from the public right of way footpath, looking west



Photo E.45: Digesters looking north



Photo E.46: Digesters looking north across an area of improved grassland



Photo E.47: Hedgerow lining the Marchwiel Marsh Nature Reserve



Photo E.48: The amenity grassland park west of Marchwiel Marsh Nature Reserve



Photo E.49: Access bridge over a wet ditch into Marchwiel Marsh Nature Reserve



Photo E.50: Scrub area within the Nature Reserve



Photo E.51: Pond 12 within the nature reserve



Photo E.52: Pond 12 with a good habitat suitability index for great crested newts



Photo E.53: Dominant reed species within the Nature Reserve (Potentially Common Reed (*Phragmites australis*))



Photo E.54: Boardwalk through the Nature Reserve



Photo E.55: Pond 14 within the Nature Reserve with a good habitat suitability index



Photo E.56: Boardwalk, looking west



Photo E.57: Marchwiell Marsh Nature Reserve, looking northwest



Photo E.58: Tree line surrounding the Nature Reserve



Photo E.59: Pond 17 with poor habitat suitability index for GCNs



Photo E.60: Pond 18 with an average habitat suitability index for GCNs



Photo E.61: Diseased tree along the dismantled railway



Photo E.62: Access into the unmanaged ancient woodland



Photo E.63: Ivy covered tree within the woodland



Photo E.64: Woodland has a lack of structural diversity



Photo E.65: Wet ditch running through the woodland



Photo E.66: Wet ditch flowing through the woodland



Photo E.67: Potentially an old badger set, currently being used by rabbits



Photo E.68: Potentially an old badger set, currently being used by rabbits



Photo E.69: Sapling trees planted in the semi-improved grassland adjacent to the woodland



Photo E.70: A rabbit burrow within the earth bank surrounding the southern section of the sewage works



Photo E.71: Pond 34 with a poor habitat suitability index for GCNs



Photo E.72: Pond 35 with a poor habitat suitability index for GCNs



Photo E.73: Pond 37 with a good habitat suitability index for GCNs



Photo E.74: Pond 38 with a good habitat suitability index for GCNs



Photo E.75: Wet ditch flowing around the eastern section of the woodland



Photo E.76: A flock of birds on site



Figure E.77: A confirmed bat roost northeast of the sewage works



Figure E.78: A badger print observed within an area of semi-improved grassland, northeast of the sewage works

