

Wrexham Industrial Estate Plot C4

Abenbury Way- Ecology and Landscape

1 Introduction

This report summarises the baseline conditions of Plot C4, Wrexham Industrial Estate, with respect to ecology and landscape issues, assesses the likely impacts arising from the proposed development, and identifies appropriate mitigation measures.

2 Ecology

2.1 General

An Extended Phase 1 Habitat Survey of the site was carried out by J W Ecological Ltd in June 2013, which identified the existing habitats and potential protected species. See Appendix A. The findings of that survey and subsequent work are briefly summarised below.

2.2 Habitats

There are a number of habitats and species on site that would be affected by the development proposals. The majority of the site area is semi-improved neutral grassland, which as well as having its own value provides habitat for invertebrates and amphibians. The woodland and watercourse situated to the southern end of the development have significant value for wildlife and as wildlife corridors. A band of dense scrub runs through the site whilst a native hedgerow marks its northern boundary.

2.3 Great Crested Newts

Great Crested Newts have been recorded in a pond 20m north-west of the site, with terrestrial habitat on site (semi-improved grassland, scrub and woodland) providing suitable refuge and foraging areas. This is within the context of a known metapopulation within and around the Wrexham Industrial Estate. Consequently connectivity across the wider area is a key consideration and has been assessed in this case through a high resolution GCN model created and managed by The Amphibian and Reptile Conservation Trust (ARC). The first step in the assessment was the consideration of the baseline condition across the Industrial Estate, as the study area, and in relation to the proposed development area, the site.

The majority of the GCN ponds (nodes) are situated on the eastern side of the study site, closest to the bounds of the Industrial Estate. The ponds are densely distributed to the middle of the study area, with decreasing numbers present to the north and the south of the industrial estate. A small number of poorly connected/isolated ponds lie to the west of the development site. There are numerous good links between the ponds to the east, with a few tenuous links between a small cluster to the south west and the main cluster area. There are only two low importance links which cross the proposed development area.

2.4 Bats

There are a number of features onsite and adjacent, including mature trees that have the potential to support roosting sites. There are a small amount of trees which were classed as Category 1 and 2 for potential, these trees should be retained where possible. There are trees situated in the woodland area on the southern site boundary, which are classed as category 2 and mature oak and ash trees on the north-west and east site boundary which are classed as Category 1 and 2 respectively. Bat commuting and foraging areas also extend to the southern and western boundaries of the site

2.5 Reptiles:

There are several different habitat types on site, mainly the semi-improved grassland and scrub which have suitability for foraging and refuge areas for common species, which include slow worm and grass snake.

2.6 Birds:

Trees and scrub vegetation on site and in adjacent habitats provides nesting areas for birds. Ground nesting birds could also use the site as suitable habitat.

2.7 Badgers:

Evidence of Badgers was identified through badger paths which entered on the west side of the site and passed through the woodland on the southern boundary of the site, which provides a movement corridor.

2.8 Impacts of Development:

The proposed scheme would result in the development of 50% of the site area, and consequently in the loss of that proportion of the existing habitat. This would include the central band of dense scrub through the centre of the site and a large area of semi-improved neutral grassland. The woodland associated with the watercourse on the southwest boundary would be largely retained, as would the group of three mature oaks towards the southeast boundary. The existing hedgerow and trees on the northern boundary would be unaffected.

The ARC Model assessed the impact of the proposed development both without and with the proposed mitigation measures, summarised as follows:

Without Mitigation: There are two low importance links which cross the proposed development site, and only one of these will be lost as part of the development. No ponds will be lost as part of this and therefore there are no major impacts upon the network as part of the proposed site. The loss of this low importance link reduces the overall landscape value by 0.01%.

With Mitigation: Four ponds have been added to land adjacent to the building to the north/northwest. These form connections with the northeast cluster. Although a new connection has been made to the northeast, this does not replace the connection lost to the main node cluster to the east of the study site. This connection is lost due to the development, however with the addition of four new nodes to the network, which provides increased connectivity and therefore an increase in cohesiveness, an increase in overall landscape value of 4.5% is achieved.

Overall Assessment: The Modelling suggests that impacts on the GCN population through the development of the Abenbury Way C4 plot are minimal, with the loss of only one minor link which is of low importance for connectivity. Also no ponds are lost as part of this development, with four new ponds being created as part of the mitigation strategy ensuring that the development will more than adequately compensate for the loss of connectivity within the study area.

2.9 Ecological Mitigation:

See Drawing 2134/01C – Ecological Mitigation

The mitigation strategy for Plot C4 has been developed in order to mitigate for the habitat losses sustained by the onsite development, which predominantly affects Great Crested Newts and reptiles as well as birds and other wildlife. Grassland and scrub habitats would be lost as part of the development and therefore maintaining existing habitat and providing additional aquatic and terrestrial habitat is a key feature of the strategy. The site habitats would be enhanced through proposed planting of native species- scrub vegetation surrounding the borders of the plot which would improve connectivity and wildlife corridors throughout the site and with adjacent habitats.

A 1.8m high close-boarded fence to the west of the Service Yard would provide a 'dark zone' immediately behind this feature and will also ensure separation between the vegetated and developed areas. Lighting would also be kept minimal in order to provide 'dark zones' where possible for species such as Great Crested Newts and bats. Additional areas of brash/log piles and vegetated rubble piles will provide hibernacula for newts and reptiles, as well as basking areas on the south facing banks. Open water ponds to the north of the site, with a mix of marginal, aquatic and floating vegetation are a key feature for GCN and other amphibians that may be present on the site.

Improvements of onsite terrestrial habitat, including the creation of over seeded grassland to improve floral diversity, will ultimately provide enhanced foraging opportunities for birds and bats, through presence of a variety of insects and invertebrates. Root protection areas under the existing trees provide added security for retention of these features.

Additional mitigation would be provided in the form of a Great Crested Newt underpass to allow passage for GCN under the proposed car park access, thereby maintaining connectivity around and through the site. The adjacent woodland would include additional roosting sites in the form of bird and bat boxes.

A key element of the mitigation strategy would be the development of a Biodiversity Management Plan, to ensure that the site habitats are allowed to establish and mature for maximum biodiversity benefit, set against a series of defined objectives, and monitored through regular surveys and condition assessments.

3 Landscape

3.1 Trees

An arboricultural assessment was carried out by Jerry Ross in March 2014. The resulting Constraints Report is included in Appendix C.

The report assesses the Retention Category of the site trees, and notes that the most significant are a group of three oaks close to the frontage on Abenbury Way.

The proposed development scheme would result in the loss of a Category B Oak and a Category C Ash in the centre of the site, and loss of a small number of Category B Alders on the edge of the woodland to the west of the site.

The group of three Oaks (two Category A, one Category B) would be retained through careful positioning of the proposed car park and access outside their defined root protection areas (RPA). The car park levels would be determined to avoid impacts on the RPA, and would result in a small timber retaining wall along its northern edge. A no-dig construction approach would be adopted for the small area where car parking conflicts with the RPA, and for the proposed pedestrian path beneath the trees.

3.2 Landscape and Visual Impact

Within the context of the Industrial Estate the current site presents a 'green' space, with the three Oak trees having a significant visual impact on Abenbury Way, in combination with areas of scrub vegetation. The woodland along the southwest boundary provides a degree of visual separation from the adjacent industrial units, whilst the eastern boundary is very open, marked by only a security fence. The northern site boundary is more in character with the wider countryside context, adjacent fields and hedgerows.

The scheme proposal would retain the frontage oaks and provide a scrub hedge along the Abenbury Way boundary. Although including a security fence this treatment would maintain the vegetated character of the site, and would maintain the influence of the trees on the road corridor. Scrub planting would create a more defined and naturalistic eastern boundary, whilst the woodland associated with the western stream would be maintained.

The proposed building would be seen over and through the proposed and retained vegetation, but within the context of the Industrial Estate would not have a significant adverse landscape impact. The landscape and ecological measures in the site surroundings would provide a planted context and mitigate the effect of the building scale within the site.

The retention and enhancement of the ecological mitigation area north of the building would further mitigate any adverse landscape character effects on the adjacent countryside, particularly within the context of adjacent existing development.

Appendix A

Extended Phase 1 Habitat Survey

J W Ecological Ltd - June 2013



Ecological Assessment

**Plot C4, Abenbury Way,
Wrexham Industrial Estate**

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THIS REPORT REPRESENTS AN INITIAL ECOLOGICAL ASSESSMENT OF THE SITE. FURTHER SURVEYS, AS DESCRIBED IN THE CONCLUSIONS SECTION, MAY NEED TO BE IMPLEMENTED PRIOR TO THE SUBMISSION OF A PLANNING APPLICATION. ECOLOGICAL ISSUES ARE A MATERIAL CONSIDERATION IN DETERMINING PLANNING APPLICATIONS AND ALL RELEVANT SURVEYS MUST BE COMPLETED PRIOR TO APPLYING FOR PLANNING PERMISSION.

PLEASE NOTE THAT WHILST EVERY EFFORT HAS BEEN MADE TO ENSURE THAT THE CONTENT OF THIS REPORT IS ACCURATE THE SURVEY REPRESENTS ONLY A SNAPSHOT IN TIME AND THE ECOLOGICAL ISSUES ON SITE MAY CHANGE. THE ADDITIONAL SURVEY WORKS RECOMMENDED IN THIS REPORT ARE WHAT IS THOUGHT TO BE REQUIRED IN THE OPINION OF THE SURVEYOR, THE LOCAL PLANNING AUTHORITY OR NATURAL RESOURCES WALES MAY IN SOME CASES REQUEST ADDITIONAL INFORMATION NOT OUTLINED IN THIS REPORT.



1.0 INTRODUCTION

- 1.1 J W Ecological Limited were commissioned in May 2013 to undertake a baseline ecological assessment of an area of land on the north-western side of Abenbury Way, Wrexham Industrial Estate, Wrexham (SJ 37374 50548). The survey area is shown on drawing D/JWE/1368/001 (Appendix 1).
- 1.2 The aims of this ecological assessment were to:
- Assess and describe the Valuable Ecological Components (VECs) of the proposed development site and all land within 250 metres (referred to as “the wider survey area”).
 - Assess the likely ecological impacts of the development.
 - Identify further survey and mitigation requirements
 - Identify ecological features of the site that should be protected
 - Provide guidance as to ecological enhancement of the site
- 1.3 To meet the aims of the ecological assessment the following actions were undertaken:
- Desktop study of all land within 500 metres of the development site
 - Extended phase one habitat survey of the development site and adjacent land
- 1.4 The sites ecological value was assessed in context with current UK planning and legislative policy, including:
- Protected sites (statutory and non-statutory)
 - Statutorily protected species
 - UK and local Biodiversity Action Plan (BAP) species
 - Species and habitats of local concern
 - Local wildlife strategies
- 1.5 Prior to any survey work a health and safety risk assessment of the site was undertaken. Risk assessments are undertaken on a site by site basis in order to identify potential risks with the aim to reduce these as far as is practicable.

2.0 SITE LOCATION AND DESCRIPTION

- 2.1 The site is located on the north-western side of Abenbury Way, to the north-west of the Wrexham Industrial Estate.
- 2.2 The survey area comprises a semi-improved grassland meadow with a band of mature woodland extending along the western and southern site boundaries. A small watercourse extends along the southern boundary of the site within the woodland area. A band of dense scrub extends across the survey part of the site.
- 2.3 The site is bordered by industrial buildings and associated access roads and hard-standing areas to the north, east and south. Erilas Lane is located outside of the western site boundary with improved grassland fields beyond.
- 2.4 The proposals for the site will involve a new industrial building and associated areas of hard standing.



3.0 DESKTOP STUDY

- 3.1 Ecological data and records of protected species were requested/gathered from the following sources (Table 1):

Table 1: Desktop Study Sources

Consultee/Source of Information	Information Supplied
NBN Gateway	Protected species records within 1 kilometre of the proposed development site.
Natural Resources Wales	Online protected sites register.
Cofnod	Protected species and protected sites within 1 kilometre of the survey area.
UK Biodiversity Action Plan	Identification of national priority species and habitats known to occur in the region.
Local Biodiversity Action Plan	Identification of local priority species and habitats known to occur in the area.

Protected Sites

- 3.2 No statutorily designated nature conservation sites are located within 1 kilometre of the survey area.
- 3.3 The Erlas Wood (Wrexham Industrial Estate) Wildlife Site is located approximately 370 metres south-east of the survey area and the Big Wood Wildlife Site is located approximately 530 metres south-west of the site.

Protected Species

- 3.4 Cofnod hold numerous records of Great Crested Newts in the ponds within and around the Wrexham Industrial Estate. The closest of these records is for a pond located on the western side of Erlas Lane, 20 metres west of the survey site.

Bat species including Whiskered bat and Pipistrelle have been recorded within 1 kilometre of the survey area.

Slow Worm and Adder have been recorded associated with the Redwither Brook corridor.

Badgers are known to be present in the area.

The UK and Local Biodiversity Action Plan (BAP) species Grizzled Skipper and Dingy Skipper have both been recorded at a number of locations within the Wrexham Industrial Estate.

- 3.5 Full details of the Cofnod search are provided in Appendix 4.



3.6 Based on information gathered from the sources listed above and desk based assessment of the site from OS maps and aerial photographs the following protected species were taken into account during the site assessment:

- Bats (all species)
- Great crested newt (*Triturus cristatus*)
- Badger (*Meles meles*)
- Water Vole (*Arvicola terrestris*)
- Otter (*Lutra lutra*)
- Reptiles (all species)

UK Biodiversity Action Plan (UKBAP) Priority Species

3.7 The UKBAP priority species which may potentially use the survey area, based on the results of the desktop study are:

- Mammals – Bats*, Badgers*, Hedgehog;
- Birds – Song Thrush, Sky Lark etc.
- Amphibians – Great Crested Newts*, Common Toad.
- Invertebrates – Dingy Skipper, Grizzled Skipper.

** These species and/or their habitats are also statutorily protected*

Local Biodiversity Action Plan (LBAP)

3.8 The Wrexham Biodiversity Action Plan (BAP) lists key local species and habitats considered to be rare or declining in the area. Some of these species and habitats may also be of national concern.

3.9 Although local BAP documents have no legal status the Local Planning Authority (LPA) and Natural Resources Wales will expect the listed species and habitats to be taken into account in the overall layout and landscape strategy for the development.

3.10 The species of local concern which may potentially utilise the survey area based on the results of the desktop study are:

- Mammals – Badger*, Otter*, Lesser Horseshoe bat*, Hedgehog;
- Amphibians – Great Crested Newts*;
- Birds – Barn Owl*;
- Reptiles – All species*;
- Invertebrates – Dingy Skipper, Grizzled Skipper.

** These species and/or their habitats are also statutorily protected*

3.11 Derelict and industrial land is listed as a habitat in the Wrexham Biodiversity Action Plan.



4.0 PLANNING CONTEXT

Planning Policy Wales (Edition 3, July 2010)

- 4.1 This document contains current land use planning policy for Wales. It provides the policy framework for the effective preparation of local planning authorities' development plans. This is supplemented by 21 topic based Technical Advice Notes (TANs). Procedural guidance is given in Welsh Office / National Assembly for Wales / Welsh Assembly Government circulars
- 4.2 Technical Advice Note 5 provides advice about how the land use planning system should contribute to protecting and enhancing biodiversity and geological conservation. This guidance note should be read in conjunction with *Planning Policy Wales (2002)*, in particular with Chapter 5 *Conserving and Improving the Natural Heritage and Coast* which sets out the Assembly Government's objectives for the natural heritage and the land use planning policies which support these.
- 4.3 This TAN brings together advice on sources of legislation relevant to various nature conservation topics which may be encountered by local planning authorities. Chapter 2 sets out the key principles of planning for nature conservation. Chapter 3 provides advice about the preparation and review of development plans, including the relevant statutory requirements. Chapter 4 addresses nature conservation in development control procedures. Chapter 5 deals with the conservation of internationally and nationally designated sites and habitats and also covers local sites. Chapter 6 deals with the conservation of protected and priority species.

5.0 LEGISLATIVE CONTEXT

- 5.1 This is a brief summary of the ecological legislative context in Wales. This is general advice only and does not relate specifically to the site being assessed.

Ecological Assessments

- 5.2 Ecological assessments have now become an important part of the planning process. This initial assessment is used as a means of identifying any specific interests of the site in question which are in turn used to assess suitability for protected species and to make recommendations for further survey work and mitigation.

Statutory Designated Sites

- 5.3 Sites with Statutory designations receive varying degrees of legal protection under UK law and European Directives. A number of statutory designations are used for sites of high conservation value in the UK dependent on the importance of the site at a local, regional, national and international level. These designations are:
 - Special Area of Conservation (SACs)
SACs are sites of European importance for nature conservation. These receive legal protection under the EC Habitats Directive (1992) which was incorporated into UK legislation through the Conservation (Natural Habitats, &c) Regulations 1994. In the UK all SACs are also designated as SSSIs.



- Special Protection Areas (SPAs)
SPAs are sites of European importance for birdlife as designated under the Birds Directive. As with SACs all SPAs in the UK will also be designated as SSSIs.
- Ramsar Sites
These sites are wetlands of international importance designated under the Ramsar Convention 1971. In most cases these sites are also designated as SPAs or Sites of Special Scientific Interest (SSSI) and receive legal protection in the UK through these designations.
- Sites of Special Scientific Interest (SSSI)
SSSIs are UK sites of national importance for nature conservation. These sites may be designated as a result of the habitats present or for the presence of rare species or species assemblages. SSSIs receive some legal protection through the Wildlife and Countryside Act 1981. This protection was recently extended through the Countryside and Rights of Way (CROW) Act 2000.
- National Nature Reserves (NNR)
NNRs are nationally important nature reserves designated by CCW under the Wildlife and Countryside Act 1981. These sites will either be managed by CCW or an approved body and are often designated as SSSIs.
- Local Nature Reserves (LNR)
Local Nature Reserve is a statutory designation made by local authorities under the Section 21 of the National Parks and Access to Countryside Act 1949. These sites may or may not be SSSIs.

Non-Statutory Designated Sites

- 5.4 Non-statutory sites are afforded no statutory legal protection but are in most cases recognised by local planning authorities and statutory agencies as being of local conservation value. The protection of these sites is usually afforded through Local Plan Policies (county, district and Unitary Development Plans) and these sites will in most cases be taken into account as a material consideration by the local authority when deciding planning applications. These sites are designated by the local authority (usually in consultation with the local Wildlife Trust and other agencies).

Protected Species and their Habitats

- 5.5 In the majority of cases relevant to planning applications protected species are those listed in Schedules 1, 5 and 8 of the Wildlife and Countryside Act (as amended), the Protection of Badgers Act 1992 and the Habitats & Species Regulations 2010. The extent of legal protection varies between species, as do the implications for developments where these species are to be affected.



5.6 Great Crested Newts

Great Crested Newts (*Triturus cristatus*) are protected under Regulation 41 of The Conservation of Habitats and Species Regulations 2010 and Section 9 of the Wildlife and Countryside Act 1981 (as amended), being listed in Schedule 5 of the act. Under the legislation it is an offence to:

- Intentionally kill, take or injure a great crested newt;
- Damage, destroy or obstruct a place a great crested newt uses for breeding, resting, shelter or protection or to disturb a great crested newt in such a place.
- Possess or control a great crested newt alive or dead, or any part of them, or anything derived from them.
- Sell, offer for sale, advertise for sale or offer to buy a great crested newt, or a part of them or anything derived from them.
- Deliberately disturb or deliberately take or destroy the eggs of a great crested newt.

Offences under Section 9 carry a maximum penalty of a fine up to £5000, imprisonment for up to six months, or both, for each animal in respect of which an offence is committed.

Licenses can be issued in order to allow activities that would constitute an offence under the legislation. Licenses can be issued for specific purposes including scientific study, photography, conservation management and development.

It is important to identify the presence of great crested newts as early as possible in a development so that the legal obligations regarding this species can be observed. If surveys identify the presence of great crested newts on site a mitigation scheme must be developed in consultation with the local CCW team. This mitigation scheme must minimise direct threats to newts and compensate for any habitat loss. A licence issued by the Welsh Assembly is required before the mitigation scheme can be legally implemented. Mitigation licence applications require full Method Statements and a Reasoned Statement of Application. The method statement contains details of the proposed mitigation works whilst the Reasoned Statement must provide justification as to how the proposed development meets the requirements of the legislation.

5.7 Bats

All species of bat and their breeding sites or resting places (roosts) are protected under Regulation 41 of The Conservation of Habitats and Species Regulations 2010 and Section 9 of the Wildlife and Countryside Act 1981 (as amended). Under the legislation it is an offence to:

- intentionally kill, injure or handle a bat;
- to possess a bat (whether live or dead)
- disturb a roosting bat;
- sell or offer a bat for sale without a licence;
- damage, destroy or obstruct access to any place used by bats for shelter, whether they are present or not.

The potential fine for each offence is £5,000. If more than one bat is involved, the fine is £5,000 per bat. An offender can also be imprisoned for up to six months.

Where bats are found to occur on a development site, and there is considered to be a reasonable possibility that a roost may be damaged or destroyed or that bats using a roost will be disturbed, a licence must be obtained from Welsh Assembly.



5.8 Badgers

Badgers (*Meles meles*) and their habitat are protected under The Protection of Badgers Act 1992 and are also included on Schedule 6 of the Wildlife and Countryside Act 1981, and Appendix III of the Bern Convention. The legislation affords badgers protection against deliberate harm or injury making it an offence to:

- wilfully kill, injure, take, possess or cruelly ill-treat a badger (or attempt to do so)
- to interfere with a sett by damaging or destroying it
- to obstruct access to, or entrance of, a badger sett
- to disturb a badger whilst it is occupying a sett

Penalties for offences include fines of up to £5000, plus up to six months imprisonment, for each illegal sett interference, badger injury or death.

Works that disturb badgers whilst they are occupying a sett are illegal without a licence. Disturbance can occur even without direct interference or damage to the sett in question. In general, the following activities are likely to require a licence:

- Use of heavy machinery or significant earth moving within 30m of a sett
- Use of lighter machinery (usually any wheeled vehicles) within 20m of a sett
- Any digging, chain saw use or scrub clearance within 10m of a sett

5.9 Reptiles

All species of British reptile are protected against intentional killing, injury or sale under the Wildlife and Countryside Act 1981 (as amended). The Sand Lizard and the Smooth Snake are afforded a higher degree of protection under Regulation 41 of The Conservation of Habitats and Species Regulations 2010 making it an offence to:

- Intentionally kill, take or injure these species of reptile;
- Damage, destroy or obstruct a place a these species use for breeding, resting, shelter or protection or to disturb these species in such a place;
- Possess or control these species alive or dead, or any part of them, or anything derived from them;
- Sell, offer for sale, advertise for sale or offer to these species, or a part of them or anything derived from them;
- Deliberately disturb or deliberately take or destroy the eggs of these species.

The distribution of Smooth Snakes and Sand Lizards is limited to heathland habitats in Surrey, Dorset, Hampshire and Sussex. The Sand Lizard is also known to occur on sand dune habitats in Merseyside and has recently been introduced to some areas of North Wales.

Licenses can be issued in order to allow activities that would constitute an offence under the legislation. Licenses can be issued for specific purposes including scientific study, photography, conservation management and development.

In England and Wales a development license must be obtained from Natural England or the Welsh Assembly before undertaking any works that will affect Sand Lizards or Smooth Snakes or their habitat. A license is not required to carry out surveys or mitigation for other reptile species.



5.10 Otters

The Eurasian Otter is protected under Regulation 41 of The Conservation of Habitats and Species Regulations 2010 and Section 9 of the Wildlife and Countryside Act 1981 (as amended), being listed in Schedule 5 of the act. Under the legislation it is an offence to:

- Deliberately, capture, injure or kill an Otter;
- Damage, destroy or obstruct their breeding or resting places;
- Disturb otters in their breeding or resting places.

Offences under Section 9 carry a maximum penalty of a fine up to £5000, imprisonment for up to six months, or both, for each animal in respect of which an offence is committed.

There is, however, provision within the legislation to kill, take, disturb or possess otters or to use prohibited methods to kill or take under a licence in certain defined circumstances, if the issue cannot be resolved by any alternative means. Licenses can be granted for a variety of purposes, including development.

5.11 Water Vole

Water Voles and their habitats are afforded protection under Section 9 of the Wildlife & Countryside Act 1981 (as amended). Under the legislation it is an offence to:

- Intentionally kill, injure or take (capture) a water vole;
- Possess or control a live or dead water vole, or any part of a water vole or anything derived from a water vole;
- Intentionally or recklessly damage, destroy or obstruct access to any structure or place which a water vole uses for shelter or protection
- Intentionally or recklessly disturb a water vole while it is occupying a structure or place which it uses for shelter or protection;
- Sell, offer or expose for sale, or have in one's possession or transport for the purpose of sale, any live or dead water voles, or any part of a water vole or anything derived from a water vole;
- Publish any advertisement, or cause any advertisement to be published, which is likely to be understood as conveying that a person buys or sells, or intends to buy or sell, any of the above things.

Offences under Section 9 carry a maximum penalty of a fine up to £5000, imprisonment for up to six months, or both, for each animal in respect of which an offence is committed.

There is no provision under the Wildlife and Countryside Act 1981 for licences to be issued for the purpose of development



5.12 Birds

Section 1 of the Wildlife and Countryside act 1981 makes it an offence to intentionally kill, injure, handle or remove any wild bird (with the exception of some pest species), to take or damage a nest whilst it is in use or being built and to take or destroy eggs.

Species listed in Schedule 1 of the Act (see Table 1), including the Little Ringed Plover, Barn Owl and Kingfisher, are afforded an even higher level of protection. In addition to the offence of taking, damaging or destroying nests or eggs it is also an offence to disturb Schedule 1 species whilst they are building or sitting on nests.

Whilst it is not an offence to disturb non-Schedule 1 species whilst they are building or sitting on a nest an offence may occur if the bird is permanently driven away from its nesting site by prolonged disturbance which leads to the failure of eggs or the death of young.

Surveys for the presence of breeding birds are required if any nesting habitat is to be removed during the breeding season (March to August inclusive).

Invasive Plant Species

- 5.13 Under Section 14 (2) of the Wildlife and Countryside Act (1981) it is illegal to spread the invasive non-native plants Japanese Knotweed (*Fallopia japonica*), Himalayan Balsam (*Impatiens glandulifera*) and Giant Hogweed (*Heracleum mantegazzianum*). At present no requirement exists to eradicate these plants from sites where they are already established
- 5.14 Environment Agency guidance also exists for the aquatic weeds Australian swap stonecrop (*Crassula helmsii*), Floating pennywort (*Hydrocotyle ranunculoides*) and Parrot's feather (*Myriophyllum aquaticum*). Although no legal obligation exists it is considered good practice to avoid spreading these invasive plants when working in infested areas.



6.0 HABITAT SURVEY

Extended Phase One Methods

- 6.1 An extended phase one habitat survey of the site was undertaken by Joe Whittick BSc (Hons.) on the 6th June 2013. Joe Whittick has over nine years experience as an ecological consultant and is a full member of the Chartered Institute of Ecology and Environmental Management (MCIEEM).
- 6.2 The survey was undertaken prior to the start of any construction or site preparation works.
- 6.3 The extended phase one habitat survey is a standard method of survey widely used as the basis of ecological assessments (JNCC, 1993). The phase one survey covers the footprint of the proposed development and descriptions of the immediate surrounding area (up to 100 metres). A habitat map is prepared to show the locations and extent of habitats. Detailed descriptions of important plant communities, other valuable ecological components (e.g. protected species potential) and invasive plant species are provided as target notes.
- 6.4 The phase one habitat survey is not intended to provide a comprehensive list of species. Plant species lists have been compiled with the aim of characterising habitats in order to assess their importance for nature conservation.
- 6.5 Incidental observations of birds and mammals were also made during the phase one habitat survey.

Results

- 6.6 The habitat survey is illustrated on Drawing D/JWE/1368/002 (Appendix 1). Target Notes are presented in Appendix 2.
- 6.7 The following habitats were recorded within the survey area and adjacent land:
 - Semi-improved grassland
 - Improved grassland
 - Amenity grassland
 - Broad-leaved semi-natural woodland
 - Scattered broad-leaved trees
 - Dense/continuous scrub
 - Scattered scrub
 - Hedgerows
 - Running water
 - Standing water



6.8 Habitats within the proposed development site and wider survey area:

- Semi-improved grassland

The majority of the survey area comprises areas of semi-improved neutral grassland meadow (see photographs 1 and 2, Appendix 3). Species in these areas include Timothy (*Phleum pratense*), meadow foxtail (*Alopecurus pratensis*), cock's-foot (*Dactylis glomerata*), perennial rye-grass (*Lolium perenne*), ribwort plantain (*Plantago lanceolata*), daisy (*Bellis perennis*), self-heal (*Prunella vulgaris*), creeping buttercup (*Ranunculus repens*) and cuckoo flower (*Cardamine pratensis*).

- Improved grassland

An improved grassland sheep grazed field is located outside of the northern corner of the site. Further improved grassland fields are located outside of the western site boundary on the opposite side of Erlas Lane.

- Amenity grassland

Mown amenity grassland verges are located outside of the south-eastern site boundary adjacent to Abenbury Way and outside of the north-eastern site boundary (see photograph 3, Appendix 3).

- Broad-leaved semi-natural woodland

A band of broad-leaved woodland extends along the north-western site boundary adjacent to Erlas Road and along the southern site boundary (see photographs 4, and 5, Appendix 3). A small area of woodland also extends from the eastern end of the woodland on the southern site boundary out across the eastern side of the site (see photograph 6, Appendix 3). Species in the woodland include ash (*Fraxinus excelsior*), alder (*Alnus glutinosa*), lime (*Tilia spp.*), copper beech (*Fagus sylvatica*), and willow (*Salix spp.*). A mature oak (*Quercus spp.*) tree is located in the woodland area on the north-western site boundary (see photograph 7, Appendix 3) and three mature oaks are located in the area of woodland which extends out across the eastern side of the site.

The woodland area on the southern site boundary is quite boggy in places, particularly to the west.

- Scattered broad-leaved trees

A mature oak tree is located in an area of scrub towards the northern corner of the site (see photograph 8, Appendix 3).

- Dense/continuous scrub

A band of dense blackthorn (*Prunus spinosa*), elder (*Sambucus nigra*), willow (*Salix spp.*) and hawthorn (*Crataegus monogyna*) scrub extends from the southern corner of the survey area north-west across the southern part of the site (see photograph 9, Appendix 3).

A small area of scrub comprising hawthorn (*Crataegus monogyna*) and elder (*Sambucus nigra*) is located in the northern corner of the site (see photograph 10, Appendix 3).

An area of scrub with elder (*Sambucus nigra*), hawthorn (*Crataegus monogyna*) and bramble (*Rubus fruticosus agg.*) is located in the southern corner of the survey area.



- Hedgerows
A mature hedgerow connects into the northern site boundary. A further mature hedgerow containing mature oak trees is located outside of the western site boundary on the opposite side of Erilas Lane.
- Running water
A small watercourse runs through the woodland area on the southern site boundary (see photograph 11, Appendix 3). The watercourse is relatively shallow and has poorly vegetated earth banks.
- Standing water
A pond is located outside of the north-western boundary of the site on the opposite side of Erilas Lane. The pond has a number of duck houses and is in relatively poor condition with very turbid water (see photograph 12, Appendix 3) No aquatic plants could be seen.



6.9 Extended Phase One Habitat Survey Overview

- Great crested newts – No ponds are located within the site under survey. Three ponds are shown on OS maps within 250 metres of the site with the closest being located approximately 20 metres outside of the north-western site boundary. Great crested newt records exist for this pond and for another group of ponds located approximately 300 metres west of the survey area.

The semi-improved grassland, scrub and woodland habitats on site have high potential value as foraging and refuge habitat for amphibian species, including great crested newts.

- Bats – No buildings are located within the survey area. All trees on site were assessed for their potential to support roosting bats including:
 - Features suitable as roosting sites (natural holes, woodpecker holes, cracks/splits in major limbs, loose bark, dense ivy, hollows, bird and bat boxes);
 - Signs indicating possible use by bats (scratches around entry points, staining around entry points, bat droppings, smell of bats, smoothing of surfaces around cavity).

Trees were categorised for their potential to support roosting bats using the Bat Conservation Trust (BCT, 2012) survey guidelines (see Appendix 5 for the definition of the categories used).

The majority of the trees on site, including trees within the woodland areas, were classed as Category 3 in terms of their roosting potential. A number of small diameter ivy clad trees are present in the woodland area on the southern site boundary and these trees were classed as Category 2 in terms of their roosting potential.

The mature oak tree in the band of woodland on the north-western site boundary was classed as Category 1 in terms of its roosting potential due to the presence of splits and cavities in the trunk and main limbs. Two mature ash trees in this band of woodland were also classed as Category 2. Three mature oak trees are present in the band of woodland which extends along the eastern side of the site. Of these one was classed as Category 1 and two as Category 2. The mature oak tree in the scrub area to the north of the site was also classed as Category 1 in terms of its roosting potential.

Category 1 and Category 2 trees are marked as C1 and C2 respectively on drawing D/JWE/1368/002 (Appendix 1).

Bats may forage over the site and are likely to commute and forage along the woodland edges to the south and west of the survey area.

- Badgers – No badger setts were identified within the site boundary, however dense scrub and trees restricted the survey in some areas. A mammal path was identified entering the western site boundary in close proximity to the small watercourse. The path extends into the woodland area on the southern site boundary. The path originates from the improved grassland field on the opposite side of Erilas Road before passing under a fence and crossing Erilas Lane. A single badger guard hair was found attached the fence which the badger path passes beneath confirming that it is used by badgers. No other evidence of badger activity (latrines, scrapes etc.) was identified during the survey.



- Reptiles – The scrub and rough grassland habitats on site offer suitable refuge and foraging opportunities for common reptile species including slow worm and grass snake.
- Water Voles – The small watercourse in the woodland area on the southern site boundary has poorly vegetated earth banks and is relatively shallow making it sub-optimum as habitat for water voles. The length of the watercourse where it passes through the site was walked during the phase one survey and no evidence of water voles was identified.
- Otters – No potential otter habitat was identified in close proximity to the survey area.
- Birds – Birds are likely to nest in the trees and scrub on and adjacent to the site. Ground nesting birds could also potentially use the site.
- Invasive Species – No invasive plant species were identified on site during the phase one survey. Dense scrub and trees did however restrict the survey in some areas.
- Dingy and Grizzled Skipper – The land that will be impacted by the proposals is not thought to have high value for Dingy and Grizzled Skipper due to the lack of preferred food plants for these species, eg. birdsfoot trefoil.

6.10 Other Observations

Rabbits and foxes are active on site and a number of active burrows were noted at the time of survey.



7.0 CONCLUSIONS AND RECOMMENDATIONS

7.1 Protected Sites

No statutorily designated nature conservation sites are located within 1 kilometre of the survey area.

Two locally designated Wildlife Sites are located within 1 kilometre of the survey area. Given their distance from the site, no direct impacts on these areas are predicted. The woodland and other semi-natural habitats on site, particularly along the southern site boundary, have a significant wildlife corridor function and there is a risk of indirect impacts on the Wildlife Sites due to fragmentation of habitats and a general loss of connectivity across the industrial estate. This is dealt with in more detail in section 7.2 below.

7.2 Habitats

No statutorily protected habitats are present on site and all plant species identified within the survey area are considered to be common at local and regional levels. Rivers and streams, such as that on the southern site boundary, and woodland are however both Wrexham Biodiversity Action Plan (BAP) habitats.

Any proposals for the site should aim to protect, and where possible enhance, existing biodiversity interest in line with *Wrexham Planning Guidance Note 29 – Employment Development and Nature Conservation*. This should be achieved primarily by retaining and protecting the higher quality areas of habitat on site and by enhancing other areas in order to compensate for the land lost to development. Off-site compensation may be considered but only as a last resort and where it can be shown that there would be significant benefits to this approach (measures would need to be agreed with WCBC and Natural Resources Wales).

The woodland areas on site, particularly the band of woodland and the associated watercourse on the southern site boundary, have significant ecological value as both habitats for wildlife and as wildlife corridors. The woodland on the southern boundary particularly acts as a link from the wider countryside to the west of the site through into the industrial estate and its importance has been specifically highlighted in Planning Guidance Note 29. The woodland has been confirmed as a corridor for badgers and will also be used by other species. The woodland and scrub areas on site, particularly those to the south, should wherever possible be retained as part of any proposals and should also be protected during any site works using temporary fencing. New native tree and shrub planting, particularly at the site boundaries and fronting roads, would also serve to improve the wildlife corridor function of the site.

The proposals for the site will ultimately lead to the loss of areas of semi-improved neutral grassland. The grassland habitats on site have value for invertebrates and also as terrestrial habitat for amphibians. Areas of this habitat should be retained with the most obvious area for retention being the grassland between the woodland area and band of scrub to the south of the site. This grassland area could be enhanced for amphibians through the addition of new refuge and hibernation mounds and for invertebrates through the addition of insect boxes. New landscaping as part of the proposals should also aim to avoid formal mown grassland areas and should instead try to create species rich seeded wild-flower verges or wildflower turf areas which will have significant value for invertebrate species.



The site could be further enhanced for wildlife, particularly amphibians through the creation of a new pond. The pond located outside of the north-western site boundary, where great crested newts have previously been recorded, was found to be in poor condition at the time of survey and the creation of a new pond within the site boundary would therefore have significant biodiversity benefits. The pond would ideally be located in areas of retained semi-improved grassland, potentially in the south-western corner of the site.

A management plan for the site will need to be produced detailing the management of all retained and enhanced habitats. Management works would include measures such as removing non-native species from woodland areas, retaining dead wood within woodlands and mowing grassland areas once a year in autumn after flowers have seeded in order to create and maintain a diverse grassland sward. In the majority of cases, long-term management of retained and enhanced habitats should be passed to an appropriate nature conservation organisation.

7.3 Great Crested Newts

A pond located 20 metres north-west of the site has records of great crested newts. The terrestrial habitats within the survey area also have suitability for great crested newts. Given the proximity of the known great crested newt pond, and the suitability of the terrestrial habitats within the site for this species, the presence of great crested newts should be assumed. There is considered to be a risk that great crested newts could be killed or injured as a result of the proposed construction works on site and areas of good quality terrestrial habitat for this species will be lost.

In order to mitigate for these potential impacts it is thought to be necessary to erect a temporary amphibian fence around the proposed construction area and to undertake a trapping scheme within the fenceline to ensure that no great crested newts are present when development works begin. Trapping works can only be undertaken between March and October when newts are active. These works would need to be undertaken under an appropriate Habitats Regulations license issued by the Welsh Assembly. Up to date amphibian survey information (less than 3 years old) for all ponds within a minimum of 250 metres of the site will be required in order to support a license application. Great crested newt surveys can only be undertaken between March and early June with at least three of the required six survey visits being undertaken between mid-April and mid-May.

There will be a loss of grassland habitat as a result of the proposals and this will reduce the available foraging area for great crested newts. This should be compensated for through the enhancement of retained areas of semi-improved grassland through the addition of hibernation/refuge sites and potentially the creation of a new pond (see section 7.2). The design of the site itself should also take into account the presence of great crested newts. Kerb stones and gully pots, which can trap amphibians, should be avoided where possible in favour of SuDS. If the use of SuDS is not possible then ACO kerb stones or similar should be used adjacent to gully pots in order to minimise the risk to amphibians.



7.4 Bats

A number of the mature trees on site and within the woodland areas were assessed as having potential to support roosting bats and were classed as Category 1 and Category 2 in terms of their roosting potential (BCT, 2012). These trees should wherever possible be retained. Where works to trees with bat roosting potential are unavoidable the following approach should be adopted:

- **Category 1 trees** – Further dusk/dawn bat activity surveys should be undertaken in order to confirm the presence/absence of bats (these surveys can be undertaken from May to early September only). If bats are found a license will be required for any works to the tree. If no bats are found roosting then the tree should be treated as Category 2.
- **Category 2 trees** – Works to these trees should be undertaken using Reasonable Avoidance Measures (RAMs) for bats. These measures should include raised inspections prior to the tree works and soft felling where necessary. All works should cease and appropriate advice should be sought if any bats are found.

The woodland and scrub areas on site have good potential value as foraging habitat and commuting routes for bat species and should be retained and protected as described in section 7.2. If significant tree or scrub removal is to take place then additional bat activity surveys of the site should be undertaken between May and August in order to identify any significant bat commuting routes and foraging areas and to ensure that these are adequately mitigated for.

New external lighting as part of the proposals has significant potential to disrupt bat commuting and foraging activity, particularly for *Myotis* species which are known to be present on the estate. Measures should be implemented on site to minimise the potential impacts of the development on foraging and commuting activity. Potential measures to reduce impacts on bats include:

- Do not "over" light. This is a major cause of obtrusive light and is a waste of energy. Use only the minimum amount of light needed for safety. There are published standards for most lighting tasks, adherence to which will help minimise upward reflected light.
- Eliminate any bare bulbs and any light pointing upwards. The spread of light should be kept near to or below the horizontal.
- Use narrow spectrum bulbs to lower the range of species affected by lighting.
- Use light sources that emit minimal ultra-violet light. Insects are attracted to light sources that emit ultra-violet radiation.
- Reduce light-spill so that light reaches only areas needing illumination. Shielding or cutting light can be achieved through the design of the luminaire or with accessories, such as hoods, cowls, louvers and shields to direct the light. Lighting should be directed towards the centre of the site and away from adjacent woodland edges where bats are likely to forage.
- Reduce the height of lighting columns. Light at a low level reduces ecological impact.
- For pedestrian lighting, use low level lighting that is directional as possible and below 3 lux at ground level.
- Use embedded road lights to illuminate the roadway and light only high-risk stretches of roads, such as crossings and merges, allowing headlights to take up the slack at other times.
- Limit the times that lights are on to provide some dark periods for wildlife.

(Bat Conservation Trust, 2011)



In order to enhance the site for bats it would be desirable to provide a number of new bat boxes on the retained trees within the woodland areas. Positioning of these boxes should be agreed with an appropriately experienced bat ecologist.

7.5 Badgers

No badger setts were identified on site however dense scrub and trees restricted the survey in some areas. Evidence of badger activity was identified in the form of a badger path entering the western side of the site and passing through the woodland area on the southern site boundary. The woodland area is acting as a corridor for badgers and this feature of the site should be retained and protected as described in section 7.2.

Badgers can form new setts at any time therefore a repeat survey of the site for active badger setts should be undertaken immediately prior to the proposed start on site. Any clearance of dense vegetation from the site should then be undertaken with care and where appropriate under the supervision of an experienced badger ecologist. If any large mammal holes are identified during clearance works then works should cease and specialist advice should be sought.

Badgers may cross the proposed working areas and may forage within the site boundary therefore general site precautions for this species should be implemented during any construction works. These precautions should include limiting the movement of machinery to daylight hours in order to avoid harming badgers and covering deep excavations at night and capping any exposing pipework in order to prevent badgers becoming traps. Alternatively, the full development area should be securely badger fenced in order to restrict access for badgers throughout the construction period.

7.6 Reptiles

The semi-improved grassland and scrub habitats on site have suitability as foraging and refuge sites for common reptile species. Slow Worm and grass snake have also been recorded within 1 kilometre of the survey area. Further reptile surveys of the site would be required in order to confirm the presence/absence of these species within the proposed development area. The optimum months for reptile surveys are April/May and September.

The measures employed in order to exclude amphibians from the site (see section 7.3) should also be sufficient to exclude reptiles during any development works. Artificial reptile refuges should be used in addition to pitfall traps during the trapping of the site. The habitat creation/enhancement proposed for great crested newts should also serve to provide new/enhanced habitat for common reptile species.

7.7 Water Voles

The watercourse which passes through the woodland on the southern site boundary was found to be sub-optimum as habitat for water voles and no evidence of this species was identified at the time of survey. However, as a precaution a detailed water vole survey of the watercourse should be undertaken if any works are to come within 8 metres of the top of the bank of the watercourse. Water vole surveys can only be undertaken between March and October.



7.8 Otters

No potential otter habitat was identified in close proximity to the survey area. No otter issues are thought to exist for the proposals.

7.9 Birds

Birds are likely to nest in the trees and scrub on and adjacent to the site. Ground nesting birds could also use the site. Existing areas of trees and scrub should wherever possible be retained as part of any proposals for the site. Where removals are unavoidable, where possible clearance of potential nesting habitat should be undertaken outside of the nesting season (the nesting season runs from March to August inclusive). If works are to take place during the nesting season the site should be checked for nesting birds by an experienced surveyor immediately prior to the start of works. If breeding birds are found during the survey the nest should not be disturbed and works in the area of the nest should be delayed until nesting is complete and young birds have fledged (as confirmed by a suitably qualified ecologist).

Any new planting schemes should include a variety of native tree and shrub species which will have value to bird species both as nesting sites and a food source. A number of new bird nesting boxes should also be provided on retained trees in order to compensate for the loss of nesting sites as a result of the proposals.

7.10 Invasive Species

No invasive plant species were identified on site during the phase one survey, however dense scrub and trees restricted the survey in some parts of the site. Any clearance of dense vegetation from the site should be undertaken with care and with invasive plant species in mind. If any invasive species are identified then works should cease and specialist advice should be sought.

7.11 Dingy and Grizzled Skipper

The land that will be impacted by the proposals is not thought to have high value for Dingy and Grizzled Skipper due to the lack of preferred food plants for these species, eg. birdsfoot trefoil. The semi-improved neutral grassland habitats on site will however have value to other invertebrate species and areas of this habitat should be retained and enhanced as described in section 7.2.

THESE SURVEY RESULTS ARE VALID FOR UP TO 1 YEAR AFTER WHICH RE-SURVEYS ARE RECOMMENDED



8.0 REFERENCES

Wrexham Biodiversity Action Plan (BAP)

WCBC Local Planning Guidance Note No. 29 – *Wrexham Industrial Estate – Employment, Development and Nature Conservation*

NATURE CONSERVANCY COUNCIL (1990) Handbook for Phase 1 habitat survey. NCC. Peterborough.

STACE, C. A. (1997) *Flora of the British Isles, 2nd edition*. Cambridge University Press

ENGLISH NATURE (2001) *Great crested newt mitigation guidelines*. English Nature, Peterborough.

Mitchell-Jones, A.J, & McLeish, A.P. Ed. 2004. *Bat Workers Manual*

ENGLISH NATURE 2004. *Bat Mitigation Guidelines*.

BAT CONSERVATION TRUST. 2007. *Bat Surveys – Good Practice Guidelines*



APPENDIX 1

Drawings:

Site Location Plan - D/JWE/1368/001

Extended Phase One Habitat Plan - D/JWE/1368/002





= Site Location

 J W ECOLOGICAL LTD

TITLE: Site Location Plan

SITE: Plot C4, Abenbury Way

NGR: SH 37374 50548

DRAWING NUMBER: D/JWE/1368/001



J W ECOLOGICAL LTD

Site: Plot C4, Abenbury Way

Title: Extended Phase One Habitat Plan

KEY:

- SI Semi-improved grassland
- I Improved grassland
- A Amenity grassland
- Broad-leaved semi-natural woodland
- Scattered broad-leaved tress
- Dense/continuous scrub
- Scattered scrub
- Standing water
- Buildings
- Bare ground
- Hedgerow
- Hedgerow with mature trees
- Fence
- Running water
- Target Notes (See Appendix 2)

Bat Survey of Trees:

- C1 Tree classed as Category 1 in terms of its roosting potential
- C2 Tree classed as Category 2 in terms of its roosting potential

GRID REFERENCE:

SJ 37374 50548

SCALE:

1:1000

DRAWN BY:

JW

CHECKED BY:

JM

DATE:

08/06/13

DRAWING NUMBER:

D/JWE/1368/002

ISSUE:

A

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APPENDIX 2

Target Notes



The target notes listed below relate to drawing number D/JWE/1368/002 (Appendix 1):

Target Note 1 (T1)

Areas of semi-improved neutral grassland meadow. Species in these areas include Timothy (*Phleum pratense*), meadow foxtail (*Alopecurus pratensis*), cock's-foot (*Dactylis glomerata*), perennial rye-grass (*Lolium perenne*), ribwort plantain (*Plantago lanceolata*), daisy (*Bellis perennis*), self-heal (*Prunella vulgaris*), creeping buttercup (*Ranunculus repens*) and cuckoo flower (*Cardamine pratensis*).

Target Note 2 (T2)

Improved grassland sheep grazed field located outside of the northern corner of the site.

Target Note 3 (T3)

Mown amenity grassland verge located outside of the south-eastern site boundary adjacent to Abenbury Way.

Target Note 4 (T4)

Band of broad-leaved woodland extending along the north-western site boundary adjacent to Erlas Road and along the southern site boundary. Species in the woodland include ash (*Fraxinus excelsior*), alder (*Alnus glutinosa*), lime (*Tilia spp.*), copper beech (*Fagus sylvatica*), and willow (*Salix spp.*). A mature oak (*Quercus spp.*) tree is located in the woodland area on the north-western site boundary.

Target Note 5 (T5)

Small area of woodland extending from the eastern end of the woodland on the southern site boundary out across the eastern side of the site. Three mature oak (*Quercus spp.*) trees are located in this area of woodland.

Target Note 6 (T6)

Mature oak (*Quercus spp.*) tree located in a small area of hawthorn (*Crataegus monogyna*) and elder (*Sambucus nigra*) scrub in the northern corner of the site.

Target Note 7 (T7)

Band of dense blackthorn (*Prunus spinosa*), elder (*Sambucus nigra*), willow (*Salix spp.*) and hawthorn (*Crataegus monogyna*) scrub extending from the southern corner of the survey area north-west across the southern part of the site.

Target Note 8 (T8)

Area of scrub with elder (*Sambucus nigra*), hawthorn (*Crataegus monogyna*) and bramble (*Rubus fruticosus agg.*) located in the southern corner of the survey area.

Target Note 9 (T9)

Small watercourse running through the woodland area on the southern site boundary. The watercourse is relatively shallow and has poorly vegetated earth banks.

Target Note 10 (T10)

Pond located outside of the north-western boundary of the site on the opposite side of Erlas Lane. The pond has a number of duck houses and is in relatively poor condition with very turbid water. No aquatic plants could be seen in the pond.



Target Note 11 (T11)

Badger path entering the western side of the site.

Target Note 12 (T12)

Badger guard hair on fence.



APPENDIX 3

Photographs





Photograph 1 – Semi-improved grassland (view north)



Photograph 2 – Semi-improved grassland (view south)



Photograph 3 – Amenity grassland verge adjacent to Abenbury Way



Photograph 4 – Woodland on the southern site boundary

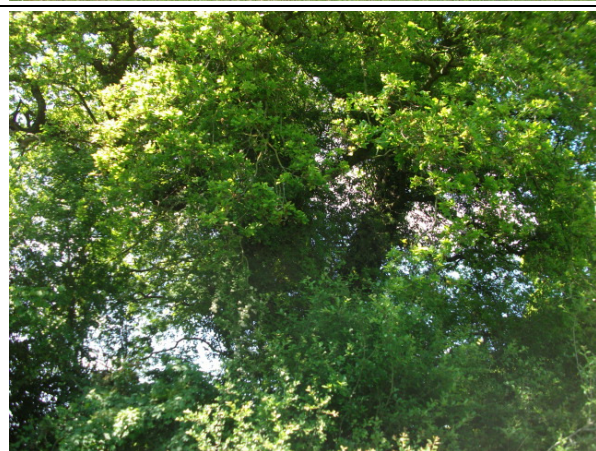




Photograph 5 – Woodland on the north-western site boundary adjacent to Erlas Lane



Photograph 6 – Band of woodland on the eastern side of the site



Photograph 7 – Mature Oak tree in the woodland area on the north-western site boundary



Photograph 8 – Mature Oak tree in the scrub area to the north of the site





Photograph 9 – Dense scrub area extending across the southern part of the site



Photograph 10 – Dense scrub area in the northern corner of the site



Photograph 11 – Small watercourse in the woodland area on the southern site boundary



Photograph 12 – Pond located outside of the north-western site boundary



APPENDIX 4

Desktop Study Response





Please read **Important Issues** and **Notes** before interpreting the following information.

Our Ref.	Client Name	Date Run	Your Ref.
E03359	J W Ecological Ltd	11/06/2013	1368

Site Name	Grid Reference
Abenbury Way	SJ3737450548

Category 1 Species (Species with European and/or UK Legal Protection, Section 42 [NERC] Species or UK BAP Priority Species) within 1000m - 174 records										
Taxon Name	Grid Reference	Date	Recorder(s)	Abundance	Record Type	Site Name	Comments	Dataset ID	Lists	V
Triturus cristatus (Great Crested Newt/Madfall Ddwr Gribog)	SJ373506 (Estimated from Map)	14/04/2000	Anon	2		near Erlas Hall		D1125/001/03 (1857546)	Bern, EPS, HDir, S42, UKBAP, WCA5, LBAP[ANG, CON, DEN, FLI, SNP, WRE]	3
Myotis mystacinus (Whiskered Bat/Ystlum Barfog)	SJ3750 (Estimated from Map)	30/09/1999	Anon	1		Site Name Withheld		D1049/001/02 (683473)	Bern, Bonn, EPS, HDir, WCA5, LBAP[DEN, FLI, GWY]	3
Chiroptera (Bat Species/Ystlum)	SJ3750 (Estimated from Map)	2003	Anon	1		Site Name Withheld		D1049/001/02 (683085)	WCA5	3
Triturus cristatus (Great Crested Newt/Madfall Ddwr Gribog)	SJ37465087	Before 29/08/2003	EAC	Eggs (2001)		Erlas Hall		D1125/001/03 (1857825)	Bern, EPS, HDir, S42, UKBAP, WCA5, LBAP[ANG, CON, DEN, FLI, SNP, WRE]	3
Triturus cristatus (Great Crested Newt/Madfall Ddwr Gribog)	SJ370507 (Estimated from Map)	09/03/2000	EAC	2M, 21F (200)		Redwither Wood		D1125/001/03 (1857448)	Bern, EPS, HDir, S42, UKBAP, WCA5, LBAP[ANG, CON, DEN, FLI, SNP, WRE]	3
Chiasmia clathrata (Latticed Heath/Seffyr Delltog)	SJ376502	25/05/2004	Rob W Whitehead	1 Adult	Daytime observation	Wrexham Ind Estate - Ash Road South	Substrate:Unknown.	D1285/001/01 (3067924)	S42, UKBAP, LBAP[GWY]	3
Coenonympha pamphilus (Small Heath/Gweirlöyn Bach y Waun)	SJ376502	25/05/2004	Rob W Whitehead	2	Field record / observation	Wrexham Ind Estate - Ash Road South	Substrate:Unknown.	D1373/001/02 (3101078)	S42, UKBAP, LBAP[GWY]	3
Triturus cristatus (Great Crested Newt/Madfall Ddwr Gribog)	SJ368503 (Estimated from Map)	28/04/2000	Anon	8		Big Wood		D1125/001/03 (1857731)	Bern, EPS, HDir, S42, UKBAP, WCA5, LBAP[ANG, CON, DEN, FLI, SNP, WRE]	3
Triturus cristatus (Great Crested Newt/Madfall Ddwr Gribog)	SJ368502 (Estimated from Map)	28/04/2000	EAC	8		Big Wood		D1125/001/03 (1857730)	Bern, EPS, HDir, S42, UKBAP, WCA5, LBAP[ANG, CON, DEN, FLI, SNP, WRE]	3
Coenonympha pamphilus (Small Heath/Gweirlöyn Bach y Waun)	SJ380502	2 records, on 22/05/2004 and 25/05/2004	Rob W Whitehead	2, 2	Field record / observation	Wrexham Ind Estate - Norish FP Ltd	Substrate:Unknown	D1373/001/02	S42, UKBAP, LBAP[GWY]	3
Erynnis tages (Dingy Skipper/Gwibiwr Llwyd)	SJ380502	2 records, on 22/05/2004 and 25/05/2004	Rob W Whitehead	4, 4	Field record / observation	Wrexham Ind Estate - Norish FP Ltd	Substrate:Unknown	D1373/001/02	S42, UKBAP, LBAP[CON, FLI, GWY]	3
Pyrgus malvae (Grizzled Skipper/Gwibiwr Brith)	SJ380502	2 records, on 22/05/2004 and 25/05/2004	Rob W Whitehead	1, 2	Field record / observation	Wrexham Ind Estate - Norish FP Ltd	Substrate:Unknown	D1373/001/02	S42, UKBAP, LBAP[DEN, FLI]	3
Pyrgus malvae (Grizzled Skipper/Gwibiwr Brith)	SJ3737249791	11/05/2011	Clare Williams	2 Adult		Wrexham Industrial Estate: Clywedog Road North	Species survey.	D1466/001/01 (3667432)	S42, UKBAP, LBAP[DEN, FLI]	3
Pyrgus malvae (Grizzled Skipper/Gwibiwr Brith)	SJ3746449796	24/05/2012	George Tordoff	1 Adult		Wrexham Industrial Estate: Coed Aben Road	Species survey.	D1466/001/01 (3667434)	S42, UKBAP, LBAP[DEN, FLI]	3
Triturus cristatus (Great Crested Newt/Madfall Ddwr Gribog)	SJ379500 (Estimated Centroid of Site Name))	May 2004	Raymond Gemmell	+ Adult; + Juvenile; + Egg		Wrexham Industrial Estate	Bottle trap, torch survey and egg search.	D1310/001/01 (2701533)	Bern, EPS, HDir, S42, UKBAP, WCA5, LBAP[ANG, CON, DEN, FLI, SNP, WRE]	1
Pyrgus malvae (Grizzled Skipper/Gwibiwr Brith)	SJ3739149779	11/05/2011	Clare Williams	1 Adult		Wrexham Industrial Estate: Clywedog Road North	Species survey.	D1466/001/01 (3667431)	S42, UKBAP, LBAP[DEN, FLI]	3
Pyrgus malvae (Grizzled Skipper/Gwibiwr Brith)	SJ3740349733	24/05/2012	George Tordoff	10 Adult		Wrexham Industrial Estate: Clywedog Road North	Timed Count.	D1466/001/01 (3667436)	S42, UKBAP, LBAP[DEN, FLI]	3
Triturus cristatus (Great Crested Newt/Madfall Ddwr Gribog)	SJ378498 (Estimated from Map)	22/04/1998	Dylan Lloyd	6		Wrexham Industrial Estate - Woodland Corridor Pond		D1125/001/03 (1857673)	Bern, EPS, HDir, S42, UKBAP, WCA5, LBAP[ANG, CON, DEN, FLI, SNP, WRE]	3
Triturus cristatus (Great Crested Newt/Madfall Ddwr Gribog)	SJ379498 (Estimated from Map)	22/04/1998	Dylan Lloyd	7		Wrexham Industrial Estate - Typha pond		D1125/001/03 (1857672)	Bern, EPS, HDir, S42, UKBAP, WCA5, LBAP[ANG, CON, DEN, FLI, SNP, WRE]	3
Myotis mystacinus (Whiskered Bat/Ystlum Barfog)	SJ3749 (Estimated from Map)	30/04/1998	Anon	1		Site Name Withheld		D1049/001/02 (683474)	Bern, Bonn, EPS, HDir, WCA5, LBAP[DEN, FLI, GWY]	3

Taxon Name	Grid Reference	Date	Recorder(s)	Abundance	Record Type	Site Name	Comments	Dataset ID	Lists	V
<i>Triturus cristatus</i> (Great Crested Newt/Madfall Ddwr Gribog)	SJ36984954	08/07/1992	Anon - Herpetofauna Consultants International			Pear Tree Cottage	Report identifies this as a probable record, supplied by local person.	D1125/001/03 (1857447)	Bern, EPS, HDir, S42, UKBAP, WCA5, LBAP[ANG, CON, DEN, FLI, SNP, WRE]	3
<i>Triturus cristatus</i> (Great Crested Newt/Madfall Ddwr Gribog)	SJ3632651051	Before 29/08/2003	EAC	Eggs (2001)		Bryn Estyn		D1125/001/03 (1857952)	Bern, EPS, HDir, S42, UKBAP, WCA5, LBAP[ANG, CON, DEN, FLI, SNP, WRE]	3
<i>Triturus cristatus</i> (Great Crested Newt/Madfall Ddwr Gribog)	SJ381496 (Estimated from Map)	15/04/1998	Dylan Lloyd	1		Wrexham Industrial Estate - Field Corner Pond		D1125/001/03 (1857566)	Bern, EPS, HDir, S42, UKBAP, WCA5, LBAP[ANG, CON, DEN, FLI, SNP, WRE]	3
<i>Triturus cristatus</i> (Great Crested Newt/Madfall Ddwr Gribog)	SJ385500	14 records, between 26/04/2007 and 22/05/2007	Tom Knight			Oth:sa:140:2006		D1317/001/01	Bern, EPS, HDir, S42, UKBAP, WCA5, LBAP[ANG, CON, DEN, FLI, SNP, WRE]	3
<i>Triturus cristatus</i> (Great Crested Newt/Madfall Ddwr Gribog)	SJ3839651317	02/07/2002	Wrexham/JG&AH			Cornish Hall, Holt, Pond No. 8, 2002		D1125/001/03 (1857306)	Bern, EPS, HDir, S42, UKBAP, WCA5, LBAP[ANG, CON, DEN, FLI, SNP, WRE]	3
<i>Triturus cristatus</i> (Great Crested Newt/Madfall Ddwr Gribog)	SJ3620351072	2001	EAC	2M & 2F		Bryn Estyn		D1125/001/03 (1857259)	Bern, EPS, HDir, S42, UKBAP, WCA5, LBAP[ANG, CON, DEN, FLI, SNP, WRE]	3
Lutra lutra (Otter/Dyfrgi)	SJ3751	2 records, both on 06/01/2011	Cardiff University & Environment Agency	Female, Not recorded Not recorded	Dead on road	Site Name Withheld	Comments Withheld	D0120/001/01	Bern, CITES, EPS, HDir, S42, UKBAP, WCA5, LBAP[ANG, CON, DEN, FLI, GWY, SNP, WRE]	3
<i>Triturus cristatus</i> (Great Crested Newt/Madfall Ddwr Gribog)	SJ38735091	18/06/1993	Anon - Herpetofauna Consultants International	P		near Wrexham Industrial Estate		D1125/001/03 (1857643)	Bern, EPS, HDir, S42, UKBAP, WCA5, LBAP[ANG, CON, DEN, FLI, SNP, WRE]	3
<i>Triturus cristatus</i> (Great Crested Newt/Madfall Ddwr Gribog)	SJ38545141	15/06/1993	Anon - Herpetofauna Consultants International	P		near Honeysuckle Cottage		D1125/001/03 (1857581)	Bern, EPS, HDir, S42, UKBAP, WCA5, LBAP[ANG, CON, DEN, FLI, SNP, WRE]	3
<i>Vipera berus</i> (Adder/Gwiber)	SJ380490	Before 2009	Anon.			Redwither Brook		D0035/002/01 (2502299)	S42, UKBAP, WCA5, LBAP[ANG, CON, DEN, FLI, GWY, SNP]	4
<i>Meles meles</i> (Badger/Mochyn Daear)	SJ3650	3 records, between 01/03/2001 and 19/12/2003	Clwyd Badger Group (CBG)		Badger Sett		CBG Ref: A54.0. Please contact CBG for more details.; CBG Ref: A23.0; CBG Ref: A32.0.	D0059/001/01	BA, LBAP[CON, DEN, FLI, WRE]	3
<i>Meles meles</i> (Badger/Mochyn Daear)	SJ3751	2 records, both on 19/12/2003	Clwyd Badger Group (CBG)		Badger Sett		CBG Ref: A53.1. Please contact CBG for more details.; CBG Ref: A58.0.	D0059/001/01	BA, LBAP[CON, DEN, FLI, WRE]	3
<i>Meles meles</i> (Badger/Mochyn Daear)	SJ3749	19/08/2003	Clwyd Badger Group (CBG)		Badger Sett		CBG Ref: B51.0. Please contact CBG for more details.	D0059/001/01 (804446)	BA, LBAP[CON, DEN, FLI, WRE]	3
<i>Scotopteryx chenopodiata</i> (Shaded Broad-bar/Rhesen Lydan Dywyll)	SJ3749	2 records, on 07/09/2009 and 09/07/2010	Graham, A.N. & J.E.; Justin Williams	2 Adult	Netted	Wrexham Industrial Estate	Substrate:Unknown	D1285/001/01	S42, UKBAP, LBAP[GWY]	3
<i>Falco tinnunculus</i> (Kestrel/Cudyll Coch)	SJ3850	15/06/2008	Norman Hallas	1		Wrexham, Industrial Estate	H Activity.	D1297/002/01 (3408426)	Bern, Bonn, CITES, S42, WBR[RSPB], LBAP[ANG, CON, DEN, FLI, GWY]	1
<i>Muscicapa striata</i> (Spotted Flycatcher/Gwybedog Mannog)	SJ3850	15/06/2008	Norman Hallas	1		Wrexham, Industrial Estate	S Activity.	D1297/002/01 (3417287)	Bern, Bonn, S42, UKBAP, WBR[RSPB], LBAP[CON, DEN, FLI, GWY]	1
<i>Cuculus canorus</i> (Cuckoo/Cog)	SJ3651	2 records, on 02/06/2007 and 17/06/2007	Colin Jones	1, 2		Wrexham, Clwyd House		D1297/002/01	S42, UKBAP, WBR[RSPB], LBAP[CON, DEN, FLI, GWY]	1
<i>Falco tinnunculus</i> (Kestrel/Cudyll Coch)	SJ3651	9 records, between 24/02/2007 and 01/03/2008	Colin Jones	1, 1, 1, 1, 1, 1, 1, 1, 1		Wrexham, Clwyd House		D1297/002/01	Bern, Bonn, CITES, S42, WBR[RSPB], LBAP[ANG, CON, DEN, FLI, GWY]	1
<i>Meles meles</i> (Badger/Mochyn Daear)	SJ3651	3 records, between 01/03/2000 and 01/01/2003	Clwyd Badger Group (CBG)		Badger Sett		CBG Ref: A63.0. Please contact CBG for more details.; CBG Ref: A86.0; CBG Ref: A49.0.	D0059/001/01	BA, LBAP[CON, DEN, FLI, WRE]	3
<i>Passer domesticus</i> (House Sparrow/Aderyn y To)	SJ3651	30/11/2008	Colin Jones			Wrexham, Clwyd House		D1297/002/01 (3414987)	S42, UKBAP, WBAm[RSPB], LBAP[CON, FLI, GWY]	1
<i>Vanellus vanellus</i> (Northern Lapwing/Cornchwiglen)	SJ3651	3 records, between 02/06/2007 and 03/01/2009	Colin Jones	1, 1, 1		Wrexham, Clwyd House		D1297/002/01	BDir, Bonn, S42, UKBAP, WBR[RSPB], LBAP[ANG, CON, DEN, FLI, GWY, SNP]	1
<i>Emberiza schoeniclus</i> (Reed Bunting/Bras y Cyrs)	SJ3649	17/04/2009	Simon Boswell			Plas Issa Farm		D1297/002/01 (3416844)	Bern, S42, UKBAP, WBAm[RSPB], LBAP[CON, DEN, FLI, GWY]	1
<i>Meles meles</i> (Badger/Mochyn Daear)	SJ3649	19/12/2003	Clwyd Badger Group (CBG)		Badger Sett		CBG Ref: B38.0. Please contact CBG for more details.	D0059/001/01 (804430)	BA, LBAP[CON, DEN, FLI, WRE]	3
<i>Passer domesticus</i> (House Sparrow/Aderyn y To)	SJ3649	17/04/2009	Simon Boswell			Plas Issa Farm		D1297/002/01 (3415035)	S42, UKBAP, WBAm[RSPB], LBAP[CON, FLI, GWY]	1

Taxon Name	Grid Reference	Date	Recorder(s)	Abundance	Record Type	Site Name	Comments	Dataset ID	Lists	V
<i>Vanellus vanellus</i> (Northern Lapwing/Cornchwiglen)	SJ3649	17/04/2009	Simon Boswell			Plas Issa Farm		D1297/002/01 (3416297)	BDir, Bonn, S42, UKBAP, WBR[RSPB], LBAP[ANG, CON, DEN, FLI, GWY, SNP]	1
<i>Anguis fragilis</i> (Slow-worm/Neidr Ddefaid)	SJ3849	1999	Anon			Wrexham Industrial Estate		D1076/001/01 (450915)	S42, UKBAP, WCA5, LBAP[ANG, CON, DEN, FLI, GWY, SNP]	3
<i>Anguis fragilis</i> (Slow-worm/Neidr Ddefaid)	SJ3849	1999	Young Assoc.			Wrexham Industrial Estate	Habitat: Scrub, grassl'd.	D0035/002/01 (2502260)	S42, UKBAP, WCA5, LBAP[ANG, CON, DEN, FLI, GWY, SNP]	4
<i>Coenonympha pamphilus</i> (Small Heath/Gweirlöyn Bach y Waun)	SJ3849 (Selected from Interactive Map)	19 records, between 01/06/2007 and 12/05/2009	John V Smith	: 1 to 3		Calypso WIE	Section 1.; Section 3.; Section 5.; Section 6.; Section 8.; Section 2.; Section 4.; Section 7.; Section 9.	D1470/001/01	S42, UKBAP, LBAP[GWY]	4
<i>Cuculus canorus</i> (Cuckoo/Cog)	SJ3849 (Selected from Interactive Map)	14/05/2007	John V Smith	1		Calypso WIE	Heard.	D1470/001/01 (3698488)	S42, UKBAP, WBR[RSPB], LBAP[CON, DEN, FLI, GWY]	4
<i>Erynnis tages</i> (Dingy Skipper/Gwibiwr Llwyd)	SJ3849 (Selected from Interactive Map)	23 records, between 03/05/2009 and 14/06/2009	John V Smith	: 1 to 9		Calypso WIE	Section 3.; Section 8.; Section 1.; Section 6.; Section 9.; Section 2.; Section 7.; Section 4.; Section 5.	D1470/001/01	S42, UKBAP, LBAP[CON, FLI, GWY]	4
<i>Erynnis tages</i> (Dingy Skipper/Gwibiwr Llwyd)	SJ3849	2 records, on 12/05/2000 and 15/05/2000	Anon.			The Oaks		D1050/003/01	S42, UKBAP, LBAP[CON, FLI, GWY]	1
<i>Falco tinnunculus</i> (Kestrel/Cudyll Coch)	SJ3849	2 records, on 16/04/2008 and 17/03/2009	Norman Hallas	1, 1		Wrexham, Industrial Estate, W		D1297/002/01	Bern, Bonn, CITES, S42, WBR[RSPB], LBAP[ANG, CON, DEN, FLI, GWY]	1
<i>Meles meles</i> (Badger/Mochyn Daear)	SJ3849	3 records, all on 02/01/2003	Clwyd Badger Group (CBG)		Badger Sett		CBG Ref: B56.0. Please contact CBG for more details.; CBG Ref: B89.0; CBG Ref: B20.0.	D0059/001/01	BA, LBAP[CON, DEN, FLI, WRE]	3
<i>Pyrgus malvae</i> (Grizzled Skipper/Gwibiwr Brith)	SJ3849 (Selected from Interactive Map)	35 records, between 03/05/2009 and 14/06/2009	John V Smith	: 1 to 4		Calypso WIE	Section 3.; Section 8.; Section 2.; Section 1.; Section 4.; Section 6.; Section 7.; Section 9.; Section 5.	D1470/001/01	S42, UKBAP, LBAP[DEN, FLI]	4
<i>Pyrgus malvae</i> (Grizzled Skipper/Gwibiwr Brith)	SJ3849	2 records, on 12/05/2000 and 15/05/2000	Anon.	3 adult, 11 adult		The Oaks		D1050/003/01	S42, UKBAP, LBAP[DEN, FLI]	1
<i>Vipera berus</i> (Adder/Gwiber)	SJ3849	1999	Anon			Wrexham Industrial Estate		D1076/001/01 (451117)	S42, UKBAP, WCA5, LBAP[ANG, CON, DEN, FLI, GWY, SNP]	3
<i>Vipera berus</i> (Adder/Gwiber)	SJ3849	1999	Young Assoc.			Wrexham Industrial Estate	Habitat: Scrub, grassl'd.	D0035/002/01 (2502297)	S42, UKBAP, WCA5, LBAP[ANG, CON, DEN, FLI, GWY, SNP]	4

Category 2 Species (Global Red List, British Red Data Book, Nationally Rare & Scarce, Welsh Red and Amber Birds & Welsh Vascular Plant Red Data List, where these are not identified in Category 1) within 1000m - 36 records										
Taxon Name	Grid Reference	Date	Recorder(s)	Abundance	Record Type	Site Name	Comments	Dataset ID	Lists	V
<i>Crepis biennis</i> (Rough Hawk's-beard/Gwalchlys Garw)	SJ3749	11/06/2011	Anon - BSBI			Wrexham Industrial Estate		D1169/002/01 (3682451)	WVP, LBAP[CON]	3
<i>Hirundo rustica</i> (Swallow/Gwennol)	SJ3850	15/06/2008	Norman Hallas	2		Wrexham, Industrial Estate	H Activity.	D1297/002/01 (3404518)	Bern, WBAm[RSPB], LBAP[ANG, CON, GWY]	1
<i>Aegithalos caudatus</i> (Long-tailed Tit/Titw Cynffon-Hir)	SJ3651	5 records, between 29/04/2007 and 04/01/2009	Colin Jones	1, 1, 3, 3		Wrexham, Clwyd House		D1297/002/01	WBAm[RSPB]	1
<i>Apus apus</i> (Common Swift/Gwennol Ddu)	SJ3651	4 records, between 05/05/2007 and 09/06/2007	Colin Jones	2, 2, 4		Wrexham, Clwyd House		D1297/002/01	WBAm[RSPB]	1
<i>Hirundo rustica</i> (Swallow/Gwennol)	SJ3651	5 records, between 05/05/2007 and 17/06/2007	Colin Jones	8, 8		Wrexham, Clwyd House		D1297/002/01	Bern, WBAm[RSPB], LBAP[ANG, CON, GWY]	1
<i>Periparus ater</i> (Coal Tit/Titw Penddu)	SJ3651	30/11/2008	Colin Jones			Wrexham, Clwyd House		D1297/002/01 (3406799)	Bern, WBAm[RSPB], LBAP[CON]	1
<i>Sturnus vulgaris</i> (Common Starling/Drudwen)	SJ3651	4 records, between 12/04/2007 and 03/01/2009	Colin Jones	2, 2, 2		Wrexham, Clwyd House		D1297/002/01	BDir, WBR[RSPB], LBAP[CON, FLI, GWY]	1
<i>Turdus philomelos</i> (Song Thrush/Bronfraith)	SJ3651	01/03/2008	Colin Jones	2		Wrexham, Clwyd House		D1297/002/01 (3417177)	BDir, WBAm[RSPB], LBAP[ANG, CON, DEN, FLI, GWY, SNP, WRE]	1
<i>Aegithalos caudatus</i> (Long-tailed Tit/Titw Cynffon-Hir)	SJ3649	17/04/2009	Simon Boswell			Plas Issa Farm		D1297/002/01 (3415556)	WBAm[RSPB]	1
<i>Anas platyrhynchos</i> (Mallard/Hwyaden Wylt)	SJ3649	17/04/2009	Simon Boswell			Plas Issa Farm		D1297/002/01 (3415744)	BDir, Bonn, WBAm[RSPB], LBAP[CON, GWY]	1
<i>Anthus pratensis</i> (Meadow Pipit/Corhedydd y Waun)	SJ3649	17/04/2009	Simon Boswell			Plas Issa Farm		D1297/002/01 (3415884)	Bern, WBAm[RSPB], LBAP[CON]	1
<i>Carduelis cannabina</i> (Linnet/Llinos)	SJ3649	17/04/2009	Simon Boswell			Plas Issa Farm		D1297/002/01 (3408537)	Bern, WBR[RSPB], LBAP[ANG, CON, DEN, FLI, GWY]	1
<i>Hirundo rustica</i> (Swallow/Gwennol)	SJ3649	17/04/2009	Simon Boswell			Plas Issa Farm		D1297/002/01 (3404535)	Bern, WBAm[RSPB], LBAP[ANG, CON, GWY]	1
<i>Larus argentatus</i> (Herring Gull/Gwylan y Penwaig)	SJ3649	17/04/2009	Simon Boswell			Plas Issa Farm		D1297/002/01 (3414543)	BDir, WBR[RSPB], LBAP[CON, GWY]	1

Taxon Name	Grid Reference	Date	Recorder(s)	Abundance	Record Type	Site Name	Comments	Dataset ID	Lists	V
<i>Phoenicurus phoenicurus</i> (Common Redstart/Tingoch)	SJ3649	17/04/2009	Simon Boswell			Plas Issa Farm		D1297/002/01 (3409075)	Bern, WBAm[RSPB], LBAP[CON, GWY, SNP]	1
<i>Phylloscopus trochilus</i> (Willow Warbler/Telor yr Helyg)	SJ3649	17/04/2009	Simon Boswell			Plas Issa Farm		D1297/002/01 (3417639)	WBR[RSPB], LBAP[CON]	1
<i>Turdus philomelos</i> (Song Thrush/Bronfraith)	SJ3649	17/04/2009	Simon Boswell			Plas Issa Farm		D1297/002/01 (3417243)	BDir, WBAm[RSPB], LBAP[ANG, CON, DEN, FLI, GWY, SNP, WRE]	1
<i>Acanthiophilus helianthi</i> (An Insect - True Fly (Diptera))	SJ3849	04/07/2000	Mike Howe		Field Observation	The Oaks		D0217/001/01 (1057403)	RD2	3
<i>Diplapion stolidum</i> (An Insect - Beetle (Coleoptera))	SJ3849	04/07/2000	Adrian Fowles	1 Adult	Field Observation	The Oaks		D0217/001/01 (1017798)	RD2	3
<i>Oxyna nebulosa</i> (An Insect - True Fly (Diptera))	SJ3849	04/07/2000	Mike Howe	2 Female; 2 male	Field Observation	The Oaks		D0217/001/01 (1057364)	RD1	3
<i>Pseudorchestes pratensis</i> (An Insect - Beetle (Coleoptera))	SJ3849	04/07/2000	Adrian Fowles	1 Adult	Field Observation	The Oaks		D0217/001/01 (1017789)	RD2	3
<i>Sylvia communis</i> (Common Whitethroat/Llwydfron)	SJ3849 (Selected from Interactive Map)	14/05/2007	John V Smith	1		Calypso WIE		D1470/001/01 (3698487)	WBAm[RSPB], LBAP[CON]	4

Category 3 Species (LBAP Species not identified under Categories 1 & 2, Locally Important species as specified by local experts) within 1000m - 66 records										
Taxon Name	Grid Reference	Date	Recorder(s)	Abundance	Record Type	Site Name	Comments	Dataset ID	Lists	V
<i>Phylloscopus collybita</i> (Common Chiffchaff/Siff-Siaff)	SJ377512	05/10/2010	Rob Smith	1 None	field	Borras		D0969/001/03 (3514464)	LBAP[CON]	1
<i>Melilotus altissimus</i> (Tall Melilot/Yr Wydro Dal)	SJ3749	06/07/2009	Graham, A.N.			Wrexham Industrial Estate		D1169/002/01 (3682527)	LBAP[GWY]	3
<i>Ophrys apifera</i> (Bee Orchid/Tegeirian y Wenynen)	SJ3749	06/07/2009	Graham, A.N.			Wrexham Industrial Estate	3, not together.	D1169/002/01 (3682537)	CITES, LBAP[GWY]	3
<i>Buteo buteo</i> (Buzzard/Bwncath)	SJ3850	15/06/2008	Norman Hallas	1		Wrexham, Industrial Estate	H Activity.	D1297/002/01 (3407802)	Bonn, CITES, LBAP[CON]	1
<i>Carduelis chloris</i> (Greenfinch/Llinos Werdd)	SJ3850	15/06/2008	Norman Hallas	1		Wrexham, Industrial Estate		D1297/002/01 (3412048)	Bern, LBAP[CON]	1
<i>Parus major</i> (Great Tit/Titw Mawr)	SJ3850	15/06/2008	Norman Hallas			Wrexham, Industrial Estate		D1297/002/01 (3413432)	Bern, LBAP[CON]	1
<i>Phylloscopus collybita</i> (Common Chiffchaff/Siff-Siaff)	SJ3850	15/06/2008	Norman Hallas	1		Wrexham, Industrial Estate	S Activity.	D1297/002/01 (3408029)	LBAP[CON]	1
<i>Prunella modularis</i> (Dunnock/Llwyd y Gwrych)	SJ3850	15/06/2008	Norman Hallas	1		Wrexham, Industrial Estate		D1297/002/01 (3414146)	Bern, LBAP[CON]	1
<i>Sylvia atricapilla</i> (Blackcap/Telor Penddu)	SJ3850	15/06/2008	Norman Hallas	1		Wrexham, Industrial Estate		D1297/002/01 (3405387)	LBAP[CON]	1
<i>Accipiter nisus</i> (Sparrowhawk/Gwalch Glas)	SJ3651	2 records, on 07/04/2007 and 30/11/2008	Colin Jones			Wrexham, Clwyd House		D1297/002/01	Bonn, CITES, LBAP[CON]	1
<i>Buteo buteo</i> (Buzzard/Bwncath)	SJ3651	11 records, between 24/02/2007 and 01/03/2008	Colin Jones	1, 1, 2, 2, 2, 2, 1, 1, 1, 3, 2		Wrexham, Clwyd House		D1297/002/01	Bonn, CITES, LBAP[CON]	1
<i>Carduelis carduelis</i> (Goldfinch/Nico)	SJ3651	5 records, between 11/03/2007 and 01/03/2008	Colin Jones	2, 2, 2, 2, 2		Wrexham, Clwyd House		D1297/002/01	Bern, LBAP[ANG, CON]	1
<i>Certhia familiaris</i> (Treecreeper/Dringwr Bach)	SJ3651	4 records, between 11/03/2007 and 07/04/2007	Colin Jones	1, 1, 1, 1		Wrexham, Clwyd House		D1297/002/01	Bern, LBAP[CON]	1
<i>Cyanistes caeruleus</i> (Blue Tit/Titw Tomos Las)	SJ3651	11 records, between 24/02/2007 and 03/01/2009	Colin Jones	2, 2, 4, 4, 5, 5, 6, 6, 2, 2		Wrexham, Clwyd House		D1297/002/01	Bern, LBAP[CON]	1
<i>Dendrocopos major</i> (Great Spotted Woodpecker/Cnocell Fraith Fwyaf)	SJ3651	3 records, between 07/04/2007 and 30/11/2008	Colin Jones	1, 1		Wrexham, Clwyd House		D1297/002/01	Bern, LBAP[CON]	1
<i>Motacilla alba</i> subsp. <i>yarrellii</i> (Pied Wagtail/Siglen Fraith)	SJ3651	3 records, between 02/06/2007 and 17/06/2007	Colin Jones	2, 1, 2		Wrexham, Clwyd House		D1297/002/01	Bern, LBAP[CON]	1
<i>Parus major</i> (Great Tit/Titw Mawr)	SJ3651	2 records, both on 11/03/2007	Colin Jones	1, 1		Wrexham, Clwyd House		D1297/002/01	Bern, LBAP[CON]	1
<i>Buteo buteo</i> (Buzzard/Bwncath)	SJ3649	17/04/2009	Simon Boswell			Plas Issa Farm		D1297/002/01 (3407886)	Bonn, CITES, LBAP[CON]	1
<i>Carduelis carduelis</i> (Goldfinch/Nico)	SJ3649	17/04/2009	Simon Boswell			Plas Issa Farm		D1297/002/01 (3411860)	Bern, LBAP[ANG, CON]	1
<i>Carduelis chloris</i> (Greenfinch/Llinos Werdd)	SJ3649	17/04/2009	Simon Boswell			Plas Issa Farm		D1297/002/01 (3412101)	Bern, LBAP[CON]	1
<i>Certhia familiaris</i> (Treecreeper/Dringwr Bach)	SJ3649	17/04/2009	Simon Boswell			Plas Issa Farm		D1297/002/01 (3411537)	Bern, LBAP[CON]	1
<i>Columba oenas</i> (Stock Pigeon/Colomen Wyllt)	SJ3649	17/04/2009	Simon Boswell			Plas Issa Farm		D1297/002/01 (3417323)	BDir, LBAP[GWY]	1

Taxon Name	Grid Reference	Date	Recorder(s)	Abundance	Record Type	Site Name	Comments	Dataset ID	Lists	V
<i>Corvus corax</i> (Common Raven/Cigfran)	SJ3649	17/04/2009	Simon Boswell			Plas Issa Farm		D1297/002/01 (3408952)	LBAP[CON]	1
<i>Cyanistes caeruleus</i> (Blue Tit/Titw Tomos Las)	SJ3649	17/04/2009	Simon Boswell			Plas Issa Farm		D1297/002/01 (3405814)	Bern, LBAP[CON]	1
<i>Dendrocopos major</i> (Great Spotted Woodpecker/Cnocell Fraith Fwyaf)	SJ3649	17/04/2009	Simon Boswell			Plas Issa Farm		D1297/002/01 (3413220)	Bern, LBAP[CON]	1
<i>Motacilla alba subsp. yarrellii</i> (Pied Wagtail/Siglen Fraith)	SJ3649	17/04/2009	Simon Boswell			Plas Issa Farm		D1297/002/01 (3416580)	Bern, LBAP[CON]	1
<i>Parus major</i> (Great Tit/Titw Mawr)	SJ3649	17/04/2009	Simon Boswell			Plas Issa Farm		D1297/002/01 (3413506)	Bern, LBAP[CON]	1
<i>Phylloscopus collybita</i> (Common Chiffchaff/Siff-Siaff)	SJ3649	17/04/2009	Simon Boswell			Plas Issa Farm		D1297/002/01 (3408058)	LBAP[CON]	1
<i>Prunella modularis</i> (Dunnock/Llwyd y Gwrych)	SJ3649	17/04/2009	Simon Boswell			Plas Issa Farm		D1297/002/01 (3414225)	Bern, LBAP[CON]	1
<i>Sylvia atricapilla</i> (Blackcap/Telor Penddu)	SJ3649	17/04/2009	Simon Boswell			Plas Issa Farm	S Activity.	D1297/002/01 (3405404)	LBAP[CON]	1
<i>Bombus (Melanobombus) lapidarius</i> (Large Red Tailed Bumblebee)	SJ3849	04/07/2000	Mike Howe		Field Observation	The Oaks		D0217/001/01 (1057404)	LBAP[FLI]	3
<i>Bombus (Thoracobombus) pascuorum</i> (Common Carder Bee)	SJ3849	04/07/2000	Mike Howe		Field Observation	The Oaks		D0217/001/01 (1057385)	LBAP[FLI]	3
<i>Buteo buteo</i> (Buzzard/Bwncath)	SJ3849	17/03/2009	Norman Hallas	2		Wrexham, Industrial Estate, W		D1297/002/01 (3407863)	Bonn, CITES, LBAP[CON]	1

Statutory Sites intersecting 1000m buffer	None
Wildlife Sites within 1000m (C=Candidate)	Cefn Park (W316) (600m) , Wrexham Industrial Estate (W337) (490m)
NWWT Reserves within 1000m	None
RSPB Reserves within 1000m	None
RIGS within 1000m	None
Habitat type at application grid reference	Semi-improved Neutral Grassland
Habitat type(s) within 1000m	Amenity Grassland, Arable, Buildings, Dense Scrub, Gardens, Improved Grassland, Not Accessed Land, Planted Broad-leaved Woodland, Planted Coniferous Woodland, Planted Mixed Woodland, Semi-improved Neutral Grassland, Semi-natural Broad-leaved Woodland, Standing Water, Swamp, Tall Ruderal Herb
Ancient Woodland within 1000m	Restored Ancient Woodland Site, Ancient Semi Natural Woodland

Important Issues

1. Usage of the above information is governed by Cofnod's **Terms and Conditions of Data Release** (available from Cofnod on request).
2. Records shown in bold typeface are sensitive species records. In this public version of the original report, the resolution of sensitive species grid references have been reduced and site names and comments have been removed.
3. Past records of presence of a habitat or species do not guarantee continued occurrence; absence of records does not imply absence of a species, merely that no records are held at Cofnod; Cofnod cannot guarantee the accuracy of supplied data; copyright of records remains with the original recorder.

Notes

This report should be used in conjunction with any relevant maps, where these are supplied.

Cofnod uses a search system which reports species (usually high priority or protected species) within a specified search radius or buffer. Where required a search will also include high priority 'Mobile Species', such as bats, otters, amphibians and certain invertebrates, which lie outside the specified search radius. These species are highlighted on the report with an **asterisk**. They have been selected as 'Mobile Species' as their territory (possibly due to foraging activity or life cycle) could intersect with the search radius. The list of 'Mobile Species', invasive non-native plant species and species categories used in Cofnod's reporting system can be found at <http://www.cofnod.org.uk/Enquiries.aspx> under the 'Species Categories' tab.

Records with 4 figure grid references are displayed as 1km squares on any relevant maps. They are listed separately in reports and highlighted in grey *italic* script.

Please note that while we hold Wales Raptor Study Group data for North East Wales we are only permitted to release it to a limited number of trusted partners. We can provide contact details if you would like to contact the Raptor Study Group directly to request species information.

Sites - Designated Sites and non-designated Wildlife Sites within 50m of the grid reference are highlighted in red. Wildlife Sites which remain unconfirmed by the relevant Local Authority are given 'Candidate' status and are displayed with the (c) suffix. The following reasons for candidate status apply: 1. Anglesey and Flintshire Wildlife Sites were identified by survey but have not been formally confirmed. 2. Conwy and Gwynedd Wildlife Sites were identified by survey and air photos and remain candidate until evaluated using selection criteria.

Dataset ID - All species records within the reports include Dataset ID codes, which can be used to find the relevant Metadata, using the **Data We Hold** page on the Cofnod website (www.cofnod.org.uk/DataWeHold.aspx). The number below the Dataset ID is the individual record ID. Please quote this if you need more information on a specific record.

'V' column - Record Verification Level. The following abbreviations apply: **1**: Unassessed, **2**: Unconfirmed, **3**: Considered Correct by Cofnod, **4**: Considered Correct by Expert. Dataset Categories and Record Verification Levels are explained in more detail within Cofnod's policy on Data Quality, available from our website.

Maps - This report should be used in conjunction with any relevant maps, where these are supplied. Where Statutory protected sites (e.g. SSSI, SAC, SPA) are displayed on Cofnod maps, more details can be obtained from Countryside Council for Wales. (Visit their website at <http://www.ccw.gov.uk/interactive-maps/official-maps-search.aspx>) Where a Phase 1 Habitat map has been supplied, this illustrates habitats mapped by CCW as part of their Habitat Survey of Wales 1979 to 1997. A separate legend is also supplied.

Lists

BA - Protection of Badgers Act, **BDir** - EU Birds Directive, **Bern** - The Bern Convention on the Conservation of European Wildlife and Natural Habitats, **Bonn** - The Bonn Convention on the Conservation of Migratory Species of Wild Animals, **CCWP** - CCW Priority Species List, **CITES** - Convention on International Trade in Endangered Species, **EPS** - European Protected Species, **HDir** - EU Habitats Directive, **LI** - Locally Important Species, identified by the County Recorder as being of particular importance in the specified Vice-County (see below for a list of Vice-Counties) N.B: Only available for certain species groups and certain areas, **LBAP** - Local Biodiversity Action Plan, **RD1** - Red Data Book listing based on IUCN guidelines, **RD2** - Red Data Book listing not based on IUCN guidelines (Nationally Rare and Scarce), **S42** - Natural Environment and Rural Communities Act 2006 (Section 42), **UKBAP** - UK Biodiversity Action Plan Priority Species, **WBAm[RSPB]** - Birds of Conservation Concern 2002-07 - Welsh Amber listed birds (not based on IUCN criteria), **WBR[RSPB]** - Birds of Conservation Concern 2002-07 - Welsh Red listed birds (not based on IUCN criteria), **WCA1** - Wildlife & Countryside Act 1981 Schedule 1, **WCA5** - Wildlife & Countryside Act 1981 Schedule 5, **WCA8** - Wildlife & Countryside Act 1981 Schedule 8, **WVP** - IUCN Threat Listing of Welsh Vascular Plants

Abbreviations

ANG - Isle of Anglesey, **CON** - Conwy, **DEN** - Denbighshire, **FLI** - Flintshire, **GWY** - Gwynedd, **SNP** - Snowdonia National Park, **WRE** - Wrexham, **LBAP** - Local Biodiversity Action Plan, **NWWT** - North Wales Wildlife Trust, **RSPB** - Royal Society for the Protection of Birds, **RIGS** - Regionally Important Geodiversity Sites, **WS** - Wildlife Site

Vice-Counties

48 - Meirionethshire, **49** - Caernarfonshire, **50** - Denbighshire, **51** - Flintshire, **52** - Anglesey

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APPENDIX 5

Categorisation of trees for their potential to support roosting bats



Categorisation of trees for their potential to support roosting bats as per the Bat Conservation Trust Bat Surveys - Good Practice Guidelines (2012):

Tree Category and Description	Likely Mitigation Requirements
Known or confirmed roost	The tree can only be felled under EPS license following the installation of appropriate habitat as a replacement.
Category 1* Trees with multiple highly suitable features capable of supporting larger roosts	Further dusk/dawn bat activity surveys required to confirm the presence/absence of bats (May to September only). If bats are found refer to "Known or confirmed roost" above. If no bats are found roosting then the tree should be treated as Category 2 and felled using Reasonable Avoidance Measures (RAMs).
Category 1 Trees with definite bat potential, supporting fewer suitable features than category 1* trees or with potential to be used by single bats	Further dusk/dawn bat activity surveys required to confirm the presence/absence of bats (May to September only). If bats are found refer to "Known or confirmed roost" above. If no bats are found roosting then the tree should be treated as Category 2 and felled using Reasonable Avoidance Measures (RAMs).
Category 2 Trees with no obvious potential, although the tree is of an age and size that elevated surveys may result in cracks or crevices being found; or the tree supports some features which may have some limited potential to support roosting bats.	Trees may be felled using Reasonable Avoidance Measures (RAMs). All works should cease and appropriate advice should be sought if any bats are found.
Category 3 Trees with no potential to support roosting bats.	No mitigation for bats required.



Appendix B

Great Crested Newt Model Report
Amphibian & Reptile Conservation
Trust – February 2014



Site C4 Abenbury Way, Wrexham:

**Comparative modelling of impacts on
great crested newts to inform planning.**

D.H. Fletcher, G.C.A. French & J.W. Wilkinson

February 2014

**amphibian and reptile
conservation**



Site C4 Abenbury Way GCN Modelling

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Executive summary

North Wales is a known hotspot for Great Crested Newts (GCNs). Previous ARC work (i.e. Arnell & Wilkinson, 2013) has trialled high resolution (25m) modelling to quantify a number of GCN attributes (e.g. distribution, habitat suitability, importance of metapopulations, etc.) in Anglesey, NE Wales and Powys.

Wrexham industrial estate is located within the boundaries of the aforementioned modelling work. The present work aims to use existing outputs from previous high resolution modelling (Anglesey and NE Wales), namely the resistance surface and the cleaned presence location data, in a comparative analysis. The overarching premise of the work is that a baseline, or current state, can be used as a reference, against which multiple theoretical development scenarios may be compared in order to assess their relative impacts.

The following work represents the development of an objective, data-driven, analysis method that can be used as a decision-making support tool, with regard to the consideration of GCN within the planning process. We utilise graph theory-based connectivity analysis techniques to quantify relative impacts of development options on GCN metapopulations in the localised area around Wrexham industrial estate, the site of a proposed development.

The development's main building footprint was supplied in the format of a shapefile. Locations of proposed mitigation ponds were also supplied in shapefile format. A total of three model scenarios were run: (i) Baseline model – the current state, with no development simulated. (ii) Post-development model – with the development of the area described by the building footprint simulated (i.e. made impermeable to GCN). (iii) Mitigation model – the same as the Post-development model, but with the proposed mitigation ponds added too.

We found that the modelled impacts of development of Site C4 Abenbury Way site (building footprint) on the wider GCN population network appears to be minimal, with no loss of ponds/nodes and the loss of only one link that possesses a low importance value. Whilst the modelled impacts may represent a relatively conservative estimate, the addition of four ponds to the network, as a means of mitigation, appears to compensate more than adequately for the minor loss in connectivity, though is unlikely to represent the optimal mitigation scenario which would comprise ponds located to the east of the development, or to the south to strengthen links to other relatively isolated populations.

Introduction

Great crested newts (GCN) are protected by both British and European law, which together make provision for the protection of the species and its associated habitats. In England and Wales it is illegal to (i) intentionally or deliberately capture, kill, or intentionally injure great crested newts. (ii) Deliberately disturb great crested newts or intentionally or recklessly disturb them in a place used for shelter or protection. (iii) Damage or destroy a breeding site or resting place. (iv) Intentionally or recklessly damage, destroy or obstruct access to a place used for shelter or protection. (v) Possess a great crested newt, or any part of it, unless acquired lawfully. (vi) Sell, barter, exchange, transport or offer for sale great crested newts or parts of them.

Any activity likely to contravene the legislation must be licensed by the appropriate party, whom issues licences for the purposes of “preserving public health or public safety or other imperative reasons of overriding public interest, including those of a social or economic nature and beneficial consequences of primary importance for the environment” [Regulation 44(2)(e)].

A licence will not be granted unless:

- “There is no satisfactory alternative” [Regulation 44(3)(a)], and
- “The action authorised will not be detrimental to the maintenance of the population of the species concerned at a favourable conservation status in their natural range” [Regulation 44(3)(b)].

Therefore, any proposed development must show that any damage to the status of GCN must be adequately compensated for. Compensation must amount to the maintenance of conservation status, taking into account population size, viability and connectivity.

Local planning authorities have the responsibility of ensuring that protected species issues are taken into account as a material consideration when determining planning applications. They must also ensure that protected species issues are taken into account in the preparation of Local Development Plans (LDPs). These responsibilities are underlined by Regulation 3(4) of the Conservation (Natural Habitats & c.) Regulations 1994, which require authorities to have regard for the conservation of European Protected Species, such as great crested newts.

When considering options for development plans, it can be costly and time-consuming to undertake detailed surveys at all ponds and GCN presence locations, for the purpose of quantifying impacts. Although it is usually a requirement that any submitted plans are accompanied by full surveys of the areas affected, this is not to say that **all** options considered prior to submission need to be subject to full surveys.

In the interest of optimising allocation of time and resources to full surveys, it would be immensely valuable to be able to assess relative impacts of options, without having to first undertake detailed surveys at all presence locations within the vicinity of candidate development sites. Desktop studies can be useful, in the interest of time and costs; however they still require data on GCN presence. These data are sometimes present, in the form of local/regional records centre data, but rarely provide much beyond the species’ presence or absence.

The present study utilises Species Distribution Modelling (SDM) in order to quantify the potential value of populations at GCN presence locations and incorporates this data into a wider, landscape-level connectivity analysis. The connectivity analysis uses a resistance surface, which can be modified to reflect proposed developments, to model the likely movement of GCN through the landscape between locations of known presence. By using a metric that captures both the value of individual habitat patches (ponds/nodes) and the degree of connectivity at a landscape level, it is possible to compare the relative predicted impacts of multiple development scenarios without having to first carry out detailed GCN surveys at all sites. This approach allows many development options/scenarios to be compared with minimal outlay, both in terms of time and money.

Materials and Methods

Software & Data

The following software was used in this study:

- The majority of analysis was conducted in R (R Core Team, 2013), using the 'gdistance' (van Etten, 2012), 'rgdal' (Bivand et al., 2013) and 'raster' (Hijmans, 2013) packages.
- Network analysis was conducted using the Command Line version of Conefor software (Torné & Saura, 2013).
- Composition and creation of map outputs was carried out using ArcGIS 10.2 (ESRI, 2014).

All GCN presence location data used in this study was derived from the Cofnod dataset used in Arnell & Wilkinson (2013). MaxEnt model output and resistance surface GIS layers were all taken from Arnell & Wilkinson (2013). GIS shapefile data describing the proposed candidate development site and detailing the mitigation pond locations was provided by the client.

Study area



Figure 1 – Map showing location of study area.

The proposed development site is located in the Wrexham industrial estate, on the eastern outskirts of Wrexham town, north Wales (see Fig.1 above). The study area is essentially defined by a 2km buffer around the development site. However, after visual inspection we concluded that there were additional GCN records just outside the buffer (predominantly to the north-east), near enough to the study site as to be relevant. The study area was expanded to include these additional records.

Resistance Surface Scenarios

The resistance surface created for the Anglesey and NE Wales project was clipped to the extent of the study area. An unmodified version was used as the baseline “no development” scenario. The remaining 2 scenarios were each represented by a modified resistance surface, where cells of the selected development site was assigned a high value (10000), rendering those cells impermeable to all intents and purposes.

Least Cost Pathways

Calculating Least Cost Pathways (LCPs) is a necessarily processor-intensive procedure, particularly when working at high resolutions. However these calculations can be minimised by limiting the number of pairs of points for which the LCPs are calculated. In this study, we filtered out any pair of points that possessed a Euclidean separation distance exceeding 2000m, a distance beyond which it is reasonable to assume that negligible dispersal occurs.

LCPs were calculated for the remaining pairwise combinations of points (1866 combinations/LCPs in total for the first two scenarios, 1968 for the mitigation scenario). LCPs were calculated for each the baseline, development and mitigation scenarios, which were represented by the resistance surfaces. Line shapefiles containing the LCPs, and their corresponding cost-distance values, as attributes, were generated for subsequent visualisation and map creation.

Graph Construction & Analysis

We used the graph theory software Conefor (see Software section) to highlight populations that are likely to be most important. Graph theory has been used for a variety of applications, including geography and computer science and recently has been employed to provide estimates of connectivity between habitat patches at landscape scale (Minor and Urban, 2007; Saura and Rubio, 2010; Urban and Keitt, 2001). This software is able to calculate a connectivity index (Probability of Connectivity, ‘dPC’) for each population, which is comprised of the habitat quality/patch size of each patch (dPC Intra), the patches’ contribution to connecting between patches (varPC Con) and the position of the patch within the network (dPC Flux) (Saura and Rubio, 2010).

Nodes: The GCN presence points were used as nodes in graph construction. Each of the nodes was assigned a “patch” value, representing some surrogate for habitat value. These “patch” values were derived from the MaxEnt model output from the Anglesey and NE Wales project, on the basis that most suitable locations were of higher habitat value than less suitable locations.

Edges/Links: The LCP cost-distance values were used as edge/link distance values in the graph construction – the higher the LCP cost-distance value, the further apart the two corresponding nodes are.

Conefor Parameterisation: In order to calculate dPC values for the graph objects, thresholds must first be defined. In the context of this study, the threshold relates to dispersal distances. The median dispersal distance used in previous studies was 250m, and as such, was the value utilised in this study also.

As all of our edge/link values are in cost-distance, rather than Euclidean distance, the threshold had to be converted into corresponding units of cost-distance. In order to do this, we calculated an average cost per metre of the LCPs (29.76), which characterises the wider landscape, then multiplied this landscape value by 250 to give a cost-distance of 7440 for median (0.5 probability) dispersal.

For each node, the dPC index and its components were recorded. For each edge/link, the change in overall, landscape PC number associated with its removal from the graph (representing link importance) was recorded. The overall PC number, a measure of combined graph object coherence, was also recorded for each of the scenarios.

Results

Initial, Baseline Analysis (no sites developed)

Those edges/links with cost-distance values above a cost-distance threshold equivalent to a Euclidean distance of 2000m ($2000 \times 29.76 = 59520$) were removed from the final maps, as dispersal beyond this cost-distance is deemed to be negligible, leaving a total of 1509, 1508 and 1543 remaining links for the Baseline, Post-development and Mitigation scenarios respectively.

In the initial baseline model (see Appendix 1) the bulk of pond/nodes are down the eastern side of the study area in a slight crescent shape, wrapping around the industrial estate. They are most densely distributed in the middle, thinning out to the north and to the south. There are a few sparsely distributed nodes to the west of the development site, which are relatively poorly connected to the main part of the network. More important ponds/nodes generally represent those that are better connected, and less important ones generally represent those that are more isolated. Overall pond/node importance (sum of PC components – Intra, Flux and Con) is reflected in the diameter of the corresponding pie-chart.

Due to the relatively dense configuration of the main body of the network of nodes, the links between them are good and numerous. There are some more tenuous links, separating a small sub-cluster in the south of the study area from the main body of the network, but not so much as to be significant. There appears to only be two, relatively low importance links crossing the proposed development site.

Regarding composition of importance/PC metric for each node, 'dPC Con' is very low, almost non-existent, due to the spatial configuration of individual nodes within network components (removal does not increase fragmentation of components significantly). For the main part, the only visible components of PC are 'Intra' (red) and 'Flux' (green). The variations in relative proportions of these components is broadly explained by isolation of the pond/node in question – 'Intra', representing the actual habitat patch value, increases as a function of isolation, thus those ponds/nodes that are more isolated tend to display a higher proportion of red.

Development Scenario

As mentioned above, there are only two, relatively weak links that cross the development site (see Baseline model, Appendix 1), and only one is lost as a result of the development. There are no nodes lost as a result of the development. Beyond the loss of the individual link, there are no significantly discernable impacts on the network through the development of the site (see Post-development model, Appendix 2). The loss of the link, which is of relatively low importance, results in a decrease in overall landscape value (PCnum) of just 0.01%, from 2426799 to 2426769 (See Fig. 2).

Mitigation Scenario

Four ponds/nodes were added to land adjacent to the building in the mitigation scenario (see Mitigation model, Appendix 3). The ponds border the development to the northwest and form connections with existing nodes to the northeast and southwest, resulting in the creation of a new link with the northeast node cluster. It should be noted however, that this link is relatively weak and does not replace the link to the main cluster of nodes to the east that is lost due to the development. The addition of four nodes (i.e. habitat patches) to the network, in conjunction with the increase in cohesiveness of the network through improved connectivity results in an increase in overall landscape value (PCnum) of 4.5%, from post-development value of 2426769 to 2535926 (see Fig. 2). While this value might be considered as acceptable for mitigation, it is highly unlikely to represent the optimal mitigation scenario, which is more likely to be achieved by placing the new ponds in closer proximity to the main node cluster to the east of the development.

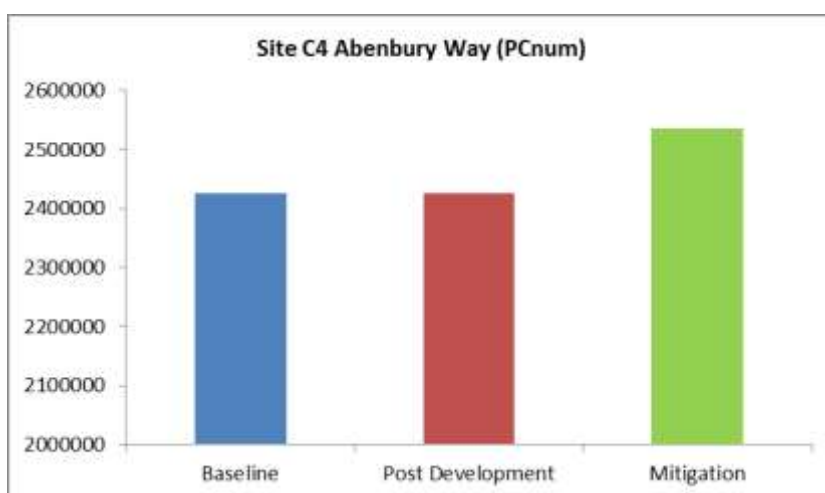


Figure 2 – Graph displaying the overall landscape metric, PCnum (sum of all nodes' components) associated with each scenario. The baseline model, 'no development', is coloured blue, post-development model is coloured red and the mitigation model is green. *Note that Y-axis does not start at zero*

Discussion

Methods

We used MaxEnt output as a surrogate for habitat patch value. The approach could be augmented by the addition of HSI data and ground-truthing. Nevertheless, this approach follows a clear and logical theoretical grounding and in the absence of HSI, or other survey data, may provide a more realistic representation of potential patch habitat value than a simple binary present/absent approach.

Generally, the methods used in this study offer useful insights into the way that the target taxa may use and move through the landscape, although data-imposed limitations must be recognised and considered when interpreting the outputs. For instance, the resistance layers, the basis for LCP creation, are far from a perfect representation of the real world. It is highly probable that barriers exist that are not captured by the data sources used to derive the resistance surfaces (i.e. fences, walls, etc). Furthermore, there is a paucity of research relating to the relative resistance of landcover types to GCN movement – this research would be invaluable in calibrating more accurate resistance surfaces.

Nonetheless, providing the limitations are kept in mind when interpreting outputs, the methods outlined in this study can highlight key areas for potential corridors of dispersal, which can be verified through short-term, focussed surveys (i.e. drift netting). They can also provide a consistent, objective, transparent means of comparing various development scenarios, without the cost of detailed surveys. This could potentially allow planners to consider a greater number of options, refining them through the methods used here, before carrying out more detailed analysis on only the best two or three.

Model Outputs

It is important to note that the comparative analyses carried out in this study, were done so on the strict basis that specific combinations of development sites and nodes (those stipulated by the client) comprised the development scenarios. The authors would recommend the use of extreme caution when trying to extrapolate beyond the remit of the specified combinations of developed sites set out herein. Furthermore, the modelled impact of the development does not necessarily capture the full range of possible negative effects associated with such a development. For instance, the footprint of the building will not be the spatial limit of influences during construction (i.e. people and vehicles moving

around site). However, the identification of important dispersal pathways and ponds should allow planners and developers to minimise impacts through avoiding them where possible.

These analyses elucidate the current structure of the GCN population network in the localised area around the proposed, Site C4 Abenbury Way development site and highlight the links most important to the taxa's dispersal capabilities. The 'post-development' model suggests that there is relatively little impact to the GCN population network through the development of the proposed site; specifically the loss of a single, relatively low importance, link. The 'mitigation' model suggests that the impact of the development is more than compensated for by the addition of four new ponds (under the assumption that these ponds are made suitable for GCNs), though is unlikely to represent the optimal mitigation scenario which would comprise ponds located to the east of the development, or to the south to strengthen links to other relatively isolated populations.

Conclusions

The modelled impacts of development of the Site C4 Abenbury Way site (building footprint) on the wider GCN population network appears to be minimal, with no loss of ponds/nodes and the loss of only one link that possesses a low importance value. Whilst the modelled impacts may represent a relatively conservative estimate, the addition of four ponds to the network, as a means of mitigation, appears to compensate more than adequately for the minor loss in connectivity.

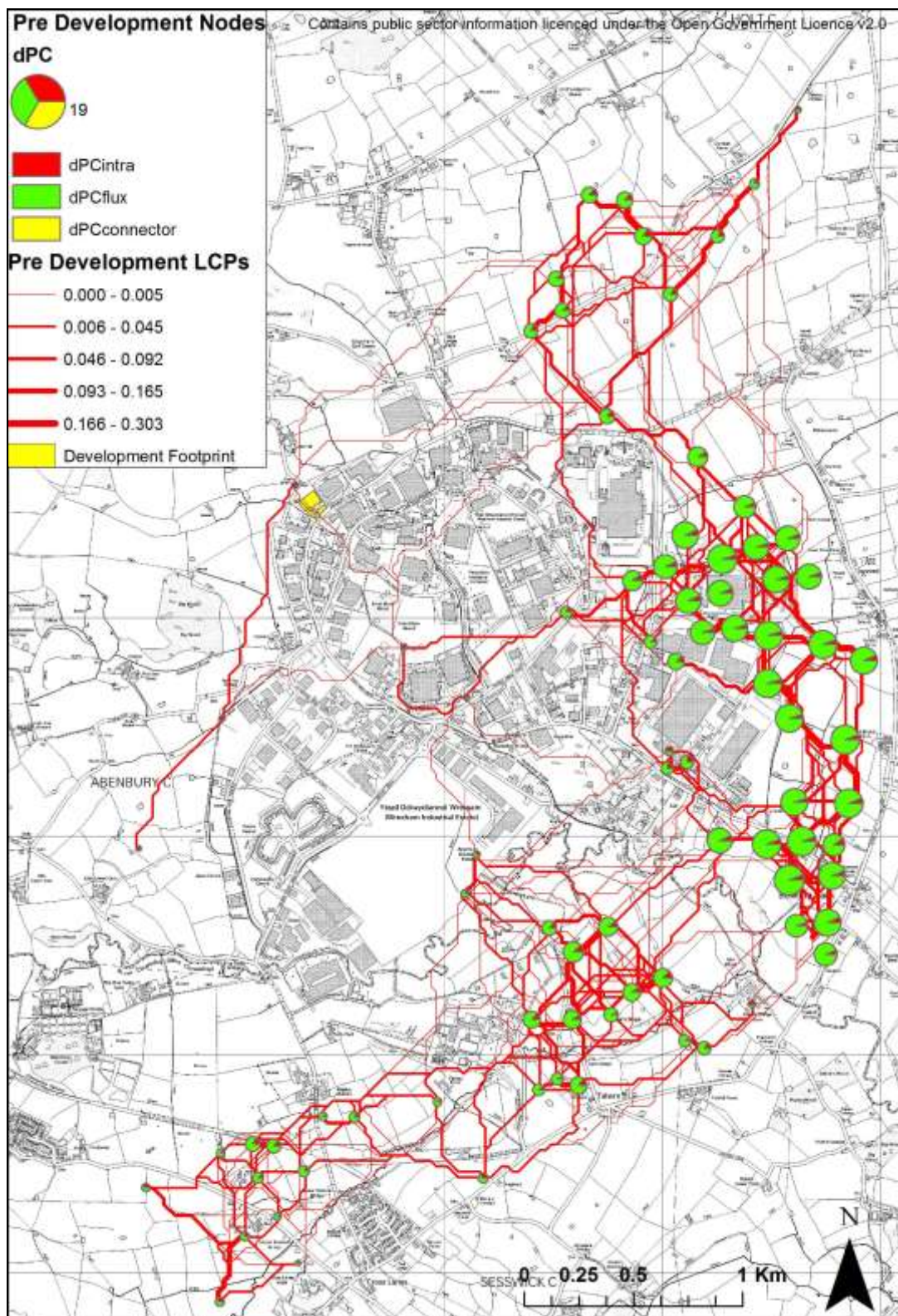
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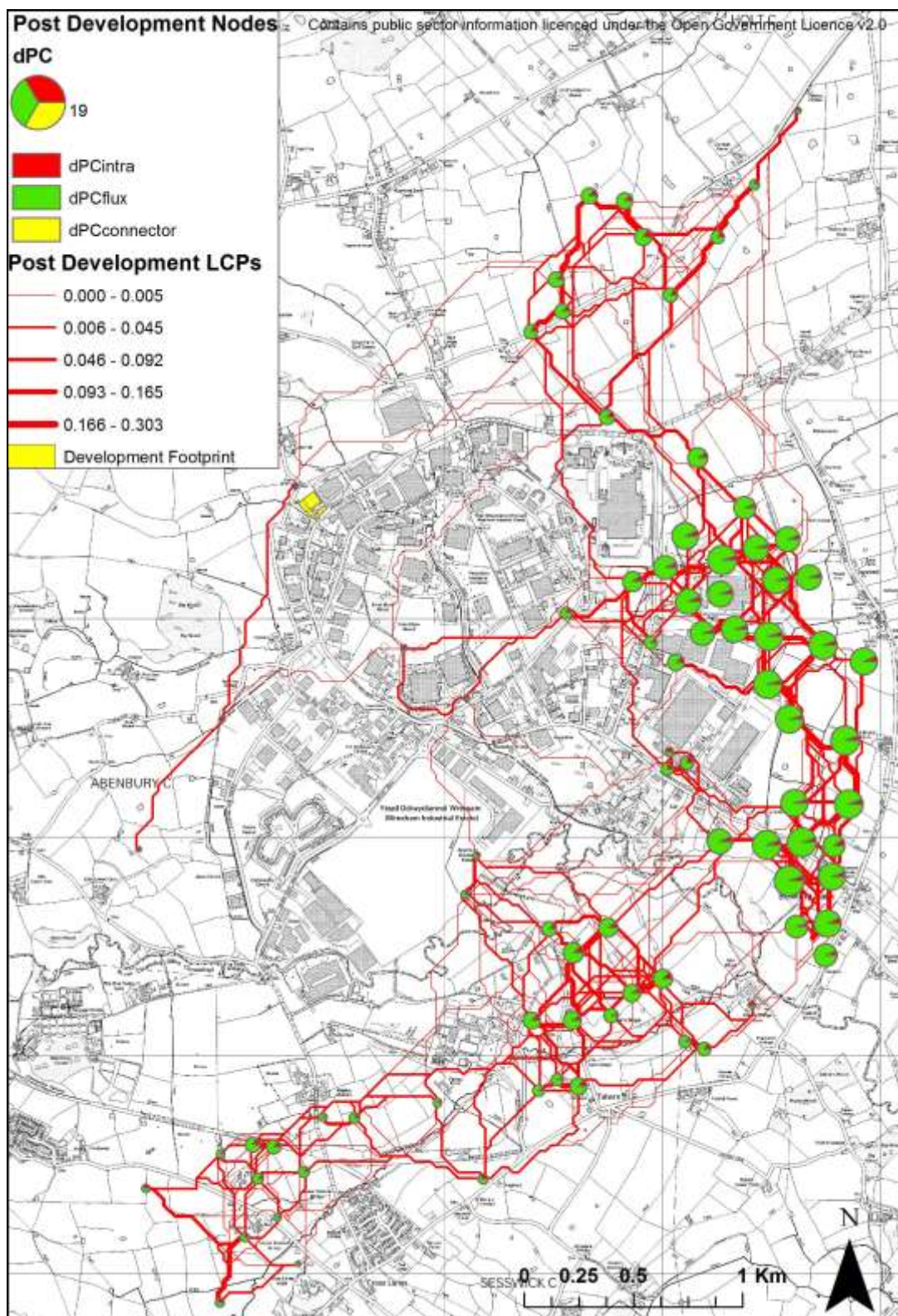
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Appendix 1 – Baseline Model (no development).



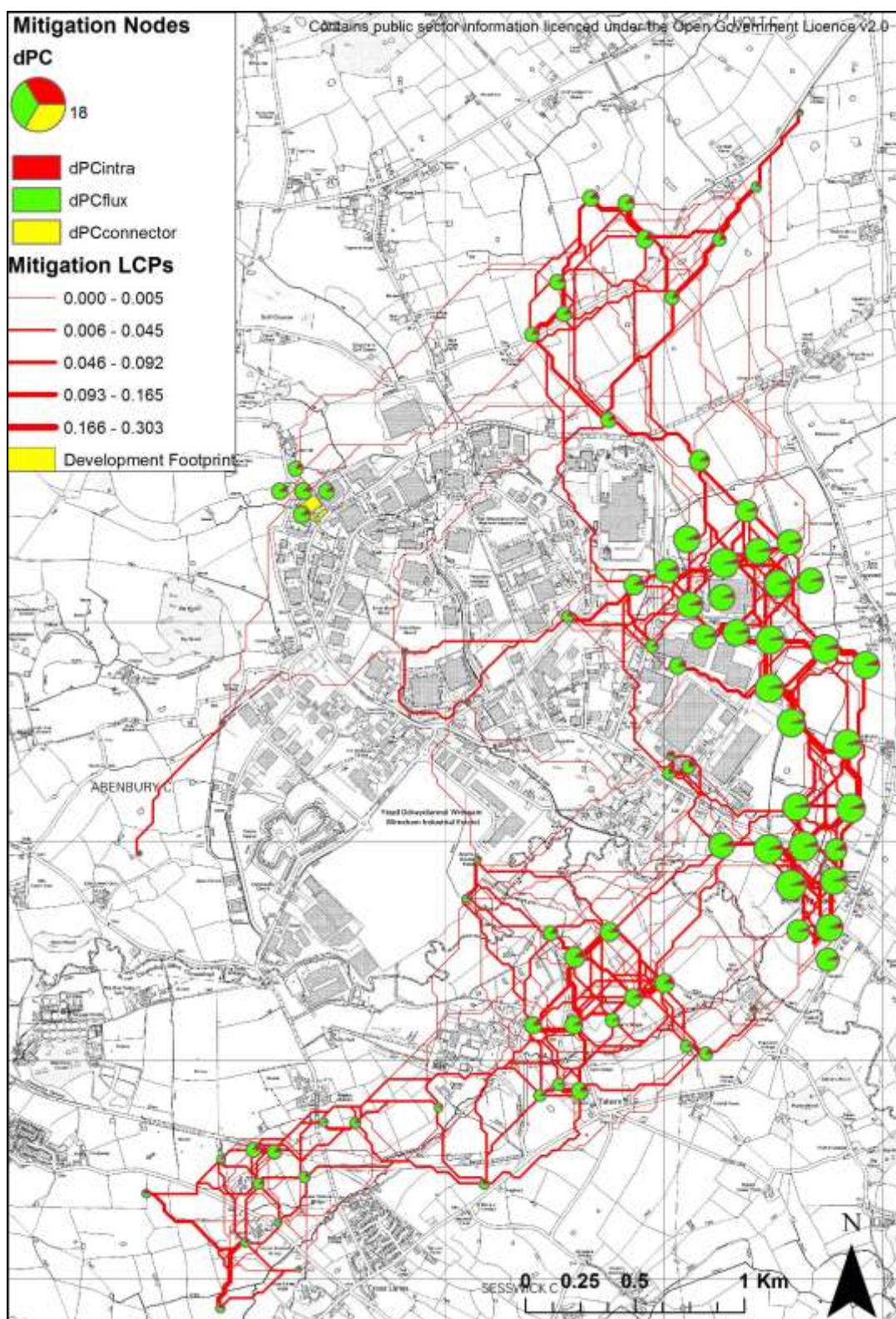
Site C4 Abenbury Way GCN Modelling

Appendix 2 – Post-Development Model (without mitigation)



Site C4 Abenbury Way GCN Modelling

Appendix 3 – Mitigation Model (post-development model with added nodes)



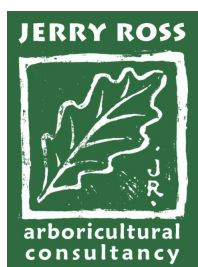
Site C4 Abenbury Way GCN Modelling



Appendix C

Arboricultural Constraints Report

Jerry Ross – March 2014



Land at
Abenbury Way
Wrexham Industrial Estate, Wrexham
Tree Survey and
Arboricultural Constraints Report



Prepared on the instructions of
TACP

on behalf of
Welsh Government

Based on an inspection
carried out

31st January 2014

by
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Land at
Abenbury Way
Wrexham Industrial Estate, Wrexham

Tree Survey and
Arboricultural Constraints Report

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1 Introduction:

- 1.1 The following report was prepared on the instructions of TACP on behalf of the Welsh Government and concerns land at Abenbury Way, Wrexham Industrial Estate; my brief was to visit the site and to make an inspection of the major trees in order to assess their form and general condition, specifically in order to consider what degree of constraint that they may represent with regard to its possible development to provide an additional industrial unit with associated office space and car parking etc.
- 1.2 The survey area is as illustrated in the Tree Location & Constraints Plan that accompanies this report, that having been based upon a topographical survey drawing provided by TACP. Most tree locations are as indicated on that survey but it should be noted that certain trees were not been included in the land survey and in these cases their positions as shown on the tree location plan are estimates only. Where measurements may be critical (for instance in determining clearances between trees and proposed structures) tree locations should be confirmed by further on-site measurements.
- 1.3 The methodology used is outlined in Appendix 1 below and the results are given in section 4, the Tree Schedule. The terminology is explained and codes and abbreviations used in the tree schedule in Appendix 2.
- 1.4 Some provisional comments on the likely arboricultural impact of the development (as currently proposed in the TACP drawing GA 01, job no. 13004) are provided in section 3
- 1.5 It should be stressed that, although the health and safety of the trees is part of the assessment methodology used, this is an *arboricultural constraints* report, as defined by BS5837:2012, and as such is intended for planning purposes only; *it should not be construed as an exhaustive assessment of tree safety*. Faults may be identified and recorded as part of this study, but although measures to deal with immediate and significant hazards may be made, general management recommendations will *not* normally be made, not least because these should be determined by future patterns of site usage: it remains the land owner's responsibility to take appropriate action to maintain appropriate levels of safety.

2 Inspection and General Observations

- 2.1 My inspection was carried out on 29th January 2014 and it was made from ground level only. Weather conditions were wet with heavy rain however visibility was quite adequate for the purposes of this investigation.
- 2.2 The site is not within a designated Conservation Area and neither are any tree preservation orders currently in force. Attention is drawn, however, to the Wrexham C.B.C. Local Planning Guidance Note 17: Trees & Development, which sets out policies on trees in development sites. Of special note in LPG 17 is the requirement that trees placed in the BS5837 category Aiii (trees of particularly high value with special reference to their cultural and/or ecological importance (especially veteran' trees) should be given larger root protection areas than specified in the British Standard. The most prominent trees here is a line of three large, late-mature oak trees which run parallel to Abenbury Way: although important and undoubtedly worthy of retention within a developed site, they are not regarded as being of exceptional value for wildlife and cannot be considered as 'veterans'. Thus two have been classified as retention category 'Ai' while the third tree has been downgraded to 'Bi' as a result of recent storm damage.

- 2.3 Other trees of note include a fourth late-mature oak (ID number 4, category Ai), located outside the site boundary on the opposite side of the small stream where it is unlikely to be unduly influenced by developments within the site. A fifth oak (16, also Ai) located on the northern corner of the site, at some distance from the proposed area to be developed.
- 2.4 The stream, which runs along the south of the site, has trees on its northern bank, including the mature alder trees number 5 to 15 and group B, a large group of crack willow growing quite densely (at approx. 3-5m centres). The alders are generally good specimens and have been allocated to category Bii while the willows are of lesser arboricultural significance and have been placed in category Cii. The stream-side trees do, however, provide habitat likely to be of some significance for wildlife and the 'green corridor' they represent should be maintained if at all practicable.
- 2.5 Groups A, C and D constitute grown-out hedgerows which provide good wildlife habitat and screening potential. Although generally of limited arboricultural significance there are a three mature trees (two oaks and an ash) within group C & D; these trees were not plotted on the topographical survey and their locations on the tree constraints plan are approximate only. The oaks are of moderate value (category B) while the ash has been allocated to category C.

3 Preliminary Observations on Arboricultural Impact:

- 3.1 The TACP 'Proposed Site Layout' drawing no 13004/GA01 indicates areas outlined in red that are effectively excluded from the areas proposed for development. (Note, however, that trees within these areas will be protected during construction, they do not at this stage define construction exclusion zones: i.e. they do not necessarily indicate the proposed locations of tree protection barriers, which will be specified when all other constraints affecting the development have been specified.)
- 3.2 Trees 8, 9, 10, 12, 13, 14 & 15 would be lost, along with some of area B, but stream-side vegetation would be retained to maintain the continuity of the green corridor.
- 3.3 Area C, including the oak and ash tree, will be lost, but areas to the north-west (area d and tree 16) are to be retained and the locality improved to create an "ecological area".
- 3.4 Trees 1, 2 and 3 are recognised as the most significant specimens in landscape terms and will be retained. The required car parking spaces and access routes have been set out to avoid encroachment into their root protection areas, with the exception of a small incursion into that of tree 3.
- 3.5 No significant level alterations will be required in the immediate areas around the trees although some excavation will be needed to create the car park to the south of the oak trees 1 and 2: this will be retained by a timber retaining wall, maximum height 750mm, to be situated just outside the trees' nominal RPAs.
- 3.6 A pedestrian access between trees 2 and 3 will be of no-dig construction and will have a gas and moisture permeable wearing surface. It is currently felt that the degree of incursion by the disabled parking bays into the RPA of tree 3 is unlikely to be significant, but similar measures could be employed here if so required.

4 Tree Schedule:

ID	Species	Stem No.	Trunk Diam (cm)	Height (m.)	Crown Spread (metres)				Clearance (metres)		Life stage	Health & Vigour	Structural Condition	Remaining useful life	Observations	Retention CATEGORY	Protection Radius (m)	RPA (m ²)
					N	E	S	W	Mean	Lowest over site + Direction								
1	Oak	1	85	16	6	7	6.5	8	1.5	1-E	LM	Good	Fair	20-40	Storm damage, large heavy branch recently snapped out and remains hanging in canopy	Bi	10.2	327
2	Oak	1	97	13.5	4	6	6	6.5	2	1.5	LM	Good	Good	40+	Good specimen tree	Ai	11.6	423
3	Oak	1	123.5	17.5	8.5	8	8.5	8	2.5	1.5-W	LM	Good	Good	40+	Good specimen tree	Ai	14.8	688
4	Oak	1	102	16	6.5	7	6.5	7	2	1.5-S	LM	Good	Good	40+	On SW side of small stream	Ai	12.2	468
5	Alder	2	49.5	17	-	-	-	-	-	-	M	Good	Good	20-40	One of a group of mature alder	Bii	5.9	109
6	Alder	4	54	17	-	-	-	-	-	-	M	Good	Good	20-40	One of a group of mature alder	Bii	6.5	133
7	Alder	2	51.5	17	-	-	-	-	-	-	M	Good	Good	20-40	One of a group of mature alder	Bii	6.2	121
8	Alder	2	51	17	-	-	-	-	-	-	M	Good	Good	20-40	One of a group of mature alder	Bii	6.1	117
9	Alder	2	42	17	-	-	-	-	-	-	M	Good	Good	20-40	One of a group of mature alder	Bii	5.0	78
10	Alder	1	46	17	-	-	-	-	-	-	M	Good	Good	20-40	One of a group of mature alder	Bii	5.5	95
11	Alder	1	59	17	-	-	-	-	-	-	M	Good	Good	20-40	One of a group of mature alder	Bii	7.1	158
12	Alder	2	63.5	17	-	-	-	-	-	-	M	Good	Good	20-40	One of a group of mature alder	Bii	7.6	181
13	Alder	1	62	17	-	-	-	-	-	-	M	Good	Good	20-40	One of a group of mature alder	Bii	7.4	172
14	Alder	1	32	17	-	-	-	-	-	-	M	Good	Good	20-40	One of a group of mature alder	Bii	3.8	45
15	Alder	2	50	17	-	-	-	-	-	-	M	Good	Good	20-40	One of a group of mature alder	Bii	6	113
16	Oak	1	84	12	4	5	7	7	2.5	2-E	LM	Good	Good	40+	Good specimen tree	Ai	10.1	319

GROUPS:

ID	Dominant Species	Approx. no. of trees	Av. Height (or range) (m.)	Av. Trunk Diam (or range) (mm)	Approximate Canopy size (crown radius or length x width)	Life stage	Remaining useful life	General condition	Observations	Retention CATEGORY	Protection Radius (m)
A	Hawthorn	-	4-6	<150	-	M	10-20	Fair	Outgrown hedgerow	Cii	1.8
B	Crack willow	-	14-16	200-600	-	M	20-40	Fair	Large group of willow growing adjacent stream corridor	Cii	4.8
C	Blackthorn / hawthorn	-	4-6	<150	-	M	10-20	Fair	Outgrown hedgerow (incs. mature ash & oak)	Cii	1.8
D	Hawthorn / hazel	-	6-8	<250	-	M	10-20	Fair	Outgrown hedgerow (incs. mature oak)	Cii	3.0

APPENDIX 1: Methodology

- The report has been framed as an 'Arboricultural Constraints Report', as defined in BS5837:2012 - *Trees in relation to design, demolition & construction-Recommendations*. Its purpose is to set out and to quantify the degree of constraint offered by existing tree cover with regard to any development or alteration in land-use that may be proposed and is intended to be used to inform feasibility studies and design options. As such it reflects the conditions *as they existed at the time of our inspections*: no account has been taken of any specific development proposals, although it has been assumed that certain unspecified alterations in site usage patterns are likely to occur, which are likely to result in an increase in site occupancy levels. Additional arboricultural input may be required at subsequent stages of design, planning and implementation in relation to the assessment & management of possible arboricultural impacts.
- The survey parameters are as set out in BS5837:2012 and based on the findings each tree or group is allocated to one of four 'Retention Categories' (see Appendix 2, p2). The factors taken into account in categorising the trees include their overall arboricultural quality, their general health and structural stability, their likely useful life-expectancy, their significance to the local landscape and general public amenity value, the degree to which they provide wildlife habitat and enhance local biodiversity and any other social or cultural values that they may embody.
- Also integral to the methodology of BS5837 is the calculation of **Root Protection Areas (RPAs)** for each of the trees in question. The RPA is defined as a "*layout design tool indicating the minimum area around a tree deemed to contain sufficient roots and rooting volume to maintain the tree's viability, and where the protection of the roots and soil structure is treated as a priority.*"
- It should be noted that in most cases the plan accompanying this report will show the nominal RPAs of the trees, indicated as circles centred upon the tree of a radius such that they enclose an area equal to the relevant RPA. In practice the distribution of roots around a tree will frequently prove to be uneven due to the presence of a variety of constraining influences. These may be physical barriers such as existing foundations etc, or the existence of localised soil conditions inhospitable to root growth, such as waterlogging or soil compaction. Conversely, soil conditions may be particularly *conducive* to root development in one quarter and this might also lead to an asymmetric distribution of roots around the tree. However in most cases the nominal circular areas as indicated will provide a reasonable guide as to where special measures will be required to protect tree roots and preserve good soil condition.
- The RPAs of the trees will provide the basis for defining **Construction Exclusion Zones (CEZs)**, these being areas around all of those trees intended to be retained where access should be prevented throughout the entire process of site preparation and construction. In certain cases the CEZ will exceed the size of the RPA in order to accommodate the aerial parts of wide-spreading trees.
- Access within the CEZ should be prevented through the erection of barriers, constructed in accordance with BS5837:2012. Where access within an RPA is unavoidable, appropriate ground protection should be installed. Outline details of the design of suitable barriers and ground protection are given in Appendices A & B. These protection measures should be put in place prior to any site clearance or construction work commencing on the site and they should remain *in situ* until all works have been completed. Some activities within the CEZs may be acceptable but should not be put in hand until appropriate arboricultural advice has been sought.

APPENDIX 2: Terms & Definitions

(including codes & abbreviations used in Tree Schedule)

The **DIMENSIONS** Taken are:

- **STEM-No.** indicates the number of main stems (i.e. whether the trunk divides at or below 1.5m; (Used in the calculation of RPA.) "m-s" = Multi-stemmed.
- **DIAMETER** (in centimetres), obtained from the girth measured at approx.1.5m. For trees with 2 to 5 sub-stems, a notional figure is derived from the sum of their cross-sectional areas. For multi-stemmed trees the notional diameter may be estimated on the basis of the average stem size x the number of stems. (A notional diameter may be estimated where measurement is not possible.)
- **HEIGHT**, estimated and expressed in metres.
- The **CROWN SPREAD** is expressed in terms of the crown radii estimated at the four cardinal points (or as otherwise specified) and given in metres.
- **CLEARANCES** are indicated as an estimate of the *mean, overall* height of the canopy above ground level with an additional figure for the height above ground of the *lowest significant branch* within the site, together with the direction of its growth.

LIFE STAGE is defined as follows:

- P** recently Planted; sapling: A tree that is still establishing and which would be relatively easy to replace or even transplant. Likely to be vulnerable to damage from (e.g.) strimmers, mowing equipment, drought, vandals, etc. (Easily replaced thus a negligible constraint).
- Y** Young, establishing trees. Should be growing fast, usually primarily increasing in height more than spread, but as yet making limited impact upon the landscape.
- EM** Early-mature. Established young trees, normally of good vigour and still increasing in height, but beginning to spread laterally. Beginning to make an impact upon the local landscape & environment.
- M** Mature: Well-established trees, still growing with some vigour, but tending to fill out and increase spread. Bark may be beginning to crack & fissure. In the middle half of their safe, useful life-expectancies.
- LM** Late-Mature: In full maturity. Still retaining some vigour but growth slowing.
- O** Old: Fully mature with vigour declining. Likely to possess features that could be regarded as potential faults, such as large, ponderous branches, old wounds etc. etc., but also likely to be of high amenity value.
- A** Ancient: Old trees can survive for very many years with healthy growth continuing although the tree may be of low vigour. Crown size usually becomes reduced, either through natural branch-loss or through management (e.g. pollarding). Decay is usually present. Such trees may embody certain hazards but they are also likely to be of considerable conservation value (i.e. "Veteran" trees).

HEALTH & VIGOUR: Essentially a snapshot of the general health of the tree based upon its general appearance, its apparent vigour and the presence or absence of symptoms associated with poor health, physiological stress etc. (Fungal infections may be recorded here but *decay giving rise to structural weakness* would be recorded under 'Structural Condition' – see next parameter):

- Good** no significant health issues.
- Fair** indications of slight stress or minor disease (e.g. the presence of minor dieback/deadwood or of epicormic shoot growth)
- Poor** Significant stress or disease noted; larger areas of dieback than above
- Bad** Severe decline; widespread dieback and/or severe stress; life-threatening disease.
- Dead** (or Moribund)

STRUCTURAL CONDITION: Defects affecting the structural stability of the tree, including decay, significant dead wood, root-plate instability or significant damage to structural roots, weak forks (e.g. those where bark is included between the members) etc. etc. Classified as:

- Good** No obvious structural defects: basically sound
- Fair** Minor, potential or incipient defects
- Poor** Significant defect(s) likely to lead to actual failure in the medium to long-term
- Bad** Defects liable to cause significant failure in the short term, or to lead to a major or total collapse in the foreseeable future
- Severe** Tree that has already suffered or is at imminent risk of a major collapse.

APPENDIX 2: Terms & Definitions

(including codes & abbreviations used in Tree Schedule)

REMAINING USEFUL LIFE EXPECTANCY: An estimate of the length of time in years that a tree might be expected to continue to make a useful contribution to the locality at an acceptable level of risk (based on an assumption of continued routine maintenance)

V - less than 10 years	S - 10+ years
M - 20+ years	L - 40+ years

RETENTION CATEGORY: Trees are classed as category **U**, **A**, **B** or **C**, based on criteria given in BS5837:2012; summary definitions as follow (see BS5837 for further details). Categories A, B and C are further characterised by the use of sub-categories, which attempt to identify what aspect of the tree is the main source of its perceived value: (i) **arboricultural** qualities (ii) **landscape** qualities and (iii) **cultural, historic or ecological/conservation** qualities. Examples of these qualities for each of the three categories are given below, although these are indicative only.

Note: *This is NOT a health and safety classification; the classification does not take into account any requirement for remedial tree care or ongoing maintenance apart from that which may affect the trees' general suitability for retention.*

U **UNSUITABLE** (★): Trees likely to prove to be unsuitable for retention for longer than 10 years should any significant increase in site usage arise as a result of development.

Dead or moribund trees; those at risk of collapse or in terminal decline;; trees that will be left unstable by other essential works such as the removal of nearby category U trees; trees infected by pathogens that could materially affect other trees; low quality trees that are suppressing better specimens

(Category U trees may have conservation values which it might be desirable to preserve. It may also include trees that should be removed irrespective of *any* development proposals.)

A **HIGH QUALITY** (●): Trees or groups whose retention should be given a particularly high priority within the design process. Normally with an expected useful life-expectancy of at least 40 years.

- (i) *Notably fine specimens; rare or unusual specimens; essential component trees within groups, semi-formal or formal plantings (e.g. dominant trees within an avenue etc.)*
- (ii) *Trees, groups or woodlands of particular visual importance as landscape features.*
- (iii) *Trees, groups or woodlands of particular significance by virtue of their conservation, historical, commemorative or other value (e.g. veteran trees or wood pasture.)*

B **MODERATE QUALITY** (■): Trees or groups of some importance with a likely useful life-expectancy in excess of 20 years. Their retention would be highly desirable; selective removal of certain individuals may be acceptable, but only after full consideration of all alternative courses of action.

- (i) *Fair quality but not exceptional; good specimens showing some impairment (e.g. remediable defects, minor storm damage or poor past management.)*
- (ii) *Acceptable trees situated such as to have little visual impact within the wider locality. Also numbers of trees, perhaps in groups or woodlands, whose value as landscape features is greater collectively than would warrant as individuals (such that the selective removal of an individual would not impact greatly upon the trees' overall, collective value).*
- (iii) *Trees, groups or woodlands with clearly identifiable conservation or other cultural benefits.*

C **MINOR VALUE** (▲): Trees or groups of rather low quality, although potentially capable of retention for at least approx. 10 years. Also small trees below 15cm diam. Potentially retainable, but not of sufficient value to be regarded as a significant planning constraint.

- (i) *Unremarkable trees of very limited merit or of significantly impaired condition.*
- (ii) *Trees offering only low or short-term landscape benefits; also secondary specimens within groups or woodlands whose loss would not significantly diminish their landscape value.*
- (iii) *Trees with extremely limited conservation or other cultural benefit.*

ROOT PROTECTION AREA (RPA): *This is the area in square metres formed by a circle of radius (the **Protection Radius**) twelve times the actual or notional stem diameter of the tree (see 'Diameter', above). The RPA represents the minimum area deemed to contain sufficient roots & soil to maintain the tree's viability. It is the basis whereby the layout of the **Construction Exclusion Zone (CEZ)** is determined, which should encompass an area equal to the RPA, although its form may be adapted in the light of arboricultural considerations and pre-existing physical constraints. The CEZ should be protected by sturdy temporary fencing (see BS5837:2012) throughout the entire process of site preparation and construction.*

APPENDIX 3: The Protection of trees on demolition & construction sites:

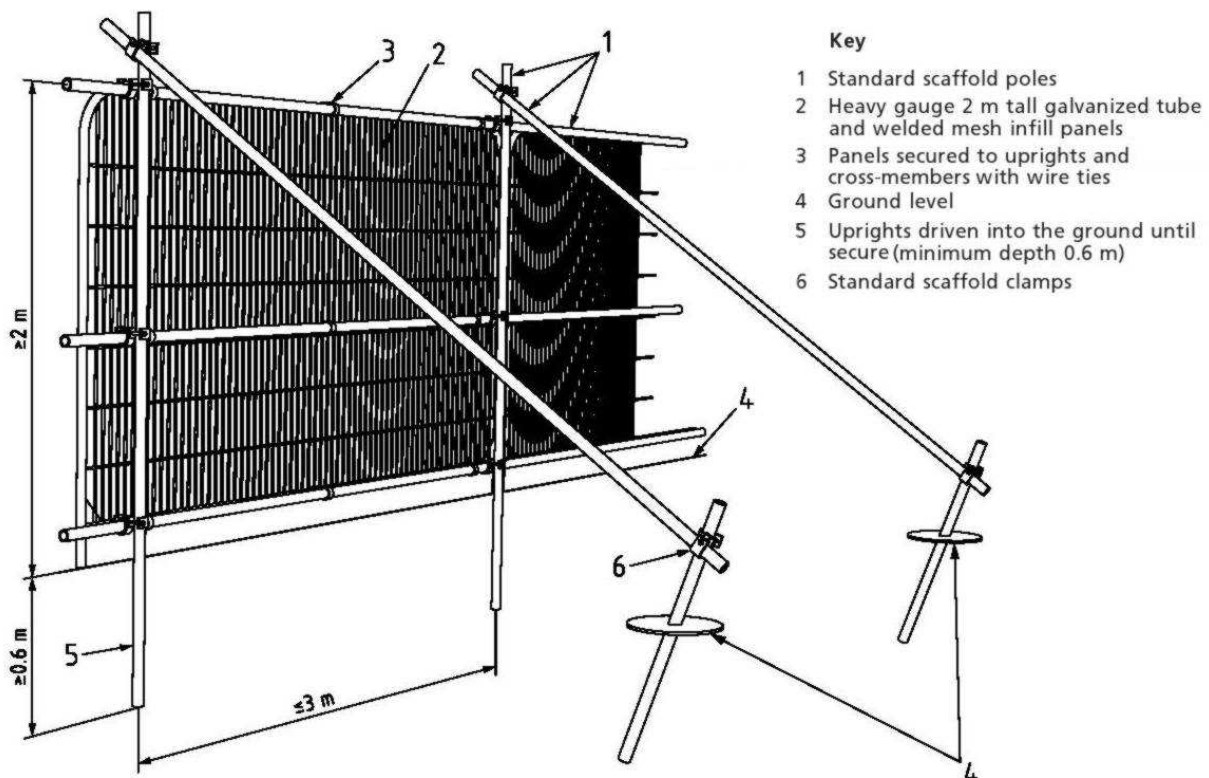
[Including extracts from BS5837:2012 - Trees in relation to design, demolition & construction – Recommendations.]

A **CONSTRUCTION EXCLUSION ZONE** should be established around all trees intended for retention, based upon the Root Protection Areas (RPAs) of those trees. These zones should be adequately protected by appropriately designed **Protective Barriers & Ground Protection** throughout the all demolition & construction processes.

A: PROTECTIVE BARRIERS

- Vertical barriers should be erected and ground protection installed **before any materials or machinery are brought onto the site and before any demolition, development or stripping of soil commences**. Areas of new or retained structure planting should be similarly protected, based on the extent of the soft landscaping as shown on the approved drawings. The project arboriculturist should confirm that barriers and ground protection have been erected and set out correctly prior to the commencement of other operations, and that they are fit for purpose
- Where required, pre-development tree work may be undertaken before the installation of tree protection, with the agreement of the project arboriculturist and the local planning authority.
- **Once erected, barriers and ground protection should be regarded as sacrosanct**, and should not be removed or altered without prior recommendation by the project arboriculturist and approval of the local planning authority.
- Barriers should be fit for the purpose of excluding construction activity and appropriate to the degree and proximity of work taking place around the retained tree(s). On all sites, special attention should be paid to ensuring that barriers remain rigid and complete.
- In most cases, barriers should consist of a scaffold framework in accordance with the illustration below, comprising a vertical and horizontal framework, well braced to resist impacts, with vertical poles spaced at a maximum interval of 3m. Onto this, weldmesh panels should be securely fixed.

Default specification for protective barrier



- Where driven vertical poles are impractical due to the likelihood of causing damage to tree roots or to underground services, above-ground stabilizing systems may be specified.
- Alternative specifications may be acceptable but should be specified in conjunction with the project arboriculturist but they must always ensure an adequate degree of protection for the conditions likely to obtain on site. Weldmesh panels on rubber or concrete feet may be sufficient where protection is only required from pedestrians, cars, vans and manually operated plant, but in such cases the panels should be securely joined together using a minimum of two anti-tamper couplers, installed so that they can only be removed from inside the fence. The panels should be supported on the inner side by stabilizer struts.
- It may be appropriate on some sites to use temporary site office buildings as components of the tree protection barriers.

APPENDIX 3: The Protection of trees on demolition & construction sites:

[Including extracts from BS5837:2012 - Trees in relation to design, demolition & construction – Recommendations.]

B: GROUND PROTECTION

- Where construction working space or temporary construction access is justified within the RPA, this should be facilitated by a set-back in the alignment of the tree protection barrier. In such areas, suitable existing hard surfacing that is not proposed for re-use as part of the finished design should be retained to act as temporary ground protection during construction, rather than being removed during demolition. The suitability of such surfacing for this purpose should be evaluated by the project arboriculturist and an engineer as appropriate
- However, where the set-back of the tree protection barrier would expose unmade ground to construction damage, new temporary ground protection should be installed as part of the implementation of physical tree protection measures prior to work starting on site. Such temporary ground protection should be capable of supporting any traffic entering or using the site without being distorted or causing compaction of underlying soil.
- The ground protection might comprise one of the following:
 - a) *for pedestrian movements only, a single thickness of scaffold boards placed either on top of a driven scaffold frame, so as to form a suspended walkway, or on top of a compression-resistant layer (e.g. 100 mm depth of woodchip), laid onto a geotextile membrane;*
 - b) *for pedestrian-operated plant up to a gross weight of 2 t, proprietary, inter-linked ground protection boards placed on top of a compression-resistant layer (e.g. 150 mm depth of woodchip), laid onto a geotextile membrane;*
 - c) *for wheeled or tracked construction traffic exceeding 2 t gross weight, an alternative system (e.g. proprietary systems or pre-cast reinforced concrete slabs) to an engineering specification designed in conjunction with arboricultural advice, to accommodate the likely loading to which it will be subjected.*
- In all cases, the objective should be to avoid compaction of the soil, which can arise from the single passage of a heavy vehicle, especially in wet conditions, so that tree root functions remain unimpaired.

C: ADDITIONAL PRECAUTIONS OUTSIDE THE EXCLUSION ZONE:

- Once the exclusion zone has been protected by barriers and/or ground protection, construction work can commence. All weather notices should be erected on the barrier with words such as:

Construction exclusion zone – NO ACCESS
--

In addition the following should be addressed or avoided.

- Care should be taken when planning site operations to ensure that wide or tall loads, or plant with booms, jibs and counterweights (including drilling and piling rigs) can operate without coming into contact with retained trees. Such contact can result in serious damage to them and might make their safe retention impossible. Consequently, any transit or traverse of plant in close proximity to trees should be conducted under the supervision of a banksman to ensure that adequate clearance from trees is maintained at all times. In some circumstances it may be impossible to maintain adequate clearance thus necessitating access facilitation pruning. Local Planning Authority consent for such pruning may be required.
- Material which will contaminate the soil, e.g. concrete mixings, diesel oil and vehicle washings, should not be discharged within 10 m of the tree stem.
- Fires should be avoided on sites if at all possible. Where they are unavoidable they must not be lit in a position where heat could affect the trunk, branches or foliage of any tree. The size of the fire and the wind direction should be taken into account, and fires must be attended at all times.
- Notice boards, telephone cables or other services should not be attached to any part of the tree.
- It is essential that allowance should be made for the slope of the ground so that damaging materials such as concrete washings, mortar or diesel oil cannot run towards trees..

APPENDIX 3: The Protection of trees on demolition & construction sites:

[Including extracts from BS5837:2012 - Trees in relation to design, demolition & construction – Recommendations.]

D: **ROADS, DRIVEWAYS AND PATHS NEAR TREES** **(including outline notes on 3-dimensional 'Cellular Confinement' load-support systems)**

1. The overriding principles to be adhered to in the design of hard surfaces near trees are:
(i) the preservation of the character of the soil in a form no more compacted or otherwise disturbed, disrupted or contaminated than it is at present; (ii) to maintain gaseous exchange between the upper layers of soil and the atmosphere; (iii) to ensure adequate (but not excessive) water supply to the soil; and (iv) the avoidance of damage to retained trees as a result of root severance, crushing or abrasion.
2. Tree roots are concentrated in the upper metre of the soil, with the great majority 300-600 mm below the soil surface. Beyond 3 or 4 metres from the trunk most of the roots are small in diameter and not readily apparent as originating from trees. They are nevertheless vital to the tree's well-being, as well as being very easily damaged by even rather shallow soil disturbance, such as may be required in establishing a path or driveway.
3. Wherever possible paths etc should be routed well outside the Root Protection Area (RPA), when problems should not arise. Note, however, that the position of a path or road on a layout plan may indicate the surface only: *Allowance must be made for any kerbing, and the footing into which kerbs will be set, when considering possible conflicts between trees and nearby paths, roadways etc.*
4. Where there is no alternative other than for such a route to impinge upon the RPA of a tree, the possibility of damage can be significantly reduced through the use of No-Dig techniques, where an adequately load-bearing sub-base and hard-wearing surface is established over existing roots without them being disturbed. A variety of techniques are available including three-dimensional cellular confinement systems¹. Alternatively, piles, pads or elevated beams can be used to support surfaces to bridge over the RPA or, following exploratory investigations to determine location, to provide support within the RPA while allowing the retention of roots greater than 25 mm in diameter. The design of all such systems should be specified in liaison with the project arboriculturist.
5. Temporary haul roads must be similarly designed and specified, taking into account the extra loading that is likely to be imposed by construction traffic. Where proposed *permanent* new surfaces will be used for construction access, it is essential that this extra loading and wear is taken into account during the design process. A temporary sacrificial wearing surface may be required for the duration of construction activity.
6. Wherever possible, new surfaces should permit the percolation of moisture into the soil and allow free gaseous exchange. Suitable permeable wearing course include washed gravel (either loose or in laid gravel-retention grids, but note that self-binding gravels and 'hoggin' is NOT suitable) or paving slabs or block pavers with built-in infiltration spaces. These must be laid dry-jointed, bedded onto a free-draining sub-base such as sharp sand or coarse, no-fines aggregate. Porous asphalt and resin-bonded gravels will provide good porosity initially but will eventually become blocked by fines and should be laid following the principles used for impermeable surfaces (see below).
7. New permanent impermeable hard surfacing should not exceed 20% of any existing un-surfaced ground within the RPA. The hard surface should be resistant to or tolerant of deformation by tree roots, and should be set back from the stem of the tree and its above-ground root buttressing by a minimum of 500 mm to allow for growth and movement. Resulting gaps may be filled using appropriate inert granular material.
8. Prior to and during installation, the soil structure in the area beneath the proposed new surfacing must be protected from compaction, using temporary ground protection where necessary (see appendix 2B). During installation the new surface should be "rolled out", using machinery working forward from the surface as it is constructed.
9. If it proves necessary, existing surface vegetation should be killed using an *appropriate herbicide* that will not leach into the soil and will not affect tree roots. All herbicides must be applied strictly in accordance with the manufacturer's instructions.
10. The soil should not be skimmed to reduce ground levels. However loose organic matter and/or turf should be removed carefully, using hand tools. If the surface needs to be levelled or raised, this should be achieved using a suitable granular fill material (e.g. no-fines gravel, washed aggregate etc.)

¹ Suppliers of suitable proprietary products include Geosynthetics ('CellWeb') and Terram ('Geocell') and Greenfix ('Geoweb')



KEY

Trees are indicated by symbols below with Root Protection Areas (RPAs) shown as circles drawn at a radius calculated according to BS 5837:2012. The nominal circular RPAs are for guidance only, to assist in determining the design & layout of any proposed development: they do not represent definitive Construction Exclusion Zones.

Both tree symbols and RPAs are colour-coded to indicate their "Retention Categories"

- ★ Category U (Unsuitable for retention within a developed site)
- Category A (High retention value)
- Category B (Moderate Ret. value)
- ▲ Category C (Low retention value)

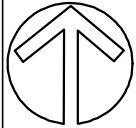
[Dashed RPAs are estimated only]

● APPROXIMATE crown spread



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SITE Wrexham Industrial Estate (Abenbury Way)	
CLIENT TACP (for the Welsh Government)	
DRAWING TITLE Arboricultural Constraints Plan	
DRWG. No. LL139UZ-TAC-ACP01	REVISION A
SCALE 1:500 @ A2	DRAWN BY JPR
TREE SURVEY BY Wyn Davies	DATE 31/01/2014



NORTH

Based on topographical survey data provided by TACP.
Do not scale from this drawing: check all critical dimensions on site.
Constraints Plan © copyright JRAC