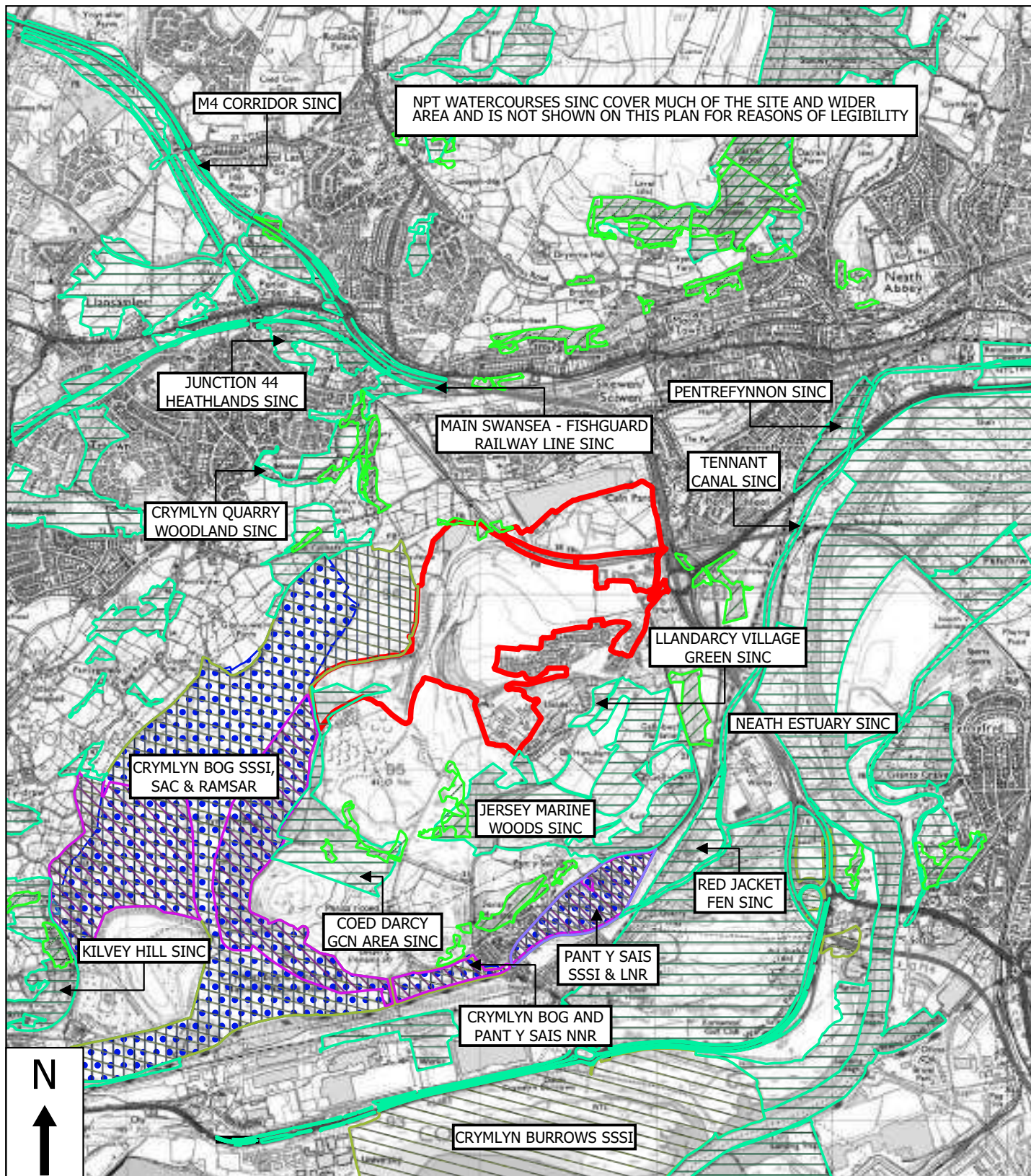


ENVIRONMENTAL STATEMENT
CHAPTER 10 - BIODIVERSITY
FIGURES

FIGURE 10-1
Site Location
and Ecological Designations



- SITE BOUNDARY
- SPECIAL AREA OF CONSERVATION (SAC)
- RAMSAR SITE
- SITE OF SPECIAL SCIENTIFIC INTEREST (SSSI)
- NATIONAL NATURE RESERVE (NNR)
- LOCAL NATURE RESERVE (LNR)
- SITE OF IMPORTANCE FOR NATURE CONSERVATION (SINC)
- AREA DESIGNATED AS ANCIENT WOODLAND



68 Quay Street
Manchester
M3 3EJ

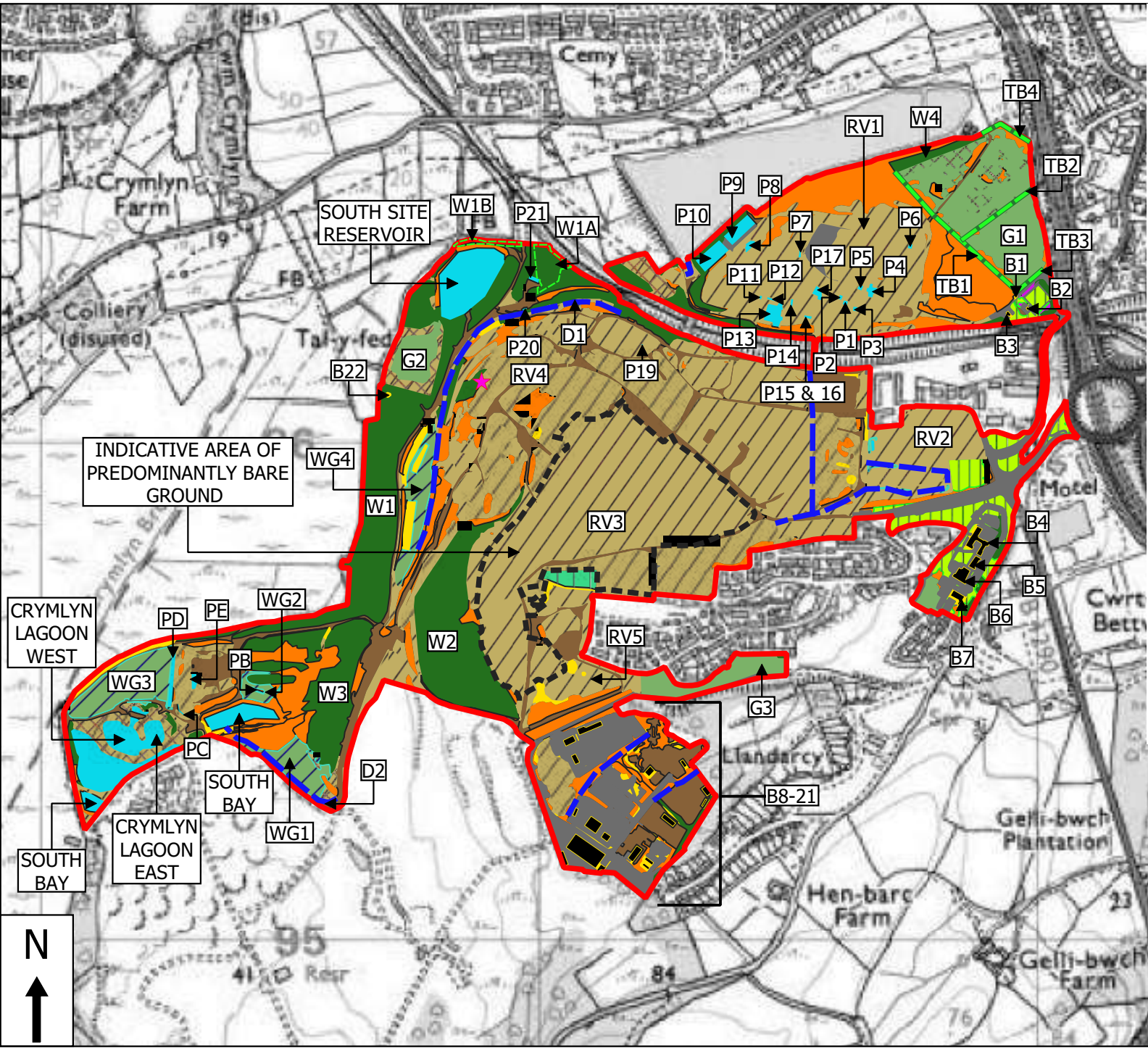
+44(0)161 4703232
mcr@ecology-solutions.co.uk
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9011M: COED DARCY,
LLANDARCY, NEATH

FIGURE 10-1: SITE LOCATION
AND ECOLOGICAL DESIGNATIONS

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FIGURE 10-2
Baseline Habitats



Key:

- SITE BOUNDARY
- COMPACTED CLAY SOILS WITH A MOSAIC OF RECOLONISING VEGETATION
- WET GRASSLAND AND MIXED SCRUB
- SPECIES-POOR SEMI-IMPROVED GRASSLAND
- SECONDARY WOODLAND
- DENSE SCRUB
- SCATTERED SCRUB
- WATERBODY / POND
- DITCH
- RUSH PASTURE
- EXPOSED ROCK / CLIFF
- TREE BELTS / LINES
- AMENITY GRASS
- AMENITY PLANTING
- BUILDING
- SEALED (METALLED) HARDSTANDING
- UNSEALED HARDSTANDING
- RUDERAL
- AREA OF PREDOMINANTLY BARE GROUND
- JAPANESE KNOTWEED



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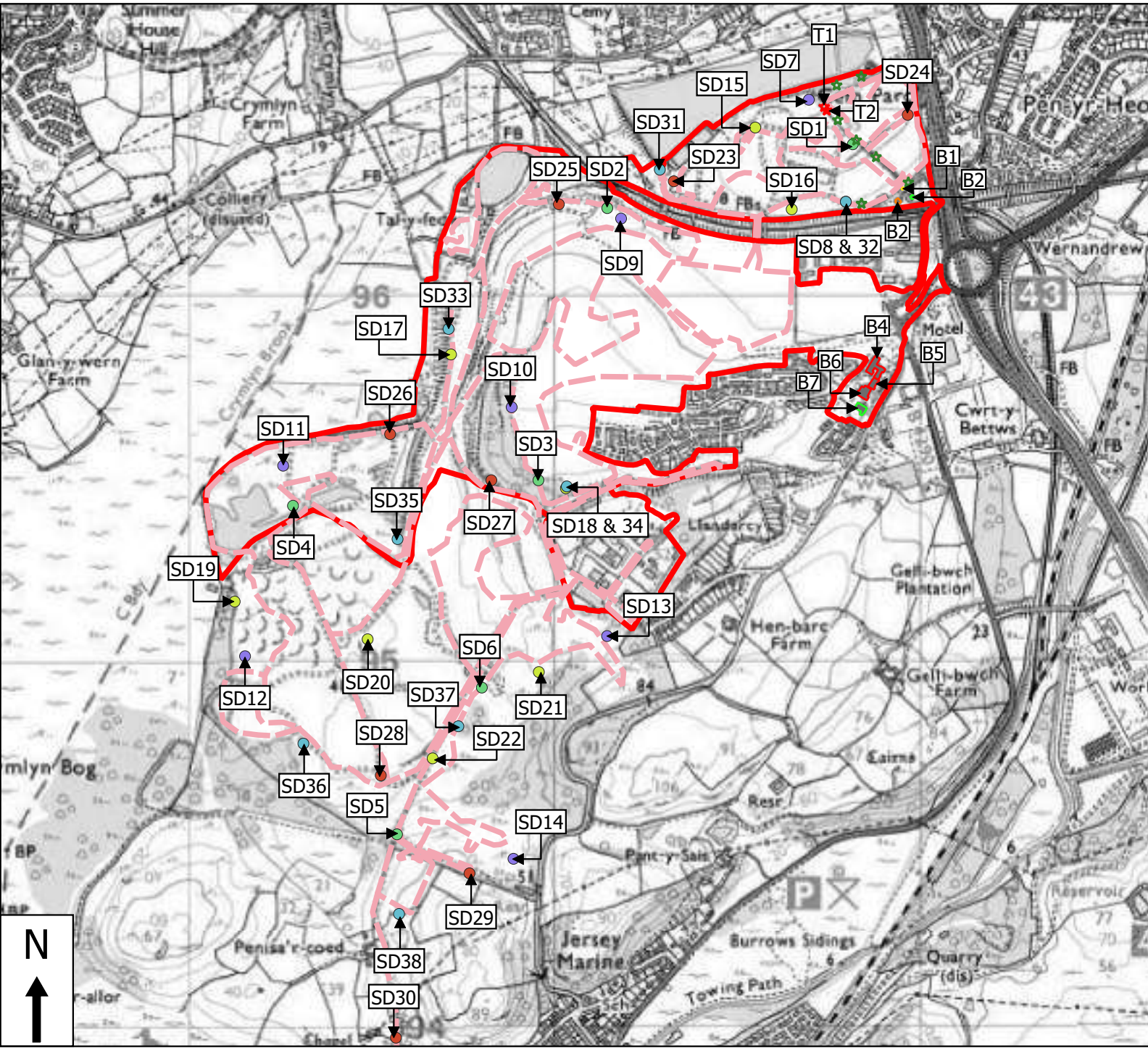
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FIGURE 10-2:
BASELINE HABITATS

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FIGURE 10-3
Bat Surveys



Key:

- SITE BOUNDARY
- INDICATIVE TRANSECT ROUTE
- JUNE 2020 STATIC LOCATIONS
- JULY 2020 STATIC LOCATIONS
- AUGUST 2020 STATIC LOCATIONS
- SEPTEMBER 2020 STATIC LOCATIONS
- OCTOBER 2020 STATIC LOCATIONS
- BUILDING SUBJECT TO EMERGENCE AND RE-ENTRY
- BUILDING SUBJECT TO EMERGENCE SURVEY ONLY
- BUILDING SUBJECT TO INTERNAL AND EXTERNAL SURVEY
- BUILDING SUBJECT TO EXTERNAL SURVEY ONLY
- ★ TREE SUBJECT TO AERIAL SURVEY
- ★ TREE DEEMED LOW BAT ROOST POTENTIAL

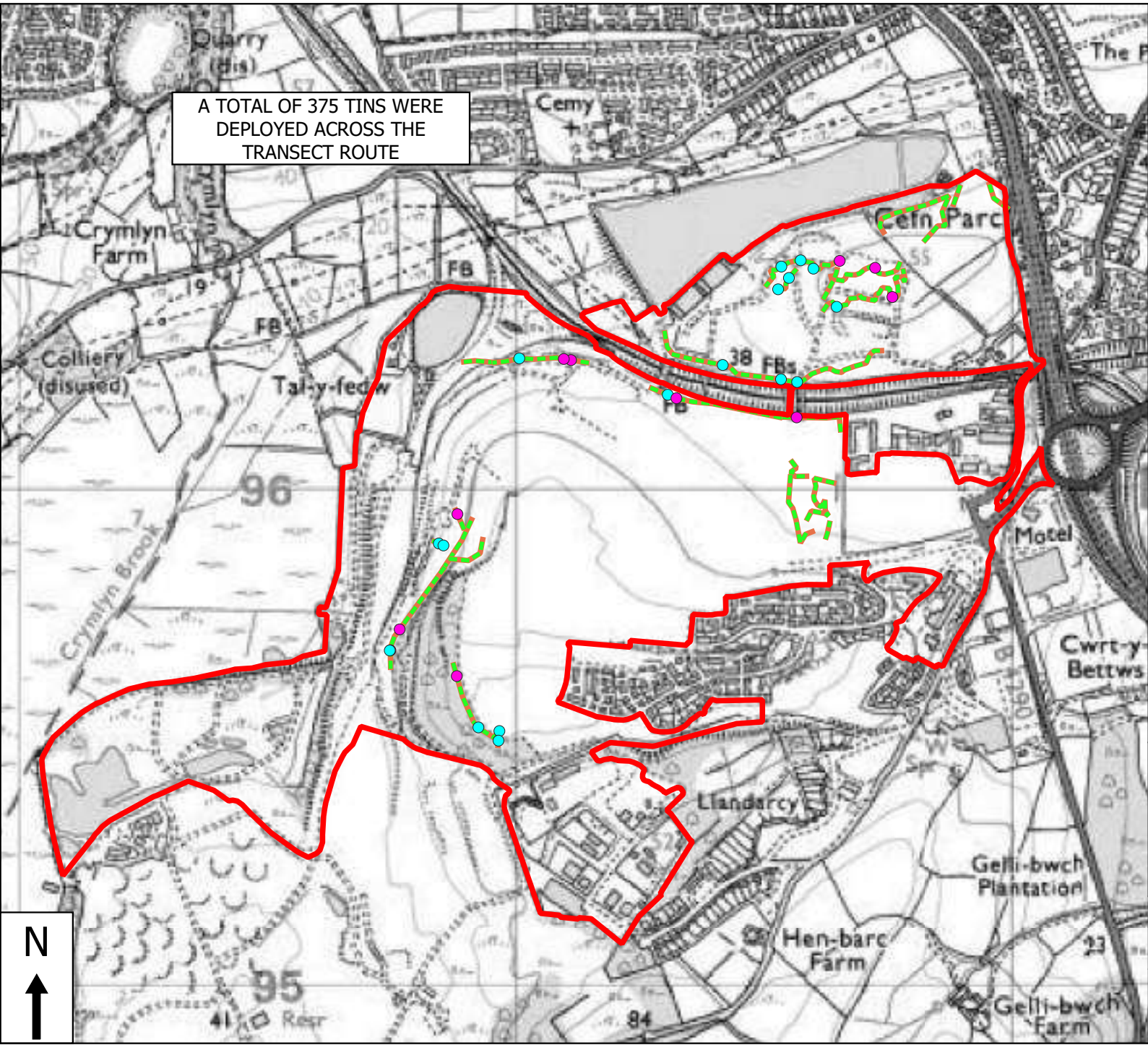


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FIGURE 10-4
Reptile Surveys



Key:

- SITE BOUNDARY
- INDICATIVE REPTILE TIN LOCATIONS
- COMMON LIZARD
- GRASS SNAKE



68 Quay Street
Manchester
M3 3EJ

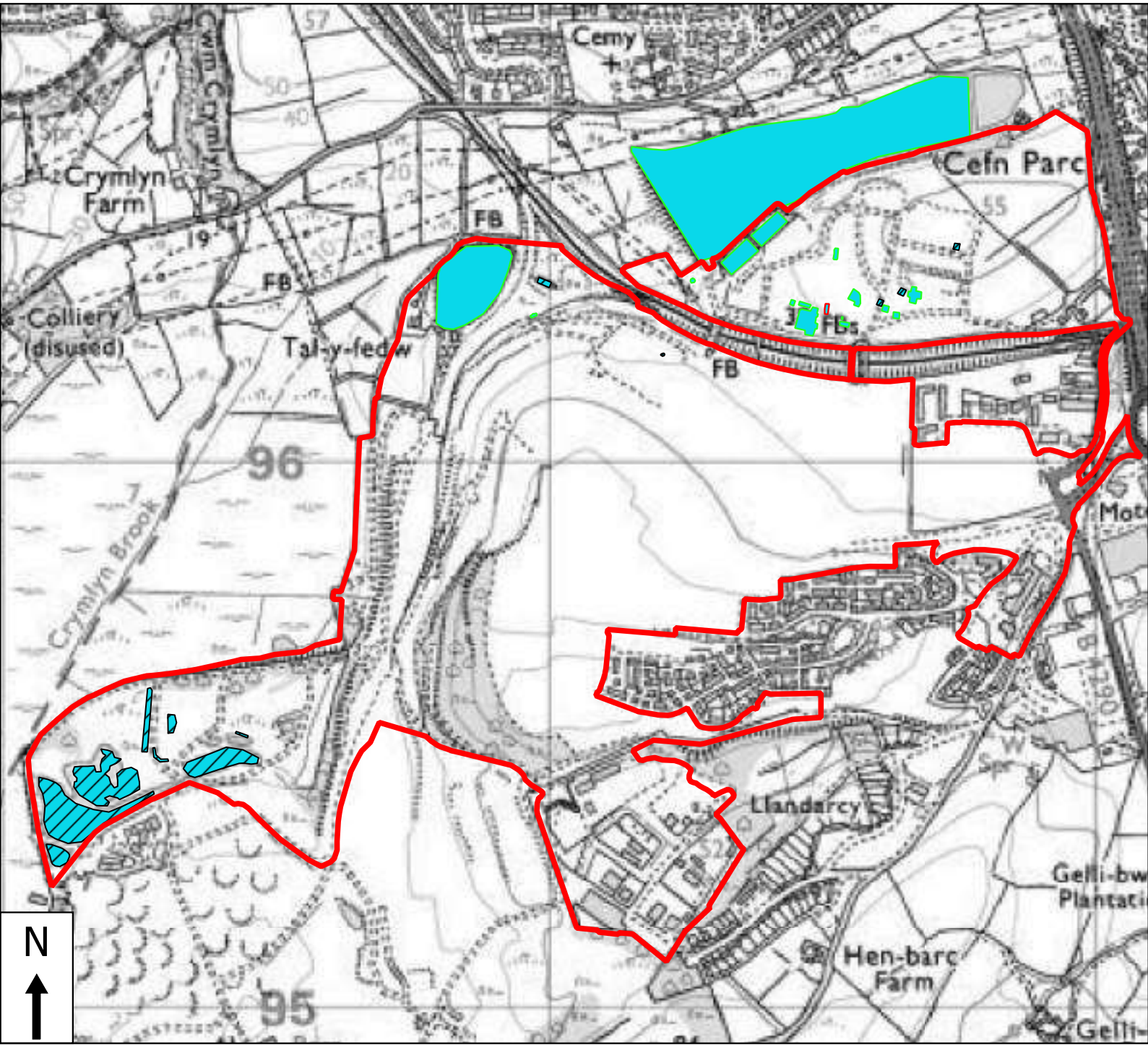
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FIGURE 10-4: REPTILE
SURVEY RESULTS

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FIGURE 10-5
eDNA Surveys



Key:

- SITE BOUNDARY
- NOT SURVEYED
- WATERBODY WITH NEGATIVE eDNA RESULT
- WATERBODY WITH POSITIVE eDNA RESULT



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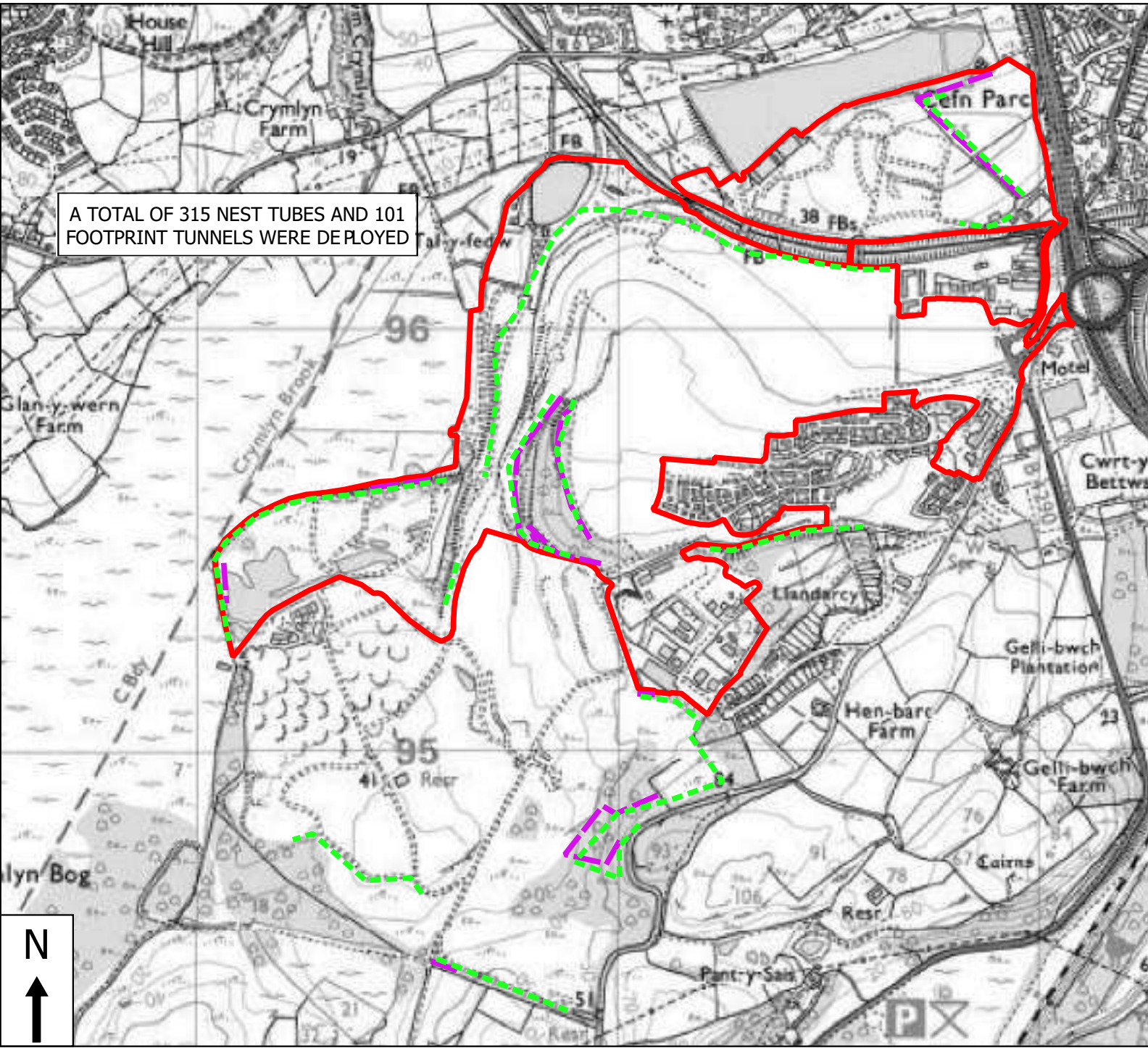
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FIGURE 10-5: EDNA
SURVEY RESULTS 2021

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FIGURE 10-6
Dormouse Nest Tubes
and Footprint Tunnel Locations



Key:

- SITE BOUNDARY
- - - NEST TUBE LOCATIONS
- - - FOOTPRINT TUNNEL LOCATIONS



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FIGURE 10-6: DORMOUSE
NEST TUBES AND FOOTPRINT
TUNNEL LOCATIONS

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Oct 21

FIGURE 10-7
Breeding Bird Surveys

FIGURE 10-8
Ground Nesting Bird Surveys



Key:

- SITE BOUNDARY
- NJ NIGHTJAR NOT BREEDING
- L LAPWING BREEDING PAIR
- RP RINGER PLOVER BREEDING PAIR



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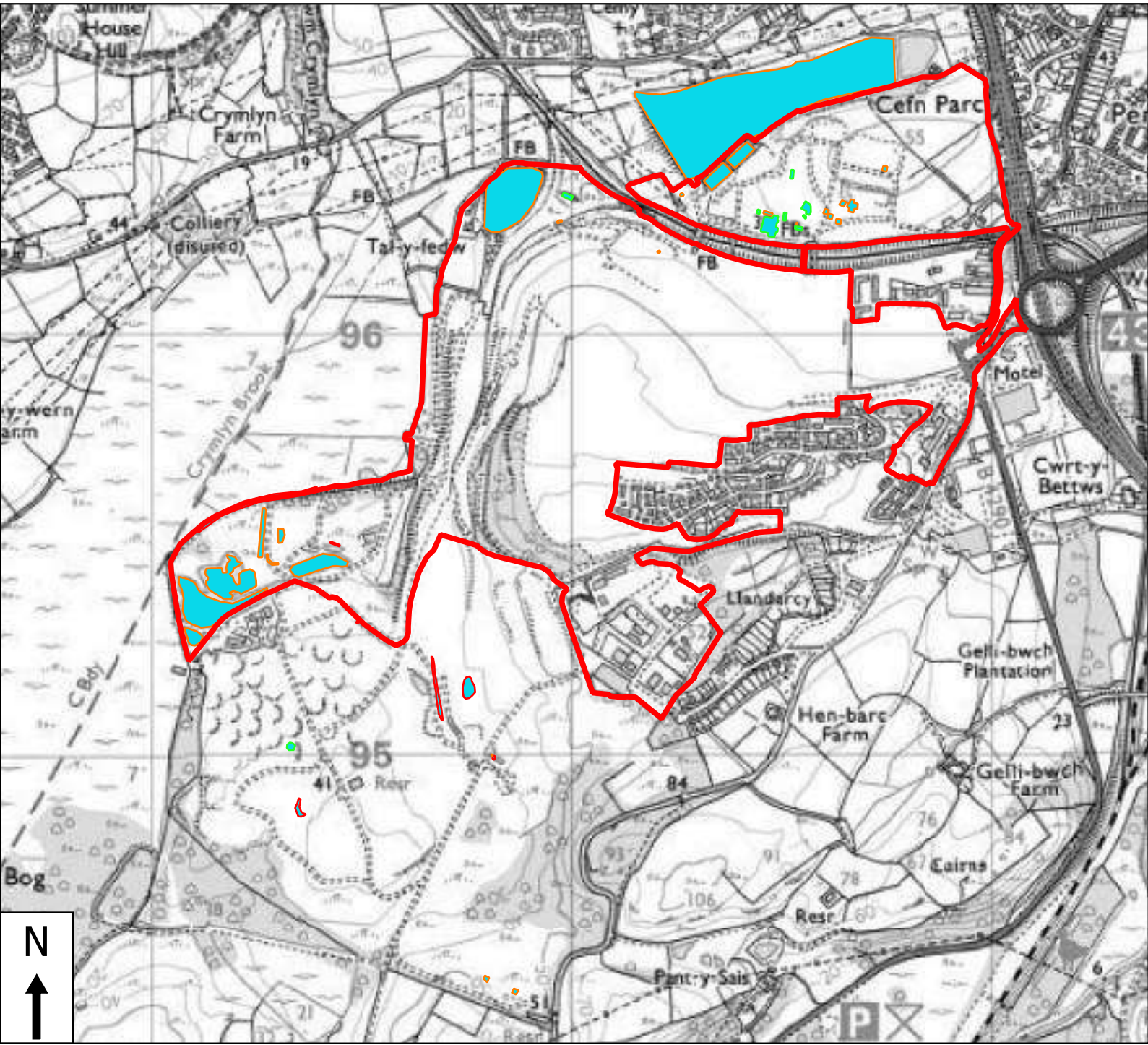
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FIGURE 10-8: GROUND
NESTING BIRD RESULTS 2021

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FIGURE 10-9
eDNA Surveys
Atkins, 2020



Key:

- SITE BOUNDARY
- NO RESULTS OBTAINED
- WATERBODY WITH NEGATIVE eDNA RESULT
- WATERBODY WITH POSITIVE eDNA RESULT



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FIGURE 10-9: ATKINS
2020 EDNA RESULTS

Rev: A
Oct 21

APPENDIX 3

Winter Bird Survey Results ES Addendum

1. Wintering Birds

1.1. Introduction

1.1.1. Ecology Solutions (Manchester) Limited were initially commissioned by St. Modwen Properties in April 2020 to undertake Ecological Assessment work of land at Coed Darcy, Llandarcy, Skewen, Neath, (See Figure 10-1 of the ES Chapter), hereafter referred to as 'the Site', and to undertake a detailed assessment of the Proposed Development.

1.1.2. Subsequent to the submission of the Environmental Statement (ES) Chapter in November 2021, and noting comments received from statutory consultees as part of the PAC (Pre-Application Consultation) process, Ecology Solutions were commissioned to undertake a series of wintering bird surveys at the Site. The findings of the results are summarised below and form the Wintering Bird ES Addendum.

1.1.3. The Wintering Bird Addendum should be read in conjunction with the Biodiversity Chapter of the ES, as submitted in November 2021. For clarity, the updated information detailed within this Addendum relates specifically to wintering birds.

1.1.4. As detailed in the following sections of this Addendum, the survey findings do not materially alter the conclusions reached within the original ES submission.

Characteristics

1.1.5. The Site is located to the north of Llandarcy, Neath, and is approximately 126ha in size. The Site is bounded to the east by the current Coed Darcy built form (Phase 1), with the M4 beyond. The south of the Site is bounded by existing brownfield land (part of the wider Coed Darcy landholding), with localised areas of broad-leaved woodland, and the Coed Darcy Great Crested Newt *Triturus cristatus* (GCN) area Site of Importance for Nature Conservation (SINC) beyond. To the south-east of the Site lies an existing built form (Contractors Yard Industrial Estate), with Jersey Marine Woods SINC beyond. Much of the west of the Site is bounded by Crymlyn Bog Site of Special Scientific Interest (SSSI), Special Area of Conservation (SAC), and Ramsar, with Crymlyn Bog and Pant-y-Sais National Nature Reserve (NNR) extending from the south-west boundary to the south-east beyond. To the immediate north of the Site boundary is the North Site Reservoir (NSR), and areas of scrubby woodland, with existing residential development beyond.

1.1.6. Further to the west and south of the Site lies open countryside and agricultural fields, with existing built form further afield to the north, west, and east of the Site. To the far south lies existing building with Crymlyn Burrows SSSI still further south, before Swansea Bay.

1.1.7. The Site itself comprises an area of previously developed land, the former site of the Llandarcy Oil Refinery, which has been subject to extensive remediation, re-profiling, and habitat clearance over an extended period. As a result of these works large areas of the Site comprise predominantly bare ground with very limited semi-natural habitats present. Where remediation works were completed less recently, substantial areas of the Site have recolonised with a range of early successional habitats. These early

Wintering Bird (Addendum to ES Chapter 10: Biodiversity)

Coed Darcy



successional habitats are complemented by the Site's topographical variety as well as the presence of numerous ponds and mature vegetation such as scrub, tree belts, and woodland.

Study Area

1.1.8. The study area considered as part of this Wintering Bird Addendum is primarily focused on the Site itself. To provide additional context, the winter bird surveys included assessment of the North Site Reservoir (NSR), as shown on Figure 10-10.

1.2. Methodology

Survey Methodology

1.2.1. On each survey an experienced ornithologist slowly walked a circuitous route taking in all parts of the area, recording the locations, numbers, and activity of all bird species present in (and around) the area during this time. It is considered three visits provide a reliable picture of winter bird activity, although some species that may use the Site as part of a larger territory, especially nocturnal species such as owls, may be missed. The dates of the surveys are detailed below in Table 1.1A.

Table 1.1A – Dates and Weather Conditions for Wintering Bird Surveys

Date	Weather Conditions
12 December 2021	Cloud: 8/8; temperature: 13°C; wind speed: 2; drizzle
9 January 2022	Cloud: 6/8; temperature: 8°C; wind speed: 3; dry
5 February 2022	Cloud: 7/8; temperature: 8°C; wind speed: 3-4; dry

1.3. Baseline Environment

Wintering Birds

1.3.1. A total of 54 species of bird was recorded during the three surveys. A summary of observations for each species is included in the schematic list in Table 1.2A below, whilst the distribution of wintering birds is shown in Figure 10-10.

1.3.2. These surveys confirmed both the Site and the wider Coed Darcy site supports a relatively wide range of species, reflecting the variety of habitats present, although it is noticeable that even the commonest species occur only in very small numbers.

1.3.3. The most significant record was of a Goshawk *Accipiter gentilis*, present over the main woodland at the Site in January. This Schedule 1 species was not recorded during the breeding bird survey undertaken in 2020 and presumably related to a wandering individual, although the woodland in and around

Wintering Bird (Addendum to ES Chapter 10: Biodiversity)

Coed Darcy



the Site is suitable to support the species. Likewise, Red Kites *Milvus milvus* were regularly seen during the winter but were not present during the breeding bird survey. Woodcocks *Scolopax rusticola* were also flushed from the edges of the woodland; this Red List species being much more numerous and widespread in winter, when large numbers of continental birds return to the UK.

1.3.4. Also of note is the presence of up to seven Water Pipits *Anthus spinoletta* in a loose flock, ranging widely across the open areas and ephemeral pools, and colonising grasslands across the centre of the Site, as well as north of the railway. Water Pipit is a winter visitor to the UK in relatively small numbers, taking advantage of ephemeral habitats such as those at the Site. Other species present in these habitats include Jack Snipe *Limnocryptes minima*, Snipe *Gallinago gallinago*, Kestrel *Falco tinnunculus*, Skylark *Alauda arvensis*, Mistle Thrush *Turdus viscivorus*, Meadow Pipit *Anthus pratensis*, Grey Wagtail *Motacilla cinerea* and Linnet *Linaria cannabina*, although none of these were recorded in significant numbers, and they are all widespread and common species in winter.

1.3.5. The wetland habitats (western ponds and reedbeds, South Site Reservoir [SSR] and NSR) support very small numbers of very common species, with Teal *Anas crecca*, Mallard *Anas platyrhynchos* and Tufted Duck *Aythya fuligula* the only species to reach double figures. Other species recorded included a single Pochard *Aythya ferina* and Kingfisher *Alcedo atthis*, with Cetti's Warblers *Cettia cetti* and Reed Buntings *Emberiza schoeniclus* in reedbeds and associated vegetation.

1.3.6. Additionally, a few species associated with buildings (industrial estate and adjacent housing) include Herring Gull *Larus argentatus*, Starling *Sturnus vulgaris* and House Sparrow *Passer domesticus*, all of which are Red Listed, but remain abundant species during the winter.

Table 1.2A – Bird Species Recorded During Wintering Bird Surveys

Species and BTO Species Code	RSPB Listed	Notes
Blackbird (B.) <i>Turdus merula</i>	Green	Small numbers in vegetated areas
Blue Tit (BT) <i>Cyanistes caeruleus</i>	Green	Small numbers in vegetated areas
Bullfinch (BF) <i>Pyrrhula pyrrhula</i>	Amber	Flocks of up to 10 in vegetated areas
Buzzard (BZ) <i>Buteo buteo</i>	Green	One or two ever present
Canada Goose (CG) <i>Branta canadensis</i>	Feral	Two on western ponds and seven flew over in February
Carrion Crow (C.) <i>Corvus corone</i>	Green	Scattered ones or twos throughout

Wintering Bird (Addendum to ES Chapter 10: Biodiversity)

Coed Darcy



Species and BTO Species Code	RSPB Listed	Notes
Cetti's Warbler (CW) <i>Cettia cetti</i>	Sch. 1	Up to four in western wetlands
Chaffinch (CH) <i>Fringilla coelebs</i>	Green	One or two in vegetated areas
Coot (CO) <i>Fulica atra</i>	Green	Up to two on western ponds and south site reservoir
Cormorant (CA) <i>Phalacrocorax carbo</i>	Green	One on western ponds in February
Dunnock (D.) <i>Prunella modularis</i>	Amber	One or two in vegetated areas
Goldcrest (GC) <i>Regulus regulus</i>	Green	One or two in vegetated areas
Goldfinch (GO) <i>Carduelis carduelis</i>	Green	Up to 15 in vegetated areas
Goshawk (GI) <i>Accipiter gentilis</i>	Sch. 1	A young female over the main woodland area in January
Great Spotted Woodpecker (GS) <i>Dendrocopos major</i>	Green	Singles in peripheral trees
Great Tit (GT) <i>Parus major</i>	Green	Small numbers in vegetated areas
Green Woodpecker (G.) <i>Picus viridis</i>	Green	Singles in peripheral trees
Greenfinch (GR) <i>Carduelis chloris</i>	Red	One or two in vegetated areas
Grey Heron (H.) <i>Ardea cinerea</i>	Green	Two in western ponds in February
Grey Wagtail (GL) <i>Motacilla cinerea</i>	Amber	Singles mobile around wet areas
Greylag Goose (GJ) <i>Anser anser</i>	Feral	One or two on western ponds or flying over
Herring Gull (HG) <i>Larus argentatus</i>	Red	Up to five at industrial estate, many others flying over
House Sparrow (HS) <i>Passer domesticus</i>	Red	Associated with the industrial estate and housing

Wintering Bird (Addendum to ES Chapter 10: Biodiversity)

Coed Darcy



Species and BTO Species Code	RSPB Listed	Notes
Jack Snipe (JS) <i>Lymnocyptes minima</i>	Green	One flushed from pools north of the railway line in February
Jackdaw (JD) <i>Corvus monedula</i>	Green	Up to five present
Kestrel (K.) <i>Falco tinnunculus</i>	Amber	One in the area in January
Kingfisher (KF) <i>Alcedo atthis</i>	Sch. 1	One on western ponds in February
Lesser Redpoll (LR) <i>Acanthis cabaret</i>	Red	Up to five in vegetated areas
Linnet (LI) <i>Linaria cannabina</i>	Red	Up to 20 in open areas
Little Grebe (LG) <i>Tachybaptus ruficollis</i>	Green	Up to three on the north site reservoir
Long-tailed Tit (LT) <i>Aegithalos caudatus</i>	Green	Small numbers in vegetated areas
Magpie (MG) <i>Pica pica</i>	Green	Ever present around the industrial estate
Mallard (MA) <i>Anas platyrhynchos</i>	Amber	Up to 10 on each of the western ponds and south site and north site reservoir
Meadow Pipit (MP) <i>Anthus pratensis</i>	Amber	Up to 30 in open areas
Mistle Thrush (M.) <i>Turdus viscivorus</i>	Red	Up to eight in open areas
Mute Swan (MS) <i>Cygnus olor</i>	Green	Three on western ponds in February
Pied Wagtail (PW) <i>Motacilla alba</i>	Green	Scattered singles in open areas
Pochard (PO) <i>Aythya ferina</i>	Red	Singles on north site and south site reservoir
Raven (RN) <i>Corvus corax</i>	Green	One or two regularly in or over The area

Wintering Bird (Addendum to ES Chapter 10: Biodiversity)

Coed Darcy



Species and BTO Species Code	RSPB Listed	Notes
Red Kite (KT) <i>Milvus milvus</i>	Sch. 1	One or two regularly over the site
Redwing (RE) <i>Turdus iliacus</i>	Amber	Up to five in wetland areas
Reed Bunting (RB) <i>Emberiza schoeniclus</i>	Amber	One or two in wetland areas
Robin (R.) <i>Erithacus rubecula</i>	Green	One or two in vegetated areas
Siskin (SK) <i>Spinus spinus</i>	Green	Up to four in or over vegetated areas
Skylark (S.) <i>Alauda arvensis</i>	Red	At least seven in open grassland In February
Snipe (SN) <i>Gallinago gallinago</i>	Amber	Up to nine flushed from pools, especially north of the railway
Song Thrush (ST) <i>Turdus philomelos</i>	Amber	Scattered singles in vegetated areas
Starling (SG) <i>Sturnus vulgaris</i>	Red	Up to 30 in associated with adjacent built areas.
Teal (T.) <i>Anas crecca</i>	Amber	Up to 18 on each of the western ponds and south site and north site reservoir
Tufted Duck (TU) <i>Aythya fuligula</i>	Green	Up to 11 on western ponds and South site and north site reservoir
Water Pipit (WI) <i>Anthus spinoletta</i>	Amber	Up to seven in open areas
Woodcock (WK) <i>Scolopax rusticola</i>	Red	Two singletons flushed from vegetation in December
Woodpigeon (WP) <i>Columba palumbus</i>	Amber	Small numbers in woodland
Wren (WR) <i>Troglodytes troglodytes</i>	Amber	Small numbers in vegetated areas

Sch.1 indicates a species included in Schedule 1 of the 1981 Wildlife and Countryside Act (as Amended).
Note: Schedule 1, Red, Amber and Green Lists relate to breeding populations rather than wintering populations for most species but are included for completeness.

Impacts on Protected Species

Wintering Birds

1.3.7. The following Section considers impacts with the potential to arise on wintering birds as a result of the Proposed Development.

Site Usage

1.3.8. The Biodiversity Chapter of the ES, submitted in November 2021, concluded the Site as being of low importance for wintering birds and unlikely to support populations of raised conservation significance.

1.3.9. The wintering bird surveys completed between December 2021 and February 2022 largely reaffirm the previous conclusions reached in the Biodiversity Chapter, with the assemblage present not considered to be of heightened ecological significance.

1.3.10. Unsurprisingly given its scale and the variety of habitats present, the Site supports a relatively wide range of species during the winter. However, it was noticeable that even the commonest species occur only in very small numbers

1.3.11. The greatest winter interest recorded was associated with the woodland habitats, not least given the presence of a wondering Goshawk, with Woodcock providing additional interest. Of note within the ephemeral habitats in central areas was a group of up to 7 Water Pipit. Wetland habitats supported only small numbers of generally common species, as did areas of open habitat and scrub.

1.3.12. Where habitats of heightened value are present (for example the areas of woodland, as well as the larger waterbodies associated with Coed Darcy GCN SINC), these are to be retained and unimpacted. Moreover, whilst temporary impacts will be realised to SSR, this resource will be retained (and indeed enhanced) as a large wetland habitat.

Impacts

1.3.13. Prior to mitigation, potential impacts include:

- Some losses to wintering habitats (short to long term);
- Disturbance during construction (short term);
- Disturbance during operational phases (long term).

1.3.14. Given the limited use of the Site by wintering birds, impacts are considered **adverse** at Site level and of minor significance.

1.4. Additional Mitigation, Compensation and Enhancement Measures

1.4.1. This Section details the additional measures incorporated into the scheme such that potential effects on ecological receptors may be avoided or minimised, and enhancements sought. The measures

have been developed with input from other technical consultants in the Design Team, in order to ensure a viable scheme can be delivered, as well as with regard to discussions with relevant authorities (not least ecology consultees).

Wintering Birds

1.4.2. The range of bird species recorded during the winter surveys confirmed the Site supports a relatively wide range of species, albeit in small numbers. Whilst the presence of some species, such as Goshawk and Water Pipit, added to the overall interest, the interest of the assemblage overall is assessed as low, as previously concluded within the submitted Biodiversity Chapter of the ES.

1.4.3. The avoidance, mitigation and enhancement measures outlined previously are therefore considered to remain appropriate and proportional for the Site. These measures are reiterated for completeness below. Where appropriate, specific consideration is given to target species such as Goshawk and Water Pipit.

1.4.4. Whilst SSR will be subject to significant modification, these works seek to create a naturalistic waterbody, replacing the somewhat artificial and steep banked feature currently present. The overall surface area of the waterbody will remain broadly unchanged. However, the emerging Proposals include for a reduction in waterbody depth (allowing it to be de-registered as a reservoir), and the removal of the concrete/aggregate lined banks, replacing these with gradual natural banks providing a wide draw down zone. Moreover, an island will be created within the centre of the Reservoir, providing optimal winter and breeding refuge, as well as foraging opportunities. This will ensure continued and enhanced opportunities for all of those species recorded within the SSR (and indeed other wetland habitats) during the winter survey work.

1.4.5. In addition, the Proposals would include for a dedicated ecology area measuring approximately 12ha, within which no formal public access will be permitted. The provision and retention of this dedicated ecology area, which adjoins the larger waterbodies within the Coed Darcy GCN SINC (and significant wetland), will ensure optimal wintering opportunities for a range of bird species. The retention of a resource within which disturbance is avoided in the long-term will moreover provide an enhancement relative to a baseline situation where extensive (if not irregular) disturbance has occurred over several years.

1.4.6. For example, in respect of Water Pipit, management will allow the retention of sparse and early successional habitats, including pools and marshy grassland which will ensure continued wintering opportunities in future years.

1.4.7. Moreover, the retention of woodland habitats (much of which will remain undisturbed on account of habitat topography) will ensure continued opportunities for species such as Woodcock. Regarding Goshawk, the retention of the woodland habitat will ensure the Site may continue to function as a component of a wider winter resource.

1.4.8. The adoption of a long-term management regime, to include marginal habitat creation and wetland habitat within the SSR, meadow management, open mosaic habitats (OMH) 're-generation' and waterbody management will further secure qualitative enhancement for wintering assemblages. The provision of retention/re-instatement of large areas of open grassland, to include for sensitive scrub

removal, will provide loafing habitat for waders, as well as foraging opportunities for flocks of Finches, whilst extensive areas of woodland and scrub will be retained for the benefit of Thrushes.

1.4.9. The retention and/or enhancement of large areas of open water, as well as extensive terrestrial habitat creation within the proposed green infrastructure network, will retain existing opportunities for wintering birds, with these to be further secured in the long-term through the establishment of appropriate management.

1.4.10. The above measures would further be secured within a Landscape Ecological Management Plan (LEMP) for the Site, with this to include targeted conservation measures (i.e. a Conservation Plan) for birds, amongst other relevant species.

1.4.11. As such, following mitigation and enhancements, potential effects are **positive** at Site level and of **minor** significance.

1.5. Residual Environment Impacts and Effects

1.5.1. Residual impacts remain as described within the submitted ES. For clarity, residual impacts will be positive at Site level and of minor significance.

1.6. Cumulative Effects

1.6.1. Cumulative effects remain as described within the submitted ES.

1.7. Assessment Summary

1.7.1. This Addendum is based on results from wintering bird surveys undertaken between December 2021 and February 2022. This addendum should be read in conjunction with the Biodiversity Chapter of the ES, as submitted in November 2021.

1.7.2. The Site supports a relatively wide variety of wintering bird species, albeit generally common and widespread and at relatively low numbers.

1.7.3. The most significant record was of a Goshawk, although this species was not recorded during previous breeding bird surveys in 2020 and therefore can be considered as a wandering individual. Likewise for the small number of Red Kites observed but not recorded during the previous breeding bird surveys.

1.7.4. A very small number of common and widespread species of waterfowl were recorded utilising the wetland habitats in the south-west of the Site and in the NSR and SSR. The wetland habitats in the south-west are to be fully retained as part of the Proposals, and the SSR will be enhanced.

1.7.5. The winter survey findings do not materially alter the conclusions reached within the original ES submission. The range of bird species recorded during the winter surveys confirmed the Site supports a relatively wide range of species, albeit in small numbers. Whilst the presence of some species such as Goshawk and Water Pipit added to the overall interest, the interest of the assemblage is low, as predicted within the submitted Biodiversity Chapter of the ES.

Wintering Bird (Addendum to ES Chapter 10: Biodiversity)

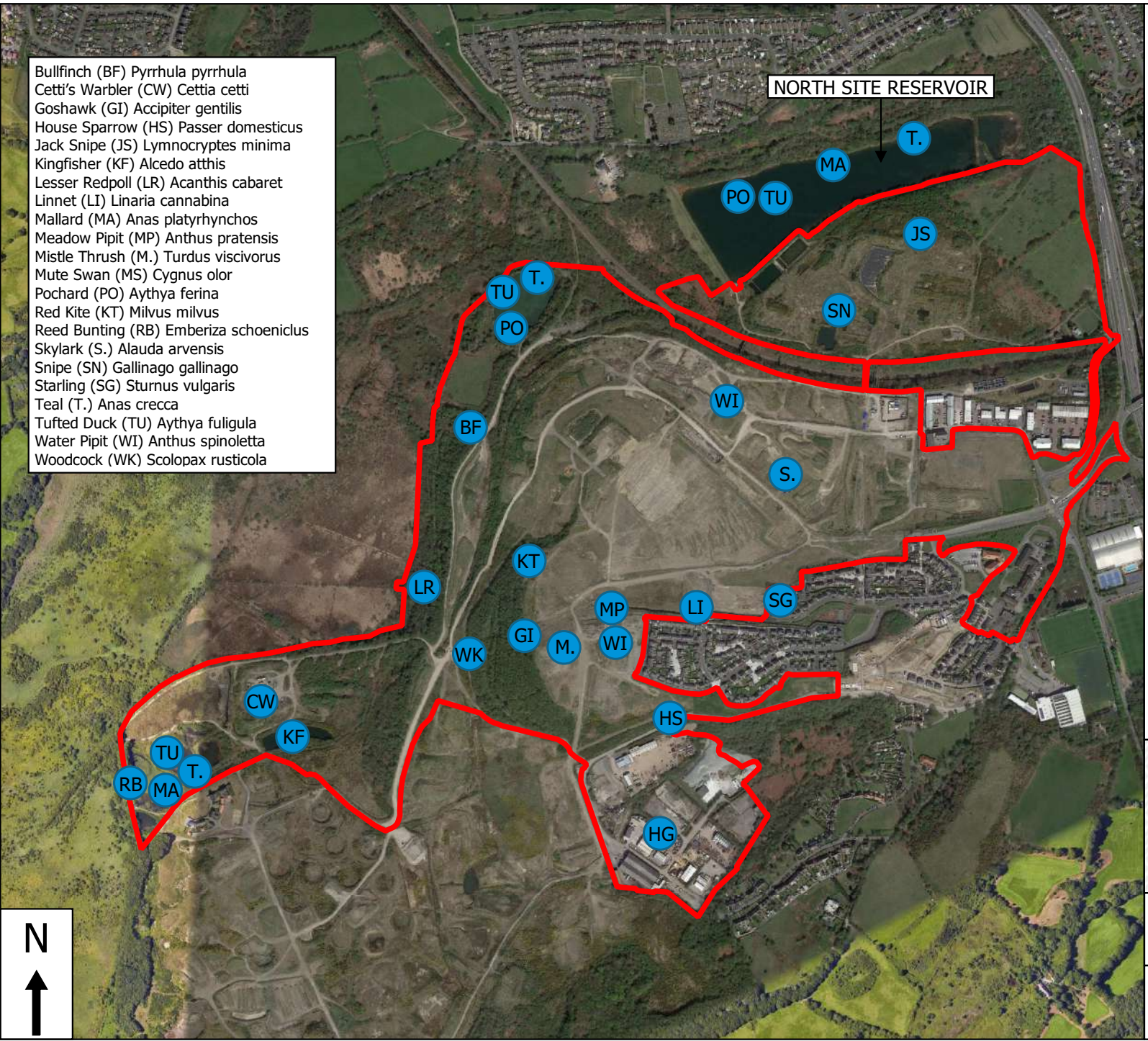
Coed Darcy



1.7.6. Accordingly, and with reference to the species recorded, the avoidance, mitigation and enhancement measures outlined previously remain appropriate and proportional for the Site. These measures will ensure adverse residual impacts on wintering bird populations will be avoided. Indeed, the suite of mitigation and enhancement measures proposed will ensure opportunities for positive ecological outcomes post-development

1.7.7. Overall, it is not considered the Proposals will have a significant impact on wintering birds at Coed Darcy, and the mitigation proposals will enhance opportunities to support wintering birds.

Topic	Mitigation Measures	Designed into the Proposed Development	Delivery via Condition (Outline/RM)	Delivery via Legal Obligation	Paragraph Reference in the ES	Proposed Monitoring Arrangement
Wintering Birds	Construction safeguards within CEMP. Dedicated Green Infrastructure design and, habitat creation and management. Provision of LEMP.	No	Yes		10.6.112 to 10.6.116	Construction monitoring by site personnel/ ecological oversight of relevant activities by Ecological Clerk of Works (ECoW). Long term habitat monitoring to be secured in LEMP and undertaken by adopted management body.



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9011M: COED DARCY, LLANDARCY, NEATH		
FIGURE 10-11: INDICATIVE DISTRIBUTION OF SELECTED WINTERING BIRDS		Rev: A Apr 22

APPENDIX 4

Invertebrate Survey Report

Richard Wilson Ecology Limited



Terrestrial Invertebrate Survey, Former Llandarcy
Oil Refinery, near Neath

Final Report

Prepared for Ecology Solutions Limited

October 2021

Notice

This document and its contents have been prepared for Ecology Solutions Limited and is intended solely for information and use in relation to the proposed development located within the former Llandarcy Oil Refinery, near Neath, Glamorgan. This is the final report which should be used for the purposes of informing any ecological impact assessment, planning application or Development Consent Order.

Richard Wilson Ecology Limited assumes no responsibility to any other party in respect of or arising out of or in connection with this document and/ or its contents.

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Executive Summary

- Ecology Solutions Ltd commissioned Richard Wilson Ecology Limited to undertake terrestrial invertebrate surveys for the purpose of informing an Ecological Impact Assessment for proposed residential development, known locally as Coed Darcy, within the former extensive footprint of the Llandarcy Oil Refinery ('the study site').
- The study site, located immediately to the south of Neath, covers just under 200 ha split unevenly between two land parcels; one to the north of the railway line and the substantial majority (170 ha) to the south. The habitats present include mosaics of grasslands, short perennial vegetation, scrub (scattered and more continuous), mature woodland and wetlands, much of which is identifiable as open mosaic habitat on previously developed land (OMH). The OMH is largely present within remediated and disturbed ground, which includes spoil heaps and other topography, which has resulted in a highly varied landscape. These have all been placed in context, considering invertebrate ecology, within the wider ecological landscape, considering the Swansea Bay National Landscape Character Area, and south Wales more generally.
- Two non-statutory sites are present within the study site and several more are designated within the local plan for their nature conservation interest.
- For the purposes of description, the study site has been divided in to two sectors, northern and southern, to reflect the proposed phasing of the development. However, evaluation has considered the site as a single entity. Reference to recent historical survey work within and immediately adjacent to the study site has been undertaken to place the 2020 data in context.
- Nine survey visits took place between mid-May and mid-September 2020 in reasonable to optimal weather conditions using a variety of methods including aerial netting, sweeping vegetation, vacuum sampling and direct observation. Static trapping (pitfall traps) were deployed to supplement the active surveying.
- A total of 505 species were recorded throughout the study site, of which 30 (6 % of the assemblage) are Key Species – those with a nature conservation status.
- Of the 30 Key Species, three are Rare Key Species (a spider – *Zodarion fuscum*; and two butterflies: dingy skipper and grayling); all of which are associated with dry grasslands and bare ground. Three Welsh threatened bees (*Andrena congruens*, *Sphecodes reticulatus* and brown-banded carder bee (*Bombus humilis*) were recorded in addition to several other species that are scarce or rare in the county/ Wales. The carder bee and both butterflies are also included in the Welsh Biodiversity List as Species of Principal Importance.
- Within the study site, 76 species are reliant on the vegetation communities present to complete their lifecycle, of which 57 species are present within the northern sector. Most are intrinsically linked with the OMH which represents a substantial resource in the context of the Swansea Bay National Landscape Character Area and south Wales.
- The physical characteristics of the OMH share similar properties to nearby coastal dune systems such as at Crymlyn Burrows SSSI and Kenfig SSSI. The OMH supports an assemblage of invertebrates that are characteristic of dry, flower-rich grasslands on highly heterogeneous topography of which coastal sand dune systems are interpreted as the natural equivalent. The study site is located within an ecological coastal landscape where there are several high quality protected sites such as at Crymlyn Burrows and Kenfig SSSIs which are known to support important populations of individual Key Species.
- The invertebrate assemblages associated with the OMH has been evaluated to be of **regional nature conservation value**, based on the relative quality and extent of the habitat resource present for invertebrates within the wider region, number of Key Species and the proportion of stenotopic taxa (species dependent on restricted habitat conditions) recorded in specific assemblages, indicating favourable conservation status.

- Survey work during 2020 has been thorough, sufficient to evaluate the nature conservation value of invertebrate assemblages present within the study site and identify habitats and features of importance for terrestrial invertebrate assemblages.
- A narrative on relevant mitigation principles is provided, identifying development-led opportunities and means by which the existing OMH can be integrated within the proposed development and ensuring its resilience post-construction.

1 Introduction

1.1 Background

Richard Wilson Ecology Limited was commissioned by Ecology Solutions Ltd in mid-May 2020 to undertake terrestrial invertebrate surveys within the former Llandarcy Oil Refinery complex to inform the Ecological Impact Assessment (EclA) for a proposed phased residential development ('Coed Darcy') project.

This report provides the results of the survey work undertaken in 2020, including data analysis and evaluation, which can inform the future planning application's EclA.

1.1.1 Previous Invertebrate Surveys

The study site has had a prolonged ecological survey history dating back to the late 1990s (at least) and the Ecology and Nature Conservation chapter of the Environmental Statement that supported the Outline Planning Application (Planning Reference: P2005/0393) granted in February 2008 refers to "A *comprehensive suite of invertebrate surveys...*" in the summer of 2001 and again in 2004 (Parsons Brinckerhoff, 2005; paragraphs 16.3.9 to 16.3.11). However, whilst the relevant technical report (Appendix 16B to the Environmental Statement) has not been located, the report of the Planning and Development Control Committee (PDCC) meeting of ¹Neath Port Talbot County Borough Council (dated: 11th December 2007) provides a description which is summarised below:

The invertebrate surveys revealed a very diverse assemblage, including a number of species of conservation importance, including two Red Data Book species and eight that are nationally notable/ scarce. The high diversity is likely to be due to the variety of habitats present, as well as to the close proximity of the Crymlyn Bog SAC, which is known to support a very extensive invertebrate fauna. The most valuable areas for invertebrates were the large mosaic of woodland, grassland and heathland in the south-eastern corner of the site, the areas of species-rich grassland in the south-western corner, and the heathland/grassland habitats on the hillside in the centre of the site. However, species of conservation importance were distributed throughout the site.

The PDCC report further adds that:

A total of 195 moth species were recorded, including a number of Notable and 'local' species. This include dentated pug (*Anticollis sparsata*), silky wainscot (*Chilodes maritima*), thyme pug (*Eupithecia distinctaria*), marsh opaque-barred [sic] (it is actually marsh oblique-barred (*Hypenodes humidalis*)), dusky thorn (*Ennomos fuscantaria*) and frosted orange (*Gortyna flavago*), all of which are local priority species. The most significant result of the moth surveys was the presence of the double line (*Mythimna turca*) moth, which was recorded both in the south-west of the refinery site, near to the Crymlyn Bog, and within the corridor of the proposed Southern Access Route. This 'Notable B' [Nationally Scarce (Nb)] species is listed as a priority species in both the UKBAP [UK Biodiversity Action Plan] and the Neath Port Talbot LBAP, and is a species of principal importance listed under Section 74 of the Countryside and Rights of Way Act 2000. It is considered likely that its population is centred on Crymlyn Bog, but that areas of marshy grassland in the vicinity of the Bog are also used.

The ²PDCC report further states that a total of 247 invertebrate species were recorded during these surveys though no complete list of taxa, even those with a nature conservation status, is included. The text refers to three Red Data Book (Rare) insects: an unspecified species of caddisfly (Trichoptera), horsefly (Diptera, Tabanidae) and rove beetle (Coleoptera, Staphylinidae); and the Nationally Scarce hairy dragonfly (*Brachytron pratense*).

¹ See [https://democracy.npt.gov.uk/Data/Planning%20and%20Development%20Control%20Committee/20071211/Agenda/\\$PLANDEV-111207-REP-EN-GW.doc.pdf](https://democracy.npt.gov.uk/Data/Planning%20and%20Development%20Control%20Committee/20071211/Agenda/$PLANDEV-111207-REP-EN-GW.doc.pdf); last accessed on the 11th February 2021.

² There is some confusion in the report as the initial paragraph refers to two Red Data Book and eight Nationally Scarce taxa (without stating what they are). Later, it refers to three unspecified Red Data Book species (see main text). Further, there is also confusion on the moth and butterfly species-richness: 195 species of moth are referred to initially; then 164 species of moth and butterfly.

In the absence of the detailed invertebrate survey report, given that moths and butterflies are the dominant component, representing between two-thirds and just over three-quarters of the assemblage (see Footnote 2), it suggests that the primary focus of the historical surveys was light-trapping moths, supplemented by direct observations of dragonflies and limited sampling of fauna.

The survey data is now between fifteen and twenty years old, and in the intervening period, substantial changes have occurred within the study site following remediation of the surface. Historical aerial photography on Google Earth illustrates that after 2009, substantial groundworks sequentially cleared surface infrastructure and vegetation communities that were present at the time of the invertebrate surveys, such that assemblages recorded then will have been substantially affected by habitat loss. Thus, the historical invertebrate survey work is likely to have limited relevance to placing assemblages present today in context as the vegetation communities that have developed post-remediation are likely to be different structurally and in terms of species composition. This said, given the extensive nature of the study site, there may be isolated small areas, particularly on the edge of the site or adjacent to the mature woodland where some previously recorded taxa, or remnant historical invertebrate assemblages have persisted, but in the absence of any detailed report, it is not possible to state with confidence whether species and assemblages recorded in 2020 are related to the earlier fauna. Therefore, any relationship between the current invertebrate assemblage and the historical one is likely to be tenuous, or a consequence of the adjacent, relatively more stable ecological landscape. This is considered in more detail in Section 4.1.

1.2 Study Site

The former Llandarcy Oil Refinery occupies approximately 196 ha over two separate land parcels separated by the Cardiff to Swansea mainline railway. The smaller land parcel to the north (Cefn Parc, centred on SS 716 963) occupies about 26 ha; and the substantially larger land parcel is to the south (centred on SS 708 954) and occupies about 170 ha. Additionally, there is a proposed approximate 1 km long Southern Access Road leading from Parc Amazon in the south (at SS 705 935) to the former Oil Refinery's southern boundary (at SS 705 944).

The Oil Refinery was constructed in the 1920s on a natural raised landform (ranging between 10 m AOD on its western flank to just over 90 m AOD on its eastern edge), between Neath and Aberavon to its east, and Swansea to its west, in south Wales (vice-county 41: Glamorgan). Following closure in 1998, the infrastructure was demolished in 2009.

The study site is located within the Swansea Bay National Landscape Character Area (NLCA), a narrow coastal plain with the steeply rising South Wales Valleys as its hinterland. The Swansea Bay NLCA is characterised by a mix of urban settlement and industry, coastal sand dunes and heaths and major estuaries, of which the Rivers Neath and Abertawe are proximal to the study site.

Immediately adjacent to the study site and sharing a boundary is Crymlyn Bog (Cors Crymlyn) Site of Special Scientific Interest (SSSI), Special Area of Conservation (SAC) and Ramsar Site (hereafter referred to as Crymlyn Bog SSSI for simplicity). Crymlyn Bog has been designated for a number of features including wetland invertebrate assemblages associated with flushes, streams and ditch habitats; and the presence of the ³hornet robberfly (*Asilus crabroniformis*). Crymlyn Burrows SSSI is located approximately 1.4 km south of the former Oil Refinery (excluding the proposed footprint of the southern access road) and is also noted for the invertebrate assemblages associated with the sand dune system

Several non-statutory sites (Sites of Importance for Nature Conservation (SINC)) are present within a 2 km buffer of the study site, of which three are partially located within its boundaries. The mature oak woodland located within the study site (centred on SS 709 947) forms part of the more extensive Jersey Marine Woods SINC which extends to the east and also includes scrub, bracken and lowland meadow habitat. The land to the immediate south of the former Oil Refinery, associated with Penisa'r Coed farmhouse, and through which the proposed Southern Access Route passes (SS 701 945), and the large waterbody associated with the 'demonstration village' in the south-west of the study site (SS 701 953) is designated as the Coed Darcy Great Crested Newt Area SINC and is a receptor site for great crested newt (*Triturus cristatus*) that were translocated out from the study site in the late 2000s. Habitats include waterbodies, grasslands and scrub. The third non-statutory site lies at the southern end of the proposed southern access route: Amazon Woodlands SINC has been designated for a rare plant and woodland habitat.

³ At the time of designation, the robberfly was Nationally Scarce, but it has since become more widespread and consequently downgraded to Least Concern (Drake, 2017).

1.2.1 Summary of Habitats and Vegetation Communities (2020)

Botanical surveys that have mapped vegetation communities within the study site have been completed by Ecology Solutions during 2020 and are reported elsewhere but for the purposes of this report, field notes and photographs taken by the surveyor have been used to provide the following description.

No evidence of surface infrastructure pertaining to the former Oil Refinery remains *in situ*, having been subject to demolition and remediation. As a consequence of the varying intensities of remediation over an extended period of time (i.e. several years), of which it is understood that the last main period occurred during 2018 (north-eastern area behind the security cabin), vegetation communities and cover are variable throughout the study site. Further, the made ground topography is highly heterogeneous with spoil heaps of soil, rubble and other broken hardstanding scattered throughout the extensive area. Based on an informal understanding of the recent site's history, vegetation communities within much of the study site are of variable age, ranging from recently established (< 2 years) upwards to approximately ten years old. These habitats include floristically diverse tall grassland swards, short perennial vegetation with a high percentage of bare ground, ephemeral wetland vegetation as a consequence of impeded drainage and scattered scrub, which form mosaics on a complicated topographical surface that includes hollows, vertical and sloping surfaces ('soft cliffs') and undulating level ground. Collectively, this entire area can be defined as Open Mosaic Habitat on Previously Developed Land (OMH), a Habitat of Principal Importance (HoPI) (see Section 2.1 for further details). The OMH included habitats with an abundant and diverse pollinator resource of varying species of which the Asteraceae (daisy family), and Apiaceae (carrot family, 'umbellifers') were a substantial component.

Established and stable vegetation communities occur as pockets associated with the extensive OMH such as adjacent to retained internal access roads/ tracks, or towards the edges of the study site. In the latter's instance, these retained communities exist as boundary features; for example, the woodland strip/ mature hedgerow delineating the former Oil Refinery's western edge and the adjacent Crymlyn Bog SSSI; and the mature woodland component of the Jersey Marine Woods SINC.

In summary the dominant component of the study site is a diverse OMH that forms structurally complex vegetation communities with more established mature vegetation. The site's topography, including spoil heaps, smaller mounds and linear embankments in combination with the OMH and mature vegetation communities have provided a complex resource for terrestrial invertebrates. The composition of the invertebrate assemblages present will be influenced by the study site's relationship with the wider ecological landscape and this is considered in more detail below, and when evaluating the results (see Section 5).

1.2.2 Context with Surrounding Landscape

The study site is located on a natural landform that forms a distinctive ridge defined by the River Neath valley to its east, and Crymlyn Bog SSSI to its west. To the north, the land rises, forming north-south orientated valleys separated by linear high ground that define the South Wales Valleys. This landform is a prominent feature within the narrow coastal strip of the Swansea Bay NLCA, which is characterised by a mix of urban and industrial development in close proximity to more natural landforms such as the coastal sand dunes at Crymlyn Burrows SSSI and Baglan Bay; and the valley mire of Crymlyn Bog SSSI. The OMH, which is the dominant vegetation community within the study site is of relatively recent origin, following post-demolition remediation work that commenced about ten years ago, and is in stark contrast to the more established semi-natural vegetation communities, which are known to support nationally important invertebrate assemblages including those known from the adjacent statutory protected sites. However, the OMH share similar features with some of the coastal habitats including free-draining substrates, highly heterogeneous topography, flower-rich grasslands, a bare ground resource, including spoil heaps that mimic soft cliff exposures and therefore, the habitats present within the study site are potentially functionally connected to these high value habitats, despite their different origins. As a consequence, the invertebrate assemblages, particularly more mobile groups such as the Diptera and aculeate Hymenoptera may have affinities with these biotopes that are present in the not too distant wider landscape, including the protected coastal sites in the vicinity of the study site.

1.2.3 Proposed Development Footprint

The current proposals are for a multi-phased development of the entire site, including a Southern Access Road linking the future completed development to Parc Amazon. The survey work reported here covers the majority of the former Llandarcy Oil Refinery footprint (though see Section 1.3.2 for access limitations). However, only the extreme southern end of the Southern Access Route, immediately off Parc Amazon and within the Amazon Woodlands SINC, was surveyed due to lack of access north of the Tennant Canal.

In January 2021, Ecology Solution Ltd communicated that the next phase of the development would be confined to the northern section of the study site, comprising Cefn Parc (smaller land parcel north of the railway line) and the northern half of the main site, approximately north of Tank Farm Road (see Appendix A).

1.3 Survey Limitations

1.3.1 Coronavirus Pandemic

In mid-March 2020, following the emergence of Coronavirus (Covid-19), the UK and devolved Governments announced a strict lockdown which extended through until late April 2020. This lockdown required all but essential workers to stay at home. As a consequence, and until the Chartered Institute of Ecology and Environmental Management (CIEEM) issued guidance following confirmation from the Welsh Government (Minister for Housing and Local Government), it was uncertain whether ecology surveys (within the planning system) were included in the definition of 'essential worker'. This was resolved in early May 2020, and thus the first survey commenced shortly after. The implications of this delayed start are discussed below.

1.3.2 Access Limitations

Access was not gained into the mature woodland that forms part of the Jersey Marine Woods SINC due to the dense impenetrable field layer, the western edge within the Oil Refinery being ringed by dense growth of continuous gorse (*Ulex europaeus*) and other scrub that formed a barrier at the base of a steeply sloping extensive spoil mound. An attempt was made to access the SINC from the minor road leading up from Jersey Marine and which forms the study site's eastern boundary. Most of the boundary is defined by tall metal fencing, though a section had been damaged sufficiently to gain safe access. However, the dense underscrub prevented any meaningful access in to the woodland.

Access was also not obtained along the proposed route of the Southern Access Road, with the exception of the short corridor leading north from Parc Amazon and the Tennant Canal (which was accessed via the towpath).

For safety reasons, the shoreline of the large reservoir in Cefn Parc was not approached, or spoil heaps where the substrate was considered unstable.

1.3.3 Weather Limitations

The spring of 2020 was remarkable for its prolonged dry and hot weather. Weather conditions leading up to the first main visit (mid-May 2020) were generally warmer and substantially drier than the long-term average (Meteorological Office ⁴ website). This was followed by a generally average, in terms of warmth (temperature), but a wetter and cloudier early to mid-summer (Meteorological Office ⁵ website). This combination of an exceptionally warm and dry spring followed by a cloudier and wetter summer is considered likely to have affected invertebrate species, especially their larval stages. Spring and early summer faunas are considered to have emerged early, in response to the clement weather, or died before emerging as adults due to desiccation. This, in combination with the delayed start as a consequence of Government restrictions arising from the Coronavirus Pandemic (see Section 1.3.1) resulted in this initial spring emergence possibly being at least partially missed.

1.3.4 Implications

The results of the surveys undertaken are likely to have been influenced by the conditions (weather and Pandemic) experienced in 2020 in that some spring and early summer species, if present, may have been missed. Evaluating the data will have a greater focus on invertebrate assemblages and not just individual species of conservation interest. This, combined with a thorough survey effort and consideration of habitat features will ensure a robust evaluation of the study site and individual land parcels, enabling an informed conclusion. Lack of survey in the Jersey Marine Woods SINC and the Southern Access Route corridor north of the Tennant Canal will have reduced our understanding of invertebrate assemblages associated with mature woodland and intact grasslands. Given that these sites are not being brought forward (Southern Access Route) or developed (SINC), there are no implications for the lack of access. However, if/ when these areas are brought forward, access will be required, especially within the SINC. For the latter, it may be necessary to initially clear some vegetation (outwith the breeding bird season) sufficient to create a safe access path into the woods.

⁴ See https://www.metoffice.gov.uk/binaries/content/assets/metofficegovuk/pdf/weather/learn-about/uk-past-events/summaries/uk_monthly_climate_summary_spring_2020_may.pdf; accessed on 22nd September 2020.

⁵ See https://www.metoffice.gov.uk/binaries/content/assets/metofficegovuk/pdf/weather/learn-about/uk-past-events/summaries/uk_monthly_climate_summary_summer_2020_3.pdf; accessed on 22nd September 2020.

2 Legislation

2.1 Legislation

Sixteen species of invertebrate present in the United Kingdom are protected through international law. These were originally included in Appendices to the European Union's Habitats Directive and transposed into domestic legislation by the Conservation of Habitats and Species Regulations 2017 (as amended). Since January 2021, following the UK's departure and the end of the transition period, retained EU-derived legislation has been carried over via Sections 2 and 3 of the European Union (Withdrawal Agreement) Act 2018 (as amended). This Act ensures the retention of the 2017 Regulations on and after departure day (1st January 2021). Further, for the purposes of biodiversity, the Conservation of Habitats and Species (Amendment) (EU Exit) Regulations 2019 have been made to address failures of retained EU law to operate effectively and other deficiencies, by amending the 2017 Regulations to ensure their validity.

Approximately 50 species of invertebrate are included in Schedule 5 of the Wildlife and Countryside Act 1981 (as amended).

Section 6 of the Environment (Wales) Act 2016 requires all local authorities to introduce an enhanced biodiversity and resilience of ecosystems duty (the Section 6 duty) in the exercise of functions in relation to Wales. The duty requires that public authorities must seek to maintain and enhance biodiversity so far as consistent with the proper exercise of their functions and in so doing promote the resilience of ecosystems. Further, Section 7 provides for a list of species and habitats of principal importance, of which 188 invertebrate taxa are listed.

A full list of all species covered by legislation and policy is available via the Biodiversity Wales' ⁶website.

2.2 Policy

Paragraphs 6.4.1 to 6.4.27 inclusive of Planning Policy Wales conveys Welsh policy on conserving and enhancing the natural environment including protecting habitats and biodiversity in the planning system (Welsh Government, 2018a). Guidance underpinning Planning Policy Wales is available via the Technical Advice Note 5: Nature Conservation and Planning (Welsh Government, 2009) which provides a detailed narrative on considerations to protect and enhance biodiversity as part of the planning process.

The original Welsh National Pollinator Strategy (Welsh Government, 2013) is particularly relevant for nature conservation of pollinators and emphasised the then duty under Section 42 of the Natural Environment and Rural Communities Act 2006 for local authorities to have regard to biodiversity. This has now been updated to reflect the Environment (Wales) Act 2016 and the Well-being of Future Generations (Wales) Act 2015 (Welsh Government, 2018b).

⁶ See <https://www.biodiversitywales.org.uk/File/56/en-GB>; last accessed on the 12th February 2021.

3 Methodology

3.1 Desk Study

The ecological desk study has been undertaken by Ecology Solutions and relevant historical records of invertebrates received from the South-east Wales Biological Record Centre (SEWBRc) have been forwarded on for the report. Further information sources have been referred to as necessary, including from the author's library, in addition to referencing previous survey work (referred to in Section 1.1.1).

3.2 Field Survey

The purpose of the work was to undertake an appraisal of the study site's nature conservation value for terrestrial invertebrates and is therefore not intended to provide an exhaustive list of invertebrate taxa present. In achieving these aims, the surveys followed the methodologies described in Drake *et al.* (2007) using a variety of techniques, including sweeping of vegetation and aerial netting for flying invertebrates using a light-weight butterfly net as well as a more heavy duty sweep-net. This was complemented by vacuum sampling (using a commercially available modified garden blow-vac), sieving leaf-litter, searching under refugia and direct observation plus some limited pitfall trapping.

Specimens collected were either identified in the field or retained for subsequent microscopic identification. Surveys paid particular attention to those groups most likely to include species of nature conservation interest, focussing on aculeate Hymenoptera (solitary bees and wasps), Diptera (flies), Araneae (spiders), Coleoptera (beetles) and Hemiptera (bugs). However, a wide range of invertebrate orders were recorded including day-flying Lepidoptera (butterflies and moths).

3.3 Evaluation Methodologies

There is currently no standard frame of reference to evaluate the nature conservation value of invertebrate assemblages for the purposes of EclA, though increasingly, in addition to placing reliance on professional judgement of the surveyor and associates, the use of Pantheon (Webb *et al.*, 2018) is being applied.

3.3.1 Proportion of Key Species

An initial indication of a study site's nature conservation value is the proportion of species with a nature conservation status (NCS) recorded. NCS species are those that are assigned a formal status based on three systems applied to British invertebrates since the late 1980s. Details are provided in Appendix B but in summary, all NCS species are assigned a formal status which initially included Red Data Book (Shirt, 1987; Bratton, 1991), and Nationally Notable species (by various species status reviews administered by the Joint Nature Conservation Committee). Since 2001, consideration of a species threat to survival such as through habitat loss, based on the International Union for the Conservation of Nature's (IUCN) criteria (IUCN, 2012) has been adopted and this is gradually replacing the old Red Data Book categories. Running parallel with the IUCN criteria are two British rarity categories, which are based on the hectad system, which again are being defined by ⁷updating species status reviews.

Telfer (2017) provided a means of evaluating a study site's potential nature conservation value by considering the proportion of NCS species present within a study site, on the basis that the higher the percentage of NCS species, the more important the study site is. He refers to NCS species as 'Key Species' and splits this in to two groups: Rare Key Species, which are those taxa assigned Red Data, IUCN Threatened and Data Deficient, and Nationally Rare status; and Scarce Key Species, which are those assigned IUCN Near Threatened, and Nationally Scarce/ Notable status. As a rule of thumb, if close to 10 % of the species recorded are Key Species; and more than 1 % are Rare Key Species, it is suggestive that the study site is potentially of national significance for its invertebrate fauna.

⁷ Updated species status reviews are published on the JNCC website: <http://jncc.defra.gov.uk/page-3352>

3.3.2 Invertebrate Assemblages

In considering species assemblages, the taxa recorded within the study site have been entered into Pantheon, a database tool developed by ⁸Natural England and the Centre for Ecology & Hydrology to analyse invertebrate sample data (Webb *et al.*, 2018). Pantheon has incorporated the Invertebrate Species-habitat Information System (ISIS) developed by Derek Lott and referenced in Drake *et al.*, (2007) but takes the analysis further by attaching associated habitats and resources, habitat fidelity scores and other ecological information against each species. This is currently based on approximately 13,000 invertebrate species out of an estimated 37,000 species known from the UK. The taxa primarily used for this analysis are Coleoptera, Diptera, Hemiptera, Lepidoptera, aculeate Hymenoptera and Araneae; hence the focus on these groups for survey. As for the original ISIS, some caution must be applied as strictly speaking, survey effort would normally require standardisation such as timed sweeps.

For the purposes of EcIA, the methods have allowed what ⁹Webb *et al.* (2018) describe as a semi-ISIS approach, stated to include some standardised methods such as timed vacuum sampling, static trapping such as pitfall or Malaise trapping; but extending to include more freeform sampling such as focussed searches for pollinators in a non-standardised way. Nevertheless, Pantheon can at least inform which invertebrate assemblages recorded are of particular importance within a site, such as those associated with wood decay, floristically rich habitats or both. A positive aspect of this approach is that attention is given to assemblages rather than solely relying on the national status of individual species, though the latter can also be indicative, especially as a proportion of the total species recorded.

Pantheon interrogates the composition of the terrestrial invertebrate assemblage in terms of biotopes, habitats, and the distribution of stenotopic species i.e. those terrestrial invertebrates with very specific and restricted habitat requirements and have an intrinsic nature conservation value; referred to as ¹⁰Specific Assemblage Types (SAT) (Webb *et al.*, 2018). In doing so, the limitations of Pantheon as a tool have been recognised based on the semi-ISIS compliant approach and confidence in the reported condition is therefore medium. To mitigate this confidence level, professional judgement has been applied where necessary to assist robust valuation.

Pantheon can only identify whether a site is in favourable or unfavourable condition expected for SSSIs, and condition is not strictly analogous with value. However, if favourable condition is concluded then this can, taking into account other factors, provide evidence that objectives for sites of national value (SSSIs) are being met and this seems a reasonable proxy in this instance for national value. However, use of unfavourable condition to argue against national value is more problematic and requires a degree of caution and application of professional judgement to determine the appropriate geographic scale of nature conservation value. In addition, as the survey did not strictly comply with methods described in Drake *et al.* (2007), such as timed sweeps, a degree of caution and professional judgement is likewise necessary to accommodate for any bias (detracting or enhancing) within the analysis that might introduce subjectivity into the evaluation.

In an attempt to inject some objectivity into the use of Pantheon SATs to inform evaluation of nature conservation value and to counteract some of the caveats given above, the threshold limits for each of the SATs has been noted with the intention of providing a reasonable judgement. This can be made in terms of the Proportion to Threshold (PtT) achieved for each SAT identified. The threshold referred to is the number of species within a SAT expected to be present if a site is considered to be in favourable condition (FC). Thus, if a SAT records or exceeds the expected threshold, the PtT will be 100 % or greater and this is taken as the basis for considering assigning national value. In the absence of other guidance, where the PtT is < 100 %, professional judgement is used to assist with the rationale for assessing a nature conservation value of the invertebrate assemblage in a sub-national context (i.e. regional, county, district, local). The further away from the threshold, the lower the nature conservation value the SAT. Other factors considered when determining the value include species-richness, proportion of Key Species in the assemblage, proportion of county rarities or significant records (where known), and site context within the landscape (i.e. availability and connectivity to similar semi-natural habitat, whether statutorily protected or not). Thus, whilst Pantheon remains a useful guide when assessing the

⁸ Whilst Pantheon was designed for use in England, biogeographically, the invertebrate fauna of coastal south Wales is not going to be substantially different to comparable habitats and environments in England, which is about 80 km (50 miles) east.

⁹ See <http://www.brc.ac.uk/pantheon/lexicon/reported-condition>; last accessed on the 16th January 2019

¹⁰ SATs are characterised by species restricted to certain features within habitats (= stenotopic species) such as types of decaying wood (e.g. sapwood, or heartwood), fluctuating marsh or rich flower resource. Some SATs such as rich flower resource are cross-cutting, i.e. can be present in more than one habitat.

nature conservation value for each of the land parcels for terrestrial invertebrates, professional judgement incorporating other evidence is necessary to come to a defensible evaluation.

3.3.3 Designated Site Guidelines

3.3.3.1 Statutory Sites

The Joint Nature Conservation Committee (JNCC) has recently updated and ¹¹ published its guidance on invertebrates for the selection of biological SSSIs (Curson *et al.*, 2019). This document has been useful in considering the study site's nature conservation value based on the presence of, for example, Key Species, edge of range species or species assemblages, and placing this in context with the Area of Search, which for the purpose of this approach, is taken to be the relevant NLCA. The relevant NLCA profile to the study site is the Swansea Bay NLCA (Natural Resource Wales, 2014).

In summary, Curson *et al.* (2019) state that any species which are Critically Endangered, Endangered or Vulnerable (IUCN); or Nationally Rare (British rarity status) should be represented in SSSIs; and Near Threatened and Nationally Scarce taxa should also be considered if certain caveats apply. The presence of any such designated species at a site is not in itself sufficient for that site to be formally designated, but it would reach a threshold *for it to be considered*. Therefore, the presence of Critically Endangered, Endangered, Vulnerable (¹²IUCN), or Nationally Rare species in a site can be considered as a proxy for considering national importance. The presence of Near Threatened or Nationally Scarce species in the absence of any of the previous four categories would need to consider additional factors such as their status in the vice-county/ region. A Near Threatened or Nationally Scarce species that is new, or rare in the vice-county would potentially merit consideration; whereas if it is frequent, it will likely fall short of the threshold for consideration.

3.3.3.2 Non-Statutory Sites

Wales has a single set of guidelines which define how non-statutory sites, termed Sites of Importance for Nature Conservation (SINC), covering all authority areas (Wales Biodiversity Partnership, 2008). SINC are selected based on five general criteria:

- *Any site which supports populations of a species, which is listed in the UK Red Data Book, or listed on the Section 42 [now the Section 7 List] List [SoPI] with the specific requirement for site protection action.*
- *Any site which supports an important assemblage or population(s) of 'Nationally Scarce' species. To be determined in consultation with appropriate experts.*
- *Any site which supports a species, recorded from 10 or fewer 10 km grid squares in Wales (where the distribution is well known).*
- *Any site which supports a species that breeds in 4 or fewer sites within a Vice County.*
- *Any site which supports a significant population or assemblage of Local Priority Species listed in a Local Biodiversity Action Plan.*

Further, for specific groups, such as butterflies and moths, additional criteria are set out:

- *Any site which supports a Section 42 species listed in their respective Tables.*
- *Sites which support significant populations or assemblages of species listed in their respective Tables. Their presence should also contribute towards the designation of sites that qualify under other guidelines.*

And for Odonata (dragonflies and damselflies) and Orthoptera (grasshoppers & crickets):

- *Any site which supports a species which is 'Nationally Scarce';*

¹¹ Guidance is available via their website: <https://jncc.gov.uk/our-work/guidelines-for-selection-of-sssis/>; last accessed on 29th October 2020.

¹² International Union for the Conservation of Nature. See <https://www.iucnredlist.org/assessment/process> for more information.

- *Any site which supports an assemblage of 9 or more species;*
- *Any site which supports any species in list 'A' of their respective Table;*
- *Sites which support significant populations or assemblages of species in list 'B' of their Table. Their presence should also contribute towards the designation of sites that qualify under other guidelines.*

3.4 Personnel

The invertebrate survey (field visits) was undertaken by Richard Wilson CEnv MCIEEM Mem.RES MSc; an experienced field entomologist. He is a ¹³recognised arachnid (spiders and harvestmen) specialist though he is familiar with a wider range of taxonomic groups. In addition to the arachnids, Richard identified some Diptera families such as the hoverflies (Syrphidae) and larger Brachycera (e.g. robberflies (Asiliidae)); and aculeate Hymenoptera in addition to groups readily identifiable in the field such as the Lepidoptera (butterflies and moths) and Odonata (dragonflies and damselflies). Steven Falk FRES, who is a recognised specialist in pollinators identified other Diptera families (e.g. Muscidae) and verified some of the aculeate Hymenoptera (e.g. *Lasioglossum* spp.). Steve Lane identified most of the Coleoptera and Hemiptera collected.

¹³ Richard is the YNU's spider recorder, the Yorkshire, County Durham and Northumberland recorder for the national spider recording scheme; and sits on the conservation committee of the British Arachnological Society.

4 Results and Interpretation

4.1 Desk Study

Ecology Solutions passed on relevant biological data received from SEWBRc which included 122 records of 56 species recorded within the former Oil Refinery between May 2001 and July 2018. The majority (35 spp.) were moths with a scattering of other Orders such as beetles (9 spp.), bumblebees (5 spp.), dragonflies (3 spp.) and one species each of butterflies, hoverflies, caddisflies and grasshoppers. A high proportion of the 56 species recorded are assigned a nature conservation status (32 spp.), though 21 taxa are moths which are Species of Principal Importance (SoPI) – Research Only. Eleven taxa (see Table 1) have a formal nature conservation status – Key Species – of which one, dingy skipper (*Erynnis tages*) is a Rare Key Species.

Table 1: Key species recorded historically between May 2001 and July 2018 within former Oil Refinery.

Order	Family	Species	Conservation status
Coleoptera	Curculionidae	<i>Ceutorhynchus atomus</i>	[Nationally Scarce (Na)]
Coleoptera	Curculionidae	<i>Orthochaetes setiger</i>	[Nationally Scarce (Nb)]
Coleoptera	Curculionidae	<i>Sitona waterhousei</i>	Nationally Scarce (Nb)
Coleoptera	Eirrhinidae	<i>Grypus equiseti</i>	[Nationally Scarce (Nb)]
Coleoptera	Hydrophilidae	<i>Cercyon nigriceps</i>	Nationally Scarce
Coleoptera	Rhynchitidae	<i>Temnocerus longiceps</i>	Nationally Scarce (Nb)
Coleoptera	Staphylinidae	<i>Lomechusa emarginata</i>	Nationally Scarce
Coleoptera	Staphylinidae	<i>Quedius scitus</i>	Nationally Scarce (Nb)
Diptera	Syrphidae	<i>Anasimyia lunulata</i>	Nationally Scarce
Lepidoptera	Hesperiidae	Dingy skipper	VU; SoPI
Trichoptera	Hydroptilidae	<i>Tricholeiochiton fagesii</i>	Nationally Scarce

The invertebrate records are scattered throughout the study site and the emphasis on moths suggests that the focus was on light-trapping. The dingy skipper was recorded at two locations towards the southern half of the former Oil Refinery in early summer 2006, but this is not to suggest populations were not present elsewhere as suitable habitat throughout the site was likely to be present. Two species, the hoverfly *Anasimyia lunulata* and the caddisfly *Tricholeiochiton fagesii* are most likely wanderers from the adjacent Crymlyn Bog SSSI; the former associated with bog-pools with abundant *Sphagnum* and bog-bean (*Menyanthes trifolia*), and the latter from fens.

Three of the taxa in Table 1 were recorded during the 2020 field season: the weevils *Sitona waterhousei* and *Grypus equiseti*; and dingy skipper. *S. waterhousei* and dingy skipper's foodplants are bird's-foot trefoil (*Lotus* spp.) where as *G. equiseti* is horsetails.

In 2012, a chance discovery of the of the Near Threatened and Nationally Rare 'Blue ground beetle', *Carabus intricatus* was made on a log-pile in a Neath garden. Prior to this, it was previously only known from riverine valleys south of Dartmoor, Devon. Survey work reported by Boyce and Walters (2017) following up this discovery identified a population of this large ground beetle in a Woodland Trust nature reserve at Coed Maesmelin (SS 724 981), which is about 3.6 km north north-east of Jersey Marine Woodland SINC. Despite searches in woodlands elsewhere in the Neath Valley, including Daren Wen (SS 745 939), Dyffryn Wood (SN 729 000), and Craig Gwladys Country Park (SS 760 992), all between 3.5 and 6.5 km from Jersey Marine Woodland SINC, no additional records of this beetle were recorded.

Based on its known ecology, the ground beetle requires open woodland with a sparse shrub and field layer. As discussed in Section 1.3.2, the underscrub and field layer at Jersey Marine Woodland SINC is dense and impenetrable, suggesting that its current state is not in favourable condition for this species and it is not likely to be present.

The historical survey work referred to in Section 1.1.1 has only been partially obtained via the PDCC and interpreting the narrative this contained. The data is approaching two decades old, and there have been substantial alterations to the vegetation communities since then, such that it is probable that the assemblage present in the late 2010s and in 2020 will be different to what was present prior to the remediation work undertaken in the intervening period. Therefore, whilst this data is of historical interest, it offers little in contextual information that can inform the current proposals.

4.2 Field Survey

4.2.1 Summary of Survey Results

Nine survey visits were completed during reasonable to optimal weather conditions for the time of year between mid-May and mid-September 2020. The details are conveyed in Table 2.

Table 2: Weather conditions for survey visits.

Date	Weather	Notes
19 th May 2020	Cloud: 8/8; Temperature: 15°C; Wind Speed: 1 (2) SW.	Scoping site
20 th May 2020	Cloud: 0/8; Temperature: 18°C to 28°C; Wind Speed: Calm.	Very dry everywhere with ephemeral wetlands or shallow waterbodies dried out.
21 st May 2020	Cloud: 8/8; Temperature: 16°C to 22°C; Wind Speed: 1.	
17 th June 2020	Cloud: 7/8; Temperature: 17.5°C; Wind Speed: 1	Rain from 11:45 hrs. Installed pitfall traps
2 nd July 2020	Cloud: 8/8 clearing to 6/8; Temperature: 14°C to 20°C; Wind Speed: 2 W to 1 SW	Light drizzle and intermittent showers until 13:00 hrs.
21 st July 2020	Cloud: 2/8 (high cloud); Temperature: 22°C; Wind Speed: Calm to 1 S.	
22 nd July 2020	Cloud: 4/8; Temperature: 18°C to 23°C Wind Speed: 1 (2) W to 2(3) SW.	
29 th July 2020	Cloud: 6/8; Temperature: 18°C; Wind Speed: Calm	
10 th September 2020	Cloud: 8/8 to 7/8; Temperature: 13°C to 17°C; Wind Speed: 1	

Two short transects of pitfall traps were placed in different OMH environments (see Table 3).

Table 3: Location of static traps.

Trap	National Grid Reference	Compartment & habitat
Pitfall traps (x 5)	SS 7089 9589	West facing slope on OMH from woodland edge to open short swards.
Pitfall traps (x 4)	SS 7068 9518	Edge of ephemeral waterbody with abundant sift rush (<i>Juncus effusus</i>) and bryophyte cover.

A total of 505 species were recorded throughout the former Oil Refinery, of which 30 taxa (excluding Research Only) are Key Species (as defined by Telfer (2017) with definitions provided in Appendix B).

In describing the results, the study site has been divided in to two compartments:

- Former Llandarcy Oil Refinery (northern sector); and
- Former Llandarcy Oil Refinery (southern sector).

Table 4 provides the breakdown of species-richness for each land parcel surveyed and Table 5 by taxonomic group. A complete list of species in taxonomic order is provided in Table 9 (Appendix C). The division of the study site into two sectors is based on the proposed phase being brought forward for planning following post-survey communication in January 2021; and not on a discernible ecological (e.g. change in habitat) or physical (e.g. fence) features (see Section 1.2.3 for more details). Sampling during 2020 covered most of the study site and included definable locations in the northern and southern sectors where methods such as vacuum sampling, grubbing or pitfall trapping efforts were contained within six, or eight-figure, national grid references. However, more mobile survey methods such as aerial netting for the purposes of collecting flying insects, or direct observations, were allocated to the 1 km grid square SS 70 95 (monad) which straddled the boundary between the two sectors. Given open habitat biotopes were broadly similar between the two sectors, all records relating to the monad SS 70 95 are included in both sectors. Mobile faunas such as Hymenoptera and Diptera are likely to be present throughout the site, such that these groups species-richness and presence/ apparent absence would be an artefact of survey effort and strategic planning decisions, and not ecology. Therefore, aggregating the data in this way is considered to reflect a more realistic distribution of species within the former Oil Refinery.

The data presented in Table 4 provides an indication of species-richness and proportion of the invertebrate assemblage that are Key Species and Rare Key Species in the study site's two sectors. The data suggests that the species-richness is broadly similar between the two sectors, as is the proportion of Key Species, which supports the observations of habitat distribution and extent throughout the study site. That the Northern Sector appears to proportionately support twice the number of Rare Key Species is considered a likely response to aggregating the data given the low absolute numbers involved and little should be inferred from this.

Table 4: Total species-richness distribution within study site and individual compartments.

Compartment	Species-Richness	Key Species	Proportion Key Species	Rare Key Species	Proportion Rare Key Species
Former Llandarcy Oil Refinery	505	30	5.9 %	3	0.6 %
Northern Sector	380	25	6.6 %	3	0.8 %
Southern Sector	357	22	6.2 %	2	0.6 %

Table 5 provides a breakdown of taxonomic groups recorded in each of the compartments, which suggest that the distribution of taxa is similarly broadly comparable between the two sectors, which supports the view that in general, equivalent invertebrate assemblages are distributed throughout the former Oil Refinery and that the distinction between a Northern and Southern sector is, in ecological terms, likely to be of no relevance.

Table 5: Distribution of main taxonomic groups studied. Red numbers in parentheses equate to Key Species (excluding Research Only – see text for explanation).

Taxonomic Group	Former Llandarcy Oil Refinery	Northern Sector	Southern Sector
Arachnida, Araneae & Opiliones (Spiders & harvestmen)	85 (7)	66 (6)	54 (4)
Coleoptera (Beetles)	158 (12)	103 (8)	113 (9)
Diptera (Flies)	102 (3)	78 (3)	74 (3)
Hemiptera (Bugs)	59 (1)	37 (0)	48 (1)
Hymenoptera (Bees, wasps & allies)	49 (4)	45 (4)	19 (1)

Taxonomic Group	Former Llandarcy Oil Refinery	Northern Sector	Southern Sector
Lepidoptera (Butterflies & moths)	28 (3)	28 (3)	28 (3)
Others	24 (0)	23 (0)	21 (0)

4.2.2 Key Species

A total of 30 Key Species were recorded within the study site, of which four are Rare Key Species, including taxa that subject to a formal status review, will likely be downgraded. These 30 Key Species represent 6.0 % of the total number of species recorded and a similar proportion were recorded within each Sector. Rare Key Species represent just under 1 % of the fauna recorded taking the former Oil Refinery as a single entity; the variation between sectors a likely artefact of survey. Details, including their ecology and occurrence at the study site is conveyed in Table 6.

Table 6: Selection of species recorded with an NCS within the study site.

Species	Status	Sector Recorded	Ecology
<i>Pardosa tenuipes</i> Araneae, Lycosidae	Nationally Scarce	Northern Southern	A wolf-spider associated with sparsely vegetated but humid (damp) environments such as dune slacks, floodplain meadows and riparian vegetation. It is a southern species in Britain and very scattered records within Wales. Recorded within damper hollows and edge of waterbodies where there are exposed substrates.
<i>Xerolycosa miniata</i> Araneae, Lycosidae	Nationally Scarce	Southern	A contrastingly marked large wolf-spider of coastal environments, particularly fixed sand dunes. It is recorded throughout Britain but nowhere is it common; in Wales it is recorded along the Glamorgan and Pembrokeshire coast. A single individual recorded from the OMH just off Parc Amazon at the extreme southern tip of the proposed Southern Access Route.
<i>Argenna subnigra</i> Araneae, Dictynidae	Nationally Scarce	Northern.	A ground-dwelling spider associated with sparsely vegetated open grasslands, including those characteristic of brownfield sites. A rare species in Wales with only a dozen known locations. It is more frequent in south-eastern England.
<i>Cheiracanthium virescens</i> Araneae, Cheiracanthiidae	Nationally Scarce	Northern Southern	A ground-dwelling species associated with open habitat biotopes including coastal grasslands, dunes, heathland and OMH on brownfield sites. Away from south-east England, there are scattered records in the Midlands, becoming rare north of an imaginary line linking the Humber and the Mersey. Within Wales, it is a predominantly coastal species.
<i>Zodarion fuscum</i> Araneae, Zodariidae	Vulnerable; Nationally Rare	Northern	A very rare species known from six locations (five hectads) in Britain with only one previous record from Wales (Porthkerry Country Park, near Barry). It requires open habitats where the vegetation is either short or patchy, thus exposed to sunshine, creating a locally warmer microclimate, where it specialises in hunting ants (Hymenoptera, Formicidae). A single male was collected in a pitfall trap located on the west-facing slope near the centre of the Oil Refinery.
<i>Marpissa nivoyi</i> Araneae, Salticidae	Nationally Scarce	Northern	A characteristic jumping-spider associated with coastal semi-fixed dunes with marram (<i>Ammophila</i>

Species	Status	Sector Recorded	Ecology
			<i>arenaria</i>). The single individual was collected in tall dry grassland which presumably has a similar structure and environment. The species is restricted to coastal England with only five other modern Welsh records, though it has previously been recorded at Crymlyn Burrows SSSI in May 1991.
<i>Synageles venator</i> Araneae, Salticidae	Nationally Scarce	Northern	An ant-mimicking jumping spider associated with coastal dunes and other dry habitats, including inland. Within Wales, it is only known from the coast around Swansea and Port Talbot, where it has previously been recorded at Crymlyn Burrows SSSI.
<i>Haliphus mucronatus</i> Coleoptera, Halipidae	Nationally Scarce	Northern Southern	A small brown 'crawling water beetle', distinctive within the genus due to its bulky appearance. It has a rather disjunct distribution, with its core across the east and south-east regions of England, but another centre of distribution occurs in south Wales clockwise into Somerset. Its habitat is typically on clay, including natural subsidence ponds, but also in man-made stagnant water bodies. The species probably feeds on plant and/ or algal matter.
<i>Elaphrus parvulus</i> Coleoptera, Carabidae	Nationally Scarce	Southern	This is a miniscule ground beetle, found on sandy and gravelly soils, but also in old walls and cracked paths, often in association with buildings. However, it can also occur next to water in gravel and sand pits and other post-industrial habitats. The species is widely distributed throughout southern and Midlands England and Wales and has recently been expanding its range. It has to date been found as far north as Cumbria.
<i>Paederus fuscipes</i> Coleoptera, Staphylinidae	Nationally Scarce (Nb)	Northern Southern	This is a remarkably colourful species as are all the members of the genus. It has striking metallic blue elytra, the remainder of the beetle being black and red. It is a predator, found in marshes and bogs, on the margins of ponds and dykes and in permanently wet mires. It is also recorded in saltmarsh habitats. Its distribution is patchy throughout England and Wales, with most records from the coastal fringes. Adults have been recorded in most months of the year.
<i>Meligethes fulvipes</i> & <i>Meligethes rotundicollis</i> Coleoptera, Nitidulidae	Nationally Scarce	<i>M.f.</i> (Northern) <i>M.r.</i> (Southern)	<i>M. fulvipes</i> is a nondescript, brown pollen beetle, is very locally distributed in England and Wales with a predominantly coastal stronghold (South Wales and south-east England), but also inland in several areas, including East Anglian Breckland. It feeds on brassicas, within which plant group, it is certainly associated with charlock (<i>Sinapis arvensis</i>). <i>M. rotundicollis</i> is a small black, nondescript pollen beetle is primarily found in south-east England, but is also known from Wales. It can be located in waste and disturbed ground habitats, including brownfield sites, and road verges. Its foodplant associations are with charlock and also hedge mustard (<i>Sisymbrium officinale</i>) and possibly other plants in this family. Adults have been recorded in the field, mainly between April and August.
<i>Sitona waterhousei</i> Coleoptera, Curculionidae	Nationally Scarce (Nb)	Southern	This is a small weevil, with characteristic convex protruding eyes. It is found in England and Wales, although its distribution is predominantly coastal, with occurrences almost exclusively between

Species	Status	Sector Recorded	Ecology
			Anglesey anticlockwise to the Thames Gateway in West Kent. There are a very few inland records, from post-industrial sites. Otherwise, habitats such as coastal undercliffs, coastal shingle and coastal quarries are examples of its typical haunts. The species feeds on common bird's-foot trefoil (<i>Lotus corniculatus</i>) as both a larva and adult. Adults have been recorded between February and September.
<i>Bombylius canescens</i> Diptera, Bombyliidae	Nationally Scarce	Northern Southern	This small bee-fly is restricted to south-west England and southern Wales where it is associated with sparsely vegetated sandy or base-rich substrates in grasslands, woodland edge or coastal soft-cliffs (Stubbs and Drake, 2014; Harvey, 2018). It is a parasite of smaller mining bees in the genus <i>Lasiglossum</i> which are frequent within the study site.
<i>Drymus pilicornis</i> Hemiptera, Lygaeidae	Nationally Scarce	Southern	A small brown ground-bug. Sparsely distributed in southern England and Wales where it is associated with short turf habitats, including chalk downland. Adults overwinter, mating in spring to give a new generation of adults by August. There is one generation a year. It most probably feeds on mosses at ground level, and possibly also fungi.
<i>Andrena congruens</i> Hymenoptera, Andrenidae	Nationally Scarce (Na)	Northern	This mining bee is associated with exposures of soils, sand or chalk on sloping ground in southern England, with outlier populations associated with the region around the Forest of Dean and the Gower Peninsula in south Wales (Else and Edwards, 2018). It is identified as a threatened species in Wales (Olds <i>et al.</i> , 2018). Several specimens were recorded within the former Oil Refinery and it seems likely that they are exploiting the various spoil heaps as nesting habitat.
<i>Bombus humilis</i> (brown-banded carder bee) Hymenoptera, Apidae	SoPI	Northern Southern	The brown-banded carder bee is a species of warm, dry sites with extensive flower-rich calcareous or coastal grasslands. Within Britain, it is largely restricted to coastal south-east, southern and south-west England, and in Wales, to the coastal fringes of Gwynedd, Glamorgan and Pembrokeshire (Else and Edwards, 2018). It is identified as a threatened species in Wales (Olds <i>et al.</i> , 2018).
<i>Sphecodes reticulatus</i> Hymenoptera, Halictidae	[Nationally Scarce (Nb)]	Northern	This blood-bee (so called, because of its partially red abdomen) is more-or-less restricted to south-east England where it is associated with sandy sites in open woodland or grassland: the extensive dry grasslands and scrub mosaics likely providing suitable habitat for the species in the study site. There are only three Welsh locations; one being in VC 41 near Merthyr Tydfil (Else and Edwards, 2018); and consequently, it is identified as a threatened species in Wales (Olds <i>et al.</i> , 2018). It is a cuckoo of a few mining bees though its host range is poorly understood. A female was recorded in May 2020 at the western end of the study site.
<i>Erynnis tages</i> (Dingy skipper)	Vulnerable; SoPI	Northern Southern	A declining butterfly which is generally associated with brownfield sites, colliery spoil heaps and similar places where habitats supporting short swards

Species	Status	Sector Recorded	Ecology
Lepidoptera, Hesperidae			where its food plant, bird's-foot trefoil (<i>Lotus</i> spp.) occurs. Several individuals were recorded in late May 2020 at various locations within the OMH.
<i>Coenonympha pamphilus</i> (small heath) Lepidoptera, Nymphalidae	Near Threatened; SoPI	Northern Southern	Although a widespread species in the UK, this otherwise common species has experienced a substantial decline in both abundance and occurrence (Fox <i>et al.</i> , 2015), hence its classification as Near Threatened.
<i>Hipparchia semele</i> (Grayling [butterfly]) Lepidoptera, Nymphalidae	Vulnerable, SoPI	Northern Southern	A butterfly of patchy grasslands, which has suffered a substantial decline in Britain such that it is now more or less restricted to coastal habitats such as sand dunes and grasslands; or in Wales, colliery spoil heaps. Individuals were observed in late June and mid-July across the dunes.

4.3 Baseline Invertebrate Assemblage Analysis

The following section describes the invertebrate assemblages recorded within the Northern and Southern Sectors make up the study site. The species list for each of these has been analysed using Pantheon to identify the habitat associations and dependencies of the terrestrial invertebrate assemblage associated with each land parcel. The analysis first considers stenotopic species i.e. those terrestrial invertebrates with very specific and

Photograph 1: Examples of OMH within the former Llandarcy Oil Refinery (May 2020). **Top row:** Northern sector – variably vegetated spoil mounds with rich flower resource, bare ground and impeded drainage creating ephemeral pools. **Bottom left:** Southern sector – bare ground and scattered gorse ('scrub-heath') vegetation. **Bottom right:** west-facing slope with scrub edge habitat (background) and patchy short vegetation.



¹⁴restricted habitat requirements. They are considered to have an intrinsic nature conservation value as stenotopic species are generally only recorded on sites that are of nature conservation value. The analysis then considers the habitat affinities of the wider assemblage.

4.3.1 Northern Sector

The sector analysed here comprises all habitats north of an imaginary line that extends from Tank Farm Road within the curtilage of the former Llandarcy Oil Refinery (see Appendix A). A total of 380 species were recorded in this compartment of which 359 have been ¹⁵analysed by Pantheon. A total of 57 stenotopic species were recorded, representing 15 % of the invertebrate fauna identified from the compartment (see Table 10; Appendix C). Most (53 stenotopic species) are associated with the open habitat biotopes (SAT codes prefixed with an 'F' in Table 10) which are interpreted as representing the OMH that is prevalent throughout this sector. The OMH occurs across a range of topographies from spoil mounds though to predominantly level ground but on variable aspects such as south or west facing slopes, which collectively interplay with scattered scrub, taller, flower-rich grasslands and more established treed habitat such as where it adjoins the western boundary of Jersey Marine Woods SINC (see Section 1.2.1).

The surveys in 2020 recorded 23 stenotopic species that are indicative of the rich flower resource available within the OMH including the Nationally Scarce *Andrena congruens* which form nesting aggregations on sloping, sparsely vegetated ground such as is present on the numerous spoil heaps and more natural landforms within the study site. This is a rare species in Wales, which has only been recorded recently and known only from the Swansea area and eastern Pembrokeshire coast (Else and Edwards, 2018; p. 546).

The above habitats also support faunas that express a fidelity to calcareous grasslands, their presence having the potential to amplify the value of a habitat present within a study site as calcareous, or base-rich grasslands, are one of the most species-rich grassland types in Britain (Alexander, 2003; page 11) and so assemblages that support species with a moderate or high degree of fidelity to this habitat are potentially of nature conservation value.

Photograph 2: *Andrena congruens* (female) captured on former Llandarcy Oil Refinery. 22.vii.2020



Six species (see Table 7) have a moderate to high ¹⁶fidelity to calcareous grasslands, of which the brown-banded carder bee (*Bombus humilis*) is most significant as it is a SoPI. In Britain, the species is largely confined to coastal flower-rich grasslands where there is an abundant pollinator resource and suitable nesting habitat in an open vegetation structure where ground temperatures can warm up (Else and Edwards, 2018; p. 368).

¹⁴ Referred to as Specific Assemblage Types (SAT) in Pantheon (Webb *et al.* 2018).

¹⁵ Pantheon analyses species, attaching associated habitats and resources, assemblage types (adapted from the Invertebrate Species-habitat Information System), conservation status, habitat fidelity scores and other information against them.

¹⁶ **High:** species routinely recorded from calcareous grasslands. They may also be recorded to a greater or lesser degree from other open habitats on freely draining soils, but it is likely that they are mainly dependent on calcareous grasslands to sustain viable populations.

Moderate: species routinely recorded from calcareous grasslands, but also from semi-natural open habitats on freely-draining soils over all or part of their geographical area of distribution.

Table 7: Invertebrates scoring moderate or low fidelity to calcareous grassland recorded.

Order	Family	Species	Conservation Status	Habitat score
Hemiptera	Cicadellidae	<i>Aphrodes bicincta</i>		High
Lepidoptera	Sesiidae	<i>Bembecia ichneumoniformis</i>		High
Araneae	Gnaphosidae	<i>Drassyllus pusillus</i>		Moderate
Hemiptera	Lygaeidae	<i>Scolopostethus puberulus</i>		Moderate
Hymenoptera	Apidae	<i>Bombus humilis</i>	SoPI	Moderate
Hymenoptera	Halictidae	<i>Lasioglossum morio</i>		Moderate

A substantial number of Key Species have been recorded within the northern sector including the Vulnerable and Nationally Rare spider *Zodarion fuscum* and five Nationally Scarce spiders: *Argenna subnigra*, *Cheiracanthium virescens*, *Marpissa nivoyi* and *Synageles venator*; in addition to two Near Threatened (small heath and wall) and one Vulnerable butterfly (grayling) are associated with the short swards and bare ground; the butterflies also being SoPI.

Photograph 3: Tall dry grassland swards with abundant pollinator resource. **Left:** Ox-eye daisy (*Leucanthemum vulgare*) in May 2020. **Right:** Wild carrot (*Daucus carota*) in July 2020. Tall open swards supported an abundant pollinator resource reflected in the 23 stenotopic species associated with this cross-cutting SAT (see main text for more details).



A common theme that the invertebrate assemblage analysis has identified is the number of taxa, including stenotopic and Key Species, that are associated with coastal grasslands and dune systems. The proximity of Crymlyn Burrows SSSI, which is between 2.2 km and 3.6 km south of the northern sector, and the similar physical characteristics of the vegetation communities and habitats, i.e. tall dry grasslands, flower-rich swards, open vegetation on a varied topography, has potentially enabled an invertebrate assemblage to develop within the OMH that share a similar composition. In contrast, there are few species recorded in the northern sector that are associated with valley fen and mire, potentially reflecting the lack of substantial or permanent wetland habitats (excluding the large reservoir) here. Thus, other than highly mobile taxa, such as dragonflies, there would not appear to be as strong an ecological connection with the adjacent Crymlyn Bog SSSI, even though it shares a boundary with the former Oil Refinery, in contrast to the PDCC report referred to in Section 1.1.1.

4.4 Southern Sector

The sector described here is south of the imaginary line leading from Tank Farm Road and is outwith the footprint of the proposed phase of the development (Appendix A). A total of 357 species were recorded in this sector of which 330 have been analysed by Pantheon.

A total of 50 stenotopic species were recorded, representing 14 % of the invertebrate fauna identified from the compartment (see Table 11; Appendix C). A similar assemblage is associated with the open habitat biotopes (SAT codes prefixed with an 'F' in Table 11), which as for the northern sector, are interpreted as representing the OMH that is also prevalent throughout.

Photograph 4: **Top left:** *Synageles venator*, an ant-mimicking Nationally Scarce jumping spider collected from OMH at the former Llandarcy Oil Refinery. **Bottom left:** Example of habitat where *S. venator* was collected (Cefn Parc, Northern Sector). **Top right:** *Zodarion fuscum*, a Vulnerable and Nationally Rare specialist ant predator. **Bottom right:** Location where *Z. fuscum* was collected on west-facing slope.



The distribution and nature of the OMH within the southern sector are broadly comparable with the northern section of the study site; the boundary between the two being defined by planning requirements and not ecology. There are some more permanent wetland habitats within the southern sector, for example the recently constructed waterbody within the Coed Darcy Great Crested Newt Area SINC, but also smaller drainage channels and ephemeral waterbodies. Three stenotopic species recorded solely within the southern sector are associated with wetland habitats, though the long-legged fly *Tachytrechus insignis* (Diptera, Dolichopodidae) is associated with saltmarsh and transitional brackish marsh so is likely a wanderer from the coast. The spider-hunting wasp *Anoplius concinnus* (Hymenoptera, Pompilidae) is associated with damp, gravelly sand and potentially occurs as a resident in such habitats as drainage channels and on the edge of ephemeral waterbodies where they may well predate wolf-spiders such as *Piratula latitans* which was recorded on the site.

All four SoPI previously mentioned were recorded, or are highly likely to be present, within the southern sector, and a further five Nationally Scarce taxa, including the wolf-spider *Xerolycosa miniate*, the weevil *Sitona waterhousei*, which was previously reported within the study site (see Section 4.1) and the western bee-fly (*Bombylius canescens*) (Diptera, Bombyliidae). The latter is a species restricted to south Wales and south-west England where it occurs on south-facing hillsides on limestone, open woodland (especially in Wales) and riparian grasslands where they occur on shingle or sandy alluvium (Stubbs and Drake, 2014).

Photograph 5: The Nationally Scarce western bee-fly (*Bombylius canescens*) was recorded from OMH at the southern end of the study site but is likely to be present throughout. It is a parasite of various solitary bees in the genera *Lasioglossum* and *Halictus*.



5 Nature Conservation Evaluation

As stated in Section 3.3, there is no standard frame of reference to evaluate a study site's invertebrate assemblages' nature conservation value. Instead, reliance is placed on various sources, including proportion of Key Species recorded, and analysis using Pantheon (Webb *et al.*, 2018). Added to this is recent guidance which considers how Key Species can best be represented in protected sites (SSSIs) (Curson *et al.*, 2019). Whilst the presence of Key Species in themselves is not a sole indication of national value, it is considered a useful guide as to where a particular site may sit in a geographical hierarchy.

For the purposes of evaluation, the entire study site has been considered as a single unit as the separation in to two separate compartments is solely based on the phased development proposals and not on ecological principles. Further, the baseline analysis has not identified any substantial ecological differences in invertebrate assemblages across the study site.

Curson *et al.* (2019) suggests that sites can be valued based on:

- individual species that are considered to be threatened species (IUCN and British rarity, see this report's Appendix B for details), species of country conservation priority (i.e. SoPI), species with restricted or disjunct ranges, and edge of range species; and
- assemblages of specialised habitats and habitat-based assemblages such as OMH faunas, and habitat heterogeneity/ mosaics.

In addition to the above, it remains relevant to assess the invertebrate assemblage recorded against non-statutory site guidelines, if applicable. The administrative region's guidelines includes reference to terrestrial invertebrates (Wales Biodiversity Partnership, 2008) and the criteria are referred to in Section 5.3.

This approach forms the basis for the following evaluation and in doing so, takes into consideration the criteria referred to above and more general points such as the relative value of how terrestrial invertebrate assemblages relate to both the importance and uniqueness of the habitats present, and the characteristics of the assemblage itself. The assessment first considers the presence of individual species recorded, also taking in to account the likelihood of continued presence of historically recorded taxa where relevant, followed by the assemblages recorded (i.e. not just the rarer taxa).

Following assessment of this, as explained in more detail below, the former Llandarcy Oil Refinery is considered to support an assemblage of terrestrial invertebrates of **regional nature conservation value**.

5.1 Individual Species

Out of a total species list of 505, 30 Key Species and three Rare Key Species (based on Telfer, 2017) were recorded, representing 5.9 % and 0.6 % of the assemblage respectively. Both these proportions are substantially below the proposed threshold for national importance (Key Species (10 %) and Rare Key Species (1 %)).

Applying Curson *et al.* (2019) three species are classified as Vulnerable (IUCN criteria): the Nationally Rare spider *Zodarion fuscum*, and two butterflies, dingy skipper and grayling (which are also SoPI). A butterfly (the Near Threatened small heath) and brown-banded carder bee are also SoPI (see Table 6 for details). Other taxa, including *Andrena congruens*, western bee-fly and the spiders *Argenna subnigra* and *Synageles venator* are rare in Wales, or their core range is restricted to south Wales. *Z. fuscum* is known from Wales from one other location where it was recorded from coastal shingle (Porthkerry Country Park, some 47 km south-east of the study site but within VC 41); *S. venator* has been recorded at Crymlyn Burrows SSSI immediately to the south of the study site; and *A. nigra* was collected from Kenfig Burrows SSSI, about 17 km to the south south-east. The SSSIs immediately adjacent to the study site (Crymlyn Bog SSSI, Crymlyn Burrows SSSI and Pant-y-Sais SSSI) are known to support important invertebrates, as are those further afield including Kenfig SSSI. The assemblages recorded within the study site, based on the SATs and individual taxa's ecologies, suggest that the OMH is providing an equivalent and supplementary resource that is present elsewhere within the coastal plain as characterised by Swansea Bay NLCA.

5.2 Habitat Assemblages

The relative value of the terrestrial invertebrate assemblages relates to both the importance and uniqueness of the habitats present, and the characteristics of the assemblage itself.

5.2.1 Landscape context

The Swansea Bay NLCA does not include information on the distribution and extent of OMH within the vicinity of the study site, so reference to Lush *et al.* (2016) and Gwent Wildlife Trust (2010) has been used instead to provide some context. Lush *et al.* (2016) identified that the distribution of OMH within Wales was patchy but concentrated in the south Wales coalfields and identified just over 6,600 ha throughout the Principality. An estimated 950 ha was identified as being highly likely or high/ medium likelihood of meeting the definition of OMH within Gwent (Gwent Wildlife Trust, 2010). It is estimated that there are approximately 115 ha of OMH within the study site, which represents an additional 1.7 % of Wales' resource and 12.1 % of south Wales' resource (taking Gwent as a proxy). Given that there is likely to be additional, but smaller habitat patches, within the Neath Port Talbot and Swansea conurbation, an approximate 10 % additional resource is considered a not unreasonable estimate.

It has also been noted that the OMH supports several taxa that are known from coastal sand dune systems.¹⁷ Within the Swansea Bay NLCA, there are 1,617.4 ha of sand dunes including those at Kenfig and Crymlyn Burrows SSSIs, but also substantial areas within the Merthyr Mawr and Pembrey Coast SSSIs. From an invertebrate assemblage perspective, the OMH resource represents up to 7.1 % of additional similar habitat in terms of its edaphic features such as free-draining substrates, exposed friable material equivalent to soft-cliffs and ephemeral damp soils analogous to dune slacks. Whilst the processes and vegetation communities within the sand dune systems differ from the OMH within the former Oil Refinery, there would appear to be some overlap with species composition.

Therefore, the additional 115 ha, supporting 30 Key Species including four SoPI and three Vulnerable taxa, one of which (*Zodarium fuscum*) is only known from coastal dunes in Wales (and the only known semi-natural habitat in Britain) represents a substantial contribution to the total resource of OMH within the NCLA and more widely in south Wales; and as a proxy coastal sand dune system.

5.2.2 Stenotopic Species

The relative value of the notable habitats present for terrestrial invertebrate species can be interrogated in more detail regarding the stenotopic species recorded by the survey. As explained in Section 3.3, stenotopic species are dependent on quite specific and restricted habitat conditions that are rarely encountered in the wider landscape. Therefore, stenotopic species are considered to have an intrinsic nature conservation value and generally only occur in association with sites of relatively high nature conservation importance.

Pantheon has been used to investigate this further by interrogating the composition of the terrestrial invertebrate assemblage in terms of biotopes, habitats, and the distribution of stenotopic species recorded. In doing so, the limitations of Pantheon as a tool have been considered, and professional judgement has been applied where necessary to assist robust valuation.

Table 8: Invertebrate assemblage assessment for the former Llandarcy Oil Refinery.

Broad biotope	Habitat	SAT	No. of species	FC Threshold	Proportion to Threshold	Species with conservation status
Open habitats	Cross-cutting	F001: Scrub edge	17	11	155 %	
Open habitats	Cross-cutting	F002: Rich flower resource	23	15	153 %	1
Open habitats	Cross-cutting	F003: Scrub-heath & moorland	10	9	111 %	
Open habitats	Short sward & bare ground	F112: Open short sward	12	13	92 %	4

¹⁷ Taken from the Welsh Sand Dune metadata available via the Multi-Agency Geographic Information for the Countryside (MAGIC) website, available here: https://magic.defra.gov.uk/Metadata_for_MAGIC/magsanddune_wal.html; last accessed on 19th February 2021.

Broad biotope	Habitat	SAT	No. of species	FC Threshold	Proportion to Threshold	Species with conservation status
Open habitats	Short sward & bare ground	F111: Bare sand & chalk	12	19	63 %	6
Tree-associated	Decaying wood	A212: Bark & sapwood decay	8	19	42 %	
Wetland	Running water	W122: Riparian sand	1	5	20 %	
Tree-associated	Decaying wood	A211: Heartwood decay	1	6	17 %	
Coastal	Saltmarsh	M311: Saltmarsh & transitional brackish marsh	1	9	11 %	
Wetland	Running water	W111: Shingle banks	1	9	11 %	
Wetland	Peatland	W314: Reed-fen & pools	1	11	9 %	

Following review of the number of stenotopic species recorded and the thresholds published in Drake *et al.* (2007), as conveyed in Table 8, three cross-cutting SATs: scrub edge (F001), rich flower resource (F002) and scrub-heath and moorland (in this instance gorse scrub) (F003) have exceeded the threshold considered to represent Favourable Conservation Status; and two short sward and bare ground SATs (open short sward (F112) and bare sand and chalk (F111) achieve very high, or moderately high PtT scores. Whilst cross-cutting SATs have a poor discriminatory value in nature conservation terms (i.e. exceeding the threshold is not sufficient on its own to conclude national significance) (Webb *et al.*, 2018), that three do, in combination with two short sward and bare ground SATs scoring very high to moderately high PtT scores suggest that the invertebrate assemblages associated with the OMH are likely to compare positively with those present on the coastal dune dominated SSSIs present in the ecological landscape. This is consistent with the narrative conveyed in Section 5.2.1.

It should be recalled that survey work missed the spring season (i.e. April through to early May) and in combination with the very dry spring (see Section 1.3.3) was generally observed to have had a negative effect on insect activity, particularly pollinators, as the ground vegetation suffered from desiccation. This may have reduced activity and possibly resulted in increased species mortality at the pre-adult stage (larvae or pupae), or more rapid adult mortality, resulting in lower species-richness than otherwise may have been the case. Had surveys been undertaken, they may have resulted in additional stenotopic species being recorded within the two short sward and bare ground SATs (F112 and F111) reached or exceeded Favourable Conservation Status. Professional judgement has been applied and it is considered that the F112 Favourable Conservation Status threshold would almost certainly have been reached and likely exceeded; and the F112 would certainly have scored a higher PtT score; potentially reaching the threshold; and this has influenced the conclusion on the study site's nature conservation value for invertebrates.

5.3 Taxonomic Assemblages

In addition to the guidelines for statutory site designation (refer back to Section 5.1), there are published guidelines for non-statutory site designation (SINCs) in Wales (refer back to Section 3.3.3.2). The guidelines provide a coherent means by which the compartment can be assessed against. Applying the five general criteria, the study site would meet the guidelines for SINC designation based on four general criteria on the basis that:

- there are four SoPI taxa (brown-banded carder bee; and dingy skipper, small heath and grayling butterflies) in addition to the Nationally Rare (and Vulnerable) spider *Zodarion fuscum*; and
- there are 25 additional taxa that are formally assigned Nationally Scarce status, of which 20 species are considered to be genuinely so; and
- several of which (and including three of the above SoPI) are rare in Wales; and
- the presence of genuinely rare species in the vice-county (see above).

The former Llandarcy Oil Refinery also qualifies as a SINC on the presence of three butterfly species that are SoPI. It should also be noted that 21 species of butterfly were recorded, which represents half of all taxa present in Wales; and approximately two-thirds known from south Wales (¹⁸based on the species list for the adjacent Monmouth vice-county).

Finally, the site would also potentially qualify under the criterion for Odonata species-richness. Nine species were recorded as adults and certainly several will breed in the newly created waterbodies. If the criterion's definition of 'supported' extends to foraging habitat, as opposed to confirmed breeding, then it would qualify on this basis alone.

5.4 Conclusion

The invertebrate assemblage recorded within the former Oil Refinery in 2020 includes 30 Key Species, of which three are Rare Key Species; and four are SoPI. The entire site supports 76 stenotopic species, of which the northern sector supports 23; and the southern 50. The OMH supports an assemblage of invertebrates that are characteristic of dry, flower-rich grasslands on highly heterogeneous topography of which coastal sand dune systems are interpreted as the natural equivalent. The study site is located within an ecological coastal landscape where there are several high quality protected sites such as at Crymlyn Burrows and Kenfig SSSIs which are known to support important populations of individual species, some of which such as the ant-mimicking spider *Synageles venator*, are present within the OMH on the former Oil Refinery site.

The estimated 115 ha of OMH represents a substantial element of the OMH resource within south Wales, adding an additional 10 %; which given its similarity and functional connection, supporting Key Species associated with coastal sand dune and grassland systems, also represents an additional 7 % of this resource for invertebrate assemblages and taxa that are dependent on the edaphic characteristics of these habitats.

Data analysis has identified three cross-cutting SATs that are in Favourable Conservation Status, and two short sward and bare ground SATs that are close to being in a similar condition, and that if further survey work, or more amenable environmental conditions persisted in spring, are judged to likely be so.

Four out of the five general criteria for SINC status have been easily met for the entire invertebrate assemblage; and the site also meets the threshold for its butterfly and Odonata assemblages alone (Welsh Biodiversity Partnership, 2008).

In conclusion, the OMH, which dominates the study site, represents a substantial resource and contribution to invertebrate nature conservation within the vice-county and the NLCA. The assemblages present, and particularly for some taxa such as *Andrena congruens* and *Zodarion fuscum*, the study site is important in a Welsh context, though there are other locations such as the coastal dune SSSIs which support similar habitats and where these taxa may be present. For all the reasons summarised above, it is justifiable to conclude that the habitats within the former Llandarcy Oil Refinery are of **regional nature conservation value** for their invertebrate assemblages.

¹⁸ See <https://butterfly-conservation.org/sites/default/files/butterflies-of-montgomeryshire-2017.pdf>; last accessed on the 19th February 2021.

6 Recommendations and Mitigation Principles

6.1 Recommendations

Nine survey visits were completed between mid-May and mid-September 2020 and material collected by various methods was obtained from representative broad biotopes and habitats within the study site. The site has been evaluated as a single entity, but for the purposes of describing the habitats and invertebrate assemblages, the former Oil Refinery has been divided in to two sectors reflecting the proposed phasing of the future development. The evaluation has concluded that the invertebrate assemblages are of regional nature conservation value.

Consideration has been given to whether further survey effort is proportionate and justifiable to inform the future planning application in the northern and southern sectors. Survey work applying general methods (aerial netting, sweeping the field layer, vacuum sampling ground vegetation and direct observation) has resulted in a total of 505 species (30 Key Species) which is a diverse assemblage. This has been supplemented by some limited targeted static trapping (pitfall traps). This effort has been sufficient for the purposes of evaluating the nature conservation value of the broad biotopes and habitats within the study site **and** on the understanding that the two SINCs (Jersey Marine Woods and Coed Darcy Great Crested Newt Area) and boundary hedgerow/ scrub adjacent to the Crymlyn Bog SSSI remain intact and their ecological integrity is maintained, including but not limited to no direct habitat loss, no further invertebrate survey is justified.

However, given the dynamic processes that occur on brownfield sites, and are occurring at the study site, including colonisation and maturation of vegetation communities and/ or anthropogenic activities such as remediation and disturbance, it *may* become appropriate for further survey if a submission for the northern sector is delayed for a period of approximately two years. In this instance, it is recommended in the first instance that a site walkover by an experienced entomologist (ideally, the same individual who undertook the 2020 survey) to visually appraise habitats and consider whether sufficient substantial changes have occurred that might justify further, more detailed surveys.

Likewise, the southern sector (at the time of writing in late February 2021) is not being taken forward for development. It remains unclear as to the end use for this development and for the same reasons as the paragraph above, if new proposals are brought forward, follow-up survey work is likely to be justified.

It is assumed that regardless of timescales, the SINCs will remain intact (or managed for nature conservation – see Section 6.2). However, if these habitats are to be directly affected, through habitat loss or alteration for the purposes of development footprints; or through meaningful indirect effects such as changes to nocturnal lux levels through inappropriate external lighting, then further survey work *is likely to be* justified within these land parcels. The loss of the woodland SINC, either in whole, or in part will result in a not insubstantial loss of an important and specific ¹⁹dead wood resource, that cannot be straightforwardly replaced. Log piles or other artificial dead wood provision will not necessarily recreate the specific conditions for the relevant fungi to develop; and it is this process, which breaks down the woody material, which provides the specialist habitat that saproxylic invertebrates, and particularly those taxa which are Key Species, or stenotopic species, require.

Therefore, whilst survey effort has been sufficient to understand the nature conservation value for the purposes of the currently understood proposed development footprint, it is recommended that if this changes and has the potential to encroach in to safeguarded areas such as the SINCs, and has the potential to negatively affect ecological integrity, the requirement for further survey should be reviewed to ensure that appropriate mitigation is delivered and compliance with Welsh legislation and policy is met.

¹⁹ Based on a visual appraisal only.

6.2 Mitigation Principles

The following mitigation principles are provided for the purposes of informing the iterative design and assumes no further survey work is required (see above).

The survey work has identified that the extensive OMH within the former Oil Refinery is a substantial resource within the NLCA and shares similar features such as bare ground, rich flower resource, topographic and vegetation structural diversity to the nearby coastal dune systems, several of which are statutory protected sites. The disturbed vegetation communities within the northern sector will inevitably be lost to the development; and the southern sector are vulnerable to future development aspirations in the absence of formal protection or agreement with the landowner. However, and importantly, these disturbed vegetation communities are also temporary in nature and a 'do nothing' approach would likely result in their eventual loss to less diverse habitats such as tall, species-poor grasslands and/ or scrub. Thus, there is a development-led opportunity to recreate and retain these habitats within the intended greenspace provision and advantageously, where places such as Crymlyn Burrows SSSI share similar assemblages, increase their resilience within the wider ecological landscape.

There is potential for the qualities associated with the OMH such as the rich flower resource, mosaics of bare ground and varied topography, including exposures of soft friable substrates to be retained and/ or recreated in the boundary and greenspace provision within the northern sector's proposed development, thus maintaining connectivity with the southern sector and Crymlyn Burrows SSSI. This would concurrently provide an opportunity for the creation of a biodiverse corridor for pollinators that supports national pollinator policy (Welsh Government, 2018b) and wider biodiversity obligations as well as the potential to meet or possibly exceed Biodiversity Net Gain targets which will become a legal obligation through planning law, with the added potential benefit of reduced soft estate management. Details will be provided in a separate landscape and ecological management plan (or similar document) but it is sufficient to state here that there will be a requirement to reflect existing conditions with a varied topography, bare ground and a dominant rich flower resource. By reducing the grass cover, this will likely reduce mowing rates and volume of arisings (cut material) from being disposed.

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A. **Appendix A: Former Llandarcy Oil Refinery Sectors**

