

Appendix 7E

Amphibian Survey Report

Welsh Government

**Global Centre for Rail Excellence
(GCRE)**

Amphibian Survey Report

Rev A | 18 June 2020

This report takes into account the particular instructions and requirements of our client.

It is not intended for and should not be relied upon by any third party and no responsibility is undertaken to any third party.




Job number 264904

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Contents

	Page	
1	Introduction	1
1.1	Background	1
1.2	Objectives	1
2	Project Description and Context	2
3	Site Description	3
4	Study Area	4
5	Legislation	5
6	Methodology	6
6.1	Desk Study	6
6.2	Field Surveys	6
6.3	Limitations	7
7	Results	9
7.1	Desk Study	9
7.2	Field Surveys	9
8	Conclusions	11

Figures

Figure 1 Study Area

Figure 2 Waterbody locations and field survey results

Figure 3 Amphibian species recorded during 2019 reptile surveys

Appendices

Appendix A

HSI Assessment Results

Appendix B

NatureMetrics eDNA Results

Appendix C

Incidental Amphibian Records

1 Introduction

1.1 Background

Ove Arup & Partners Ltd (Arup) was commissioned by the Welsh Government (WG) to undertake a range of consultancy services in relation to the Global Centre for Rail Excellence (GCRE), hereafter referred to as ‘the Project’.

As part of that commission, a range of ecological surveys have been undertaken to identify the baseline ecological conditions of the Project area, to inform the assessment of impacts as part of the Environmental Impact Assessment (EIA) process.

This document describes the amphibian surveys undertaken for the Project.

1.2 Objectives

The objectives of the amphibian survey were to ascertain the following:

- Presence/likely absence of great crested newts *Triturus cristatus* within the site;
- Population size-class of great crested newts, if present;
- Distribution of great crested newts, if present; and
- An appreciation of other notable¹ amphibian species that may be present.

¹ ‘Notable’ species and habitats considered in this report include species and habitats of principal importance for the purpose of maintaining and enhancing biodiversity in relation to Wales, in response to section 7 of the Environment (Wales) Act 2016, in addition to any species considered to be of significance for nature conservation such species listed in red data books, the Royal Society for the Protection of Birds (RSPB) ‘Birds of Conservation Concern’ lists and or Local Biodiversity Action Plans (LBAPs).

2 Project Description and Context

The WG are proposing to develop a rail testing, maintenance, research, development and storage facility (also referred to as the Global Rail Centre for Excellence) at the site of the Onllwyn washery and Nant Helen open cast mine site. The site for development is approximately 475 ha.

The proposed site is currently being mined by Celtic Energy, who will cease extraction operations in 2021, at which point Celtic Energy will be required to restore the land in accordance with regulatory requirements and agreements with Powys County Council (PCC) and Neath Port Talbot County Borough Council (NPTCBC). This includes Section 106 planning obligations and planning conditions that need to be discharged.

Celtic Energy has submitted two recent planning applications for the site, including: the revised restoration strategy for approval (Planning reference number: 19/1899/REM) which would change the existing approved restoration scheme (for planning application ref 18/1070/REM). And, the Nant Helen complementary earthworks application for approval (Planning reference number: 20/0738/FUL) The purpose of these applications is to allow for a 'flexible and adaptable landform for a variety of future uses on restoration, including the use of the site as a rail testing and storage facility, proposed by the WG.

3 Site Description

The study area is shown on Figure 1 and is hereafter referred to as the 'site'.

The site is within the Dulais Valley located within Powys and Neath Port Talbot, with the Brecon Beacons National Park Authority boundary immediately to the north. Nearby settlements include Onllwyn, Seven Sisters, Ystradgynlais, Caehopkin, Abercrave or Coelbren.

The site is predominantly brownfield land that has been heavily worked by open cast mining. Much of the site has been revegetated.

4 Study Area

The study area encompasses the majority of land within the Nant Helen open cast operational site, which at the time of commencing the ecological surveys was considered to be the likely boundary of the project site.

For the present survey, which is detailed in this report, guidance² recommends assessing all waterbodies within 500 m of such a project, except where great crested newts are highly unlikely to be present or where the proposed development is unlikely to affect great crested newts.

The study area excludes waterbodies on the other side of such physical barriers (i.e. roads).

² English Nature (2001) *Great crested newt survey guidelines*.

5 Legislation

Great crested newt is a European Protected Species (EPS) under the Conservation of Habitats and Species Regulations 2017 (as amended) (known as the Habitats Regulations). The Habitats Regulations protects EPS against the following:

- Deliberate capturing, injuring or killing of any wild EPS;
- Deliberate disturbance of any wild EPS;
- Deliberate removal or destruction of the eggs of any EPS; and
- The damage or destruction of a breeding site or resting place of any EPS.

Great crested newt is also fully protected under Schedule 5 of the Wildlife and Countryside Act 1981 (as amended) (WCA) along with natterjack toad *Bufo calamita*. Natterjack toad is almost exclusively confined to coastal sand dune systems, coastal grazing marshes and sandy heaths, however, and are therefore unlikely to be found within the study area. The WCA protects great crested newt and natterjack toad against intentional killing, injuring or taking, possession and trade, and disturbance through prohibition of actions that could affect places they use for shelter.

Palmate newt *Lissotriton helveticus*, smooth newt *Triturus vulgaris*, common toad *Bufo bufo* and common frog *Rana temporaria* are only partially protected under the WCA. This protection prohibits the trading of these three species.

Great crested newt, natterjack toad and common toad are listed as priority species of principal importance for the conservation of biodiversity in response to Section 7 of the Environment Act (Wales) 2016. This legislation places the duties on public bodies in Wales to conserve and enhance biodiversity in the exercise of their functions, including the consideration of the resilience of ecosystems in terms of their diversity, connectivity, adaptability, scale and condition.

Lastly, great crested newt, common toad and natterjack toad are all listed as UK Biodiversity Action Plan Priority Species. Action Plans exist for each UK BAP Priority Species to demonstrate the UK's commitment to help reduce or halt the significant losses in global biodiversity.

Actions which are prohibited by legislation can be made lawful on the approval and granting of a licence from Natural Resources Wales (NRW), subject to conditions.

6 Methodology

6.1 Desk Study

A data search was obtained from the Biodiversity Information Service (BIS³) for Powys & Brecon Beacons National Park on 21st November 2018. The data search included all historic records of protected and/or notable¹ species from the last 10 years within a 5 km radius of the site (Figure 1). This included protected and/or notable amphibian species, which are summarised in Table 2 in the Desk Study Results section below.

The relevant reports produced for the previous Environmental Statement (ES)⁴ for the Project were also reviewed for records of protected and/or notable amphibian species.

All waterbodies within the study area (Figure 2) were identified through a desk study using publicly available Ordnance Survey mapping and aerial imagery, and the previous ES.

6.2 Field Surveys

6.2.1 Habitat Suitability Index Assessment

All waterbodies within the study area (Figure 2) were assessed for their suitability to support great crested newt using the standard Habitat Suitability Index (HSI)^{5:6} methodology. HSI assessments were carried out on the 15th, 16th and 24th April 2019.

The methodology has been designed to evaluate habitat quality in order to assess which waterbodies provide suitability habitat for great crested newts as breeding ponds. The HSI is a numerical index, which ranges from 0 to 1. It is calculated using ten key habitat criteria and is based on the assumption that habitat quality determines great crested newt presence/absence. Using this standard approach, ponds with higher scores are considered more likely to support great crested newts compared to those with lower scores (see Table 1 below).

Table 1: Predicted presence of great crested newts based upon HSI results

HSI	Pond Suitability	Predicted Occupancy
<0.5	Poor	0.03
0.5-0.59	Below average	0.20

³ Aderyn is a Local Environmental Records Centres (LERC) Wales system, developed and maintained by the Biodiversity Information Service (BIS).

⁴ Celtic Energy Ltd (2011). *Environmental Statement*.

⁵ Amphibian and Reptile Groups of the United Kingdom, *ARG UK Advice Note 5, Great Crested Newt Habitat Suitability Index*, May 2010.

⁶ Oldham R.S., Keeble J., Swan M.J.S. & Jeffcote M.(2000). *Evaluating the suitability of habitat for the Great Crested Newt (Triturus cristatus)*. Herpetological Journal 10 (4), 143-155.

HSI	Pond Suitability	Predicted Occupancy
0.6-0.69	Average	0.55
0.7-0.79	Good	0.79
>0.8	Excellent	0.93

Great crested newt were considered likely to be absent from ponds assessed as ‘poor’, whilst ponds assessed as ‘below average’ or above required further survey to determine presence or likely absence. This further survey was in the form of Environmental DNA (eDNA) sampling, which is described in the following section.

6.2.2 Environmental DNA Survey

eDNA tests were carried out on the ten waterbodies (shown on Figure 2) that were assessed as ‘below average’ or above during the HSI assessment, in line with best practice as detailed above in section 6.2.1.

In accordance with best practice guidelines⁷ surveys were undertaken within the optimum timeframes (sampling was undertaken on the 15th, 16th and 24th April 2019) and followed the recommended methodology. Collected samples were sent to NatureMetrics⁸ for analysis.

6.2.3 Surveyors

Field surveys were carried out by pairs of ecologists, all experienced in undertaking HSI Assessments and eDNA surveys across a range of projects: Catherine Jones MCIEEM with Rosemary Cripps MCIWEM C.WEM CEnv, and Martyn Owen MCIEEM with Stuart Thomas MCIEEM.

Catherine and Martyn both hold Natural England Great Crested Newt Class Licences (Licence Registration Numbers 2018-33182-CLS-CLS and 2016-19752-CLS-CLS, respectively). Stuart holds an NRW Class Licence (Licence Registration Number 78910:OTH:SA:2018). Rosemary Cripps is an accredited agent on NRW Licence Number S086134/1.

6.3 Limitations

There are a small number of areas that lie within a 500 m buffer around the site, but fall outside of the study area, which were therefore not accessible at the time of the surveys. These areas were checked using publicly available ordnance survey mapping and aerial imagery, and during walkovers (looking onto adjacent land). This confirmed the likely absence of further waterbodies, which may have required assessment in terms of great crested newts. One area to the south was also separated from the site by the River Dulais, which is considered to be a physical barrier to movement by great crested newt.

⁷ <https://naturalresources.wales/media/3509/guidance-on-use-of-dna-sampling-of-great-crested-newts.pdf>

⁸ NatureMetrics Ltd. <https://www.naturemetrics.co.uk/>

The findings presented in this study represent those at the time of survey and reporting, and data collected from available sources. Ecological surveys are limited by factors which affect the presence of flora and fauna, factors such as the time of year and natural behaviour of the animals. Nevertheless, these surveys were conducted at the optimal survey periods and using methodologies which are in accordance with published guidelines.

7 Results

7.1 Desk Study

The BIS provided 12 records of common toad, 32 records of common frog, and five records of palmate newt within 5 km of the site from the last 10 years. These records are summarised in Table 2. No records of great crested newt were returned by BIS.

Table 2: Summary of historic amphibian records within 5 km of the site

Species	Latin name	Status	Number of records	Approximate distance of closest record
Common toad	<i>Bufo bufo</i>	WCA (sale only)	12	0.2 km
Common frog	<i>Rana temporaria</i>	WCA (sale only)	32	0.7 km
Palmate newt	<i>Lissotriton helveticus</i>	WCA (sale only)	5	1.7 km

The surveys carried out for the 2011 ES established the likely absence of great crested newt, and the presence of palmate newt, common frog and common toad within the study area.

A total of 76 waterbodies were identified within the study area through the desk study, all of which are shown on Figure 2.

7.2 Field Surveys

7.2.1 HSI Assessment

Of the 76 waterbodies identified, ten were assessed as having ‘below average’ suitability and 64 were assessed as having ‘poor’ suitability for great crested newt during the HSI assessment. The remaining three waterbodies were found to be dry and were thus not subject to a HSI assessment or subsequent eDNA sampling. The HSI calculations for each waterbody are detailed in Appendix A and results of the HSI assessments are shown on Figure 2.

7.2.2 eDNA Survey

The ten eDNA samples that were taken from the ‘below average’ waterbodies were all returned as negative. The eDNA results are shown on Figure 2 with results forms provided in Appendix B.

7.2.3 Incidental Amphibian Records from Other Surveys

No great crested newt or other amphibians were recorded during any of the HSI or eDNA surveys. However, amphibian species including common frog, common toad, and palmate and/or smooth newt, were recorded on multiple occasions

during the 2019 suite of reptile surveys.⁹ The amphibians were recorded within terrestrial habitat either on or near artificial reptile refugia.

It is therefore considered that common amphibian species such as these will be present throughout the survey area where suitable habitats occur. Amphibian species recorded during the reptile surveys are detailed in Appendix C and shown on Figure 3.

⁹ Arup (2019) *Nant Helen Complementary Restoration Earthworks: Reptile Survey Report*.

8 Conclusions

Habitat Suitability Index surveys on site identified 64 waterbodies that were of ‘below average’ suitability for great crested newt and were not surveyed further. There were 10 waterbodies on site that were considered to be of ‘poor’ suitability. These waterbodies were then subject to eDNA surveys, but all samples were negative for great crested newt DNA.

No great crested newts were recorded during any of the surveys. Great crested newt is therefore considered likely to be absent from the site and no further survey is required at this time. However, common amphibian species, such as common frog, common toad, smooth newt and palmate newt are present in some areas on site.

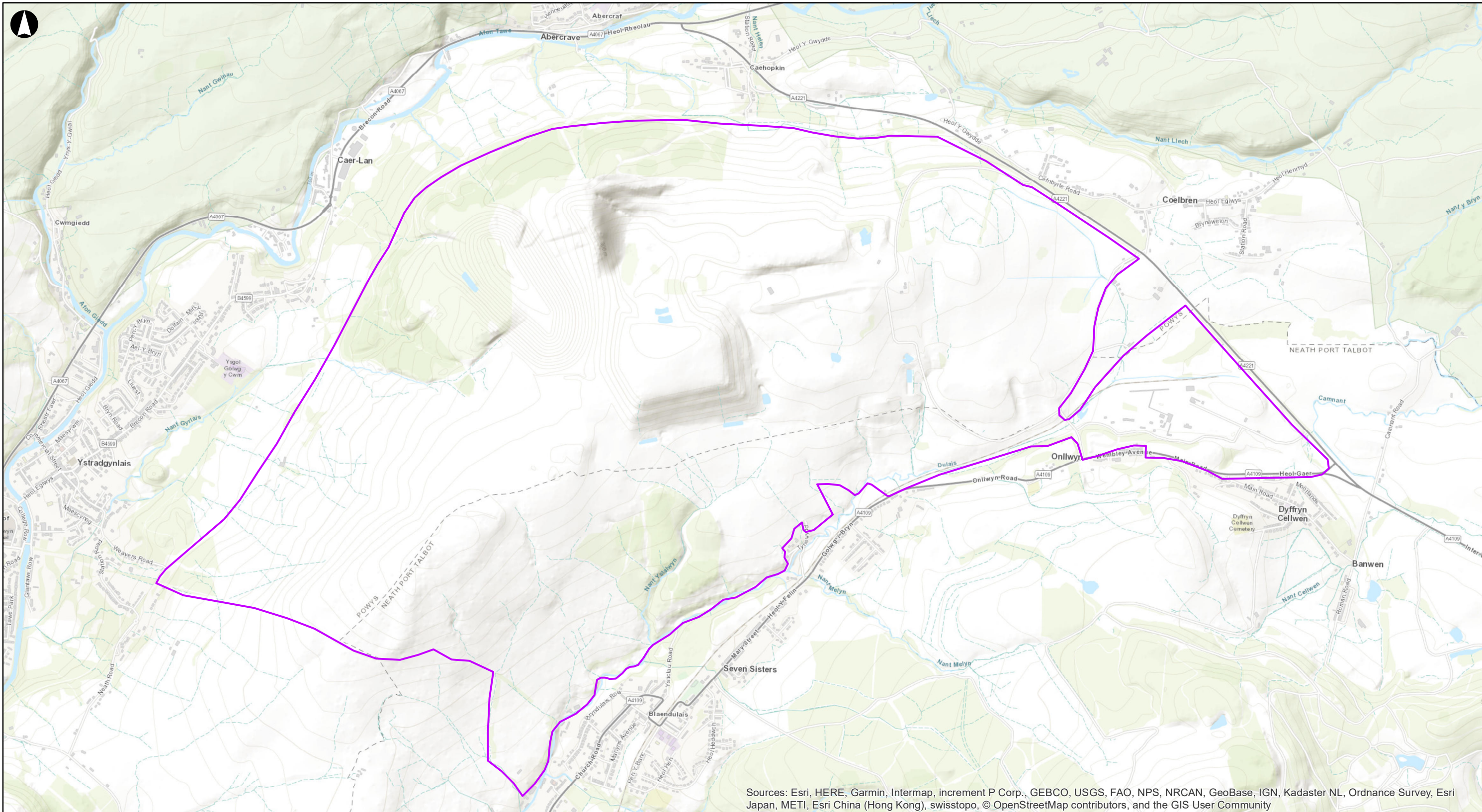
A full ecological impact assessment will be included within the Environmental Statement for the project and this will include an assessment of the significance of impacts from the project on protected and/or notable amphibian species. This will also detail any mitigation or compensation measures required to ensure there is no significant effect on amphibian species within the site.

This report is the result of the survey work undertaken in April 2019. This report refers, within the limitations stated, to the condition of the site at the time of the surveys. Changes in legislation, guidance, best practice, etc. may necessitate a re-assessment/survey, as may the passage of time.

The results of these surveys are considered valid for a minimum of 18 months to a maximum of 3 years. If more than 18 months elapses before any planning application is submitted, the requirement for repeat surveys should be reviewed¹⁰. No warranty is given as to the possibility of future changes in the condition of the site.

¹⁰ Chartered Institute of Ecology and Environmental Management (2019) *Advice Note on the Lifespan of Ecological Reports and Surveys*.

Figures



Sources: Esri, HERE, Garmin, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), swisstopo, © OpenStreetMap contributors, and the GIS User Community

LEGEND

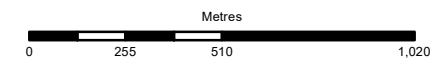
 Study Area

F1	2019-11-14	EA	CP	NH
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Issue	Date	By	Chkd	Appd
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**Figure 1
Study Area**

Scale at A3

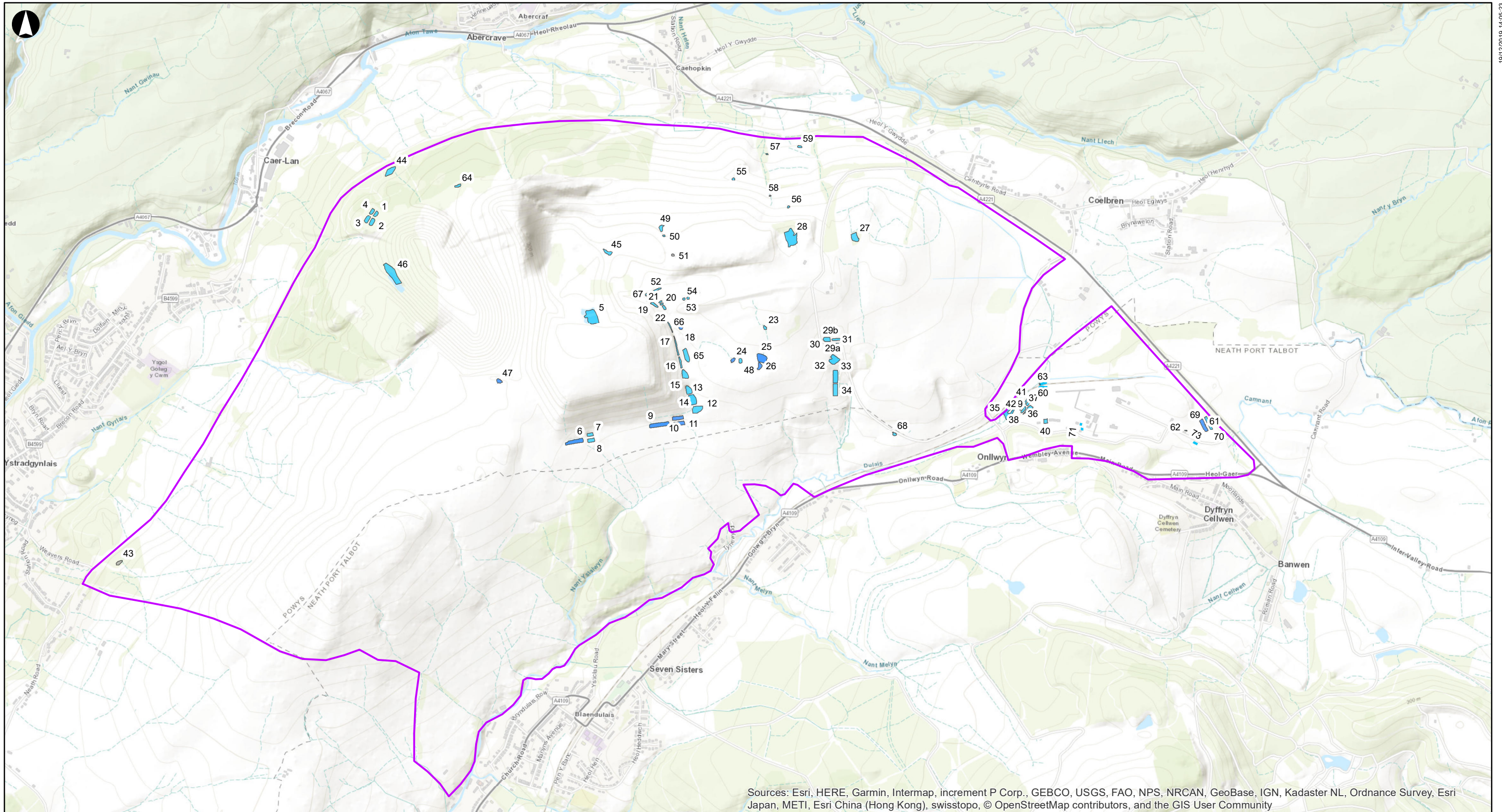
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Job No
264904

Drawing Status
For Issue

Drawing No
001

Issue
F1



Sources: Esri, HERE, Garmin, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), swisstopo, © OpenStreetMap contributors, and the GIS User Community

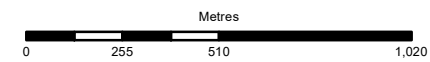
LEGEND

- Study Area
- Poor HSI score
- Poor HSI score
- Below average HSI score, negative eDNA result
- Dry

F1	2019-11-14	EA	CP	NH
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Figure 2
Waterbody locations and field survey results
Sheet 1

Scale at A3

1:20,000

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264904

Drawing Status
For Issue

Drawing No
2.1

Issue
F1



Sources: Esri, HERE, Garmin, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), swisstopo, © OpenStreetMap contributors, and the GIS User Community

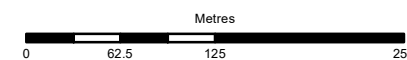
LEGEND

- Study Area
- Poor HSI score
- Below average HSI score, negative eDNA result

F1	2019-11-14	EA	CP	NH
Issue	Date	By	Chkd	Appd

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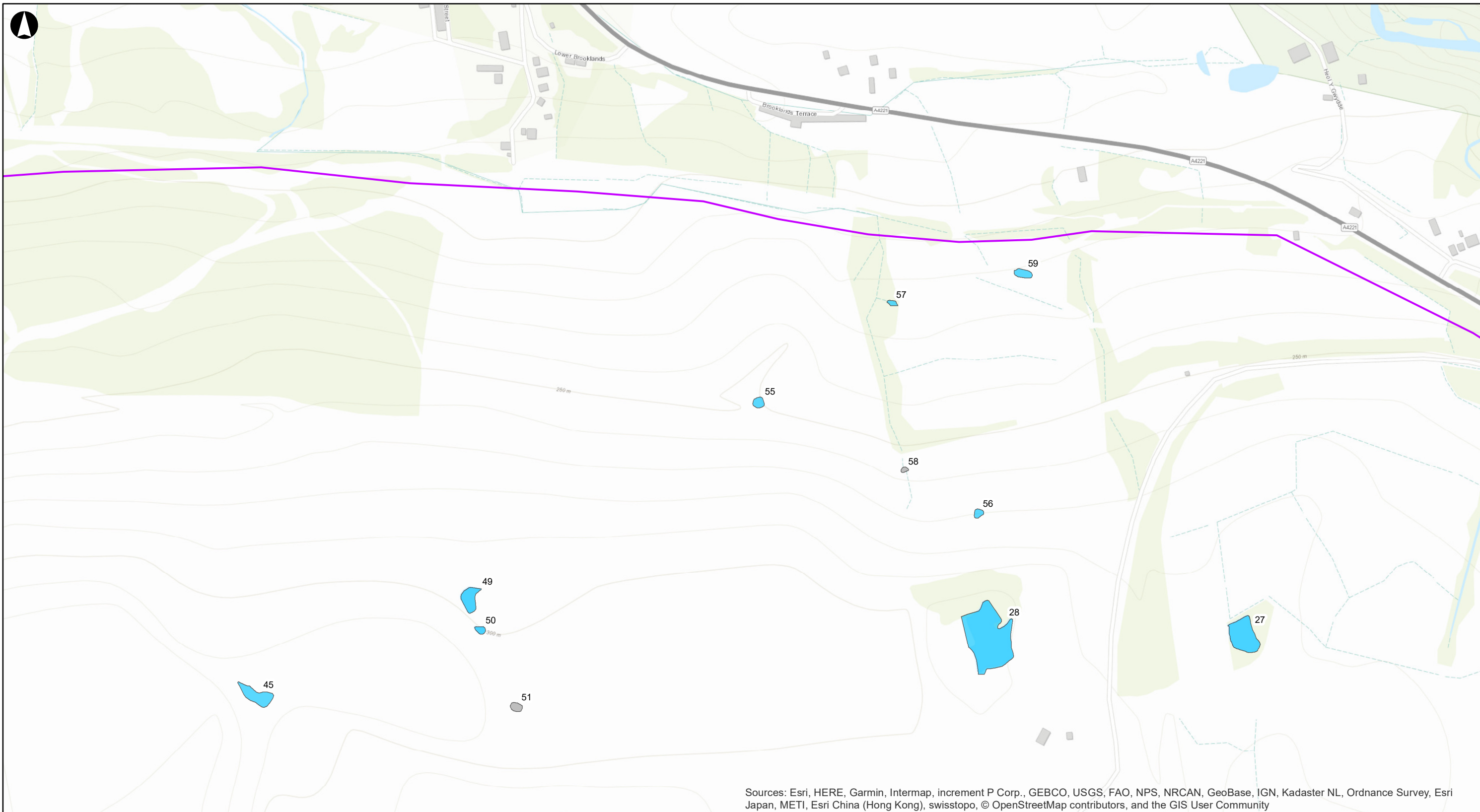
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Figure 2
Waterbody locations and field survey results
Sheet 2

Scale at A3
1:5,000

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Drawing No 2.2	Issue F1



Sources: Esri, HERE, Garmin, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), swisstopo, © OpenStreetMap contributors, and the GIS User Community

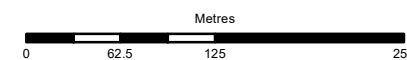
LEGEND

- Study Area
- Poor HSI score
- Dry

F1	2019-11-14	EA	CP	NH
Issue	Date	By	Chkd	Appd

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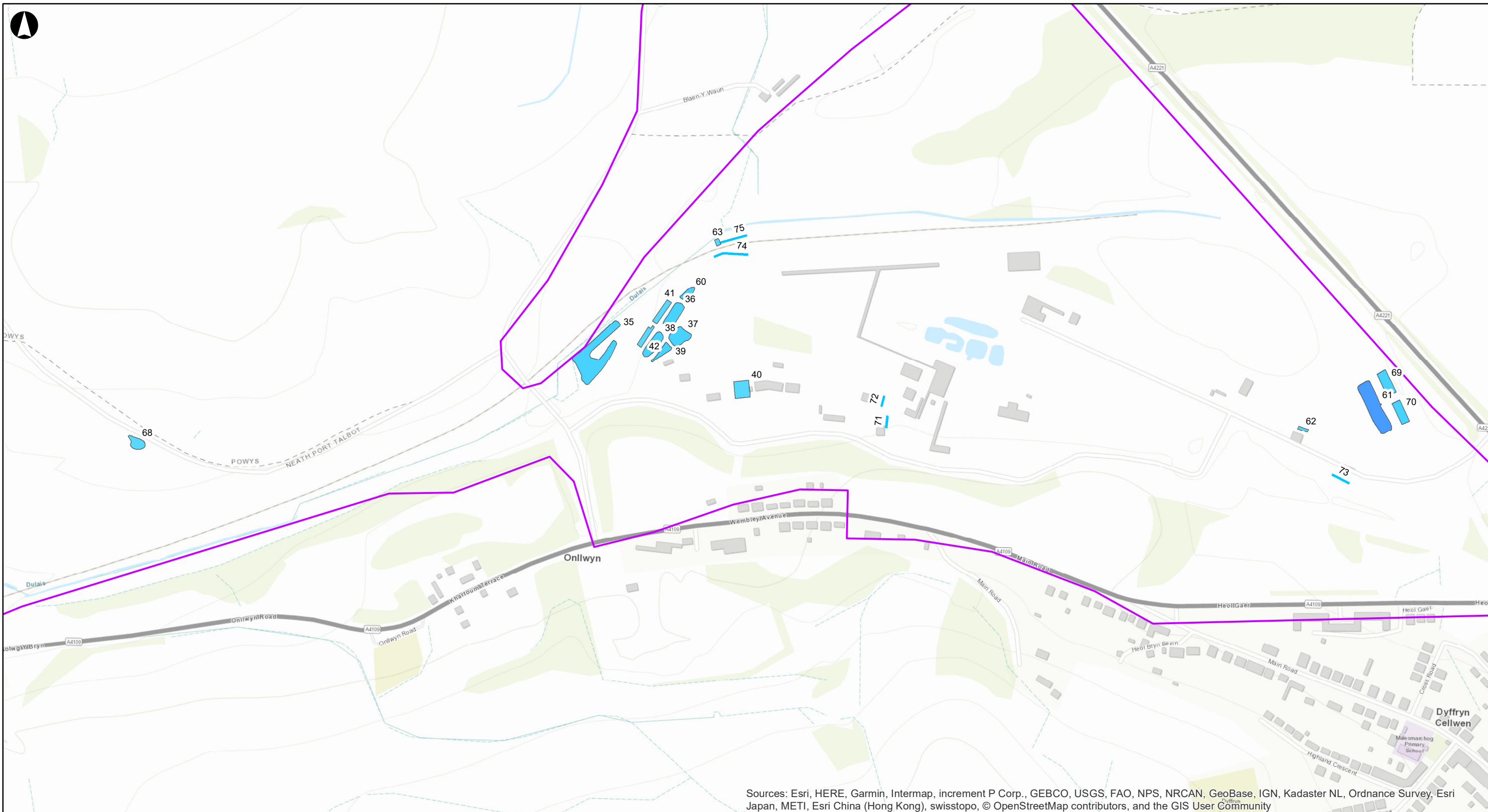
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**Figure 2
Waterbody locations and field
survey results
Sheet 3**

Scale at A3
1:5,000

Job No 264904	Drawing Status For Issue
Drawing No 2.3	Issue F1



Sources: Esri, HERE, Garmin, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), swisstopo, © OpenStreetMap contributors, and the GIS User Community

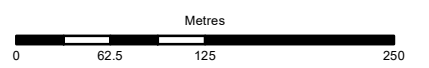
LEGEND

- Study Area
- Poor HSI score
- Poor HSI score
- Below average HSI score, negative eDNA result

F1	2019-11-14	EA	CP	NH
Issue	Date	By	Chkd	Appd

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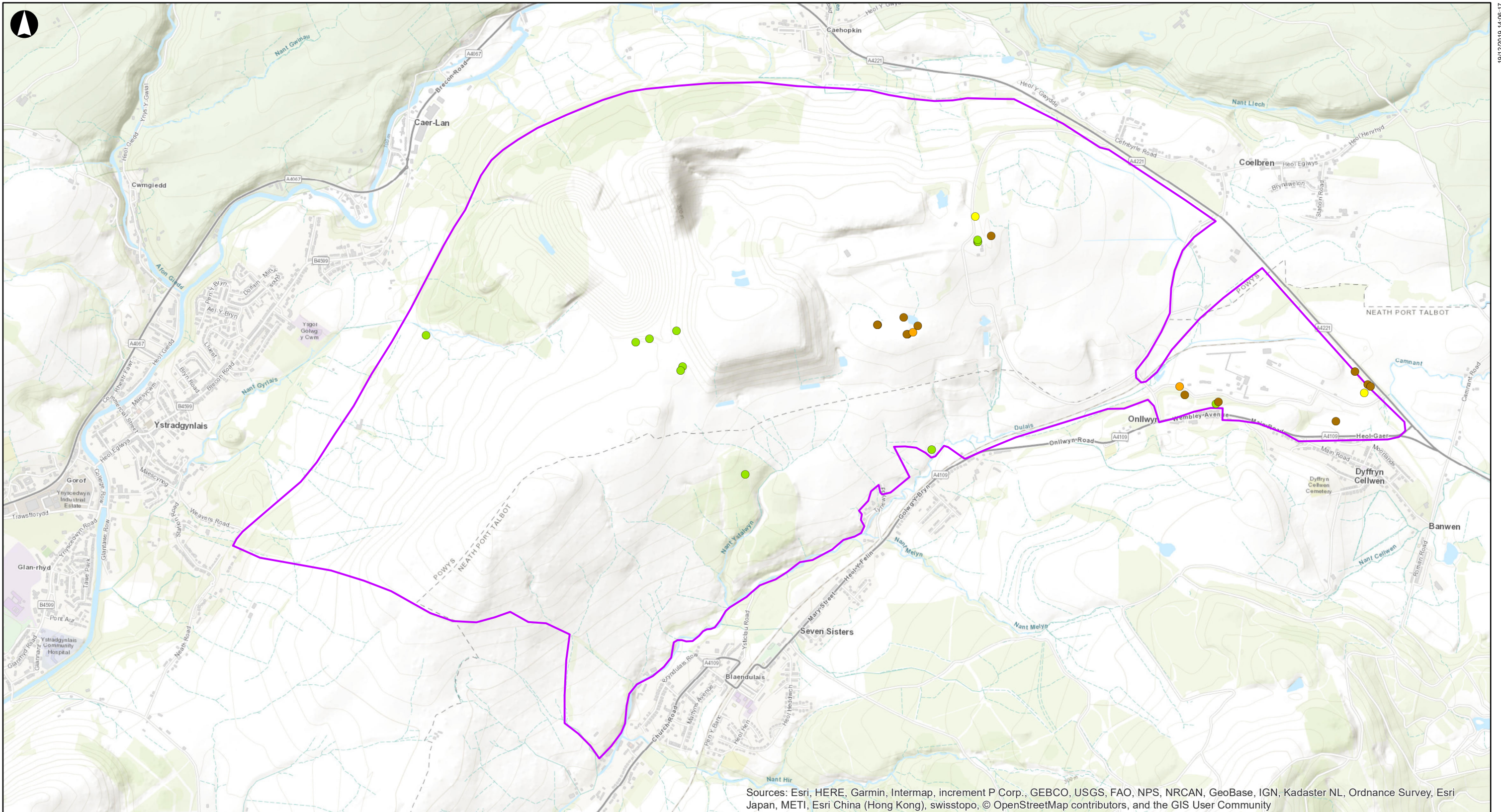
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Figure 2
Waterbody locations and field survey results
Sheet 4

Scale at A3
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Drawing No 2.4	Issue F1

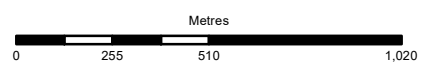


- LEGEND**
- Common frog
 - Common toad
 - Palmate newt
 - Smooth / palmate newt
 - Study Area

F1	2019-11-14	EA	CP	NH
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Figure 3
Amphibian species recorded during 2019 reptile surveys

Scale at A3

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Drawing No 003	Issue F1

Appendix A

HSI Assessment Results

A1 HSI Assessment Results

TableA1: Details and results of HSI assessment¹¹ and eDNA sampling

Water-body No.	NGR	HSI Assessment											HSI Score	Pond Suitability	Comments
		Date of HSI	SI ₁	SI ₂	SI ₃	SI ₄	SI ₅	SI ₆	SI ₇	SI ₈	SI ₉	SI ₁₀			
1	SN 80847 11602	15/04/2019	0.01	0.40	0.90	0.67	1.00	0.67	1.00	1.00	0.67	0.51	0.47	Poor	Part of settlement complex
2	SN 80826 11559	15/04/2019	0.01	0.40	0.90	0.67	1.00	0.67	1.00	1.00	0.33	0.51	0.44	Poor	Part of settlement complex
3	SN 80803 11573	15/04/2019	0.01	0.50	0.90	0.67	1.00	0.67	1.00	1.00	0.33	1.00	0.48	Poor	Part of settlement complex, water clear
4	SN 80826 11617	15/04/2019	0.01	0.40	0.90	0.67	1.00	0.67	1.00	1.00	0.33	0.51	0.44	Poor	Part of settlement complex
5	SN 81999 11052	15/04/2019	0.01	0.71	1.00	0.33	1.00	1.00	1.00	1.00	0.33	0.31	0.43	Poor	Isolated on high ground. Slurry pond pumped from barrel wash
6	SN 81911 10392	16/04/2019	0.01	0.70	0.90	1.00	1.00	0.67	1.00	1.00	0.67	0.81	0.54	Below average	Part of three pond complex with good water quality, pond weed and <i>Typha</i> spp.
7	SN 81982 10426	16/04/2019	0.01	0.40	0.90	1.00	1.00	0.67	1.00	1.00	0.67	0.41	0.48	Poor	Canada goose and mallard in area. Part of three pond complex. Good water quality with some <i>Potamogeton</i> spp.
8	SN 81992 10398	16/04/2019	0.01	0.40	0.90	1.00	1.00	0.67	1.00	1.00	0.67	0.41	0.48	Poor	Canada goose and mallard in area. Part of three pond complex. Good water quality with some <i>Potamogeton</i> spp.
9	SN 82345 10475	16/04/2019	0.01	0.80	0.90	1.00	1.00	0.67	1.00	1.00	0.67	0.41	0.52	Below average	Canada goose nesting near pond and mallard on pond. Water clear, though some suspended sediment. Part of complex of three ponds with in and outflow
10	SN 82466 10522	16/04/2019	0.01	0.90	0.90	1.00	1.00	0.67	1.00	1.00	0.67	0.46	0.53	Below average	Canada goose nesting near pond and mallard on pond. Water clear, with blue tinge. Part of complex of three ponds with in and outflow
11	SN 82462 10491	16/04/2019	0.01	0.90	0.90	1.00	1.00	0.67	1.00	1.00	0.67	0.41	0.52	Below average	Canada goose nesting near pond and mallard on pond. Water clear, with blue tinge. Part of complex of three ponds with in and outflow
12	SN 82551 10556	16/04/2019	0.01	0.30	1.00	0.67	1.00	1.00	1.00	1.00	0.67	0.36	0.47	Poor	Small pond not within drainage complex
13	SN 82536 10612	16/04/2019	0.01	0.80	0.90	0.33	1.00	1.00	1.00	1.00	0.67	0.31	0.47	Poor	Very steep banks, part of drainage ditch complex
14	SN 82517 10667	16/04/2019	0.01	0.45	0.90	0.33	1.00	1.00	1.00	1.00	0.33	0.71	0.45	Poor	Within drainage ditch complex, stand of <i>Phragmites</i> spp.
15	SN 82494 10749	16/04/2019	0.01	0.40	1.00	0.33	1.00	1.00	1.00	1.00	0.33	0.31	0.41	Poor	Shallow, part of drainage channel complex. Absence of aquatic vegetation, poor water quality
16	SN 82469 10813	15/04/2019	0.01	0.25	1.00	0.33	1.00	1.00	1.00	1.00	0.33	0.36	0.40	Poor	Part of drainage channel complex
17	SN 82448 10894	16/04/2019	0.01	0.40	0.50	0.33	1.00	1.00	1.00	1.00	0.33	0.31	0.38	Poor	Shallow, part of drainage ditch system, no surrounding vegetation
18	SN 82469 10994	15/04/2019	0.01	0.45	0.90	1.00	1.00	0.67	1.00	1.00	0.67	0.51	0.50	Below average	Natural pond within pasture
19	SN 82329 11119	15/04/2019	0.01	0.10	0.10	0.33	1.00	1.00	1.00	1.00	0.33	0.31	0.28	Poor	Shallow, used for storage of wash water
20	SN 82360 11131	15/04/2019	0.01	0.10	0.90	0.01	1.00	1.00	1.00	1.00	0.33	0.31	0.25	Poor	Used to store wash water
21	SN 82366 11119	15/04/2019	0.01	0.10	0.90	0.01	1.00	1.00	1.00	1.00	0.33	0.31	0.25	Poor	Used to store/pump wash water
22	SN 82381 11100	15/04/2019	0.01	0.09	0.90	0.01	1.00	1.00	1.00	1.00	0.33	0.31	0.25	Poor	Used to store/pump wash water
23	SN 82921 10993	15/04/2019	0.01	0.05	1.00	1.00	1.00	1.00	1.00	0.96	0.67	0.70	0.43	Poor	Reeds and aquatic vegetation present. Small pond, quite exposed and unfenced.

¹¹ Suitability Index (SI)₁ = geographic location; SI₂ = pond area; SI₃ = permanence; SI₄ = water quality; SI₅ = shade; SI₆ = waterfowl; SI₇ = fish; SI₈ = pond count; SI₉ = terrestrial habitat; SI₁₀ = macrophytes.
HSI Score = (SI₁ x SI₂ x SI₃ x SI₄ x SI₅ x SI₆ x SI₇ x SI₈ x SI₉ x SI₁₀)^{1/10}

Water-body No.	NGR	HSI Assessment												Pond Suitability	Comments
		Date of HSI	SI ₁	SI ₂	SI ₃	SI ₄	SI ₅	SI ₆	SI ₇	SI ₈	SI ₉	SI ₁₀	HSI Score		
24	SN 82749 10821	15/04/2019	0.01	0.30	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.50	0.52	Below average	Fenced
25	SN 82897 10833	15/04/2019	0.01	N/A (too large)	0.90	1.00	1.00	0.67	1.00	0.52	1.00	0.35	0.54	Below average	<i>Typha</i> spp. present and <i>Juncus</i> spp. around edge
26	SN 82892 10788	15/04/2019	0.01	1.00	0.90	1.00	1.00	1.00	1.00	1.00	1.00	0.60	0.59	Below average	Kidney-shaped pond. About 25% submerged vegetation, the rest emergent
27	SN 83399 11473	16/04/2019	0.01	0.83	0.90	1.00	1.00	0.67	0.67	0.30	1.00	0.40	0.46	Poor	Canada goose nesting on pond edge and another nesting on island. Pond surrounded by willow, reed, bramble and scrub. Water boatman seen.
28	SN 83035 11480	16/04/2019	0.01	N/A (too large)	0.90	0.67	1.00	0.67	1.00	0.08	1.00	0.30	0.44	Poor	Pond that collects run-off from slag heap. Canada goose nesting on island
29a	SN 83300 10934	16/04/2019	0.01	0.80	0.90	0.67	1.00	0.67	1.00	0.66	0.67	0.35	0.47	Poor	Two Canada geese nesting on pond edge. Ponds collect run-off from road
29b	SN 83249 10933	16/04/2019	0.01	0.98	0.90	0.67	1.00	0.67	1.00	0.66	0.67	0.35	0.48	Poor	Collects run-off from road. Some oil on surface of water. Mallard sitting on eggs on pond edge
30	SN 83249 10907	16/04/2019	0.01	0.05	0.10	0.01	1.00	1.00	1.00	0.66	0.67	0.30	0.19	Poor	
31	SN 83295 10911	16/04/2019	0.01	0.05	0.10	0.01	1.00	1.00	1.00	0.66	0.67	0.30	0.19	Poor	Coal dust settlement ditch, next to wheel wash area, dried out.
32	SN 83288 10826	16/04/2019	0.01	0.81	0.90	0.33	1.00	0.67	1.00	0.66	0.67	0.35	0.44	Poor	Very steep-sided. Small amount of macrophytes on western edge. Two Canada geese present.
33	SN 83294 10732	16/04/2019	0.01	0.60	0.90	0.67	1.00	1.00	1.00	0.66	1.00	0.30	0.48	Poor	Settling ponds from the wheel wash bay and access road.
34	SN 83294 10665	16/04/2019	0.01	0.70	0.90	0.67	1.00	1.00	1.00	0.66	1.00	0.30	0.49	Poor	Settling pond from wheel wash bay.
35	SN 84206 10533	24/04/2019	0.01	0.40	0.90	0.33	1.00	0.01	1.00	1.00	0.33	1.00	0.29	Poor	High sediment load in water, water evidently heavily contaminated with coal dust. Canada goose nest and mallard present
36	SN 84322 10598	15/04/2019	0.01	0.40	1.00	0.33	1.00	0.67	1.00	0.74	0.67	0.30	0.41	Poor	Pond lined with coal sediment
37	SN 84331 10574	15/04/2019	0.01	0.20	0.50	0.33	1.00	0.67	1.00	0.74	0.67	0.40	0.37	Poor	Coal sediment on banks and coal sediment sand banks in pond. Canada goose likely nesting on bank. Bulrush and reeds on one bank but no other macrophyte cover
38	SN 84295 10562	24/04/2019	0.01	0.21	0.90	0.01	1.00	1.00	1.00	1.00	0.33	0.31	0.27	Poor	On edge of washery and receiving run-off water from site, resulting in heavy sediment load (coal dust). Bulrushes on banks. Increased water level resulting in overland flow between waterbody 38 and 42, and receiving water from 39
39	SN 84306 10549	15/04/2019	0.01	0.20	0.50	0.33	1.00	0.67	1.00	0.74	0.67	0.35	0.36	Poor	Algae in pond, coal sediment banks, waterbody 37 drains into this waterbody
40	SN 84411 10500	24/04/2019	0.01	0.45	0.90	0.01	1.00	1.00	1.00	1.00	0.01	0.36	0.21	Poor	Square waterbody. Clear water pumped into this waterbody from polishing ponds after settlement. Very diluted so only trace levels of contaminants present, but water heavily contaminated with coal dust. Used to fill bowsers and wet site. Water within this waterbody also gets pumped.
41	SN 84306 10603	24/04/2019	0.01	0.28	0.90	0.01	1.00	1.00	1.00	1.00	0.33	0.31	0.28	Poor	Tank on edge of washery and receiving run-off water from site, resulting in heavy sediment load (coal dust)
42	SN 84285 10572	15/04/2019	0.01	0.40	0.50	0.33	1.00	1.00	1.00	0.44	0.67	0.35	0.38	Poor	
43	SN 79477 09747	15/04/2019	DRY												
44	SN 80925 11829	15/04/2019	0.01	0.91	0.90	0.67	0.40	0.67	1.00	1.00	1.00	0.36	0.47	Poor	Receives discharge water from settlement lagoons. Water shows turquoise colouration
45	SN 82079 11396	15/04/2019	0.01	0.45	0.50	0.01	1.00	1.00	1.00	1.00	0.01	0.31	0.19	Poor	Shallow pond on spoil tip. No vegetation
46	SN 80958 11264	15/04/2019	0.01	0.02	0.90	0.33	1.00	1.00	1.00	1.00	0.01	0.31	0.21	Poor	In base of working quarry. 25-30m deep. Water turquoise in colouration
47	SN 81503 10710	15/04/2019	0.01	0.60	0.90	1.00	1.00	0.67	1.00	1.00	0.67	0.41	0.50	Below average	Canada goose on nest within pond. Natural pond on edge of workings

Water-body No.	NGR	HSI Assessment												Pond Suitability	Comments
		Date of HSI	SI ₁	SI ₂	SI ₃	SI ₄	SI ₅	SI ₆	SI ₇	SI ₈	SI ₉	SI ₁₀	HSI Score		
48	SN 82790 10816	15/04/2019	0.01	0.05	0.10	1.00	1.00	1.00	1.00	1.00	1.00	0.85	0.37	Poor	Boggy area with ponding in fenced off area
49	SN 82368 11524	15/04/2019	0.01	0.20	0.90	0.01	1.00	1.00	1.00	1.00	0.01	0.31	0.19	Poor	Small pond within works area, reduced in area (dried) compared to mapped area. No surrounding vegetation
50	SN 82382 11485	15/04/2019	0.01	0.10	0.90	0.01	1.00	1.00	1.00	1.00	0.01	0.31	0.18	Poor	Small pond within works area. Steep sides and low water quality
51	SN 82428 11381	15/04/2019	DRY												
52	SN 82320 11186	15/04/2019	0.01	0.40	0.90	0.33	1.00	1.00	1.00	1.00	0.33	0.31	0.41	Poor	Thin area to hold water from wash plant. Recently re-configured
53	SN 82510 11153	15/04/2019	0.01	0.30	0.90	0.33	1.00	1.00	1.00	1.00	0.33	0.41	0.41	Poor	Small circular pond used for wash water. After cleaning, water drains back into pond
54	SN 82489 11148	15/04/2019	0.01	0.30	0.90	0.33	1.00	1.00	1.00	1.00	0.33	0.31	0.39	Poor	Small circular pond used for wash water. After cleaning, water drains back into pond
55	SN 82751 11788	16/04/2019	0.01	0.30	0.90	1.00	1.00	1.00	0.67	0.44	1.00	0.85	0.48	Poor	In depression and fenced off. Looks to have been used historically as part of the mine as large pipe
56	SN 83044 11639	16/04/2019	0.01	0.05	0.50	1.00	1.00	1.00	1.00	0.44	1.00	1.00	0.40	Poor	Infinity pool. Surface area of water 10m x 10m approx.
57	SN 82927 11923	16/04/2019	0.01	0.05	0.50	1.00	0.30	1.00	1.00	0.44	1.00	0.85	0.35	Poor	Stream flowing through pond so not conducive to newts. Contains grasses, buttercup and aquatic species
58	SN 82951 11695	16/04/2019	DRY												
59	SN 83105 11959	16/04/2019	0.01	0.98	1.00	0.67	0.30	1.00	1.00	0.37	1.00	0.35	0.44	Poor	Pond divided into two by iron drainage pipe. Willow and reed surrounding pond and within it, bulrush present at one end and water boatman present
60	SN 84340 10623	15/04/2019	0.01	0.05	0.50	0.33	1.00	0.67	1.00	0.74	0.67	0.30	0.31	Poor	Coal sediment pond at highest point of group of ponds and drains into pond just south of it
61	SN 85254 10476	15/04/2019	0.01	0.91	0.90	0.67	0.90	0.67	1.00	0.30	1.00	0.90	0.50	Below average	Lots of bulrush in pond. Surrounded by willow and bramble scrub, and some gorse
62	SN 85158 10448	15/04/2019	0.01	0.05	0.50	0.01	1.00	1.00	1.00	0.30	0.67	0.30	0.21	Poor	Concrete sided, square waterbody used as a wheel wash
63	SN 84381 10696	15/04/2019	0.01	0.05	1.00	0.67	1.00	1.00	1.00	0.74	0.67	0.35	0.38	Poor	Bulrush present. Fed from ditch adjacent to the railway which has iron oxide. Pond is deep green colour indicative of mine pollution. Coal dust is collecting on pond surface and covers approx. 30% of surface area today
64	SN 81319 11761	15/04/2019	0.01	0.50	0.10	0.33	1.00	1.00	1.00	1.00	0.01	0.31	0.23	Poor	Shallow, apparently temporary/drying area of standing water on edge of spoil/roadway. No surrounding vegetation
65	SN 82496 10854	16/04/2019	0.01	0.98	0.50	0.33	1.00	1.00	1.00	1.00	0.67	0.31	0.45	Poor	Very shallow and drying. Likely to be 100% dry shortly after survey. Absence of vegetation and poor water quality
66	SN 82417 10997	16/04/2019	0.01	0.40	0.50	0.33	1.00	1.00	1.00	1.00	0.33	0.31	0.38	Poor	Shallow, part of drainage ditch system, no surrounding vegetation
67	SN 82299 11159	15/04/2019	0.01	0.80	0.10	0.33	1.00	1.00	1.00	1.00	0.67	0.31	0.37	Poor	Shallow, used for storage of wash water
68	SN 83608 10428	16/04/2019	0.01	0.20	0.50	1.00	1.00	1.00	1.00	0.22	1.00	0.85	0.42	Poor	Located in sheep field. Bulrush and duckweed present
69	SN 85270 10505	15/04/2019	0.01	0.90	1.00	1.00	0.70	0.67	1.00	0.44	1.00	0.35	0.48	Poor	5% cover <i>Typha</i> spp. Concrete square waterbody. Moorhen present
70	SN 85287 10469	15/04/2019	0.01	0.90	0.90	1.00	0.70	1.00	1.00	0.30	1.00	0.35	0.48	Poor	<i>Typha latifolia</i> present. Concrete sided square water body.
71	SN 84606 10446	15/04/2019	0.01	0.05	0.10	0.33	0.70	1.00	1.00	0.44	0.33	0.60	0.25	Poor	Ditch between garage and dry coal building. Tadpoles present. Main macrophyte cover is buttercup. Water full of coal solids.
72	SN 84591 10485	15/04/2019	0.01	0.05	0.10	0.33	1.00	1.00	1.00	0.44	0.33	0.60	0.26	Poor	Small ditch adjacent to transformers, near dry coal building. Water mint and <i>Buddleija</i> spp. scrub present.
73	SN 85219 10377	15/04/2019	0.01	0.05	0.10	0.33	1.00	1.00	1.00	0.44	0.33	0.35	0.25	Poor	Ditch adjacent to weighbridge. The ditch dries out regularly but there is always water beneath the weighbridge, the water under the weighbridge always supports large population of frogs. None visible in ditch.

Water-body No.	NGR	HSI Assessment												Pond Suitability	Comments
		Date of HSI	SI ₁	SI ₂	SI ₃	SI ₄	SI ₅	SI ₆	SI ₇	SI ₈	SI ₉	SI ₁₀	HSI Score		
74	SN 84397 10687	15/04/2019	0.01	0.05	0.10	0.33	1.00	1.00	1.00	0.44	0.67	1.00	0.29	Poor	Ditch is slow flowing, running parallel to rail line and contains iron oxides. Seems to be a lot of bacterial growth and algae covered in iron oxide. Plants include horsetail, bulrush. Drains into waterbody 63 which is on the other side of the railway
75	SN 84395 10702	15/04/2019	0.01	0.05	0.90	0.01	0.80	1.00	1.00	1.00	0.33	0.36	0.23	Poor	Flowing ditch with bigger area of connected stagnant water. Bulrushes and water mint present. Looks suitable for amphibians but high sediment load in water

Appendix B

NatureMetrics eDNA Results

Report: 19075-AGL-AC-1

Order number: AGL-19001-AC

Great Crested Newt eDNA Results

Company: Ove Arup and Partners Ltd (Arup)
Contact: Adam Cross
Project code | Task code: GCRE - 264094
Date of Report: 29 April 2019
Number of samples: 18

Thank you for sending your samples for analysis by NatureMetrics. Your samples have been processed in accordance with the protocol set out in Appendix 5 of Biggs et al. (2014).

DNA was precipitated via centrifugation at 14,000 x g and then extracted using Qiagen Blood and Tissue extraction kits.

qPCR amplification was carried out in 12 replicates per sample, using the primers and probe described by Biggs et al. (2014), in the presence of both positive and negative controls.

Results indicate GCN absence in '11', '29A', '29b', '55', '56', 'Pond 10', 'Pond 11', 'Pond 12', 'Pond 14', 'Pond 16', 'Pond 18', 'Pond 27', 'Pond 47', 'Pond 59', 'Pond 6', 'Pond 7', 'Pond 8', and 'Pond 9'. All controls performed as expected and so the results are conclusive.

Results are based on the samples as supplied by the client to the laboratory. Incorrect sampling methodology may affect the results. Note that a negative result does not preclude the presence of Great Crested Newts at a level below the limits of detection.



Sample	Pond ID	Arrived	Inhibition	Degradation	Score	GCN status
355	'11'	18-Apr	No	No	0	Negative
363	'29A'	18-Apr	No	No	0	Negative
364	'29b'	18-Apr	No	No	0	Negative
369	'55'	18-Apr	No	No	0	Negative
352	'56'	18-Apr	No	No	0	Negative
366	'Pond 6'	18-Apr	No	No	0	Negative
365	'Pond 7'	18-Apr	No	No	0	Negative
357	'Pond 8'	18-Apr	No	No	0	Negative
370	'Pond 9'	18-Apr	No	No	0	Negative
375	'Pond 10'	18-Apr	No	No	0	Negative
371	'Pond 11'	18-Apr	No	No	0	Negative
374	'Pond 12'	18-Apr	No	No	0	Negative
373	'Pond 14'	18-Apr	No	No	0	Negative
372	'Pond 16'	18-Apr	No	No	0	Negative
377	'Pond 18'	18-Apr	No	No	0	Negative
362	'Pond 27'	18-Apr	No	No	0	Negative
376	'Pond 47'	18-Apr	No	No	0	Negative
358	'Pond 59'	18-Apr	No	No	0	Negative

End of report

Report issued by: Dr. Cuong Tang

Contact: ct@naturemetrics.co.uk | 01491 829042



Understanding your results

- Positive:** GCN DNA has been detected in this sample, meaning that at least one of the 12 replicates has amplified. Remember that this is not a quantitative test, so you should not interpret a high eDNA score (e.g. 12/12) as necessarily indicating a larger population of GCN than a low eDNA score (e.g. 1/12).
- Negative:** No GCN DNA has been detected in this sample, and the internal and external controls worked as expected. This tells us that if there had been GCN DNA in the sample, we would have detected it, so we can be confident in its absence from the sample provided. Samples marked as 'Negative after dilution' are those where inhibition was detected (when the marker added in the lab fails to amplify) but overcome by diluting the DNA. Inhibition can be caused by certain chemicals or organic compounds that may be present in the water sample.
- Inconclusive:** No GCN DNA was detected in the sample, but the internal controls failed to amplify as expected. This means that any GCN DNA in the sample might also have failed to amplify properly, so we cannot have confidence in this negative result. Inconclusive results can be caused by degradation of the DNA (when the DNA marker contained in the ethanol in the kits fails to amplify) or by inhibition of the reaction (when the marker added in the lab fails to amplify) caused by certain chemicals or organic compounds that may be present in the water sample.



Report: 19082-AGL-AC-1

Order number: AGL-19002-AC

Great Crested Newt eDNA Results

Company: Ove Arup and Partners Ltd (Arup)
Contact: Adam Cross
Project code | Task code: GCRE - 264094
Date of Report: 30 April 2019
Number of samples: 8

Thank you for sending your samples for analysis by NatureMetrics. Your samples have been processed in accordance with the protocol set out in Appendix 5 of Biggs et al. (2014).

DNA was precipitated via centrifugation at 14,000 x g and then extracted using Qiagen Blood and Tissue extraction kits.

qPCR amplification was carried out in 12 replicates per sample, using the primers and probe described by Biggs et al. (2014), in the presence of both positive and negative controls.

Results indicate GCN absence in 'Pond 23', 'Pond 24', 'Pond 25', 'Pond 26', 'Pond 61', 'Pond AB', 'Pond AC', and 'Pond U'. All controls performed as expected and so the results are conclusive.

Results are based on the samples as supplied by the client to the laboratory. Incorrect sampling methodology may affect the results. Note that a negative result does not preclude the presence of Great Crested Newts at a level below the limits of detection.



Sample	Pond ID	Arrived	Inhibition	Degradation	Score	GCN status
354	'Pond 23'	26-Apr	No	No	0	Negative
359	'Pond 24'	26-Apr	No	No	0	Negative
368	'Pond 25'	26-Apr	No	No	0	Negative
360	'Pond 26'	26-Apr	No	No	0	Negative
356	'Pond 61'	26-Apr	No	No	0	Negative
367	'Pond AB'	26-Apr	No	No	0	Negative
353	'Pond AC'	26-Apr	No	No	0	Negative
361	'Pond U'	26-Apr	No	No	0	Negative

End of report

Report issued by: Dr. Cuong Tang

Contact: ct@naturemetrics.co.uk | 01491 829042

Understanding your results

Positive: GCN DNA has been detected in this sample, meaning that at least one of the 12 replicates has amplified. Remember that this is not a quantitative test, so you should not interpret a high eDNA score (e.g. 12/12) as necessarily indicating a larger population of GCN than a low eDNA score (e.g. 1/12).

Negative: No GCN DNA has been detected in this sample, and the internal and external controls worked as expected. This tells us that if there had been GCN DNA in the sample, we would have detected it, so we can be confident in its absence from the sample provided. Samples marked as 'Negative after dilution' are those where inhibition was detected (when the marker added in the lab fails to amplify) but overcome by diluting the DNA. Inhibition can be caused by certain chemicals or organic compounds that may be present in the water sample.

Inconclusive: No GCN DNA was detected in the sample, but the internal controls failed to amplify as expected. This means that any GCN DNA in the sample might also have failed to amplify properly, so we cannot have confidence in this negative result. Inconclusive results can be caused by degradation of the DNA (when the DNA marker contained in the ethanol in the kits fails to amplify) or by inhibition of the reaction (when the marker added in the lab fails to amplify) caused by certain chemicals or organic compounds that may be present in the water sample.



Appendix C

Incidental Amphibian Records

C1 Incidental Amphibian Records

Table C1: Incidental records of amphibians recorded during the 2019 reptile surveys

Date	Reptile refugia Number	NGR	Species	Comments
14/05/2019	N/A	SN 81680 10590	Common frog	Incidental sighting on <i>Molinia spp.</i> whilst installing refugia
06/06/2019	N/A	SN 81647 10774	Common frog	Seen near refugia 104
	114	SN 81431 10715	Common frog	
14/06/2019	170	SN 83251 11248	Common toad	Two adult toads under mat
26/06/2019	235	SN 83007 10145	Common frog	Next to refugia
	28	SN 84519 10389	Common frog	
	32	SN 85157 10292	Common toad	
	9	SN 84353 10437	Common toad	Two toads
02/07/2019	97	SN 81670 10560	Common frog	
	170	SN 83252 11251	Common frog	
	165	SN 83323 11287	Common toad	
03/07/2019	65	SN 85327 10496	Common toad	Juvenile under refugia
	70	SN 85343 10484	Common toad	Juvenile under refugia
03/09/2019	N/A	SN 80315 10756	Common frog	
	196	SN 82878 10754	Common toad	
	180	SN 82717 10808	Common toad	
10/09/2019	227	SN 82013 10008	Common frog	Next to refugia
	196	SN 82874 10756	Common toad	
	180	SN 82717 10811	Common toad	
	193	SN 82931 10799	Common toad	
	147	SN 83238 11380	Palmate newt	Adult female palmate newt
16/09/2019	72	SN 85259 10559	Common toad	
	9	SN 84327 10481	Smooth / palmate newt	Juvenile newt
17/09/2019	117	SN 81504 10732	Common frog	
	174	SN 82857 10848	Common toad	
23/09/2019	57	SN 85308 10453	Palmate newt	Two palmate newts
25/09/2019	170	SN 83251 11257	Common frog	
	195	SN 82906 10769	Smooth / palmate newt	Juvenile male newt found
03/10/2019	29	SN 84533 10397	Common toad	