Cinderford Northern Quarter, Forest of Dean

Great Crested Newt Monitoring Survey

Forest of Dean Council

Report prepared by:
Ecus Ltd.
3rd Floor, The Pin Mill
New Street
Charfield
Gloucestershire
GL12 8ES

01453 796 144

December 2017

Ecus Ltd

Report to:	Forest of Dean District Council
Report Title:	Cinderford Northern Quarter, Forest of Dean – Great Crested Newt Monitoring Survey
Revision:	Revision 1
Issue Date:	December 2017
Report Ref:	9269

Originated By:

Russell Goodchild
Consultant Ecologist Date: 8 December 2017

Reviewed By:

Simon Inger
Principal Ecologist Date: 8 December 2017

Approved By:

Kit Hawkins
Technical Director Date: 8 December 2017

Prepared by:
Ecus Ltd.
3rd Floor, The Pin Mill
New Street
Charfield
Gloucestershire
GL12 8ES
01453 796 144

Contents

1. INTRODUCTION 1
1.1 BACKGROUND 1
2. METHODOLOGY 2
2.1 INTRODUCTION 2
2.2 HABITAT SUITABILITY INDEX ASSESSMENT 2
2.3 POND CONDITION AND TERRESTRIAL HABITAT ASSESSMENT 2
2.4 HIBERNACULA SUITABILITY ASSESSMENT 3
2.5 EDNA SAMPLING 3
2.6 GREAT CRESTED NEWT POPULATION ESTIMATES 3
2.7 SURVEY LIMITATIONS 6
3. RESULTS AND EVALUATION 8
3.1 HABITAT SUITABILITY INDEX 8
3.2 POND CONDITION ASSESSMENT 8
3.3 HIBERNACULA CONDITION ASSESSMENT 8
3.4 GREAT CRESTED NEWT PRESENCE/ABSENCE SURVEY 10
3.5 EDNA SAMPLING 11
3.6 ADDITIONAL SPECIES RECORDED 11
4. ASSESSMENT AND RECOMMENDATIONS 12
4.1 LEGISLATION 12
4.2 GREAT CRESTED NEWT POPULATION ASSESSMENT 12
4.3 POND AND HABITAT CONDITION ASSESSMENT 12
4.4 COMPENSATORY PROVISION FOR GCN ASSESSMENT 12
4.5 HIBERNACULA CONDITION ASSESSMENT 13
4.6 RECOMMENDATIONS 13
5. REFERENCES 16
FIGURE 1.1. POND LOCATION PLAN
FIGURE 1.2 – POND LOCATION PLAN – NORTHERN SECTION
FIGURE 1.3 – POND LOCATION PLAN – SOUTHERN SECTION
FIGURE 2.1 – HIBERNACULA AND REFUGIA LOCATION PLAN
APPENDIX 1. HSI ASSESSMENT TABLE
APPENDIX 2. POND CONDITION METHODS AND ASSESSMENT REPORT
APPENDIX 3. HIBERNACULA CONDITION ASSESSMENT
APPENDIX 4. BOTTLE TRAPPING DETAILS
APPENDIX 5. EDNA ANALYSIS REPORT

1. Introduction

1.1 Background

1.1.1 Ecus Ltd (Ecus) was commissioned by Forest of Dean District Council (FDDC) in January 2017 to undertake great crested newt (*Triturus cristatus*) pond monitoring at Cinderford Northern Quarter (CNQ), in Gloucestershire. The commission includes:

- Undertaking population size class assessments for all ponds included within the assessment;
- Undertaking habitat suitability index (HSI) assessments on all ponds included within the assessment and eDNA analysis specifically on Ponds 10, 17 and 29;
- Assessment of pond condition and terrestrial habitat for all ponds included within the assessment; and
- Assessment of the 40 hibernacula constructed on site.

1.1.2 The CNQ development is located north-west of Cinderford, within the Forest of Dean. An Area Action Plan (AAP) for CNQ was published by FDDC in 2012. This set out regeneration opportunities, whilst aiming to safeguard the ecological importance of the area.

1.1.3 Planning permission was granted in 2014 for the development of an education facility, hotel, office and industrial spaces, new homes and spine road within the boundary of the AAP. The commercial conifer plantation on the land to the south of the AAP area has been removed and has been replaced with new ponds, grassland and broadleaved woodland habitats, to mitigate loss of habitat for protected and important species, including great crested newt.

1.1.4 Great crested newt surveys previously undertaken in 2012 and 2013 by Johns Associates identified 33 ponds on site, of which 17 had confirmed GCN presence. In 2015, Ecus surveyed 20 ponds and confirmed presence of great crested newts in 15 of them, as well as confirming six as breeding ponds.

1.1.5 As part of the licence mitigation provisions four new ponds, designated as N1, N2, N3 and N4, have been created to the west of the central cluster of ponds. As such the total number of ponds initially scoped into this monitoring scheme is 39 individual ponds or pond complexes. However, due to changing hydrology of the land and the period of time since the last monitoring effort, the number or size of certain ponds have changed and this is discussed below.

1.1.6 The purpose of this survey work is to update the existing dataset on the status of the great crested newt population in the area and to inform the requirements for future mitigation and management.

2. Methodology

2.1 Introduction

2.1.1 The survey area is shown on Figures 1.1 – 1.3, which detail the location of the ponds. The location of the hibernacula and refugia is shown on Figure 2.1.

2.2 Habitat Suitability Index Assessment

2.2.1 The great crested newt is a habitat specialist and its presence in a given water-body is influenced by the presence of particular features such as fish, heavy shading or nearby suitable terrestrial habitat. The HSI assessment process provides a numerical value (ranging from 0 to 1) that indicates the suitability of a water body for supporting great crested newts. The higher the HSI score, the more suitable (or closer to optimum habitat conditions) the waterbody may be considered for great crested newts. However, it should be noted that the HSI score should be verified by an experienced surveyor and a low suitability score does not necessarily mean that great crested newt will not be present.

2.2.2 All ponds were assessed for their potential to support great crested newts using the HSI assessment methodology (Oldham *et al*., 2000).

2.3 Pond Condition and Terrestrial Habitat Assessment

2.3.1 A pond condition and terrestrial habitat assessment were carried out for all ponds to be monitored as outlined in the project scope. Pond condition was assessed in regards to the presence of invasive species, silt levels and evidence of pollution incidence, fire or damage, in order to give a broader assessment of the condition of each of the ponds.

2.3.2 Pond condition was scored into four categories; 'poor', 'fair', 'good' and 'excellent'. The scores were based on criteria set out below in Table 1. The detailed matrix used to assess each pond is provided in Appendix 2.

Table 1: Criteria for Pond Condition Score

Pond Condition Score			
Poor	Fair	Good	Excellent
- If non-native invasive species are present, pond condition is considered poor. - If non-native invasive species are absent but silt levels are high and dumped rubbish is present, then pond condition is considered poor.	- Non-native invasive species are absent. - High silt levels but dumped rubbish is absent, or - Moderate silt levels but dumped rubbish is present.	- Non-native invasive species are absent. - Moderate silt levels and dumped rubbish is absent, or - Low silt levels but some dumped rubbish is present.	- Non-native invasive species and dumped rubbish are absent. - Silt levels are low.

2.4 Hibernacula Suitability Assessment

2.4.1 As part of the mitigation works, 40 hibernacula have been built in several locations across the survey area. These hibernacula comprise purpose built log piles of around 2 m long, 1 m wide and 1 m tall, held within wooden posts and wire. These provide suitable terrestrial refugia potential for reptiles, great crested newts, other amphibians and fauna.

2.4.2 The hibernacula were assessed due to their importance in providing a stable environment for shelter and overwintering. Assessment was based on criteria such as size, distance to body of water and composition. As with the HSI, this assessment provides a numerical value (ranging from 0 to 1) that indicates the suitability of each hibernaculum in relation to great crested newts and other amphibians alike. The higher the assessment score, the more suitable (or closer to optimum conditions/features) the hibernaculum may be considered for target species. Details of the scoring system is presented in Appendix 3.

2.5 eDNA Sampling

2.5.1 Pond 10 was surveyed using eDNA sampling to provide a indication of whether great crested newts were present or absent from the water bodies, based on the presence of their DNA within the water.

2.5.2 Water samples were taken in accordance with methodology approved by Natural England (Biggs *et al*., 2014). All samples were taken using sterile equipment provided by SureScreen Scientifics. Twenty water samples were taken from regularly distributed sample points around each water body, these were then mixed together and from this six samples were taken to be sent for analysis. In accordance with the guidance, samples were kept cool prior to being sent to SureScreen Scientifics, who carry out the laboratory analysis of the sampled.

2.5.3 Biosecurity measures were followed to prevent contamination, including avoiding entering the waterbody when taking samples, washing boots with bleach solution prior to attending site, wearing gloves and using only the sterile kit provided by the laboratory.

2.6 Great Crested Newt Population Estimates

2.6.1 Great crested newt surveys of the 38 ponds (those that able to be surveyed) on site were undertaken following methodologies described in the Great Crested Newt Mitigation Guidelines (English Nature, 2001). In accordance with best practice guidelines, to determine presence of the species each pond was visited four times with at least three visits occurring between mid-April and mid-May with air temperatures greater than 5°C. If presence of great crested newt was confirmed, an additional two surveys were undertaken to calculate population.

2.6.2 Surveys used a combination of techniques appropriate to the site conditions at the time of survey. Techniques used included; trapping with bottle traps, torchlight searches, egg searches and terrestrial search. The survey techniques used varied between water bodies and visits, with at least three techniques employed on each visit.

2.6.3 Ponds with no great crested newts recorded after four visits were scoped out of further surveys. This is in line with Natural England's acceptable level of surveying effort for great crested newt detection which indicates that after four visits with no recorded GCN it is considered likely that the species is absent.

Bottle Trapping

2.6.4 The number of bottle traps placed in each pond was based upon how many traps could fit into a pond at 2 m intervals to ensure consistency in survey effort. Traps were deployed in bunches of fives to minimise the risk of leaving traps in the water through miscounting. The number of traps used in each survey visit is provided in Appendix 4.

2.6.5 Bottles were left in place overnight, and checked the following morning before the air temperature became too warm or before 11:00 am. Any animals found in the bottle traps were recorded and then immediately released. For any animals found, where possible the species, gender and an assessment of age was recorded.

2.6.6 As part of the standard survey protocols, biosecurity measures were taken to prevent the possible spread of disease. Boots were washed with Virkon solution between different groups of ponds in the same night. This was to prevent the spread of chytrid fungus (*Batrachochytrium dendrobatidis*), a known fungal disease harmful to amphibians. Virkon deactivates quickly in the environment once activated and is an industry recognised bio-control measure.

Torchlight Survey

2.6.7 Torch surveys were completed using 1 million candle power Cluson Clu-Light torches were conducted in the shallow water around the perimeters of each pond during full darkness. A systematic approach was followed to ensure full coverage of the ponds. Records of observations were made onto field survey data forms.

Hand Search

2.6.8 Surveyors undertook a hand search of aquatic vegetation to determine presence of great crested newt eggs. Searches were undertaken during the bottle trapping process and were conducted systematically around the pond to ensure all sections of suitable vegetation were searched. Searches were undertaken for a minimum of ten minutes per pond by two surveyors or until the presence of eggs was confirmed. Once great crested newt egg presence was confirmed in a pond, no further egg searches were conducted, in order to minimise disturbance to any laid eggs.

2.6.9 Terrestrial searches were also undertaken which involved carefully searching the margins of the ponds as well as natural and artificial hibernacula present around the ponds.

2.6.10 Surveys were undertaken under the appropriate Natural England great crested newt licence and were led by consultant ecologist Russell Goodchild (class licence registration number: 2016-19897-CLS-CLS).

2.6.11 Survey dates and weather conditions are provided in Table 2 below. Pond locations were provided by the client and are shown in Figure 1.

Table 1: Conditions for GCN surveys during bottle trap deployment

Visit No.	Pond Number	Date	General weather conditions
1	2,3,4,5,6,30,31	10th – 11th April 2017	Temp – 8°C Cloud – 25% Wind – 0 Rain – 0
	1(19), 9, 11, 14, 16, 18 (a, b), 20, and 21	12th – 13th April 2017	Temp – 5°C Cloud – 40% Wind – 2 Rain – 0
	8, 24 (a, b, c, d, e), 25, 26, 27, 28, N1, N2, and N3	19th – 20th April 2017	Temp – 8°C Cloud – 80% Wind – 0 Rain – 0
	23 (a,b,c), 32 and 33	20th – 21st April 2017	Temp – 8°C Cloud – 80% Wind - 0 Rain – 0
2	14, 15, 16, 20 and 21	20th – 21st April 2017	Temp – 8°C Cloud – 80% Wind – 0 Rain – 0
	1,2,3,4,5,6,9,11,18a,18b, 19,30 and 31	2nd – 3rd May 2017	Temp – 11°C Cloud – 50% Wind – nil Rain – nil
	8, 23 (abc), 24 (a, b, c, d), 25, 26, 27 (a, b, c, d, e), 28, 32, 33, N1, N2 and N3	3rd – 4th May 2017	Temp – 12°C Cloud – 100% Wind – nil Rain – nil
3	14, 15, 16,20 and 21	3rd – 4th May 2017	Temp – 12°C Cloud – 100% Wind – nil Rain – nil
	1 (19), 2, 3, 4, 5, 6, 8, 11, 18 (a, b), 23, 24 (a, b, c, d, e), 25, 26, 27 (a, b, c, d, e), 28, 30, 31, 32, N1, N2 and N3	10th – 11th May 2017	Temp – 17°C Cloud – 0% Wind – nil Rain – nil
4	14, 15, 16, 20 and 21	11th – 12th May 2017	Temp – 12°C Cloud – 100% Wind – nil Rain – recent
	8, 23, 24a, 24b, 24d, 24e, 25,26, 27a-e, 28, 32, 33, N1, N2, N3	17th – 18th May 2017	Temp – 14°C Cloud – 100% Wind – nil

Visit No.	Pond Number	Date	General weather conditions
			Rain – recent
	1, 2, 3, 4, 5, 6, 9, 11, 18 (a,b), 19, 30 and 31	18th – 19th May 2017	Temp – 12°C Cloud – 20% Wind – nil Rain – nil
5	8, 14, 15, 16, 20, 21, 23, 24a, 25, 26, 27b, 28, 32	30th – 31st May 2017	Temp – 14°C Cloud – 10 % Wind – nil Rain – nil
	2, 3, 4, 5, 6, 11, 30, 31, N1, N2, N3	31st May – 1st June 2017	Temp – 16°C Cloud – 80% Wind – nil Rain – nil
6	2, 3, 4, 5, 6, 11, 23, 30, 31, 32	14th – 15th June 2017	Temp – 24°C Cloud – 10% Wind – 1 Rain – 0
	8, 24a, 25, 26, 27b, 82, N1, N2, N3	15th – 16th June 2017	Temp – 12°C Cloud – 40% Wind – 1 Rain – nil

2.7 Survey Limitations

2.7.1 As documented in previous reports, the hydrology of the land is unstable. It was found that several ponds for the 2017 surveys had dried up since the previous survey and other which has now merged together to form one single waterbody. The following ponds included in previous year's surveys were recorded as being totally dry; 7, 13, 13a, 15, 22, 29, 33, 34 and N4.

2.7.2 Additionally, some ponds had altered shape, or even increased in size, to various degrees since the previous surveys. Bottle trap numbers were adjusted accordingly where significant changes had occurred. Where changes in the hydrology resulted in ponds becoming unsuitable for bottle trapping, netting or terrestrial searches were employed as an alternative third survey technique.

2.7.3 Pond 19 is not considered to be a separate water body, as it is directly linked to Pond 1. Therefore, Pond 19 was subject to great crested newt surveys as part of Pond 1.

2.7.4 Ponds 23 a, b & c are no longer three separate ponds and have merged to form one large pond. Pond 23 was therefore subject to great crested newt surveys as a single water body. This reduced the total number of separate ponds surveyed from 44 to 42.

2.7.5 Pond 17 is recorded as a flowing ditch. It is connected to pond 23's southern extent for approximately three meters and then flows away over a public footpath. It was therefore not subject to eDNA assessment and was considered as a whole with pond 23 during the other survey elements.

2.7.6 Pond 29 (a run-off lagoon) has dried up since the industrial works that fed the pond have ceased. This has now been filled in was not considered suitable to support great crested newt. This pond was therefore excluded from the assessment and was not subject to an eDNA assessment as initially proposed. A letter from the current landowner is appended to this report.

2.7.7 All surveys were conducted where the overnight forecast was greater than 5°C in the interest of animal welfare. This lead to movement of survey dates in some instances.

2.7.8 A single bottle trap was unknowingly removed from both pond 14 during the first survey round and pond 28 during the second survey round. In both cases the cane was left behind and just the bottle taken. The missing bottles were searched for but were deemed to have been removed from the site.

2.7.9 In order to make deployment and collection more manageable and as agreed with Alistair Chapman, Sustainability Team Leader at FDDC, the traps, bottles and canes, were left on site throughout the duration of the survey period.

2.7.10 Several incidences of vandalism took place, including; the burning of 30 traps near pond 5, 15 traps in a tied black plastic sack being thrown into pond 2, and canes being stolen several times. This did not affect great crested newt welfare or the survey effort as the items were no deployed at the time, and spare canes and traps were brought onto site to replace losses. Alistair Chapman was informed of these incidences.

2.7.11 Only ten purpose built refugia to the mitigation specifications (see Section 2.3) were recorded on site during the assessment. It considered likely that the missing 30 refugia have been disassembled and removed off.

3. Results and Evaluation

3.1 Habitat Suitability Index

3.1.1 HSI assessments were carried out on all ponds. Table 3 shows a simplified view of what individual ponds scored, with detailed information presented in Appendix 1.

Table 3: Overview of Pond Habitat Suitability Index

Condition	Pond No.	No. ponds
Poor	1 & 19, 7, 10, 12, 18a, 18b, 32 and 34	8
Below Average	13, 24b, 24c, 24e, 27d, 27e, 28 and 33	8
Average	2, 11, 15, 24d and 30	5
Good	4, 9, 14, 25, 27a, 27b and 31	7
Excellent	3, 5, 6, 8, 16, 20, 21, 23abc, 24a, 26, 27c, N1, N2 and N3	14

3.1.2 Of the 42 ponds 21 were scored as being good or excellent and 16 as below average or poor.

3.2 Pond Condition Assessment

3.2.1 The pond condition assessment graded all suitable ponds (those that aren't dry) as 'fair' condition or above. The summary of the results are shown in Table 4 below and the complete pond condition assessment is presented in Appendix 2.

Table 4: Results of Pond Condition Assessment

Condition	Pond No.	No. ponds
Poor		0
Fair	1 (and 19), 2, 6, 18a, 18b, 21, 23a, 23b, 23c, 24d and 32	11
Good	3, 4, 5, 11, 13, 15, 16, 17, 25, 27b, 27c, 27d, 27e, 30, 31, 33, N1, N2 and N3	19
Excellent	8, 9, 10, 12, 14, 20, 24a, 24b, 24c, 24e, 26, 27a and 28	13

3.2.2 The results show that no ponds on site are considered to be in 'poor' condition, and that the majority are considered to be in 'good' to 'excellent' condition.

3.2.3 This reflects the general well kept nature of the majority of the site, with few incidences of littering and no presence of non-native invasive species of plant.

3.3 Hibernacula Condition Assessment

3.3.1 Of the 40 purpose built hibernacula only ten remain on site, the others apparently dismantled and removed from site. The summary results of assessment are shown on table 5 below with the detailed assessment presented in Appendix 3.

Table 5: Results of Hibernacula Suitability Assessment

Condition	Refugia No.	No. refugia
Poor		0
Fair	MP2, MP6, MP7, MP8, MP9, MP10	6
Good	MP4	1
Excellent	MP1, MP3, MP5	3

3.3.2 The results indicate that the majority of the hibernacula offer potential based on the assessment criteria but that almost all have some negative features associated with them limiting their overall score. The reasons are generally associated with a single negative score such as the habitat connectivity, proximity to water or evidence of damage.

3.4 Great Crested Newt Presence/Absence Survey

3.4.1 Of the 42 ponds surveyed presence of great crested newt was confirmed in 21, half of the total number of ponds surveyed. The results are shown in Table 6.

Table 6. Great crested newt presence/absence survey results

Pond Number	GCN Found? (Y/N)	Eggs Found? (Y/N)	Peak Count (Method)
1	N	N	N/A
2	Y	N	1 (Torch)
3	Y	N	1 (Bottle)
4	Y	N	2 (Bottle & Torch)
5	Y	N	5 (Bottle)
6	Y	N	55 (Bottle)
7	N	N	N/A
8	Y	N	27 (Bottle)
9	N	N	N/A
10	N	N	N/A
11	Y	N	5 (Torch)
12	N	N	N/A
13	N	N	N/A
13a	N	N	N/A
14	N	N	N/A
15	N	N	N/A
16	Y	N	6 (Bottle & Torch)
17	N	N	N/A
18a	N	N	N/A
18b	N	N	N/A
19	N	N	N/A
20	N	N	N/A
21	Y	N	6 (Bottle)
22	N	N	N/A
23a, b & c	Y	Y	5 (Torch)
24	Y	N	2 (Bottle & Torch)
25	Y	Y	5 (Bottle)
26	Y	N	6 (Torch)
27a	N	N	N/A
27b	Y	N	1 (Bottle)
27c	N	N	N/A
28	Y	N	2 (Bottle & Torch)
29	N	N	N/A
30	Y	N	5 (Torch)
31	Y	N	3 (Bottle & Torch)
32	Y	N	1 (Bottle & Torch)
33	N	N	N/A
34	N	N	N/A
N1	Y	Y	9 (Bottle)
N2	Y	N	9 (Bottle)

Pond Number	GCN Found? (Y/N)	Eggs Found? (Y/N)	Peak Count (Method)
N3	Y	Y	9 (Bottle)
N4	N	N	N/A

3.5 eDNA Sampling

3.5.1 The analysis if the eDNA sample taken from Pond 10, carried out by SureScreen Scientifics was returned with a negative result (report provided in Appendix 5). This indicates that great crested newt eDNA was not detected or was below the threshold detection levels, and as such the results are considered as no evidence of GCN presence. Pond 10 is a large pond currently stocked for fishing (which is generally considered unsuitable for supporting GCN), and therefore this result is consistent with the initial assessment of habitat suitability made for the pond.

3.6 Additional Species Recorded

3.6.1 Incidences of smooth newt (*Lissotriton vulgaris*), palmate newt (*L. helveticus*), common frog (*Rana temporaria*) and common toad (*Bufo bufo*) were recorded in the majority of the ponds. A juvenile European eel (*Anguilla anguilla*) was recorded in a bottle trap in pond 25.

3.6.2 Many of the ponds had fish species present, including three-spined stickleback (*Gasterosteus aculeatus*) in various ponds throughout the site and a perch species (*Perca spp*) in ponds 18a and 18b.

3.6.3 Throughout the site a diverse suite of aquatic invertebrates were present within the pond including various species of diving beetle and dragonfly larvae.

4. Assessment and Recommendations

4.1 Legislation

4.1.1 Great crested newts are a European Protected Species and as such receive protection under The Conservation of Habitats and Species Regulations 2010 and the Wildlife and Countryside Act 1981 (as amended). It is illegal to kill, injure, capture, handle or disturb them, and the places they use for breeding, resting, shelter and protection are protected from being damaged or destroyed. Great crested newts are a Species of Principal Importance under Section 41 of the NERC Act 2006.

4.1.2 Smooth newt, palmate newt, common frog and common toad are included in Section 9(5) of the Wildlife and Countryside Act 1981 (as amended) which prohibits sale, barter, exchange, transporting for sale and advertising to sell or to buy these species. Common toad is also a Species of Principal Importance under Section 41 of the NERC Act 2006.

4.2 Great Crested Newt Population Assessment

4.2.1 The CNQ continues to support a good population of great crested newt (JNCC, 1998) with numbers relatively comparable to previous surveys undertaken. It does however appear that concentrations of the population are favouring certain ponds in difference to previous year results. Most notably is pond 6 which had a peak count of 55 great crested newts in 2017 compared to just two in 2015. This contrasted with pond 34 which in 2015 recorded a peak count of 23 great crested newt individuals with none recorded in 2017, similar to pond 31 which had 16 in 2015 and 3 in 2017.

4.2.2 The entire site also supports populations of smooth newts, palmate newts, common frog and common toad. Additionally European eel is confirmed on site.

4.3 Pond and Habitat Condition Assessment

4.3.1 Of the 42 ponds assessed using the recognised HSI, 21 were scored as being ‘good’ or ‘excellent’, five as ‘average’ and 16 as ‘below average’ or ‘poor’.

4.3.2 The project specific pond condition assessment produced no scores for ‘poor’ although six, forming a majority, scored as ‘fair’. One was scored as ‘good’ and three as ‘excellent’. This reflects the relatively tidy nature of the site with few incidences of rubbish tipping or contamination.

4.4 Compensatory Provision for GCN Assessment

4.4.1 Three of the new ponds created on site, N1, N2, and N3, had low populations of great crested newts in them. Given the relatively recent construction of these ponds and that it is considered they still need to develop a strong flora and invertebrate fauna association these can be considered as effective in their design. It is considered that some positive intervention management would be beneficial to these ponds as discussed below. Pond N4 has, as stated above, totally drained out and is considered ineffective.

4.5 Hibernacula Condition Assessment

4.5.1 None of the ten purpose built hibernacula included within this assessment are considered to be in poor condition, with the majority considered to be in fair condition.

4.5.2 The eastern half of the site that runs adjacent to A4151 contains at least 50 wind row / brash piles left as part of habitat management. These will also function as refugia for a variety of species including great crested newts.

4.6 Recommendations

4.6.1 It is considered that the following suggested recommendations would benefit great crested newts on site as well as other species of amphibians and reptiles.

Re-establishment and maintenance of ponds N4 and 34

4.6.2 N4 will likely need additional clay lining to block the failure in its water proofing. Pond 34 has likely dried out due to the shifting hydrology of the site. The vegetation within it is of terrestrial species and therefore suggests has been dry for some time and unlikely to be wetted naturally unless there is another hydrological shift on site. Digging out an additional 0.5 m would increase the likelihood of this pond becoming permanently wet again.

4.6.3 Ponds not filled with water, such as N4 and 34, do not necessarily constitute a detrimental feature for wildlife. They provide damp hollows which serve as another habitat for the area. Therefore, repair work which would improve the ponds for great crested newts may not be necessary to make the ponds suitable for other wildlife. Additionally, with the shifting hydrology of the site they may become wet in the future; this kind of shifting water levels is useful in preventing large populations of fish becoming established.

Removing the fish species from ponds

4.6.4 Fish, including three-spined stickleback, are known to predate the eggs and larvae of great crested newts. Therefore removing fish from the ponds would potentially increase the survival rate of newt eggs and larvae and have the positive impact of increasing over time the amount of breeding adults.

4.6.5 Ponds that would benefit from this include ponds 2, 3, 5, 27c and 30. Ponds 1 & 19, 18a and 18b all had fish, notably perch which is often introduced to waterways by anglers, but are next to Steam Mills Lake (pond 10), which is a coarse fishing pond. It is considered that removing the fish stock from these would not have a lasting positive impact as they are likely to be restocked by anglers. Pond 12 is the managed Meadowcliffe fishing lake and is stocked with coarse fish.

4.6.6 The most efficient method for removing fish from ponds is likely to be through electrofishing. This, to be effective, would likely have to be repeated over a number of years, due to the hardy nature of stickleback and their eggs. This method of management would not guarantee that fish would not return, while it would also carry the risk, albeit a low one, of harming any overwintering efts.

Brash Piles

4.6.7 It is recommended increasing the size of some of the existing brash piles as well as increasing the number of them on site. This is considered preferential to replacing the purpose built hibernacula as they are prone to theft, and the dismantlement of each one, particularly in the winter, risks death and injury to amphibians and reptiles, including great crested newt.

4.6.8 Areas to concentrate improving and increasing brash piles would ideally be those between ponds that have high populations of great crested newts and those that have low populations or do not have any at all but with the suitability to support them. This would help encourage the newts to move into areas they are currently not in. Examples of good locations include:

- Between ponds 2, 3, 4, 5 and 6;
- Between ponds 16 and 21, concentrated to the woodland south of pond 12 (course fishing pond);
- Between the cluster of ponds 22, 23a, 23b, 23c, 32 and 33;
- Between the cluster of ponds 8, 24, 25, 26, 27a, 27b, 27c and 28; and
- Between ponds N1, N2 and N3.

Pond De-vegetation

4.6.9 Partial de-vegetation of aquatic flora will improve several ponds for great crested newts and other amphibians, increasing breeding display areas which are an important component of the life cycle and a key requirement for the species. This could be achieved over the winter months with equipment such as 'lake rakes' that enable rapid de-vegetation of ponds and water bodies without the used having to enter the water. Ponds that would benefit the most from this include ponds 24a and 25.

Pond Shading

4.6.10 Thinning of trees around ponds in heavily wooded areas as this would allow light through to the ponds, increasing the presence of aquatic flora. This in turn would also stimulate plant growth at the ground level, improving foraging habitat for a variety of animals including great crested newts and other amphibians and reptiles.

Aquatic Plant Introduction

4.6.11 Planting of suitable aquatic flora within several ponds to increase egg laying opportunities and day time cover for great crested newts and other amphibians. Species could include pondweed (*Potamogeton spp*) and bulrush (*Typha spp*). These examples can be quite invasive in small pond situations and so care should be taken as to ensure an appropriate planting scheme to the size of the pond. For smaller ponds it maybe more appropriate to use species such as marsh marigold (*Caltha palustris*), lesser spearwort (*Ranunculus flammula*), water plantain (*Alisma plantago-aquatica*) or water forget-me-not (*Myosotis scorpiodes*) which are generally less invasive but still provide opportunities for use by great crested newt. Ponds that would benefit from this include ponds 5, 30 and 31 and N1, N2 and N3.

4.6.12 The plants listed above are found within the Cinderford northern quarter and translocation of these species to un-vegetated ponds from local ponds would

limit the incidences of introducing undesirable invasive species.

Pollution Incidences

4.6.13 A reporting mechanism for pollution and tipping incidences, as well as general site and pond conditions. The appointment of a site inspector to periodically inspect the entirety of the site and to report on any degradation to the habitats there.

5. References

Biggs, J., Ewald, N., Valentini, A., Gaboriaud, C., Griffiths, R.A., Foster, J., Wilkinson, J., Arnett, A., Williams, P. and Dunn, F. (2014). *Analytical and methodological development for improved surveillance of the Great Crested Newt. Appendix 5. Technical advice note for field and laboratory sampling of great crested newt (Triturus cristatus) environmental DNA*. Freshwater Habitats Trust, Oxford.

Ecus (2015) *Cinderford Northern Quarter – Great Crested Newt Pond Surveys*. A report to Homes and Communities Agency (HCA). June 2015.

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

JNCC (1998) *Guidelines for the Selection of Biological SSSI's*, JNCC, Peterborough

John Associates (2013) *7294: Northern Quarter – Great Crested Newt Survey Methods*. John Associates Ltd

Oldham, R.S; Keeble, J; Swan, M.J.S. and Jeffcote, M. (2000) *Evaluating the suitability of habitat for the great crested newt* (*Triturus cristatus*). Herpetological Journal. 10: 143-155.

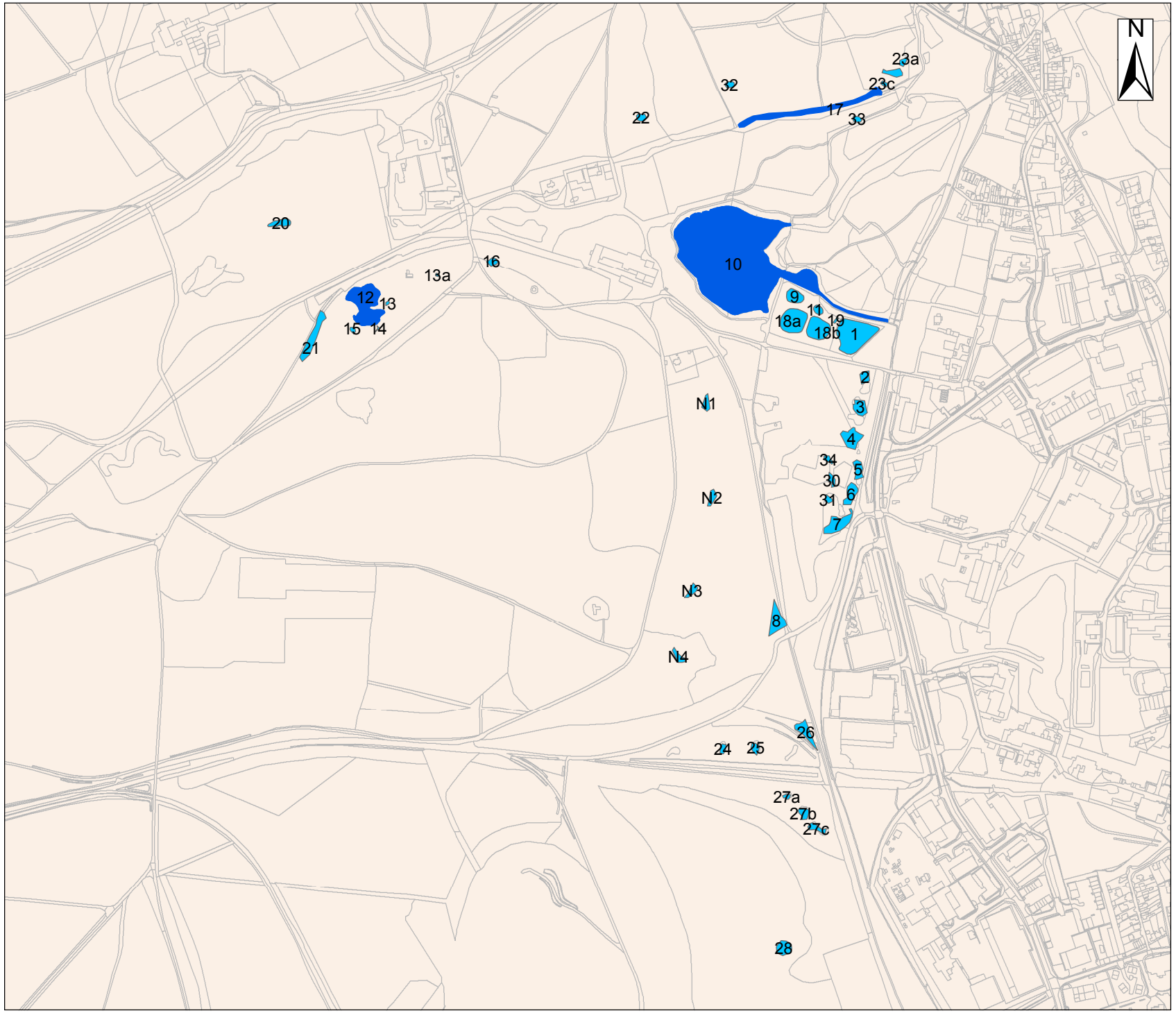
Figure 1.1. – Pond Location Plan

Figure 1.2 – Pond Location Plan – Northern Section

Figure 1.3 – Pond Location Plan – Southern Section

Figure 2.1 – Confirmed Great Crested Newt Ponds Location Plan

Figure 3.1 – Hibernacula and Refugia Location Plan



ecus
ENVIRONMENTAL CONSULTANTS

Legend

- Location of monitoring ponds
- Location of other waterbodies

0 250 500
Meters

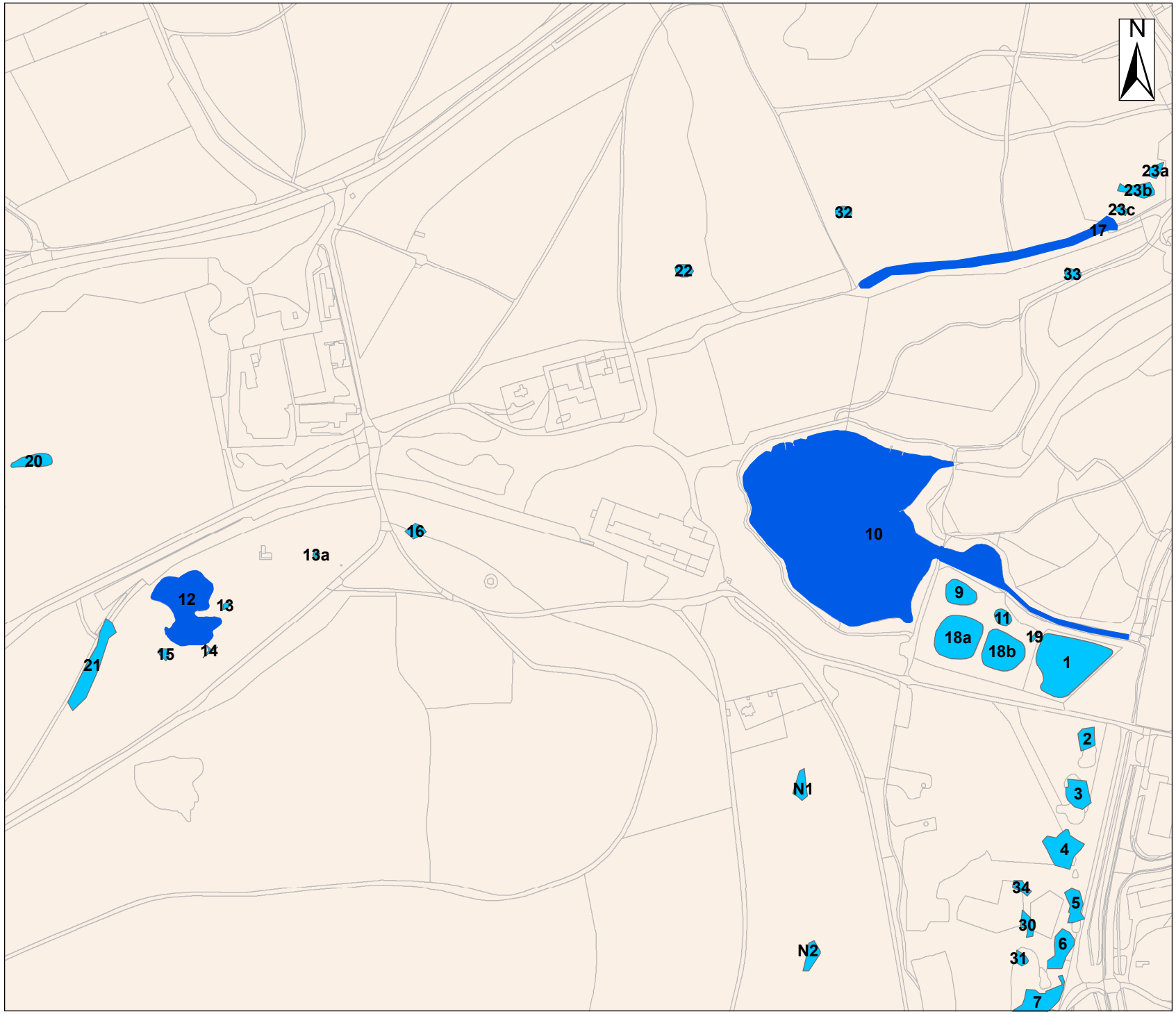
Forest of Dean District Council

Cinderford Northern Quarter Great Crested Newt Monitoring Assessment

Figure 1.1
Pond Location Plan

Brook Holt 3 Blackburn Road Sheffield S61 2DW
T: 0114 2669292 www.ecusltd.co.uk

Date: July 2017 | Scale: 1:9,000 @A4 | Drg.Ref: CP/9269/1.1



ecus
ENVIRONMENTAL CONSULTANTS

Legend

- Location of monitoring ponds
- Location of other waterbodies

0 130 260
Meters

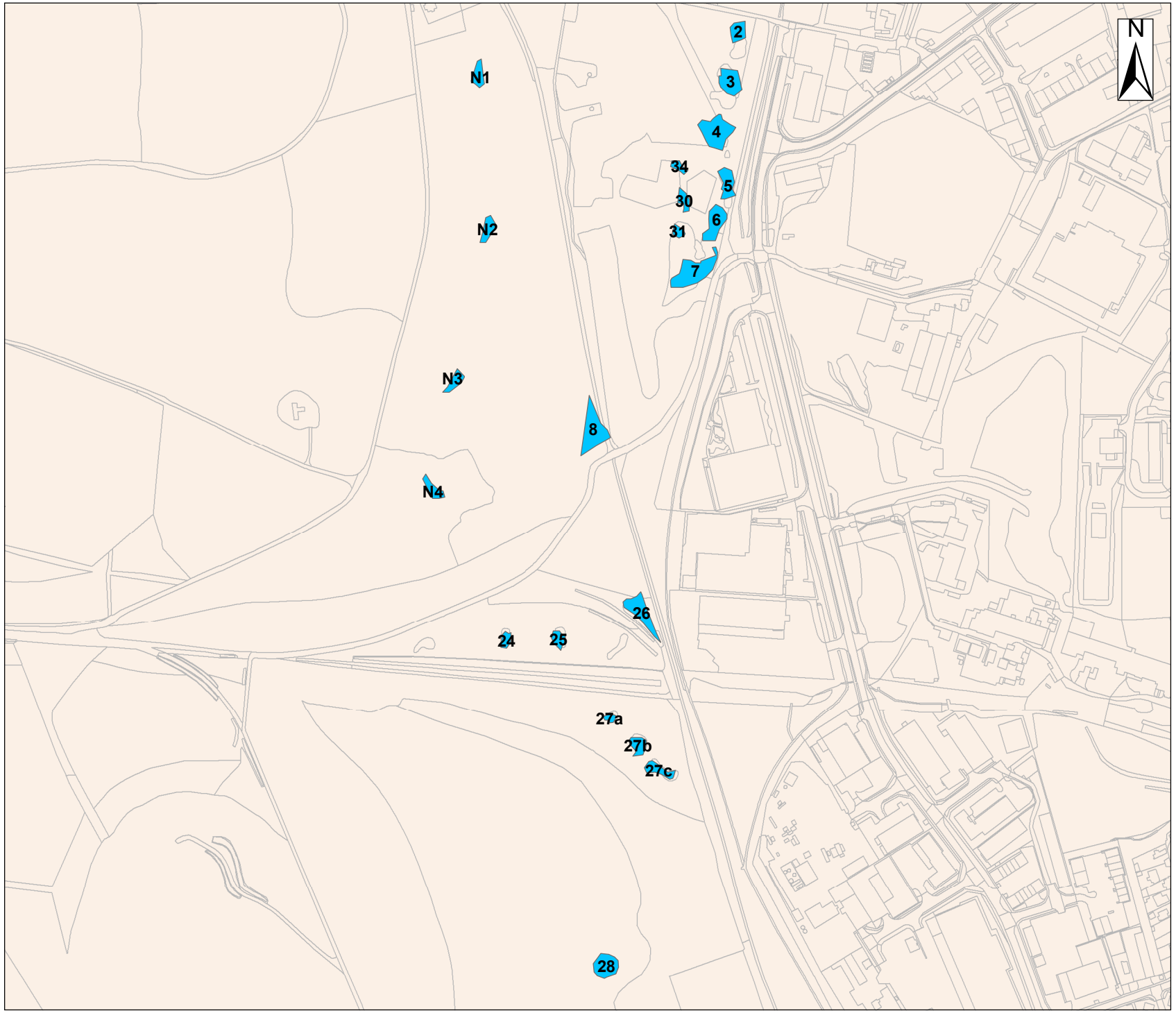
Forest of Dean District Council

Cinderford Northern Quarter Great Crested Newt Monitoring Assessment

Figure 1.2
Pond Location Plan- Northern Section

Brook Holt 3 Blackburn Road Sheffield S61 2DW
T: 0114 2669292 www.ecusltd.co.uk

Date: July 2017 | Scale: 1:5,000 @A4 | Drg.Ref: CP/9269/1.2



ecus
ENVIRONMENTAL CONSULTANTS

Legend

- Location of monitoring ponds
- Location of other waterbodies

0 150 300
Meters

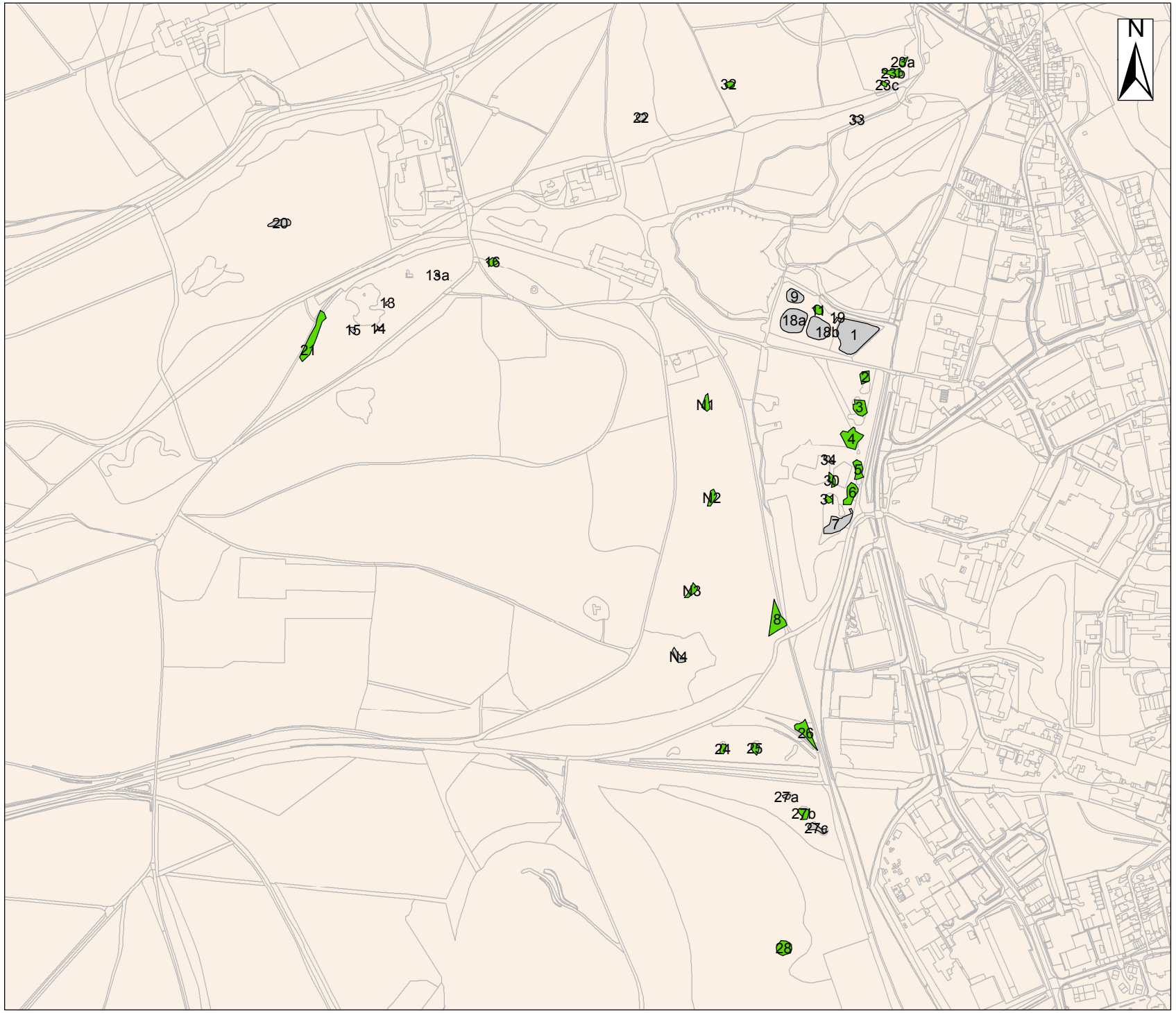
Forest of Dean District Council

Cinderford Northern Quarter Great Crested Newt Monitoring Assessment

Figure 1.3
Pond Location Plan- Southern section

Brook Holt 3 Blackburn Road Sheffield S61 2DW
T: 0114 2669292 www.ecusltd.co.uk

Date: July 2017 | Scale: 1:5,500 @A4 | Drg.Ref: CP/9269/1.3



ENVIRONMENTAL CONSULTANTS

Legend

- Ponds with confirmed GCN
- Ponds without confirmed GCN

0 250 500

Meters

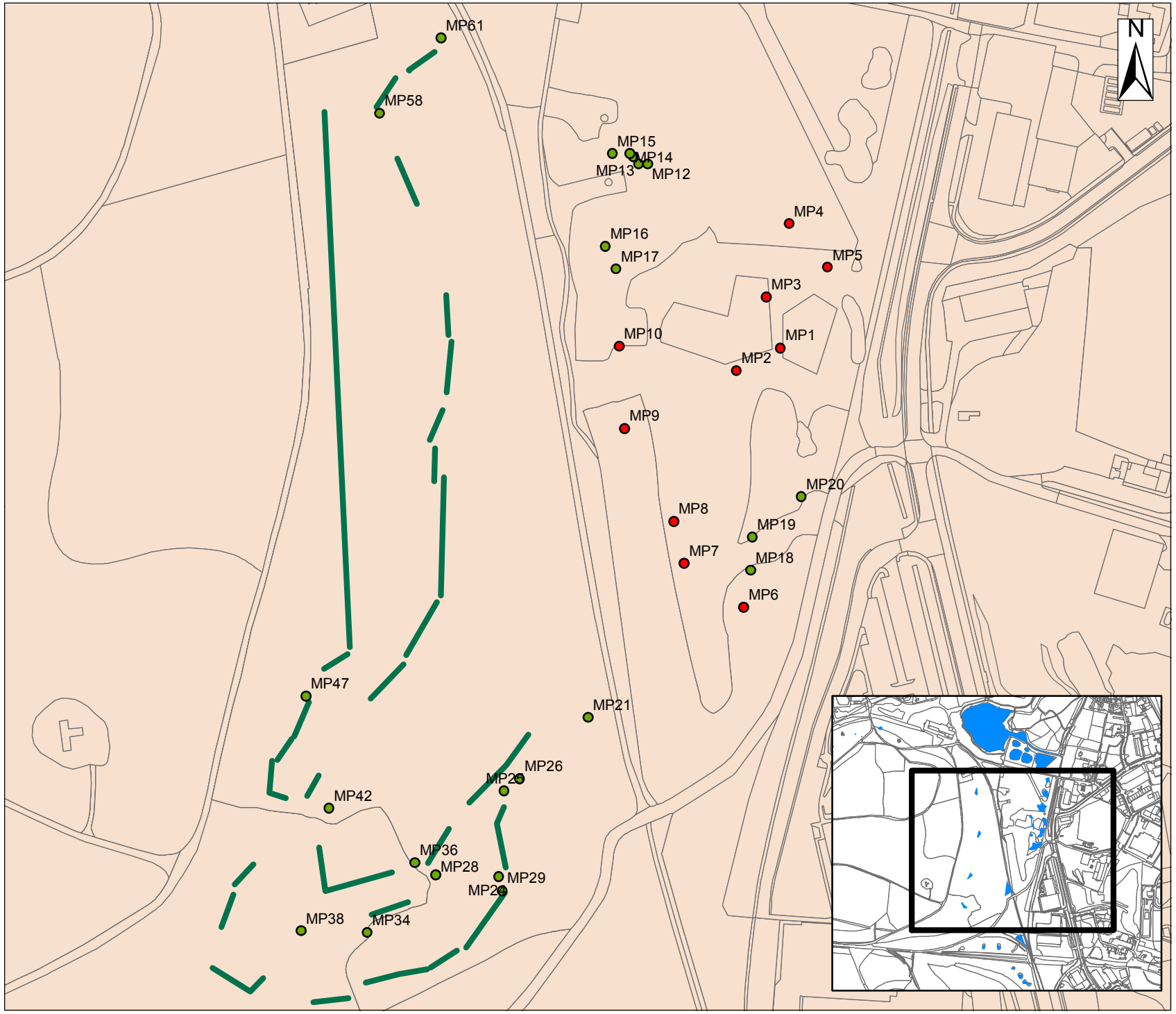
Forest of Dean District Council

Cinderford Northern Quarter Great Crested Newt Monitoring Assessment

Figure 2.1
Confirmed Great Crested Newt Ponds Location Plan

Brook Holt 3 Blackburn Road Sheffield S61 2DW
T: 0114 2669292 www.ecusltd.co.uk

Date: December 2017 | Scale: 1:9,000 @A4 | Drg.Ref: RY/9269/2.1



ecus
ENVIRONMENTAL CONSULTANTS

Legend

- Hibernacula
- Logpile
- Windrow location

0 80 160
Meters

Forest of Dean District Council

Cinderford Northern Quarter Great Crested Newt Monitoring Assessment

Figure 3.1
Hibernacula and Refugia Location Plan

Brook Holt 3 Blackburn Road Sheffield S61 2DW
T: 0114 2669292 www.ecusltd.co.uk

Date: July 2017 | Scale: 1:3,000 @A4 | Drg.Ref: CP/9269/3.1

Appendix 1. HSI Assessment Table

Waterbody	Individual Habitat Feature Assessment											Prediction (Likelihood of GCN)
	Location	Area (sq. m)	Pond Permanence	Water Quality	Shade	Waterfowl	Fish	Pond Density	Terrestrial Habitat Quality	Macrophyte Cover	Final HSI Score	
P1	1	0.85	0.9	0.67	1	0.33	0.33	0.6	0.67	0.4	0.62	Average
P2	1	0.8	0.9	1	1	0.67	0.01	1	0.67	1	0.56	Below Average
3	1	0.925	0.9	1	0.9	0.67	0.33	1	1	1	0.84	Excellent
4	1	0.2	0.9	1	0.7	0.67	1	1	1	1	0.78	Good
5	1	1	0.9	1	1	0.67	0.33	1	1	0.9	0.84	Excellent
6	1	0.955	0.9	1	1	0.67	1	1	1	1	0.95	Excellent
7	1	0.05	0.1	0.01	1	1	1	1	1	0.8	0.36	Poor
8	1	0.97	0.5	1	0.6	0.67	1	1	1	1	0.85	Excellent
9	1	0.6	0.9	1	1	0.67	1	1	0.33	0.4	0.74	Good
11	1	0.1	0.9	0.67	1	0.67	1	1	0.33	0.8	0.64	Average
10	1	0.8	0.9	1	1	0.01	0.01	1	0.67	0.35	0.33	Poor
12	1	0.8	0.9	0.67	1	0.01	0.01	1	1	0.45	0.34	Poor
13	1	0.05	0.1	0.67	1	1	1	1	1	1	0.57	Below Average
14	1	0.1	0.5	0.67	1	1	1	1	1	1	0.71	Good
15	1	0.05	0.5	0.67	1	1	1	1	1	0.85	0.65	Average
16	1	0.6	0.9	0.67	1	1	1	1	1	0.95	0.90	Excellent
18a	1	0.97	0.9	0.33	1	0.67	0.67	1	0.01	0.3	0.46	Poor
18b	1	0.97	0.9	0.33	1	0.67	0.67	1	0.01	0.3	0.46	Poor
20	1	0.3	1	1	1	0.67	1	1	0.67	1	0.82	Excellent
21	1	1	0.9	0.67	0.9	0.67	1	1	1	1	0.90	Excellent
23abc	1	0.8	0.9	0.67	0.8	0.67	1	1	1	0.6	0.83	Excellent
24a	1	0.4	1	0.67	1	0.67	1	1	1	0.8	0.82	Excellent
24b	1	0.05	0.1	1	1	1	1	1	1	0.85	0.58	Below Average
24c	1	0.05	0.1	0.67	1	1	1	1	1	0.8	0.55	Below Average
24d	1	0.3	0.1	0.67	1	0.67	1	1	1	0.5	0.61	Average
24e	1	0.05	0.1	1	1	1	1	1	1	0.85	0.58	Below Average
25	1	0.4	1	0.67	1	0.67	0.33	1	1	1	0.75	Good
26	1	1	0.5	1	1	0.67	1	1	1	1	0.90	Excellent
27a	1	0.2	0.5	0.67	1	1	1	1	1	0.85	0.75	Good
27b	1	0.8	0.5	0.67	1	0.67	0.67	1	1	0.7	0.78	Good
27c	1	0.6	0.5	0.67	1	0.67	1	1	1	1	0.82	Excellent

Waterbody	Individual Habitat Feature Assessment											Prediction (Likelihood of GCN)
	Location	Area (sq. m)	Pond Permanence	Water Quality	Shade	Waterfowl	Fish	Pond Density	Terrestrial Habitat Quality	Macrophyte Cover	Final HSI Score	
27d	1	0.05	0.1	0.67	1	1	1	1	1	0.6	0.54	Below Average
27e	1	0.05	0.1	0.67	1	1	1	1	1	0.85	0.56	Below Average
28	1	0.4	0.1	0.67	0.3	1	1	1	1	0.6	0.59	Below Average
30	1	0.1	0.9	1	0.6	0.67	1	1	1	0.3	0.64	Average
31	1	0.2	0.9	1	1	0.67	1	1	1	0.45	0.75	Good
32	1	0.05	0.1	0.01	0.2	1	1	1	0.67	0.3	0.27	Poor
33	1	0.05	0.5	0.67	0.3	1	1	1	1	1	0.59	Below Average
34	1	0.05	0.1	0.01	1	1	1	1	1	0.8	0.36	Poor
N1	1	0.6	0.9	0.67	1	1	1	1	1	0.45	0.83	Excellent
N2	1	0.6	0.9	0.67	1	1	1	1	1	0.45	0.83	Excellent
N3	1	0.6	0.9	0.67	1	1	1	1	1	0.5	0.84	Excellent

Appendix 2. Pond Condition Methods and Assessment Report

All possible combinations of the pond condition criteria outcomes and the corresponding pond condition score				
Pond Condition Score	**Pond Condition Criteria**			
	Invasive species	**Major damage**	**Silt levels**	**Dumped rubbish**
Poor	Present	Absent	Low	Present
Poor	Present	Absent	Low	Absent
Poor	Present	Absent	Moderate	Present
Poor	Present	Absent	Moderate	Absent
Poor	Present	Absent	High	Present
Poor	Present	Absent	High	Absent
Poor	Absent	Present	Low	Present
Poor	Absent	Present	Low	Absent
Poor	Absent	Present	Moderate	Present
Poor	Absent	Present	Moderate	Absent
Poor	Absent	Present	High	Present
Poor	Absent	Present	High	Absent
Poor	Present	Present	Low	Present
Poor	Present	Present	Low	Absent
Poor	Present	Present	Moderate	Present
Poor	Present	Present	Moderate	Absent
Poor	Present	Present	High	Present
Poor	Present	Present	High	Absent
Poor	Absent	Absent	High	Present
Fair	Absent	Absent	High	Absent
Fair	Absent	Absent	Moderate	Present
Good	Absent	Absent	Moderate	Absent
Good	Absent	Absent	Low	Present
Excellent	Absent	Absent	Low	Absent

Pond	Pond Description	Photo	Pond Condition Assessment Criteria	Score per Index	Total HSI score and overall pond condition score
1 & 19	Grid reference: Pond 1: SO 64515 15221 Pond 19: SO 64493 15282 Pond 1 and Pond 19 are located within a cluster of ponds (new ponds to the east and more mature ponds to the south), Pond 1 is approximately 60m x 50m and over 1m deep. Pond 19 is a short stretch of channel lying immediately to the northwest of Pond 1. Pond 19 is not considered to be a separate water body in its own right, as it is directly linked to Pond 1. Spawning media noted including water mint. Other aquatic species included bulrush and water horsetail. Significant populations of coarse fish were noted representing predatory pressure on GCN. Terrestrial habitats available nearby are woodland and semi-natural grasslands with a good number of refuges available.	Pond 1  Pond 19 	Location	1	Total HSI Score: 0.47 Poor suitability with fair pond condition
			Pond area	0.8	
			Pond drying	0.9	
			Water quality	1	
			Shade	0.2	
			Fowl	0.67	
			Fish	0.01	
			Pond count	1	
			Terrestrial habitat	1	
			Macrophytes	0.6	
			Invasive species	Absent	
			Major damage	Absent	
			Silt levels	Moderate	
			Dumped rubbish	Present – 3 large tyres	
2	Grid reference: SO 64535 15182 Northern-most pond within a linear cluster of ponds (located to the west of Forest Vale Road). Pond 2 is approximately 20m x 30m and over 1m deep. Plants present were water horsetail, bulrush, water mint, bog bean, sweet grass and yellow iris. A small stickleback population present represents a small predatory pressure on GCN in this pond. Grassland and woodland provides excellent terrestrial habitat throughout with abundant refugia present.	 	Location	1	Total HSI Score: 0.69 Average suitability with fair pond condition
			Pond area	0.4	
			Pond drying	0.9	
			Water quality	1	
			Shade	0.8	
			Fowl	0.67	
			Fish	0.33	
			Pond count	1	
			Terrestrial habitat	1	
			Macrophytes	0.4	
			Invasive species	Absent	
			Major damage	Absent	
			Silt levels	Moderate	
			Dumped rubbish	Present – general litter	

ecus
ENVIRONMENTAL CONSULTANTS
Brook Holt 3 Blackburn Road Sheffield S61 2DW
T: 0114 2669292 www.ecusltd.co.uk

3	Grid reference: SO 64537 15150 Part of a cluster of ponds to the west of Forest Vale Road. Pond 3 is approximately 30m x 50m and over 1m deep. Abundant bulrush was noted along with bogbean, water mint, and water horsetail, bog pondweed, and yellow iris. Abundant stickleback were noted representing a significant predatory pressure on GCN populations. Grassland and woodland provides excellent terrestrial habitat throughout with abundant refugia present.	 	Location	1	Total HSI Score: 0.84 Excellent suitability with good pond condition
			Pond area	0.93	
			Pond drying	0.9	
			Water quality	1	
			Shade	0.9	
			Fowl	0.67	
			Fish	0.33	
			Pond count	1	
			Terrestrial habitat	1	
			Macrophytes	1	
			Invasive species	Absent	
			Major damage	Absent	
			Silt levels	Moderate	
			Dumped rubbish	Absent	
4	Grid reference: SO 64536 15076 Pond 4 is a part of a cluster of ponds to the west of Forest Vale Road. Pond 4 is approximately 100m² and 0.5 - 1m deep and is made up of three small sections that all connect. Abundant bog pondweed and Glyceria present as egg laying media. Other species present are water horsetail, bulrush, soft rush and a submerged grass species. Grassland and woodland provides excellent terrestrial habitat throughout with abundant refugia present.	 	Location	1	Total HSI Score: 0.78 Good suitability with good pond condition
			Pond area	0.2	
			Pond drying	0.9	
			Water quality	1	
			Shade	0.7	
			Fowl	0.67	
			Fish	1	
			Pond count	1	
			Terrestrial habitat	1	
			Macrophytes	1	
			Invasive species	Absent	
			Major damage	Absent	
			Silt levels	Moderate	
			Dumped rubbish	Absent	

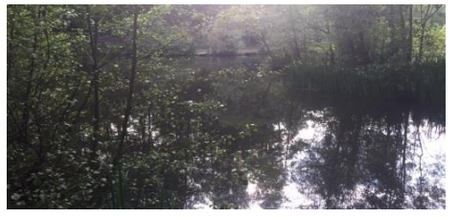
ecus
ENVIRONMENTAL CONSULTANTS
Brook Holt 3 Blackburn Road Sheffield S61 2DW
T: 0114 2669292 www.ecusltd.co.uk

5	Grid reference: SO 64529 15020 Part of a cluster of ponds to the west of Forest Vale Road. Pond 5 is made up of two sections, a small section and a large section, and is approximately 10m x 20m in size and over 1m deep. Macrophyte populations were sparse but the species recorded were water horsetail, bulrush, *Glyceria* sp., water mint and marginal soft rush. Overhanging trees surround this pond and provide shade and dead leaves. Some of the aquatic vegetation and the dead leaves provide some potential for egg laying. Very clear water. Grassland and woodland provides excellent terrestrial habitat throughout with abundant refugia present.	 	Location	1	Total HSI Score: 0.84 Excellent suitability with good pond condition
			Pond area	1	
			Pond drying	0.9	
			Water quality	1	
			Shade	1	
			Fowl	0.67	
			Fish	0.33	
			Pond count	1	
			Terrestrial habitat	1	
			Macrophytes	0.9	
			Invasive species	Absent	
			Major damage	Absent	
			Silt levels	Moderate	
			Dumped rubbish	Absent	
6	Grid reference: SO 64523 14975 This is the largest pond of a cluster of ponds to the west of Forest Vale Road. Pond 6 was previously recorded as approximately 70m x 50m in size but it is now approximately 30m x 20m in size. It is over 1m deep with very clear water and abundant macrophytes. Water mint and *Glyceria* sp. were readily available as spawning media. Other species recorded were water lily, bulrush, soft rush and water horsetail. Grassland and woodland provides excellent terrestrial habitat throughout with abundant refugia present.	 	Location	1	Total HSI Score: 0.95 Excellent suitability with fair pond condition
			Pond area	0.96	
			Pond drying	0.9	
			Water quality	1	
			Shade	1	
			Fowl	0.67	
			Fish	1	
			Pond count	1	
			Terrestrial habitat	1	
			Macrophytes	1	
			Invasive species	Absent	
			Major damage	Absent	
			Silt levels	Moderate	
			Dumped rubbish	Present – general litter	

7	Grid reference: SO 64490 14892 This is the most southerly of the cluster of ponds to the west of Forest Vale Road. The pond 7 basin is approximately 20m x 20m In size. In 2013, this pond was recorded as being 0.3m deep in water after heavy rainfall and then dried up for all subsequent visits. In 2017, it was dry throughout all survey visits. Grassland and woodland provides excellent terrestrial habitat throughout with abundant refugia present.	 	Location	1	Unsuitable for HSI - Dry
			Pond area	N/A	
			Pond drying	0.1	
			Water quality	N/A	
			Shade	1	
			Fowl	1	
			Fish	1	
			Pond count	1	
			Terrestrial habitat	1	
			Macrophytes	0.8	
			Invasive species	Absent	
			Major damage	Absent	
			Silt levels	N/A	
			Dumped rubbish	Absent	
8	Grid reference: SO 64393 14797 Approximately 80m to the southwest of the cluster of ponds lying to the west of Forest Vale Road. This pond is approximately 35m x 25m in size and up to 0.5m deep in places. Abundant *Glyceria sp.* and leaves were present providing egg laying media throughout. Water levels in this pond were noted to change frequently as the pond had significantly dried up after four weeks of the initial visit and then later water levels rose after a period of heavy rainfall. Species recorded were bulrush, soft rush, water horsetail and sweet grass.	04/04/17   05/05/17 	Location	1	Total HSI Score: 0.85 Excellent suitability with excellent pond condition
			Pond area	0.97	
			Pond drying	0.5	
			Water quality	1	
			Shade	0.6	
			Fowl	0.67	
			Fish	1	
			Pond count	1	
			Terrestrial habitat	1	
			Macrophytes	1	
			Invasive species	Absent	
			Major damage	Absent	
			Silt levels	Low	
			Dumped rubbish	Absent	

ecus
ENVIRONMENTAL CONSULTANTS
Brook Holt 3 Blackburn Road Sheffield S61 2DW
T: 0114 2669292 www.ecusltd.co.uk

9	Grid reference: SO 64410 15323 Located within a cluster of five ponds in the east of the Northern Quarter, Pond 9 measures approximately 35m x 30m with a maximum depth of 1m. Pond 9 has been newly-created (estimated in the last 5-10 years). Areas of open water are present, with some stands of *Glyceria* sp. available as potential spawning vegetation. Brent geese were observed at this pond in 2013, and Canada geese were observed in nearby ponds in 2017, which represents a predatory pressure on any amphibian species. A coot nest was recorded in the abundant bulrush. The pond is surrounded by suitable terrestrial habitat, including rough grassland and woodland, with refugia also available nearby. As previously mentioned in the 2013 report, there is an area adjacent to the pond that comprises of bare soil, with no cover for migrating amphibians, however it is no longer immediately adjacent to this pond.	 	Location	1	Total HSI Score: 0.74 Good suitability with excellent pond condition
			Pond area	0.6	
			Pond drying	0.9	
			Water quality	1	
			Shade	1	
			Fowl	0.67	
			Fish	1	
			Pond count	1	
			Terrestrial habitat	0.33	
			Macrophytes	0.4	
			Invasive species	Absent	
			Major damage	Absent	
			Silt levels	Low	
			Dumped rubbish	Absent	
10	Grid reference: SO 64365 15315 Pond 10 is a very large fishing pond, measuring approximately 22,000m² in size, that is frequently used by a privately owned angling club. Pond 10 is vast, open and very deep. There is very minimal marginal vegetation and the edges of the pond are steep. A number of fishing platforms are located around the edge of the pond. Species noted were water lily, yellow iris, and soft rush, none of which are suitable as spawning media. Lots of fowl,including Canada geese and gulls, were noted. The presence of a large stock of fish, as well as fowl, poses a large predatory threat on amphibians and their eggs, indicating that this pond is unsuitable.	 	Location	1	Unsuitable for great crested newts – Fishing pond Total HSI Score: 0.33 Poor suitability with excellent pond condition
			Pond area	0.8	
			Pond drying	0.9	
			Water quality	1	
			Shade	1	
			Fowl	0.01	
			Fish	0.01	
			Pond count	1	
			Terrestrial habitat	0.67	
			Macrophytes	0.35	
			Invasive species	Absent	
			Major damage	Absent	
			Silt levels	Low	
			Dumped rubbish	Absent	

11	Grid reference: SO 64462 15299 Located in the same cluster as Pond 9, Pond 11 is also recently-created, but is slightly smaller, with a maximum depth of approximately 0.5m. Areas of open water are present, with some limited *Glyceria* sp. available as potential spawning vegetation. Bulrush is abundant and there is marginal soft rush. Evidence of waterfowl was observed around the margins of the pond. Suitable terrestrial habitat is available around Pond 11, comprising rough grassland and woodland, with refugia and hibernacula also present. As previously mentioned in the 2013 report, there is an area adjacent to the pond that comprises of bare soil, with no cover for migrating amphibians, however it is no longer immediately adjacent to this pond.	 	Location	1	Total HSI Score: 0.64 Average suitability with good pond condition
			Pond area	0.1	
			Pond drying	0.9	
			Water quality	0.67	
			Shade	1	
			Fowl	0.67	
			Fish	1	
			Pond count	1	
			Terrestrial habitat	0.33	
			Macrophytes	0.8	
			Invasive species	Absent	
			Major damage	Absent	
			Silt levels	Moderate	
			Dumped rubbish	Absent	
12	Grid reference: SO 63732 15294 Pond 12 is located south-west of the former Northern United colliery and comprises a small lake surrounded by a small cluster of 4 ponds. It measures approximately 45m in width and 70m in length, with a maximum depth of over 1m. The surface area of the water body is dominated by open water, with very little aquatic vegetation which could be used for egg-laying. Species noted were yellow iris, water mint, willow herbs, and marginal grasses and sedges. Suitable terrestrial habitat is present around the pond, comprising woodland, with refugia and hibernacula also noted. The lake is managed for angling and supports a number of fishing platforms.	 	Location	1	Unsuitable for great crested newts – Fishing pond Total HSI Score: 0.34 Poor suitability with excellent pond condition
			Pond area	0.8	
			Pond drying	0.9	
			Water quality	0.67	
			Shade	1	
			Fowl	0.01	
			Fish	0.01	
			Pond count	1	
			Terrestrial habitat	1	
			Macrophytes	0.45	
			Invasive species	Absent	
			Major damage	Absent	
			Silt levels	Low	
			Dumped rubbish	Absent	

13	Grid reference: SO 63744 15322 Pond 13 is part of a cluster of 4 ponds to the south west of the former Northern United colliery. Pond 13 has significantly dried and shrunk in size since last report. Most of the pond is dry and largely grassed over and has a boggy margin with less than 5cm depth of water. Vegetation noted was soft rush and *Lemna* sp. Aquatic vegetation within the pond is dominated by *Glyceria* sp., which provides good opportunities for egg laying. This pond is shaded on all sides by adjacent trees. The surrounding terrestrial habitat is good, comprising woodland, scattered shrub and bracken, with numerous refugia and hibernacula.	 	Location	1	Total HSI Score: 0.57 Below average suitability with good pond condition
			Pond area	0.05	
			Pond drying	0.1	
			Water quality	0.67	
			Shade	1	
			Fowl	1	
			Fish	1	
			Pond count	1	
			Terrestrial habitat	1	
			Macrophytes	1	
			Invasive species	Absent	
			Major damage	Absent	
			Silt levels	Moderate	
			Dumped rubbish	Absent	
13a	Grid reference: SO 63811 15384 Located to the east of ponds 12, 13 and 14, pond 13a is approximately 3m x 5m in size. However, as previously mentioned could be possible, its small size has meant that the pond is dry on the 2017 visit. Some possible aquatic species were noted.		Location	1	Unsuitable for HSI - Dry
			Pond area	N/A	
			Pond drying	0.5	
			Water quality	N/A	
			Shade	1	
			Fowl	N/A	
			Fish	N/A	
			Pond count	1	
			Terrestrial habitat	1	
			Macrophytes	N/A	
			Invasive species	Absent	
			Major damage	Absent	
			Silt levels	N/A	
			Dumped rubbish	Present	

14	Grid reference: SO 63762 15290 Pond 14 is part of the cluster of 4 ponds to the south west of the former Northern United colliery. It is irregular in shape, with a maximum depth of 1m. There is a very small amount of Lemna sp. on the few existing areas of water. The surface of the pond is almost completely covered by *Glyceria* sp., which provides a suitable substrate for egg laying. Many of the macrophytes are encroaching non-aquatic species , such as rushes and grasses. The surrounding terrestrial habitat comprises woodland. There was no evidence of fish or waterfowl at this pond.	 	Location	1	Total HSI Score: 0.71 Good suitability with excellent pond condition
			Pond area	0.1	
			Pond drying	0.5	
			Water quality	0.67	
			Shade	1	
			Fowl	1	
			Fish	1	
			Pond count	1	
			Terrestrial habitat	1	
			Macrophytes	1	
			Invasive species	Absent	
			Major damage	Absent	
			Silt levels	Low	
			Dumped rubbish	Present	
15	Grid reference: SO 63691 15264 Pond 15 is part of the cluster of 4 ponds to the south west of the former Northern United colliery. Since the last report, the size of the pond has reduced from approximately 20m x 20m to 7m x 7m. The water level in the pond has reduced since the last report as the water depth is no longer suitable for bottle trapping. There is only a small area of open water unlike previously suggested, with woody debris (fallen trees) also noted. *Glyceria* sp. is present in discreet stands within the pond. The surrounding terrestrial habitat comprises woodland.		Location	1	Total HSI Score: 0.65 Average suitability with good pond condition
			Pond area	0.05	
			Pond drying	0.5	
			Water quality	0.67	
			Shade	1	
			Fowl	1	
			Fish	1	
			Pond count	1	
			Terrestrial habitat	1	
			Macrophytes	0.85	
			Invasive species	Absent	
			Major damage	Absent	
			Silt levels	Moderate	
			Dumped rubbish	Absent	

ecus
ENVIRONMENTAL CONSULTANTS
Brook Holt 3 Blackburn Road Sheffield S61 2DW
T: 0114 2669292 www.ecusltd.co.uk

<table>
<tr>
<td>16</td>
<td>Grid reference: SO 63811 15384

Pond 16 is located within mixed woodland, and is approximately 25m x 15m in size with a maximum depth of 2m (estimated). Some potential egg laying vegetation is present, (fallen leaves and very limited Glyceria sp.), with areas of open water also noted. Adjacent terrestrial habitat comprises woodland, grassland and scrub, which is suitable for great crested newts. There was no evidence of fish or waterfowl in this pond at the time of survey.</td>
<td> 
  </td>
<td>Location</td><td>1</td>
<td rowspan="12">Total HSI Score: 0.90

Excellent suitability

with

good pond condition</td>
</tr>
<tr><td></td><td></td><td></td><td>Pond area</td><td>0.6</td></tr>
<tr><td></td><td></td><td></td><td>Pond drying</td><td>0.9</td></tr>
<tr><td></td><td></td><td></td><td>Water quality</td><td>0.67</td></tr>
<tr><td></td><td></td><td></td><td>Shade</td><td>1</td></tr>
<tr><td></td><td></td><td></td><td>Fowl</td><td>1</td></tr>
<tr><td></td><td></td><td></td><td>Fish</td><td>1</td></tr>
<tr><td></td><td></td><td></td><td>Pond count</td><td>1</td></tr>
<tr><td></td><td></td><td></td><td>Terrestrial habitat</td><td>1</td></tr>
<tr><td></td><td></td><td></td><td>Macrophytes</td><td>0.95</td></tr>
<tr><td></td><td></td><td></td><td>Invasive species</td><td>Absent</td></tr>
<tr><td></td><td></td><td></td><td>Major damage</td><td>Absent</td></tr>
<tr><td></td><td></td><td></td><td>Silt levels</td><td>Moderate</td></tr>
<tr><td></td><td></td><td></td><td>Dumped rubbish</td><td>Absent</td></tr>
<tr>
<td>17</td>
<td>Grid reference: SO 64526 15625

Pond 17 is a long thin stream that runs parallel to the path in the Hawkwell Inclosure. At the time of the visit, the stream was mostly dry apart from one section , indicating that the condition of this stream is influenced by the weather. Species noted were yellow iris and soft rush. There was no aquatic vegetation that would be suitable for egg laying. However, there were dead leaves in the stream that provide some potential as egg laying media. As there is running water in this stream, it was deemed unsuitable for great crested newts.</td>
<td> 
  </td>
<td>Location</td><td>1</td>
<td rowspan="12">Unsuitable for great crested newts – Running stream

Total HSI Score: 0.61

Average suitability

with

good pond condition</td>
</tr>
<tr><td></td><td></td><td></td><td>Pond area</td><td>0.1</td></tr>
<tr><td></td><td></td><td></td><td>Pond drying</td><td>0.5</td></tr>
<tr><td></td><td></td><td></td><td>Water quality</td><td>0.67</td></tr>
<tr><td></td><td></td><td></td><td>Shade</td><td>0.2</td></tr>
<tr><td></td><td></td><td></td><td>Fowl</td><td>1</td></tr>
<tr><td></td><td></td><td></td><td>Fish</td><td>1</td></tr>
<tr><td></td><td></td><td></td><td>Pond count</td><td>1</td></tr>
<tr><td></td><td></td><td></td><td>Terrestrial habitat</td><td>1</td></tr>
<tr><td></td><td></td><td></td><td>Macrophytes</td><td>1</td></tr>
<tr><td></td><td></td><td></td><td>Invasive species</td><td>Absent</td></tr>
<tr><td></td><td></td><td></td><td>Major damage</td><td>Absent</td></tr>
<tr><td></td><td></td><td></td><td>Silt levels</td><td>Moderate</td></tr>
<tr><td></td><td></td><td></td><td>Dumped rubbish</td><td>Absent</td></tr>
</table>

18a	Grid reference: SO 64475 15247 Ponds 18a and 18b are within a cluster of 5 ponds in the east of the Northern Quarter site. These newly-created ponds lie adjacent to each other, and measure approximately 30m x 30m with a maximum depth of 0.5-1m. Areas of open water are present in both ponds, with a limited abundance of aquatic macrophytes for egg laying (small areas of *Glyceria* sp. noted). Adjacent ponds are used for angling, and Ponds 18a and 18b have evidence of use by waterfowl. At least two Canada geese were present throughout the 2017 surveys. Abundant geese excrement surrounded the pond particularly on the embankment between the two ponds. Surrounding terrestrial habitat is suitable for great crested newt, comprising woodland and rough grassland. However, the area immediately adjacent to the pond comprises bare soil, with no cover for migrating amphibians. It was noted that there was litter deposited next to pond 18b, on the side closest to the road.	 	Location	1	Total HSI Score: 0.46 Poor suitability with fair pond condition
			Pond area	0.97	
			Pond drying	0.9	
			Water quality	0.33	
			Shade	1	
			Fowl	0.67	
			Fish	0.67	
			Pond count	1	
			Terrestrial habitat	0.01	
			Macrophytes	0.3	
			Invasive species	Absent	
			Major damage	Absent	
			Silt levels	Moderate	
			Dumped rubbish	Present - general litter	
18b		 	Location	1	Total HSI Score: 0.46 Poor suitability with fair pond condition
			Pond area	0.97	
			Pond drying	0.9	
			Water quality	0.33	
			Shade	1	
			Fowl	0.67	
			Fish	0.67	
			Pond count	1	
			Terrestrial habitat	0.01	
			Macrophytes	0.3	
			Invasive species	Absent	
			Major damage	Absent	
			Silt levels	Moderate	
			Dumped rubbish	Present – general litter	

ecus
ENVIRONMENTAL CONSULTANTS
Brook Holt 3 Blackburn Road Sheffield S61 2DW
T: 0114 2669292 www.ecusltd.co.uk

20	Grid reference: SO 63543 15446 Since the last report Pond 20 has substantially reduced in size from approximately 90m x 15m, with a maximum depth greater than 1m, to 15m x 8m with a maximum depth of 25cm.60% of the pond margin was subject to poaching by deer, and there was evidence of waterfowl using the pond. Macrophytes cover most of the pond, with soft rush (*Juncus effusus*) covering approximately 50% of the pond. The pond is located within woodland. No suitable aquatic vegetation was identified for egg-laying purposes. The previous report confirmed with Peter Kelsall of the Forestry Commission that this pond had been created on a restored opencast site and holds acidic water.	  	Location	1	Total HSI Score: 0.82 Excellent suitability with excellent pond condition
			Pond area	0.3	
			Pond drying	1	
			Water quality	1	
			Shade	1	
			Fowl	0.67	
			Fish	1	
			Pond count	1	
			Terrestrial habitat	0.67	
			Macrophytes	1	
			Invasive species	Absent	
			Major damage	Absent	
			Silt levels	Low	
			Dumped rubbish	Absent	
21	Grid reference: SO 63594 15248 Pond 21 appears to have established along the line of a former tramway and lies to the west of a cluster of ponds (comprised of ponds 12, 13, 14 & 15). Pond 21 is approximately 50m x 15m and about 1m deep. Beds of abundant *Glyceria* sp. and bog pondweed provide abundant spawning potential in this pond. Open water is clear and terrestrial vegetation comprising area of grassland and open woodland provide abundant refuge potential. A fishing net was found in the pond so it was removed from the pond to prevent it from harming any wildlife. There is also the remains of an old vehicle nearby to the pond but it is not affecting the pond.	  	Location	1	Total HSI Score: 0.9 Excellent suitability with fair pond condition
			Pond area	1	
			Pond drying	0.9	
			Water quality	0.67	
			Shade	0.9	
			Fowl	0.67	
			Fish	1	
			Pond count	1	
			Terrestrial habitat	1	
			Macrophytes	1	
			Invasive species	Absent	
			Major damage	Absent	
			Silt levels	Moderate	
			Dumped rubbish	Present	

ecus
ENVIRONMENTAL CONSULTANTS
Brook Holt 3 Blackburn Road Sheffield S61 2DW
T: 0114 2669292 www.ecusltd.co.uk

22	Grid reference: N/A The area in the south of the Hawkwell Inclosure was searched for ponds with the description given from the previous report. The pond was not found and was assumed to be dried up as there were a few ditches that had similar descriptions. If there was water present in the pond, spawning would be limited to the use of dead leaves. Nearby ancient oak woodland provides ample refuge and foraging potential.	No photograph	Location	1	Unsuitable for HSI - Dry
			Pond area	N/A	
			Pond drying	N/A	
			Water quality	N/A	
			Shade	N/A	
			Fowl	1	
			Fish	1	
			Pond count	1	
			Terrestrial habitat	1	
			Macrophytes	N/A	
			Invasive species	N/A	
			Major damage	N/A	
			Silt levels	N/A	
			Dumped rubbish	N/A	
23a, 23b & 23c	Grid reference: SO 64630 15702 This pond comprised a single large area of water (approximately 80m x 40m) when first identified in April 2017, but the water levels were found to reduce towards the end of the survey period. The pond did not shrink to form three separate ponds as in previous years, however, it was noted that there was substantial variation in pond levels across the whole pond. Aquatic vegetation was limited and most of the macrophytes present were marginal, such as soft rush, encroaching grass species and water mint. A large proportion of the pond extended back into the woodland, which meant that trees were both within the pond and overhanging the much of the pond. The dead leaves from the trees provide some potential as egg laying media. The surrounding terrestrial habitat comprises of woodland, scrub and lots of deadwood, which provides ample refuge and foraging potential.	 	Location	1	Total HSI Score: 0.83 Excellent suitability with fair pond condition
			Pond area	0.8	
			Pond drying	0.9	
			Water quality	0.67	
			Shade	0.8	
			Fowl	0.67	
			Fish	1	
			Pond count	1	
			Terrestrial habitat	1	
			Macrophytes	0.6	
			Invasive species	Absent	
			Major damage	Absent	
			Silt levels	Moderate	
			Dumped rubbish	Present – some litter in wooded area	

ecus
ENVIRONMENTAL CONSULTANTS
Brook Holt 3 Blackburn Road Sheffield S61 2DW
T: 0114 2669292 www.ecusltd.co.uk

24a	Grid reference: SO 64298 14549 Pond 24 a was previously pond 24 but as new ponds have arisen close by, new pond numbers were allocated. This is a recently excavated pond within Laymoor Quag noted as 'a stronghold for great crested newts'. Pond 24a is approximately 10m x 30m in size and between 0.5m to 1m deep. Abundant bog pondweed provides spawning potential. Soft rush and water horsetail were also noted. The bog pondweed covers the whole of the pond, which meant that visibility through the water column was low/moderate. Tussocky grassland and nearby woodland provide abundant foraging potential and many log piles in the area provide good refuges for newts.	No photograph	Location	1	Total HSI Score: 0.82 Excellent suitability with excellent pond condition
			Pond area	0.4	
			Pond drying	1	
			Water quality	0.67	
			Shade	1	
			Fowl	0.67	
			Fish	1	
			Pond count	1	
			Terrestrial habitat	1	
			Macrophytes	0.8	
			Invasive species	Absent	
			Major damage	Absent	
			Silt levels	Low	
			Dumped rubbish	Absent	
24b	Grid reference: SO 64282 14550 Pond 24b is a newly formed pond located to the west of pond 24a, which has most likely formed due to the changing hydrology. Pond 24b measures less than 5m x 5m in size and is less than 25cm in depth. Vegetation includes: grass species, *Glyceria* sp., a buttercup species and rushes.	 	Location	1	Total HSI Score: 0.58 Below average suitability with excellent pond condition
			Pond area	0.05	
			Pond drying	0.1	
			Water quality	1	
			Shade	1	
			Fowl	1	
			Fish	1	
			Pond count	1	
			Terrestrial habitat	1	
			Macrophytes	0.85	
			Invasive species	Absent	
			Major damage	Absent	
			Silt levels	Low	
			Dumped rubbish	Absent	

24c	Grid reference: SO 64266 14551 Pond 24c is a newly formed pond located to the west of pond 24a and 24b, which has most likely formed due to the changing hydrology. Pond 24c measures less than 5m x 10m in size and is less than 25cm in depth. Vegetation includes: grass species, bog pondweed and soft rush.		Location	1	Total HSI Score: 0.55 Below average suitability with excellent pond condition
			Pond area	0.05	
			Pond drying	0.1	
			Water quality	0.67	
			Shade	1	
			Fowl	1	
			Fish	1	
			Pond count	1	
			Terrestrial habitat	1	
			Macrophytes	0.8	
			Invasive species	Absent	
			Major damage	Absent	
			Silt levels	Low	
			Dumped rubbish	Absent	
24d	Grid reference: SO 64239 14550 Pond 24d is a newly formed pond located to the far west of pond 24a, 24b and 24c. It was noted that there was a pipe leading to this pond, so it is likely that this pond was formed from runoff water exiting this pipe. Pond 24d measures approximately 10m x 15m in size and is approximately 0.5m in depth. Aquatic vegetation was very limited to a small section of bog pondweed. Most of the vegetation was marginal rush and grass species. Algae was present on the surface of the water, which suggests the water is high in nutrients (potentially from the runoff by nearby agricultural fields).	 	Location	1	Total HSI Score: 0.61 Average suitability with fair pond condition
			Pond area	0.3	
			Pond drying	0.1	
			Water quality	0.67	
			Shade	1	
			Fowl	0.67	
			Fish	1	
			Pond count	1	
			Terrestrial habitat	1	
			Macrophytes	0.5	
			Invasive species	Absent	
			Major damage	Absent	
			Silt levels	High	
			Dumped rubbish	Absent	

ecus
ENVIRONMENTAL CONSULTANTS
Brook Holt 3 Blackburn Road Sheffield S61 2DW
T: 0114 2669292 www.ecusltd.co.uk

24e	Grid reference: SO 64291 14561 Pond 24e is a newly formed pond located north of pond 24a and 24b, which has most likely formed due to the changing hydrology. Pond 24e measures less than 5m x 5m in size and is less than 25cm in depth. Vegetation includes: soft rush, *Glyceria* sp. and buttercup species.		Location	1	Total HSI Score: 0.58 Below average suitability with excellent pond condition
			Pond area	0.05	
			Pond drying	0.1	
			Water quality	1	
			Shade	1	
			Fowl	1	
			Fish	1	
			Pond count	1	
			Terrestrial habitat	1	
			Macrophytes	0.85	
			Invasive species	Absent	
			Major damage	Absent	
			Silt levels	Low	
			Dumped rubbish	Absent	
25	Grid reference: SO 64357 14548 As with pond 24a, this is a recently excavated pond within Laymoor Quag noted as 'a stronghold for great crested newts'. Pond 25 has been excavated to the same dimensions as pond 24a and is approximately 10m x 30m in size and between 0.5m to 1m deep. Abundant bog pondweed provides spawning potential. Soft rush and bulrush were also noted. Unlike pond 24a, pond 25 has an area of open water. Water was moderate visibility. The north west edge of the pond has collapsed, which has provided a gradual slope allowing easier access into the pond and areas of shallow water. Tussocky grassland and nearby woodland provide abundant foraging potential and many log piles in the area provide good refuges for newts.	 	Location	1	Total HSI Score: 0.75 Good suitability with good pond condition
			Pond area	0.4	
			Pond drying	1	
			Water quality	0.67	
			Shade	1	
			Fowl	0.67	
			Fish	0.33	
			Pond count	1	
			Terrestrial habitat	1	
			Macrophytes	1	
			Invasive species	Absent	
			Major damage	Absent	
			Silt levels	Moderate	
			Dumped rubbish	Absent	

ecus
ENVIRONMENTAL CONSULTANTS
Brook Holt 3 Blackburn Road Sheffield S61 2DW
T: 0114 2669292 www.ecusltd.co.uk

26	Grid reference: SO 64457 14548 Pond 16 is located immediately adjacent to the path to the east of Laymoor Quag. There is an area of clear open water at the southern narrower end of the pond. *Glyceria* sp. beds dominated the pond by at least 50%, providing good spawning potential. Marginal rush species were also noted. Tussocky grassland and nearby woodland provide abundant foraging potential and many log piles in the area provide good refuges for newts. Evidence of wild boar activity was present within close proximity to the pond.		Location	1	Total HSI Score: 0.9 Excellent suitability with excellent pond condition
			Pond area	1	
			Pond drying	0.5	
			Water quality	1	
			Shade	1	
			Fowl	0.67	
			Fish	1	
			Pond count	1	
			Terrestrial habitat	1	
			Macrophytes	1	
			Invasive species	Absent	
			Major damage	Absent	
			Silt levels	Low	
			Dumped rubbish	Absent	
27a	Grid reference: SO 64412 14465 This is the southern most pond of a cluster of five ponds lying to the south of Laymoor Quag. Pond 27a has reduced in size since the last report, from 60m x 20m to approximately 10m x 10m, and is approximately 0.5m deep. A small stickleback population was noted in 2013, but fish were not found in the 2017 surveys. However, fish were noted in two of the other ponds in this cluster so it is possible that there may still be a small stickleback population present, which presents a predatory pressure on GCN within these ponds. Macrophytes noted were *Glyceria* sp., soft rush, spagnum moss and a buttercup species. Tussocky grassland with abundant deadwood provides numerous refuges throughout this area.		Location	1	Total HSI Score: 0.75 Good suitability with excellent pond condition
			Pond area	0.2	
			Pond drying	0.5	
			Water quality	0.67	
			Shade	1	
			Fowl	1	
			Fish	1	
			Pond count	1	
			Terrestrial habitat	1	
			Macrophytes	0.85	
			Invasive species	Absent	
			Major damage	Absent	
			Silt levels	Low	
			Dumped rubbish	Absent	

27b	Grid reference: SO 64439 14438 This is the central pond of a cluster of five ponds lying to the south of Laymoor Quag. Pond 27b is approximately 30m x 30m and up to 0.5m deep. Water mint and bog pondweed provide spawning potential. Other vegetation noted was water horsetail, bulrush and *Glyceria* sp. Tussocky grassland with abundant deadwood provides numerous refuges throughout this area.		Location	1	Total HSI Score: 0.78 Good suitability with good pond condition
			Pond area	0.8	
			Pond drying	0.5	
			Water quality	0.67	
			Shade	1	
			Fowl	0.67	
			Fish	0.67	
			Pond count	1	
			Terrestrial habitat	1	
			Macrophytes	0.7	
			Invasive species	Absent	
			Major damage	Absent	
			Silt levels	Moderate	
			Dumped rubbish	Absent	
27c	Grid reference: SO 64462 14409 This is the southern pond of a cluster of five ponds lying to the south of Laymoor Quag. Pond 27c is irregular in shape and is approximately 20m long and 10m wide in the widest sections and 5m wide at the narrowest point. Pond 27c is less than 0.5m deep. Abundant bog pondweed provides spawning opportunities. Abundant bulrush was noted and horsetail and soft rush were also noted. Tussocky grassland with abundant deadwood provides many refuges throughout this area.		Location	1	Total HSI Score: 0.82 Excellent suitability with good pond condition
			Pond area	0.6	
			Pond drying	0.5	
			Water quality	0.67	
			Shade	1	
			Fowl	0.67	
			Fish	1	
			Pond count	1	
			Terrestrial habitat	1	
			Macrophytes	1	
			Invasive species	Absent	
			Major damage	Absent	
			Silt levels	Moderate	
			Dumped rubbish	Absent	

27d	Grid reference: SO 64429 14454 Pond 27d is a newly formed pond located north west of 27b by approximately 10m, which has most likely formed due to the changing hydrology. Pond 27d measures approximately 5m x 5m and is less than 0.5m deep. Vegetation includes: *Glyceria* sp., water horsetail and soft rush. Tussocky grass, brambles and deadwood surrounds the pond, which provides a good terrestrial habitat for ample foraging and refuge opportunities.		Location	1	Total HSI Score: 0.54 Below average suitability with good pond condition
			Pond area	0.05	
			Pond drying	0.1	
			Water quality	0.67	
			Shade	1	
			Fowl	1	
			Fish	1	
			Pond count	1	
			Terrestrial habitat	1	
			Macrophytes	0.6	
			Invasive species	Absent	
			Major damage	Absent	
			Silt levels	Moderate	
			Dumped rubbish	Absent	
27e	Grid reference: SO 64399 14448 Pond 27e is a newly formed pond located south west of 27a by approximately 15m, which has most likely formed due to the changing hydrology. Pond 27e measures less than 5m x 5m and is less than 25cm deep. Vegetation includes: *Glyceria* sp., water horsetail and soft rush. Tussocky grass, brambles and deadwood surrounds the pond, which provides a good terrestrial habitat for ample foraging and refuge opportunities.		Location	1	Total HSI Score: 0.56 Below average suitability with good pond condition
			Pond area	0.05	
			Pond drying	0.1	
			Water quality	0.67	
			Shade	1	
			Fowl	1	
			Fish	1	
			Pond count	1	
			Terrestrial habitat	1	
			Macrophytes	0.85	
			Invasive species	Absent	
			Major damage	Absent	
			Silt levels	Moderate	
			Dumped rubbish	Absent	

ecus
ENVIRONMENTAL CONSULTANTS
Brook Holt 3 Blackburn Road Sheffield S61 2DW
T: 0114 2669292 www.ecusltd.co.uk

28	Grid reference: SO 64457 14205 Located to the south of ponds 27a, b, c, d and e, pond 28 is approximately 20m x 20m in size with clear water. Since the initial visit in April 2017, the water levels reduced. Few macrophytes were noted with a small bed of water starwort noted. Other species noted were bog bean, water mint, soft rush and broadleaf dock. Nearby woodland and grassland provides abundant potential for foraging and refuge.	 	Location	1	Total HSI Score: 0.59 Below average suitability with excellent pond condition
			Pond area	0.4	
			Pond drying	0.1	
			Water quality	0.67	
			Shade	0.3	
			Fowl	1	
			Fish	1	
			Pond count	1	
			Terrestrial habitat	1	
			Macrophytes	0.6	
			Invasive species	Absent	
			Major damage	Absent	
			Silt levels	Low	
			Dumped rubbish	Absent	
30	Grid reference: SO 64496 15041 This pond lies 50m to the east of a cluster of ponds (ponds 2,3,4,5,6,8) to the west of Forest Vale Road. Pond 30 is approximately 5m x 20m in size and approximately 0.5m deep. Unlike previously reported in 2013, water mint and bog pond weed were not noted, therefore spawning media was limited to dead leaves. Other species noted were water horsetail, broadleaf dock and some marginal grass species. Very clear water. This pond is shaded by the trees surrounding it. One tree has grown leaning over and many of its branches are just above the water. Grassland and woodland provides excellent terrestrial habitat throughout with abundant refugia present.	04/04/17   05/05/17 	Location	1	Total HSI Score: 0.64 Average suitability with good pond condition
			Pond area	0.1	
			Pond drying	0.9	
			Water quality	1	
			Shade	0.6	
			Fowl	0.67	
			Fish	1	
			Pond count	1	
			Terrestrial habitat	1	
			Macrophytes	0.3	
			Invasive species	Absent	
			Major damage	Absent	
			Silt levels	Moderate	
			Dumped rubbish	Absent	

31	Grid reference: SO 64478 14996 This pond lies to the south of pond 30, within the cluster of ponds to the west of Forest Vale Road. Pond 31 is approximately 10m x 10m in size and up to 1m deep. Spawning media was sparse and limited to *Glyceria* sp. with occasional bog pond weed. Water horsetail and marginal soft rush were also noted. Grassland and woodland provides excellent terrestrial habitat throughout with abundant refugia present.	 	Location	1	Total HSI Score: 0.75 Good suitability with good pond condition
			Pond area	0.2	
			Pond drying	0.9	
			Water quality	1	
			Shade	1	
			Fowl	0.67	
			Fish	1	
			Pond count	1	
			Terrestrial habitat	1	
			Macrophytes	0.45	
			Invasive species	Absent	
			Major damage	Absent	
			Silt levels	Moderate	
			Dumped rubbish	Absent	
32	Grid reference: SO 64306 15693 This pond is no longer long and narrow as in the 2013 report as most of the pond has now dried up, and the pond measures less than 5m x 5m in size. It is located alongside the footpath through the Hawkwell Inclosure. The water levels in this pond did not vary as previously found as the water level remained shallow throughout the 2017 survey period. No aquatic vegetation was present so spawning media is limited to dead leaves. Nearby habitats consist mainly of woodland with plenty of refugia.	 	Location	1	Total HSI Score: 0.27 Poor suitability with fair pond condition
			Pond area	0.05	
			Pond drying	0.1	
			Water quality	0.01	
			Shade	0.2	
			Fowl	1	
			Fish	1	
			Pond count	1	
			Terrestrial habitat	0.67	
			Macrophytes	0.3	
			Invasive species	Absent	
			Major damage	Absent	
			Silt levels	High	
			Dumped rubbish	Absent	

33	Grid reference: SO 64541 15614 A small pond to the south of the Hawkwell Inclosure. It is less than 0.5m deep and formed by two main sections which are hydrologically connected. Some macrophyte cover was present providing some egg laying media. Species noted were water mint, grass species and soft rush. Nearby habitats consist of grassland and woodland with plenty of refugia present for amphibians. The water levels were found to fluctuate frequently and was found dry up on some visits.	 	Location	1	Total HSI Score: 0.59 Below average suitability with good pond condition
			Pond area	0.05	
			Pond drying	0.5	
			Water quality	0.67	
			Shade	0.3	
			Fowl	1	
			Fish	1	
			Pond count	1	
			Terrestrial habitat	1	
			Macrophytes	1	
			Invasive species	Absent	
			Major damage	Absent	
			Silt levels	Moderate	
			Dumped rubbish	Absent	
34	Grid reference: SO 64501 15072 Pond 34 no longer resembles a pond in the 2017 visit and is a boggy grassland. There is no aquatic vegetation and there is no substantial proportion of water.		Location	1	Unsuitable for HSI - Dry
			Pond area	0.05	
			Pond drying	0.1	
			Water quality	0.01	
			Shade	1	
			Fowl	1	
			Fish	1	
			Pond count	1	
			Terrestrial habitat	1	
			Macrophytes	0.8	
			Invasive species	Absent	
			Major damage	Absent	
			Silt levels	N/A	
			Dumped rubbish	Absent	

N1	Grid reference: SO 64279 15152 This pond is one of four man-made ponds within an area of the forest that has been felled. The banks of the pond have been built up with clay mud. The water is turbid and a rusty orange colour from the clay mud. Some aquatic vegetation provides potential as spawning media, such as *Glyceria* sp. and *Potamogeton* sp. Soft rush was also noted marginally. The surrounding area comprises of tussocky grassland, bracken, wood chippings and man-made log piles, which provides abundant potential for refuge and foraging.		Location	1	Total HSI Score: 0.83 Excellent suitability with good pond condition
			Pond area	0.6	
			Pond drying	0.9	
			Water quality	0.67	
			Shade	1	
			Fowl	1	
			Fish	1	
			Pond count	1	
			Terrestrial habitat	1	
			Macrophytes	0.45	
			Invasive species	Absent	
			Major damage	Absent	
			Silt levels	Moderate	
			Dumped rubbish	Absent	
N2	Grid reference: SO 64291 15022 This pond is one of four man-made ponds within an area of the forest that has been felled. The banks of the pond have been built up with clay mud. The water is turbid and a rusty orange colour from the clay mud. Some aquatic vegetation provides potential as spawning media, such as *Glyceria* sp. and *Potamogeton* sp. Soft rush was also noted marginally. The surrounding area comprises of tussocky grassland, bracken, wood chippings and man-made log piles, which provides abundant potential for refuge and foraging.		Location	1	Total HSI Score: 0.83 Excellent suitability with good pond condition
			Pond area	0.6	
			Pond drying	0.9	
			Water quality	0.67	
			Shade	1	
			Fowl	1	
			Fish	1	
			Pond count	1	
			Terrestrial habitat	1	
			Macrophytes	0.45	
			Invasive species	Absent	
			Major damage	Absent	
			Silt levels	Moderate	
			Dumped rubbish	Absent	

ecus
ENVIRONMENTAL CONSULTANTS
Brook Holt 3 Blackburn Road Sheffield S61 2DW
T: 0114 2669292 www.ecusltd.co.uk

N3	Grid reference: SO 64279 14912 This pond is one of four man-made ponds within an area of the forest that has been felled. The banks of the pond have been built up with clay mud. The water is turbid and a rusty orange colour from the clay mud. Some aquatic vegetation provides potential as spawning media, such as *Glyceria* sp. and *Potamogeton* sp. Soft rush was also noted marginally. The surrounding area comprises of tussocky grassland, bracken, wood chippings and man-made log piles, which provides abundant potential for refuge and foraging.		Location	1	Total HSI Score: 0.84 Excellent suitability with good pond condition
			Pond area	0.6	
			Pond drying	0.9	
			Water quality	0.67	
			Shade	1	
			Fowl	1	
			Fish	1	
			Pond count	1	
			Terrestrial habitat	1	
			Macrophytes	0.5	
			Invasive species	Absent	
			Major damage	Absent	
			Silt levels	Moderate	
			Dumped rubbish	Absent	
N4	Grid reference: SO 64245 14723 This pond is one of four man-made ponds within the area of the forest that has been felled. The banks of the pond have been built up with clay mud. The pond is completely dry and there is no vegetation, terrestrial or aquatic, within the clay banks. The structure of the pond may require adjustment in order to provide the breeding potential for great crested newts as the other N ponds. The surrounding area comprises of tussocky grassland, bracken, wood chippings and man-made log piles, which provides abundant potential for refuge and foraging.		Location	1	Unsuitable for HSI - Dry
			Pond area	N/A	
			Pond drying	N/A	
			Water quality	N/A	
			Shade	1	
			Fowl	1	
			Fish	1	
			Pond count	1	
			Terrestrial habitat	1	
			Macrophytes	N/A	
			Invasive species	Absent	
			Major damage	Absent	
			Silt levels	N/A	
			Dumped rubbish	Absent	

ecus
ENVIRONMENTAL CONSULTANTS
Brook Holt 3 Blackburn Road Sheffield S61 2DW
T: 0114 2669292 www.ecusltd.co.uk

Appendix 3. Hibernacula Condition Assessment

Assessment Criteria	Score	Description
Size	1	Optimum (2m*1m*1m +)
	0.5	Minimum (2m*1m*1m)
	0.01	Insufficient (less than the minimum
Signs of damage or theft	1	None
	0.01	Signs of damage
Basking opportunities	1	Extensive vegetation cover on south facing side
	0.5	Moderate vegetation cover on south facing side
	0.01	No vegetation cover on south facing side
Naturalness of appearance	1	Good appearance
	0.5	Moderate appearance
	0.01	Poor appearance
Surrounding terrestrial habitat	1	Excellent surrounding habitat
	0.67	Good surrounding habitat
	0.33	Moderate surrounding habitat
	0.01	Poor surrounding habitat
Signs of flooding	1	Well-drained soil
	0.5	Moderately drained soil
	0.1	Poorly drained soil
Shading opportunities	1	Extensive vegetation cover on north facing side
	0.5	Moderate vegetation cover on north facing side
	0.01	No vegetation cover on north facing side
Habitat connectivity	1	Good connectivity
	0.5	Moderate connectivity
	0.01	Poor connectivity
Proximity to water	1	<10 metres
	0.5	10 – 50 metres
	0.01	50 – 100 metres

Calculation:

Refugia Condition Assessment (RCA) product score = each score per index multiplied together (i.e. size score * signs of damage score * basking opportunities score * etc…)

Overall refugia condition score (using POWER function in Excel) = POWER (product score,(1/No. of index's))

Example of calculation (MP1):

RCA product score = 1 * 1 * 1 * 0.5 * 1 * 1 * 1 * 0.5 * 1 = 0.25

Overall refugia condition score = POWER (0.25, (1/9)) = 0.86 (Excellent)

Table A3.1: Refugia Condition Results

Refugia	Overall refugia condition score	Overall rating	Refugia	Overall refugia condition score	Overall rating
MP1	0.86	Excellent	MP32	0.48	Fair
MP2	0.48	Fair	MP33	0.51	Good
MP3	0.79	Excellent	MP34	0.43	Fair
MP4	0.51	Good	MP35	0.46	Fair
MP5	0.79	Excellent	MP36	0.41	Fair
MP6	0.49	Fair	MP37	0.27	Fair
MP7	0.49	Fair	MP38	0.48	Fair
MP8	0.31	Fair	MP39	0.51	Good
MP19	0.49	Fair	MP40	0.51	Good
MP10	0.49	Fair	MP41	0.51	Good
MP11	0.30	Fair	MP42	0.56	Good
MP12	0.29	Fair	MP43	0.51	Good
MP13	0.33	Fair	MP44	0.48	Fair
MP14	0.33	Fair	MP45	0.51	Good
MP15	0.33	Fair	MP46	0.51	Good
MP16	0.18	Poor	MP47	0.51	Good
MP17	0.23	Poor	MP48	0.51	Good
MP18	0.66	Good	MP49	0.68	Good
MP19	0.86	Excellent	MP50	0.59	Good
MP20	0.79	Excellent	MP51	0.72	Good
MP21	0.79	Excellent	MP52	0.72	Good
MP22	0.48	Fair	MP53	0.72	Good
MP23	0.49	Fair	MP54	0.69	Good
MP24	0.86	Excellent	MP55	0.69	Good
MP25	0.33	Fair	MP56	0.77	Excellent
MP26	0.51	Good	MP57	0.61	Good
MP27	0.79	Excellent	MP58	0.69	Good
MP28	0.51	Good	MP59	0.93	Excellent
MP29	0.51	Good	MP60	0.77	Excellent
MP30	0.48	Fair	MP61	0.77	Excellent
MP31	0.48	Fair			

Refugia	Refugia Description	Photo	Refugia Condition Assessment Criteria	Score per Index	Overall refugia condition score
MP1			Size	1	0.86 EXCELLENT
			Surrounding habitat	1	
			Signs of flooding	1	
			Shading opportunities	0.5	
			Basking opportunities	1	
			Signs of damage	1	
			Naturalness of appearance	1	
			Habitat connectivity	0.5	
			Proximity to area of water	1	
MP2			Size	0.01	0.48 FAIR
			Surrounding habitat	1	
			Signs of flooding	0.5	
			Shading opportunities	0.5	
			Basking opportunities	1	
			Signs of damage	1	
			Naturalness of appearance	1	
			Habitat connectivity	0.5	
			Proximity to area of water	1	

MP3			Size	1	0.79 EXCELLENT
			Surrounding habitat	1	
			Signs of flooding	0.5	
			Shading opportunities	1	
			Basking opportunities	0.5	
			Signs of damage	1	
			Naturalness of appearance	1	
			Habitat connectivity	0.5	
			Proximity to area of water	1	
MP4			Size	1	0.51 GOOD
			Surrounding habitat	1	
			Signs of flooding	1	
			Shading opportunities	0.5	
			Basking opportunities	1	
			Signs of damage	1	
			Naturalness of appearance	1	
			Habitat connectivity	0.01	
			Proximity to area of water	0.5	

ecus
ENVIRONMENTAL CONSULTANTS
Brook Holt 3 Blackburn Road Sheffield S61 2DW
T: 0114 2669292 www.ecusltd.co.uk

MP5			Size	1	0.79 EXCELLENT
			Surrounding habitat	1	
			Signs of flooding	0.5	
			Shading opportunities	0.5	
			Basking opportunities	0.5	
			Signs of damage	1	
			Naturalness of appearance	1	
			Habitat connectivity	1	
			Proximity to area of water	1	
MP6			Size	1	0.49 FAIR
			Surrounding habitat	0.67	
			Signs of flooding	1	
			Shading opportunities	1	
			Basking opportunities	0.5	
			Signs of damage	1	
			Naturalness of appearance	1	
			Habitat connectivity	0.5	
			Proximity to area of water	0.01	

ecus
ENVIRONMENTAL CONSULTANTS
Brook Holt 3 Blackburn Road Sheffield S61 2DW
T: 0114 2669292 www.ecusltd.co.uk

MP7			Size	1	0.49 FAIR
			Surrounding habitat	0.67	
			Signs of flooding	1	
			Shading opportunities	1	
			Basking opportunities	0.5	
			Signs of damage	1	
			Naturalness of appearance	1	
			Habitat connectivity	0.5	
			Proximity to area of water	0.01	
MP8			Size	0.01	0.31 FAIR
			Surrounding habitat	1	
			Signs of flooding	1	
			Shading opportunities	0.5	
			Basking opportunities	1	
			Signs of damage	1	
			Naturalness of appearance	1	
			Habitat connectivity	0.5	
			Proximity to area of water	0.01	

MP9			Size	1	0.49 FAIR
			Surrounding habitat	0.67	
			Signs of flooding	1	
			Shading opportunities	0.5	
			Basking opportunities	1	
			Signs of damage	1	
			Naturalness of appearance	1	
			Habitat connectivity	0.5	
			Proximity to area of water	0.01	
MP10			Size	1	0.49 FAIR
			Surrounding habitat	0.67	
			Signs of flooding	1	
			Shading opportunities	0.5	
			Basking opportunities	1	
			Signs of damage	1	
			Naturalness of appearance	1	
			Habitat connectivity	0.5	
			Proximity to area of water	0.01	

ecus
ENVIRONMENTAL CONSULTANTS
Brook Holt 3 Blackburn Road Sheffield S61 2DW
T: 0114 2669292 www.ecusltd.co.uk

MP11		 	Size	1	0.30 FAIR
			Surrounding habitat	1	
			Signs of flooding	1	
			Shading opportunities	1	
			Basking opportunities	0.5	
			Signs of damage	0.01	
			Naturalness of appearance	1	
			Habitat connectivity	0.5	
			Proximity to area of water	0.01	
MP12		 	Size	1	0.29 FAIR
			Surrounding habitat	1	
			Signs of flooding	1	
			Shading opportunities	0.5	
			Basking opportunities	0.5	
			Signs of damage	0.01	
			Naturalness of appearance	1	
			Habitat connectivity	0.5	
			Proximity to area of water	0.01	

MP13		 	Size	1	0.33 FAIR
			Surrounding habitat	1	
			Signs of flooding	1	
			Shading opportunities	1	
			Basking opportunities	0.5	
			Signs of damage	0.01	
			Naturalness of appearance	1	
			Habitat connectivity	1	
			Proximity to area of water	0.01	
MP14			Size	1	0.33 FAIR
			Surrounding habitat	1	
			Signs of flooding	1	
			Shading opportunities	1	
			Basking opportunities	0.5	
			Signs of damage	0.01	
			Naturalness of appearance	1	
			Habitat connectivity	1	
			Proximity to area of water	0.01	

MP15			Size	1	0.33 FAIR
			Surrounding habitat	1	
			Signs of flooding	1	
			Shading opportunities	1	
			Basking opportunities	0.5	
			Signs of damage	0.01	
			Naturalness of appearance	1	
			Habitat connectivity		
			Proximity to area of water		
MP16			Size	1	0.18 POOR
			Surrounding habitat	0.67	
			Signs of flooding	1	
			Shading opportunities	1	
			Basking opportunities	0.5	
			Signs of damage	0.01	
			Naturalness of appearance	0.5	
			Habitat connectivity	0.01	
			Proximity to area of water		

ecus
ENVIRONMENTAL CONSULTANTS
Brook Holt 3 Blackburn Road Sheffield S61 2DW
T: 0114 2669292 www.ecusltd.co.uk

MP17			Size	0.5	0.23 POOR
			Surrounding habitat	0.67	
			Signs of flooding	1	
			Shading opportunities	0.5	
			Basking opportunities	0.5	
			Signs of damage	0.01	
			Naturalness of appearance	0.5	
			Habitat connectivity	0.5	
			Proximity to area of water	0.01	
MP18		 	Size	1	0.66 GOOD
			Surrounding habitat	1	
			Signs of flooding	1	
			Shading opportunities	0.1	
			Basking opportunities	1	
			Signs of damage	1	
			Naturalness of appearance	0.5	
			Habitat connectivity	1	
			Proximity to area of water	0.5	

MP19			Size	1	0.86 EXCELLENT
			Surrounding habitat	1	
			Signs of flooding	1	
			Shading opportunities	0.5	
			Basking opportunities	1	
			Signs of damage	1	
			Naturalness of appearance	1	
			Habitat connectivity	1	
			Proximity to area of water	0.5	
MP20			Size	1	0.79 EXCELLENT
			Surrounding habitat	1	
			Signs of flooding	1	
			Shading opportunities	0.5	
			Basking opportunities	0.5	
			Signs of damage	1	
			Naturalness of appearance	1	
			Habitat connectivity	1	
			Proximity to area of water	0.5	

MP21			Size	1	0.79 EXCELLENT
			Surrounding habitat	1	
			Signs of flooding	0.5	
			Shading opportunities	0.5	
			Basking opportunities	0.5	
			Signs of damage	1	
			Naturalness of appearance	1	
			Habitat connectivity	1	
			Proximity to area of water	1	
MP22		 	Size	1	0.48 FAIR
			Surrounding habitat	1	
			Signs of flooding	1	
			Shading opportunities	0.5	
			Basking opportunities	1	
			Signs of damage	0.01	
			Naturalness of appearance	1	
			Habitat connectivity	0.5	
			Proximity to area of water	0.5	

MP23			Size	1	0.49 FAIR
			Surrounding habitat	1	
			Signs of flooding	1	
			Shading opportunities	0.5	
			Basking opportunities	1	
			Signs of damage	0.01	
			Naturalness of appearance	1	
			Habitat connectivity	0.5	
			Proximity to area of water	0.5	
MP24			Size	1	0.86 EXCELLENT
			Surrounding habitat	1	
			Signs of flooding	1	
			Shading opportunities	0.5	
			Basking opportunities	1	
			Signs of damage	1	
			Naturalness of appearance	1	
			Habitat connectivity	1	
			Proximity to area of water	0.5	

MP25			Size	1	0.33 FAIR
			Surrounding habitat	1	
			Signs of flooding	1	
			Shading opportunities	0.5	
			Basking opportunities	1	
			Signs of damage	0.01	
			Naturalness of appearance	1	
			Habitat connectivity	1	
			Proximity to area of water	0.01	
MP26			Size	1	0.51 GOOD
			Surrounding habitat	1	
			Signs of flooding	1	
			Shading opportunities	0.5	
			Basking opportunities	1	
			Signs of damage	0.01	
			Naturalness of appearance	1	
			Habitat connectivity	1	
			Proximity to area of water	0.5	

MP27		  	Size	1	0.79 EXCELLENT
			Surrounding habitat	1	
			Signs of flooding	1	
			Shading opportunities	0.5	
			Basking opportunities	1	
			Signs of damage	1	
			Naturalness of appearance	1	
			Habitat connectivity	0.5	
			Proximity to area of water	0.5	
MP28			Size	1	0.51 GOOD
			Surrounding habitat	1	
			Signs of flooding	1	
			Shading opportunities	0.5	
			Basking opportunities	1	
			Signs of damage	1	
			Naturalness of appearance	1	
			Habitat connectivity	0.5	
			Proximity to area of water	0.01	

MP29			Size	1	0.51 GOOD
			Surrounding habitat	1	
			Signs of flooding	1	
			Shading opportunities	0.5	
			Basking opportunities	0.5	
			Signs of damage	1	
			Naturalness of appearance	1	
			Habitat connectivity	1	
			Proximity to area of water	0.01	
MP30			Size	1	0.48 FAIR
			Surrounding habitat	1	
			Signs of flooding	1	
			Shading opportunities	0.5	
			Basking opportunities	0.5	
			Signs of damage	1	
			Naturalness of appearance	1	
			Habitat connectivity	0.5	
			Proximity to area of water	0.01	

MP31		 	Size	1	0.48 FAIR
			Surrounding habitat	1	
			Signs of flooding	1	
			Shading opportunities	0.5	
			Basking opportunities	0.5	
			Signs of damage	1	
			Naturalness of appearance	1	
			Habitat connectivity	0.5	
			Proximity to area of water	0.01	
MP32		 	Size	1	0.48 FAIR
			Surrounding habitat	1	
			Signs of flooding	1	
			Shading opportunities	0.5	
			Basking opportunities	0.5	
			Signs of damage	1	
			Naturalness of appearance	1	
			Habitat connectivity	0.5	
			Proximity to area of water	0.01	

ecus
ENVIRONMENTAL CONSULTANTS
Brook Holt 3 Blackburn Road Sheffield S61 2DW
T: 0114 2669292 www.ecusltd.co.uk

MP33		 	Size	1	0.51 GOOD
			Surrounding habitat	1	
			Signs of flooding	1	
			Shading opportunities	0.5	
			Basking opportunities	0.5	
			Signs of damage	1	
			Naturalness of appearance	1	
			Habitat connectivity	1	
			Proximity to area of water	0.01	
MP34			Size	1	0.43 FAIR
			Surrounding habitat	1	
			Signs of flooding	1	
			Shading opportunities	0.1	
			Basking opportunities	1	
			Signs of damage	1	
			Naturalness of appearance	0.5	
			Habitat connectivity	1	
			Proximity to area of water	0.01	

MP35		 	Size	1	0.46 FAIR
			Surrounding habitat	1	
			Signs of flooding	1	
			Shading opportunities	0.1	
			Basking opportunities	1	
			Signs of damage	1	
			Naturalness of appearance	1	
			Habitat connectivity	1	
			Proximity to area of water	0.01	
MP36			Size	1	0.41 FAIR
			Surrounding habitat	0.67	
			Signs of flooding	1	
			Shading opportunities	0.1	
			Basking opportunities	1	
			Signs of damage	1	
			Naturalness of appearance	1	
			Habitat connectivity	0.5	
			Proximity to area of water	0.01	

MP37		 	Size	1	0.27 FAIR
			Surrounding habitat	0.67	
			Signs of flooding	1	
			Shading opportunities	0.1	
			Basking opportunities	1	
			Signs of damage	1	
			Naturalness of appearance	1	
			Habitat connectivity	0.01	
			Proximity to area of water	0.01	
MP38			Size	1	0.48 FAIR
			Surrounding habitat	1	
			Signs of flooding	1	
			Shading opportunities	0.5	
			Basking opportunities	0.5	
			Signs of damage	1	
			Naturalness of appearance	1	
			Habitat connectivity	0.5	
			Proximity to area of water	0.01	

MP39			Size	1	0.51 GOOD
			Surrounding habitat	1	
			Signs of flooding	1	
			Shading opportunities	0.5	
			Basking opportunities	0.5	
			Signs of damage	1	
			Naturalness of appearance	1	
			Habitat connectivity	1	
			Proximity to area of water	0.01	
MP40		 	Size	1	0.51 GOOD
			Surrounding habitat	1	
			Signs of flooding	1	
			Shading opportunities	0.5	
			Basking opportunities	0.5	
			Signs of damage	1	
			Naturalness of appearance	1	
			Habitat connectivity	1	
			Proximity to area of water	0.01	

ecus
ENVIRONMENTAL CONSULTANTS
Brook Holt 3 Blackburn Road Sheffield S61 2DW
T: 0114 2669292 www.ecusltd.co.uk

MP41		 	Size	1	0.51 GOOD
			Surrounding habitat	1	
			Signs of flooding	1	
			Shading opportunities	0.5	
			Basking opportunities	0.5	
			Signs of damage	1	
			Naturalness of appearance	1	
			Habitat connectivity	1	
			Proximity to area of water	0.01	
MP42			Size	1	0.56 GOOD
			Surrounding habitat	1	
			Signs of flooding	1	
			Shading opportunities	1	
			Basking opportunities	0.5	
			Signs of damage	1	
			Naturalness of appearance	1	
			Habitat connectivity	1	
			Proximity to area of water	0.01	

MP43			Size	1	0.51 GOOD
			Surrounding habitat	1	
			Signs of flooding	1	
			Shading opportunities	0.5	
			Basking opportunities	0.5	
			Signs of damage	1	
			Naturalness of appearance	1	
			Habitat connectivity	1	
			Proximity to area of water	0.01	
MP44		 	Size	1	0.48 FAIR
			Surrounding habitat	1	
			Signs of flooding	1	
			Shading opportunities	0.05	
			Basking opportunities	0.05	
			Signs of damage	1	
			Naturalness of appearance	1	
			Habitat connectivity	0.5	
			Proximity to area of water	0.01	

MP45			Size	1	0.51 GOOD
			Surrounding habitat	1	
			Signs of flooding	1	
			Shading opportunities	0.5	
			Basking opportunities	0.5	
			Signs of damage	1	
			Naturalness of appearance	1	
			Habitat connectivity	1	
			Proximity to area of water	0.01	
MP46			Size	1	0.51 GOOD
			Surrounding habitat	1	
			Signs of flooding	1	
			Shading opportunities	0.5	
			Basking opportunities	0.5	
			Signs of damage	1	
			Naturalness of appearance	1	
			Habitat connectivity	1	
			Proximity to area of water	0.01	

MP47			Size	1	0.51 GOOD
			Surrounding habitat	1	
			Signs of flooding	1	
			Shading opportunities	0.5	
			Basking opportunities	0.5	
			Signs of damage	1	
			Naturalness of appearance	1	
			Habitat connectivity	1	
			Proximity to area of water	0.01	
MP48			Size	1	0.51 GOOD
			Surrounding habitat	1	
			Signs of flooding	1	
			Shading opportunities	0.5	
			Basking opportunities	0.5	
			Signs of damage	1	
			Naturalness of appearance	1	
			Habitat connectivity	1	
			Proximity to area of water	0.01	

MP49		 	Size	1	0.68 GOOD
			Surrounding habitat	1	
			Signs of flooding	1	
			Shading opportunities	0.5	
			Basking opportunities	0.5	
			Signs of damage	1	
			Naturalness of appearance	0.5	
			Habitat connectivity	0.5	
			Proximity to area of water	0.5	
MP50		 	Size	1	0.59 GOOD
			Surrounding habitat	0.67	
			Signs of flooding	1	
			Shading opportunities	0.1	
			Basking opportunities	0.5	
			Signs of damage	1	
			Naturalness of appearance	1	
			Habitat connectivity	0.5	
			Proximity to area of water	0.5	

MP51		 	Size	1	0.72 GOOD
			Surrounding habitat	1	
			Signs of flooding	1	
			Shading opportunities	0.1	
			Basking opportunities	1	
			Signs of damage	1	
			Naturalness of appearance	1	
			Habitat connectivity	1	
			Proximity to area of water	0.5	
MP52			Size	1	0.72 GOOD
			Surrounding habitat	1	
			Signs of flooding	0.5	
			Shading opportunities	0.1	
			Basking opportunities	1	
			Signs of damage	1	
			Naturalness of appearance	1	
			Habitat connectivity	1	
			Proximity to area of water	1	

MP53		 	Size	1	0.72 GOOD
			Surrounding habitat	1	
			Signs of flooding	1	
			Shading opportunities	0.1	
			Basking opportunities	1	
			Signs of damage	1	
			Naturalness of appearance	1	
			Habitat connectivity	0.5	
			Proximity to area of water	1	
MP54		 	Size	1	0.69 GOOD
			Surrounding habitat	0.67	
			Signs of flooding	1	
			Shading opportunities	0.1	
			Basking opportunities	1	
			Signs of damage	1	
			Naturalness of appearance	1	
			Habitat connectivity	0.5	
			Proximity to area of water	1	

MP55		 	Size	1	0.69 GOOD
			Surrounding habitat	0.67	
			Signs of flooding	1	
			Shading opportunities	0.1	
			Basking opportunities	1	
			Signs of damage	1	
			Naturalness of appearance	1	
			Habitat connectivity	0.5	
			Proximity to area of water	1	
MP56		 	Size	1	0.77 EXCELLENT
			Surrounding habitat	1	
			Signs of flooding	1	
			Shading opportunities	0.1	
			Basking opportunities	1	
			Signs of damage	1	
			Naturalness of appearance	1	
			Habitat connectivity	1	
			Proximity to area of water	1	

ecus
ENVIRONMENTAL CONSULTANTS
Brook Holt 3 Blackburn Road Sheffield S61 2DW
T: 0114 2669292 www.ecusltd.co.uk

MP57		 	Size	1	0.61 GOOD
			Surrounding habitat	1	
			Signs of flooding	0.5	
			Shading opportunities	0.1	
			Basking opportunities	1	
			Signs of damage	1	
			Naturalness of appearance	1	
			Habitat connectivity	0.5	
			Proximity to area of water	0.5	
MP58			Size	1	0.69 GOOD
			Surrounding habitat	0.67	
			Signs of flooding	1	
			Shading opportunities	0.1	
			Basking opportunities	1	
			Signs of damage	1	
			Naturalness of appearance	1	
			Habitat connectivity	0.5	
			Proximity to area of water	1	

ecus
ENVIRONMENTAL CONSULTANTS
Brook Holt 3 Blackburn Road Sheffield S61 2DW
T: 0114 2669292 www.ecusltd.co.uk

MP59		 	Size	1	0.93 EXCELLENT
			Surrounding habitat	1	
			Signs of flooding	1	
			Shading opportunities	0.5	
			Basking opportunities	1	
			Signs of damage	1	
			Naturalness of appearance	1	
			Habitat connectivity	1	
			Proximity to area of water	1	
MP60			Size	1	0.77 EXCELLENT
			Surrounding habitat	1	
			Signs of flooding	1	
			Shading opportunities	0.1	
			Basking opportunities	1	
			Signs of damage	1	
			Naturalness of appearance	1	
			Habitat connectivity	1	
			Proximity to area of water	1	

MP61		 	Size	1	0.77 EXCELLENT
			Surrounding habitat	1	
			Signs of flooding	1	
			Shading opportunities	0.1	
			Basking opportunities	1	
			Signs of damage	1	
			Naturalness of appearance	1	
			Habitat connectivity	1	
			Proximity to area of water	1	

ecus
ENVIRONMENTAL CONSULTANTS
Brook Holt 3 Blackburn Road Sheffield S61 2DW
T: 0114 2669292 www.ecusltd.co.uk

Appendix 4. Bottle Trapping Details

A4.1: Number of bottle traps used at each pond

Pond	Number of Traps Used	Notes	Pond	Number of Traps Used	Notes
1 (& 19)	15		24a	20	
2	15		24b	5	
3	30		24c	5	
4	15		24d	10	
5	30		24e	0	
6	40		25	20	
7	0	Dry	26	35	
8	50		27a	10	
9	25		27b	30	
10	0	Not included	27c	35	
11	20		27d	5	
12	0		27e	5	
13	0	Dry	28	15	
13a	0	Dry	29	0	Dry
14	15		30	10	
15	0	Dry	31	10	
16	35		32	5	
17	0	Dry	33	0	Dry
18a	40		34	0	Dry
18b	40		N1	30	
20	40		N2	30	
21	60		N3	30	
22	0	Dry	N4	0	Dry
23 (a,b,c)	100				

Appendix 5. eDNA Analysis Report

SureScreen Scientifics

Folio No:	E0764
Report No:	1
Order No:	[No PO received on paperwork]
Client:	ECUS LTD
Contact:	Catherine Pittman
Contact Details:	catherine.pittman@ecusltd.co.uk
Date:	22/05/2017

TECHNICAL REPORT

ANALYSIS OF ENVIRONMENTAL DNA IN POND WATER FOR THE DETECTION OF GREAT CRESTED NEWTS

Date sample received at Laboratory: 18/05/2017
Date Reported: 22/05/2017
Matters Affecting Results: 2016 sampling kit used

RESULTS

Lab Sample No.	Site Name	O/S Reference	SIC	DC	IC	Result	Positive Replicates
34000	Forest Vale road, Pond 10	SO 64355 15316	Pass	Pass	Pass	Negative	0

SUMMARY

When Great Crested Newts (GCN); Triturus cristatus inhabit a pond, they deposit traces of their DNA in the water as evidence of their presence. By sampling the water, we can analyse these small environmental DNA (eDNA) traces to confirm GCN habitation, or establish GCN absence.

The water samples detailed below were submitted for eDNA analysis to the protocol stated in DEFRA WC1067 (Latest Amendments). Details on the sample submission form were used as the unique sample identity.

RESULTS INTERPRETATION

Lab Sample No.- When a kit is made it is given a unique sample number. When the pond samples have been taken and the kit has been received back in to the laboratory, this sample number is tracked throughout the laboratory.

Site Name- Information on the pond.

O/S Reference – Location/co-ordinates of pond.

SIC- Sample Integrity Check. Refers to quality of packaging, absence of tube leakage, suitability of sample (not too much mud or weed etc.) and absence of any factors that could potentially lead to results errors. Inspection upon receipt of sample at the laboratory. To check if the Sample is of adequate integrity when received. Pass or Fail.

DC- Degradation Check. Analysis of the spiked DNA marker to see if there has been degradation of the kit since made in the laboratory to sampling to analysis. Pass or Fail.

IC- Inhibition Check- PCR inhibitors can cause false results. Inhibitors are analysed to check the quality of the result. Every effort is made to clean the sample pre-analysis however some inhibitors cannot be extracted. An unacceptable inhibition check will cause an indeterminate sample and must be sampled again.

Result- NEGATIVE means that GCN eDNA was not detected or is below the threshold detection level and the test result should be considered as no evidence of GCN presence. POSITIVE means that GCN eDNA was found at or above the threshold level and the presence of GCN at this location at the time of sampling or in the recent past is confirmed. Positive or Negative.

Positive Replicates- To generate the results all of the tubes from each pond are combined to produce one eDNA extract. Then twelve separate analyses are undertaken. If one or more of these analyses are positive the pond is declared positive for the presence of GCN. It may be assumed that small fractions of positive analyses suggest low level presence but this cannot currently be used for population studies. In accordance with Natural England protocol, even a score of 1/12 is declared positive.

METHODOLOGY

The laboratory testing adheres to strict guidelines laid down in WC1067 Analytical and Methodological Development for Improved Surveillance of The Great Crested Newt, Version 1.1

The analysis is conducted in two phases. The sample first goes through an extraction process where all six tubes are pooled together to acquire as much eDNA as possible. The pooled sample is then tested via real time PCR (also called q-PCR). This process amplifies select part of DNA allowing it to be detected and measured in ‘real time’ as the analytical process develops. qPCR combines PCR amplification and detection into a single step. This eliminates the need to detect products using gel electrophoresis. With qPCR, fluorescent dyes specific to the target sequence are used to label PCR products during thermal cycling. The accumulation of fluorescent signals during the exponential phase of the reaction is measured for fast and objective data analysis. The point at which amplification begins (the Ct value) is an indicator of the quality of the sample. True positive controls, negatives and blanks as well as spiked synthetic DNA are included in every analysis and these have to be correct before any result is declared so they act as additional quality control measures.

The primers used in this process are specific to a part of mitochondrial DNA only found in GCN ensuring no DNA from other species present in the water is amplified. The unique sequence appropriate for GCN analysis is quoted in DEFRA WC 1067 and means there should be no detection of closely related species. We have tested our system exhaustively to ensure this is the case in our laboratory. We can offer eDNA analysis for most other species including other newts.

Analysis of eDNA requires scrupulous attention to detail to prevent risk of contamination. Kits are manufactured by SureScreen Scientifics to strict quality procedures in a separate building and with separate staff, adopting best practice from WC1067 and WC1067 Appendix 5. Kits contain a ‘spiked’ DNA marker used as a quality control tracer (SureScreen patent pending) to ensure any DNA contained in the sampled water has not deteriorated in transit. Stages of the DNA analysis are also conducted in

different buildings at our premises for added

SureScreen Scientifics Ltd also participate in Natural England's proficiency testing scheme and we also carry out inter-laboratory checks on accuracy of results as part of our quality procedures.

Reported by: Harry Neal **Approved by:** Troy Whyte

End Of Report