
Great Crested Newt Survey Report

Sesswick Way, Wrexham

for

Low Carbon Farming 2 Ltd.

13 July 2020



Client

Low Carbon Farming 2 Ltd.

Planning authority

Wrexham County Borough Council

Time limit of reliance

Please note that the reported surveys were conducted on the date(s) stated in the report and that it represents site conditions at the time of the visit. The findings and recommended mitigation are based on these conditions. If site conditions change materially after the site survey, the original report cannot be relied upon and will need to be updated. Ecological reports and surveys can typically be relied on for 18 to 24 months from the date of survey.

Surveys supporting European Protected Species Mitigation Licence applications must be within the current or most recent survey season for bats (May to September), or within two survey seasons for great crested newts (March to June).

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<i>Signed disclosure</i> <i>The information, data, advice and opinions provided in this report which I have provided is true and has been prepared in accordance with the Chartered Institute of Ecology and Environmental Management's Code of Professional Conduct. I confirm that the opinions expressed are my true and professional bona fide opinions.</i> <i>Etienne Swarts, ACIEEM</i>	
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SUMMARY

- Greenlight Environmental Consultancy Ltd. has been commissioned to carry out protected species surveys for great crested newts *Triturus cristatus* ("GCN"), relating to a proposed development of land adjacent to Sesswick Way, Wrexham, Wales, LL13 0PA (grid reference: SJ 36923 47983).
- This report provides the results of the GCN survey and any potential effects of the proposed development on such species.
- The ecology report is required in support of a planning application for the construction of a glasshouse, packing and welfare building, energy centre and heating system, CO₂ storage tanks, customer and DNO substation, access and parking, and a closed irrigation system.
- The survey and assessment were completed by independent qualified and experienced ecologists with Natural Resources Wales survey licences for the relevant protected species, and in accordance with the latest survey guidelines.
- The findings of the assessment are that there are no significant ecological constraints that would prevent the proposed works.
- If the following mitigation and enhancements are incorporated into the proposed layout, there will be a net gain for biodiversity, as is encouraged by the National Planning Policy Framework.

Protected habitats/species	Status	Potential effect	Recommended mitigation and enhancements
Great crested newts	No aquatic habitats and some suitable terrestrial habitats on site. 26 ponds within 250m – 16 assessed as below average to excellent suitability for GCN, three dry and seven could not be accessed for detailed assessment. eDNA survey returned a positive result for 12 ponds. Historic records indicate a large GCN population, of National Importance and of European Importance within northeast Wales, near the site.	Loss of some terrestrial habitat including corridors of dispersal (arable land and hedgerow). Temporary disturbance of terrestrial habitat for pipeline works. Risk of injuring or killing individual GCN potentially present within the site. No impacts on aquatic habitats.	<u>Mitigation</u> EPS mitigation licence required prior to any works being conducted. The licence will include the following: Creation of receptor area to the northwest of the site to include terrestrial (rough grassland, scrub planting and 10 of 25m south facing hibernacula) and aquatic habitats (creation of four ponds 100-300m²). Exclusion fencing with pitfall traps installed around the site perimeter and checked for 90 nights in suitable weather during the GCN active period. Any animals caught to be moved to the receptor site. Phased vegetation clearance and hand search of all suitable refugia. Soft landscaping, using native species, to maintain habitat links across the site. Long-term management of the receptor area and monitoring of GCN population.

1. METHODOLOGY

- 1.1. A Draft Interim Ecological Impact Assessment ("EclA") was carried out and issued by Greenlight Environmental Consultancy Ltd. (2020). The report recommended further GCN surveys prior to the commencement of the development.
- 1.2. The water features on and near the site were assessed for their suitability for GCN, according to a Habitat Suitability Index (Oldham *et al.*, 2000) and reported in Appendix C.

eDNA analysis

- 1.3. In order to determine the presence/likely absence of GCN on site, an eDNA survey was conducted on 16 ponds (ponds 2-9, 17-20, 22-23, 25-26) across three separate dates in May 2020, following the field sampling protocol provided by the Department for Environment, Food and Rural Affairs ("DEFRA") and Biggs *et al.* (2014).
- 1.4. The eDNA method detects pond occupancy from GCN using traces of DNA shed into the pond environment. The water samples collected were sent to SureScreen Scientifics for laboratory analysis.
- 1.5. The results of the analysis are defined as follows by SureScreen Scientifics:
 - **Sample Integrity Check ("SIC"):** 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.
 - **Degradation Check ("DC"):** 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.
 - **Inhibition Check ("IC"):** 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 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.
- 1.6. The surveys were undertaken by Sarah Carver (Natural England GCN survey licence level 1 2015-16713-CLS-CLS, Natural Resources Wales GCN survey licence level 1 S085140/1).

Historic records

- 1.7. Historic records, obtained from Cofnod North Wales Environmental Information Service, were interrogated to review whether the ponds had previously supported GCN. Records are presented in Table 1.

Constraints

- 1.8. Limitations and constraints affecting survey techniques will be detailed in Appendix E where the percentage of the shorelines/pond margins that could be accessed is specified. Access to the steep sides of some ponds, silted ponds and those in dense impenetrable woodland was challenging.

2. SITE CONTEXT

- 2.1. The site is accessed off Sesswick Way, a busy road to the south of Wrexham Industrial Estate. The site centre is at grid reference: SJ 36888 47980.
- 2.2. The site comprises a large arable field divided into two separate compartments separated by a track bordered by a hedgerow and public right of way. Surrounding the site are a number of woodlands including mature woodland, ponds, river, mature trees and hedgerows.

3. FIELD STUDY

Ponds

- 3.1. There are no ponds or waterbodies within the red line boundary. Although there are twenty six ponds within 250m of the red line boundary that were studied, access was not granted to visit and survey all of them. Access was permitted to ponds 2, 3, 4, 5, 6, 7, 8, 9, 17, 18, 19, 20, 22, 23, 24 (dry), 25 & 26.
- 3.2. Refer to Appendix F for descriptions of ponds and their immediate surrounding habitats.
- 3.3. Some of the ponds are mitigation ponds (2, 3, 4, 8, 9 & 14) constructed approximately 10 years ago as compensation for the construction of Sesswick Road. Ponds 3, 7, 20, 17, 18 & 19, are old. Ponds 22 and 23 were 'functional' lagoons within the Welsh Water Site with ponds 25 and 26 understood to be mitigation ponds within the Welsh Water site.

GCN status at and around the development site

- 3.4. Wrexham is considered to be of national importance for GCN. There are numerous records for great crested newt within 1km of the site and several for the individual ponds within 250m of the site. In addition, there is a terrestrial record from 2016 for a sub-adult on the southern edge of the track. It is considered that due to the proximity of the waterbodies to each other that there is a reasonable certainty of animal interchange between them and therefore a meta-population of GCN exists to the south of the site, possibly spread across two main population centres. There are also numerous records for common amphibians.
- 3.5. There were two additional ponds identified on the boundary of the 250 buffer zone, but separated from the site by habitat barriers. One was present to the south west of Pond 21 on the 250m buffer line border, which was south of the A525 road and the other to the east of Pond 7 east of Bedfield Road at grid reference SJ 37442 47716, which held records of GCN adults, eggs and larvae from 1999-2005.

- 3.6. The HSI survey results and whether or not great crested newts were recorded during any historic surveys are provided in Table 1.
- 3.7. The proposed development areas comprise the main agricultural field and two temporary disturbance areas; one each to the north and west. The main arable field compartment to the east of the track will involve permanent habitat loss by construction of commercial scale glasshouses and reservoirs. The arable compartment to the west of the track will be retained.
- 3.8. The mosaic of terrestrial habitats across and around the site including mature woodland, grassland and tall ruderal vegetation and to a lesser extent the arable land, were considered suitable for great crested newts.

Habitat Suitability Index

- 3.9. The results of the HSI are summarised in Table 1 and detailed Appendix C.
- 3.10. The majority of the ponds provided a range of scores from 0.72 to 0.94 categorising the ponds as between 'good' to 'excellent' in terms of their suitability to support great crested newts, with only one scoring 0.59 'below average'.

eDNA Analysis

- 3.11. Pond water samples were taken on three separate dates in May 2020 in fine and dry weather conditions. The individual sample kit reference numbers and date of sampling are specified in Appendix E.
- 3.12. The results of the eDNA survey indicated that ponds 12 ponds (ponds 2-4, 6-9, 17-18, 23 and 25-26) are used by GCN, with a **positive** result and 1-12 positive replicates. The eDNA sample analysis provided by SureScreen Scientifics are summarised in Table 1 and detailed in Appendix D.
- 3.13. The results are caveated with reference to the limitations and constraints described in section 1.8, where in some instances for some ponds, less than 80% of the shoreline was accessible.

Pond No.	HSI suitability	eDNA results	Cofnod GCN records
1	No authorised access		-
2	Excellent	Positive	Adults and larvae 2005-2015
3	Excellent	Positive	3 males 2017
4	Excellent	Positive	Adults 2017-2019
5	Excellent	Negative	Adults and larvae 2014-2019
6	Excellent	Positive	Adults 2015
7	Excellent	Positive	Adults 2015
8	Good	Positive	Adults and larvae 2014-2017
9	Excellent	Positive	Adults and larvae 2014-2017
10	No authorised access		Adults, larvae and eggs 2000 Adults 2001-2009
11	No authorised access		Adults, larvae and eggs 2000 Adults 2001-2009
12	Dry	N/A	Adults and eggs 1999-2000
13	No authorised access		Adults and larvae 2013-2015
14	No authorised access		Adults and juveniles 2014-2017
15	No authorised access		Adults 2014-2015
16	Dry	N/A	-
17	Excellent	Positive	Male and female 2000 and 2017
18	Excellent	Positive	Present 1992-2000
19	Excellent	Negative	Adults 2014-2015 and before 2003
20	Excellent	Negative	-
21	No authorised access		-
22	Excellent	Negative	Adult 2002
23	Good	Positive	-
24	Dry	N/A	-
25	Below average	Positive	-
26	Good	Positive	-
Pond on 250m buffer. Grid ref: SJ 37442 47716	Not assessed		Adults, eggs, larvae – 30 records from 1999-2015

Table 1, HSI suitability, eDNA results and history data summary.

4. EVALUATION AND POTENTIAL IMPACTS

GCN status of habitats

- 4.1. No ponds will be directly affected by the development proposals.
- 4.2. The proposed works will require the clearance of vegetated habitats on site, including ≈26.8ha of an arable field, ≈115m of species-poor hedgerow (Priority Habitat) and a small number of scattered mature trees.
- 4.3. The majority of the proposed development area is likely to constitute suboptimal terrestrial habitat for GCN with, however, some good quality corridors of dispersal. The arable compartments are less favourable than grassland, hedgerows and woodland. The peripheral margins and the grassy track dividing the arable compartments could provide habitat linkages and foraging opportunities.
- 4.4. In terms of its suitability as terrestrial habitat for GCN, although it is accepted that intensively managed arable land is not a barrier to dispersal, it can regulate migration and dispersal, (Great crested newt conservation handbook, Langton *et al.* 2001). The arable field itself offers little opportunities for refuge (daytime, summer or winter), few foraging opportunities and some dispersal though limited. The field margins and hedgerows do however provide habitat linkages and corridors.
- 4.5. Two areas of temporary disturbance for the purposes of pipeline installation will be affected. These are 0.56ha to the west in primary core habitat <50m from known GCN ponds and 0.67ha distant to the north approximately 450m from GCN ponds; most of which is in primary habitat and a proportion of which is in more distant suboptimal habitat. These primary good quality GCN habitat are classified as such because they comprise grassland, scrub and tall ruderal vegetation. Those classified as suboptimal comprise arable intensively managed farmland.
- 4.6. Both the eDNA results and the historic Cofnod records show that a GCN population or populations exist to south, southeast and southwest of the proposed development site. The habitats within the landscape are likely to facilitate good interchange between the ponds and general dispersal where continuity exists and where no major barriers are present. Ponds that do not currently support GCN could feasibly do so in the future based on the results of the HSI Assessment.
- 4.7. Some of the ponds to the southeast of the development were constructed in 2010 as part of the mitigation and compensation measures for the development of Sesswick Road and are under monitoring and management for the purposes for great crested newt conservation.

GCN Status

- 4.8. The current full population status of GCN in the ponds around the site is not known. The GCN status in Wrexham is accepted to be of National Importance and of European Importance within northeast Wales.

Predicting Impacts of the development on the GCN population status

- 4.9. Impacts have been assessed below in accordance with guidance set out in section 6 of the Great Crested Newt Mitigation Guidelines (English Nature, 2001): -

Pre- and mid-development short term impacts

- 4.10. There is perceived to be a general increased disturbance to habitats and species during the construction period. Site clearance, regrading, drainage work and degradation of habitats are likely to be the main effects. There is the potential for killing, injuring or disturbing GCN.

Long-term impacts

- 4.11. Permanent loss and modification of terrestrial habitat, comprising foraging, refuge/hibernation and dispersal routes are considered to be the primary impacts. Even when ponds are unaffected directly, GCN populations can become less viable through terrestrial habitat loss and fragmentation and isolation.
- 4.12. Other impacts could be deemed as alteration in runoff volumes and water chemistry, changes to water quality, alteration in other amphibian and invertebrate assemblage and effects relating to biosecurity.

Post-development interference impacts

- 4.13. Alteration in lighting, traffic and noise could be considered as potential impacts.

Cumulative influences

- 4.14. Cumulative influences on existing ponds must be considered and assessed in the context. These include past, present and future potential developments, for example both the construction of Sesswick Road and the proposed new glasshouse development.

Positive impacts

- 4.15. Positive impacts that have been identified include increased dispersal opportunities for newts from the south to the new mitigation site in the north. This could lead to a higher more viable metapopulation less prone to future threats. Furthermore, the long term management of a site designed for the benefits of GCN is considered to have more conservation and biodiversity value than that of a large intensively farmed arable compartment.

Current conservation status and determining impacts

- 4.16. In order to achieve long term FCS, Current Conservation Status ("CCS") must be assessed. Some work assessing population changes in ponds to the south and southeast of the proposed development by Middlemarch Environmental as part of the Sesswick Road development has already been undertaken.
- 4.17. The Spatial Action Plan for Great Crested Newts in Wrexham Report Number 77 Natural Resources Wales Modelling NRW March 2017 is a Manual for Achieving FSC. It provides a strategy for setting out how to achieve the greatest conservation benefit for great crested newts.
- 4.18. The Spatial Action Plan report sets out scoring methodology that can be used to determine the CCS of GCN at a single pond or a series of ponds and predictive modelling techniques to determine FCS for the county of Wrexham.
- 4.19. It uses a number of attributes and considers for assessment both positive and negative factors in relation to site protection and surrounding land use, pollution risk, human disturbance, natural succession, environmental change. The scores are derived from assessing population size, pond density, habitat quality and prospects to the pond persisting.
- 4.20. The distribution of pond quality across the whole population would also need to be considered.
- 4.21. In accordance with the Spatial Plan, *'the impact of a project upon a great crested newt population can be assessed as the predicted change in CCS as a result of the activity'*.
- 4.22. In accordance with the Spatial Plan the following methodology must be adopted to assess an impact of a development:-

'1. The total CCS for the population should be calculated in absence of the proposed activity. This is calculated as detailed in Chapter 5 where each pond comprising the population is scored in terms of its population size, HSI score and number of ponds within the vicinity. The total CCS can be used to establish a baseline metric for assessing the population prior to the activity. Individual pond scores should be assessed to see if the population is in a favourable conservation status.'

2. *The CCS should be calculated for the population after the proposed activity, in the absence of any mitigation.*
3. *The difference between the total CCS before and after should be calculated in order to quantify the loss of conservation status.*
4. *Individual pond scores should be used to assess whether the population is favourable after the activity. An accurate impact assessment relies on being able to accurately predict CCS after the activity. Some aspects of this are relatively straightforward, whereas others are more difficult'.*

4.23. The Spatial Plan states that ...

'The CCS of a species is considered to be the sum of all elements of its biological condition and all influences acting upon it, and can be described by the status of its:

- *range/area of occupancy within the range*
- *viability and abundance of populations*
- *amount of habitat*
- *future prospects*

The conservation status of a species can be considered favourable when the species is prospering (in both quality and extent/population) and with good prospects to do so in the future (Evans & Arvela 2011)'.

4.24. Table 7.2 in The Spatial Action Plan provides advice for predicting the impacts of development on pond HSI scores.

4.25. The Spatial Action Plan maintains that the primary objective of GCN mitigation is to maintain the conservation status of GCN in the long-term, and as such it must ensure that in the very least there is no long-term loss. Because successful mitigation cannot be guaranteed, it upholds the provision of additional resources as an 'insurance' mechanism to increase the chance of success. It specifies that

'the mitigation targets should be proportional to the value of the population (i.e. the contribution of the population to overall FCS) and the severity of the predicted impact'.

4.26. The Spatial Plan goes on to say that

'The likely effectiveness of a mitigation scheme can be assessed using the same method as the impact assessment. Once the mitigation has been designed, the predicted total and relative CCS for the affected population post mitigation can be calculated and compared to that prior to the development. The aims of any mitigation scheme should be:

1. To ensure that there is no net loss in CCS as a result of the development
2. To maintain affected populations at FCS
3. Dependent on the level of impact, to enhance the CCS of affected populations. For high impact schemes (any project involving the loss of ponds or core terrestrial habitat) the mitigation should aim to increase the total CCS by at least 1.3x the pre- development level, and ensure all affected populations are at FCS, regardless of their CCS before the development. For a moderate impact project, the mitigation should aim to increase the CCS of the affected populations. For low impact schemes, the CCS is not predicted to decline as a result of the development and therefore the mitigation will be would be focussed on the protection of individual animals in order to ensure legal compliance.'

Impacts of the development on the GCN population status in relation to CCS

- 4.27. On balance, based on **predicting Impacts of the development on the GCN population status** above, the impact is assessed to be **Moderate-High** with no loss of aquatic habitat and the majority of the habitat lost considered suboptimal. Some loss of **primary core habitat** is acknowledged in the southeast region of the site adjacent to the 'Sesswick Road' existing mitigation ponds. Intermediate and distant losses of poorer quality newt habitat are also envisaged. Temporary disturbance of good quality habitat followed by reinstatement are likely to exert impacts.
- 4.28. The CCS of the affected GCN population to the southeast of the proposed development should be calculated and used to determine the requirements of the habitat creation, which should aim to significantly increase the CSS or converted into a financial contribution for habitat creation, management and monitoring by a third party or specialist body.

Achieving FCS

- 4.29. Assessing whether the status of the species is favourable, 'Favourable Reference Values' (FRV) for each of the four components of status must be calculated (population size, number/density of ponds, habitat quality and prospects).
- 4.30. A variety of options for achieving FCS at a county level in Wrexham were considered in the Spatial Plan. Restoring the number of ponds with an **HSI >0.7 to 1843** levels was concluded to be the preferred option.
- 4.31. 1843 pond data was selected as a baseline because it reflected the status of GCN prior to the significant decline recorded in the 20th Century. The Spatial Plan states that '*Gleed-Owen (2007) estimated a 37% decline in the number of ponds in northeast Wales between 1843 and 2007*'.

4.32. The Spatial Plan goes on to state that...

'Based on this rationale, FCS in Wrexham will be met when there is either the equivalent number of ponds in total or the (estimated) equivalent number of ponds occupied by crested great newts or the (estimated) same number of high quality ponds (i.e. with HSI's >0.7) as there would have been in 1843'.

Proposed Targets

4.33. In order to achieve, maintain and measure FCS, targets would need to be set out in the mitigation strategy both for existing ponds in the landscape in proximity to the development and then new ponds created as part of the mitigation scheme. This concept is discussed in Section 5.

5. DISCUSSION, SPECIES PROTECTION & MITIGATION

General Principles

- 5.1. The main impacts requiring mitigation are considered to be the loss of terrestrial habitat along with interference in habitat connectivity. Other influences include temporary disturbance and reinstatement of terrestrial habitat, general disturbance effects, road layout and installation of drainage and engineering features, noise, lighting, changes in runoff and water quality affecting existing ponds.

Key Principles of mitigation

- 5.2. Principles of mitigation have been assessed below in accordance with guidance set out in section 7 of the Great Crested Newt Mitigation Guidelines (English Nature, 2001): -
- 5.3. It is recognised by the Great Crested Newt Mitigation Guidelines (English Nature, 2001) that there are two main elements –
- i. **Mitigation** which is defined as practises to reduce or remove damage by for example altering the layout of the proposed development, or capturing newts to avoid killing.
 - ii. **Compensation** which is offsetting the damage caused by the development by creation and management of new habitat and newt population.
- 5.4. The primary aim being to ensure that there is no detriment to conservation status of GCN. In addition, the conservation of common amphibians ought to be promoted.
- 5.5. **The level of mitigation required is said by** the Great Crested Newt Mitigation Guidelines (English Nature, 2001) to *‘depend on the size and type of impact, and the importance of the population affected’*.
- 5.6. A full population class assessment has not been undertaken within ponds surrounding the proposed development, but the ponds to the south are accepted in the very least as supporting or capable of supporting a breeding population and should be evaluated in the very least, collectively as a large size class. Based on using section 5.8.5 of Natural England GCN Mitigation Guidelines, ‘Site Status Assessment’ it would qualify as of **High Importance** in terms of **quantitative assessment** in accordance with Natural England guidance. **Qualitatively**, it is categorised as of **moderate importance** because although breeding is occurring, habitats are common in the county of Wrexham and the locality of northeast Wales. **Functionally**, because there is dispersal to and from other nearby populations and the site plays an important role for nearby populations, this would qualify it as of **major importance**. From a **contextual** view point,

the population is not fully assessed, but is thought to be typical of that in the local area and so of **moderate importance**.

Outline Mitigation Approach

- 5.7. Any development would need to meet the three tests in the European Protected Species licensing process which includes demonstrating that there are reasons of overriding public interest including those of a social or economic nature and beneficial consequences of primary importance for the environment, providing evidence of no other satisfactory alternative to the development and that the action authorised will not be detrimental to the maintenance of the population of the species concerned at a favourable conservation status in their natural range. Furthermore, a suitable compensation area of habitat to replace that lost to development would need to be provided. Natural Resources Wales ("NRW") have advised that there is a policy of needing to provide an equivalent compensation area to that of the size of area lost to development. This could be provided on site, off site but close to the site or based on a combination of both approaches. Another option that could be considered is to make a financial contribution towards a designated strategic GCN site.
- 5.8. Compensation site safeguarding would need to be secured in addition to long-term sustainable management and monitoring implemented for a period of circa 25 years to the satisfaction of Wrexham Borough Council and Natural Resource Wales.
- 5.9. Mechanisms must be adopted to ensure long-term secure management such as transfer of land and/or resources to an appropriate independent entity.
- 5.10. Monitoring of the nearby existing GCN population would need to be undertaken to measure FCS.
- 5.11. Although any proposals will require a European Protected Species Mitigation Licence from NRW to legally permit the development, the impact to GCN would however be greatly reduced if the development size was decreased and as much habitat retained as possible. Attempts have been made to achieve this with the retention of a 5m grassland swathe around the infrastructure.
- 5.12. The following mitigation and compensatory measures are recommended:
 - i. The creation of an amphibian receptor area ('wildlife area') in the northwest field (Appendix I) to include terrestrial and aquatic habitats. This area is currently intensively managed arable farmland, bordered on the north by mature woodland and a river corridor, grassland and scrub to the south.
 - a. Terrestrial habitats should consist of rough grassland, with scrub planting and the creation of 10, 25m south facing bunds/hibernacula (Appendix H), which are covered

- in low-nutrient soils. These bunds will create variation in site topography and provide varying microclimates for amphibians.
- b. Aquatic habitats should consist of the creation of four new ponds within 150m of each other. The ponds should have a surface area of 100-300m², with a maximum depth of 2.5m, gradually sloping sides and a 1m deep shelf on the southern section to provide breeding areas for newts. No fish are to be released into the ponds.
 - ii. A temporary exclusion fencing with pitfall traps (100 traps/ha) to be installed around the site perimeter and checked for a minimum of 90 nights, in suitable weather conditions and during the active season for amphibians (March to October). Any animals caught are to be translocated to the designated receptor area. The fence will remain in situ during the construction period to prevent amphibians moving back into the area of works.
 - iii. During the trapping period, night searches will be conducted by a licenced ecologist. The search will involve a thorough inspection of the site using high powered torches for active amphibians approximately an hour after sunset.
 - iv. Phased vegetation clearance conducted during the defined trapping period. The initial cut should be to a height of 10cm, with subsequent cuts once a week to maintain sward height.
 - v. A hand destructive search of all suitable amphibian habitat to take place at the end of the trapping period, under watching brief by a licensed GCN ecologist. Any animals caught are to be translocated to the designated receptor area.
 - vi. Storage of building materials to be raised from the ground on pallets to avoid providing potential resting places for amphibians.
 - vii. Any excavations should have a rough sawn plank placed inside to act as a ramp to allow any animals that have fallen in to escape. The excavations should be checked each morning works are scheduled for, to remove any animals trapped.
 - viii. The site's habitat biodiversity should be enhanced through a soft landscaping scheme, using native species, to create a 'green buffer' zone and include:
 - a. The planting of a new species-rich (≥ 5 native species) hedgerow with trees, measuring ≈ 565 m, and creation of a native woodland equating to 3,000m². A list of suitable native species for planting and sowing is provided in Appendix G.
 - b. Habitat corridors to be maintained and encourage dispersal from the south. A track of 565m in length and about 5m wide (0.32ha) consisting of a modified tall ruderal grassland mosaic and a hedgerow to be retained and protected.
 - ix. Long-term monitoring of the GCN population in accordance with the Great Crested Newt Mitigation Guidelines (English Nature, 2001).

5.13. Mitigation measures following the works will include the long-term management of the receptor area to maintain the ponds, a species-rich tussocky grassland and limit scrub encroachment:

- i. Once established, an alternating strip method should be used, where one third of the grassland is cut every three years between November and February. Cut alternating strips 1-2m wide across the grassland to a height of 10cm. The following year, cut an adjacent strip in the same way, so that each strip is cut every three years (Edgar *et al.*, 2010).
- ii. Clearing scrub and removing trees which may provide too much shade to the receptor area, particularly on the southern aspect.
- iii. Preserving the suitability of the hibernacula created for amphibians.
- iv. Aquatic vegetation (marginal and submerged) will be maintained between 50-75% by hand during autumn or winter months (ideally September to November) once established. Any vegetation removed from the pond will be left on the bankside for 48 hours to allow any wildlife to return to the water.

5.14. After the effects of the above mitigation, we predict a significant enhancement of the favourable conservation status of GCN on and near the site, and we therefore consider that a European Protected Species Mitigation Licence should be granted by NRW.

Summary of Habitat Losses, Temporary Disturbance and Creation

Habitat type		Habitat (ha)			
		Losses	Temporary disturbance	Creation	Enhancement
Terrestrial	Grassland/ruderal mosaic (ha)	0	0.56	2	0.32
	Woodland (ha)	0	0	0.3**	0
	Arable (ha)	24.2*	0.47	0	0
	Hedgerow (m)	115	30	565	0
	Scrub (ha)	0	0.2	1	0
Aquatic (ha & No. ponds)		0	0	0.08ha (4 ponds)	0

Table 2, summary of habitat losses, disturbance, creation and enhancement. * excludes 3ha of arable lost to form the new receptor area. ** outside of the new receptor area.

Proposed Targets

5.15. The proposed targets for the ponds within the GCN mitigation areas and Ponds to the south of the development are as follows:

- i. For all new Glasshouse Mitigation Ponds the HSI score should be between Good and Excellent (0.7+).
- ii. All ponds that supported GCN populations prior to the development should continue to support them at least equal to the population prior to works commencing.
- iii. All ponds that were created as aquatic mitigation habitat should support GCN populations with a target of 'medium' class size.
- iv. The overall population level for the new Glasshouse mitigation area and ponds to the south collectively should be greater than the overall population (ponds deemed to be within 250m of each other) and greater than for the metapopulation (ponds deemed to be within 500m of each other) that existed in the south prior to works commencing.

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Appendix A

Legislation

European Protected Species

National Planning Policy - National Planning Policy Framework (NPPF)

Section 15 of the National Planning Policy Framework 2019 (NPPF): Conserving and enhancing the natural environment states that 'planning policies and decisions should contribute to and enhance the natural and local environment by ... minimising impacts on and providing net gains for biodiversity.'

Office of The Deputy Prime Minister ("ODPM") Government Circular: Biodiversity and Geological Conservation – Statutory Obligations and their impact within the planning system.

Paragraph 98 of Circular 06/2005 states that 'the presence of a protected species is a material consideration when a planning authority is considering a development proposal that, if carried out, would be likely to result in harm to the species or its habitat'.

Implications of legislation and policies

Without this ecological assessment, the potential developer would be unable to demonstrate due diligence in his responsibilities. Furthermore, the local planning authority would not have been provided with sufficient information for a planning decision to be made. This could result in non-determination or refusal of the application.

With legal responsibilities and planning implications, it is essential that any ecological assessment of a potential development site, including the area of this report, must determine the possible presence or absence of any protected species as part of any planning development consideration.

Where mitigation or compensation measures are required to ensure that no significant impacts will result on biodiversity from the development, the proposed measures may be secured through planning conditions or by EPS Mitigation Licences from Natural England or Natural Resources Wales.

Great Crested Newts

Great crested newts are protected under both English and European law. It is an offence to kill, injure, disturb or take great crested newts or to damage or destroy their places of shelter, whether the animals are present or not.

Natural England or Natural Resources Wales Licensing - EPS Mitigation Licensing

Licences can be obtained from the Wildlife Management and Licensing Service at Natural England or Natural Resources Wales to allow certain activities that would otherwise constitute an offence, for the purposes of development (e.g. destruction of a bat roost, loss of great crested newt aquatic and terrestrial habitat, etc).

Appendix B

Pond locations



Appendix C

HSI scoring table

Pond	1	2	3	4	5	6	7	8	9	10	11
Geographic location	Awaiting authorised access	Zone A	Zone A	Zone A	Zone A	Zone A	Zone A	Zone A	Zone A	Authorised access refused	Authorised access refused
		1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00		
Pond surface area (m ²)		300m ²	550m ²	200m ²	300m ²	350m ²	300m ²	100m ²	200m ²		
		0.60	1.00	0.40	0.60	0.70	0.60	0.20	0.40		
Desiccation rate		Never	Never	Never	Never	Never	Never	>3 years in 10	>3 years in 10		
		0.90	0.90	0.90	0.90	0.90	0.90	0.50	0.50		
Water quality/invert density		Good	Good	Good	Good	Good	Good	Good	Good		
		1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00		
Shoreline shade (%)		50%	50%	30%	30%	80%	50%	70%	70%		
		1.00	1.00	1.00	1.00	0.60	1.00	0.80	0.80		
Waterfowl impacts		Absent	Minor	Absent	Absent	Absent	Absent	Absent	Absent		
		1.00	0.67	1.00	1.00	1.00	1.00	1.00	1.00		
Fish impacts		Absent	Minor	Absent	Absent	Absent	Absent	Absent	Absent		
		1.00	0.67	1.00	1.00	1.00	1.00	1.00	1.00		
Ponds within 1km		13+	13+	13+	13+	13+	13+	13+	13+		
		1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00		
Terrestrial habitat quality		Good	Good	Good	Good	Good	Good	Good	Good		
		1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00		
Macrophyte cover (%)		60%	10%	80%	80%	50%	50%	70%	70%		
		0.90	0.40	1.00	1.00	0.80	0.80	1.00	1.00		
HSI Score		Excellent	Excellent	Excellent	Excellent	Excellent	Excellent	Good	Excellent		
		0.93	0.83	0.90	0.94	0.88	0.91	0.77	0.83		

Pond	12	13	14	15	16	17	18	19	20	21*	22
Geographic location	Dry	Awaiting authorised access	Awaiting authorised access	Awaiting authorised access	Dry	Zone A	Zone A	Zone A	Zone A	Zone A	Zone A
Pond surface area (m ²)						1.00	1.00	1.00	1.00	1.00	1.00
Desiccation rate						700m ²	600m ²	350m ²	800m ²	150m ²	3,000m ²
Water quality/invert density						1.00	1.00	0.70	0.99	0.25	0.80
Shoreline shade (%)						Never	Never	Never	Never	Annually	Never
Waterfowl impacts						0.90	0.90	0.90	0.90	0.10	0.90
Fish impacts						Good	Good	Good	Good	Poor	Moderate
Ponds within 1km						1.00	1.00	1.00	1.00	0.33	0.67
Terrestrial habitat quality						50%	80%	40%	50%	60%	30%
Macrophyte cover (%)						1.00	0.60	1.00	1.00	1.00	1.00
HSI Score						Absent	Absent	Absent	Absent	Absent	Minor
						1.00	1.00	1.00	1.00	1.00	0.67
						Absent	Absent	Absent	Absent	Absent	Absent
						1.00	1.00	1.00	1.00	1.00	1.00
						13+	13+	13+	13+	13+	13+
						1.00	1.00	1.00	1.00	1.00	1.00
						Good	Good	Good	Good	Moderate	Good
						1.00	1.00	1.00	1.00	0.67	1.00
						20%	10%	10%	10%	70%	30%
						0.50	0.40	0.40	0.40	1.00	0.60
						Excellent	Excellent	Excellent	Excellent	Below average	Excellent
						0.92	0.86	0.84	0.90	0.59	0.85

Pond	23	24	25	26
Geographic location	Zone A	Dry	Zone A	Zone A
	1.00		1.00	1.00
Pond surface area (m ²)	2,500m ²		50m ²	100m ²
	0.80		0.10	0.20
Desiccation rate	Never		Annually	>3 years in 10
	0.90		0.10	0.50
Water quality/ invert density	Poor		Moderate	Moderate
	0.33		0.67	0.67
Shoreline shade (%)	5%		0%	40%
	1.00		1.00	1.00
Waterfowl impacts	Minor		Absent	Absent
	0.67		1.00	1.00
Fish impacts	Minor		Absent	Absent
	0.33		1.00	1.00
Ponds within 1km	13+		13+	13+
	1.00		1.00	1.00
Terrestrial habitat quality	Good		Good	Good
	1.00		1.00	1.00
Macrophyte cover (%)	10%		50%	40%
	0.40		0.80	0.70
HSI Score	Good		Below average	Good
	0.72		0.59	0.74

Table 3, HSI score for ponds within 250m of the proposed site. *data assumed from opposite side of fence.

Appendix D

eDNA results



Folio No: E7547
 Report No: 1
 Purchase Order: Etienne Swarts
 Client: GREENLIGHT
 Contact: Etienne, Sarah Carver

TECHNICAL REPORT

ANALYSIS OF ENVIRONMENTAL DNA IN POND WATER FOR THE DETECTION OF GREAT CRESTED NEWTS (TRITURUS CRISTATUS)

SUMMARY

When great crested newts (GCN), *Triturus cristatus*, inhabit a pond, they continuously release small amounts of their DNA into the environment. By collecting and analysing water samples, we can detect these small traces of environmental DNA (eDNA) to confirm GCN habitation or establish GCN absence.

RESULTS

Date sample received at Laboratory: 28/05/2020
Date Reported: 04/06/2020
Matters Affecting Results: None

Lab Sample No.	Site Name	O/S Reference	SIC	DC	IC	Result	Positive Replicates
2761	Pond 20, Five Fords		Pass	Pass	Pass	Negative	0
2762	Pond 17, Five Fords		Pass	Pass	Pass	Positive	2
2763	Pond 3, Five Fords		Pass	Pass	Pass	Positive	8
2765	Pond 9, Five Fords		Pass	Pass	Pass	Positive	4
2767	Pond 18, Five Fords		Pass	Pass	Pass	Positive	2
2769	Pond 4, Five Fords		Pass	Pass	Pass	Positive	5
2771	Pond 2 (2), Five Fords		Pass	Pass	Pass	Positive	1



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 Company Registration No. 08950940



2772	Pond 19, Five Fords		Pass	Pass	Pass	Negative	0
2773	Pond 5, Five Fords		Pass	Pass	Pass	Negative	0
2774	Pond 6, Five Fords		Pass	Pass	Pass	Positive	2
2775	Pond 26, Five Fords		Pass	Pass	Pass	Positive	1
2777	Pond 22, Five Fords		Pass	Pass	Pass	Negative	0
2778	Pond 23, Five Fords		Pass	Pass	Pass	Positive	1
2779	Pond 8, Five Fords		Pass	Pass	Pass	Positive	5
2780	Pond 7, Five Fords		Pass	Pass	Pass	Positive	12

If you have any questions regarding results, please contact us: ForensicEcology@surescreen.com

Reported by: Sarah Evans

Approved by: Chris Troth

METHODOLOGY

The samples detailed above have been analysed for the presence of GCN eDNA following the protocol stated in DEFRA WC1067 'Analytical and methodological development for improved surveillance of the Great Crested Newt, Appendix 5.' (Biggs et al. 2014). Each of the 6 sub-sample tubes are first centrifuged and pooled together into a single sample which then undergoes DNA extraction. The extracted sample is then analysed using real time PCR (qPCR), which uses species-specific molecular markers to amplify GCN DNA within a sample. These markers are unique to GCN DNA, meaning that there should be no detection of closely related species.

If GCN DNA is present, the DNA is amplified up to a detectable level, resulting in positive species detection. If GCN DNA is not present then amplification does not occur, and a negative result is recorded.

Analysis of eDNA requires scrupulous attention to detail to prevent risk of contamination. True positive controls, negative controls and spiked synthetic DNA are included in every analysis and these have to be correct before any result is declared and reported. Stages of the DNA analysis are also conducted in different buildings at our premises for added security.

SureScreen Scientifics Ltd is ISO9001 accredited and participate in Natural England's proficiency testing scheme for GCN eDNA testing. We also carry out regular inter-laboratory checks on accuracy of results as part of our quality control procedures.

INTERPRETATION OF RESULTS



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SIC:	Sample Integrity Check [Pass/Fail] When samples are received in the laboratory, they are inspected for any tube leakage, suitability of sample (not too much mud or weed etc.) and absence of any factors that could potentially lead to inconclusive results.
DC:	Degradation Check [Pass/Fail] Analysis of the spiked DNA marker to see if there has been degradation of the kit or sample between the date it was made to the date of analysis. Degradation of the spiked DNA marker may lead indicate a risk of false negative results.
IC:	Inhibition Check [Pass/Fail] The presence of inhibitors within a sample are assessed using a DNA marker. If inhibition is detected, samples are purified and re-analysed. Inhibitors cannot always be removed, if the inhibition check fails, the sample should be re-collected.
Result:	Presence of GCN eDNA [Positive/Negative/Inconclusive] Positive: GCN DNA was identified within the sample, indicative of GCN presence within the sampling location at the time the sample was taken or within the recent past at the sampling location. Positive Replicates: Number of positive qPCR replicates out of a series of 12. If one or more of these are found to be positive the pond is declared positive for GCN presence. 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. 0/12 indicates negative GCN presence. Negative: GCN eDNA was not detected or is below the threshold detection level and the test result should be considered as evidence of GCN absence, however, does not exclude the potential for GCN presence below the limit of detection.



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Folio No: E7624
Report No: 1
Purchase Order: Etienne
Client: GREENLIGHT
Contact: Sarah Carver

TECHNICAL REPORT

ANALYSIS OF ENVIRONMENTAL DNA IN POND WATER FOR THE DETECTION OF GREAT CRESTED NEWTS (*TRITURUS CRISTATUS*)

SUMMARY

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RESULTS

Date sample received at Laboratory: 04/06/2020
Date Reported: 11/06/2020
Matters Affecting Results: None

Lab Sample No.	Site Name	O/S Reference	SIC	DC	IC	Result	Positive Replicates
2768	Pond 25, Five Fords		Pass	Pass	Pass	Positive	5

If you have any questions regarding results, please contact us: ForensicEcology@surescreen.com

Reported by: Chris Troth

Approved by: Sarah Evans



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Page 1 of 2



METHODOLOGY

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If GCN DNA is present, the DNA is amplified up to a detectable level, resulting in positive species detection. If GCN DNA is not present then amplification does not occur, and a negative result is recorded.

Analysis of eDNA requires scrupulous attention to detail to prevent risk of contamination. True positive controls, negative controls and spiked synthetic DNA are included in every analysis and these have to be correct before any result is declared and reported. Stages of the DNA analysis are also conducted in different buildings at our premises for added security.

SureScreen Scientifics Ltd is ISO9001 accredited and participate in Natural England's proficiency testing scheme for GCN eDNA testing. We also carry out regular inter-laboratory checks on accuracy of results as part of our quality control procedures.

INTERPRETATION OF RESULTS

SIC:	Sample Integrity Check [Pass/Fail] When samples are received in the laboratory, they are inspected for any tube leakage, suitability of sample (not too much mud or weed etc.) and absence of any factors that could potentially lead to inconclusive results.
DC:	Degradation Check [Pass/Fail] Analysis of the spiked DNA marker to see if there has been degradation of the kit or sample between the date it was made to the date of analysis. Degradation of the spiked DNA marker may lead indicate a risk of false negative results.
IC:	Inhibition Check [Pass/Fail] The presence of inhibitors within a sample are assessed using a DNA marker. If inhibition is detected, samples are purified and re-analysed. Inhibitors cannot always be removed, if the inhibition check fails, the sample should be re-collected.
Result:	Presence of GCN eDNA [Positive/Negative/Inconclusive] Positive: GCN DNA was identified within the sample, indicative of GCN presence within the sampling location at the time the sample was taken or within the recent past at the sampling location. Positive Replicates: Number of positive qPCR replicates out of a series of 12. If one or more of these are found to be positive the pond is declared positive for GCN presence. 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. 0/12 indicates negative GCN presence. Negative: GCN eDNA was not detected or is below the threshold detection level and the test result should be considered as evidence of GCN absence, however, does not exclude the potential for GCN presence below the limit of detection.



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Appendix E

eDNA sample information

Pond No.	Kit lab reference	Sample date	Percentage of shoreline sampled %	Posted for next day delivery	Notes
1	-	-	-	-	No authorised access
2	2771	24/05/20	85	26/05/20	-
3	2763	24/05/20	65	26/05/20	-
4	2769	24/05/20	100	26/05/20	-
5	2773	24/05/20	100	26/05/20	-
6	2774	24/05/20	100	26/05/20	-
7	2780	24/05/20	75	26/05/20	-
8	2779	24/05/20	100	26/05/20	-
9	2765	24/05/20	100	26/05/20	-
10	-	-	-	-	No authorised access. Fish introduced according to owner
11	-	-	-	-	No authorised access. Fish introduced according to owner
12	-	-	-	-	Dry
13	-	-	-	-	No authorised access
14	-	-	-	-	No authorised access
15	-	-	-	-	No authorised access
16	-	-	-	-	Dry
17	2762	24/05/20	80	26/05/20	-
18	2767	24/05/20	70	26/05/20	-
19	2772	24/05/20	70	26/05/20	-
20	2761	24/05/20	80	26/05/20	-
21	-	-	-	-	No authorised access
22	2777	26/05/20	60	26/05/20	-
23	2778	26/05/20	60	26/05/20	-
24	-	-	-	-	Dry
25	2768	29/05/20	100	03/06/20	-
26	2775	26/05/20	100	26/05/20	-

Appendix F

Pond descriptions

Numbers/letters in brackets after the Pond number are the name/code assigned to the pond according to Middlemarch pond numbering system.

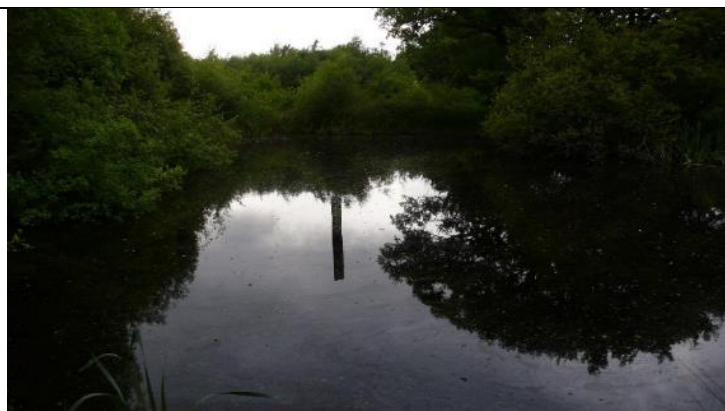
Pond 1 – Understood to be a water attenuation lagoon constructed as part of the development for the new Sesswick Road.

No photo

Pond 2 (N1) – A medium pond 280m² surrounded by dense willow including coppiced goat willow *Salix cinerea*. Reedmace *Typha latifolia*, and Rush *Juncus sp.* Water forget-me-not *Myosotis scorpioides* present. Depth not known.



Pond 3 (X2) – A large old pond of approximately 550m² in size, heavily shaded by mature woodland with little marginal or aquatic vegetation. Some reedmace, broad-leaved willow herb, bittersweet *Solanum dulcamara*, horsetail *Equisetum sp.* and broad-leaved pondweed *Potamogeton natans* were present.



Pond 4 (N4 on marker post) - A medium pond approximately 230m² with well-established marginal and aquatic vegetation comprising mainly of common reedmace. Broad-leaved pondweed was present in the open water areas. Fool's watercress *Apium nodiflorum*, Rush species and sedges were present. Pond was surrounded by dense goat willow scrub. Pond connected by a shallow ditch to pond 5.



Pond 5 (N2 on marker post) – A pond very similar to pond 4 about 320m². Pond connected by a shallow ditch to pond 4



Pond 6 (N3 on marker post) – 360m² approximately. Pond surrounded by dense goat willow with reedmace, broad-leaved pondweed and rush. Pond did not appear to be particularly deep.



Pond 7 (X1) – a small pond with 150m² open water but 320m² in total surrounded by dense bramble with some mature oak trees. Reedmace was present and much of the surface was covered in duckweed *Lemna minor*. Some bittersweet was present on the edges. The southern edge was more open water with reedmace dominating the northern end.



Pond 8 (N5) – approximately 125m². possibly a mitigation pond for the road Marginal and aquatic vegetation includes reedmace and broad-leaved pondweed and covered approximately 70% of the water surface. Some rush and large bittercress *Cardamine amara* was present on the margins.



Pond 9 (N6) – A pond about 200m², possibly a mitigation pond for the road, estimated to be approximately 1m deep with 70% vegetation cover. Plants included Broad leaved pond weed, reedmace, large bittercress, fool's watercress.



Pond 16 - A dry farm pond.



Pond 17 (X5 on marker post). 700m² approximately.
An old deep shaded pond surrounded by mature woodland. A large proportion of the surface had a covering of duckweed. Rush sp., horsetail, reedmace and bittersweet were recorded.



Pond 18 (X7) - 500m² approximately.
An old deep shaded pond surrounded by mature woodland. A large proportion of the surface had a covering of duckweed. Very little aquatic or marginal vegetation. Some reedmace was present. Smaller dry pools were present to the north and south. The southern may contain water at higher water levels.



Pond 19 (X9 on marker post) – 350m² approximately. A partially shaded old pond within mature woodland. Vegetation included Willowherb *Epilobium sp.*, Horsetail, rush, broad-leaved pondweed and water starwort *Callitriche paulustris*.



Pond 20 (X11) - A large pond with silty shallow edges 800m² approximately. Situated in dense mature woodland. Some limited vegetation included reedmace and bittersweet.



Pond 21 – A small shallow pond in a horse grazed field with Reedmace. Assessed from a distance on the opposite side of the fence to the north. 150m² approximately.



Pond 22 – A large lagoon 3000m² approximately within the Welsh Water property with shallow silty edges and willow on the banks. A fringe of dense Reedmace was present on the shoreline with frequent Gipsywort *Lycopus europaeus* and occasional bittersweet.



Pond 23 – A large engineered raised lagoon 2500m² approximately within the Welsh Water property. Possibly deep with reedmace. Nettle and dense bramble dominate the banks and Gipsywort and *Epilobium sp.* are frequent. Coot *fulica atra* was present. Anecdotal evidence of presence of fish. Swallows were skimming over the surface.



Pond 24 – A very small dry 'mitigation' pond. Bare exposed banks.



Pond 25 – A very small 'mitigation' pond with reedmace as the dominant plant and occasional rush species. Approximately 50m² with bare exposed banks.



Pond 26 – A fairly small 'mitigation' pond. Rush species, reedmace and Ragged robin *Lychnis flos-cuculi* were present. Approximately 100m².



Appendix G

Native species suitable for planting and sowing

Plants should be obtained from specialist nurseries and preferably be of local genetic stock.

Key: (f) – fruit and berry species; (e) – evergreen species; (se) semi-evergreen species; (d) – deciduous species

Trees	
Alder (d)	<i>Alnus glutinosa</i>
Apples (f; d)	<i>Malus spp.</i> (local varieties)
Ash (d)	<i>Fraxinus excelsior</i>
Beech (d)	<i>Fagus sylvatica</i>
Bird cherry (f; d)	<i>Prunus padus</i>
Elder (f; d)	<i>Sambucus nigra</i>
Elm (d)	<i>Ulmus procera</i>
Field maple (d)	<i>Acer campestre</i>
Pedunculate oak (d)	<i>Quercus robur</i>
Rowan (f; d)	<i>Sorbus aucuparia</i>
Pears (f; d)	<i>Pyrus spp.</i>
Silver birch (d)	<i>Betula pendula</i>
Small-leaved lime (d)	<i>Tilia cordata</i>
White willow (d)	<i>Salix alba</i>
Wild cherry (f; d)	<i>Prunus avium</i>
Walnut (d)	<i>Juglans regia</i>

Shrubs	
Blackthorn (f; d)	<i>Prunus spinosa</i>
Buckthorn (f; d)	<i>Rhamnus catharticus</i>
Crab apple (f; d)	<i>Malus sylvestris</i>
Dog rose (f; d)	<i>Rosa canina</i>
Dogwood (f; d)	<i>Cornus sanguinea</i>
Field maple (d)	<i>Acer campestre</i>
Guelder-rose (f; d)	<i>Viburnum opulus</i>
Hawthorn (f; d)	<i>Crataegus monogyna</i>
Hazel (d)	<i>Corylus avellana</i>
Holly (e)	<i>Ilex aquifolium</i>
Honeysuckle (f; d)	<i>Lonicera periclymenum</i>
Spindle (f; d)	<i>Euonymus europaeus</i>
Wild privet (f; se)	<i>Ligustrum vulgare</i>
Yew (f; e)	<i>Taxus baccata</i>

Flowering plants	
Bird's-foot trefoil	<i>Lotus corniculatus</i>
Black knapweed	<i>Centaurea nigra</i>
Common cat's-ear	<i>Hypochaeris radicata</i>
Common sorrel	<i>Rumex acetosa</i>
Common vetch	<i>Vicia sativa</i>
Cowslip	<i>Primula veris</i>
Field scabious	<i>Knautia arvensis</i>
Foxglove	<i>Digitalis purpurea</i>
Lady's bedstraw	<i>Galium verum</i>
Meadow buttercup	<i>Ranunculus acris</i>
Meadow vetchling	<i>Lathyrus pratensis</i>
Oxeye daisy	<i>Leucanthemum vulgare</i>
Primrose	<i>Primula vulgaris</i>
Red clover	<i>Trifolium pratense</i>
Selfheal	<i>Prunella vulgaris</i>
Sweet violet	<i>Viola odorata</i>
Wild daffodil	<i>Narcissus pseudonarcissus</i>
Yarrow	<i>Achillea millefolium</i>

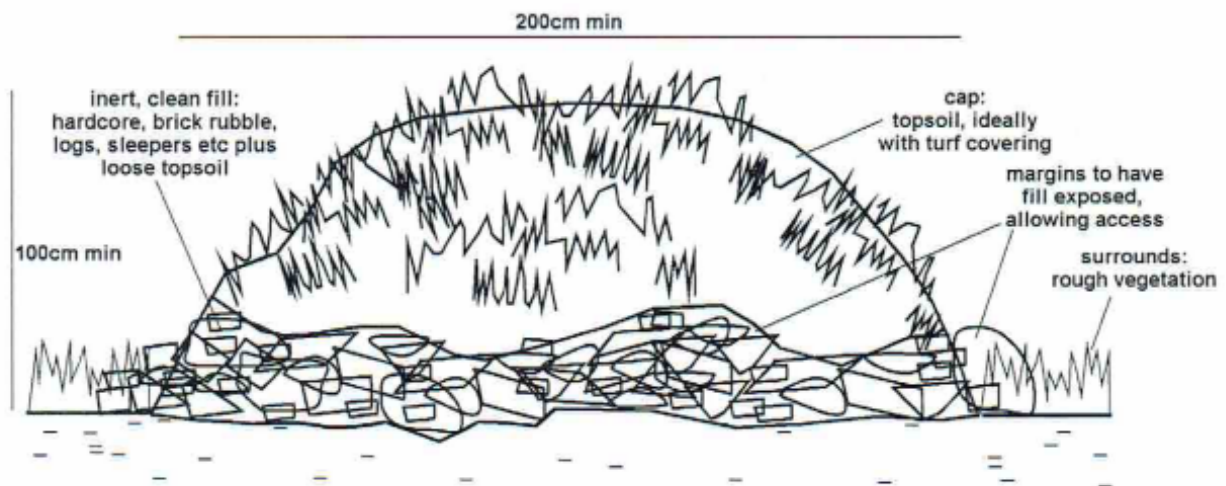
Grasses	
Common bent	<i>Agrostis capillaris</i>
Crested dog's-tail	<i>Cynosurus cristatus</i>
Meadow fescue	<i>Festuca pratensis</i>
Red fescue	<i>Festuca rubra</i>
Rough meadow-grass	<i>Poa trivialis</i>
Small timothy	<i>Phleum bertolonii</i>
Smooth meadow-grass	<i>Poa pratensis</i>
Sweet vernal-grass	<i>Anthoxanthum odoratum</i>
Yellow oat-grass	<i>Trisetum flavescens</i>

Appendix H

Newt and reptile artificial hibernaculum design

Figure 3: Suggested hibernaculum design

This design mimics artificial and natural conditions in which great crested newts have frequently been found over-wintering. Dimensions should not be below 2m length x 1m width x 1m height. The illustrated design would be suitable for locating on an impermeable substrate. On free-draining substrates, the design is largely similar but the bulk of the fill is sited in an excavated depression in the ground. Hibernacula should ideally be positioned across a site, both close to and distant from breeding ponds, always in suitable terrestrial habitat and above the flood-line.



Source: English Nature (2001) *Great Crested Newt Mitigation Guidelines*, Peterborough.

Appendix I

Proposed plans and GCN receptor area

