

LAND AT ARUNDEL

Ecology Survey Report

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Ecology Survey Report
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REPORT

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EXECUTIVE SUMMARY

- * RPS was commissioned by Redrow Homes to undertake ecology surveys at land at Arundel, Angmering, Littlehampton, BN16 4ET.
- * An outline application for the site has been approved (A/122/19/OUT) for the residential development. This report relates to the first Reserved Matters application for the site. This report presents the findings of the ecology surveys in the context of the Reserved Matters application site.
- * In 2018, a Preliminary Ecological Appraisal (PEA) was conducted by CSA Environmental (CSA 2018) for the wider site. Phase 2 surveys were also conducted by CSA Environmental were carried out for reptiles, great crested newt, badger, bats and hazel dormouse within the wider site.
- * Dormice were recorded on the wider site in 2018 and 2021. Habitat suitable for dormice (0.12 ha of sub-optimal bramble scrub) will be impacted by the proposed RM development. Therefore, an EPSML application for hazel dormouse from Natural England will be required prior to the commencement of any works related to the proposed RM development. This loss will be mitigated through the enhancement of existing hazel dormouse habitat (hedgerows) (infilling of any gaps) and the planting of a new 0.2 ha green buffer around the edge of the site adjacent to the hedgerows. The planting will incorporate species of value to dormice such as hazel but also defensive planting (such as hawthorn and blackthorn) to prevent domestic cat ingress into the hedgerows.
- * Building B1 was not accessible or available for updated bat surveys in 2021 and will need a pre-works assessment to confirm the potential for roosting bats. If any evidence of bats is found, then further emergence surveys will be required prior to the commencement of any works. Should evidence of bats be recorded within these buildings, it may alter the requirements for the low impact class licence. It is also recommended that a sensitive lighting strategy for bats is incorporated into the proposals.
- * No GCN eDNA was reported in the four surveyed ponds within the surrounding habitat.
- * Although a protected species licence is not required for sites supporting the common and widespread reptile species, in order to comply with legislation habitat manipulation methods are recommended in order to avoid killing and injury. These methods involve reducing the suitability of the habitat for reptiles and therefore encouraging them to move out of the area to adjacent suitable habitat.
- * Clearance of habitat that holds potential to support breeding birds (in particular scrub, hedgerows, and woodland), precautionary measures have been provided in this report.

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1 INTRODUCTION

1.1 Purpose and Scope of this Report

- 1.1.1 RPS was commissioned by Redrow Homes to undertake Phase 2 ecology surveys for hazel at land at Arundel, Angmering, Littlehampton, BN16 4ET.
- 1.1.2 An outline application for the site has been approved (A/122/19/OUT) for the erection of up to 160 dwellings with public open space, landscaping and sustainable drainage systems (SuDs), vehicle access point from Arundel Road, together with up to 1,393 square meters of B1/B2 units with associated parking provision and vehicular access point from Arundel Road and land made available for expansion of current sports pitch provision.
- 1.1.3 Redrow Homes now purpose to submit a Reserved Matters application for part of the wider site. This report presents the findings of the great crested newts, hazel dormouse, bat emergence and badger surveys in the context of the reserved matters application site.
- 1.1.4 The aims of this report are therefore to:
- Identify the presence of protected species (Phase 2 Protected Species Surveys) and the habitats utilised by any protected species on site;
 - Assess population sizes of protected species, if present, on site;
 - Provide an assessment of potential direct or indirect impacts of the development on the population status of any protected species present;
 - Provide outline details of mitigation required for protected species, as appropriate, in context with wildlife legislation; and
 - Provide recommendations for biodiversity enhancements in line with national and local planning policy.
- 1.1.5 Following results from the previous bat roost assessment (CSA 2018) and results from the updated site walkover (refer to Appendix A), one building was identified as having low potential for supporting roosting bats (Building B1).

1.2 Site Description

- 1.2.1 The site is located on the northern edge of Angmering village, with arable farmland directly to the south. The Reserved Matters site to which this report relates is accessed off Arundel Road and comprises approximately 1.2 hectares, in the north and east of the wider hybrid application site. At the time of the 2021 surveys the site comprised part of an arable field and an area of dense scrub with a boundary hedgerow adjoining off-site woodland.

1.3 Survey Background

- 1.3.1 In 2018, a Preliminary Ecological Appraisal (PEA) was conducted by CSA Environmental (CSA 2018) of the site covered by the outline permission including the current proposed reserved matters site. Phase 2 surveys were subsequently conducted by CSA Environmental were carried out for reptiles, great crested newt, badger, bats and hazel dormouse followed by a Mitigation and Enhancement Strategy which was submitted as part of a hybrid application for the wider site (refer to Appendix B).
- 1.3.2 A subsequent walkover survey of the whole site covered by the outline permission was carried out by RPS in 2021 (refer to Appendix A) and included a review of all of the previous ecology

survey work undertaken at the site. It was concluded that updated surveys would be required for bats, great crested newt, badgers and hazel dormouse.

- 1.3.3 Previous reptile surveys carried out by CSA in 2018 identified a low population of common lizard on the wider site, along the field margins within grassland and scrub. These habitats and their management have not altered since the original surveys; therefore, it was concluded that the status of reptiles at the site was unlikely to have changed since the earlier survey and that no update to the reptile survey was needed.
- 1.3.4 Whilst no additional survey was carried out for reptiles, recommendations regarding precautionary measures pertaining to reptile species are still included within this report based on the findings of the earlier reptile surveys.

2 METHODS

2.1 Great Crested Newt – eDNA Survey

- 2.1.1 The waterbodies within 250m and 500m of the application site boundary were reviewed as well as the connecting terrestrial habitat between them, to identify suitable waterbodies to survey for presence of great crested newt (GCN) *Triturus cristatus*.
- 2.1.2 Nine known waterbodies were within 500m of the site boundary, none of which were within the site boundary. The respective landowners were approached on behalf of RPS and the client through the Land Agent, to request survey access. Access to survey waterbodies P1, P3, P5 and P6 (refer to Figure 2.1) was procured by the Land Agent. Ponds P2, P4 P7 and P8 were not accessible and were not surveyed.
- 2.1.3 Water samples were collected from the ponds P1, P3, P5 and P6 on the 12th May 2021, which is within the optimal survey period (i.e. considered to be between mid-April and the end of June) and during suitable weather conditions. The water samples were collected by experienced surveyors, including a GCN licensed ecologist.
- 2.1.4 The eDNA survey technique is set out in the Analytical and Methodological Development for Improved Surveillance of the GCN (Biggs *et al.*, 2014).

2.2 Hazel Dormouse Survey

- 2.2.1 A hazel dormouse nest tube survey was undertaken during the active season of 2021, following a methodology based on published best practice guidelines (Bright, Morris & Mitchell Jones 2006; Chanin & Woods 2003).
- 2.2.2 The initial survey set up was completed on 13th April 2021 by RPS hazel dormouse licensed ecologists and consisted of a total 50 hazel dormouse nest tubes deployed in areas of suitable habitat on site (Figure 2.2).
- 2.2.3 Nest tubes were tied to suitable vegetation around the site following standard survey guidelines to provide nesting opportunities for any dormice present. The nest tubes consisted of stiff double walled black plastic (5 x 5 cm in width and 25 cm long) with a plywood tray placed inside. These were suspended by wire onto the underside of horizontal tree branches.
- 2.2.4 Nest tubes were checked monthly at times when dormice will be active, between April and September 2021. Any signs of occupation or evidence of activity was recorded. All visits were carried out in suitable weather conditions. All survey visits, including tube deployment, were carried by hazel dormouse license holder Jo Balch (licence number 2016-22036-CLS-CLS) in suitable weather conditions (see Table 2.1 below).

Table 2.1 Hazel dormouse survey visit dates weather conditions.

Date	Weather Conditions	Temperature (°C)
30/04/2021	Dry, 50% cloud cover, wind (Beaufort Scale) 2.	22
12/05/2021	Dry, 40% cloud cover, wind (Beaufort Scale) 2.	20-22
09/06/2021	Dry, 10% cloud cover, wind (Beaufort Scale) 3.	18-20
08/07/2021	Dry, 10% cloud cover, wind (Beaufort Scale) 4.	21-23

Date	Weather Conditions	Temperature (°C)
24/08/2021	Dry, 10% cloud cover, wind (Beaufort Scale) 4.	21-23
02/09/2021	Dry, 95% cloud cover, wind (Beaufort Scale) 2.	17-19

Survey Effort

- 2.2.5 The hazel dormouse survey guidelines provide recommendations on the minimum survey effort for presence / likely absence surveys. A method is outlined for quantifying survey effort based on the number of nest tubes used and the likelihood of encountering dormice during each month between April and November (when dormice are typically active).
- 2.2.6 Using this method, the months April through November are each allotted a value referred to as an 'index of probability' score reflecting the relative likelihood of dormice being detected in nest tubes in that month. The 'index of probability' scores for each month are given below in Table 2.2, the survey effort is calculated by totalling the index of probability scores for each month in which nest tubes are installed.
- 2.2.7 Following the table of probability of finding dormice in the Dormouse Conservation Handbook (Table 5 – Bright, T., Morris, P., Mitchell-Jones, T. 2006), this gives a score of 21, which is above the required minimum survey effort (score of 20) for a valid survey.

Table 2.2 Index of probability calculations for hazel dormouse.

Survey Month	Index of Probability (50 tubes)
April	1
May	4
June	2
July	2
August	5
September	7
Total Score for Site:	21

2.3 Badger Survey

Camera Trap Monitoring

- 2.3.1 A suspected badger sett was located along the western boundary of the adjacent field to the south of the site during the Preliminary Ecological Appraisal (CSA, 2018). The sett was monitored for signs of badger activity over three weeks as part of a wider application and results can be found in the Phase 2 survey report (RPS, 2021). This sett is approximately 350 meters from the proposed site and therefore will not be disturbed as part of these proposals. Therefore, this is not considered any further within this report.

2.4 Limitations

Great Crested Newt – eDNA Surveys

- 2.4.1 Access to ponds within 500m from the site was not available for P2, P4 P7 and P8. However, ponds P1, P3, P5 and P6 were able to be surveyed. Ponds P4 and P8 were previously identified as having poor suitability to support GCN (CSA 2018), these ponds would therefore not have been included in the updated survey suite for 2021.
- 2.4.2 Of the eight ponds in the survey area, only five were deemed suitable habitat to support GCN, of which four were surveyed. Therefore, these limitations are not considered to be a significant constraint on the survey.

Bat Emergence/re-entry surveys

- 2.4.3 Access to Buildings B1 was not available for emergence surveys, therefore this building was not surveyed.
- 2.4.4 This building was previously reported to hold low potential to support roosting bats. Previous surveys had not found evidence of bat roosts following an internal inspection and suite of surveys. However, due to the transient nature of bats that will utilise several satellite summer roosts, likely absence cannot be concluded from previous surveys alone. Recommendations in Section 5 of this report address this limitation.

Accurate Lifespan of Ecological Data

- 2.4.5 The majority of ecological data remain valid for only short periods due to the inherently transient nature of the subject. The survey results contained in this report are considered accurate for two years, assuming no significant considerable changes to the site conditions.

3 SURVEY RESULTS

3.1 Great Crested Newt

- 3.1.1 No GCN eDNA was recorded in any of the water samples collected from the surveyed waterbodies (P1, P3, P5 or P6). The full results of the eDNA analysis are provided in Appendix B.
- 3.1.2 The sample integrity check undertaken by the ADAS laboratory confirmed that all water samples passed integrity tests and there were sample quality or contamination factors that might invalidate the results.

3.2 Hazel Dormouse Surveys

Habitat Description

- 3.2.1 Suitable hazel dormouse habitat is present within the RM site, within the northern and western boundaries. An area of dense scrub within the centre of the site has suitability for supporting hazel dormouse.

Survey Results

- 3.2.2 Individual hazel dormice and dormouse nests were found within nest tubes on four of the six survey visits. Over the entire survey period hazel dormouse nests were found in six tubes spread across in the northern and western boundary hedgerows within the wider ownership boundary. None were found within the RM application site. Five tubes in total held hazel dormouse nests with evidence of a woven core structure, surrounded by leaves and a hazel dormouse was found within one of these nests in May and June 2021. Results are summarised below (excluding tubes with nothing found) in Table 3.1 and location of dormice can be seen on Figure 2.2.

Table 3.1 Survey Results of hazel dormouse nest tube survey.

Visit Number	Date	Survey Results
1	30/04/2021	No evidence found.
2	12/05/2021	Adult hazel dormouse in nest, in nest tube 30.
3	09/06/2021	Adult hazel dormouse in nest, in nest tube 30.
4	08/07/2021	Adult hazel dormouse in nest, in nest tube 12. Empty dormouse nest in tube 30 and 25.
5	24/08/2021	Adult hazel dormouse in nest, in nest tube 12. Empty dormouse nest in tubes 30 and 25.
6	02/09/2021	Empty hazel dormouse nests in tubes 11, 21, 22, 25, and 30.

3.3 Bat Emergence Surveys

- 3.3.1 Bat emergence surveys were not undertaken on Building B1 as access was not available at the time of survey. Building locations can be seen below in Figure 2.3.

4 EVALUATIONS & POTENTIAL IMPACTS

4.1 Great Crested Newt

- 4.1.1 The eDNA surveys for waterbodies P1, P3, P5 and P6 were all negative for the presence of GCN eDNA. The site contains limited suitable habitat for GCN, mainly in the dense scrub and hedgerow habitat on site.
- 4.1.2 Previous surveys (CSA 2018) found that five of the eight ponds within the surrounding area contain suitable habitat to support GCN. Four of these ponds (P1, P3, P5 and P6) have confirmed negative eDNA results for GCN (RPS, 2021) indicating GCN are very unlikely to use these ponds. Although the other ponds could not be surveyed, given the negative results, including from the pond closest to the site, indicate that this species is unlikely to be present on site. Therefore, it is concluded that the proposed development will have negligible impact on GCN.

4.2 Hazel Dormouse

- 4.2.1 Dormice have been found to be present in two hedgerows outside the site boundary but within the ownership boundary (i.e. within the wider site covered by the outline permission but not within the site covered by this RM application). The levels of activity and presence of individual animals suggest that there is a population of dormice across the wider landscape, utilising connected hedgerows. Whilst evidence of dormice was found in hedgerows outside the redline boundary of this RM application, these were connected to surrounding hedgerows, on site scrub and the woodland off site to the north west with the western hedgerow giving connectivity to the south. Therefore, it is appropriate to assume dormice could be present in all suitable connecting habitat on site and within the wider area off site, and not restricted to hedgerows.

Potential Impacts – Habitat Loss

- 4.2.2 The proposed development is designed to retain all of the hedgerows on site; however 0.12 ha of sub-optimal bramble scrub habitat will be lost under current proposals.
- 4.2.3 Due to the presence of dormice in the wider area and the connectivity present between habitats both on and off site, the loss of any suitable hazel dormouse habitat has the potential to negatively impact dormice within the site. Therefore, suitable mitigation will be provided, to be described in an application for a European Protected Species Mitigation Licence (EPSML) for hazel dormouse. An outline mitigation strategy is provided in Section 5.

Potential Impacts - Disturbance

- 4.2.4 Increased human activity occupying proposed new residential dwellings will result in an increase in disturbance to the hazel dormouse population.
- 4.2.5 Increased lighting, traffic movements and general human activity, particularly during the evening and night periods when dormice would normally be active will be likely to have some effects on the hazel dormouse population. The development is on the edge of Angmering village; however, the site is located mainly within a rural setting, therefore, an increase in residential properties and the potential increase of domestic cats to the area could have a negative impact of the local hazel dormouse population. In order to avoid such impacts, an outline mitigation strategy is provided in Section 5.

4.3 Bats

Building B1

- 4.3.1 Building B1 is considered to have low potential for supporting roosting bats. Access was not available during previous bat surveys (RPS, 2021) and therefore the building was not surveyed. Previous surveys conducted in 2018 did not find any roosts present in Building B1. Once access is available, prior to any works taking place, an internal inspection will be repeated to gather up to date data. Any further surveys will then be undertaken and any appropriate mitigation provided. Given the low potential of the building, it is considered unlikely to support a bat roost of significant conservation status.

4.4 Badgers

- 4.4.1 The site contains suitable habitat for foraging and commuting badger and the site boundary is open to allow badgers access onto site from the adjacent surrounding habitat and wider area. The construction phase of proposals has the potential to negatively impact commuting or foraging badgers, therefore precautionary measures are set out in Section 5, required to ensure no badgers are harmed during the construction phase of works.

4.5 Reptiles

- 4.5.1 A small population of common lizard *Zootoca vivipara* was previously identified on the wider site (CSA, 2018). Habitats on the RM site with potential to support common and widespread reptiles, included the hedgerows and areas of scrub. Without mitigation, the removal of habitat suitable for supporting reptiles is likely to impact common and widespread reptiles.
- 4.5.2 As the habitat conditions, since the previous survey, have not materially altered, it is reasonable to assume the presence of common reptiles and population size has not changed significantly either. Therefore, recommendations pertaining to reptiles have been provided in Section 5 of this report, to ensure the proposed development does not have a significant negative impact on reptile populations.

4.6 Breeding Birds

- 4.6.1 The hedgerows and mixed scrub on site have the potential to support breeding birds. Therefore, recommendations for timings of works have been included within Section 5 of this report to avoid disturbing nesting birds during any demolition of buildings or clearance of vegetation.

5 RECOMMENDATIONS & MITIGATION REQUIREMENTS

5.1 Common and Widespread Reptiles

- 5.1.1 All common UK reptile species (adder *Vipera berus*, grass snake *Natrix Helvetica*, common lizard and slow worm *Anguis fragilis*) are protected through part of Section 9(1 and 5) of the Wildlife & Countryside Act 1981 (as amended). This prohibits:
- Intentional or reckless injuring or killing;
 - Selling, offering or exposing for sale, or having in possession or transporting for the purpose of sale, any live or dead wild animal or any part of, or anything derived from, such an animal; or
 - Publishing or causing to be published any advertisement likely to be understood as conveying buying or selling, or intending to buy or sell, any of those things.
- 5.1.2 Although a protected species licence is not required for sites supporting the common and widespread reptile species, in order to comply with legislation habitat manipulation methods are recommended in order to avoid killing and injury. These methods involve reducing the suitability of the habitat for reptiles and therefore encouraging them to move out of the area to adjacent suitable habitat.
- 5.1.3 Any cutting of suitable grassland vegetation on site will take place during the reptile hibernation period (November-February inclusive) so that when reptiles emerge in the spring, they will move out of the area to more suitable habitat. Cuttings will not be left on site and removed before the start of the reptile active period in March.
- 5.1.4 Suitable hibernation habitat (bases of hedgerows and scrub base/below ground) and refugia such as log piles, rubble and tree stumps will not be removed during the winter. During the reptile active period (March – October) any hibernacula will be dismantled by hand with an Ecologist Clerk of Works (ECoW) present to perform hand searches prior to and during the dismantling, with any animals found moved to adjacent suitable habitat.
- 5.1.5 If the cutting of vegetation is required during the reptile active period, a cut to 30 cm above ground level (no lower) would be required at least 24 hours prior to works to encourage animals to leave the area.
- 5.1.6 This method may require consideration to nesting birds within the core nesting season (March – August inclusive). Areas to be cut during the bird nesting season and reptile active period will be searched by an ECoW before any cutting commences.
- 5.1.7 Any reptiles that are caught during the clearance process can be moved into safe, suitable adjacent habitat away from the works area.
- 5.1.8 The above methods for habitat clearance will also be applicable to common amphibian species.

5.2 Hazel Dormouse

- 5.2.1 Hazel dormice are fully protected under Schedule 2 of the Conservation of Habitats and Species Regulations 2017 (as amended) and are also protected under the Wildlife and Countryside Act 1981 (as amended) through their inclusion in Schedule 5.
- 5.2.2 Hazel dormice are also listed on Section 41 of the NERC Act 2006 as a Species of Principal Importance; national objectives & targets include the maintenance of the geographical range and viability of existing dormice populations to ensure that it remains in favourable conservation status.

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- 5.2.3 Dormice have been recorded adjacent to the RM site, and suitable habitat which supports dormice will be impacted by the proposed development. Therefore, an EPSML application for hazel dormouse will be required prior to the commencement of any works related to the proposed development.
- 5.2.4 Requirements for a future licence application are detailed below, including habitat management and recommended measures to avoid disturbance during and post construction.
- 5.2.5 The EPSML licence will consider future development within the wide site as part of the original hybrid application. The licence will be completed for each phase and updated with Natural England as required.

Mitigation Licence

- 5.2.6 Three tests must be satisfied before this licence (to permit otherwise prohibited acts) can be issued:
- 1) Regulation 44(2)(e) states that licences may be granted to “preserve public health or public safety or other imperative reasons of overriding public interest including those of a social or economic nature and beneficial consequences of primary importance for the environment.
 - 2) Regulation 44(3)(a) states that a licence may not be granted unless “there is no satisfactory alternative”.
 - 3) Regulation 44(3)(b) states that a licence cannot be issued unless the action proposed “will not be detrimental to the maintenance of the population of the species concerned at a favourable conservation status in their natural range”.
- 5.2.7 These tests will need to be addressed in a formal EPSML application to Natural England. Planning permission and the discharge of all relevant wildlife related planning conditions is usually required before Natural England will issue a licence.
- 5.2.8 In order to comply with the third test of Regulation 44, the proposed development must ensure the favourable conservation status of the dormice population onsite during the development period and after its completion. The level of mitigation must also be proportional to the ecological impact of the development (Mitchell-Jones, 2004).
- 5.2.9 This strategy will include the following elements which will form the basis of a detailed method statement to accompany the EPSML application:
- * Retention and enhancement of hedgerows around the site;
 - * Provision of 0.2 ha of new habitat suitable to support dormice within the proposed landscaping scheme, a net gain of habitat;
 - * Planting of defensive thorny habitats in the landscape scheme to deter domestic cats from entering the hedgerow network and predating on dormice;
 - * Avoid any disturbance, damage, and obstruction of retained habitat within the site to minimise impact to dormice population onsite; and
 - * During and post construction monitoring to determine success of the mitigation and compensation measures.
- 5.2.10 The EPSML application will include the proposed works. No works will be undertaken until a licence has been granted by Natural England. Timings of all licensable activities will be programmed to minimise disturbance impacts. The exact timings will depend on when works are to be implemented with either a two stage process (above ground cleared during winter with below ground stumps removed once dormice are out of hibernation in May) or a one stage

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- process when dormice are active, progressively removing circa 50 m² of habitat per day to push any animals towards retained habitat.
- 5.2.11 All works will be supervised by a suitably-licensed Ecological Clerk of Works (ECoW).
- 5.2.12 Risks to individual dormice during the construction activity can be mitigated by imposition of a strict policy protecting all retained hedgerows and retained areas of vegetation through the use of suitable tree protective fencing.
- 5.2.13 Measures to carry out any habitat clearance would be carried out using a methodology which would avoid potentially active periods /seasons for dormice (detailed in Dormouse Habitat section below).

5.3 Bats

- 5.3.1 All British bat species are fully protected under Schedule 5 of the Wildlife and Countryside Act 1981, as updated by the Countryside and Rights of Way Act 2000. All British bats are also included on Schedule 2 of The Conservation of Habitats and Species (Amendment) (EU Exit) Regulations 2019 as European Protected Species. It is an offence to:
- intentionally or recklessly kill, injure or capture bats;
 - deliberately or recklessly disturb bats (whether in a roost or not); and
 - damage, destroy or obstruct access to bat roosts.
- 5.3.2 A roost is defined as 'any structure or place which [a bat] uses for shelter or protection'. As bats tend to reuse the same roosts, legal opinion is that a roost is protected whether or not bats are present at the time of survey.
- 5.3.3 A licence will therefore be required by those who carry out any operation that would otherwise result in offences being committed.

Further Survey

- 5.3.4 Building B1 has low potential for supporting roosting bats respectively. The recommended updating surveys were not completed this season due to no access into/around the buildings being possible. Building B2 has negligible potential for supporting bats.
- 5.3.5 It is therefore recommended that internal and external inspections are completed for Building B1 as soon as access is available and that this building is left intact and undisturbed until it is established if it holds roosting potential and if any evidence of use of bats is found; work commencing on this building or within the vicinity of this building will not commence until these surveys have been completed.

Lighting

- 5.3.6 It is also recommended that a lighting strategy is incorporated into the proposals, to ensure that the lighting of any retained habitat features suitable for protected species (such as the tree line and hedgerows) is avoided or reduced to lower the impact on species utilising the site. It is anticipated that such information can be conditioned as part of the planning approval.

5.4 Badger

- 5.4.1 Badgers are protected under the Protection of Badgers Act 1992 which makes it an offence to intentionally kill, injure or take a badger or intentionally or recklessly damage, destroy or obstruct access to a sett or disturb a badger whilst it is occupying it.

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- 5.4.2 The majority of the site is suitable habitat for foraging and commuting badgers, and an inactive outlier sett was identified adjacent to the site approximately 330 meters to the south of the RM application boundary. The location of the sett outside of the application boundary but within the ownership boundary.
- 5.4.3 Measures are recommended to ensure no injury will come to foraging or commuting badgers around the site. Any holes, trenches or pits dug during construction will be fenced off and all holes will either have a mammal ramp provided (sturdy ramp or wide plank of wood) or be fully covered overnight to avoid individuals becoming trapped inside. In the event that badgers are found to be trapped or injured within the site no attempt should be made to approach the badger and the RSPCA should be contacted immediately.

5.5 Nesting Birds

- 5.5.1 All active bird nests and their eggs/young are protected whilst actively nesting under the provisions of the WCA 1981, (as amended). Clearance of bramble, scrub and woodland will have the potential to damage active nests. Timing of the works and / or inspections prior to clearance will be required to ensure that the works comply with the provisions of the WCA 1981, (as amended).
- 5.5.2 Clearance of habitat that holds potential to support breeding birds (in particular scrub, hedgerows, and woodland) will avoid the bird nesting season (March to August inclusive). If this is not possible removal will occur under the supervision of a suitably qualified ecologist (ECoW) who will check for any active nests. If found to be present, a buffer zone, where no development activities will occur, will be cordoned off by the supervising ecologist until the young have fledged.

6 ENHANCEMENT OPPORTUNITIES

- 6.1.1 The NPPF requires that the local planning authority should aim to enhance biodiversity when determining planning applications and opportunities to incorporate biodiversity in and around developments should be encouraged. Therefore, the following will be incorporated into the development:

Invertebrates, Amphibians and Reptiles

- 6.1.2 The installation of two invertebrate boxes will be provided within the proposals.
- 6.1.3 The creation of three wood log piles will be created from wood fallen or felled on site in appropriate locations within the landscaping scheme as this will provide habitat for a range of species including reptiles, amphibians and saproxylic invertebrates and small mammals.
- 6.1.4 One hibernaculum will also be created under ecological specification to provide hibernation habitat for amphibians and reptiles.

Hazel Dormouse

- 6.1.5 Nine wooden hazel dormouse nest boxes will be placed at suitable locations within the existing retained hedgerow that borders the woodland to the north of the site and within hedgerow on site, with a 5 m buffer of new habitat. This will ensure that there are features providing additional nesting habitat.
- 6.1.6 The planting of additional native fruit or nut bearing tree and shrub planting within the proposed development will increase the availability of suitable habitat for dormice as the planting establishes and matures. The planting should be completed in areas connected to existing and retained hedgerow habitat with a screening buffer from any residential properties.
- 6.1.7 This will offer both increased habitat area but will also maintain and strengthen all existing habitat linkages, ensuring that all parts of the site remain accessible to the species.

Bats

- 6.1.8 Severn bat boxes will be positioned on retained mature trees to provide additional roosting habitat for bats. The locations of these can be seen in Figure 2.4 below.
- 6.1.9 The landscaping proposals for the development will include native planting of fruit or nectar – bearing and night-scented plants, such as night-scented jasmine *Casdtum noctornum*, evening primrose *Oenothera* spp., or tuberose *Poluanthes tuberosa*. This additional planting will help attract night-flying insects and therefore providing a regular source of food for foraging bats.

Birds

- 6.1.10 The provision of three bird boxes will be located on mature trees withing the site boundary which will provide additional nesting opportunities on site. The locations of these can be seen in Figure 2.4 below.

Other Species

- 6.1.11 Any new fences to be installed as part of the proposed development will have a gap at the bottom of 20 cm, or a hole of 15 cm x 15 cm, to allow for habitat connectivity (foraging routes)

throughout the garden and into wider habitat for mammals (such as hedgehog) and reptile species.

- 6.1.12 Additionally, the incorporation of five hedgehog houses will be placed at the base of retained hedgerows, within the 5 m new habitat buffer, along the northern boundary adjacent to woodland off site to the north.

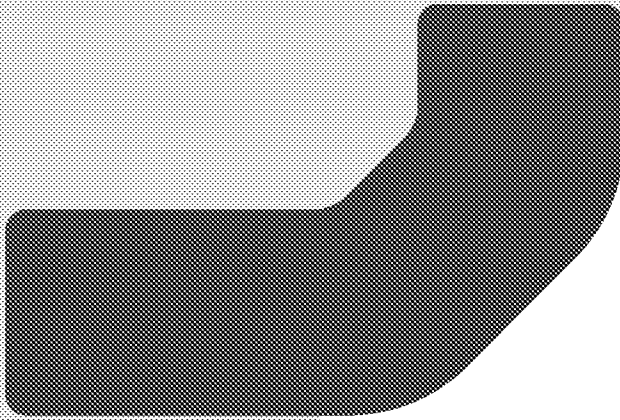
7 CONCLUSIONS

- 7.1.1 RPS was commissioned by Redrow Homes to undertake ecology surveys of land at Arundel, Angmering, Littlehampton, BN16 4ET to support a Reserved Matters application on the site.
- 7.1.2 Hazel dormice were recorded on site in 2018 and 2021. Suitable habitat which could support dormice will be impacted by the proposed development. Therefore, an EPSML application for hazel dormouse from Natural England will be required prior to the commencement of any works related to the proposed development. Existing hazel dormouse habitat (hedgerows) will be retained and enhanced by the infilling of any gaps; the replacement habitat creation to mitigate the loss of any suitable hazel dormouse habitat will be incorporated in the landscape scheme within the 0.2 ha of new planting that will form the 5 m green buffer along retained hedgerows. This will also be designed to be 'defensive' through the inclusion of spined species such as hawthorn and blackthorn to help prevent domestic cat predation.
- 7.1.3 Building B1 was not accessible or available for updated bat surveys in 2021 and will need a pre-works assessment to confirm the potential for roosting bats. If any evidence of bats is found, then further emergence surveys will be required prior to the commencement of any works. Should evidence of bats be recorded within these buildings, it may alter the requirements for the low impact class licence. It is also recommended that a sensitive lighting strategy for bats is incorporated into the proposals.
- 7.1.4 No GCN eDNA was reported in the four surveyed ponds within the surrounding habitat.
- 7.1.5 Although a protected species licence is not required for sites supporting the common and widespread reptile species, in order to comply with legislation habitat manipulation methods are recommended in order to avoid killing and injury. These methods involve reducing the suitability of the habitat for reptiles and therefore encouraging them to move out of the area to adjacent suitable habitat.
- 7.1.6 Clearance of habitat that holds potential to support breeding birds (in particular scrub, hedgerows, and woodland), precautionary measures have been provided in this report.
- 7.1.7 It is also recommended that a sensitive lighting strategy is incorporated into the proposals. This will ensure that the lighting of any retained habitat features suitable for bat foraging and commuting (such as the tree line and hedgerows) is avoided or reduced to lower the impact on bat species utilising the site.
- 7.1.8 Measures are recommended to ensure no injury will come to foraging or commuting badgers around the site are also included, mainly the covering and fencing off of any holes, trenches or pits dug during construction.
- 7.1.9 Clearance of habitat that holds potential to support breeding birds (in particular scrub, hedgerows, and woodland) will avoid the bird nesting season (March to August inclusive). If this is not possible removal will occur under the supervision of a suitably qualified ecologist (ECoW) who will check for any active nests. If found to be present, a buffer zone, where no development activities will occur, will be cordoned off by the supervising ecologist until the young have fledged.

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FIGURES





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-  Application boundary
-  Ownership boundary
-  Dormouse tubes

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Project Land at Arundel

Title Dormouse tubes set out

Status	Drawn By	PM/Checked By
Draft	RN	FM
Project Number	Scale @ A3	Date Created
ECO01659	1:1,500	08/02/22
Figure Number	Rev	
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-  Application boundary
-  Ownership boundary
-  GCN 500m Search Area
-  Standing water

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02	Updated layout	LW	FM	JAN 22
01	--	RN	FM	MAY 21
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Project **Land at Arundel**

Title **Pond Locations**

Status	Drawn By	PM/Checked By
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Project Number	Scale @ A3	Date Created
ECO01659	1:5,000	08/FEB 2022
Figure Number	Rev	
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Document: \\SOU-LH-FS-01\\EnvPlanningProjects\\Current Projects\\B ECO01659 Land at Arundel\\Tech\\Drawings\\1659_007_02 Fig C6 (Dormice Survey Results).mxd



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Legend

- Dormouse tubes
- Dormouse found
- Dormouse nest

Results Summary

Tube 30: Dormice were found in May and June 2021.

Tube 12: Dormouse was found in a dormouse nest in August 2021.

Empty dormouse nests were found in September in tubes 11, 21, 22, 25 and 30.

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Project Land at Arundel

Title Dormice Survey Results

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ECO01659	1:1,400	08/FEB 2022
Figure Number		Rev
2.2		01
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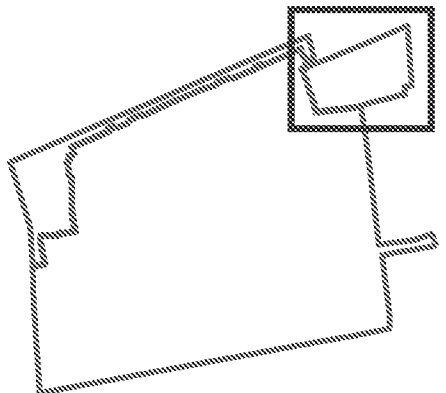
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 Application boundary

 Ownership boundary

 Buildings



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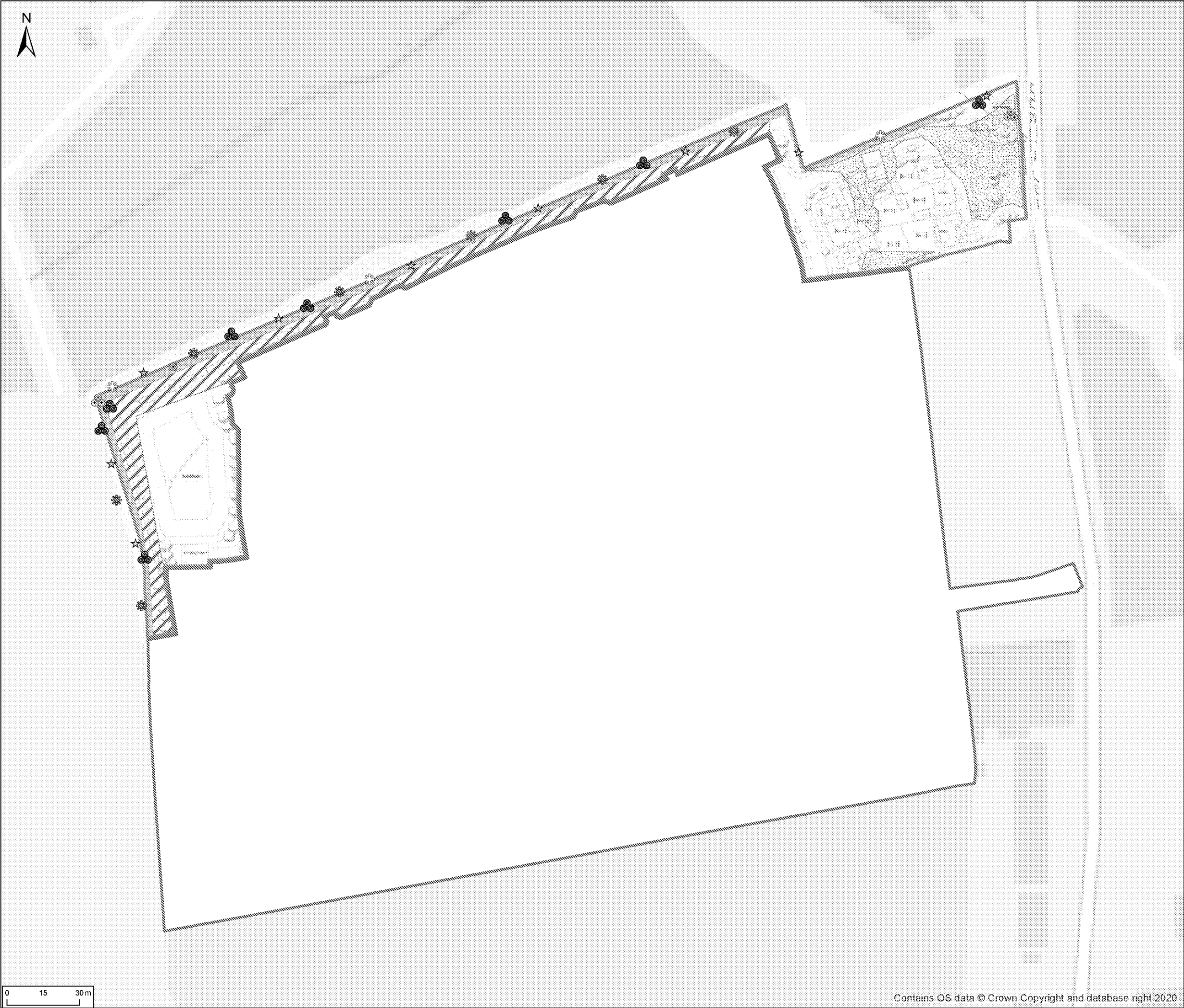
Client **Redrow**

Project **Land at Arundel**

Title **Buildings with bat potential**

Status Draft	Drawn By RN	PM/Checked By FM
Project Number ECO01659	Scale @ A3 1:412	Date Created 08/02/22
Figure Number 2.3	Rev -	
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-  Application boundary
-  Ownership boundary
-  Retained Habitat - Existing hedgerow to be enhanced with supplementary planting
-  New habitat - Thicket planting
-  Sensitive removal of vegetation
-  Bat box (7)
-  Bird box (3)
-  Dormouse box (9)
-  Hedgehog house (5)
-  Hibernacula (1)
-  Invertebrate box (2)
-  Log pile (3)

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Client **Redrow Homes Ltd**

Project **Land at Arundel**

Title **Ecological Mitigation for
Reserved Matters Application**

Status Information	Drawn By RN	PM/Checked By FM
Project Number ECO01659	Scale @ A3 1:1,500	Date Created 10/02/22
Figure Number 2.4		Rev 01

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APPENDICES

Appendix A: Land at Arundel Ecological Site Walkover

LAND AT ARUNDEL

Ecological Site Walkover



ECO07659
Land at Arundel
1
24 February 2021

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REPORT

Document status

Version	Purpose of document	Authored by	Reviewed by	Approved by	Review date
Draft	For client comment	FM	KS	NB	03/03/21

Approval for issue

NB

3 March 2021

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EXECUTIVE SUMMARY

- RPS was commissioned by Redrow Homes to undertake an Ecological Site Walkover of land at Arundel, Angerming, Littlehampton, BN16 4ET.
- The application site is located on the northern edge of Angerming village, immediately to the north of the Angerming Sports and Social Club and allocated recreational land. The site is accessed off Arundel Road. The site benefits from outline application for the construction of up to 160 dwellings together with up to 1,393m² of B1/B2 units and land made available for expansion of current sports pitch provision, approved by Arun District Council in March 2020 (A/122/19/OUT). A range of ecology surveys were undertaken across the site by CSA Environmental between 2017 to 2019.
- The site is 9.1 hectares and is mixed use, comprising agricultural, industrial, and residential (New Place Bungalow) buildings. This residential building is approved for demolition as part of the outline application. Two oak trees within the western boundary are protected by a Tree Preservation Order.
- The aim of the 2021 verification walkover was to confirm the current ecological value of the site and establish the need for any further mitigation and enhancement measures.
- The RPS updated 2021 walkover confirmed the site conditions remain the same as outlined by CSA Environmental in previous studies.
- Due to the presence of confirmed bat roosts in Buildings B3 and B4, a Natural England European Protected Species Licence (EPS) and associated mitigation will be required prior to works commencing on these structures. An updated internal inspection of these buildings will be required for the future licence application.
- In addition, repeat emergence/re-entry surveys must be completed on Buildings B3 and B4 to gather data for a Natural England Licence Application. Natural England require data that has been collected within the past two years for submission with licence applications and the existing data collected by CSA Environmental is dated 2017/2018. If any other buildings are found to have evidence of bat presence following internal inspections, these will also require emergence/re-entry surveys.
- Hazel dormouse were recorded within boundary vegetation during the CSA Environmental surveys and therefore a Natural England EPS licence and associated mitigation strategy will be required prior to works commencing on site.
- It is recommended that the following surveys and reporting are repeated to update the data for the Reserved Matters application and Natural England EPS licencing (bats and dormice):
 - Phase 2 bat surveys (emergence/re-entry) (CSA Environmental, 2017/2018);
 - Phase 2 hazel dormouse surveys (CSA Environmental, 2017/2018);
 - Phase 2 badger surveys (CSA Environmental, 2018); and
 - Phase 2 great crested newt surveys (CSA Environmental, 2018).
- An active badger sett was recorded on the northern boundary of the site during the updated walkover. It is recommended that the sett is monitored for signs of badger activity over an extended period (four weeks) to establish the extent of use. Once the layout for the scheme is confirmed, the sett may require closure under licence depending on the risk of disturbance from the proposed development. If closure is required, the monitoring data will be sufficient for a sett closure under a Natural England disturbance licence.
- An updated Ecological Mitigation and Enhancement Strategy relating to the Reserved Matters application will be required.

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Appendices

Appendix A: Site Photographs

1 INTRODUCTION

1.1 Site Location and Background

- 1.1.1 RPS was commissioned by Redrow Homes to undertake an Ecological Site Walkover of land at Arundel, Angerming, Littlehampton, BN16 4ET.
- 1.1.2 The application site is located on the northern edge of Angerming village, immediately to the north of the Angerming Sports and Social Club and allocated recreational land. The site is accessed off Arundel Road.
- 1.1.3 The site is 9.1 hectares and at the time of survey was mixed use, comprising agricultural, industrial, and residential (Building B1). This residential building is approved for demolition as part of the outline application. Two oak trees within the western boundary are protected by a Tree Preservation Order.
- 1.1.4 An outline application for the construction of up to 160 dwellings together with up to 1,393m² of B1/B2 units and land made available for expansion of current sports pitch provision was approved by Arun District Council in March 2020 (A/122/19/OUT).
- 1.1.5 As part of the outline planning application, detailed ecological information was submitted in support of the development, including:
- Ecological Impact Assessment (CSA Environmental, 2019);
 - Ecological Mitigation and Enhancement Strategy (CSA Environmental, 2019A number of Phase 2 protected species were completed in support of the Ecological Mitigation and Enhancement Strategy and include the following;
 - Preliminary Ecological Appraisal (CSA Environmental, 2017/2018);
 - Preliminary Roost Assessment (CSA Environmental, 2017);
 - Phase 2 bat surveys (emergence/re-entry and activity surveys) (CSA Environmental, 2017/2018);
 - Phase 2 hazel dormouse surveys (CSA Environmental, 2017/2018);
 - Phase 2 badger surveys (CSA Environmental, 2018);
 - Phase 2 reptile surveys (CSA Environmental, 2018); and
 - Phase 2 great crested newt surveys (CSA Environmental, 2018).

1.2 Purpose and scope of this report

- 1.2.1 The 2021 site walkover aims to:
- review and assess the habitats present on site compared to previous reports and note if any updating ecological surveys are required for a Reserved Matters planning application.
 - provide outline options for mitigation measures as appropriate; and
 - make recommendations for appropriate biodiversity enhancements in line with national and local planning policy.
- 1.2.2 To undertake a site walkover, an ecologist visited the site and systematically walked the area, noting habitats present.

- 1.2.3 This report pertains to these results only; recommendations included within this report are the professional opinion of an experienced ecologist and therefore the view of RPS. The surveys undertaken as part of this review and subsequent are prepared in accordance with the British Standard for Biodiversity Code of Practice for Planning and Development (BS42020:2013).

1.3 Site Walkover

- 1.3.1 A updated site walkover was completed on the 2nd February 2021 by Frances Morris MRSB ACIEEM.
- 1.3.2 The site walkover followed the standard methodology (JNCC, 2010), and as described in the Guidelines for Preliminary Ecological Assessment (IEEM, 2012). In summary, this comprised walking over the survey area and recording the habitat types and boundary features present.
- 1.3.3 The surveyor looked for evidence of use including signs such as burrows, droppings, footprints, paths, hairs, refugia and particular habitat types known to be used by certain groups such as ponds. Any mammal paths were also noted down and where possible followed. Fence boundaries were walked to establish any entry points or animals signs such as latrines. Areas of bare earth were inspected for mammal prints. Areas of habitat considered suitable for protected species or those of conservation interest were recorded.

1.4 Limitations

Survey

- 1.4.1 It should be noted that whilst every effort has been made to provide a comprehensive description of the site, no investigation can ensure the complete characterisation and prediction of the natural environment.
- 1.4.2 Access into the bungalow grounds (Building B1) was not provided, and the building was occupied by residents therefore assessments of this building were made from the fence line.
- 1.4.3 During the site walkover one of the tenants would not provide access to their yard and therefore Building B2 could not be thoroughly surveyed.
- 1.4.4 The site walkover was carried out outside of the optimal survey season (April to October). Although the survey was carried out at a sub-optimal time of year, it is considered that sufficient information was obtained to enable an accurate assessment of the site to be carried out.

2 RESULTS

2.1 Site walkover

2.1.1 The 2021 updated walkover results are presented in the form of survey notes below. Descriptions of the habitat types and boundary features are detailed below. Habitat descriptions are defined by broad habitat types (JNCC, 2010).

2.1.2 Site photographs can be found at Appendix A.

Buildings

2.1.3 Buildings were externally assessed during the site walkover for features suitable for supporting roosting bats. The site walkover confirmed that no physical changes have occurred to the buildings since the previous surveys (CSA Environmental, 2017). A number of buildings are considered suitable for supporting roosting bats and two are confirmed roosts.

Hardstanding

2.1.4 Areas of hardstanding were located throughout the site in the form of roads and car park. All areas remain as per previous surveys (CSA Environmental, 2017/2018).

Semi-improved grassland

2.1.5 An area of semi improved grassland was located to the north of the site which is in line with the assessment made by CSA Environmental in 2017/2018. The grassland showed signs of recent ploughing (ridge lines). The sward height was approximately 3cm as shown in Photo 2 in Appendix A. The semi improved grassland field margins were considered suitable for supporting common and widespread reptile species, as per previous reports (CSA Environmental, 2018).

Native hedgerow

2.1.6 As previously reported by CSA Environmental, the site is bordered to the south, west and north by native hedgerow. Directly adjacent to the northern boundary was an area of deciduous woodland. As previously reported by CSA Environmental, a badger sett with recent signs of activity was noted in the northern boundary hedgerow. Native hedgerow on site is considered suitable for supporting great crested newts, common and widespread reptiles, nesting birds and hazel dormouse.

Scrub

2.1.7 An area of scrub was present to the north east of the site with bramble encroachment. A trench had been excavated in this area, with vegetation clearance recently carried out as shown in Photo 10 in Appendix A. Areas of scrub on site were considered suitable for supporting great crested newts, common and widespread reptiles, nesting birds and hazel dormouse.

Amenity garden

- 2.1.8 An amenity garden associated with Building B1 was present at the time of the site walkover. This area comprised amenity grassland and managed ornamental planting as per the previous survey (CSA Environmental, 2017).

3 ECOLOGICAL RECOMMENDATIONS

3.1 Bats

- 3.1.1 Previous bat emergence/re-entry surveys recorded bat roosts in Buildings B3 and B4 with a single common pipistrelle *Pipistrellus pipistrellus* seen emerging from under a ridge tile on Building B3 on the 6th June 2018 and a soprano pipistrelle *Pipistrellus pygmaeus* seen emerging from Building B4 on the 12th June 2018.
- 3.1.2 Buildings B3 and B4 will therefore require a Natural England LowImpact Class licence to be in place and any associated mitigation measures prior to works commencing on site.
- 3.1.3 Previous internal surveys of the buildings were completed in 2017 and therefore to support an EPS licence application and assess the existing status of buildings on site, this should be repeated to gather up to date data.
- 3.1.4 In addition, repeat emergence/re-entry surveys must be completed on Buildings B3 and B4 to gather data for a Natural England Licence Application. If any other buildings are found to have evidence of bat presence following internal inspections, these will also require emergence/re-entry surveys.

3.2 Hazel dormouse

- 3.2.1 Previous surveys found hazel dormice *Muscardinus avellanarius* present within the eastern and western hedgerows on the site and therefore a Natural England EPS licence will be required for vegetation removal.
- 3.2.2 It is recommended that dormouse surveys are repeated to collect additional survey data for a Natural England licence application. Natural England require data that has been collected within the last two for submission with licence applications and the existing data collected by CSA Environmental was collected in 2018.

3.3 Other species

- 3.3.1 A badger *Meles meles* sett showing signs of recent activity was noted on the northern boundary of the site during the 2021 walkover. It is recommended that the sett is monitored for signs of badger activity over an extended period (four weeks) to ensure that, if active, badger will not be disturbed by the works. Once the layout for the scheme is confirmed, the sett may require closure under licence depending on the proximity of construction work and likelihood of disturbance from the works footprint. If closure is required, the monitoring data will be sufficient for a Natural England disturbance licence application for sett closure.
- 3.3.2 An Ecological Mitigation and Enhancement Strategy (RPS, 2021) has been provided which details further mitigation requirements for great crested newts, common and widespread reptiles and birds. This has since been updated by RPS (RPS, 2021).
- 3.3.3 For the purposes of a Reserved Matters application in 2021, the following survey reports are considered accurate due to site conditions being wholly unchanged since previous surveys:
- Ecological Impact Assessment (CSA Environmental, 2019); and;
 - Preliminary Ecological Appraisal (CSA Environmental, 2017/2018), supported by this report.
- 3.3.4 It is recommended that the following surveys and reporting are repeated to update the data for the Reserved Matters application and Natural England EPS licencing (bats and dormice):

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- Phase 2 bat surveys (emergence/re-entry) (CSA Environmental, 2017/2018);
- Phase 2 hazel dormouse surveys (CSA Environmental, 2017/2018);
- Phase 2 badger surveys (CSA Environmental, 2018); and
- Phase 2 great crested newt eDNA surveys (CSA Environmental, 2018).

4 CONCLUSIONS

- 4.1.1 Habitats on site remain unchanged from the previous ecological surveys undertaken on the site in 2017 to 2019. It is therefore considered that the protected species assessments for reptiles and associated mitigation as detailed within the CSA Environmental reports submitted within the outline application (A/122/19/OUT), remain valid.
- 4.1.2 It is recommended that the following surveys and reporting are repeated to update the data for the Reserved Matters application and Natural England EPS licencing (bats and dormice);
- Phase 2 bat surveys (emergence/re-entry and activity surveys) (CSA Environmental, 2017/2018);
 - Phase 2 hazel dormouse surveys (CSA Environmental, 2017/2018);
 - Phase 2 badger surveys (CSA Environmental, 2018); and
 - Phase 2 great crested newt eDNA surveys (CSA Environmental, 2018).
- 4.1.3 Prior to any works commencing on site, Natural England EPS licences will be required for hazel dormice and bats which have been recorded on the site, plus associated mitigation strategies.
- 4.1.4 As recommended, an updated Ecological Mitigation and Enhancement Strategy relating to the Reserved Matters application will also be required. This will detail any mitigation or enhancement with respect to birds, great crested newts, and common and widespread reptiles during all phases of the project.

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APPENDICES

Appendix A

Site Photographs



Photo 1: Southern and eastern elevations of Building B2.



Photo 2: View looking north from south.



Photo 3: View looking east towards Building B1.



Photo 4: Hardstanding to east of site, used as car park.

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Photo 5: Open storage containers to east of site.



Photo 6: Eastern elevation of Building B10.



Photo 7: Standing water in north east corner of site.



Photo 8: Tree with ivy cover to south east of site.

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Photo 9: Scrub area to south east of site.



Photo 10: Recent trenching works to south east of site.



Photo 11: View looking south from northern boundary.



Photo 12: Western elevation of Building B3.



Photo 13: Scrub and vegetation covering Building B13



Photo 14: Southern elevation of Building B3 (previous bat roost in apex)



Photo 15: Badger sett on northern boundary of site.



Photo 16: Eastern elevation of Building B2.



Photo 67: Building B14 looking east.



Photo 18: Southern elevation of Building B5.



Photo 19: Eastern elevation of Building B5.



Photo 20: Northern and western elevations of Building B1.



Photo 22: South east of site looking east.



Photo 73: Northern boundary of the site.



Photo 24: Western elevations of Building B12.



Photo 25: Southern elevation of Building B11.



Photo 26: Northern elevation of Building B4.

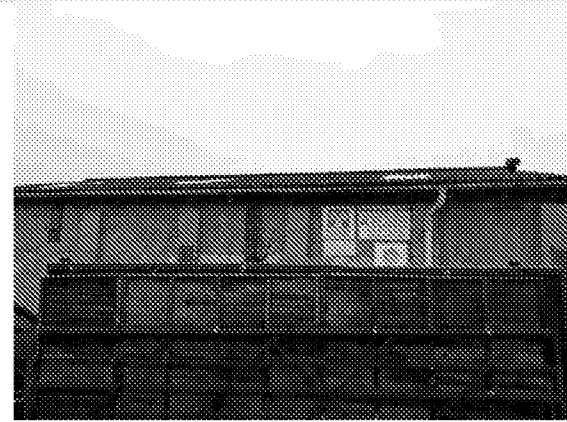


Photo 27: South western aspect of Building B1.



Photo 28: View of Building B2 looking north.



Photo 29: Building B12 looking south.

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Photo 30: Building B7 looking north.



Photo 31: Building B1, residential property owned by the client.

Appendix B: GCN eDNA Analysis Results

Client: Claire Remon,
RPS Group



ADAS
Spring Lodge
172 Chester Road
Helsby

Sample ID: ADAS-1698 Condition on Receipt: High Sediment Volume: Passed
Client Identifier: Pond 1 Arundel Description: pond water samples in preservative
Date of Receipt: 17/05/2021 Material Tested: eDNA from pond water samples

Determinant	Result	Method	Date of Analysis
Inhibition Control [†]	0 of 2	Real Time PCR	19/05/2021
Degradation Control [§]	Within Limits	Real Time PCR	19/05/2021
Great Crested Newt*	0 of 12 (GCN negative)	Real Time PCR	19/05/2021
Negative PCR Control (Nuclease Free Water)	0 of 4	Real Time PCR	As above for GCN
Positive PCR Control (GCN DNA 10 ⁻⁴ ng/μL) [#]	4 of 4	Real Time PCR	As above for GCN

Report Prepared by: Dr Helen Rees Report Issued by: Dr Ben Maddison

Signed:

Signed:

Position: Director: Biotechnology Position: MD: Biotechnology

Date of preparation: 20/05/2021 Date of issue: 20/05/2021

eDNA analysis was carried out in accordance with the stipulated methodology found in the Technical Advice Note (WC1067 Appendix 5 Technical Advice Note) published by DEFRA and adopted by Natural England.

** If all PCR controls and extraction blanks give the expected results a sample is considered: negative for great crested newt if all of the replicates are negative; positive for great crested newt if one or more of the replicates are positive.*

[†] Recorded as the number of positive replicate reactions at expected C_t value. If the expected C_t value is not achieved, the sample is considered inhibited and is diluted as per the technical advice note prior to amplification with great crested newt primer and probes.

[§] No degradation is expected within time frame of kit preparation, sample collection and analysis.

[#] Additional positive controls (10⁻¹, 10⁻², 10⁻³ ng/μL) are also routinely run, results not shown here.

Client: Claire Remon,
RPS Group



ADAS
Spring Lodge
172 Chester Road
Helsby
WA6 0AR

Sample ID: ADAS-1699 Condition on Receipt: Low Sediment Volume: Passed
Client Identifier: Pond 6 Arundel Description: pond water samples in preservative
Date of Receipt: 17/05/2021 Material Tested: eDNA from pond water samples

Determinant	Result	Method	Date of Analysis
Inhibition Control [†]	0 of 2	Real Time PCR	19/05/2021
Degradation Control [§]	Within Limits	Real Time PCR	19/05/2021
Great Crested Newt*	0 of 12 (GCN negative)	Real Time PCR	19/05/2021
Negative PCR Control (Nuclease Free Water)	0 of 4	Real Time PCR	As above for GCN
Positive PCR Control (GCN DNA 10 ⁻⁴ ng/μL) [#]	4 of 4	Real Time PCR	As above for GCN

Report Prepared by: Dr Helen Rees Report Issued by: Dr Ben Maddison

Signed:



Signed:



Position: Director: Biotechnology Position: MD: Biotechnology

Date of preparation: 20/05/2021 Date of issue: 20/05/2021

eDNA analysis was carried out in accordance with the stipulated methodology found in the Technical Advice Note (WC1067 Appendix 5 Technical Advice Note) published by DEFRA and adopted by Natural England.

** If all PCR controls and extraction blanks give the expected results a sample is considered: negative for great crested newt if all of the replicates are negative; positive for great crested newt if one or more of the replicates are positive.*

[†] Recorded as the number of positive replicate reactions at expected C_t value. If the expected C_t value is not achieved, the sample is considered inhibited and is diluted as per the technical advice note prior to amplification with great crested newt primer and probes.

[§] No degradation is expected within time frame of kit preparation, sample collection and analysis.

[#] Additional positive controls (10⁻¹, 10⁻², 10⁻³ ng/μL) are also routinely run, results not shown here.

Client: Claire Remon,
RPS Group



ADAS
Spring Lodge
172 Chester Road
Helsby
WA6 0AR

En

Sample ID: ADAS-1700 Condition on Receipt: Good Volume: Passed

Client Identifier: Pond 3 Arundel Description: pond water samples in preservative

Date of Receipt: 17/05/2021 Material Tested: eDNA from pond water samples

Determinant	Result	Method	Date of Analysis
Inhibition Control [†]	0 of 2	Real Time PCR	19/05/2021
Degradation Control [§]	Within Limits	Real Time PCR	19/05/2021
Great Crested Newt*	0 of 12 (GCN negative)	Real Time PCR	19/05/2021
Negative PCR Control (Nuclease Free Water)	0 of 4	Real Time PCR	As above for GCN
Positive PCR Control (GCN DNA 10 ⁻⁴ ng/μL) [#]	4 of 4	Real Time PCR	As above for GCN

Report Prepared by: Dr Helen Rees Report Issued by: Dr Ben Maddison

Signed:

Signed:

Position: Director: Biotechnology Position: MD: Biotechnology

Date of preparation: 20/05/2021 Date of issue: 20/05/2021

eDNA analysis was carried out in accordance with the stipulated methodology found in the Technical Advice Note (WC1067 Appendix 5 Technical Advice Note) published by DEFRA and adopted by Natural England.

** If all PCR controls and extraction blanks give the expected results a sample is considered: negative for great crested newt if all of the replicates are negative; positive for great crested newt if one or more of the replicates are positive.*

[†] Recorded as the number of positive replicate reactions at expected C_t value. If the expected C_t value is not achieved, the sample is considered inhibited and is diluted as per the technical advice note prior to amplification with great crested newt primer and probes.

[§] No degradation is expected within time frame of kit preparation, sample collection and analysis.

[#] Additional positive controls (10⁻¹, 10⁻², 10⁻³ ng/μL) are also routinely run, results not shown here.

Client: Claire Remon,
RPS Group



ADAS
Spring Lodge
172 Chester Road
Helsby
Warrington

Sample ID: ADAS-1701 Condition on Receipt: Medium Sediment Volume: Passed
Client Identifier: Pond 5 Arundel Description: pond water samples in preservative
Date of Receipt: 17/05/2021 Material Tested: eDNA from pond water samples

Determinant	Result	Method	Date of Analysis
Inhibition Control [†]	0 of 2	Real Time PCR	19/05/2021
Degradation Control [§]	Within Limits	Real Time PCR	19/05/2021
Great Crested Newt*	0 of 12 (GCN negative)	Real Time PCR	19/05/2021
Negative PCR Control (Nuclease Free Water)	0 of 4	Real Time PCR	As above for GCN
Positive PCR Control (GCN DNA 10 ⁻⁴ ng/μL) [#]	4 of 4	Real Time PCR	As above for GCN

Report Prepared by: Dr Helen Rees Report Issued by: Dr Ben Maddison

Signed:

Signed:

Position: Director: Biotechnology Position: MD: Biotechnology

Date of preparation: 20/05/2021 Date of issue: 20/05/2021

eDNA analysis was carried out in accordance with the stipulated methodology found in the Technical Advice Note (WC1067 Appendix 5 Technical Advice Note) published by DEFRA and adopted by Natural England.

** If all PCR controls and extraction blanks give the expected results a sample is considered: negative for great crested newt if all of the replicates are negative; positive for great crested newt if one or more of the replicates are positive.*

[†] Recorded as the number of positive replicate reactions at expected C_t value. If the expected C_t value is not achieved, the sample is considered inhibited and is diluted as per the technical advice note prior to amplification with great crested newt primer and probes.

[§] No degradation is expected within time frame of kit preparation, sample collection and analysis.

[#] Additional positive controls (10⁻¹, 10⁻², 10⁻³ ng/μL) are also routinely run, results not shown here.

Appendix 1: Interpretation of results

Sample Condition

Upon sample receipt we score your samples according to quality: good, low sediment, medium sediment, high sediment, white precipitate, and presence of algae.

There are three reasons as to why sediment should be avoided:

1. It is possible for DNA to persist within the sediment for longer than it would if it was floating in the water which could lead to a false positive result i.e. in this case GCN not recently present but present a long time ago
2. In some cases sediment can cause inhibition of the PCR analysis used to detect GCN eDNA within samples which could lead to an indeterminate result.
3. In some cases sediment can interfere with the DNA extraction procedure resulting in poor recovery of the eDNA which in turn can lead to an indeterminate result.

Algae can make the DNA extraction more difficult to perform so if it can be avoided then this is helpful.

Sometimes samples contain a white precipitate which we have found makes the recovery of eDNA very difficult. This precipitate can be present in such high amounts that it interferes with the eDNA extraction process meaning that we cannot recover the degradation control (nor most likely the eDNA itself) at sufficient levels for the control to be within the acceptable limits for the assay, therefore we have to classify these type of samples as indeterminate.

What do my results mean?

A positive result means that great crested newts are present in the water or have been present in the water in the recent past (eDNA degrades over around 7-21 days).

A negative result means that DNA from the great crested newt has not been detected in your sample.

On occasion an inconclusive result will be issued. This occurs where the DNA from the great crested newt has not been detected but the controls have indicated that either: the sample has been degraded and/or the eDNA was not fully extracted (poor recovery); or the PCR inhibited in some way. This may be due to the water chemistry or may be due to the presence of high levels of sediment in samples which can interfere with the DNA extraction process. A re-test could be performed but a fresh sample would need to be obtained. We have successfully performed re-tests on samples which have had high sediment content on the first collection and low sediment content (through improved sample collection) on the re-test. If water chemistry was the cause of the indeterminate then a re-test would most likely also return an inconclusive result.

The results will be recorded as indeterminate if the GCN result is negative and the degradation result is recorded as:

1. evidence of decay - meaning that the degradation control was outside of accepted limits
2. evidence of degradation or residual inhibition - meaning that the degradation control was outside of accepted limits but that this could have been due to inhibitors not being removed sufficiently by the dilution of inhibited samples (according to the technical advice note)