



Dudgeon and Sheringham Shoal Offshore Wind Farm Extensions

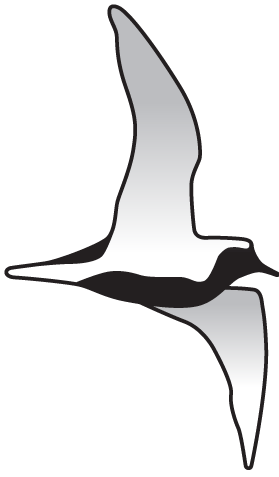
Preliminary Environmental Information Report

Volume 3

Appendix 22.3 - Bat activity survey

April 2021

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WILD FRONTIER ECOLOGY

Sheringham Shoal and Dudgeon Extension Projects



2020 Static Bat Detector Survey Report

March 2021

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The data which we have prepared and provided is accurate, and has been prepared and provided in accordance with the CIEEM's Code of Professional Conduct. We confirm that any opinions expressed are our best and professional bona fide opinions.



This report conforms to the British Standard 42020:2013 Biodiversity - Code of practice for planning and development.

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Glossary of Terms

BLE	Brown Long-eared (bat)
SAC	Special Area of Conservation
SSSI	Site of Special Scientific Interest
DCO	Development Consent Order
DEP	The Dudgeon Offshore Wind Farm Extension site as well as all onshore and offshore infrastructure.
ETG	Expert Topic Group
NBIS	Norfolk Biodiversity Information Service
OS	Ordnance Survey
PEIR	Preliminary Environmental Information Report
PEIR boundary	The area subject to survey and preliminary impact assessment to inform the PEIR, including all permanent and temporary works for DEP and SEP. The PEIR boundary will be refined down to the final DCO boundary ahead of the application for development consent.
SEP	Sheringham Shoal Extension Project
SM2	SongMeter2 static bat detector
WFE	Wild Frontier Ecology Ltd.

Non-Technical Summary

Wild Frontier Ecology Ltd. was commissioned by Equinor New Energy Ltd. (the Applicant) to undertake a suite of static bat detector surveys to understand the level of bat activity within areas considered likely to be important for foraging/commuting bats, within the PEIR boundary of proposed Dudgeon Offshore Wind Farm Extension Project (hereafter DEP) and Sheringham Shoal Offshore Wind Farm Extension Project (hereafter SEP).

The bat surveys comprised the monthly deployment of four static bat detectors within areas that had been identified as likely to be key sites for commuting and foraging bats. Areas within the PEIR boundary were outlined as important for bats based on information provided in the ETG meeting on the 28th January 2020, review of aerial photographs and maps, plus local knowledge (of the ecologists) of areas likely to be important for bats. During the ETG meeting, Norfolk County Council advised that Swannington and the River Wensum are important areas for bats. Additionally, other proposed river crossing points on the Rivers Bure, Tiffey and Yare were targeted for the bat activity survey effort, as were the areas of woodland and heathland between Bodham and Weybourne.

At the time of the surveys, the proposed PEIR boundary was not sufficiently refined to allow for targeted surveys of individual features (such as rivers and hedgerows), as the precise onshore cable route and exact crossing points of such features was not finalised. Therefore, the surveys covered the general sections of the PEIR boundary which were initially considered to offer the most suitable habitat for foraging/commuting bats. The data obtained from the survey effort provides an indication as to whether these targeted areas are important for bats. Furthermore, the 2020 survey data would provide a useful dataset in supplementing further data that will be obtained from more targeted bat surveys in 2021 (once an exact PEIR boundary and then DCO boundary is finalised), of specific features which would be directly impacted.

The static bat detectors were deployed on four occasions in 2020, between 24th June and 10th July, 30th July and 11th August (with one static re-deployed from 19th August and 25th August due to a technical fault on the initial deployment), 26th August and 10th September and finally between 24th September and 5th October. All static detector deployments have been within the appropriate survey season for foraging/commuting bats. The surveys were not commissioned until late June, so there were no surveys at the start of the survey season in April/May. Given that data was collected over a five-month period, initial conclusions can still be drawn despite no static bat detectors having been deployed early in the season.

From the first deployment of static bat detectors in June-July 2020, the detectors deployed at the Rivers Wensum and Yare recorded high numbers of bat registrations across the entire 16 nights (15,739 at River Wensum and 5,099 at River Yare respectively). The data indicates that the locations where these two detectors are deployed are important for foraging/commuting bats, specifically soprano pipistrelles *Pipistrellus pygmaeus*. Some rarer species including *Myotis* species (ultrasonic recordings of which do not allow species classification), Nathusius' pipistrelle *Pipistrellus nathusii* and barbastelle *Barbastella barbastellus* were also recorded in these two locations. The static bat detectors deployed in Weybourne Woods and a small woodland near the River Wensum recorded far fewer registrations and of fewer species (with 16 and four registrations respectively recorded in total). This may indicate that these areas may not commonly be used by foraging and commuting bats. However, technical constraints may have been a factor in such low levels of recorded activity. The number of registrations does not necessarily relate to the number of individual bats, as individual bats (or low

numbers of bats) can produce large numbers of registrations when active (e.g. foraging) in the vicinity of a bat detector.

The second deployment of static bat detectors in July-August 2020 recorded less bat activity (fewer registrations) and fewer species in general. There were no records of brown long-eared bats *Plecotus auritus*, serotines *Eptesicus serotinus* or Leisler's bats *Nyctalus leisleri*, but further registrations of soprano pipistrelles, common pipistrelles *Pipistrellus pipistrellus*, noctules, barbastelles and *Myotis* species. The detector which was deployed by the River Wensum recorded for only two days (before failing due to a likely technical fault), yet still had 666 (mostly soprano pipistrelles) registrations. As this detector had stopped recording after only two nights, it was re-deployed at the same location later in August. The other areas with high levels of bat activity recorded across 11- or 12-night periods are near Colton and Swannington (1,313 and 981, respectively). For the Colton deployment, most recordings were of soprano pipistrelles, including some which are close to the sunset times which suggests there may be nearby roosting. The Swannington results differed, with common pipistrelles having the highest number of registrations. The detector which was positioned in Weybourne Woods recorded 70 registrations relating to three bat species: common and soprano pipistrelles and *Myotis* species.

The re-deployed static detector recorded 1,486 registrations relating to at least five species of bats. The highest frequency of registrations again related to soprano pipistrelles. Of particular note, there were frequent *Myotis* sp. bats and barbastelles recorded, whereas barbastelles were not recorded in any other deployment locations across the July/ August surveys. As both *Myotis* sp. and barbastelles were recorded during the first June/ July deployment this indicates that the Wensum River corridor is important for these rarer bat species.

The third deployment of static bat detectors in August-September 2020 included moderate levels of bat activity and some records of rarer species. The detector deployed near Weybourne Woods had 1,381 records of bats, which was the highest number of records for the Weybourne Wood deployments. These records were mostly attributable to soprano pipistrelles, but there were also registrations of *Myotis* sp. and barbastelles. The detector located by Swannington and the River Wensum had high frequencies of registrations recorded across the third deployment (2,039 and 1,875, respectively). Both deployments recorded at least six species and included rarer species such as Nathusius' pipistrelle, barbastelle and *Myotis* sp. The detector located by the River Bure had the fewest registrations, with 164 in total. These registrations, however, relate to at least six species including *Myotis* sp. and barbastelle. Registrations times for pipistrelle species from these the detectors at Weybourne Woods, Swannington and the River Wensum were all close to sunset/ sunrise times, suggesting that there may be roosts located nearby.

The fourth deployment of static bat detectors in September- October 2020 recorded less bat activity overall, perhaps reflecting relatively suboptimal foraging conditions (e.g. lower overnight temperatures) into autumn. However, a range of species were still recorded throughout this deployment. The highest number of registrations was from the detector deployed by the River Wensum. There were 971 registrations recorded, of which 771 were from *Myotis* sp. bats. This is by far the highest number of *Myotis* sp. registrations recorded during any one of the static bat detector deployments. Additionally, some of these registrations are within 10 minutes of sunset/ sunrise time, suggesting that there may be a roost/ roosts located nearby. At the least, it suggests that the River Wensum provides an important foraging habitat for *Myotis* sp. bats. Barbastelles were also recorded on this detector. The detectors located by the River Bure and Tiffey had some bat activity (485 and 259, respectively) which included *Myotis* sp. and

barbastelles. The detector located in Weybourne woods had relatively low levels of bat activity (337 registrations in total) and from only common and soprano pipistrelles.

Most static bat detector surveys recorded common or soprano pipistrelles as having the highest frequency of registrations, with over 87% of all recorded bat activity relating to these species. Surveys recorded more registrations of soprano pipistrelle in total (across all surveys) and at individual survey locations on Rivers Wensum, Yare and Tiffey. Common pipistrelle was the most abundantly recorded species at River Bure, Swannington and Weybourne Woods. In most survey locations, noctule was the most frequently recorded non-pipistrelle bat species. *Myotis* species were recorded at most survey locations, with the highest levels recorded at rivers, particularly Wensum. It is likely that part/all of these registrations relate to Daubenton's bat, given the species' preference for foraging in/around aquatic habitats. Surveys recorded relatively low numbers of registrations of barbastelle and brown long-eared bat, but across most locations. From the data obtained the areas around the River Wensum and Swannington appear the most important for barbastelles. Other rarer species including Nathusius' pipistrelle and serotine were very rarely recorded, and only at the River Wensum. Results therefore show that the River Wensum supports more species and has highest number of total bat registrations of all sampled locations.

The initial results highlight the importance of undertaking further surveys to fully understand how foraging/commuting bats, particularly the rarer species, are using the habitats within the PEIR boundary. Surveys from April to September 2021 will include walked transect surveys and additional deployment of static bat detectors focusing on specific features that are identified as being likely to be impacted by the onshore cable and associated construction works.

1. Background

Equinor New Energy Ltd. (the Applicant) is proposing to extend the existing operational Dudgeon and Sheringham Offshore Wind Farms, named the Dudgeon Extension Project (hereafter DEP) and Sheringham Extension Project (hereafter SEP). DEP and SEP will consist of a number of offshore and onshore elements including the offshore wind turbines and subsea array cables, up to two offshore substations, offshore and onshore export cables, and a new area for up to two onshore substations to accommodate the connection of DEP and SEP to the transmission grid. A full description of DEP and SEP is provided within Chapter 6 Project Description.

In August 2019, Wild Frontier Ecology Ltd. (WFE) was commissioned by the Applicant to undertake surveys for foraging and commuting bats to inform an initial ecological impact assessment of the proposed onshore grid connection (a subterranean cable).

This report outlines the aims, methods and results of the static bat detector surveys completed between late June and early October 2020.

2. Relevant Policy and Legislation

All bat species are listed under Annex IV (and certain species also under Annex II) of the European Union's Council Directive 92/43/EEC (The Habitats Directive), and are given UK protected status by Schedule 2 of the Conservation of Habitats and Species Regulations 2017 (as amended).

Bats and their roosts also receive protection from disturbance from the Wildlife and Countryside Act 1981 (as amended by the Countryside and Rights of Way Act 2000). This protection extends to both the species and roost sites.

It is an offence to kill, injure, capture, possess or otherwise disturb bats. Bat roosts are protected at all times of the year (making it an offence to damage, destroy or obstruct access to bat roosts), regardless of whether bats are present at the time.

Whilst foraging and commuting bats are not legally protected in the same way that bat roosts are, there is still a legal basis for protecting features on which bats rely. This is especially the case for species which are listed under the protection of Annex IV. If a development intercepts an important commuting route of bats this could potentially prevent bats from accessing a key foraging area and result in the abandonment or long-term decline of the colony/roost, thereby committing an offence.

3. Survey Methods

3.1 Survey Objectives

The static bat detector surveys were required to identify and ascertain the usage by bats of areas anticipated to be of importance for foraging and commuting bats within the PEIR boundary. As a refined PEIR boundary had not been confirmed at the time of the surveys, it was not possible to focus the static bat detector survey effort on particular features which would be likely impacted (such as hedgerows to be breached or rivers to be crossed). Instead, the static bat detector surveys focused on general areas within the PEIR boundary where habitats were considered likely to support higher numbers and a wider variety of species of bats. Although the data from these surveys is limited in terms of its coverage, the findings will provide a useful baseline to inform further route refinement and supplement data from targeted bat surveys of likely 'high-risk' areas, which are due to be completed in 2021.

3.2 Static Bat Detector Surveys

3.2.1 Areas of the PEIR boundary surveyed

Areas of the PEIR boundary were outlined as important based on information provided in the ETG meeting on the 28th January 2020. During the meeting, Norfolk County Council advised that Swannington and the Wensum are important areas for bats (in particular, barbastelle), and surveys should focus on these areas.

The decision as to which areas warranted surveys was also based on a review of aerial photographs and maps to identify areas/features such as woodland, watercourses, scrub, non-improved grasslands, heathland and other habitats which are likely to support relatively high levels of invertebrates and therefore are likely to be important areas for foraging bats. The local knowledge of the team of field ecologists was also used to inform the selection of survey locations. However, at the beginning of the surveys in June, landowner access for ecological surveys was continuing to be arranged, which resulted in restricted access to certain sections of the PEIR boundary for bat surveys being available. Over the subsequent surveying months, landowner access became increasingly available, therefore enabling more extensive survey coverage.

In addition to the area around Swannington and the River Wensum, the static bat detector surveys targeted the PEIR boundary crossings of the Rivers Bure, Tiffey and Yare, as well as the area of woodland and heathland between Bodham and Weybourne. Areas along the PEIR boundary which were highlighted as warranting bat detector surveys are shown in Figure 21, below.

The static deployments are separated into four groups of dates, with the areas and deployment time periods summarised in Table 1, below.

The areas covered by the first deployment between June 24th and July 10th 2020 are as follows:

- The eastern part of Weybourne Woods between Bodham and Weybourne (Figure 2),
- The River Wensum near Attlebridge (Figure 3),
- Grazing floodplain near the River Wensum at Attlebridge (Figure 3), and
- The River Tiffey at Barford (Figure 4).

The areas covered by the second deployment from 30th July to 10th August and the 19th to 25th August included:

- The western part of Weybourne Woods between Bodham and Kelling (Figure 6),
- A small pocket of woodland in grazed fields near Swannington, north of the River Wensum (Figure 7),
- The River Wensum (Figure 8), and
- A pocket of woodland just north of the River Yare near Colton (Figure 9).

The areas covered by the third deployment from the 25th August and 10th September included:

- The eastern part of Weybourne Woods (Figure 11)
- The River Bure (Figure 12)
- An area of scrub adjacent to a woodland near Swannington (Figure 13), and
- The River Wensum (Figure 14)

The areas covered by the fourth deployment from the 24th September and 5th October included:

- A large conservation pond within the western part of Weybourne Woods (Figure 16)
- The River Bure (Figure 17)
- The River Wensum (Figure 18), and
- The River Tiffey (Figure 19)

Table 1. Summary of deployment locations and operational dates for static bat surveys in 2020

Deployment Location	Deployment 1	Deployment 2	Deployment 3	Deployment 4
Weybourne Woods	SM2 F 24 th June - 8 th July	SM2 H 30 th July - 11 th August	SM2 K 26 th August - 10 th September	SM2 H 24 th September - 2 nd October
River Bure	No deployment	No deployment	SM2 N 26 th August - 9 th September	SM2 J 24 th September - 5 th October
Swannington	No deployment	SM2 N 30 th July - 9 th August	SM2 J 26 th August - 10 th September	No deployment
River Wensum	SM2 E 24 th June - 9 th July And SM2 I 24 th June - 8 th July	SM2 I 30 th July - 1 st August and redeployed 19 th August - 25 th August	SM2 H 26 th August - 31 st August	SM2 N 24 th September - 5 th October
River Yare	No deployment	SM2 K River Yare 30 th July - 10 th August	No deployment	No deployment
River Tiffey	SM2 K 24 th June - 10 th July	No deployment	No deployment	SM2 K 24 th September - 5 th October

3.2.2 Deployment dates and durations of the 2020 static bat detector surveys

The first deployment of static bat detectors (SM2 F, SM2 I, SM2 E, SM2 K) was for the following period between June-July:

- SM2 F: 24th June- 8th July 2020 (14 nights)
- SM2 I: 24th June- 8th July 2020 (14 nights)
- SM2 E: 24th June- 9th July 2020 (15 nights)
- SM2 K: 24th June- 10th July 2020 (16 nights)

The first deployment of static bat detectors was for 16 nights in total, although only one detector (SM2 K) remained operational throughout this period. Detectors SM2 F, SM2 I and SM2 E did not record for the full deployments, with detectors SM2 F and SM2 I ceasing to record after 14 full nights and SM2 E ceasing to record after 15 nights. This is thought to be due to a technical fault, possibly caused by insufficient battery charge, insufficient memory on data cards (especially as detectors unavoidably record other wildlife such as crickets), or the detector being damaged, such as by livestock or the weather.

Weather conditions throughout this period were mostly mild, with only two days where there was significant rainfall. Winds were mostly below Beaufort scale 2 and cloud cover was varied. Temperatures ranged between 29°C and 11°C.

The second deployment of static bat detectors was for the following period between July-August:

- SM2 I: 30th July-1st August (2 nights)
- SM2 N: 30th July-9th August (10 nights)
- SM2 K: 30th July-10th August (11 nights)
- SM2 H: 30th July-11th August (12 nights)

The static bat detectors were deployed for 12 nights in total, although only one detector (SM2 H) remained operational throughout this period. Detectors SM2 I, SM2 N and SM2 K did not record for the full deployments, with detector SM2 I ceasing to record after just two full nights. This is thought to be due the aforementioned reasons, including technical fault, insufficient memory on data cards or the detector being damaged.

Weather conditions throughout this period were mostly mild and warm, with temperatures ranging from 34°C to 9°C. Only the first few days of August experienced occasional showers and some stronger winds.

As static bat detector SM2 I, which was deployed by the River Wensum, only recorded for two nights, this detector was deployed later in August. The re-deployed detector was operational for seven nights between the following dates:

- SM2 I: 19th August-25th August (7 nights)

Weather for the re-deployment of SM2 I was consistently mild, with highs of 22°C and lows of 11°C.

The third deployment of static bat detectors was for the following periods between August-September:

- SM2 H: 26th August- 31st August (5 nights)
- SM2 N: 26th August- 9th September (14 nights)
- SM2 K: 26th August- 10th September (15 nights)
- SM2 J: 26th August- 10th September (15 nights)

The majority of the static bat detectors were deployed for 15 nights in total, with detectors SM2 J and SM2 K operational throughout the entirety of this period. Static bat detector SM2 N was almost operational throughout the whole deployment but stopped recording one day before the detector was collected. SM2 H was only operational for five nights out of the 15-night deployment. This is thought to be due the aforementioned reasons, including technical fault, insufficient memory on data cards or the detector being damaged.

Weather conditions throughout the deployment were varied with highs of 24°C and lows of 6°C. At the beginning of the deployment, Storm Ellen was causing winds which were up to 45 mph and heavy rain. From the 26th August - 2nd September, a second storm (Storm Francis) caused further heavy rain and strong winds up to 55mph. Throughout the beginning of September the weather was mild.

The fourth deployment of static bat detectors was for the following periods between September-October:

- SM2 H: 24th September- 2nd October (8 nights)
- SM2 J: 24th September- 5th October (11 nights)
- SM2 N: 24th September- 5th October (11 nights)
- SM2 K: 24th September- 5th October (11 nights)

The majority of the static bat detectors were deployed for 11 nights in total, with three of the detectors recording throughout the duration of the deployment. One static bat detector, SM2 H, was only operational for eight nights. This is likely due to similar reasons to those listed above.

Weather conditions throughout the deployment were cooler than previous months, but less varied. Temperatures reached highs of 18°C and lows of 5°C.

The surveys used Wildlife Acoustics SongMeter SM2BAT automated bat detectors. The locations of the deployed bat detectors are shown in Figures 1-19 and summarised in Table 1. The static bat detectors were deployed, retrieved and the data analysed by WFE ecologists. Further details including the software and techniques used to analyse the data is provided in Section 3.3, below.

The bat detectors were programmed to commence recording for bats approximately 30 minutes before sunset and record throughout the night until roughly 30 minutes after sunrise.

3.3 Bat Survey Audio Recording Analysis

All sound recordings were reviewed to confirm the full range of bat species recorded. All SM2BAT recordings were analysed using AnalookW software. Registrations were analysed by Susannah Dickenson BSc MCIEEM (NE bat survey class licence registration no. 2016-22497-CLS-CLS).

Audio analysis of frequency division and time expansion data was achieved by comparing sound characteristics and sonogram shapes and measurements (peak call frequency, call frequency range, and mode pulse interval) to reference measurements and/or recordings provided by Russ et al. (2012)¹, Parsons and Jones (2000)², the Bat Conservation Trust (2008)³, Sowler (2010)⁴, and Wild Frontier Ecology's in-house call reference library.

As some of the static bat detectors recorded extremely high numbers of registrations/recordings, AnalookW filters which automatically identify registrations, were used to analyse batches of registrations (namely pipistrelle *Pipistrellus* sps. registrations) in order to reduce analysis time. Use of filters does not compromise the information presented in this report or the conclusions that have been drawn.

3.4 Data Search

A data search for biological records was completed with the Norfolk Biodiversity Information Service (NBIS) in January 2021. This returned 3,532 records of 12 confirmed species of bat within a 2km buffer of the PEIR boundary. To further refine the data, it was manipulated to show only records within the PEIR boundary and those of significance which lie outside of the PEIR boundary. Records of significance were determined by the conservation status of the species⁵. Species considered rare include noctules, Nathusius's Pipistrelle, whiskered bat *Myotis mystacinus*, western barbastelle, Leisler's bat and serotine. They were only included in the results where the location of the record was within approximately 50m of the PEIR boundary or well connected to the boundary via good quality habitat such as woodland and rivers.

There are 99 records of bats which lie within the PEIR boundary and an additional 385 records of significance outside of the PEIR boundary. The data search records for each species are summarised in 2 and 3, below.

Table 2. Summary of data search records returned within the PEIR boundary.

Species	Number of records
Soprano pipistrelle	24

¹ Russ, J. (2012). British Bat Registrations A Guide to Species Identification, Pelagic Publishing, Exeter.

² Parsons, S. and Jones, G. 2000. Acoustic Identification of Twelve Species of Echolocating Bat by Discriminate Function Analysis and Artificial Neural Networks. The Journal of Experimental Biology 203: 2641-2656.

³ Bat Conservation Trust. 2008. Bat Sound Library. Online at: http://www.bats.org.uk/pages/bat_sound_library_introduction.html?handle:bat_sound_library_introduction.html

⁴ Sowler S. (2010) Difficult Sonograms and Social Registrations - Advanced Anabat Analysis. Alana Ecology Workshop. Bury St. Edmunds, Suffolk

⁵ Battersby J. (2005) UK Mammals: Species Status and Population Trends. Online at: <http://programmeofficers.co.uk/Preston/CoreDocuments/LCC206.pdf>

⁶ Mathews F, and Harrower C. (2020). IUCN - compliant Red List for Britain's Terrestrial Mammals. Assessment by the Mammal Society under contract to Natural England, Natural Resources Wales and Scottish Natural Heritage. Natural England, Peterborough ISBN 978-1-78354-485-1

Species	Number of records
Noctule	14
<i>Pipistrelle</i> Sp.	24
Daubenton's bat	9
Western Barbastelle	9
Unidentified	5
Natterer's	4
Brown long-eared bat	3
Serotine	2
Whiskered bat	2
Nathusius's Pipistrelle	2
Common pipistrelle	1

Table 3. Summary of significant records returned outside of the PEIR boundary.

Species	Number of records
Noctule	166
Nathusius's Pipistrelle	10
Western Barbastelle	159
Whiskered bat	6
Serotine	43
Leisler's bat	1

Figure 1: Overview map showing deployment locations for all four deployments (June-July, July-August, August-September, and September-October 2020)

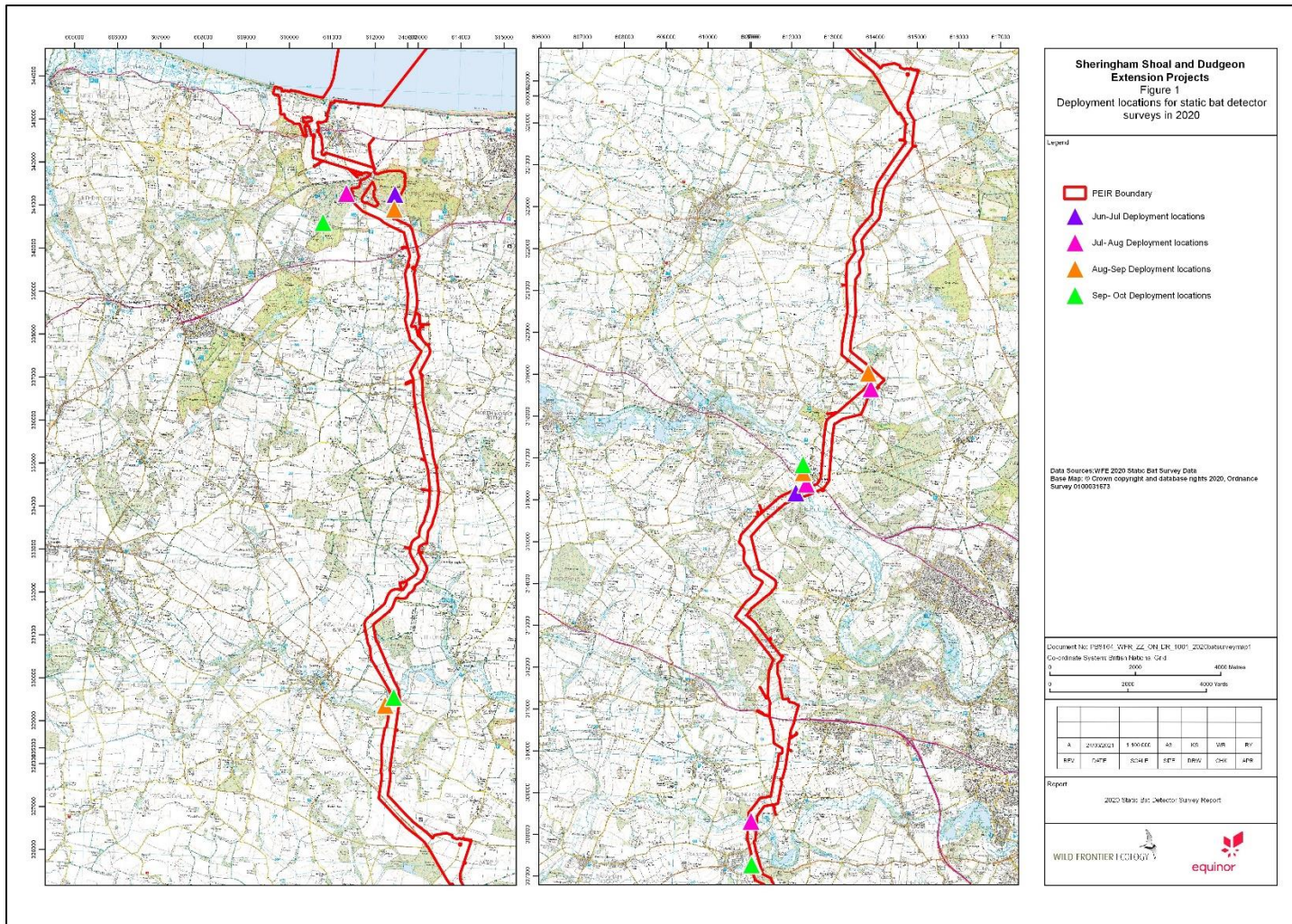


Figure 2: Overview map of first deployment of static bat detectors (24th June - 8th/ 9th/10th July 2020)

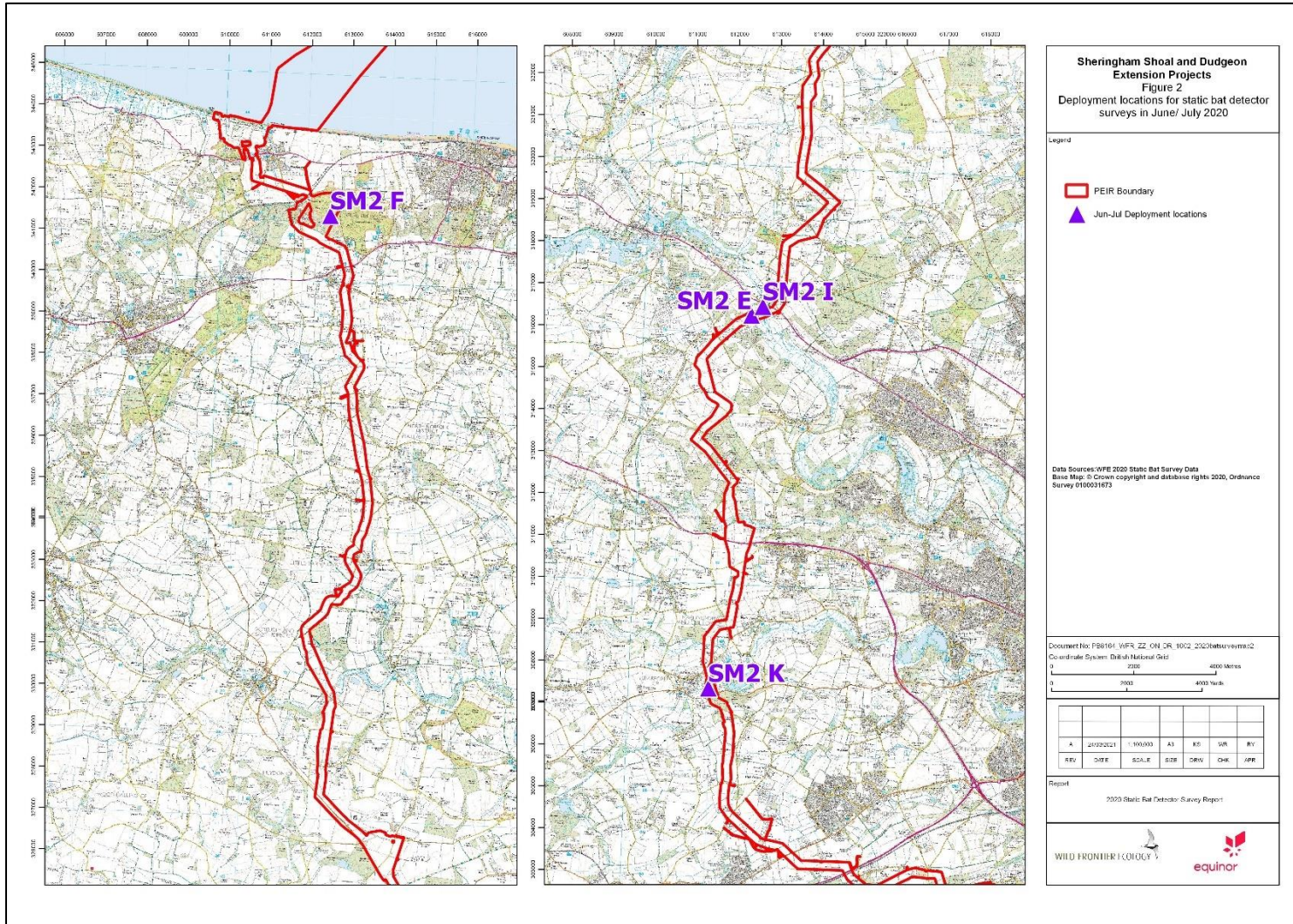


Figure 3: Location of deployment for static bat detector SM2 F (24th June - 8th July 2020)

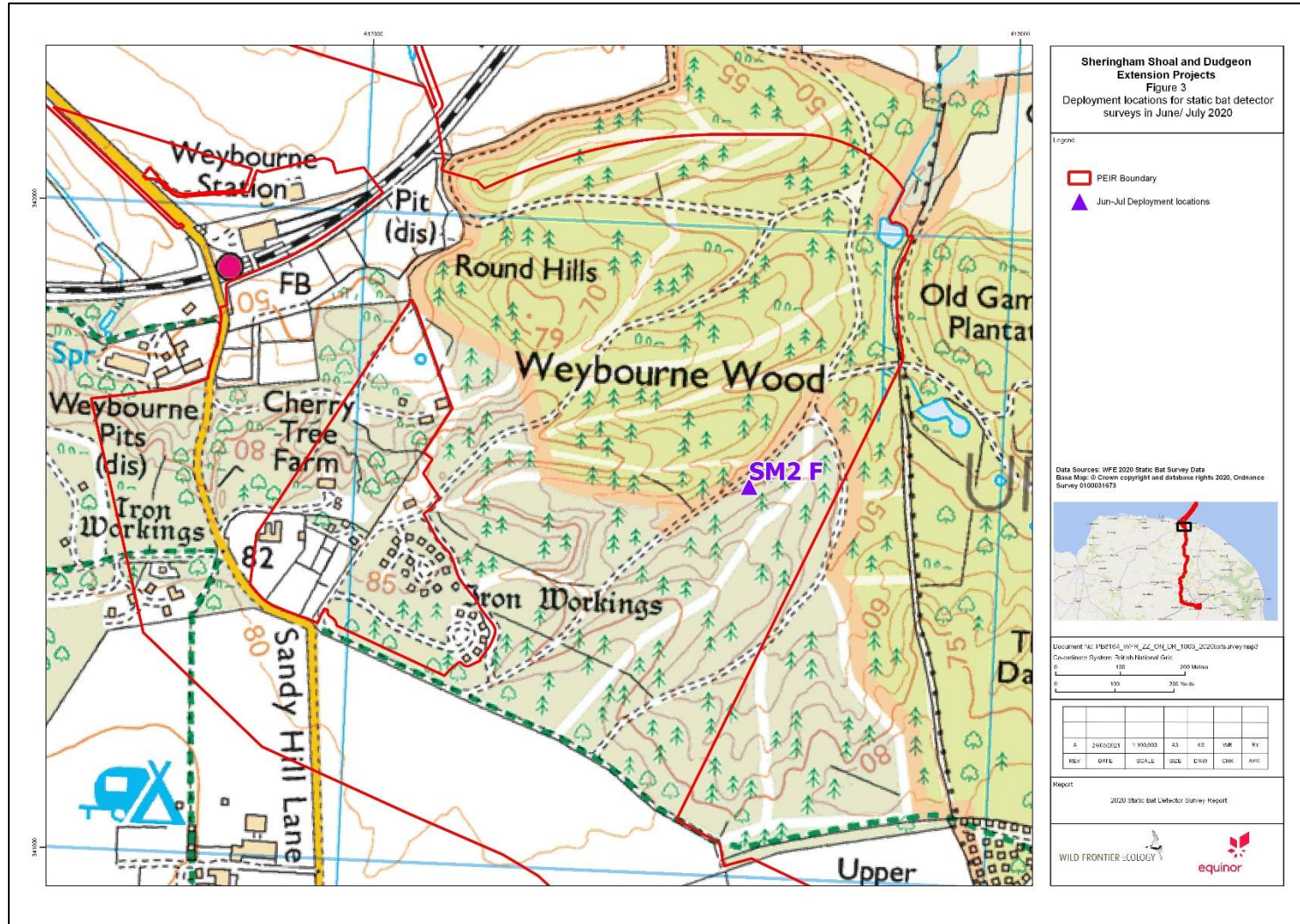


Figure 4: Location of deployment for static bat detectors SM2 I (24th June - 8th July 2020) and SM2 E (24th June -9th July 2020)

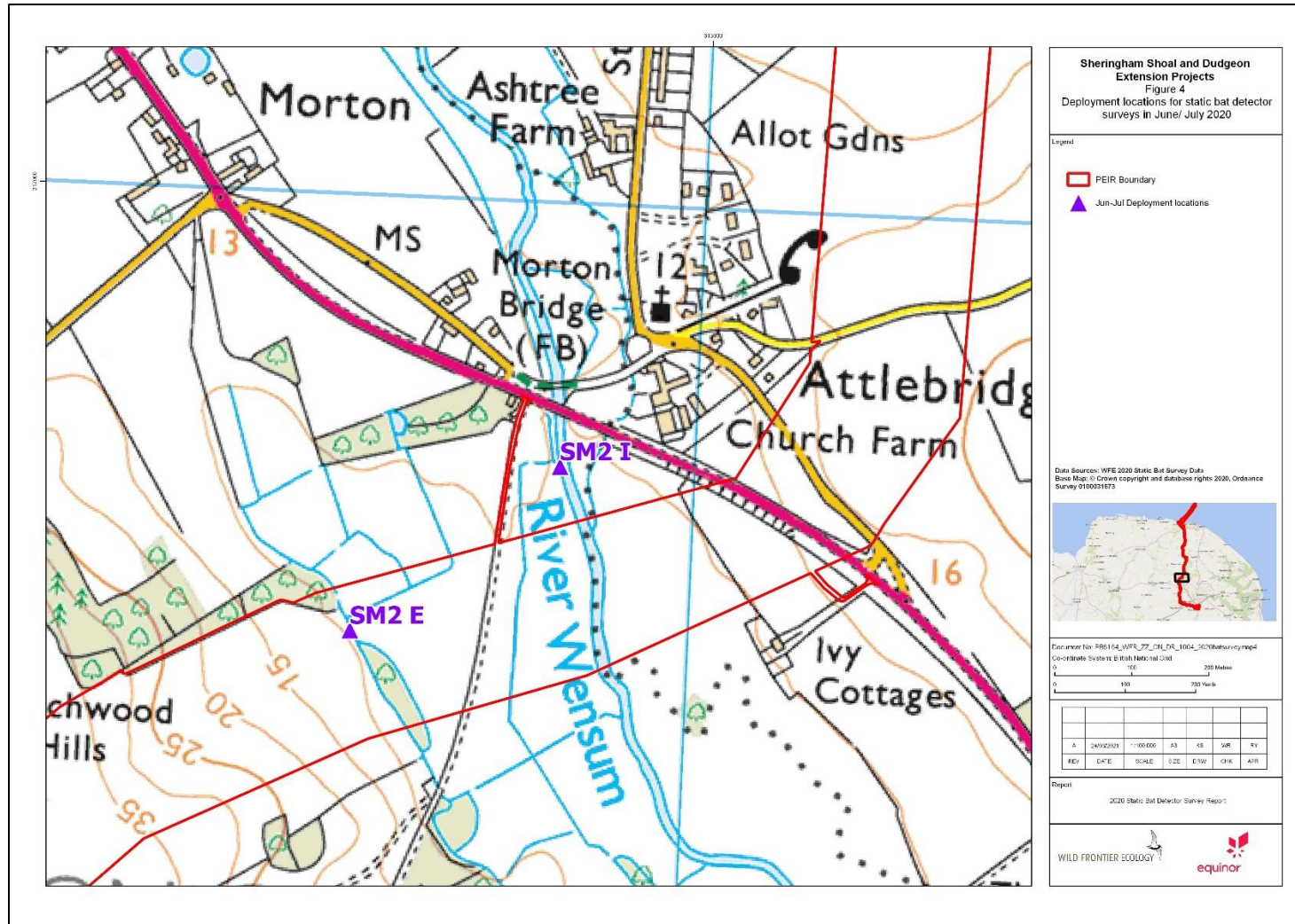


Figure 5: Location of deployment for static bat detector SM2 K (24th June - 10th July 2020)

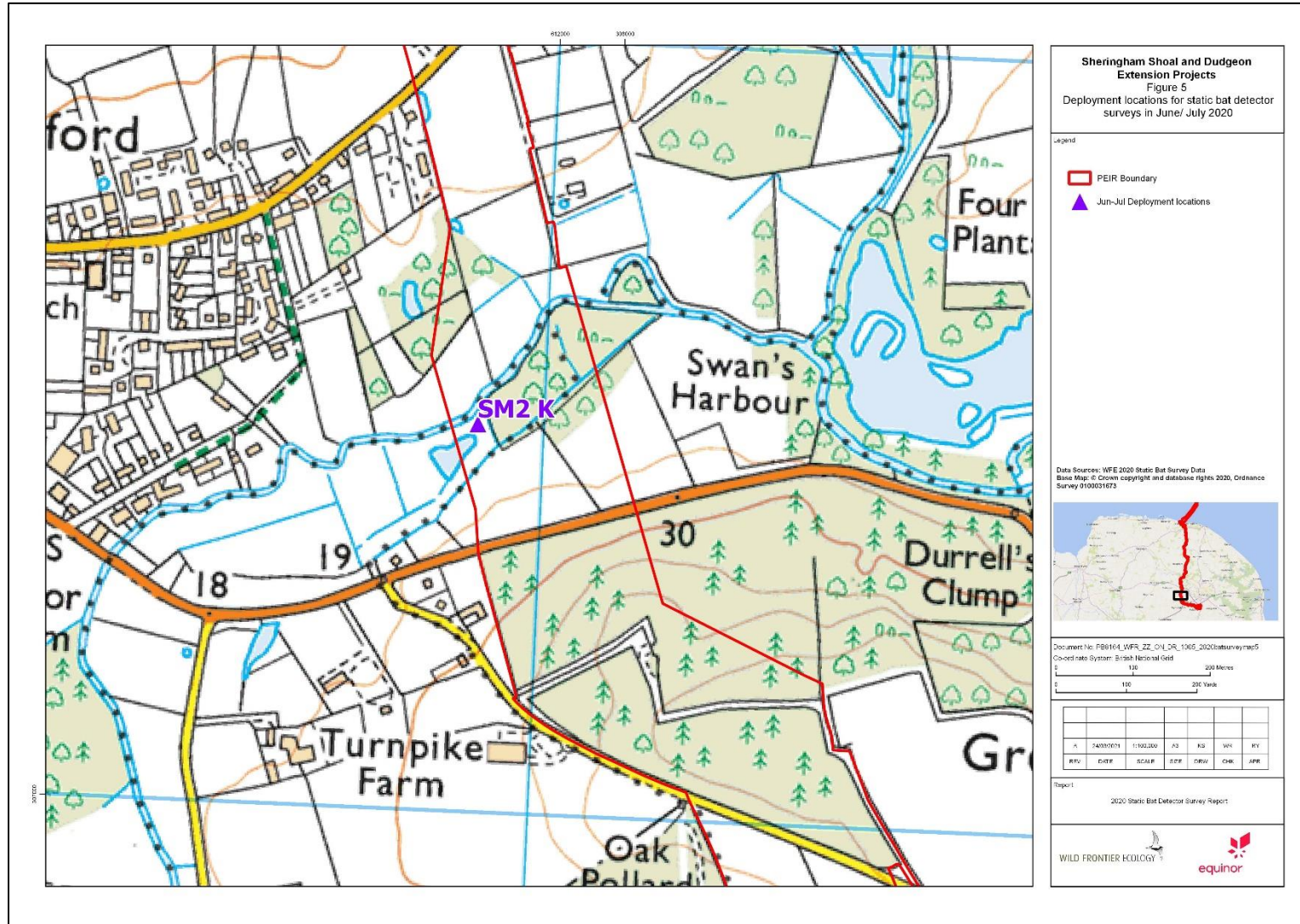


Figure 6: Overview map of second deployment of static bat detectors (30th July - 2nd/9th/10th/11th August 2020)

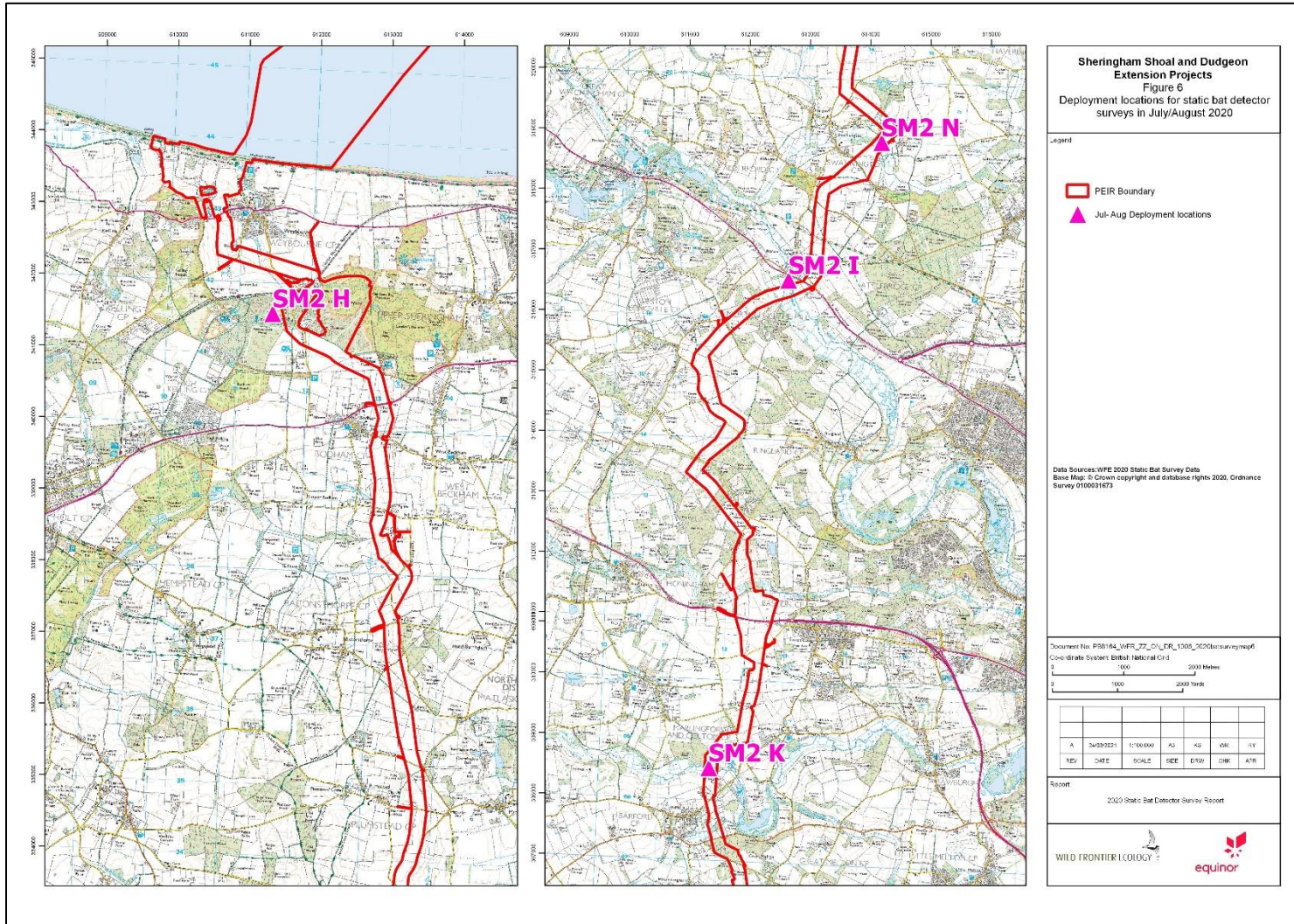


Figure 7: Location of deployment for static bat detector SM2 H (30th July - 11th August 2020)

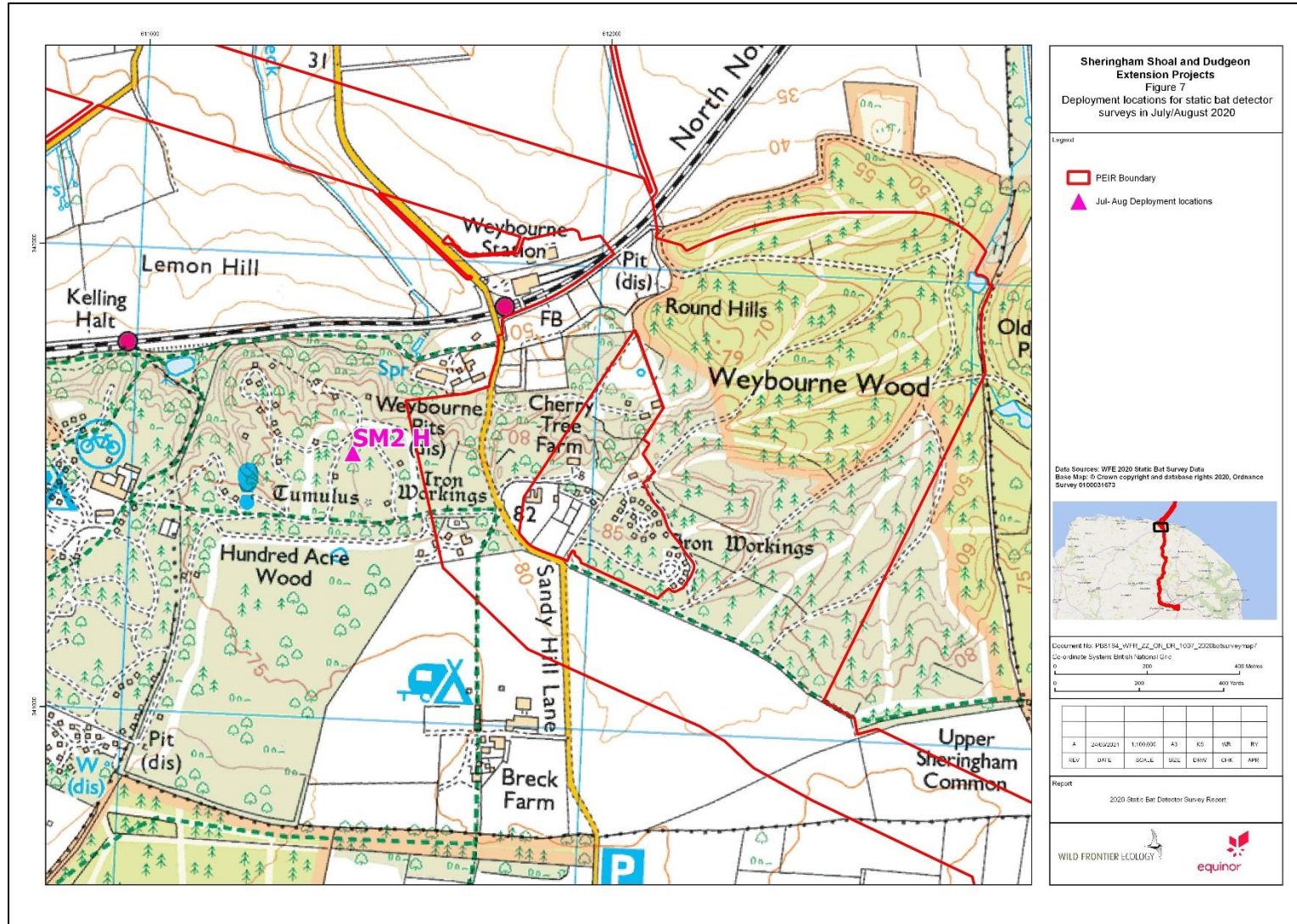


Figure 8: Location of deployment for static bat detector SM2 N (30th July - 9th August 2020)

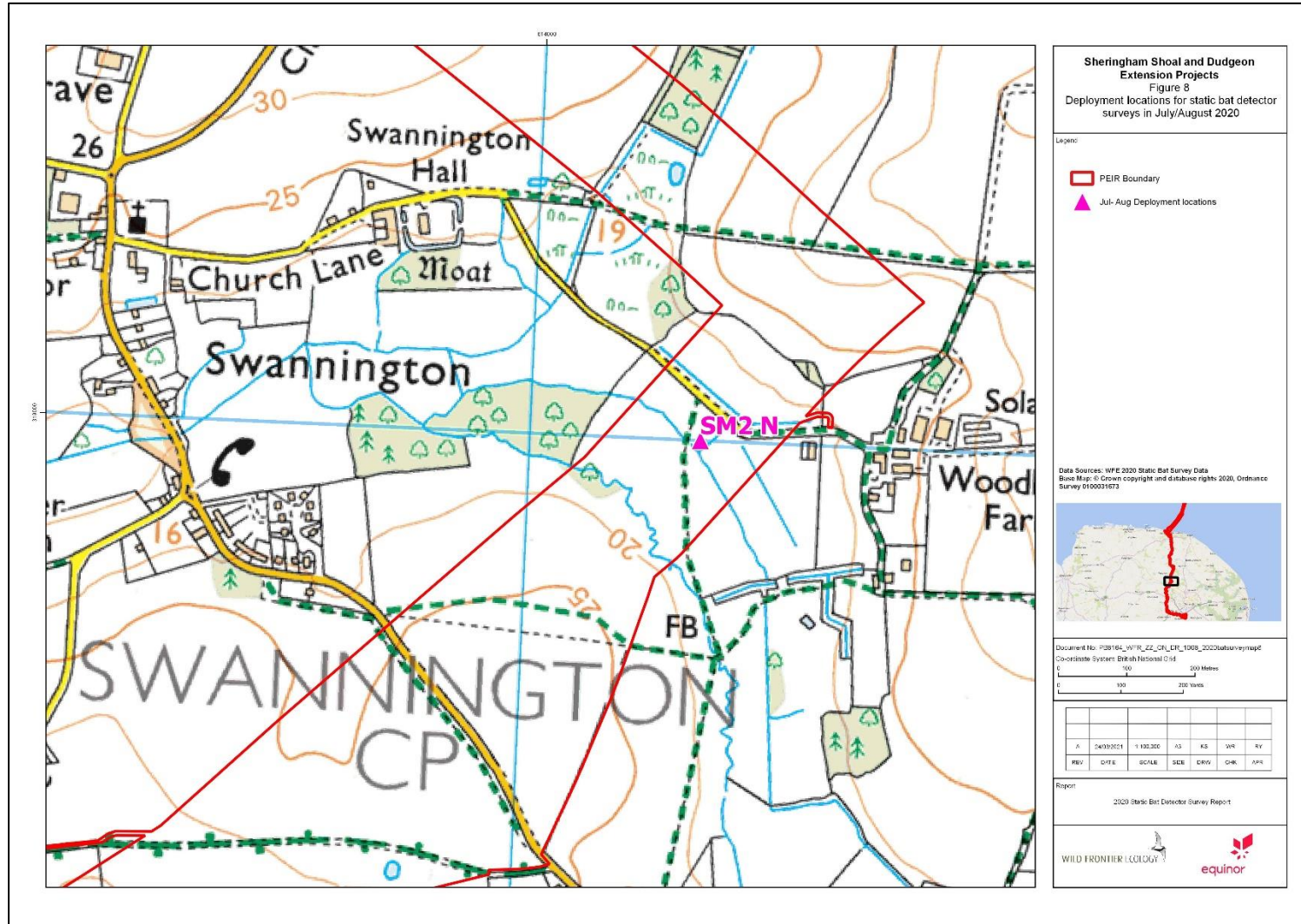


Figure 9: Location of deployment for static bat detector SM2 I (30th July - 1st August and 19th August - 25th August 2020)

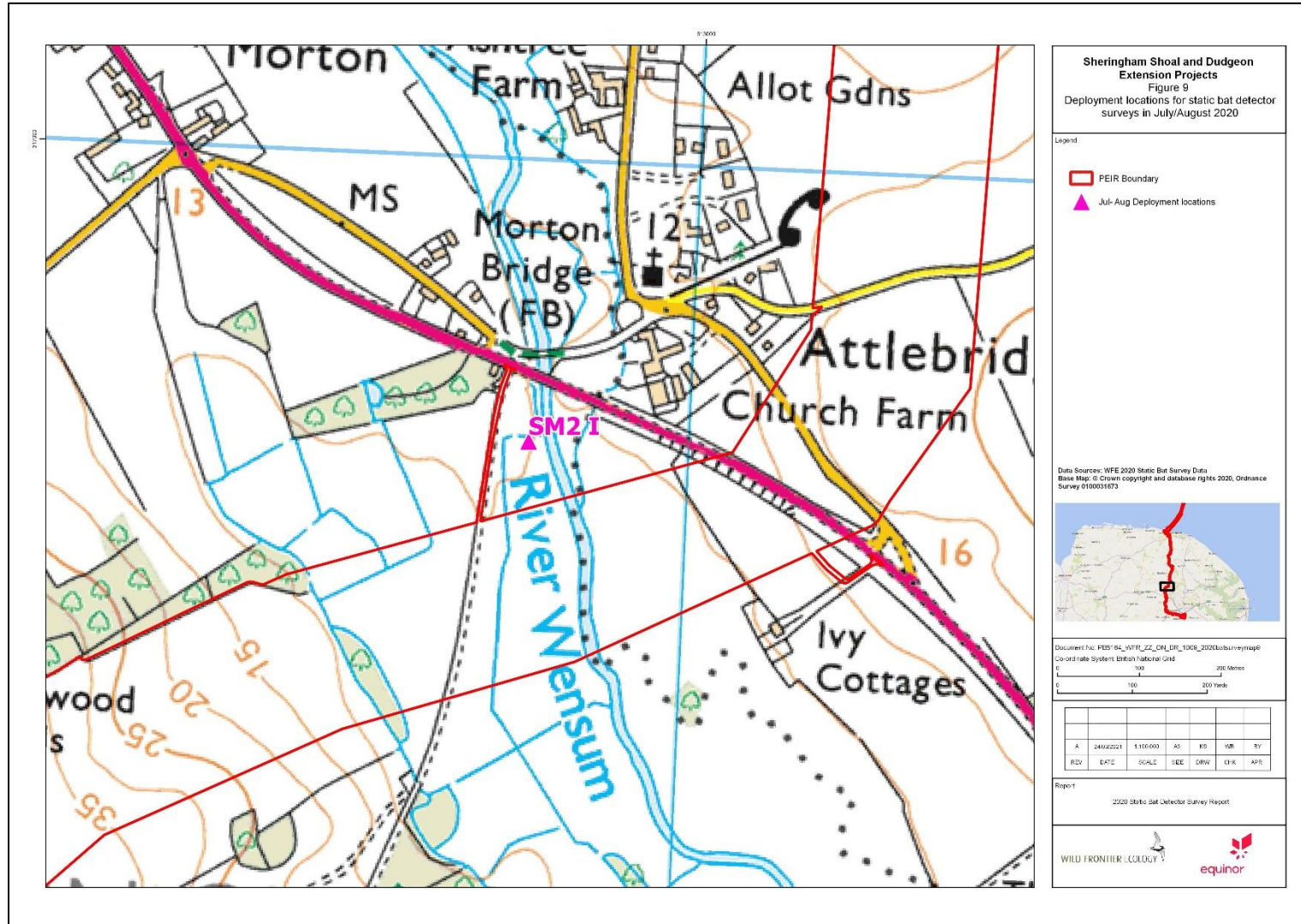


Figure 10: Location of deployment for static bat detector SM2 K (30th July - 10th August 2020)

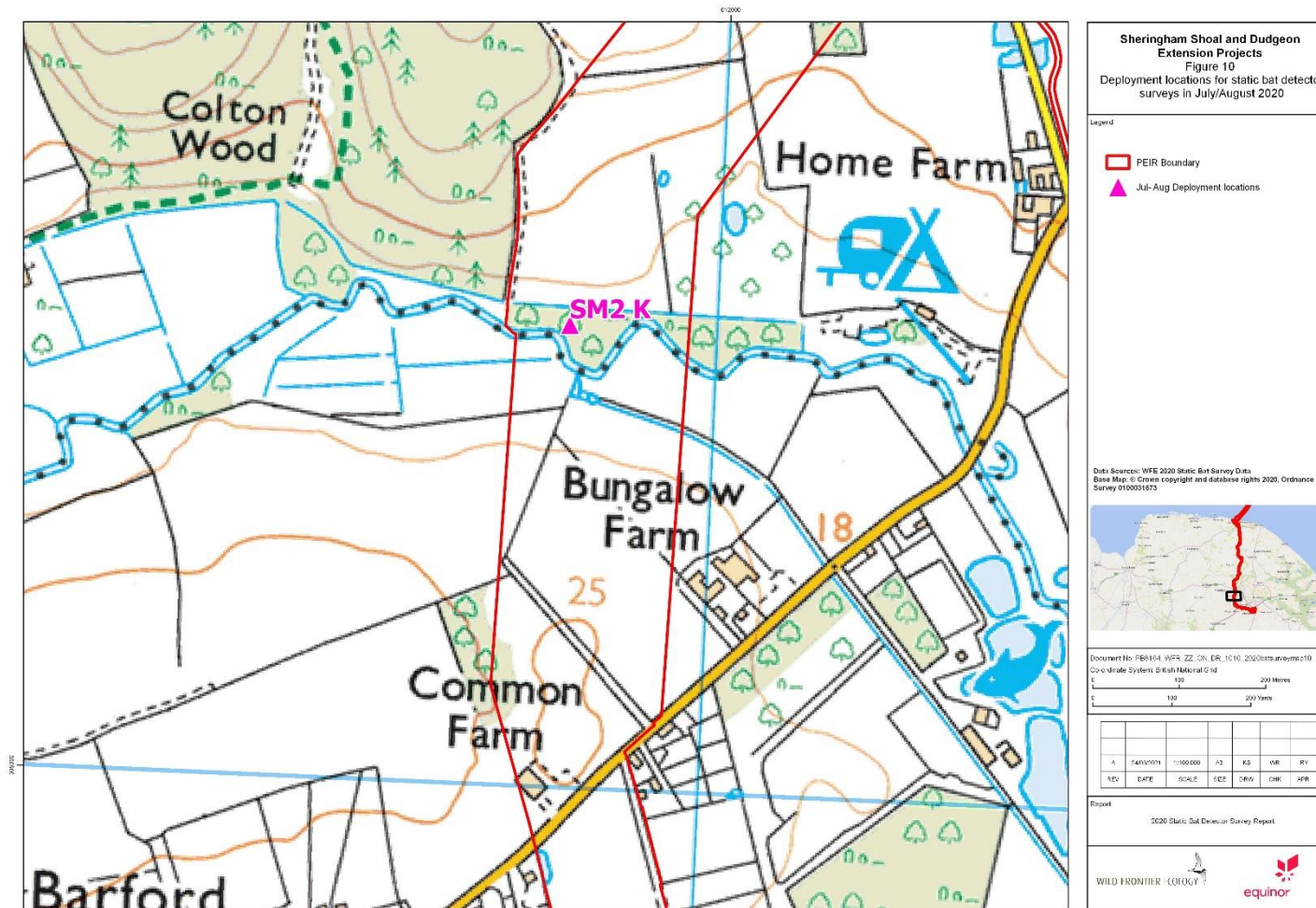


Figure 11: Overview map of third deployment of static bat detectors (26th August - 31st August/9th/10th September 2020)

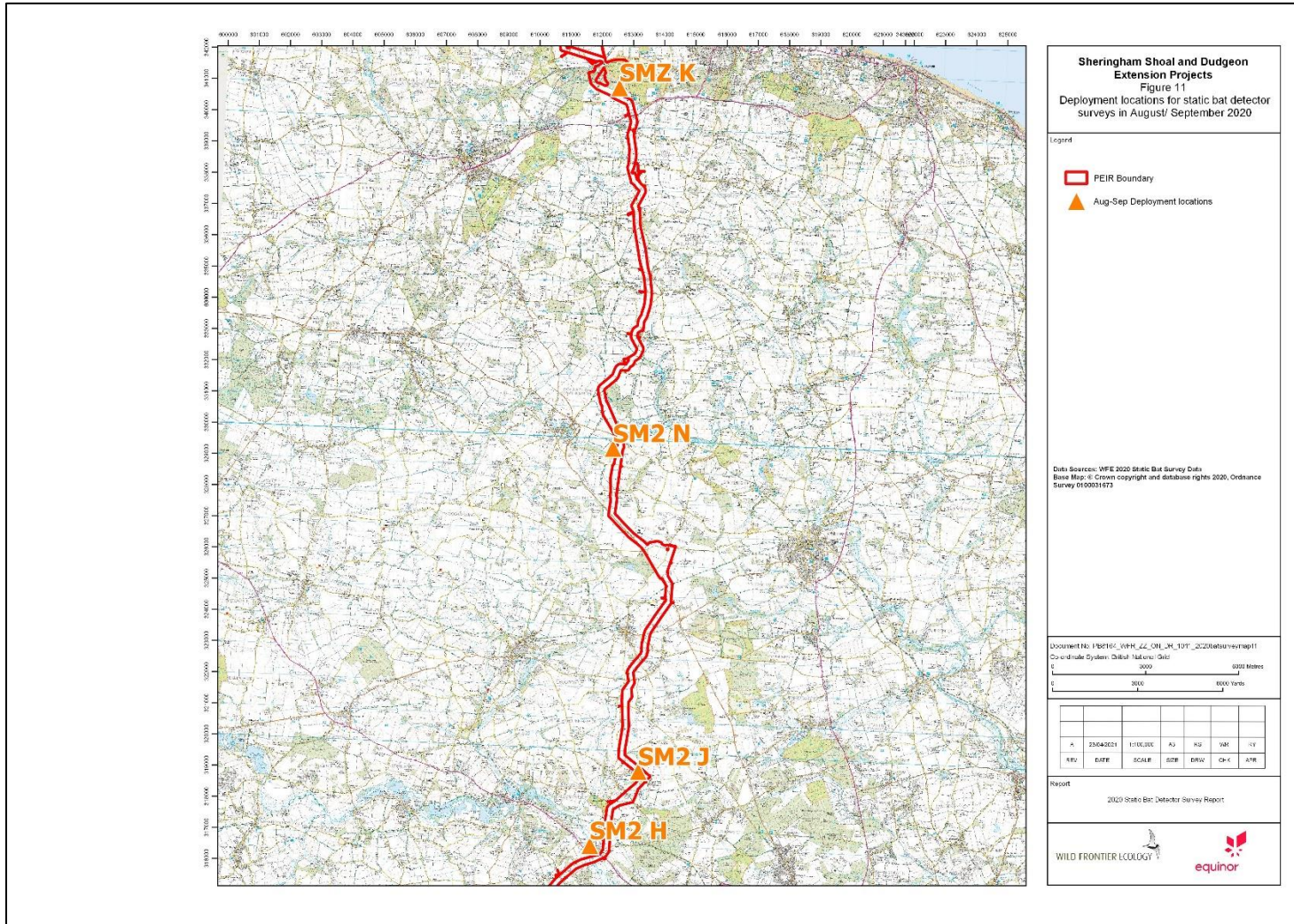


Figure 12: Location of deployment for static bat detector SM2 K (26th August - 10th September 2020)

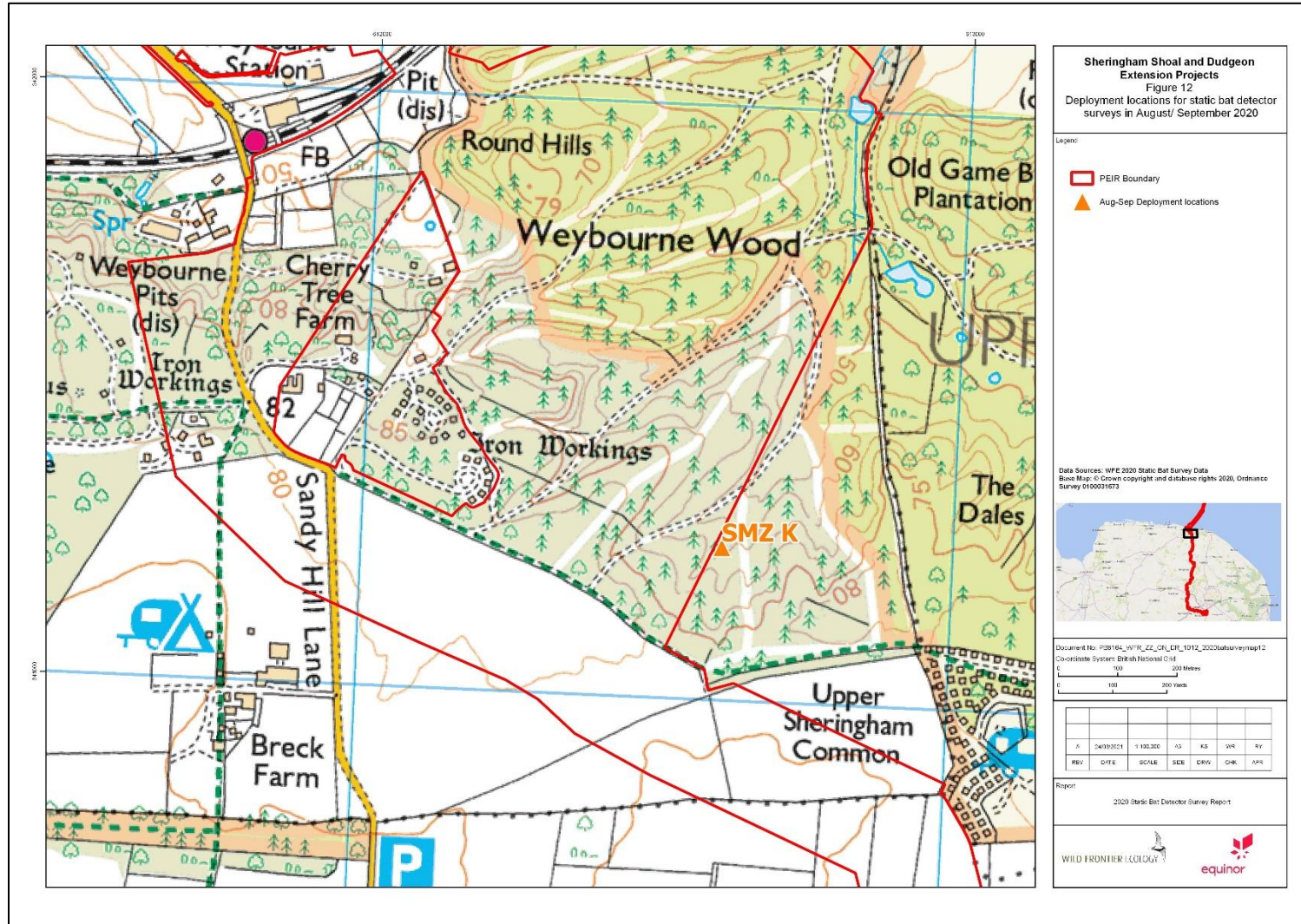


Figure 13: Location of deployment for static bat detector SM2 N (26th August - 9th September 2020)

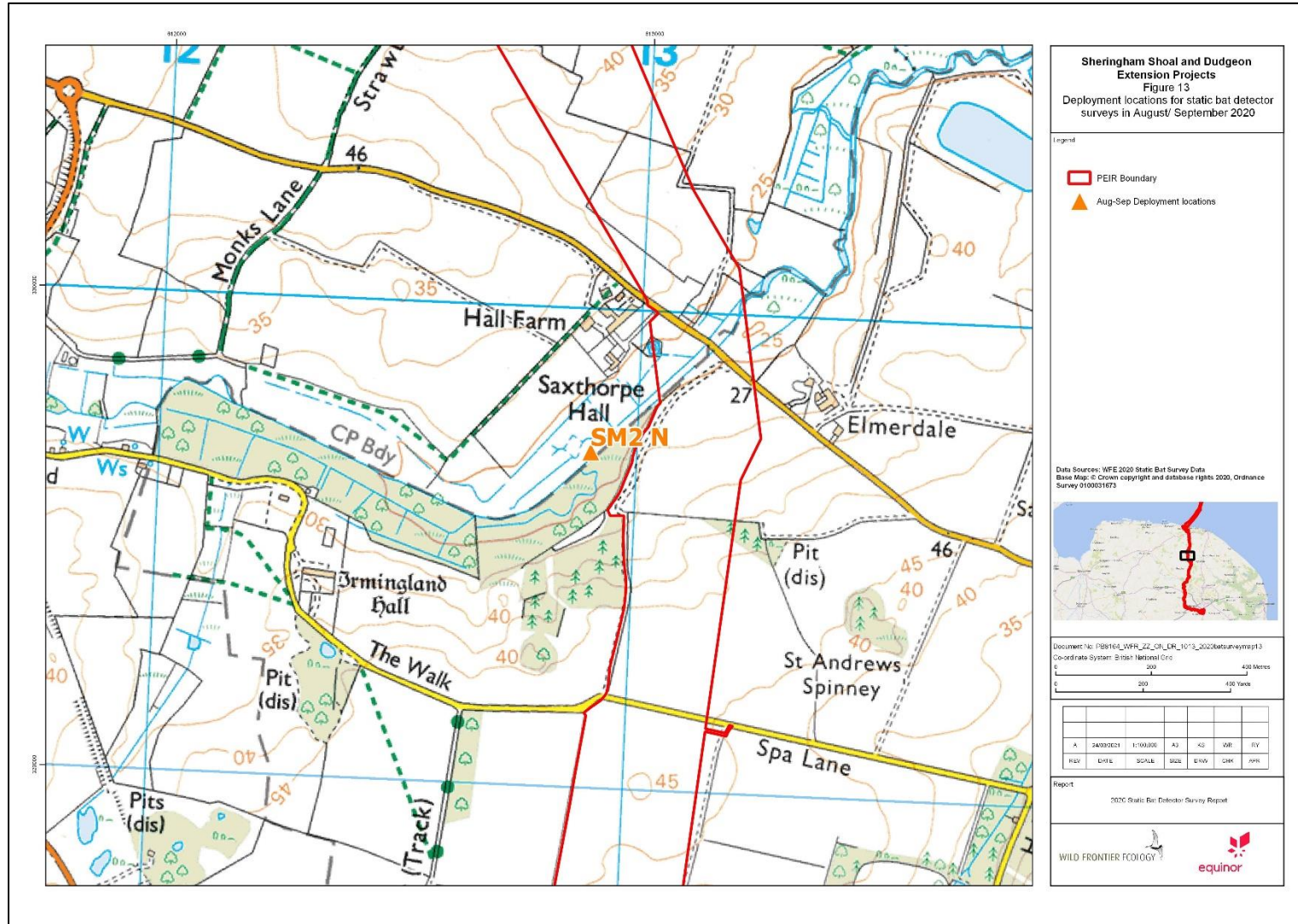


Figure 14: Location of deployment for static bat detector SM2 J (26th August - 10th September 2020)

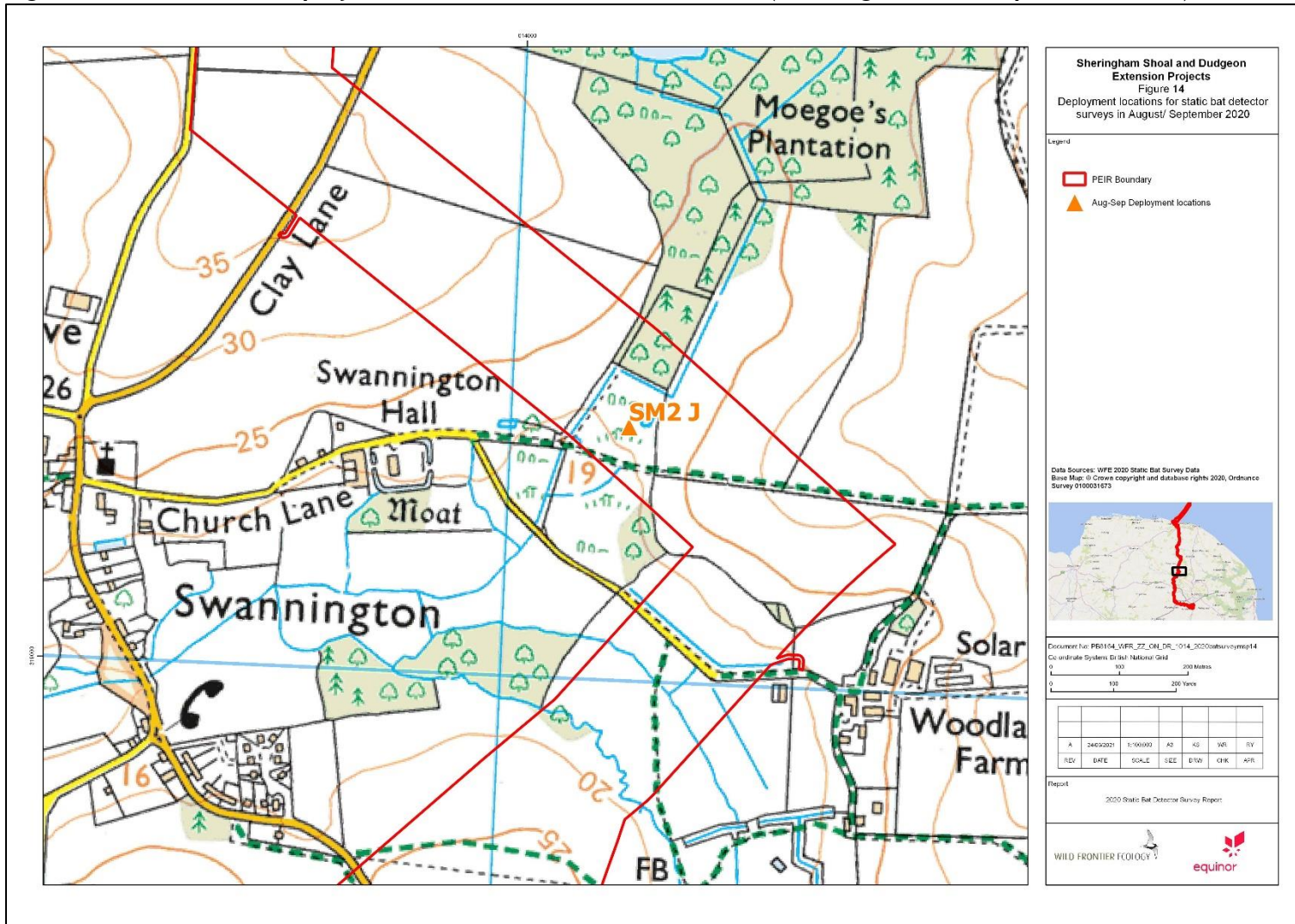


Figure 15: Location of deployment for static bat detector SM2 H (26th August - 31st August 2020)

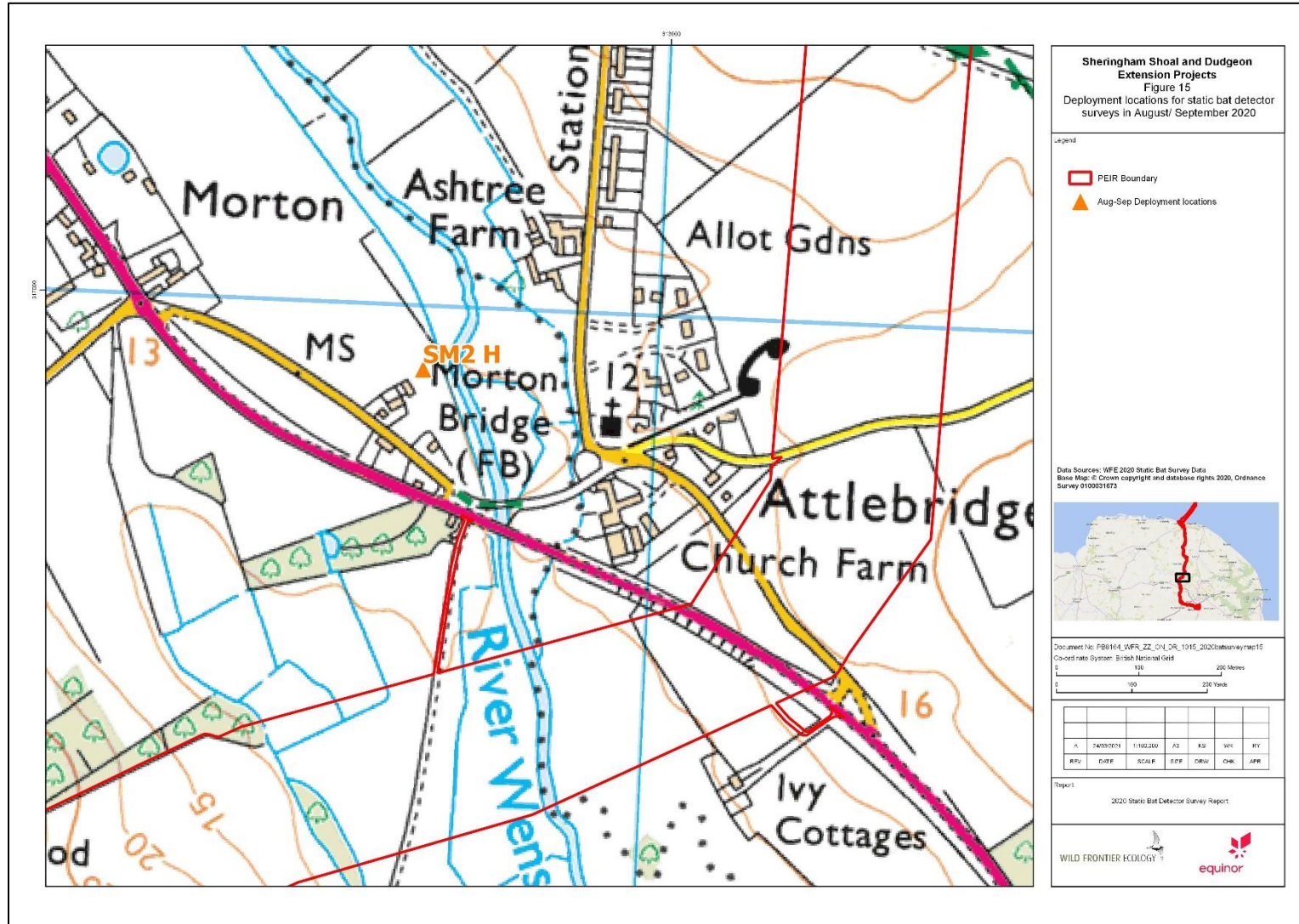


Figure 16: Overview map of fourth deployment of static bat detectors (24th September - 2nd/5th October 2020)

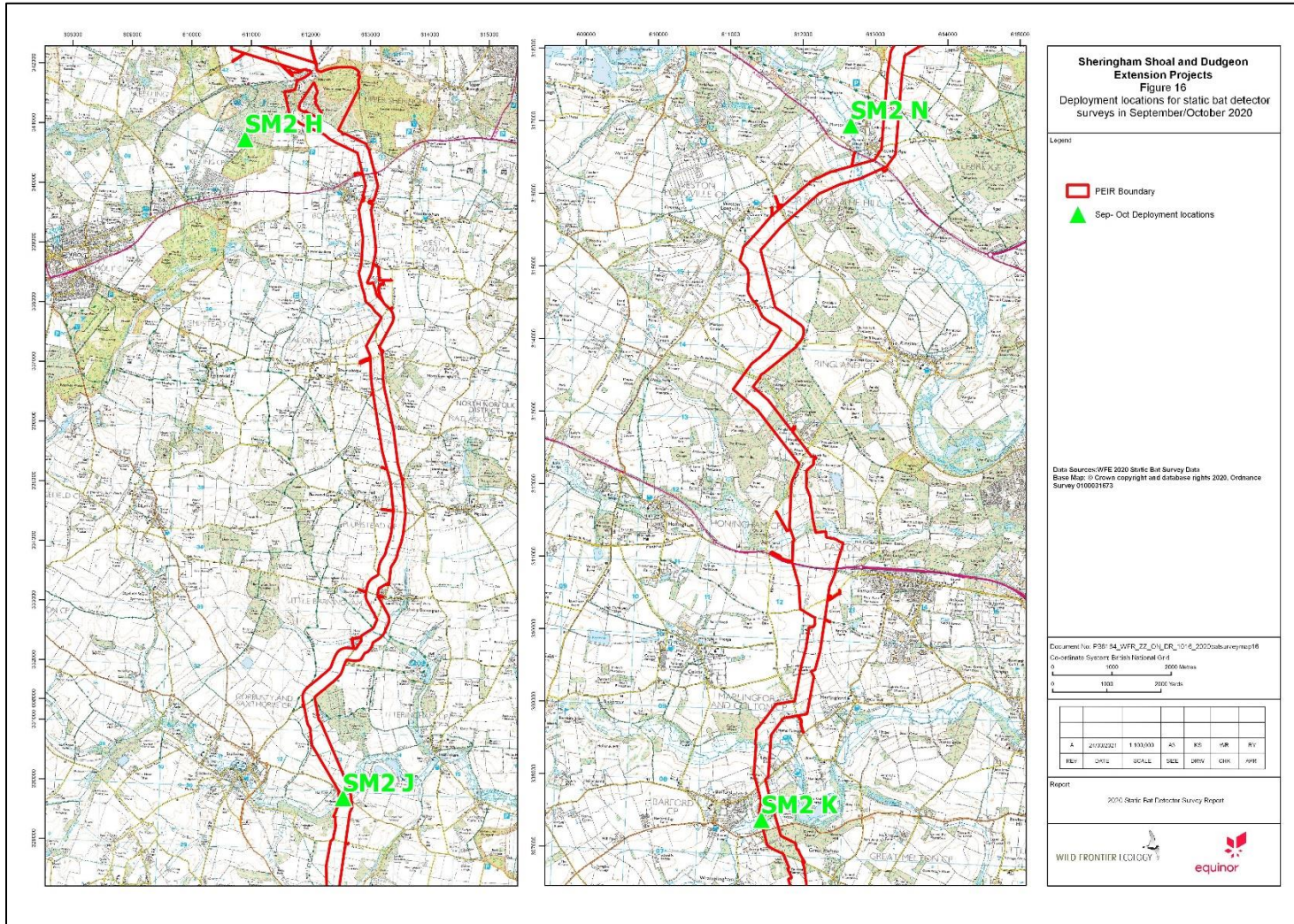


Figure 17: Location of deployment for static bat detector SM2 H (24th September - 2nd October 2020)

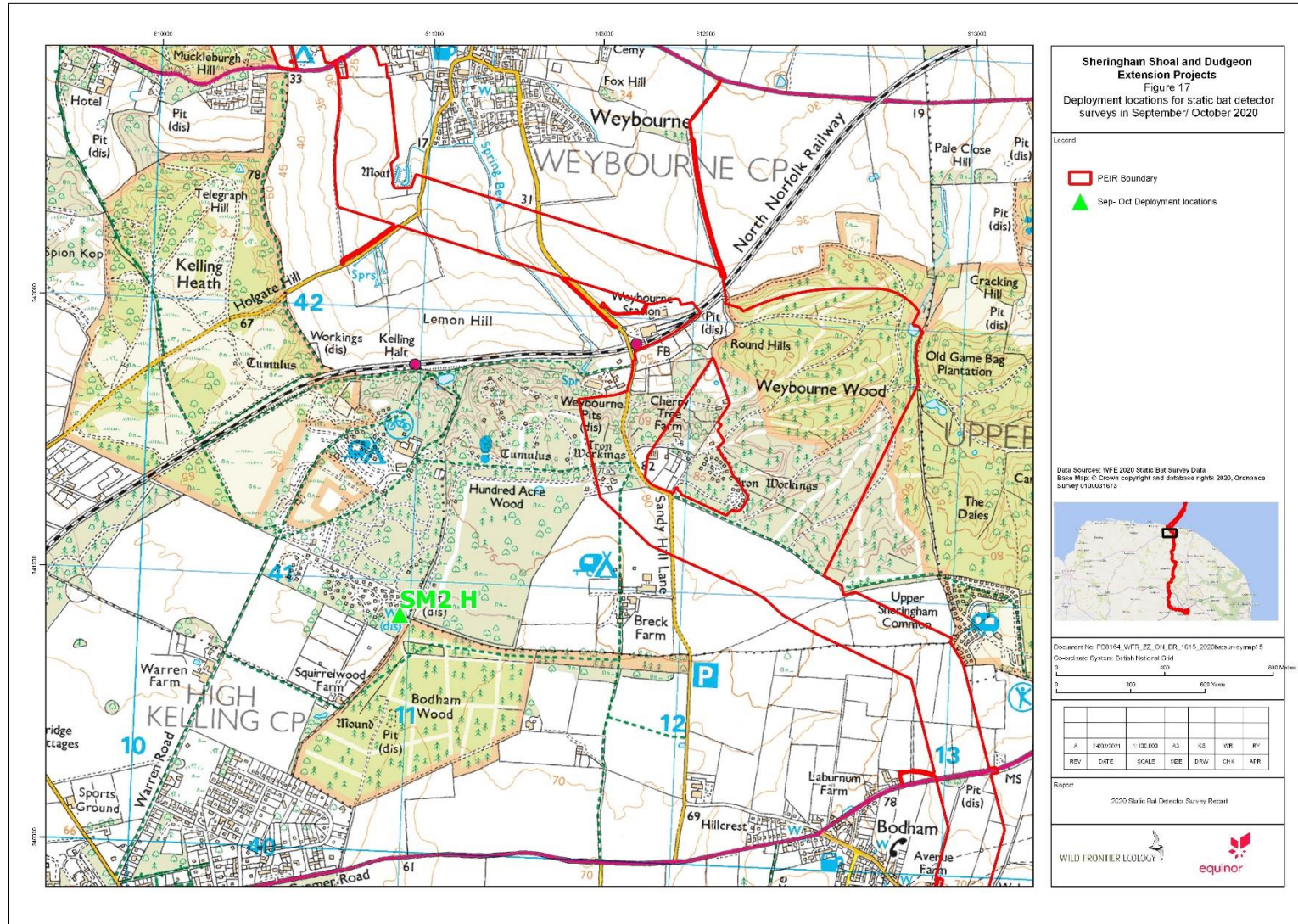


Figure 18: Location of deployment for static bat detector SM2 J (24th September - 5th October 2020)

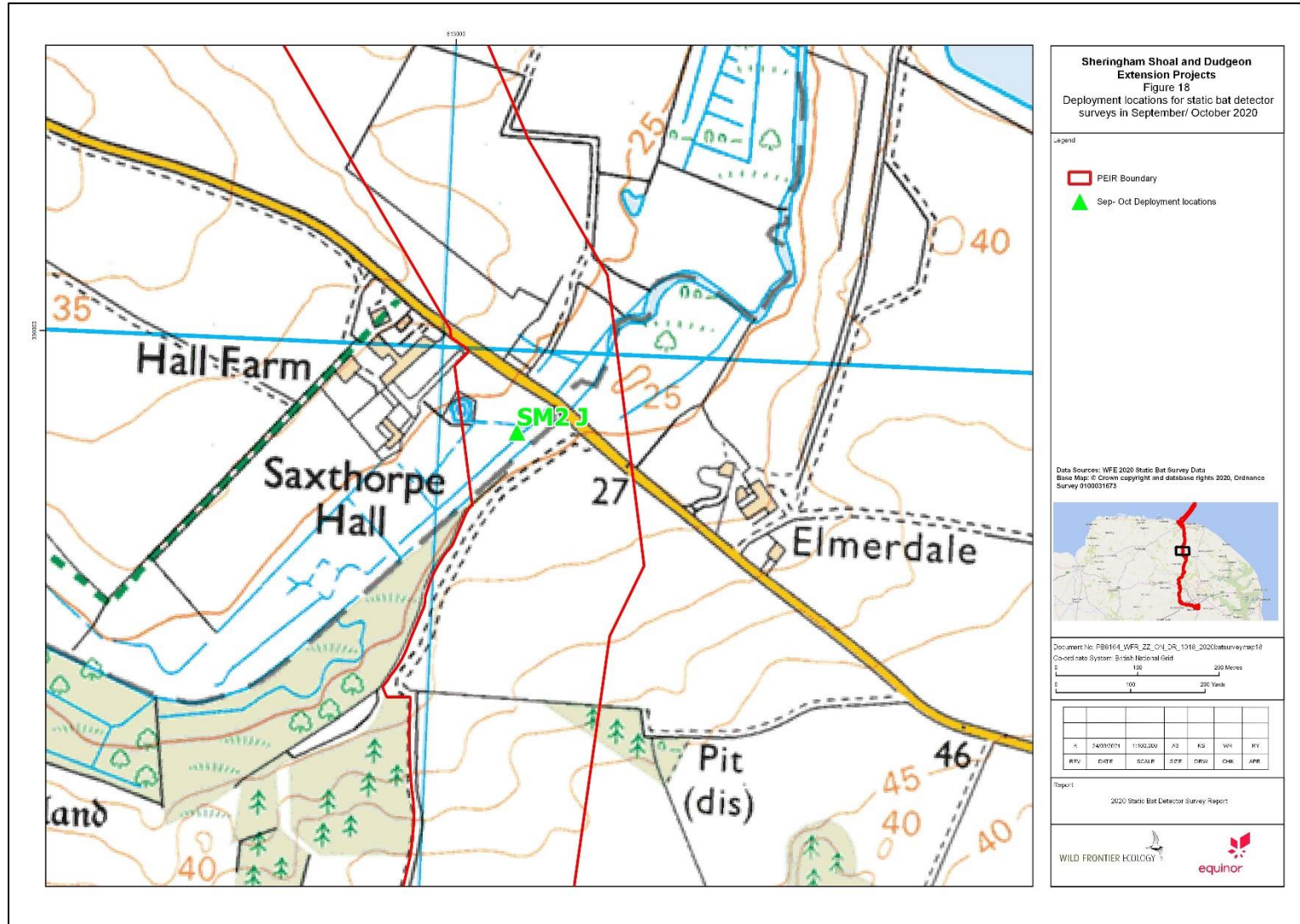


Figure 19: Location of deployment for static bat detector SM2 N (24th September - 5th October 2020)

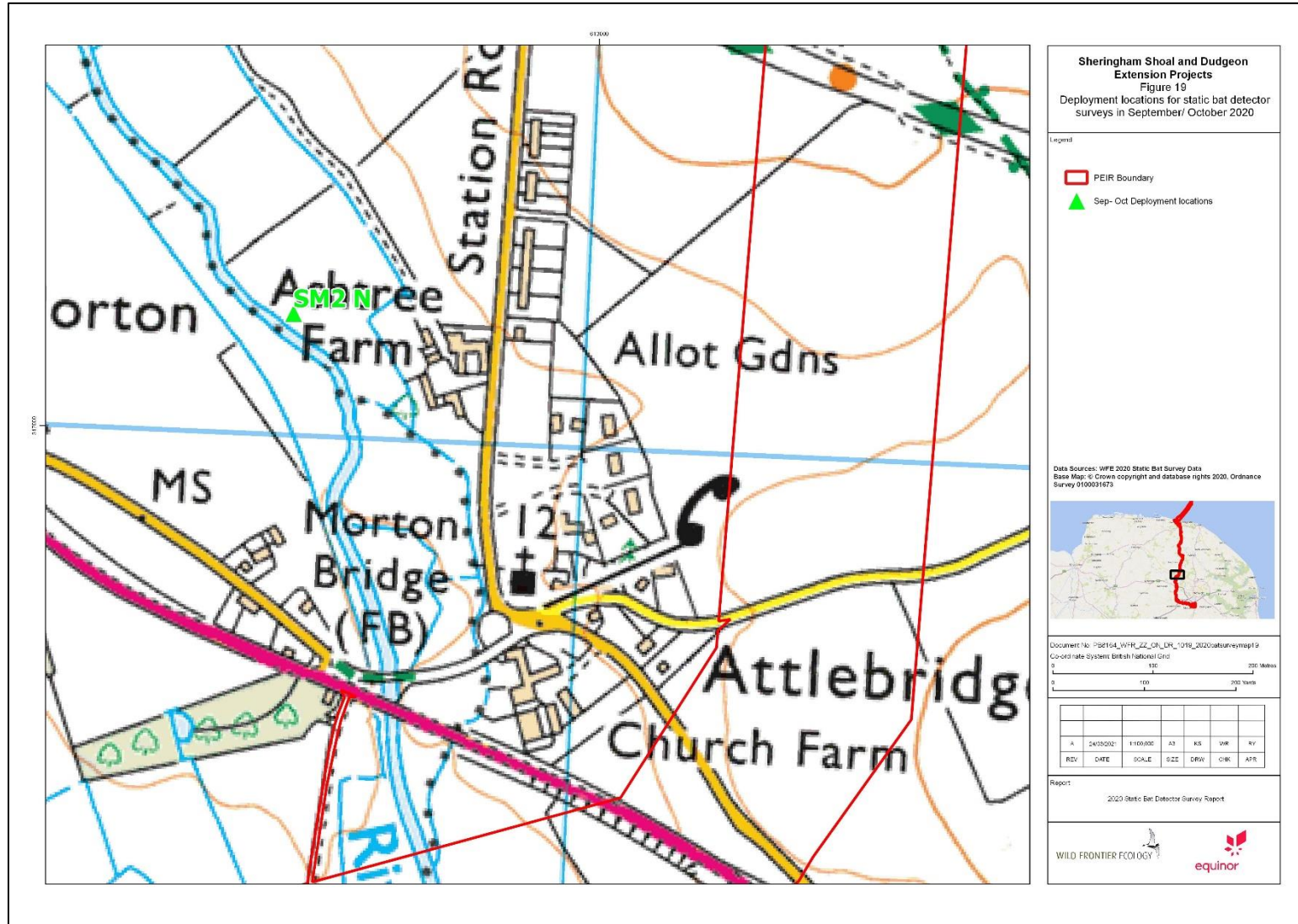


Figure 20: Location of deployment for static bat detector SM2 K (24th September - 5th October 2020)

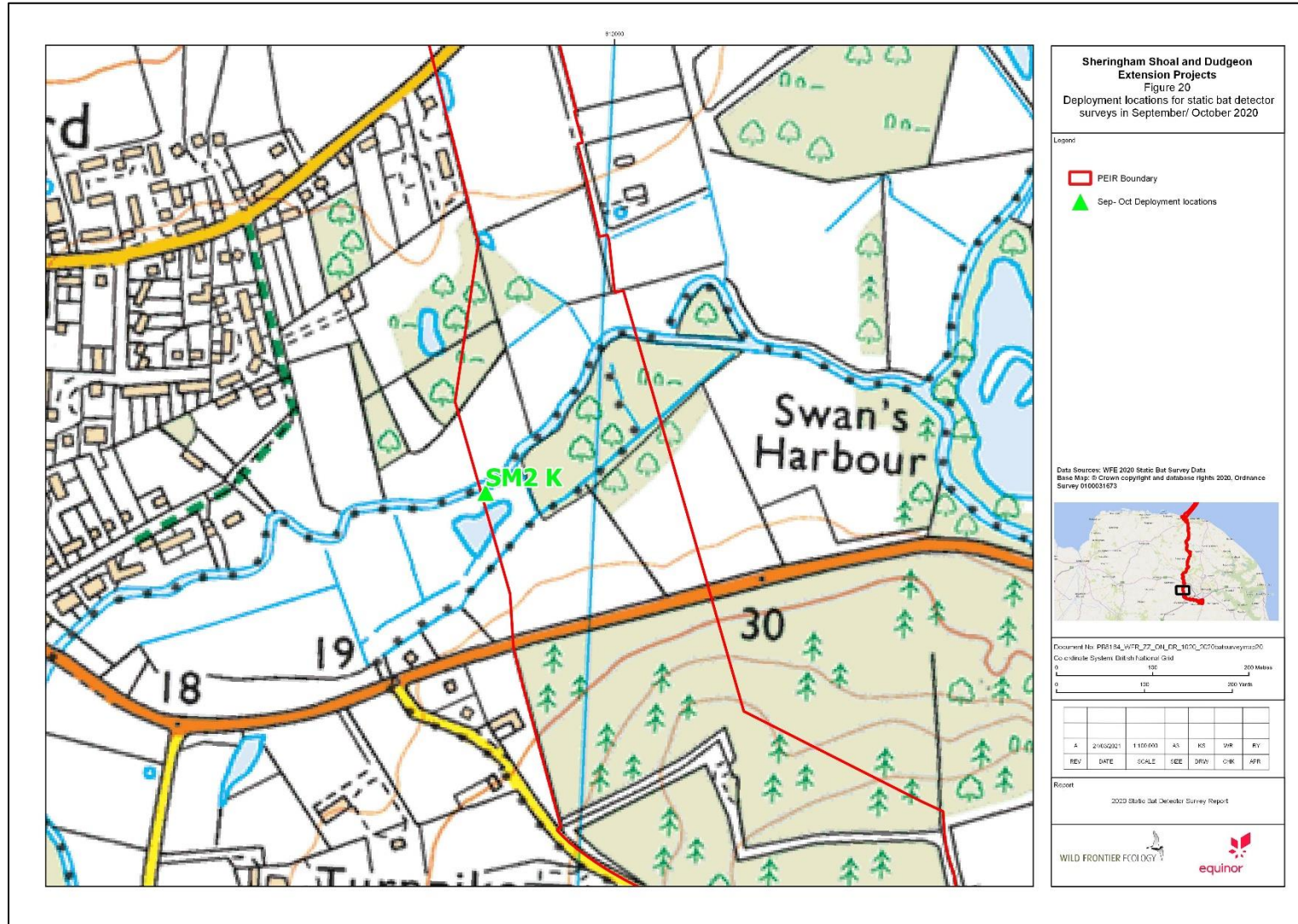
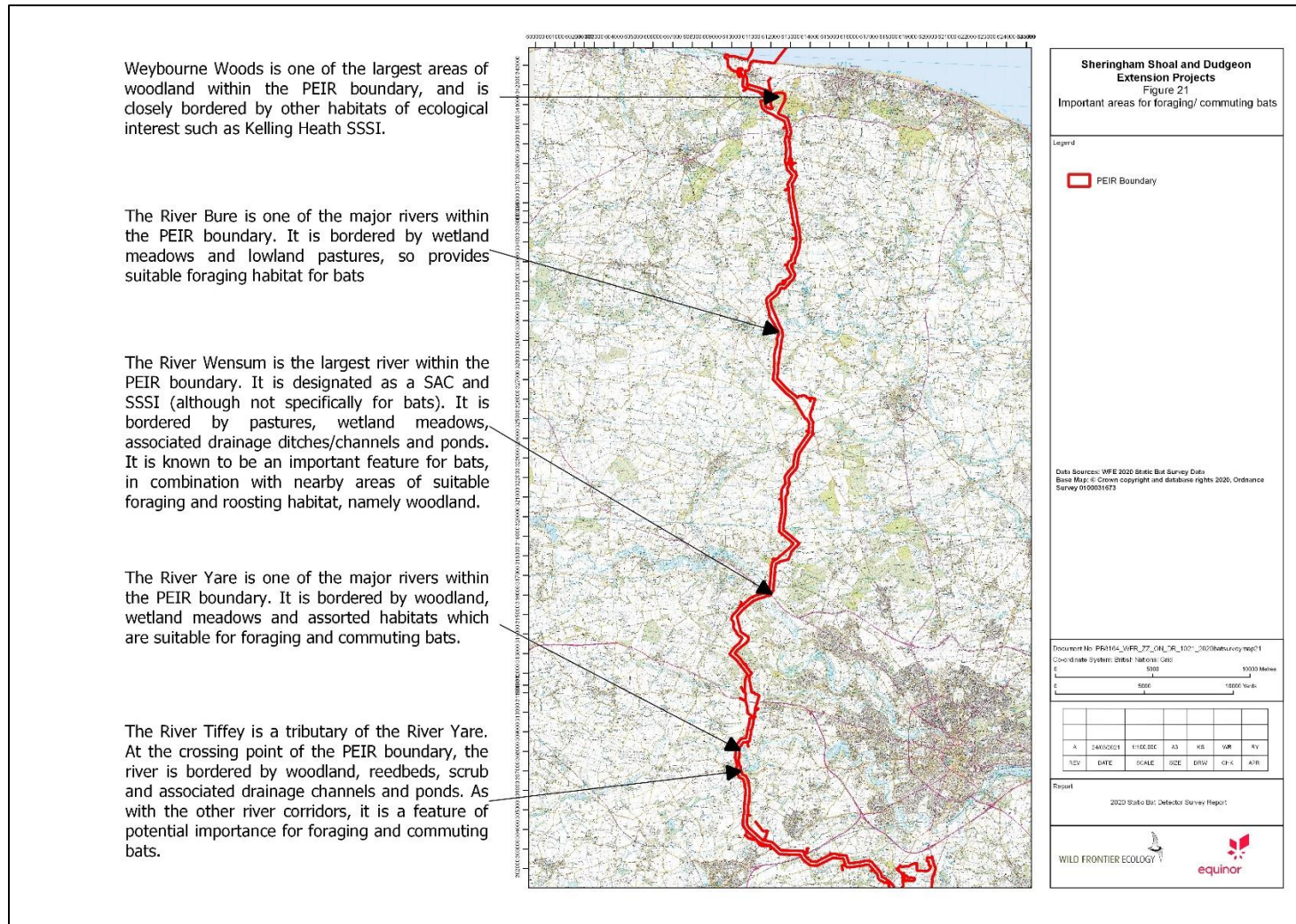


Figure 21: Map of areas selected for 2020 bat surveys based on anticipated value/sensitivity of habitats and features for bats



4. Results

4.1 Static Bat Detector Results: first deployment (24th June - 8th/9th/10th July 2020)

4.1.1 SM2 F Results

SM2 F was operational for 14 nights between the 24th June and 8th July 2020. It was deployed in the northernmost location, near 100 Acre Wood in Kelling (Figure 3). The detector recorded a total of four bat registrations consisting of one noctule and three of common pipistrelle. One of the common pipistrelle registrations was in July and all other registrations were recorded in June.

The results are summarised in Table 4, below. The sunset/sunrise times and weather for the dates of the records are displayed in Table 5, below (information for dates during which no bat registrations were recorded is not listed).

Table 4: SM2 F June-July 2020 static bat detector results

Species	Total registrations	Average registrations per night	Date of registration	Times of registrations
Noctule	1	0.06	26/06/2020	21:49
Common pipistrelle	3	0.19	29/06/2020 30/06/2020 04/07/2020	03:14 04:00 04:09

Table 5: Summary of weather and sunset/rise times for SM2 F location

Date	Sunrise time	Sunset time	Maximum temperature	Minimum temperature
26/06/2020	04:33	21:23	29°C	17°C
29/06/2020	04:35	21:23	17°C	12°C
30/06/2020	04:33	21:24	21°C	13°C
04/07/2020	04:33	21:23	21°C	15°C

4.1.2 SM2 I results

SM2 I (Figure 4) was located south of Attlebridge and positioned on the south bank of the River Wensum. The static detector was operational for 14 nights between the 24th June and 8th July 2020. This detector had the highest number of registrations of all the detectors deployed across the June/July period, with a total of 15,739 registrations. June accounted for more registrations, with 9,391 total bat registrations recorded over the seven-night period, in comparison to 6,348 registrations recorded across the nine nights in July.

Soprano pipistrelles had the highest number of registrations in total with 11,331. Common pipistrelles had the second highest total frequency, with 2,132 registrations. 184 records were assigned as 50kHz *pipistrellus*, as these registrations could not be classified to one of either common or soprano pipistrelles. There were some registrations of pipistrelle calls with peak frequency at 40-42kHz, which may have been low range registrations from common pipistrelles, or possibly Nathusius' pipistrelle. There were another 47

Pipistrellus sp. records which are attributable to either common pipistrelle, soprano pipistrelle or Nathusius' pipistrelle.

613 registrations were attributed to *Myotis* bat species, for which the echolocation registrations do not allow accurate speculation on the particular species. Considering the location of the detector close to a river, it is reasonable to expect that a significant proportion (or possibly all) of these records relate to Daubenton's bat.

There were 696 bat registrations which cannot be classified to a particular species, typically because they are too fragmented or faint to allow a confident classification. These unidentified bat registrations are possibly attributable (at least in part) to brown long-eared bat, *Myotis* sp. or barbastelle.

The detector recorded 651 registrations of noctule. There were also a further 32 registrations which may have been noctule, serotine *Eptesicus serotinus* or Leisler's bat *Nyctalus leisleri*, but the registrations do not allow confident species classification.

There were two registrations clearly identifiable as serotine, 26 attributable to brown long-eared bat and 21 attributable to barbastelle.

The results are summarised in Table 6, below. The weather and sunset times for SM2 I and SM2 E static location are summarised in Table 7.

Table 6: SM2 I June - July 2020 static bat detector results

Species	Total registrations	Average registrations per night	Earliest registration	Latest registration
Soprano pipistrelle	11,331	708.19	21:31	04:18
Common pipistrelle	2,132	133.25	21:43	04:16
Unidentified	696	43.5	22:20	04:13
50 kHz <i>Pipistrellus</i>	184	11.5	22:11	03:55
<i>Myotis</i> sp.	613	38.31	22:16	03:55
Noctule	651	40.69	21:28	04:40
<i>Pipistrellus</i> sp.	47	2.93	22:30	03:44
40-42 kHz Pipistrelle	4	0.25	23:49	02:24
<i>Nyctalus</i> sp.	32	2	22:19	03:39
Serotine	2	0.125	02:54	02:54
Brown long-eared bat	26	1.63	22:13	03:57
Barbastelle	21	1.31	22:35	03:07

Table 7: Summary of weather and sunset/rise times for SM2 I and E location

Date	Sunrise time	Sunset time	Maximum temperature	Minimum temperature
24/06/2020	(Not deployed)	21:24	25°C	15°C
25/06/2020	04:32	21:24	23°C	17°C
26/06/2020	04:33	21:24	29°C	17°C
27/06/2020	04:33	21:23	23°C	15°C
28/06/2020	04:34	21:23	20°C	11°C
29/06/2020	04:35	21:23	17°C	12°C
30/06/2020	04:35	21:23	21°C	13°C
01/07/2020	04:36	21:22	20°C	15°C
02/07/2020	04:37	21:22	18°C	13°C
03/07/2020	04:38	21:22	19°C	12°C
04/07/2020	04:38	21:21	21°C	15°C
05/07/2020	04:39	21:20	21°C	14°C
06/07/2020	04:40	21:20	18°C	12°C
07/07/2020	04:41	21:19	17°C	11°C
08/07/2020	04:42	21:18	16°C	12°C
09/07/2020	04:43	21:18	18°C	14°C
10/07/2020	04:44	(not deployed)	17°C	13°C

4.1.3 SM2 E results

SM2 E (Figure 4) was deployed alongside a ditch between two small woodlands in grazing floodplains to the south of the River Wensum. The static detector was operational for 15 nights between the 24th June and 9th July 2020. It recorded far fewer registrations than SM2 I and SM2 F, with only 16 registrations recorded in total. Ten of these registrations were in June and six were in July. All 16 registrations were of noctule.

The results are summarised in Table 8, below. The sunset, sunrise time and weather are shown in Table 7, above (as detectors SM2 E and SM2 I were deployed very close together the same sunrise/set times and weather conditions apply).

It should be noted that when this detector was collected it was found to have been knocked over (most likely by cattle grazing in the field) and was lying in dense vegetation. It is likely that the sensitivity of this detector was constrained by the dense vegetation, possibly explaining why it only recorded noctule registrations, as these species are fairly loud and easily detectable calls in relation to other bat species.

Table 8: SM2 E June-July 2020 static bat detector results

Species	Total registrations	Average registrations per night	Earliest registration	Latest registration
Noctule	16	1	21:41	03:43

4.1.4 SM2 K results

SM2 K (Figure 5), deployed just south of the River Tiffey, recorded a total of 5,099 registrations. It was deployed and operational for 16 nights, between the 24th June and the 10th July. Slightly more of these registrations (2,865 in total) were in June than July (2,234). The majority of the registrations were of soprano pipistrelles, which had a total registration count of 3,147. Common pipistrelle had the second highest frequency with 1,449 registrations recorded in total across the June/July survey.

Where *Pipistrellus* species could not be determined between common and soprano (i.e. where registrations had a peak frequency of 50kHz, rather than 45 which indicates common pipistrelle or 55 which indicates soprano pipistrelle), these were noted in a category labelled as 50 kHz *pipistrellus*; these registrations would relate to either of the aforementioned pipistrelle species, echolocating atypically. A total of 92 50kHz *Pipistrellus* registrations were recorded in total across the June/July survey period.

The detector recorded a total of 361 registrations of noctule. There was one *Nyctalus* sp. registration that could either have been from a noctule or a Leisler's bat; the call was not of sufficient clarity to allow confident assignment to either species.

There were also 33 registrations of *Myotis* species.

There were 16 registrations which were in the category of unidentified. These could not be specifically attributed to a species due to the quality of the recording (e.g. faint, distant, partial recordings), but are likely to relate to brown long-eared bat, *Myotis* sp. bats or possibly barbastelle.

The results from the SM2 K are summarised in Table 9, below. The weather and sunset times for the location of this bat detector are summarised in Table 10, below.

Table 9: SM2 K June-July 2020 static bat detector results

Species	Total registrations	Average registrations per night	Earliest registration	Latest registration
Soprano pipistrelle	3,147	196.69	21:27	04:26
Common pipistrelle	1,449	90.56	21:21	04:24
Noctule	361	22.56	21:16	04:36
50 kHz <i>Pipistrellus</i>	92	5.75	22:17	03:53
sp. <i>Myotis</i> sp.	33	2.06	22:22	03:12
Unidentified	16	1	22:40	04:04

Table 10: Summary of weather and sunset/rise times for SM2 K location

Date	Sunrise time	Sunset time	Maximum temperature	Minimum temperature
24/06/2020	(Not deployed)	21:25	25°C	15°C
25/06/2020	04:31	21:25	23°C	17°C
26/06/2020	04:32	21:25	29°C	17°C
27/06/2020	04:32	21:25	23°C	15°C
28/06/2020	04:33	21:25	20°C	11°C



Date	Sunrise time	Sunset time	Maximum temperature	Minimum temperature
29/06/2020	04:33	21:24	17°C	12°C
30/06/2020	04:34	21:24	21°C	13°C
01/07/2020	04:35	21:24	20°C	15°C
02/07/2020	04:35	21:23	18°C	13°C
03/07/2020	04:36	21:23	19°C	12°C
04/07/2020	04:37	21:22	21°C	15°C
05/07/2020	04:38	21:22	21°C	14°C
06/07/2020	04:39	21:21	18°C	12°C
07/07/2020	04:40	21:20	17°C	11°C
08/07/2020	04:41	21:20	16°C	12°C
09/07/2020	04:42	21:19	18°C	14°C
10/07/2020	04:43	(not deployed)	17°C	13°C

4.2 Static Bat Detector Results from the Second Deployment (30th July - 2nd/9th/10th/11th August 2020 and 19th August - 25th August 2020)

4.2.1 SM2 H results

SM2 H (Figure 7) was deployed in Weybourne Woods (in an alternate location to SMZ F from the June/July deployment). It recorded for 12 consecutive nights from the evening of 30th July to the morning of 11th August 2020.

Across the 12-night period a total of 70 bat registrations were recorded. *Pipistrelle* species account for 69 of these registrations, 55 of which relate to common pipistrelle and 14 of which relate to soprano pipistrelle.

There was one *Myotis* sp. registration recorded over the July-August deployment.

The results are summarised in Table 11, below. The sunset/sunrise times and weather for the dates of the records are displayed in Table 12, below.

Table 11: SM2 H July-August 2020 static bat detector results

Species	Total registrations	Average registrations per night	Earliest registration	Latest registration
Common pipistrelle	55	4.58	21:25	05:17
Soprano pipistrelle	14	1.16	20:31	05:51
<i>Myotis</i> sp.	1	0.08	04:10	04:10

**Table 12: Summary of weather and sunset/ sunrise times for SM2 H**

Date	Sunrise time	Sunset time	Maximum temperature	Minimum temperature
30/07/2020	(Not deployed)	20:52	28°C	13°C
31/07/2020	05:12	20:50	31°C	15°C
01/08/2020	05:14	20:48	26°C	17°C
02/08/2020	05:16	20:47	22°C	12°C
03/08/2020	05:17	20:45	19°C	10°C
04/08/2020	05:19	20:43	22°C	9°C
05/08/2020	05:21	20:39	28°C	16°C
06/08/2020	05:22	20:20	27°C	18°C
07/08/2020	05:24	20:37	34°C	15°C
08/08/2020	05:26	20:35	24°C	17°C
09/08/2020	05:27	20:34	24°C	17°C
10/08/2020	05:29	20:32	30°C	17°C
11/08/2020	05:31	(not deployed)	30°C	18°C

4.2.2 SM2 N results

SM2 N was located in a small pocket of woodland, which is situated in a grazed pasture area to the north-west of Swannington (Figure 8). The detector was active for ten nights from the evening of 30th July to the morning of 9th August 2020 (the detector was not retrieved until 11th August, but it had ceased recording two nights earlier).

SM2 N recorded 981 bat registrations in total, with the majority (724) relating to common pipistrelles. There were 201 soprano pipistrelle registrations and one registration categorised as 50kHz *Pipistrellus* that could have been from an atypical registration of common pipistrelle or a soprano pipistrelle but cannot be confidently assigned to either species.

There were three *Myotis* sp. registrations and 51 noctule registrations.

There was one registration which could be allocated as any bat species and was classified as 'unidentified'.

The results are summarised in Table 13, below. The sunset/sunrise times and weather for the dates of the records are displayed in Table 14, below.

Table 13: SM2 N July-August 2020 static bat detector results

Species	Total registrations	Average registrations per night	Earliest registration	Latest registration
Common pipistrelle	724	72.4	20:53	05:01
Soprano pipistrelle	201	20.1	20:57	04:38
Noctule	51	5.1	20:53	04:47
<i>Myotis</i>	3	0.3	22:23	02:21

Species	Total registrations	Average registrations per night	Earliest registration	Latest registration
Unidentified	1	0.1	23:04	23:04

Table 14: Summary of weather and sunset/ sunrise times for SM2 N

Date	Sunrise time	Sunset time	Maximum temperature	Minimum temperature
30/07/2020	(Not deployed)	20:51	28°C	13°C
31/07/2020	05:13	20:49	31°C	15°C
01/08/2020	05:15	20:47	26°C	17°C
02/08/2020	05:16	20:46	22°C	12°C
03/08/2020	05:18	20:44	19°C	10°C
04/08/2020	05:20	20:42	22°C	9°C
05/08/2020	05:21	20:40	28°C	16°C
06/08/2020	05:23	20:38	27°C	18°C
07/08/2020	05:24	20:36	34°C	15°C
08/08/2020	05:26	20:35	24°C	17°C
09/08/2020	05:28	(ceased recording)	24°C	17°C

4.2.3 SM2 I results (30th July - 1st August)

SM2 I (Figure 9) was active for two nights from the evening of 30th July to the morning of 1st August 2020. This was a much shorter time period than the other bat detectors were active for, as the detector experienced a fault and ceased recording after just two nights. The bat detector was redeployed at the same location later in August, to ensure that this area was fully surveyed as required. The results of the re-deployment are provided in Section 4.2.4, below.

The static bat detector recorded 666 registrations relating to at least four species across the two nights. There were 374 soprano pipistrelle registrations and 156 common pipistrelle registrations. There were 42 *Pipistrellus* sp. records which are attributable to either common pipistrelle, soprano pipistrelle or Nathusius' pipistrelle.

There were 19 *Myotis* sp. registrations, which, although they cannot be confidently classified to species level, given the location of the detector close to a river, there is a high likelihood that these records relate to Daubenton's bat.

The detector also recorded 72 noctule registrations.

There were three bat registrations which could not be classified to a particular species; these are listed as 'Unidentified'.

The results are summarised in Table 15, below. The sunset/sunrise times and weather for the dates of the records are displayed in Table 16, below.

**Table 15: SM2 I 30th July - 1st August 2020 static bat detector results**

Species	Total registrations	Average registrations per night	Earliest registration	Latest registration
Soprano pipistrelle	374	187	21:32	04:42
Common pipistrelle	156	78	21:29	04:46
Noctule	72	36	22:15	04:52
<i>Pipistrellus</i> sp.	42	21	21:32	04:41
<i>Myotis</i> sp.	19	9.5	21:47	04:05
Unidentified	3	1.5	23:06	03:38

Table 16: Summary of weather and sunset/ sunrise times for SM2 I

Date	Sunrise time	Sunset time	Maximum temperature	Minimum temperature
30/07/2020	(Not deployed)	20:51	28°C	13 °C
31/07/2020	05:13	20:49	31°C	15°C
01/08/2020	05:15	(ceased recording)	26°C	17°C

4.2.4 SM2 I (19th August - 25th August)

SM2 I was re-deployed at the same location by the River Wensum, as the first time it was deployed in July/ August, it was only operational for two days. The location of this deployment is shown in Figure 9. The static detector was deployed and active for six nights from the evening of the 19th August until the morning of 25th August 2020.

The static detector recorded 1,486 registrations relating to at least four species across the six nights. The highest frequency of registrations is from soprano pipistrelles, with 1,244 registrations. There were 51 common pipistrelle registrations and there were 92 *Pipistrellus* sp. records which are attributable to either common pipistrelle, soprano pipistrelle or Nathusius' pipistrelle.

There were 20 *Myotis* sp. registrations, which, although they cannot be confidently classified to species level, given the location of the detector close to a river, there is a high likelihood that these records relate to Daubenton's bat.

The detector recorded 52 noctule registrations. There were 18 barbastelle registrations and three brown long-eared bat registrations.

There were three bat registrations which could not be classified to a particular species; these are listed as 'Unidentified'.

The results are summarised in Table 17, below. The sunset/sunrise times and weather for the dates of the records are displayed in Table 18, below.

Table 17: SM2 I August 19th - August 25th 2020 static bat detector results

Species	Total registrations	Average registrations per night	Earliest registration	Latest registration
Soprano pipistrelle	1,244	207	21:00	05:01
<i>Pipistrellus</i> sp.	95	15.83	21:32	05:02
Common pipistrelle	52	8.5	20:58	05:21
Noctule	52	8.6	21:00	05:11
sp. <i>Myotis</i> sp.	29	3.3	20:40	05:02
Barbastelle	18	3	20:42	04:53
Brown long-eared bat	3	0.5	21:50	23:44
Unidentified	3	0.5	21:41	04:46

Table 18: Summary of weather and sunset/ sunrise times for SM2 I

Date	Sunrise time	Sunset time	Maximum temperature	Minimum temperature
19/08/2020	(Not deployed)	20:21	21°C	15 °C
20/08/2020	05:46	20:10	26°C	17°C
21/08/2020	05:48	20:08	23	17
22/08/2020	05:50	20:05	23	15
23/08/2020	05:51	20:03	22	14
24/08/2020	05:53	20:01	21	11
25/08/2020	05:15	(Not deployed)	23°C	14°C

4.2.5 SM2 K results

SM2 K (Figure 10) was deployed in a woodland just north of the River Yare, in an area which is surrounded by large plantation woodlands and open grasslands, south of the village of Colton. The static bat detector was deployed and active for 11 nights from the evening of 30th July until the morning of 10th August 2020.

The detector recorded 1,313 registrations relating to at least four species of bats. The highest frequency of registrations relates to soprano pipistrelles, with 817 recordings. Common pipistrelles were the second most frequently recorded species, with 359 registrations.

There were 16 *Myotis* sp. registrations, which, although they cannot be confidently classified to species level, given the location of the detector close to a river, there is a high likelihood that these records relate to Daubenton's bat.

The detector recorded 19 registrations of noctule

There were also two unidentified registrations, which could not be confidently assigned to a bat species.

The results are summarised in Table 19, below. The sunset/sunrise times and weather for the dates of the records are displayed in Table 20, below.

Table 19: SM2 K July-August 2020 static bat detector results

Species	Total registrations	Average registrations per night	Earliest registration	Latest registration
Soprano pipistrelle	817	74.27	20:40	05:06
Common pipistrelle	459	41.72	20:49	05:00
Noctule	19	1.72	20:59	02:30
<i>Myotis</i>	16	1.45	21:04	04:37
Unidentified	3	0.18	21:31	00:49

Table 20: Summary of weather and sunset/ sunrise times for SM2 K

Date	Sunrise time	Sunset time	Maximum temperature	Minimum temperature
30/07/2020	(Not deployed)	20:51	28°C	13°C
31/07/2020	05:14	20:49	31°C	15°C
01/08/2020	05:15	20:47	26°C	17°C
02/08/2020	05:17	20:46	22°C	12°C
03/08/2020	05:19	20:44	19°C	10°C
04/08/2020	05:20	20:42	22°C	9°C
05/08/2020	05:22	20:40	28°C	16°C
06/08/2020	05:24	20:38	27°C	18°C
07/08/2020	05:25	20:37	34°C	15°C
08/08/2020	05:27	20:35	24°C	17°C
09/08/2020	05:28	20:33	24°C	17°C
10/08/2020	05:30	(Not deployed)	30°C	17°C

4.3 Static Bat Detector Results from the Third Deployment (26th August - 9th/10th September 2020)

4.3.1 SM2 K results

SM2 K was deployed in the east of Weybourne Woods (Figure 12). It was deployed for 15 nights from 26th August - 10th September 2020.

The detector recorded 1,381 registrations relating to at least five species of bats. The highest frequency of registrations relates to common pipistrelles, with 857 recordings. Soprano pipistrelle was the second most frequently recorded species, with 457

registrations. There are three *Pipistrellus* sp. records which are attributable to either common pipistrelle, soprano pipistrelle or Nathusius' pipistrelle.

There were 26 *Myotis* sp. registrations, 30 of noctule, seven registrations of barbastelle and one which was unidentifiable.

The results are summarised in Table 21, below. The sunset/sunrise times and weather for the dates of the records are displayed in Table 22, below.

Table 21: SM2 K August-September 2020 static bat detector results

Species	Total registrations	Average registrations per night	Earliest registration	Latest registration
Soprano pipistrelle	457	30.5	19:26	06:06
Common pipistrelle	857	57.1	19:28	05:43
<i>Pipistrelle</i> sp.	3	0.2	21:13	05:16
Noctule	30	2	19:20	06:02
<i>Myotis</i>	26	1.7	20:34	05:12
Barbastelle	7	0.47	21:11	04:59
Unidentified	1	0.06	05:59	05:59

Table 22: Summary of weather and sunset/ sunrise times for SM2 K

Date	Sunrise time	Sunset time	Maximum temperature	Minimum temperature
26/08/2020	(Not deployed)	19:57	19°C	12°C
27/08/2020	05:57	19:55	19°C	12°C
28/08/2020	05:59	19:52	17°C	12°C
29/08/2020	06:01	19:50	15°C	14°C
30/08/2020	06:03	19:48	16°C	11°C
31/08/2020	06:04	19:45	16°C	8°C
01/09/2020	06:06	19:43	17	6
02/09/2020	06:08	19:41	21	6
03/09/2020	06:09	19:38	22	13
04/09/2020	06:11	19:36	18	12
05/09/2020	06:13	19:34	18	9
06/09/2020	06:14	19:31	18	9

Date	Sunrise time	Sunset time	Maximum temperature	Minimum temperature
07/09/2020	06:16	19:29	19	10
08/09/2020	06:18	19:26	24	15
09/09/2020	06:20	19:24	23	11
10/09/2020	06:21	(Not deployed)	17	10

4.3.2 SM2 N results

SM2 N was deployed in a small pocket of woodland near the River Bure (Figure 13). The detector was operational for 14 nights from 26th August to 9th September 2020.

The detector recorded 164 registrations relating to at least six species of bats. The highest frequency of registrations relates to common pipistrelles, with 79 registrations. Soprano pipistrelles were the second most frequently recorded species, with 19 registrations.

There were 12 *Myotis* sp. registrations.

The detector recorded 40 registrations of noctule. There were also a further three registrations which may have been noctule, serotine *Eptesicus serotinus* or Leisler's bat *Nyctalus leisleri*, but the registrations do not allow confident species classification.

There were three registrations of barbastelles, one of brown long-eared bat and seven records which were unidentifiable.

The results are summarised in Table 23, below. The sunset/sunrise times and weather for the dates of the records are displayed in Table 24, below.

**Table 23: SM2 N August - September 2020 static bat detector results**

Species	Total registrations	Average registrations per night	Earliest registration	Latest registration
Common pipistrelle	79	5.2	21:00	05:04
Noctule	40	2.67	21:10	04:15
Soprano pipistrelle	19	1.27	20:57	03:02
<i>Myotis</i>	12	0.8	20:58	03:15
<i>Nyctalus</i>	3	0.2	20:49	04:15
Barbastelle	3	0.2	20:49	01:47
Brown long-eared bat	1	0.06	21:45	21:45

Table 24: Summary of weather and sunset/ sunrise times for SM2 N

Date	Sunrise time	Sunset time	Maximum temperature	Minimum temperature
26/08/2020	(Not deployed)	19:57	19°C	12°C
27/08/2020	05:58	19:55	19°C	12°C
28/08/2020	06:00	19:52	17°C	12°C
29/08/2020	06:01	19:50	15°C	14°C
30/08/2020	06:03	19:48	16°C	11°C
31/08/2020	06:05	19:45	16°C	8°C
01/09/2020	06:06	19:43	17	6
02/09/2020	06:08	19:41	21	6
03/09/2020	06:10	19:38	22	13
04/09/2020	06:11	19:36	18	12
05/09/2020	06:13	19:34	18	9
06/09/2020	06:15	19:31	18	9
07/09/2020	06:16	19:29	19	10
08/09/2020	06:18	19:27	24	15
09/09/2020	06:20	(Not operational)	23	11

4.3.3 SM2 J results

SM2 J was deployed in an area of scrub/ rank grassland, grazed by cattle and part of a large network of grazed fields and woodlands east of Swannington (Figure 14). The detector was deployed and operational for 15 nights from 26th August - 10th September 2020.

The detector recorded 2,039 registrations relating to at least six species of bats. The highest frequency of registrations relates to common pipistrelles, with 1,533 recordings. Soprano pipistrelles were the second most frequently recorded species, with 379 registrations. There are 13 *Pipistrellus* sp. records which are attributable to either common pipistrelle, soprano pipistrelle or Nathusius' pipistrelle.

There were four *Myotis* sp. registrations.

The detector recorded 83 registration of noctule. There were also a further three registrations which may have been noctule, serotine or Leisler's bat, but the registrations do not allow confident species classification. One registration is from noctule or Leisler's.

There were 16 registrations of barbastelles, one of brown long-eared bat and six records which were unidentifiable.

The results are summarised in Table 25, below. The sunset/sunrise times and weather for the dates of the records are displayed in Table 26, below.

Table 25: SM2 J August- September 2020 static bat detector results

Species	Total registrations	Average registrations per night	Earliest registration	Latest registration
Common pipistrelle	1,533	102.2	19:45	05:49
Soprano pipistrelle	379	25.3	19:31	05:50
Noctule	83	5.5	19:23	06:00
Barbastelle	16	1.06	20:24	02:18
Pipistrelle sp.	13	0.87	21:28	21:28
<i>Myotis</i>	4	0.27	21:15	00:37
<i>Nyctalus</i>	3	0.2	21:46	04:26
Serotine/ Liesler's	1	0.06	21:23	21:23
Brown long-eared bat	1	0.06	05:20	05:20

**Table 26: Summary of weather and sunset/ sunrise times for SM2 J**

Date	Sunrise time	Sunset time	Maximum temperature	Minimum temperature
26/08/2020	(Not deployed)	19:57	19°C	12°C
27/08/2020	05:58	19:54	19°C	12°C
28/08/2020	06:00	19:52	17°C	12°C
29/08/2020	06:01	19:50	15°C	14°C
30/08/2020	06:03	19:47	16°C	11°C
31/08/2020	06:05	19:45	16°C	8°C
01/09/2020	06:06	19:43	17	6
02/09/2020	06:08	19:40	21	6
03/09/2020	06:10	19:38	22	13
04/09/2020	06:11	19:36	18	12
05/09/2020	06:13	19:33	18	9
06/09/2020	06:15	19:31	18	9
07/09/2020	06:17	19:29	19	10
08/09/2020	06:18	19:26	24	15
09/09/2020	06:20	19:24	23	11
10/09/2020	06:22	(Not deployed)	17	10

4.3.4 SM2 H results

SM2 H was deployed by the River Wensum, north of the A1067 (Figure 15). The detector was deployed from 26th August - 10th September, but it was only operational for five nights between 26th August and 31st August 2020.

The detectors recorded 1,875 registrations relating to at least four species of bats. The highest frequency of registrations relates to soprano pipistrelles, with 1,468 recordings. Common pipistrelles were the second most frequently recorded species, with 398 registrations. There are four *Pipistrellus* sp. records which are attributable to either common pipistrelle, soprano pipistrelle or Nathusius' pipistrelle.

There were four *Myotis* sp. registrations, which, although they cannot be confidently classified to species level, given the location of the detector close to a river, there is a high likelihood that these records relate to Daubenton's bat.

The detector recorded one registration of noctule.

The results are summarised in Table 27, below. The sunset/sunrise times and weather for the dates of the records are displayed in Table 28, below.

Table 27: SM2 H August 2020 static bat detector results

Species	Total registrations	Average registrations per night	Earliest registration	Latest registration
Soprano pipistrelle	1,468	293.6	19:59	05:41
Common pipistrelle	398	79.6	20:26	05:46
Pipistrelle sp.	4	0.8	21:03	21:03
<i>Myotis</i>	4	0.8	20:56	20:56
Noctule	1	0.2	20:27	20:27

Table 28: Summary of weather and sunset/ sunrise times for SM2 H

Date	Sunrise time	Sunset time	Maximum temperature	Minimum temperature
26/08/2020	(Not deployed)	19:57	19°C	12°C
27/08/2020	05:58	19:54	19°C	12°C
28/08/2020	06:00	19:52	17°C	12°C
29/08/2020	06:02	19:50	15°C	14°C
30/08/2020	06:03	19:47	16°C	11°C
31/08/2020	06:05	(Not deployed)	16°C	8°C

4.4 Static Bat Detector Results from the Third Deployment (24th September - 2nd/5th October 2020)

4.4.1 SM2 H results

SM2 H was located near a large pond within the western side of Weybourne Woods (Figure 17). The static bat detector was operational for eight nights from 24th September - 2nd October 2020.

The detector recorded 337 registrations relating to two species of bats. The highest frequency of registrations relates to soprano pipistrelles, with 315 recordings. Common pipistrelles were the second most frequently recorded species, with 22 registrations.

The results are summarised in Table 29, below. The sunset/sunrise times and weather for the dates of the records are displayed in Table 30, below.

**Table 29: SM2 H September-October 2020 static bat detector results**

Species	Total registrations	Average registrations per night	Earliest registration	Latest registration
Soprano pipistrelle	315	35	18:19	06:56
Common pipistrelle	22	2.44	18:35	06:29

Table 30: Summary of weather and sunset/ sunrise times for SM2 H

Date	Sunrise time	Sunset time	Maximum temperature	Minimum temperature
24/09/2020	(Not deployed)	18:48	17°C	8°C
25/09/2020	06:47	18:46	11°C	8°C
26/09/2020	06:49	18:43	13°C	8°C
27/09/2020	06:50	18:41	13°C	11°C
28/09/2020	06:52	18:39	16°C	9°C
29/09/2020	06:54	18:36	15°C	9°C
30/09/2020	06:56	18:34	18°C	9°C
01/10/2020	06:57	18:31	14°C	17°C
02/10/2020	06:59	(Not operational)	15°C	8°C

4.4.2 SM2 J results

SM2 J was deployed in a small section of woodland adjacent to the River Bure (Figure 18). The static bat detector was operational and deployed for 11 nights from 24th September - 5th October 2020.

The detector recorded 485 registrations relating to at least six species of bats. The highest frequency of registrations relates to common pipistrelles, with 245 recordings. Soprano pipistrelles were the second most frequently recorded species, with 86 registrations. There are two *Pipistrellus* sp. records which are attributable to either common pipistrelle, soprano pipistrelle or *Nathusius'* pipistrelle.

There were 21 *Myotis* sp. registrations, 86 noctule registrations, seven registrations of barbastelles and one record which was unidentifiable.

The results are summarised in Table 21, below. The sunset/sunrise times and weather for the dates of the records are displayed in Table 32, below.

Table 31: SM2 J September-October 2020 static bat detector results

Species	Total registrations	Average registrations per night	Earliest registration	Latest registration
Common pipistrelle	857	57.13	19:28	05:43
Soprano pipistrelle	457	30.47	19:26	06:06
Noctule	30	2	19:20	06:02
<i>Myotis</i>	26	1.73	20:34	05:12
Barbastelle	7	0.47	21:11	04:59
<i>Pipistrelle</i> sp.	3	0.2	21:13	05:06
Unidentified	1	0.06	05:09	05:09

Table 32: Summary of weather and sunset/ sunrise times for SM2 J

Date	Sunrise time	Sunset time	Maximum temperature	Minimum temperature
24/09/2020	(Not deployed)	18:48	17°C	8°C
25/09/2020	06:47	18:46	11°C	8°C
26/09/2020	06:49	18:43	13°C	8°C
27/09/2020	06:50	18:41	13°C	11°C
28/09/2020	06:52	18:39	16°C	9°C
29/09/2020	06:54	18:36	15°C	9°C
30/09/2020	06:56	18:34	18°C	9°C
01/10/2020	06:57	18:31	14°C	17°C
02/10/2020	06:59	18:29	15°C	8°C
03/10/2020	07:01	18:27	15°C	11°C
04/10/2020	07:03	18:24	11°C	9°C
05/10/2020	07:04	(Not deployed)	12°C	5°C

4.4.3 SM2 N results

SM2 N was deployed adjacent to the River Wensum (Figure 19). The static bat detector was operational and deployed for 11 nights from 24th September - 5th October 2020.

The detectors recorded 971 registrations relating to at least five species of bats. The highest frequency of registrations relates to *Myotis* sp., with 771 registrations.

Common pipistrelles were recorded, with 48 recordings. Soprano pipistrelles were also frequently recorded, with 37 registrations. There are two *Pipistrellus* sp. records which are attributable to either common pipistrelle, soprano pipistrelle or Nathusius' pipistrelle.

The detector recorded 103 registrations of noctule, two registrations of barbastelles and eight which were unidentifiable.

The results are summarised in Table 33, below. The sunset/sunrise times and weather for the dates of the records are displayed in Table 34, below.

Table 33: SM2 N September-October 2020 static bat detector results

Species	Total registrations	Average registrations per night	Earliest registration	Latest registration
<i>Myotis</i>	771	70.1	18:54	06:18
Noctule	103	9.4	18:27	07:00
Common pipistrelle	48	4.4	18:56	05:39
Soprano pipistrelle	37	3.4	18:50	06:22
Unidentified	8	0.7	19:46	00:12
<i>Pipistrelle</i> sp.	2	0.2	19:08	19:08
Barbastelle	2	0.2	19:37	02:02

Table 34: Summary of weather and sunset/ sunrise times for SM2 N

Date	Sunrise time	Sunset time	Maximum temperature	Minimum temperature
24/09/2020	(Not deployed)	18:48	17°C	8°C
25/09/2020	06:47	18:46	11°C	8°C
26/09/2020	06:49	18:43	13°C	8°C
27/09/2020	06:50	18:41	13°C	11°C
28/09/2020	06:52	18:39	16°C	9°C
29/09/2020	06:54	18:36	15°C	9°C
30/09/2020	06:56	18:34	18°C	9°C
01/10/2020	06:57	18:32	14°C	17°C
02/10/2020	06:59	18:29	15°C	8°C
03/10/2020	07:01	18:27	15°C	11°C
04/10/2020	07:02	18:25	11°C	9°C
05/10/2020	07:04	(Not deployed)	12°C	5°C

4.4.4 SM2 K results

SM2 K was deployed adjacent to the River Tiffey (Figure 20). The static bat detector was operational and deployed for 11 nights from 24th September - 5th October 2020.

The detectors recorded 259 registrations relating to five bat species. The highest frequency of registrations relates to soprano pipistrelles, with 189 registrations. Common pipistrelles were the second most frequently recorded species, with 41 registrations.

There were nine *Myotis* sp. registrations.

The detector recorded five registrations of noctule. There were also three further registrations which may have been noctule, serotine or Leisler's bat, but the registrations do not allow confident species classification.

There was one registration of barbastelles and 11 records which were unidentifiable.

The results are summarised in Table 35, below. The sunset/sunrise times and weather for the dates of the records are displayed in Table 36, below.

Table 35: SM2 K September-October 2020 static bat detector results

Species	Total registrations	Average registrations per night	Earliest registration	Latest registration
Soprano pipistrelle	189	17.2	18:29	06:54
Common pipistrelle	41	3.7	18:55	06:47
Unidentified	11	1	20:14	03:06
<i>Myotis</i>	9	0.8	20:46	04:23
Noctule	5	0.5	19:13	05:48
<i>Nyctalus</i> sp.	3	0.2	22:13	22:13
Barbastelle	1	0.09	19:22	19:22

Table 36: Summary of weather and sunset/ sunrise times for SM2 K

Date	Sunrise time	Sunset time	Maximum temperature	Minimum temperature
24/09/2020	(Not deployed)	18:48	17°C	8°C
25/09/2020	06:47	18:46	11°C	8°C
26/09/2020	06:49	18:44	13°C	8°C
27/09/2020	06:50	18:41	13°C	11°C
28/09/2020	06:52	18:39	16°C	9°C
29/09/2020	06:54	18:36	15°C	9°C
30/09/2020	06:56	18:34	18°C	9°C
01/10/2020	06:57	18:32	14°C	17°C
02/10/2020	06:59	18:29	15°C	8°C
03/10/2020	07:01	18:27	15°C	11°C
04/10/2020	07:02	18:25	11°C	9°C
05/10/2020	07:04	(Not deployed)	12°C	5°C



5.5 Summary of results across all four deployments



Survey Location	Average number of bat registrations per night for bat detector deployments in:			
	Jun-Jul	Jul-Aug	Aug-Sep	Sep-Oct
Weybourne Wood/ Hundred Acre Wood/Bodham Wood	0.19 common pipistrelle 0.06 noctule	4.6 common pipistrelle 1.2 soprano pipistrelle 0.08 Myotis sp.	57 common pipistrelle 30 soprano pipistrelle 2 noctule 1.7 Myotis sp. 0.46 barbastelle	35 soprano pipistrelle 2.4 common pipistrelle
River Bure	(no deployment at this location)	(no deployment at this location)	5.3 common pipistrelle 1.3 soprano pipistrelle 2.67 noctule 0.8 Myotis sp. 0.2 barbastelle 0.07 brown long-eared bat	22 common pipistrelle 7.8 soprano pipistrelle 7.8 noctule 2.5 barbastelle 1.9 Myotis sp. 0.45 brown long-eared bat
Swannington (tributaries of the River Wensum)	(no deployment at this location)	72 common pipistrelle 20 soprano pipistrelle 5.1 noctule 0.3 Myotis sp.	102 common pipistrelle 25 soprano pipistrelle 5.5 noctule 1.07 barbastelle 0.27 Myotis sp. 0.07 brown long-eared bat	(no deployment at this location)
River Wensum (including surrounding floodplain*)	708 soprano pipistrelle 133 common pipistrelle 42 noctule 38 Myotis sp. 1.6 brown long-eared bat 1.3 barbastelle 0.13 serotine	180 soprano pipistrelle 23 common pipistrelle 14 noctule 4.3 Myotis sp. 2 barbastelle 0.33 brown long-eared bat	294 soprano pipistrelle 80 common pipistrelle 0.8 Myotis sp. 0.8 Nathusius' pipistrelle 0.2 noctule	70 Myotis sp. 9.4 noctule 4.4 common pipistrelle 3.4 soprano pipistrelle 0.18 barbastelle
River Yare	(no deployment at this location)	74 soprano pipistrelle 42 common pipistrelle 1.7 noctule 1.5 Myotis sp.	(no deployment at this location)	(no deployment at this location)
River Tiffey	197 soprano pipistrelle 91 common pipistrelle 23 noctule 2.1 Myotis sp.	(no deployment at this location)	(no deployment at this location)	17 soprano pipistrelle 3.7 common pipistrelle 0.81 Myotis sp. 0.45 noctule 0.09 barbastelle



4.6 Constraints and Limitations of Survey

The season of peak foraging/commuting bat activity is typically between April and October, inclusive. As static bat detector surveys began in June, not all of the 2020 survey season has been covered. Considering the surveys spanned five of the seven months, the data is considered sufficient to allow initial conclusions to be drawn. As the static bat detector deployments will continue in 2021, any shortfalls in the data will be addressed in due course.

The results collected to date indicate areas which are used by foraging and commuting bats. Where analysis has revealed bat activity close to sunset/sunrise times, this can be indicative of nearby roost locations. However, a different survey approach (i.e. emergence/re-entry surveys) would be required to confirm the location of any roosts.

The results obtained from the 2020 survey effort provide a useful basis to indicate which areas are important for foraging and commuting bats. They also show areas where rarer species, such as barbastelle, may be impacted by the proposed works associated with the PEIR boundary. However further surveys must be completed before specific impacts to foraging and/or commuting bats can be made.

4.7 Further Survey Requirements and Expiry Dates

The survey results obtained from the 2020 survey effort should be regarded as valid for at least one year. Additional surveys will need to be completed throughout 2021 once a finalised PEIR boundary (followed by DCO boundary) has been determined. Whilst the surveys so far have been somewhat limited in terms of their coverage, the 2021 surveys will be able to focus far more accurately and comprehensively on features which will be impacted by the refined proposals than the surveys in 2020 have been able to. In addition, bat transect surveys and possible bat emergence surveys (e.g. of trees targeted for removal) will also be required once the precise PEIR/DCO boundary has been identified.



5. Conclusions

5.1 First deployment- June to July

The static bat detector survey effort for June and July 2020 has confirmed that the locations where static bat detectors SM2 I and SM2 K were deployed are important foraging areas for multiple species of bats. Static bat detector SM2 I was deployed adjacent to the Wensum, whilst SM2 K was deployed adjacent to the River Tiffey. Both areas are important foraging sites for soprano pipistrelle and considering the first registrations began two minutes after sunset, it is possible there are pipistrelle roosts nearby.

Static bat detector SM2 I, adjacent to the River Wensum, had the highest number and greatest range of species recorded during this deployment. Notable species recorded included barbastelle, *Nyctalus* species, serotine, *Myotis* species and possible Nathusius' pipistrelle. The area around the River Wensum is considered to be important for barbastelles, so careful consideration must be given to the potential impacts on barbastelles using this area for foraging or possibly roosting.

Static bat detector SM2 E and SM2 F recorded relatively low levels of foraging/commuting bat activity. This may indicate that these areas may not commonly be used by foraging and commuting bats. However, technical faults may have been a factor in such low levels of recorded activity. The number of registrations does not necessarily relate to the number of individual bats, as individual bats (or low numbers of bats) can produce large numbers of registrations when active (e.g. foraging) in the vicinity of a bat detector. Further surveys of Weybourne Woods and the River Tiffey were undertaken to allow more accurate conclusions to be drawn.

5.2 Second deployment- July to August

The second deployment of static bat detectors indicated that areas around the River Yare are important for foraging and commuting bats, especially soprano pipistrelles. The first registration times are often very close to the sunset time, indicating that there may be a roost or roosts nearby. Other species including common pipistrelles, *Myotis* and noctules were also recorded there.

Static bat detector SM2 N, which was located in a small pocket of woodland near Swannington, also had many registrations, mostly comprising common and soprano pipistrelles. The common pipistrelle registrations were often within a few minutes of sunset times, suggesting that there could be a roost or roosts located nearby.

The detector which was deployed near the River Wensum (SM2 I) had 666 registrations, relating to at least four species of bat, which is fairly high considering it was actively recording for just two nights. Soprano pipistrelles were frequently recorded, along with common pipistrelles, noctules and occasional *Myotis* sp. SM2 I was re-deployed at the same location by the River Wensum, to ensure that it had been fully covered by the July/August survey effort. The static detector recorded 1,486 registrations relating to at least four species across the six nights. The highest frequency of registrations is from soprano pipistrelles, with 1,244 registrations across the seven-night period. There were also frequent registrations of common pipistrelle, *Pipistrellus* sp. and noctules. Of particular note are the 20 *Myotis* sp. bats and the 18 barbastelles recorded. These two species are less frequent than the pipistrelles but have the closest registration time to sunset. This suggests that there may be a roost/ roosts in the vicinity. Barbastelles were not recorded in any other deployment locations across the July/ August surveys. As both *Myotis* sp.



and barbastelles were recorded during the first June/ July deployment this indicates that the Wensum river corridor is likely important for these rarer bat species.

Static bat detector SM2 H located in Weybourne Woods had a lower frequency of registrations compared to the other detectors. Weybourne Woods is a large and varied habitat so low registration numbers do not yet rule out the importance of the area for foraging and commuting bats.

5.3 Third deployment- August to September

SM2 K which was located in the east of Weybourne Woods had 1,381 records of bats, which was the highest number of records for the Weybourne Wood deployments. These records were mostly attributable to soprano pipistrelles, but there were also registrations from the rarer *Myotis* sp. and barbastelles. Pipistrelle species were close to sunset/ sunrise time suggesting that there may be roost/ roosts located nearby.

The detector located by Swannington (SM2 J) and the River Wensum (SM2 H) had high frequencies of registrations recorded across the third deployment (2,039 and 1,875, respectively). Both deployments recorded at least six species and included rarer species such as Nathusius' pipistrelle, barbastelle and *Myotis* sp. Both detectors also had pipistrelle registrations which were close to sunset/ sunrise time suggesting that there may be roost/ roosts located nearby.

The detector located by the River Bure (SM2 N) had the fewest number of registrations, with 164 recorded. These registrations were however from at least six species, including *Myotis* sp. and barbastelle. Registrations times for pipistrelle species from detectors SM2 K, SM2 J and SM2 H were all close to sunset/ sunrise times, suggesting that there may be roosts located nearby.

5.4 Forth deployment- September to October

The fourth deployment of static bat detectors was undertaken between September and October 2020 and the findings of which show a reduced level of bat activity being recorded. Lower levels of bat activity are to be expected when temperatures start to drop, but there was still a range of species recorded throughout this deployment.

The highest number of registrations was from static bat detector deployed by the River Wensum (SM2 N). There were 971 registrations recorded, of which 771 were from *Myotis* sp. bats. This is by far, the highest number of *Myotis* sp. registrations recorded across all the static bat detector deployments. Additionally, some of these registrations are within 10 minutes of sunset/ sunrise time, suggesting that there may be a roost/ roosts located nearby or at least that the River Wensum provides an important foraging habitat for *Myotis* sp. bats. Barbastelles were also recorded at relatively high levels during this deployment.

The detectors located by the River Bure and Tiffey had some bat activity (485 and 259, respectively) which included *Myotis* sp. and barbastelles. The detector located in Weybourne Woods had relatively low levels (337 registrations) of bat activity from only common and soprano pipistrelles.

5.5 Areas of importance/ overall summary



Most static bat detector surveys recorded *Pipistrellus* species as having the highest frequency of registrations, with over 87% of all recorded bat activity relating to pipistrelle species. Surveys recorded more registrations of soprano pipistrelle in total (across all surveys) and at individual survey locations on Rivers Wensum, Yare and Tiffey. Common pipistrelle was the most abundant species at River Bure, Swannington and Weybourne Woods. In most survey locations, noctule was the most frequently recorded non-pipistrelle bat species. *Myotis* species (ultrasonic recordings of which do not allow species classification) were recorded at most survey locations, with the highest levels recorded at rivers, particularly the Wensum. It is likely that part/all of these registrations relate to Daubenton's bat, given the species' preference for foraging in/around aquatic habitats. Surveys recorded relatively low numbers of registrations of barbastelle and brown long-eared bat, but across most locations. From the data obtained, the areas around the River Wensum and Swannington appear to be the most important for barbastelles. Other rarer species including Nathusius' pipistrelle and serotine were very rarely recorded, and only at the River Wensum. Results therefore show that the River Wensum supports more species and has highest number of total bat registrations of all sampled locations.

5.6 Further Survey and Assessment

The further 2021 static bat detector deployments will continue to focus on areas such as Weybourne Woods, the River Bure, the River Tiffey, Swannington, the River Wensum, the River Tud and the River Yare. The data collected on and around these sites will continue to build on the current data, allowing for more accurate conclusions to be drawn. During the active bat season of 2021, walked transect surveys will also take place.

Impacts to foraging/commuting bats will be assessed once the PEIR boundary has been refined and finalised. Further surveys for commuting/ foraging and roosting bats will take place to allow greater understanding on species and number of bats present along specific areas within the PEIR boundary. Once accurate conclusions from full and specific survey data can be drawn, the impact assessment for bats is possible. Following this, appropriate advice for mitigation and enhancement opportunities with respect to foraging/commuting bats can be proposed, including an requirement for European Protected Species mitigation licensing