



Haworth Group

Dearne Valley Parkway, Rockingham, Barnsley- Phases 2 and 3

BAT SURVEY REPORT

July 2020

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1.0 INTRODUCTION

- 1.1 The following bat report has been prepared by FPCR Environment & Design Ltd. on behalf of the Harworth Group. It provides details of bat surveys undertaken in 2019 and 2020 at Rockingham, Barnsley. Surveys comprised: desktop study; bat activity transects, static bat detector surveys and a light level (Lux) survey.
- 1.2 This report should be read in conjunction with the earlier bat reports^{1, 2} for the site. Where relevant summary reference is made to the findings and assessment of these earlier surveys.

Site Location and Context

- 1.3 The subject site is a former colliery located adjacent to the west of Shortwood Business Park in Barnsley, South Yorkshire (central grid ref: SE 3563 0103) and includes parcels of land to the north and south of the A6195 dual carriageway, Dearne Valley Parkway. Recent development associated with earlier phases of the development lie to the west of the northern parcel. The existing residential development of Birdwell is situated to the north-west and to the south the more extensive residential area of Hoyland. Junction 36 of the M1 Motorway lies less than 600m to the west. The surrounding land use is largely arable and pasture with an area of broad-leaved semi-natural woodland to the north, forming part of the Short Wood and Hay Green LWS.
- 1.4 The site largely comprises establishing plantation woodland and improved pasture, with associated native hedgerows along several linear edges of the plantation areas. Two compartments of species-poor grassland are located in the northern parcel, which comprised actively farmed arable land in May 2017. Several small areas of semi-improved grassland were noted in 2017, although in 2019 these have been noted as beginning to scrub over as natural succession through lack of management has occurred. Other habitats recorded included an attenuation pond and drainage channel (partially culverted).
- 1.5 The site was subject to an Extended Phase-1 Habitat survey in June 2015, with update surveys in May 2017 and October 2019. Bat activity transects and static bat detector surveys were previously undertaken by FPCR in 2015 and 2017, species diversity and activity was considered to be low during these surveys.

Development Proposals

Proposals are for a business park development comprising warehousing with associated parking, lorry compounds and access infrastructure with associated lighting. Landscaping and green infrastructure, including attenuation facilities are also proposed.

¹ FPCR 2019, Dearne Valley Parkway, Rockingham, Barnsley; Addendum: 2018 Bat Survey Report

² FPCR 2016, Rockingham Business Park, Barnsley, Bat Survey Report

2.0 LEGISLATION

- 2.1 Before any proposals take place, measures must be taken to ensure that the legislation concerning bats is not breached as a result of works. All UK bat species are afforded full protection under the Wildlife & Countryside Act 1981 (as amended) and the Conservation of Habitats and Species Regulations 2017 (as amended).
- 2.2 Under Regulation 43 of the Conservation of Habitats and Species Regulations 2017 (as amended) it is illegal to:
- Deliberately capture, injure or kill any wild animal of a European Protected Species (EPS),
 - Deliberately disturb wild animals of an EPS (affecting ability to survive, breed or rear young) – disturbance of animals includes in particular any disturbance which is likely to impair their ability to survive, to breed or reproduce, or to rear or nurture their young,
 - Deliberately disturb wild animals of an EPS (impairing ability to migrate or hibernate) – disturbance of animals includes in particular any disturbance which is likely to impair their ability in the case of hibernating or migratory species to hibernate or migrate,
 - Deliberately disturb wild animals of an EPS (affecting local distribution and abundance) – disturbance of animals includes in particular any disturbance which is likely to affect significantly the local distribution or abundance of the species to which they belong,
 - Deliberately disturb wild animals of an EPS (whilst occupying a structure or place used for shelter or protection) – intentionally or recklessly disturb any wild animal while it is occupying a structure or place which it uses for shelter or protection,
 - Damage or destroy a breeding site or resting place of a wild animal an EPS.
- 2.3 Under the Wildlife and Countryside Act 1981 (as amended) it is illegal to:
- Recklessly or intentionally kill, injure or take any wild animals included in Schedule 5.
 - Recklessly or intentionally damage or destroy, or obstruct access to any structure or place which any wild animal included in Schedule 5 uses for shelter or protection,
 - Recklessly or intentionally disturb any such animal while it is occupying a structure or place which it uses for shelter or protection.
- 2.4 If impacts to bats or their roosts cannot be avoided a European Protected Species Licence from Natural England is required in order to allow proposals to derogate from the Legislation (Licences cannot be obtained to provide protection against offences under the Wildlife & Countryside Act 1981 (as amended)). As part of the application process a number of 'Tests' have to be met by the application.
- 2.5 Natural England Guidance Note: European Protected Species and the Planning Process – Natural England's Application of the 'Three Tests' to Licence Applications (March 2011) states:
- "In determining whether or not to grant a licence Natural England must apply the requirements of Regulation 53⁵ of the Regulations and, in particular, the three tests set out in sub-paragraphs (2)(e), (9)(a) and (9)(b)⁶.*
- (1) Regulation 53(2)(e) states: a licence can be granted for the purposes of "preserving 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 53(9)(a)** states: the appropriate authority shall not grant a licence unless they are satisfied “that there is no satisfactory alternative”.

(3) **Regulation 53(9)(b)** states: the appropriate authority shall not grant a licence unless they are satisfied “that the action authorised will not be detrimental to the maintenance of the population of the species concerned at a favourable conservation status in their natural range.”

2.6 Conservation status is defined as “the sum of the influences acting on the species concerned that may affect the long term distribution and abundance of its population within its territory”. It is assessed as favourable when:

- population dynamics data on the species concerned indicate that it is maintaining itself on a long term basis as a viable component of its natural habitats, and
- The natural range of the species is neither being reduced nor is likely to be reduced for the foreseeable future, and
- There is, or will probably continue to be, a sufficiently large habitat to maintain its populations on a long term basis.

2.7 These tests must not only reach agreement with Natural England when assessing a Licence application they must also be assessed by the planning authority when determining a planning application.

3.0 METHODOLOGY

Desktop Study

3.1 In order to compile existing baseline information, relevant ecological information was requested from both statutory and non-statutory nature conservation organisations including:

- Barnsley Biological Records Centre (hosted by Sheffield City Council and accessed via Sheffield Biological Records Centre (SBRC))
- South Yorkshire Bat Group
- Natural England via the Multi Agency Geographic Information for the Countryside (MAGIC) interactive map (<http://magic.defra.gov.uk/website/magic/>)

3.2 Further inspection, using colour 1:25,000 OS base maps (www.ordnancesurvey.co.uk) and aerial photographs from Google Earth (www.maps.google.co.uk), was also undertaken in order to provide additional context and identify any features of potential importance for nature conservation in the wider countryside.

Field Surveys

Foraging and Commuting Habitat Suitability Assessment

3.3 The potential for the site and immediate surrounds to support feeding and commuting bats was re-assessed during the updated phase 1 habitat survey.

Activity Transect Surveys

- 3.4 Transect surveys were undertaken by two bat surveyors with assistants:
- James Hutchison BSc(Hons), MRes, PhD.; Ecologist, GradCIEEM, (4 seasons of bat surveying experience)
 - Alex Radl BSc(Hons), MSc.; Assistant Ecologist, GradCIEEM (3 seasons of bat surveying experience)
 - Guy Brown BSc(Hons), MSc.; Seasonal Assistant Ecologist (1 season of bat surveying experience)
 - Alfie Bunting.; Seasonal Assistant Ecologist (1 season of bat surveying experience)
- 3.5 The primary objectives of transects completed was to identify foraging areas, commuting routes, species composition and species utilisation of the site.
- 3.6 This methodology takes into account current best practice survey guidance from the Bat Conservation Trust⁵. The survey effort was determined from recommendations provided in BCT² guidance following assessment of the site.
- 3.1 The transect routes were determined prior to survey in order to cover most areas of the site and was designed to follow a route that would identify activity levels around the features of potential value to bats that are to be most affected by proposals (such as hedgerows, tree lines, dense scrub etc). The start and end points of the transect routes were varied as recommended by the current survey guidance to reduce survey bias.
- 3.2 Dusk transects were commenced either prior to or at sunset and were a minimum of 2 hours in duration. Dawn transects commenced approximately 2 hours prior to sunrise until sunrise. Each transect was walked at a steady pace and when a bat passed by the species, time and behaviour was recorded on a site plan to help to form a general view of the bat activity present on site and highlight any habitats types associated with bat activity.
- 3.3 Surveyors used Wildlife Acoustics Inc. Echo Meter Touch® bat detectors were utilised in conjunction with Echo Meter Touch® app and Apple Inc. iPad® during the transect surveys to detect bats and aid species identification.
- 3.4 Post-survey, bat calls were analysed using Kaleidoscope Viewer® (Wildlife Acoustics, Inc) software package, by taking measurements of the peak frequency, inter-pulse interval, call duration and end frequency. From this, the level of bat activity across the site in relation to the abundance of individual species foraging and commuting along habitats was assessed.
- 3.5 Both transects were undertaken when conditions were suitable (i.e. when the ambient air temperature exceeded 10°C and there was little wind and no rain) see Table 3.

Table 1: Activity Transect Survey Conditions

² Bat Conservation Trust, 2016. *Bat Surveys for Professional Ecologists Good Practice Guidelines* 3rd edition.

Date	Sunset/ Sunrise	Start Temperature °C	End Temperature °C	Rain (0-5)	Wind (0-5)	Cloud %
18/09/19	19:15	16	12	0	1	65
18/05/20	21:06	16	14	0	1	100

*Survey completed within one 24 hour period counts as one survey occasion.

Automated Static Bat Detector Surveys

- 3.6 Static remote recording broadband detectors were deployed on site (Figure 1 and 2) to supplement the manual transect surveys. In addition, such remote recording is recommended in guidance produced by the Bat Conservation Trust (2016)².
- 3.7 Passive monitoring was undertaken using an automated logging system Wildlife Acoustics Inc. Song Meter® SM4Bat FS bat detectors with outputs saved to an internal storage device. The detectors used SMM-U2 microphones. Detectors were placed along linear features considered to be of value to bats, such as an underpass, hedgerows, woodlands and tree lines.
- 3.8 Devices were placed in each location for an extended period of time of suitable weather conditions (little no rain/wind and temperatures above 10°C). The conditions over each of the survey period were however representative for the timing of the survey. Detectors were programmed to activate 30 minutes before dusk and recorded continuously until 30 minutes following sunrise.
- 3.9 For the purposes of analysis if the static detector was out over five nights the additional nights were only assessed for bat species listed on Annex II⁷ of the Habitats Directive. The recorded data were analysed using Kaleidoscope Viewer® (Wildlife Acoustics, Inc) software package to assess the amount of bat activity on site by recording the number of bat passes.
- 3.10 In accordance with the size of the site, the number of manual activity transect routes undertaken and the assessment of habitat suitability to support foraging and commuting bats, static units were deployed on site for a minimum of five consecutive nights during September 2019 April 2020 and May 2020 (see Figures 1 and 2) at various locations across the site.

Lighting assessment

- 3.11 A lighting assessment was undertaken due to concerns raised by the local wildlife trust with regards to the potential for an underpass below the Deane Valley Parkway, at the western edge of the site to be utilised by commuting bats, as it follows the line of a semi-natural habitat corridor either side of the road. To determine the levels of light spill at the entrance of the underpass a lux survey was undertaken on the 14th April 2020 by an experienced bat worker from FPCR:
- James Hutchison (see 3.4)
 - Alex Radl (see 3.4)
- 3.12 Prior to the survey, points at which to undertake the light meter readings were determined to assess the current light spill at the entrance to the underpass. This included a total of 30 points across the site, point locations can be seen in Figure 3. The survey began at 21:20 and continued for approximately half an hour to gather the readings.

⁷ Council Directive 92/43/EEC of 21 May 1992 on the conservation of natural habitats and of wild fauna and flora

- 3.13 A light meter (HANNA HI 97500 Luxmeter) was used at each of the 30 points to read the lux levels at the horizontal level; north; east; south; and west and the vertical level, all at 1.6m. The device was held in position until a steady reading was achieved. The location, time and lux reading was recorded at each point and then mapped in QGIS for a visual representation.

Limitations

- 3.14 Given the extent of existing data at the site, the lack of overall change of habitats and based on the earlier results, it was considered that two activity surveys (autumn/September and spring/May) would provide sufficient information upon which to base an up to date assessment of the site's current value to bats and the identification of likely impacts and mitigation required. Two static detectors were also deployed in the early spring (April) season to provide additional data.

4.0 RESULTS

Desktop Study

- 4.1 No records of protected or notable species were returned for within the site boundary however there were multiple records within 1km of the site boundary. Species included brown long-eared bat *Plecotus auritus*, leisler's bat *Nyctalus leisleri*, common pipistrelle *Pipistrellus pipistrellus*, soprano pipistrelle *Pipistrellus pygmaeus* and whiskered bat *Myotis mystacinus*.

Designated Sites

- 4.2 No designated sites were present within the search area that are noted for the bat populations which they support.
- 4.3 To the north of the site (25m) is Shortwood and Hey Green LWS. This LWS contains ancient woodland which is likely of value to bats providing suitable roosting and foraging habitat.

Field Surveys

Roost assessment

- 4.4 No buildings or trees were present on site that offered any roosting potential for bats, due to the relatively young age of all of the trees and consequent lack of features.

Foraging and Commuting Habitat Suitability Assessment

- 4.5 Habitats had changed little since earlier surveys. Boundary habitats within the site were considered to be of value to bats for foraging and commuting, providing links around the site and into the wider area. The intensively managed farmland was considered to be of limited value to bats due to its homogenous nature. The plantation woodland provided foraging opportunities to bats and a nearby underpass provided commuting potential for bats across the Dearne Valley Parkway A6195.

Activity Transect Surveys (Figures 1- 2)

18th September 2019

- 4.6 A total of 27 bat registrations were recorded during this survey, comprising nineteen common pipistrelle, three soprano pipistrelle, four noctule *Nyctalus noctule* and a *Nyctalus Sp.* The first registration was a common pipistrelle at 19:48 (33 minutes after sunset) which was recorded during point count 3 in the plantation woodland north of the A6195.
- 4.7 Activity was recorded throughout the south of the site, along woodland edges, hedgerows, and above grassland areas. Bats were recorded both foraging and commuting.

18th May 2020

- 4.8 A total of 15 bat registrations were recorded during this survey, comprising fourteen common pipistrelle and one soprano pipistrelle. The first registration was a common pipistrelle at 21:31 (25 minutes after sunset) which was recorded between point count 2 and 3.
- 4.9 Activity was recorded throughout the south of the site, along woodland edges, hedgerows, and above grassland areas. Bats were recorded both foraging and commuting.

Automated Static Bat Detector Surveys

- 4.10 A total of six units were deployed in September 2019 (two units), April 2020 (two units) and May 2020 (two units). Figures 1 and 2 show the locations of all static detectors.

September 2019 Survey

- 4.11 Static detector S1 and S2 each recorded for 66 hours with the detectors deployed on the evening of 25th September 2019 until the morning of 30th September 2019.
- 4.12 Common pipistrelle made up 96% of all registrations from static detector S1. They had an activity peak from 01:00-02:00 totalling 198 registrations over five nights, and their nightly total varied between 7 and 373 registrations.
- 4.13 Common pipistrelle made up 93% of all registrations from static detector S2. They had an activity peak from 21:00-22:00 totalling 750 registrations over five nights, and their nightly total varied between 327 and 1342 registrations.

Table 2: Nights of 25th September – 30th September 2019 SM4Bat FS Survey Results

Unit number	Avg. registrations per hour	Total registrations	Most recorded species (number of registrations)	Other species recorded (number of registrations)
Unit 1	8.479	560	Common pipistrelle (535)	Soprano pipistrelle (12) Noctule (7) <i>Myotis</i> species (5) Brown long-eared Bat (1)
Unit 2	63.427	4189	Common pipistrelle (3909)	<i>Myotis</i> species (237) Soprano pipistrelle (42) Brown long-eared Bat (1)

April 2020 Survey

- 4.14 Static detector S1 and S2 each recorded for 53.5 hours with the detectors deployed on the evening of 15th April 2020 until the morning of 20th April 2020.

- 4.15 Common pipistrelle made up 95% of all registrations from static detector S1. They had an activity peak from 20:00-21:00 totalling 40 registrations over five nights, and their nightly total varied between 0 and 35 registrations.
- 4.16 Common pipistrelle made up 90% of all registrations from static detector S2. They had an activity peak from 20:00-22:00 totalling 25 registrations over five nights, and their nightly total varied between 0 and 18 registrations.

Table 3: Nights of 15th April – 20th April 2020 SM4Bat FS Survey Results

Unit number	Avg. registrations per hour	Total registrations	Most recorded species (number of registrations)	Other species recorded (number of registrations)
Unit 1	1.101	59	Common pipistrelle (56)	Noctule (3)
Unit 2	0.597	32	Common pipistrelle (29)	Soprano pipistrelle (2) <i>Myotis</i> species (1)

May 2020 Survey

- 4.17 Static detector S7 and S9 each recorded for 43.5 hours with the detectors deployed on the evening of 18th May 2020 until the morning of 23rd May 2020.
- 4.18 Common pipistrelle made up 76% of all registrations from static detector S7. They had an activity peak from 22:00-23:00 totalling 33 registrations over five nights, and their nightly total varied between 3 and 53 registrations.
- 4.19 Common pipistrelle made up 98% of all registrations from static detector S9. They had an activity peak from 03:00-04:00 totalling 445 registrations over five nights, and their nightly total varied between 17 and 840 registrations.

Table 4: Nights of 18th May – 23rd May 2020 SM4Bat FS Survey Results

Unit number	Avg. registrations per hour	Total registrations	Most recorded species (number of registrations)	Other species recorded (number of registrations)
Unit 7	4.349	190	Common pipistrelle (145)	Noctule (24) Soprano pipistrelle (15) <i>Nyctalus</i> species (4) <i>Myotis</i> species (2)
Unit 9	43.925	1919	Common pipistrelle (1888)	Noctule (15) Soprano pipistrelle (10) <i>Myotis</i> species (6)

Static Monitoring Summary

- 4.20 Activity levels were generally low but varied across all statics, with the peak bat activity being recorded on unit 2 in September. This level of activity was higher than any other unit and was positioned in the plantation woodland north of the A6195.

Lighting assessment

- 4.21 Figure 3 shows the locations at which the lux readings were recorded, the results of which are shown in Table 5 below. The highest light reading recorded on site was 3.4 lux upwards at point 30. All six points taken just before the entrance of the underpass (P30, P25, P20, P15, P10 and P5) were all higher than 1.5 lux upwards.

Table 5: LUX Meter Survey Results

Locn (P#)	Latitude	Longitude	Time	Reading				
				Upwards	North	East	South	West
P1	53.5037096832	-1.4690572768	21:22	0	0	0	0	0
P2	53.5036680059999	-1.4690227434000	21:21	0.5	1.2	0.1	0	0.3
P3	53.5036460705999	-1.4689929038300	21:20	0.9	1.2	0.1	0	0.3
P4	53.5039156758000	-1.4692229032499	21:40	1.2	0.8	0	0.1	0.9
P5	53.5038103863999	-1.4691431075300	21:39	1.8	0.4	0.1	0.2	1.4
P6	53.50383591109	-1.46918132900	21:38	0	0	0	0	0
P7	53.503857248199	-1.46922994405	21:37	0.4	1	0	0	0.1
P8	53.50383351819	-1.46909918636	21:42	0.7	1.2	0	0	0.4
P9	53.50384986990	-1.46913137286	21:42	1.3	1.3	0	0	0.5
P10	53.50386861460	-1.46917194127	21:41	2.6	1.3	0.2	0.3	1.5
P11	53.50388536519	-1.46918434650	21:40	0	0	0	0	0
P12	53.50383630990	-1.46925710141	21:35	0.4	0.9	0	0	0.1
P13	53.50385984049	-1.46929867565	21:34	0.7	1.2	0.1	0	0
P14	53.50387080819	-1.46930906921	21:33	1.6	1.5	0.1	0	0.2
P15	53.50371925500	-1.46903749555	21:32	2.6	1.2	0.3	0.3	0.7
P16	53.50387639169	-1.46925777196	21:37	0	0	0	0	0
P17	53.50388775809	-1.46928627044	21:36	0.6	0	0	1.4	0.3
P18	53.50378825159	-1.46918836980	21:36	1.3	0	0	1.4	0.5
P19	53.50380400520	-1.46920748054	21:35	1.7	0	0	1.1	0.6
P20	53.50372124910	-1.46901670843	21:27	2.3	0.3	0.1	0.9	1.2
P21	53.50368555429	-1.46898116916	21:27	0	0	0	0	0
P22	53.50366561309	-1.46895971148	21:26	0.5	0	0	1	0.2
P23	53.50363909120	-1.46893925964	21:26	0.9	0	0	1.1	0.7
P24	53.50368116719	-1.46900396793	21:31	1.2	0	0	1	0.9
P25	53.50365903240	-1.46897412836	21:30	1.8	0.2	0	0.2	1.5
P26	53.50363570110	-1.46896071732	21:29	0	0	0	0	0

Locn (P#)	Latitude	Longitude	Time	Reading				
				Upwards	North	East	South	West
P27	53.50362134339	-1.46894428878	21:28	0.4	0	0	1.2	0
P28	53.50362134339	-1.46898586302	21:19	1	0	0	1.2	0.1
P29	53.50360100329	-1.46897815168	21:16	2	0.2	0.2	1.4	0.2
P30	53.50362154279	-1.46892584860	21:23	3.4	0.2	0.2	0.7	0.3

5.0 DISCUSSION & RECOMMENDATIONS

- 5.1 Proposals will result in the loss of the majority of habitats on site, with boundary habitats largely being retained. Losses include the poor semi-improved and improved grassland, dense scrub habitat in the north part of the site as well as broad leaved plantation woodland throughout the site. Green infrastructure proposals include new structural tree and scrub planting around the site and individual plots, new attenuation facilities, hedgerows and grassland areas including enhancement of retained grassland in the west of the site.

Desktop Study

- 5.2 No historic bat records were returned from within the site boundary. The species found within 1km of the site boundary consisted of common and widespread species, not unexpected given the high-quality habitat in the wider environment.

Bat Activity

- 5.3 The transect survey results indicate that bats are active throughout the site although appear to be generally more active towards the south and east of the site.
- 5.4 The majority of static detectors located around the site did not record a particularly large number of registrations. With fewer than 2,000 registrations per static detector unit (with the exception of unit 2 in September) the site is not considered exceptional for bat activity. A large number of *Myotis* species were recorded late in the season on unit 2 in September 2019, however, this is considered an anomaly as high numbers of *Myotis* species were not recorded during the other surveys. As some *Myotis* species can be light sensitive the below lighting scheme should be followed to mitigate effects on this foraging area. When compared with the findings of the transect surveys, static detector results indicate activity levels to be comparable although with a slightly more diverse species assemblage recorded of the more common bat species.
- 5.5 Overall results of the two surveys broadly correspond with those undertaken previously and assessment remains that the species assemblage and numbers using the site is not considered to be significant and the site itself is not considered to provide a significant proportion of the local foraging/commuting resource for the local population of bats, particularly given the low-quality habitats present on site and presence of better quality habitat in the wider area.
- 5.6 Impacts of habitat loss on the local population of foraging and commuting bats are not expected to be significant given the levels of activity and species recorded.

Lighting Assessment

- 5.7 The results from the lux meter survey show that the entrance to the underpass is currently impacted by existing lighting columns. These are approximately 5-6 meters in height and are LED lights, located either side of the underpass. The highest readings of lux were taken just before the entrance to the underpass (immediately below the existing lighting columns) with the levels of light spill decreasing with distance into the underpass which itself is unlit. The static detector located at the entrance to the underpass did not show higher registrations of bats in comparison to the other static detectors placed across the site. In addition, the point count undertaken at the entrance to the underpass during the transect in May 2020 (Figure 2, point count 7) had no bat contacts. Given the high levels of light spill indicate, lack of bat contacts recorded at this location it is considered that this underpass is not a significant potential commuting corridor for the local bat population and adverse effects of any changed lighting regime not anticipated.
- 5.8 Light spill onto sensitive bat habitat resources from the completed development's lighting scheme could impact on bats commuting and foraging along the retained site boundaries, wooded areas and newly-created habitats. A sensitive lighting scheme for the proposed redevelopment will be designed to minimise light-spill onto habitats both within and adjacent to it that are/have the potential to be used by the local bat population for foraging or commuting. This will be achieved by ensuring that the design of lighting is based upon guidelines presented in the Institute of Lighting Professionals 'Guidance Note 8 Bats and Artificial Lighting' 2018. Therefore, the lighting scheme will include the following:
- The strategic use of structural landscaping and planting to avoid light spill on sensitive habitats, to help to retain a dark corridor.
 - The avoidance of direct lighting of existing trees, scrub, woodland, or proposed areas of habitat creation/landscape planting.
 - Unnecessary light spill will be controlled through a combination of LED directional lighting, low lighting columns, hooded/shielded luminaires or strategic planting.
 - All new column mounted car park luminaires shall be fitted with flat glass where appropriate to aid 0% upward light discharge and shall be in accordance with the above specifications.
 - Where appropriate, luminaires on the site boundary will be fitted with light baffles to prevent light spill.
- 5.9 Residual effects of new lighting regimes would be expected to be negligible as a result.

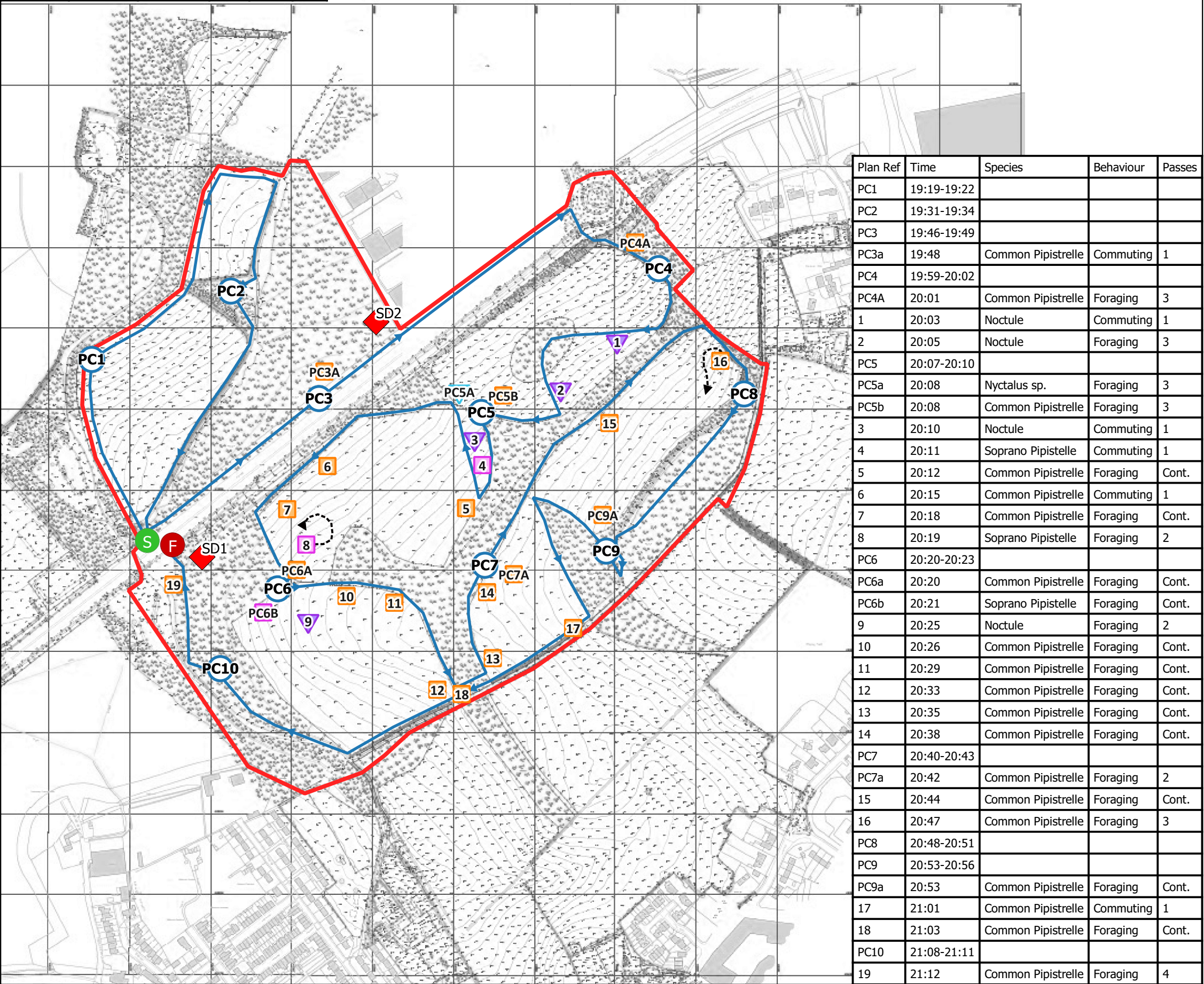
Biodiversity Enhancements

- 5.10 Green infrastructure proposals provide extensive opportunities to compensate any effects on the local bat population of bats. These proposals include the creation of new alternative woodland edge habitats along site linked to off-site suitable bat habitats, which, as they mature, will mitigate the loss of existing edge habitat features. Connectivity to the site will therefore be maintained and enhanced with the creation of a more graded wood-edge habitat which are therefore likely to support a greater range of invertebrate species to optimise foraging opportunities. Areas of species rich and wet grassland created in association with the new and retained attenuation bodies will provide further foraging opportunities. These habitats will add to a mosaic of open foraging habitats, providing greater invertebrate species diversity than the current species-poor and improved grassland areas, linked to the new habitat corridors, creating an area of greater biodiversity in the

south-western and northern parts of the site where they adjoin the off-site semi-natural habitats, which will be of value to bats.

- 5.11 To minimise any potential impact to foraging routes areas either side of the new access roads should be reinforced with native species planting to create bat “hop-overs”. The planting will include standard trees adjacent to the road which will grow to be above the level of vehicle movement. The lower branches of such trees should be regularly pruned back to the trunk in order to ensure that the most suitable flight line is above the maximum traffic height (where applicable low-level lighting columns may also be used in this instance to reduce the likelihood of the bats using the lower tree regions). The implementation of such ‘hop-overs’ will allow continued commuting across the break thereby allowing continued usage of the hedgerow as a foraging/commuting route. It will also reduce the potential for road traffics accidents to bats (and also for birds).
- 5.12 Opportunities exist to provide additional roosting sites for bats in the form of pole mounted bat boxes placed within suitable habitat, particularly along woodland edge habitats that link to off-site suitable bat habitats. The bat boxes should be a variety of designs to encourage different environmental conditions. All the boxes should be suitable for common pipistrelles and a wide range of British species, both common and uncommon. Therefore, the following boxes (or similar) are suggested:
- Pole Mounted Maternity Bat Box, good for common and soprano pipistrelles
 - Pole Mounted Large Colony Bat Box, good for a range of UK bat species
- 5.13 It is considered that the implementation of these measures would not only be sufficient to ensure that the potential for any impacts upon the local bat population using the potential roosting or foraging and commuting habitat is negligible in the long term, but will also enhance the overall suitability of the site for bats. As a result, it is considered that the proposals will maintain and potentially enhance in the longer term, the Favourable Conservation Status of bats in the local area.

Date:	18.09.2019	Sunset:	19:15	Wind:	1
Start Time:	19:15	Start Temp:	16	Rain:	0
End Time:	21:15	End Temp:	12	Cloud:	65%



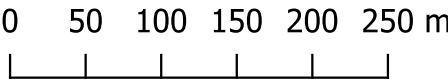
Plan Ref	Time	Species	Behaviour	Passes
PC1	19:19-19:22			
PC2	19:31-19:34			
PC3	19:46-19:49			
PC3a	19:48	Common Pipistrelle	Commuting	1
PC4	19:59-20:02			
PC4A	20:01	Common Pipistrelle	Foraging	3
1	20:03	Noctule	Commuting	1
2	20:05	Noctule	Foraging	3
PC5	20:07-20:10			
PC5a	20:08	Nyctalus sp.	Foraging	3
PC5b	20:08	Common Pipistrelle	Foraging	3
3	20:10	Noctule	Commuting	1
4	20:11	Soprano Pipistrelle	Commuting	1
5	20:12	Common Pipistrelle	Foraging	Cont.
6	20:15	Common Pipistrelle	Commuting	1
7	20:18	Common Pipistrelle	Foraging	Cont.
8	20:19	Soprano Pipistrelle	Foraging	2
PC6	20:20-20:23			
PC6a	20:20	Common Pipistrelle	Foraging	Cont.
PC6b	20:21	Soprano Pipistrelle	Foraging	Cont.
9	20:25	Noctule	Foraging	2
10	20:26	Common Pipistrelle	Foraging	Cont.
11	20:29	Common Pipistrelle	Foraging	Cont.
12	20:33	Common Pipistrelle	Foraging	Cont.
13	20:35	Common Pipistrelle	Foraging	Cont.
14	20:38	Common Pipistrelle	Foraging	Cont.
PC7	20:40-20:43			
PC7a	20:42	Common Pipistrelle	Foraging	2
15	20:44	Common Pipistrelle	Foraging	Cont.
16	20:47	Common Pipistrelle	Foraging	3
PC8	20:48-20:51			
PC9	20:53-20:56			
PC9a	20:53	Common Pipistrelle	Foraging	Cont.
17	21:01	Common Pipistrelle	Commuting	1
18	21:03	Common Pipistrelle	Foraging	Cont.
PC10	21:08-21:11			
19	21:12	Common Pipistrelle	Foraging	4

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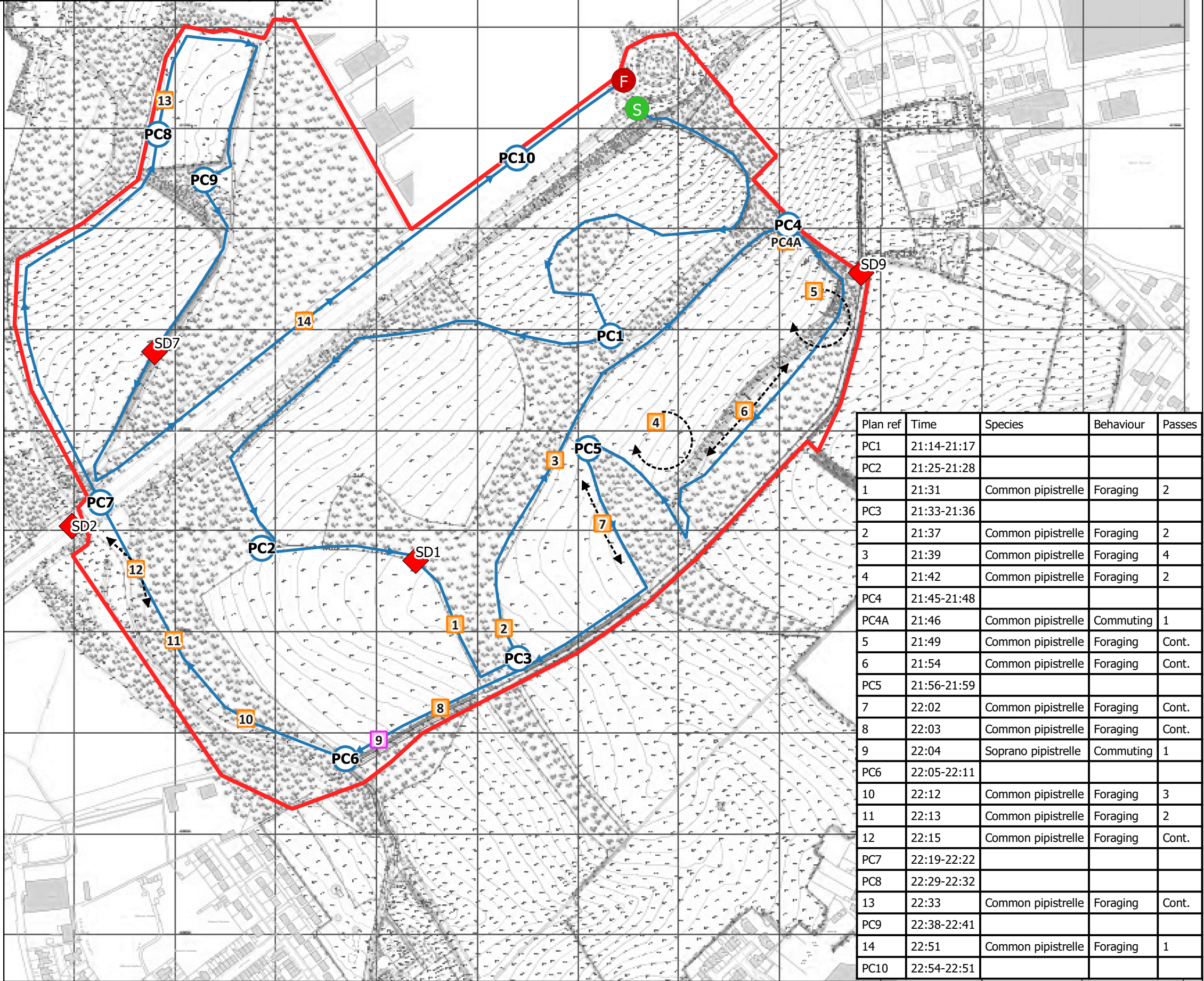
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Key:

- Site Boundary
- Static Detector (with ref.)
- Start point
- Finish point
- Point Count Locations (with ref.)
- Transect Route
- Flight Arrow
- Bat Contacts (with ref.)
- Common Pipistrelle
- Soprano Pipistrelle
- Nyctalus Species
- Noctule



Date:	18/05/2020	Sunset:	21:06	Wind:	1
Start Time:	21:06	Start Temp:	16	Rain:	0
End Time:	23:06	End Temp:	14	Cloud:	100



Plan ref	Time	Species	Behaviour	Passes
PC1	21:14-21:17			
PC2	21:25-21:28			
1	21:31	Common pipistrelle	Foraging	2
PC3	21:33-21:36			
2	21:37	Common pipistrelle	Foraging	2
3	21:39	Common pipistrelle	Foraging	4
4	21:42	Common pipistrelle	Foraging	2
PC4	21:45-21:48			
PC4A	21:46	Common pipistrelle	Commuting	1
5	21:49	Common pipistrelle	Foraging	Cont.
6	21:54	Common pipistrelle	Foraging	Cont.
PC5	21:56-21:59			
7	22:02	Common pipistrelle	Foraging	Cont.
8	22:03	Common pipistrelle	Foraging	Cont.
9	22:04	Soprano pipistrelle	Commuting	1
PC6	22:05-22:11			
10	22:12	Common pipistrelle	Foraging	3
11	22:13	Common pipistrelle	Foraging	2
12	22:15	Common pipistrelle	Foraging	Cont.
PC7	22:19-22:22			
PC8	22:29-22:32			
13	22:33	Common pipistrelle	Foraging	Cont.
PC9	22:38-22:41			
14	22:51	Common pipistrelle	Foraging	1
PC10	22:54-22:51			

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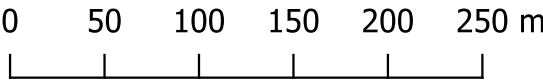
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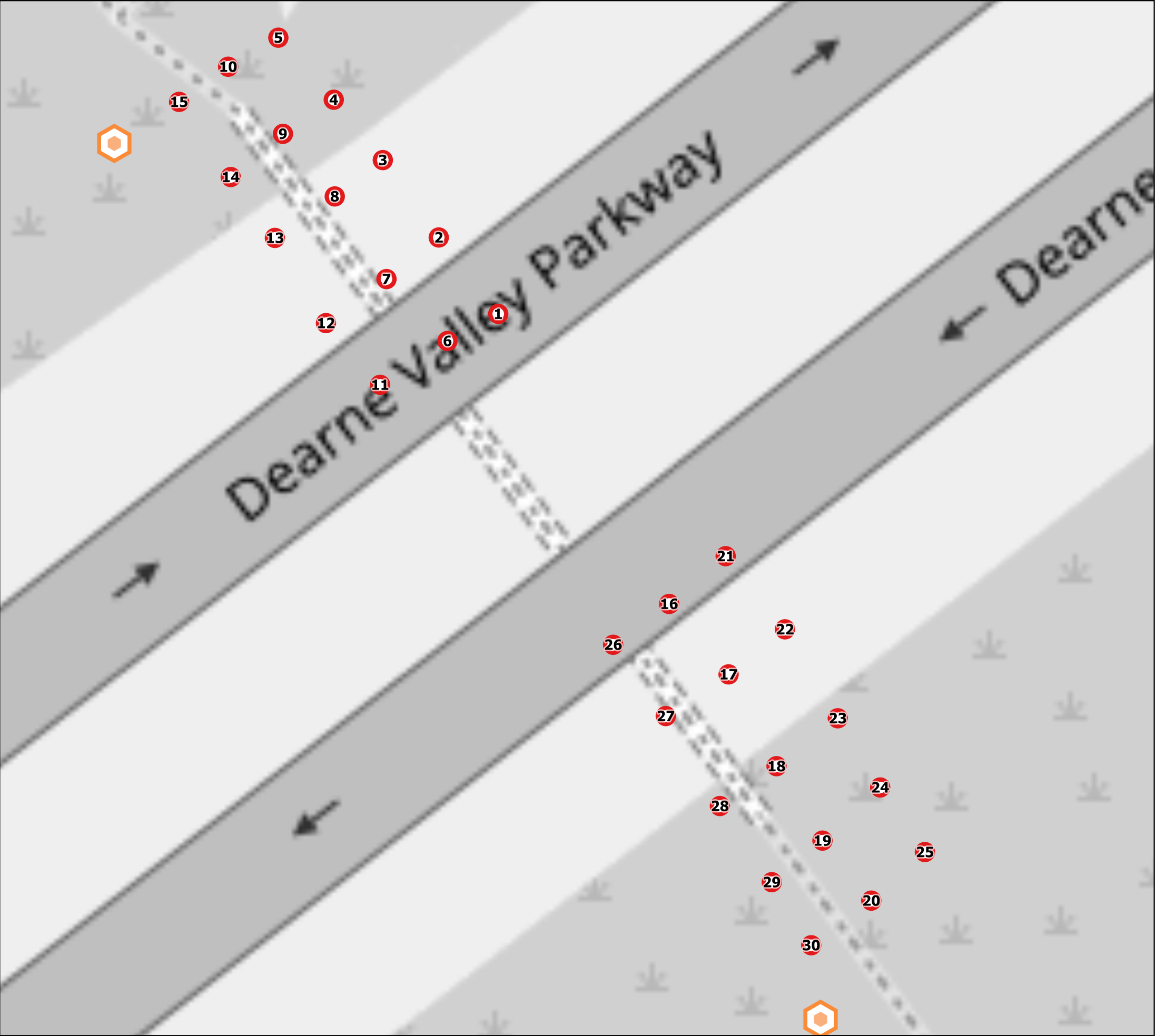
Key:

- Site Boundary
- Static Detector (with ref)
- Start point
- Finish point
- Point Count Locations (with ref)
- Transect Route
- Flight Arrow

Bat Contacts (with ref)

- Common pipistrelle
- Soprano pipistrelle





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Key

- Lux reading points (with ref)
- Lighting column

ID	Vertical	North	East	South	West
1	0	0	0	0	0
2	0.5	1.2	0.1	0	0.3
3	0.9	1.2	0.1	0	0.3
4	1.2	0.8	0	0.1	0.9
5	1.8	0.4	0.1	0.2	1.4
6	0	0	0	0	0
7	0.4	1	0	0	0.1
8	0.7	1.2	0	0	0.4
9	1.3	1.3	0	0	0.5
10	2.6	1.3	0.2	0.3	1.5
11	0	0	0	0	0
12	0.4	0.9	0	0	0.1
13	0.7	1.2	0.1	0	0
14	1.6	1.5	0.1	0	0.2
15	2.6	1.2	0.3	0.3	0.7
16	0	0	0	0	0
17	0.6	0	0	1.4	0.3
18	1.3	0	0	1.4	0.5
19	1.7	0	0	1.1	0.6
20	2.3	0.3	0.1	0.9	1.2
21	0	0	0	0	0
22	0.5	0	0	1	0.2
23	0.9	0	0	1.1	0.7
24	1.2	0	0	1	0.9
25	1.8	0.2	0	0.2	1.5
26	0	0	0	0	0
27	0.4	0	0	1.2	0
28	1	0	0	1.2	0.1
29	2	0.2	0.2	1.4	0.2
30	3.4	0.2	0.2	0.7	0.3



Haworth Group

Dearne Valley Parkway, Rockingham,
Barnsley- Phases 2 and 3

Light Meter Readings (Lux)

scale @ A3
1:250

drawn
AMS / JDH

issue
4/6/2020



drawing / figure number
Figure 3

rev
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