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Portishead Branch Line DCO Scheme (MetroWest Phase 1)

Bat Technical Appendix

Final Draft

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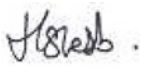
Revision 3		Harriet Webb CEol, MIEEM	Ecologist CH2M	18-12-16
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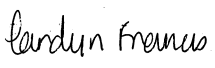
Revision 5		Carolyn Francis	Associate Director CH2M	7-9-17

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Summary

The Portishead Branch Line (MetroWest Phase 1) Development Consent Order Scheme ("the DCO Scheme") is a nationally significant infrastructure project ("NSIP") and a priority of the West of England's local authorities to improve passenger rail services. The DCO Scheme will re-open 5.45 km of disused railway line between Portishead and Pill and upgrade the Portbury freight line.

North Somerset is a stronghold for many bat species, including some of the rarest bats in the UK. The ecological importance for bats of the MetroWest wider study area is reflected in the designation of international sites, which includes the North Somerset and Mendip Bats Special Area of Conservation ("SAC"). The DCO Scheme has the potential to give rise to likely significant effects on local bat populations. This report describes and evaluates the ecological baseline from surveys in autumn 2014, summer/autumn 2015 and summer 2016 against which the potential ecological effects on bats that may arise from the construction and operation of the DCO Scheme can be assessed in the Environmental Statement.

The baseline has been established by various survey methods that comply with current industry standards and survey guidelines. The methodology comprises walked transects, static automated bat detector monitoring, trapping and radio-telemetry and bat roost surveys of structures and trees.

Bat activity surveys recorded 10 species on the disused railway line with notable species being lesser and greater horseshoe bats *Rhinolophus hipposideros* and *R. ferrumequinum*. The disused railway line is a prominent feature within the landscape between Portishead and Pill and provides a link between semi-natural habitats and foraging areas for bats. The study confirms that it provides an important corridor for movement by bats and a radio-tracking study of a single male greater horseshoe bat to Brockley Hall Stables SSSI identified a link with North Somerset and Mendip SAC. The disused railway line is an integral part of a permeable landscape for lesser and greater horseshoe bats and provides a corridor for movement west of the Avon Gorge Woodlands SAC that is evaluated as being regional significant.

Foraging habitats for bats on the disused railway line are significant within a site to local context, and lesser and greater horseshoe bats use a derelict store as a night feeding roost. Foraging opportunities enhance the value of the disused railway as a corridor for movement.

There are no large communal roosts on the disused railway line, but three day roosts of low conservation importance for local bat populations were confirmed because low numbers of common and soprano pipistrelle bats *Pipistrellus pipiustrellus* and *P. pygmaeus* roost in bridge structures. Small roosts of lesser and greater horseshoe bats were also found at Pill Station, on the Portbury freight line.

Four tunnels on the Portbury Freight line, three of which are within the Avon Gorge Woodlands SAC, have been assessed for summer and autumn roost activity. Three of the tunnels have been confirmed as being used by low numbers of bats as day roosts during summer, with lesser horseshoe, common pipistrelle, serotine *Eptesicus serotinus* and Daubenton's *Myotis daubentonii* recorded. The tunnels are not considered to be important swarming sites, but surveys in autumn recorded social activity and bats appear to use the shelter of the tunnels whilst socialising. The tunnels are assessed as being site to local value, but further surveys are scheduled to confirm the status of winter and summer roosts.

1 The DCO Scheme

The Portishead Branch Line was built in the 1860s. Passenger services continued between Portishead and Bristol until 1964, and freight services continued to 1981. The Royal Portbury Dock opened in 1978 and in 2002 the currently operational part of the former Portishead Branch Line was re-opened to service the port for freight only. The owner of the Royal Portbury Dock, Bristol Port Company, has commercial rights to run up to 20 freight trains per day in each direction along the operational railway line. The current volume of freight trains operating is substantially less than this.

MetroWest Phase 1 proposes to re-open the disused section of the Portishead Branch Line from Portishead to Pill and operate an hourly passenger service between Portishead and Bristol Temple Meads. In order to reintroduce passenger services the remaining section of disused railway between Portishead and Pill has to be rebuilt including a new station at Portishead and the re-opening of the former Pill station. The project is a nationally significant infrastructure project ("NSIP") as defined by the Planning Act 2008 and therefore a Development Consent Order ("DCO") is required for powers to build and operate the railway, as well as to acquire land, where it cannot be acquired by negotiation.

The DCO Scheme also comprises a number of associated improvements to the rail network from Pill to Ashton Vale (Ashton Junction) to enable the operation of an hourly train service (or an hourly service plus) between Portishead and Bristol Temple Meads.

The NSIP as defined under the Planning Act 2008, is a permanent railway of approximately 5,450 metres long from Quays Avenue, Portishead, North Somerset (OSGR ST471765) to Pill in North Somerset (OSGR ST520762). It comprises the reconstruction of 4,750 metres of disused railway from Quays Avenue in Portishead to the existing operational railway (the Portbury freight line) to the east of the M5 Motorway). The NSIP then comprises 750 metres of new track through Pill village parallel to the operational railway line from Portbury Dock. The NSIP terminates at a new junction east of Pill Viaduct (Pill Junction), where it connects with the existing operational railway.

The associated permanent works in summary include:

- A new station, station building, forecourt, car parks and highway modifications in Portishead,
- New Trinity Primary School footbridge in Portishead,
- A new maintenance compound and road rail access point off the highway of Sheepway near Portishead,
- A new access for agricultural purposes to the west of Station Road, Portbury from the Portbury Hundred,
- Minor works to bridges and structures along the disused railway,
- Works to widen and strengthen the embankment where the disused railway meets the operational railway at Lodway Close, Pill,
- Replacing an existing rail bridge over the Avon Road / Lodway Close pedestrian and cycle underpass (to the west of Pill station) with a new wider bridge to support a new double track section of railway,
- Minor alterations to the Bridleway (LA8/66/10) and National Cycle Route 26 south of Royal Portbury Dock,
- Extension of bridleway LA8/67/10 north of the M5 underbridge to connect with the National Cycle Route 41 to the east of the M5 that connects with Pill,
- Construction of a new station at Pill on the site of the existing southern platform, with new access, forecourt and car park located on Monmouth Road,
- A new emergency and maintenance accesses to Pill Tunnel eastern portal,
- A new vehicular maintenance road rail access point from the highway of Clanage Road, Bower Ashton to the Portishead Branch Line Railway,
- Various improvement works along the operational railway line between Pill and Ashton Junction,
- Whilst the Ashton Vale Road (Ashton Junction) level crossing will remain operational, the following works are proposed to reduce the highway traffic impact from the increased use of the level crossing:
    - Extension of the left turn flare lane on Winterstoke Road,
    - Optimisation of the Ashton Vale Road signals, and upgrade of signals to "MOVA", and
    - Provision of a ramp to the north of the level crossing to connect pedestrians and cyclists from Ashton Vale Road to Ashton Road.
- In light of the possibility that Baron's Close pedestrian level crossing may not be closed permanently before MetroWest Phase 1 opens,

MetroWest Phase 1 is proposing to close it as part of the DCO Scheme. Alternative pedestrian access will be provided, using a pedestrian and cycle path (currently under construction by the MetroBus scheme) linking to the Ashton Vale Road level crossing and the proposed MetroWest Phase 1 pedestrian / cycle ramp.

- Improvements are also required along the operational railway line between Pill Junction and Ashton Junction, including replacement of ballast, minor works to bridges and structures, minor modifications to the vertical and horizontal alignment of the railway and new signalling, telecommunications including a mast in Avon Gorge and aerials at Pill Tunnel and Portishead station and new fencing for the entire branch line, where natural boundaries are not sufficient.

Refer to the Preliminary Environmental Information Report ("PEI Report") Chapter 4 for the fully detailed project description.

2 Study Area

The study area encompasses a 5.45km disused railway line between Portishead and Pill and the existing Portbury freight line along the Avon Gorge from Pill to the Clifton Suspension Bridge.

2.1 Disused Railway Line

The character of the railway line is described in four sections, starting at National Grid Reference (NGR) ST 47111 76500 at the western end of the DCO Scheme in Portishead and ending west of Pill at NGR ST 52012 76279. The alignment is shown on Figure 1a.

Portishead NGR ST 47111 76500 to ST 48134 76136	The disused railway line provides a green corridor through a new housing estate on the eastern outskirts of the town. The alignment of the old railway line at the western end of the route passes through a trading estate, with a bridge taking the line over Portbury Ditch, to Quays Avenue, a neighbourhood road crossing the railway alignment at NGR ST475763. This section of the disused railway line supports mainly scrub habitats, and there are no mature trees. It is relatively isolated by its urban surroundings, and

	fragmented from the rest of the disused railway line by the neighbourhood road.
Portbury Common NGR ST 48134 76136 to ST 48493 76009	As the disused railway line continues from the housing estate it passes Portbury Common to the north. The semi-natural grassland of the common and wetland habitats (associated with ditches and ponds) provides good quality foraging habitats for bats. There are several large Italian Black Poplar Trees along this section of the route. The railway line is enclosed by mature trees and is more wooded than the open scrub habitats within Portishead.
Farmland NGR ST 48493 76009 to ST 49760 75696	The disused railway passes under two arch bridges that take Sheepway over the disused railway line. Farmland between the two bridges is predominantly pasture, which appears to be agriculturally improved. There is a network farmland hedges, which connect to the railway line and provide potential flight lines for bats. The disused railway line through the farmland supports relatively low scrub habitat and there are very few mature trees. The habitat of scrub and small trees has a relatively open character. At NGR ST 49344 75754 are fishing lakes immediately adjacent to the railway line. From Sheepway, the farmland narrows between built areas to the north and the M5 motorway to the south. Adjacent to the route are small fields with pasture and the farmland appears to be fairly wet and supports damp grassland.
Royal Portbury Dock NGR ST 49760 75696 to ST 52012 76279	As the disused railway line continues eastwards it passes through a narrow stretch of land between The Portbury Hundred (the A369 road) to the south and industrial areas at Royal Portbury Dock to the north. This section of the disused railway line is wooded, with semi-mature birch trees established at the edge of the track providing a well-defined tree line. There are

small field systems with grazed pasture, reedbeds and wetland habitats and along the route. At NGR ST 50054 75725 is Wessex Water's pumping station.

The combination of woodland, damp grassland and wetland habitats provides favourable habitat for bats. Mature trees border the track of the disused railway line creating an enclosed linear feature and bats can forage and commute along the track. The trees typically have a straight growth, characteristic of fast growing specimens do not contain veteran features or holes.

The disused railway line then passes under the Royal Portbury Dock Road and Marsh Lane, crossing Court House Farm. It continues under the M5 and terminates at the Portbury freight line.

Between the M5 and Pill is a tract farmland, which provides a corridor of open countryside between Royal Portbury Dock and Pill that connects to the River Avon (to the north).

2.2 Portbury Freight Line

Portbury freight line runs from Royal Portbury Dock to Parson Street Junction where it joins the south west main line between Bristol Temple Meads and Taunton. The railway passes through Pill and continues along the western flank of the Avon Gorge before entering south west Bristol. In Pill, the freight line runs through residential housing estates, passing the disused Pill station at NGR ST 52408 76024. The railway line supports low scrub and grassland, and is relatively open.

The route of the freight line passes under several road bridges before entering open countryside north east of the town, between Pill and Ham Green. At Ham Green the railway enters Pill tunnel at NGR ST 52791 75656, and once out of the tunnel it crosses farmland to the River Avon, passing Ham Green Lakes. The freight line runs along the Avon Gorge, with the River Avon to the north and Leigh Woods National Nature Reserve to the south. The railway is at the bottom of the steep sided wooded gorge. The study area for the bat surveys ends at Clifton Suspension Bridge.

There are four tunnels between Ham Green and Clifton Suspension Bridge (shown on Figure 1b) which were surveyed for bats. Key features of the tunnels are listed below.

Pill Tunnel
NGR
ST 53079 75607

A 610m long tunnel with portal entrances approximately 4m wide and 5 m high.

The tunnel is brick lined throughout. The brickwork is two courses deep and the appearance of the brickwork (and mortar) is in good condition. Opportunities for bats to roost are restricted to the following features in the tunnel:

- Drainage holes/pipes in the ceiling and walls;
- Circular core holes 8cm in diameter drilled in the walls of the tunnel every few metres;
- Missing bricks – bricks that appear to have been purposely removed from the lower part of the wall, leaving an opening the size of a brick end (c.100mm X 65mm).

The core holes and missing bricks may be engineered trial holes in the wall. Approximately two-thirds of the holes inspected extended beyond the brick lining to the natural rock and offer good potential shelter for bats.

Water ingress permeates the tunnel walls and there is seepage through the roof of the tunnel in places, which creates wet and damp conditions in the centre of the tunnel.

The tunnel is close to Ham Green Lakes, which are situated approximately 50m north-east of the eastern portal of the tunnel.

Sandstone Tunnel
NGR
ST 54921 75057

An 80m long tunnel with portal entrances approximately 5m wide and 6 m high.

The tunnel has a brick ceiling and stone lined walls. The stonework covers the lower 3m of wall and there are regular arch refuge areas in the wall that provide a 0.5m deep recesses in to the rock.

The refuge arches are backed by natural rock and there are gaps and cavities at the edge of the stonework with the rock. Many of the gaps have been pointed with cement, but eight of the arches had openings that provide access for bats behind the stone/brick lining.

Sandstone tunnel is situated at the woodland edge of Leigh Woods near the bottom of the Avon Gorge.

Clifton No. 2
OS grid reference
ST 56168 73664

A 212m long tunnel with portal entrances approximately 4.5m wide and 6m high.

The tunnel has been excavated through rock and approximately two-thirds of the interior is natural rock. Parts of the tunnel are brick lined, with two narrow sections at the eastern end of the structure. There are arch refuges in the walls of the brick lined sections. One of the arches has been repaired with stone (giving the appearance of a dry stone wall at the top of the arch) and gaps in this feature provide opportunities for bats to shelter in crevices.

The natural stone section at the western end of the tunnel is similar in character to a mine environment. The uneven surface of the natural rock offers an array of shallow depressions and there are a very few deep fissures in the rock. Of particular note was a deep fracture in the roof of the tunnel, approximately 25m from the eastern portal.

There are gaps between the brick lining and natural rock face. These gaps were evident at the top of the arch lining with openings to the tunnel interior.

Clifton 2 tunnel is situated at the woodland edge of Leigh Woods near the bottom of the Avon Gorge.

Clifton No. 1
OS grid reference
ST 56418 73072

Clifton 1 is the shortest of the tunnels at 54m long. The tunnel portals are approximately 8m wide and 6m high.

The tunnel is brick lined and the brickwork is in good condition. There are arch refuges at the side of the tunnel, behind which is the natural rock face. Crevice features in the tunnel are relatively scarce, but there are a low number of holes between the rock and brick lining at the edge of five of the arch refuges.

Clifton 1 is located at the south-eastern end of Leigh Woods, close to Clifton Suspension Bridge. At night, the tunnel is fairly well lit by street lighting on the bridge and the A4 Road (on the opposite side of the Avon Gorge valley).

3 Purpose of the Study

North Somerset supports a wide range of bat species and is a stronghold for several of the UK's rarest bats, including lesser and greater horseshoe bats *Rhinolophus hipposideros* and *R. ferrumequinum*. All bat species and their roosts are protected in the UK under the Conservation of Habitats and Species Regulations 2010 (the Habitat Regulations), which implements the EC Directive 92/43/EEC (the Habitats Directive). Bats and their roosts are also protected under the Wildlife and Countryside Act (WCA) 1981 (as amended).

The lesser and greater horseshoe bat are two of four UK bat species listed in Annex II of the Habitats Directive, which can require sites to be designated in member states for their protection. The ecological importance of the MetroWest wider study area is reflected in the designation of international sites. This includes the North Somerset and Mendip Bats Special Area of Conservation (SAC), which is designated for greater and lesser horseshoe bats and the Avon Gorge Woodlands SAC, which are a stronghold for rare and uncommon bat species.

The greater horseshoe is one of Britain's rarest and endangered bat species, with the UK population estimated as being c.6000-7000. The species is confined to South West England and South Wales, and its distribution is localised and fragmented.

The South West of England and Wales support one of the largest concentrations of lesser horseshoe bats in Europe. The British population is estimated at 14,000 (c.7000 in England, c.7000 in Wales), but populations are localised.

Upgrades to Portbury freight line for passenger services will increase the frequency of trains and track speed of the line. Online improvements will be made to the track and Pill Tunnel will need to be modernised to comply with safety standards for emergency services and routine maintenance.

Baseline data for the DCO Scheme established the presence of bat roosts in structures and trees, and the importance of the disused railway line as a commuting route and foraging habitat for rare and uncommon species.

The scope of the study distinguishes between the disused railway line and the Portbury freight line sections of the DCO Scheme.

This report describes the ecological baseline against which the potential ecological effects on bats that may arise from the construction and operation of the DCO Scheme can be assessed in the Environmental Statement. The baseline has been established by various survey methods that comply with industry standards and survey guidelines from the Bat Conservation Trust that were available at the time of publish (Hundt, 2012 and Collins, 2016).

The bat assessment for the DCO Scheme considered the following factors:

- The importance of the disused railway line as a linear landscape features and corridor for movement by bats;
- The availability and use of foraging habitats for bats along the disused railway line;
- Seasonal use of the disused railway line by bats, including the movement of bats between hibernation sites and maternity roosts.
- The location and type of bat roosts within trees and structures on the disused railway line;
- The presence of maternity roosts in tunnels on the Portbury Freight line;
- The importance of tunnels on the Portbury Freight line for swarming, mating or social activity.

4 Methodology

4.1 Overview

Bat activity on the disused railway line was initially surveyed between late August and October 2014. Walked transect and static automated bat detector surveys provided preliminary results against which recommendations for further survey in 2015 were developed. The 2014 and 2015 surveys provide year one baseline data for the study. The survey programme in 2015 comprised acoustic monitoring and advanced survey methods to trap and radio-track bats.

In 2015 bat roost surveys of the four tunnels on Portbury freight line commenced, to investigate the use of the tunnels as summer roosts and autumn swarming sites. Survey restrictions applied to surveys on the operational freight line because line blockages and line possessions are required for surveyor safety. The limitations of surveying the operational freight line in 2015 are discussed in more detail in Section 4.6.

In 2016, year 2 baseline data were obtained for the study. The objectives of year 2 surveys were:

- Establish a standardized baseline for lesser and greater horseshoe bat activity on the disused railway line using acoustic methods.
- Further survey of the four tunnels on Portbury freight line to evaluate the current conservation status of bat roosts in these structures.
- Survey of structures at Pill Station and on Portbury freight line that were not within the scope of work in 2015.

4.2 Desk Study

CH2M HILL obtained records of bats and bat roosts within 2.5 km of the DCO Scheme in April 2014 from Bristol Regional Environmental Records Centre (BRERC).

The Multi-Agency Geographic Information for the Countryside (www.magic.gov.uk) and The Joint Nature Conservation Committee (www.jncc.defra.gov.uk) websites were used to obtain information on designated sites within the wider area.

In October 2015, records were obtained from the Avon Wildlife Trust for Portbury Wharf Nature Reserve near Portishead. The nature reserve is centred on NGR ST 48496 76441, and the disused railway line defines the southern boundary.

4.3 Disused Railway line

Walked Transects

To record bat activity along the disused railway line, walked transect surveys were undertaken from August to October 2014, May to July 2015 and April 2016.

In 2014, access along the disused railway line was restricted by impenetrable scrub. Where access permitted, surveyors walked along the track following the alignment of the route in the centre of the railway corridor. When dense vegetation was encountered, deviations were taken along one side of the disused railway. Transect routes also occasionally followed designated paths around the proposed Scheme. The transects included 14 predetermined stopping points where surveyors monitored bat activity for 3 minutes (referred to as 'station stops'). The transect route and station stops taken in 2014 are shown on a Figure 2a, with deviations from the (central) track and disused railway line indicated on the plan.

The walked transects undertaken in 2014 are listed in Table 1a. The start position of the walked transect was varied so that sections of the proposed Scheme were surveyed at different times during nightly surveys. The sequence of station stops for each survey is shown in Table 1a. Sections of the Proposed Scheme that were inaccessible are also shown (and these restrictions are discussed further in the survey constraints, Section 4.8). Due to access restrictions preventing a continuous walked route along the entire length of the disused railway it was necessary to drive and park at two locations along the route (shown on Figure 2a); the drive took less than 5 minutes.

Table 1a. Walked Transects in 2014

Date (2014)	Sunset (hrs)	Survey Period (hrs)	Weather Conditions	Transect Route*
28 Aug	20:09	20:05-23:30	16-19°C 60% Cloud Light wind (2) No PPT	1-14
25 Sept	19:04	19:00-22:05	17°C 100% Cloud Light wind (2) No PPT	4-1 7-5 9-8 8-14
20 Oct+	18:20	18:15-20:00	14°C 100%Cloud Light Breeze (1) Rain until 18:45hrs and then heavy rain at 19:50hrs	14-8 7-5
21 Oct+	18:18	18:15-21:15	13-14°C 100%Cloud Light Breeze (1) Light rain between 18:00-18:50hrs, but clearing.	14-8 7-5 4-1

*Sequence of station stops shown on Figure 2a.
+Transect repeated due to rain on the 20th October
Weather conditions: PPT = Precipitation; Wind – Beaufort Scale given in Brackets

In 2015 and 2016, vegetation clearance along the disused railway line provided access for surveyors to walk along the track, following the alignment of the route in the centre of the railway corridor. A standardized transect route that followed the track alignment was established with 10 designated 3-minute listening station stops, as shown on Figure 2b. On each survey, the transect route was walked stopping at each station stop followed by a (continuous) return walk to the starting location. Transect surveys were undertaken twice a month and the starting point alternated between each end of the route each survey. The walked transect surveys cover the period of peak activity for bats at dusk. They were undertaken from sunset and were at least three hours in duration. The prevailing weather conditions, sunset times, and start and finish times of each survey are set out in Table 1b.

Table 1b. Walked Transects in 2015 and 2016

Date	Sunset (hrs)	Survey Period (hrs)	Weather Conditions+	Transect Route*
18 May 2015	21:00	20:55-00:00	10-11°C 95% Cloud Light wind (2) Very light, intermittent rain	1-10
31 May 2015	21:20	21:17-00:30	10°C 15% Cloud Moderate wind (3) No PPT	10-1
8 June 2015	21:27	21:20-00:35	12-15°C 50%Cloud Light wind (2) No PPT	1-10
23 June 2015	21:35	21:32-00:30	14-18°C 40%Cloud Light Breeze (1) No PPT	10-1
8 July 2015	21:27	21:30-01:15	15-16°C 10%Cloud Light Breeze (1) No PPT	1-10
20 July 2015	21:20	21:05-00:15	15-16°C 10%Cloud Moderate wind (3) No PPT	10-1
4 Aug 2015	20:52	20:50-00:30	15-17°C 75%Cloud Light Breeze (1) No PPT	1-10
18 Aug 2015	20:25	20:13-23:13	16-18°C 40%Cloud Light wind (2) No PPT	10-1
5 April 2016	19:52	19:40-22:15	8-9°C 5%Cloud Light wind (1)	1-10

Date	Sunset (hrs)	Survey Period (hrs)	Weather Conditions+	Transect Route*
			No PPT	
18 April 2016	20:13	20:00-23:05	9-11°C 95%Cloud Light wind (2) No PPT	10-1
*Sequence of station stops shown on Figure 2b. + Weather conditions: PPT = Precipitation; Wind – Beaufort Scale given in Brackets				

Surveyors used an Elekon BatloggerM to record bat calls during the walked transects. The recordings were analysed using Batsound or Kaleidoscope computer software for species identification.

Static Automated Bat Detectors 2014 and 2015

Remote, unattended bat detector recording units (termed 'dataloggers') were deployed at a selection of locations along the disused railway line to monitor the site for rare or uncommon species, with particular consideration to greater and lesser horseshoe bats. The datalogger locations are shown on Figure 3.

Two types of datalogger were used at the site. The first was the SM2BAT made by Wildlife Acoustics and one or two units were set out on any one deployment. The SM2BAT captures 16-bit full spectrum recordings, recording data on a high capacity secure digital card (SDHC card). The second type of datalogger used was the Anabat SD1 (with external 12V battery), a frequency-division detector that records bat sound onto a Compact Flash (CF) card. Both types of unit are suitable for long-term acoustic monitoring to determine the presence of bat species, but the data from different units is not directly comparable. Standardised monitoring to compare levels of bat activity on the disused railway line using the new generation of Wildlife Accoustic's SM4BAT-FS dataloggers is being undertaken in 2016.

Each datalogger unit was programmed to be active each night between dusk and dawn and recorded over the periods shown in Tables 2a and 2b. In total, 23 locations were monitored along the disused railway line recording 213 nights of data.

The dataloggers are triggered by the bat's (ultrasonic) echolocation call and record continuously over the duration of bat activity. The bat sound recordings are saved as 15-second duration sound files for analysis. Each sound file records a sequence of echolocation calls from a passing bat or bats, or if there is constant activity in the

vicinity of the datalogger consecutive sound files are created for the duration of the activity.

The system of recording bat sound in 15-second samples is a method that has been developed to estimate the number of 'bat passes' at a given point. A single or low number of sound files shows that a bat has passed the datalogger location, whilst foraging or social activity will create high numbers of sound files. This provides discrete data that can be counted and used to characterize the level of bat activity. The data are referred to in the results as a 'registration' of bat activity.

The recordings captured by the SM2BAT were analysed using Kaleidoscope Pro software, by Wildlife Accoustic. The Anabat zero-crossing files were analysed using and AnalookW software.

Table 2a. Deployment of Dataloggers in 2014

Location	Datalogger	NGR	Start Date	End Date	No. Nights Monitoring
S1a	AnabatSD1	ST 49588 75689	28/08/14	30/08/14	3
S1b	AnabatSD1	ST 48294 76071	28/08/14	31/08/14	4
S2a	SM2BAT	ST 49307 75728	25/09/14	26/09/14	1
S2b	SM2BAT	ST 50362 75844	25/09/14	30/09/14	6
S3	AnabatSD1	ST 48285 76083	20/10/14	05/11/14	17

Table 2b. Deployment of Dataloggers in 2015

Location	Datalogger	NGR	Start Date	End Date	No. Nights Monitoring
S4	SM2BAT	ST 50595 75934	09/04/15	17/04/15	8
S5a	SM2BAT	ST 50595 75934	21/04/15	28/04/15	7
S5b	AnabatSD1	ST 48269 76088	21/04/15	29/05/15	9
S6a	AnabatSD1	ST 49591 75696	18/05/15	31/05/15	13
S6b	SM2BAT	ST 50467 75895	18/05/15	26/05/15	9
S7a	AnabatSD1	ST 49325 75726	31/05/15	08/06/15	9
S7b	SM2BAT	ST 50467 75895	31/05/15	08/06/15	9
S8a	AnabatSD1	ST 49542 75696	09/06/15	21/06/15	14
S8b	SM2BAT	ST 49955 75711	09/06/15	14/06/15	6
S9a	AnabatSD1	ST 49977 75726	25/06/15	08/07/15	14
S9b	SM2BAT	ST 49542 75696	25/06/15	05/07/15	10
S10a	AnabatSD1	ST 51788 76277	08/07/15	14/07/15	7

Location	Datalogger	NGR	Start Date	End Date	No. Nights Monitoring
S10b	SM2BAT	ST 48308 76057	09/07/15	14/07/15	7
S10c	SM2BAT	ST 48929 75859	08/07/15	15/07/15	8
S11a	AnabatSD1	ST 50820 76009	20/07/15	03/08/15	15
S11b	SM2BAT	ST 48619 75955	23/07/15	30/07/15	8
S11c	SM2BAT	ST 48222 76097	26/07/15	30/07/15	5
S12a	AnabatSD1	ST 51417 76200	04/08/15	11/08/15	8
S12b	SM2BAT	ST 48542 75993	04/08/15	11/08/15	8
12c	SM2BAT	ST 48899 75837	04/08/15	11/08/15	8

Trapping

Avinet and Ecotone mist nets (ranging from 2m-12m in length) and three Austbat 4m^2 double lined harp traps were deployed on the disused railway line for two nights per month in June and July 2015.

The trapping surveys covered areas of the disused railway line where lesser and greater horseshoe bats were recorded in 2014 and May 2015. The trapping results and bat detector surveys from June 2015 were reviewed to inform the approach for the July survey.

The nets and harp traps were placed under bridges and tree canopy cover where bats will fly low and therefore may be directed towards the traps. The disused railway line is relatively exposed and to help improve catch efficiency in open habitats four Sussex Autobat acoustic lures were used to attract bats to the traps (Hill, D. A. and Greenaway, 2005). The lures are placed next to mist nets or harp traps and emit synthesised barbastelle, noctule, *Myotis* and nathusius pipistrelle echolocation calls and barbastelle social calls; a greater horseshoe echolocation call was also trialled to attract this species.

Captured bats were examined to determine species, sex, breeding status and, where appropriate, selected for radio tracking. Trapping surveys started at dusk and continued to approximately 02:00hrs, depending on capture success, bat activity and weather conditions.

Table 3. Trapping Surveys on the Disused Railway Line

Date	Time (hrs)	Locations	Figure 2b Ref	Weather+
23/06/15	21:30- 01:30*	Station Road, Sheepway: ST 49360 75819 -Harp Trap ST 49337 75713 - Harp Trap ST 40603 75694 - Harp Trap ST 49541 75703 – 2m Mist Net	 TR1a TR1b TR1c TR1d	18^0C Light breeze (1) 30% Cloud cover No PPT
24/06/15	21:30- 02:30	Near Wessex Water Building: ST 50098 75750 - Harp Trap ST 49955 75730 - Harp Trap ST 49941 75727 - Harp Trap	 TR2a TR2b TR2c	18^0C Light breeze (1) 60% Cloud cover No PPT
20/07/15	21:00- 02:00	Station Road, Sheepway ST 49360 75819 –Harp Trap ST 49337 75713 – Harp Trap ST 49603 75694 – Harp Trap ST 49541 75703 – 12m Mist Net	 TR3a TR3b TR3c TR3d	16^0C Light wind (2) 50% Cloud cover No PPT
22/07/15	21:00- 02:00	Portbury Common ST 48240 76097 – Harp Trap ST 48493 76003 – 9m Mist Net ST 48921 75855 – Harp Trap ST 49337 75713 – Harp Trap	 TR4a TR4b TR4c TR4d	15-16^0C Light wind (2) 25% Cloud cover No PPT
*Trapping survey ended for radio-tracking a captured bat + Weather conditions: PPT = Precipitation; Wind – Beaufort Scale given in Brackets				

Radio Telemetry

Following capture on the night of the 23 June 2015, a male greater horseshoe bat was fitted with a radio transmitter and subsequently tracked every night until the morning of the 27th June resulting in 3.5 nights of tracking data. The transmitter tag by Biotrack Ltd (Wareham, Dorset, United Kingdom) was fitted to the bat with Torbot skin bond adhesive. The bat was examined quickly and released 45 minutes after capture, once the glue attaching the transmitter had cured sufficiently.

The tagged bat was tracked using two to three Sika receivers (Biotrack Ltd., Wareham, United Kingdom) with 3 or 5-element Yagi antenna (Biotrack Ltd) following on foot or by vehicle. Triangulation methods were used to track the bat when it was distant and then when close contact was made the ''homing-in'' method was used to determine a more accurate position of the bat (White and Garrott, 1990).

During tracking the locations were recorded every 15-25 min when there was contact with the bat. If contact with the bat was lost because of the topography of the landscape (and fast flight of the bat) surveyors would move to a high vantage point to search for the animal. For each data point fix, the tracker location was recorded to an 8-figure grid reference (using a global positioning system) and the compass bearing of the direction of peak signal was taken.

Ranges 9 software (Anatrack Ltd) was used to calculate Minimum Convex Polygons (MCP) and cluster analysis to assess the greater horseshoe bat's home range area. 100% MCPs were used to show the area that the bat flew through during the entire tracking period, which shows the bat's 'outer range'. Cluster analysis for 50%, 75% and 100% of the locations was used to illustrate where the bat's activity over the tracking period was concentrated.

The radio tracking was undertaken by a team of four surveyors.

Bat Roosts in Structures

A habitat appraisal of the disused railway line in 2014 evaluated the potential for bat roosts in bridges and culverts. The initial survey considered opportunities for bats to shelter in crevices and cavities in the fabric of the structures. Close focusing binoculars were used to examine features at the top of bridges and a powerful Cluson Clulite torch with a 500m spot beam provided lighting for dark and shaded areas under the structures. Culverts were surveyed from the entrance of the structures.

The presence of bats can be detected from field signs (such as DNA analysis of droppings), but in the absence of evidence activity surveys are required. Industry standards (Hundt, 2012) advocate a level of survey effort that is proportional to the likelihood of bats being present. The conservation status of bat roosts can be evaluated from dusk emergence watches.

The criteria in Table 4 were used to assess the bat roost potential of features in the bridges and culverts.

Table 4. Categories for Bat Roost Potential in Structures

Category	Criteria
High	Large sheltered void or feature with space for several bats (c.10+ bats). Shelter provides stable temperatures and therefore potential for animals to thermoregulate (e.g. for breeding and/or hibernation). Located in a typical/ optimal location on the structure
Medium	Small features that would provide shelter for low numbers of bats, but collectively may be used by a colony. Small features located in a typical/optimal location on the structure.
Low	Small features with potential for solitary bats to shelter in summer, but the crevice or feature is unlikely to provide a stable roost climate.

Dusk emergence surveys of structures on the disused railway line identified as having bat roost potential were undertaken between June and September 2015. Details of the surveys are given in Table 5 and the location of the structures is shown on Figure 5.

Table 5. Dusk Emergence Surveys of Structures

Structure	Bat Roost Potential	Date	Sunset	Survey Period (hours)	Surveyors	Weather Conditions
B1	Low	22/09/15	19:10	1.75	TG, OC	14-15^{0}C 15% cloud, Light breeze (1) No PPT
B2	Moderate	30/06/15	21:31	2	TG, RP	14^{0}C 60% cloud, Light breeze (1) No PPT
		15/09/15	19:28	1.75	CG, RP	12-14^{0}C 100% cloud,

Structure	Bat Roost Potential	Date	Sunset	Survey Period (hours)	Surveyors	Weather Conditions
						Light breeze (1) No PPT
B3	Low	23/09/15	21:35	1.5	AK, RP	14-18^{0}C 35-40% cloud, Light breeze (1) No PPT
B4	Moderate	19/08/15	20:26	1.75	AK, RP	17^{0}C 100% cloud, Light wind(2-3), No PPT
		14/09/15	19:27	1.5	AK, RP	13^{0}C 100% cloud, Light breeze (1) Light, sporadic rain
B5	Low	12/08/15	20:48	2	AK, RP	21^{0}C 5% cloud, Light breeze (1) No PPT
B7	Low	21/09/15	19:15	1.5	CG, RP	13^{0}C 20% cloud, Light wind (1-2), No PPT
C3	Low	12/08/15	20:48	2	TG, OC	21^{0}C 5% cloud, Light breeze (1) No PPT
C4	Low	30/06/15	21:31	2	AK, OC	14^{0}C 60% cloud,

Structure	Bat Roost Potential	Date	Sunset	Survey Period (hours)	Surveyors	Weather Conditions
						Light breeze (1) No PPT

Surveyors
AK Anton Kattan MCIEEM licensed consultant ecologist with 14 years of experience with bats
RP Robert Pelc gradCIEEM licensed consultant ecologist with 3 years of experience with bats
TG Tracy Gray gradCIEEM licensed consultant ecologist with 4 years of experience with bats
CG Christopher Greenland an assistant ecologist with 1 year experience with bats
OC Owen Crawshaw gradCIEEM an assistant ecologist with 2 years of experience with bats

Weather conditions: PPT = Precipitation; Wind – Beaufort Scale given in Brackets

Surveyors were equipped with full-spectrum, frequency division or time-expansion recordable bat detectors. The Elekon BatloggerM, Pettersson D240x (with Roland Edirol digital recorded) and Anabat SD1 bat detectors were used.

Trees

The majority of the trees within the railway land of the disused railway line are young or semi-mature trees without bat roost potential. There were however mature trees at the boundary of the site with canopy cover over the railway line. These trees were inspected to assess the bat roost potential because it is possible they may be removed or reduced in size as part of the DCO Scheme.

In 2014, a walkover survey identified trees with obvious signs of damage. The assessment of these trees was carried out from the ground using close focusing binoculars to examine the upper parts of the trees. A Cluson Clulite with 500m spot beam was used to illuminate dark areas under the canopy and holes/crevices in the timber. The purpose of the ground-based assessment was to locate features in the tree that may provide shelter for bats. Examples of the type of features looked for include:

- Rot holes and cavities;
- Woodpecker holes;
- Splits and cracks in branches, such as storm damaged limbs;
- Loose bark;
- Thick-stem ivy;
- Twisted and entwined limbs.

Trees were graded high, moderate or low according to their potential to provide shelter for bats. The potential shelter for bats was assessed according to the condition of the tree, as described in Table 6.

Table 6. Categories for Trees with Potential Bat Roost Features

Category	Tree Condition
High	Veteran features and significant decay that may provide shelter for a colony of bats. Potential roost features that could provide protection in winter and may be used for hibernation. E.g. Woodpecker holes; dead wood with rot hole or split; split with sheltered cavity.
Medium	Damage and decay with a cavity space that could provide shelter for several bats. Potential for breeding bats to be present, but features are possibly too small or exposed to qualify as 'high'.
Low	Small features with potential for solitary bats to shelter in summer, but unlikely to provide protection against extreme weather conditions. Almost certainly unsuitable for breeding animals.

A further survey of trees with bat roost potential was carried out on the 11th and 12th March 2015. Eleven trees (shown on Figure 5) identified as having moderate to high bat roost potential were surveyed using roped access to climb and closely inspect cracks and holes in the trees. A high anchor point was established on the trees using ropes enabling each surveyor to ascend to the canopy and move into a suitable position to inspect features with bat roost potential. Areas showing signs of possible use by bats or having good roost potential were inspected in detail using a torch and flexible fibre-optic video endoscope. Typical signs of bat presence include bat droppings, urine spots, scratch marks, staining, feeding remains and the presence of bats themselves.

Standardised Static Automated Bat Detector Acoustic Monitoring 2016

An acoustic, static-automated bat detector ('datalogger') survey that can be replicated for monitoring the operational railway was undertaken in 2016. Five dataloggers were deployed at ten fixed locations each month. The datalogger locations are listed in Table 7a and shown on Figure 3.

Standardised acoustic monitoring was undertaken using Wildlife Accoustic's latest generation of full spectrum, realtime dataloggers, the SM4BAT-FS. The SM4BAT-FS captures 16-bit full spectrum recordings, recording data on an SDHC card.

Each datalogger unit was programmed to be active each night between dusk and dawn and recorded over the periods shown in Table 7b.

The dataloggers are triggered by the bat's (ultrasonic) echolocation call and record continuously over the duration of bat activity. The recordings captured by the SM4BAT-FS were analysed using Kaleidoscope Pro software, by Wildlife Accoustic. This information was used to produce a database of bat activity along the disused railway line throughout the April - September study period. Using this high-resolution database, it is then possible to calculate a bat activity index (BAI) for a range of spatial and temporal bandwidths for lesser and greater horseshoe bats.

Table 7a.Datalogger Locations for Standardised Monitoring in 2016

Location	**Section of Disused Railway Line***	**NGR**
1a	Portished	ST48010 76175
2a	Farmland	ST48739 75910
3a	Farmland	ST49725 75702
4a	Royal Portbury Dock	ST50549 75928
5a	Royal Portbury Dock	ST51425 76210
1b	Portbury Common	ST48406 76028
2b	Farmland	ST49315 75729
3b	Royal Portbury Dock	ST50186 75778
4b	Royal Portbury Dock	ST50885 76035
5b	Royal Portbury Dock	ST51857 76292
*Refer to Section 2.1 of the report.		

Table 7b. Deployment of Dataloggers in 2016 for Standardised Monitoring

Location	**Month**	**Start Date**	**End Date**	**No Of Nights**
1a – 5a	April	26/04/16	06/05/16	10
	May	16/05/16	23/05/16	7
	June	06/06/16	13/06/16	7
	July	18/07/16	25/07/16	7
	August	16/08/16	22/08/16	6

Location	Month	Start Date	End Date	No Of Nights
	September	19/09/16	26/09/16	7
1b -5b	April	06/05/16	16/05/16	10
	May	23/05/16	30/05/16	7
	June	13/06/16	20/06/16	7
	July	25/07/16	01/08/16	7
	August	22/08/16	29/08/16	7
	September	26/09/16	03/10/16	7

4.4 Portbury Freight Line Tunnels

Overview

To investigate the use by bats of tunnels on Portbury Freight line for roosting and swarming a combination of trapping surveys, observation watches and datalogger monitoring was used. The methodology was developed with consideration to access limitations associated with surveying an active railway line. Notably, trapping surveys close to tunnel portals were undertaken in 2015 were in response to restrictions that prevented dusk exit watch surveys. Improved access on the railway line in 2016 allowed traps to be erected at the tunnel portals and two dusk surveys during the bat breeding were undertaken.

Trapping Surveys

The primary purpose of the trapping surveys between June and August was to determine if there are maternity roosts in any of the tunnels. In 2015, mist nets and harp traps were deployed in woodland near the tunnel portals to capture bats so that breeding female bats could be fitted with radio transmitters and tracked to determine if they were roosting in the tunnels. In 2016, mist nets and harp traps were erected at the tunnel portals to capture bats that emerge from roosts within the tunnels.

Surveys in September 2015 monitored the tunnels during the mating season. Captured bats were examined to determine species, sex and breeding status.

Woodland trapping methods (used in 2015) are described in Section 4.3.3. In 2016, mist nets and harp were erected across the tunnel portals to intersect animals emerging from within the structures. Sussex Autobat acoustic lures were not used at traps erected at the tunnel portals. Details of the trapping surveys at the tunnel are provided in Table 8.

Table 8. Trapping Surveys at Tunnels on Portbury Freight Line

Date	**Trapping Location**	**Distance from Portal**	**Time**	**Weather+**
22/06/15	*Clifton 1* Harp Trap at ST 56304 73206 6m Mist net at ST 56402 73088	 10m 140m	21:30-01:00	14^{0}C Light breeze (1) 5% cloud No PPT
	Clifton 2 Harp Trap at ST 56176 73555 Harp Trap at ST 56195 73496	 10m 50m	21:30-01:00	14^{0}C Light breeze (1) 5% cloud No PPT
21/07/15	*Pill* 6m Mist Net at ST 53355 75520 6m Mist Net at ST 53355 75493	 25m 40m	21:00-02:00	17^{0}C Light breeze (1) 50% cloud No PPT
	Clifton 2 Harp Trap at ST 56176 73555 Harp Trap at ST 56167 73549	 10m 30m	21:00-02:00	17^{0}C Light breeze (1) 50% Cloud cover No PPT
23/07/15	*Sandstone* Mist net at ST 54967 75007 Mist net at ST 54973 74995 Mist net at ST 54908 75074	 15m 20m 10m	21:00-01:30	18^{0}C Light breeze (1) 80% cloud No PPT
	Clifton 2 2 Harp Traps at ST 56050 74274	 350m	21:00-01:30	18^{0}C Light breeze (1) 80% cloud No PPT
27/07/15	*Pill* 6m Mist Net at ST 53355 75520 6m Mist Net at ST 53355 75493	 25m 40m	21:00-01:00	16^{0}C Light breeze (1) 100% cloud Light rain
	Clifton 1 2 Harp Traps at ST 56304 73206	 10m	21:00-01:00	16^{0}C Light breeze (1) 100% cloud

Date	Trapping Location	Distance from Portal	Time	Weather+
				Light rain
17/09/15	*Pill* 6m Mist Net at ST 53355 75520 6m Mist Net at ST 53355 75493	 25m 40m	19:30-01:15	15^{0}C Light breeze (1) 90% cloud No PPT
	Clifton 2 Harp Trap at ST 56176 73555 Harp Trap at ST 56167 73549	 10m 30m	19:30-01:30	15^{0}C Light breeze (1) 90% cloud No PPT
21/09/15	*Sandstone* Mist net at ST 54967 75007 Mist net at ST 54973 74995 Mist net at ST 54908 75074	 15m 20m 10m	19:00-00:40	14^{0}C Light breeze (1) 80% cloud No PPT
02/06/16	Clifton 1 portals –harp traps Clifton 2 portals – harp traps Sandstone portals –mist nets Pill portals –mist nets	0m 0m 0m 0m	20:45-00:10	12^{0}C Light breeze (1) 100% cloud No PPT
17/08/16	Clifton 1 portals –harp traps Clifton 2 portals – mist nets Sandstone portals –mist nets Pill portals – harp traps	0m 0m 0m 0m	20:00-23:00	21^{0}C Light breeze (1) 100% cloud Light rain at 21:30hrs
+PPT= Precipitation Wind – Beaufort Scale given in Brackets				

Static Automated Bat Detectors

Static-automated bat detectors ('dataloggers') were deployed in tunnels on the Portbury freight line from the 19th August to 15th October to monitor for swarming activity.

Two dataloggers were placed in the tunnels to monitor activity at each portal[1]. The dataloggers were positioned approximately 10m from the portal entrance. Each datalogger unit was programmed to be active each night between dusk and dawn and recorded over the periods shown in Table 9.

The recordings captured by the SM2BAT were analysed using Kaleidoscope Pro software, by Wildlife Accoustic. The Anabat zero-crossing files were analysed using and AnalookW software.

Table 9. Deployment of Dataloggers in Tunnels on Portbury Freight Line

Tunnel	**Portal**	**Datalogger**	**Start Date**	**End Date**	**No. Nights Monitoring**
Clifton 1	NW	SM2BAT	19/08/15	24/08/15	6
Clifton 1	SE	AnabatSD1	19/08/15	24/08/15	6
Clifton 2	N	SM2BAT	19/08/15	24/08/15	6
Clifton 2	S	SM2BAT	19/08/15	24/08/15	6
Sandstone	NW	SM2BAT	25/08/15	31/08/15	7
Sandstone	SE	AnabatSD1	25/08/15	31/08/15	7
Pill	W	SM2BAT	25/08/15	31/08/15	7
Pill	E	SM2BAT	25/08/15	31/08/15	7
Clifton 1	NW	SM2BAT	01/09/15	08/09/15	8
Clifton 1	SE	SM2BAT	01/09/15	08/09/15	7
Clifton 2	N	AnabatSD1	01/09/15	08/09/15	8
Clifton 2	S	SM2BAT	01/09/15	08/09/15	8
Sandstone	Middle	SM2BAT	09/09/15	15/09/15	7
Pill	W	AnabatSD1	09/09/15	15/09/15	7
Pill	E	SM2BAT	09/09/15	15/09/15	6
Clifton 1	NW	AnabatSD1	16/09/15	21/09/15	6
Clifton 1	SE	SM2BAT	16/09/15	21/09/15	6
Clifton 2	N	SM2BAT	16/09/15	21/09/15	6
Clifton 2	S	SM2BAT	16/09/15	21/09/15	6
Sandstone	NW	SM2BAT	22/09/15	27/09/15	5
Sandstone	SE	SM2BAT	22/09/15	27/09/15	5
Pill	W	AnabatSD1	22/09/15	27/09/15	5

[1] Due to a datalogger failure, only one unit was deployed in Sandstone tunnel on the 9th September 2015

Tunnel	Portal	Datalogger	Start Date	End Date	No. Nights Monitoring
Pill	E	SM2BAT	22/09/15	27/09/15	5
Clifton 1	NW	SM2BAT	28/09/15	08/10/15	6
Clifton 1	SE	SM2BAT	28/09/15	08/10/15	7
Clifton 2	N	AnabatSD1	28/09/15	08/10/15	10
Clifton 2	S	SM2BAT	28/09/15	08/10/15	10
Sandstone	NW	SM2BAT	09/10/15	15/10/15	6
Sandstone	SE	SM2BAT	09/10/15	15/10/15	6
Pill	W	AnabatSD1	09/10/15	15/10/15	6
Pill	E	SM2BAT	09/10/15	15/10/15	6

Tunnel Observations

Visual surveys of the tunnels were undertaken in September and October to investigate bat activity and swarming behaviour by bats within the structures.

Surveyors were equipped with an Elekon BatloggerM (full spectrum), Anabat SD1 (frequency division) or Pettersson D240x (time expansion) bat detectors to record activity at the tunnels. The surveys recorded the bat species encountered and observations on the level and type of bat activity were recorded according to the criteria listed in Table 10.

Table 10. Criteria for Recording Bat Activity at Tunnels on Portbury Freight Line

Level of Activity	Criteria
High	Constant or almost constant (c.80% of the time) with the species likely to be present in the immediate vicinity of the swarming site
Moderate	Regular but intermittent with the species present for at least 50% of the time
Low	Species recorded infrequently
None	No bat activity recorded over the observation interval
Type of Behaviour	
Swarming	Several bats gathered, displaying distinctive circling flight patterns within close proximity the tunnel portal
Social	Low numbers of bats interacting in flight, possibly with social calls
Foraging	Hawking flight behaviour and/or feeding buzzes

Level of Activity	Criteria
Commuting	Direct flights through the observation area (without immediate return)

The protocol for observation watches was developed with consideration to time restrictions required for access on to the railway (discussed further in Section 4.8).

Tunnel watches commenced 2 hours after sunset with a survey period of 2-2.5 hours. One surveyor was allocated to each tunnel and undertook 15 minute observations at the tunnel entrances, alternating between portals for each consecutive observation interval. Details of the tunnel surveys are given in Table 11.

Table 11. Tunnel Observations in Autumn 2015

Tunnel	Date	Sunset	Start Time	End Time	Surveyor	Weather Conditions
Clifton 1	22/09/15	19:10	21:45	00:00	AK	15^0C 15% cloud No wind (0) No PPT
Clifton 2	22/09/15	19:10	21:50	00:20	RP	15^0C 15% cloud No wind (0) No PPT
Sandstone	28/09/15	19:00	22:45	00:45	RP	12^0C 75% cloud Light breeze (1) No PPT
Pill	28/09/15	19:00	22:30	00:15	AK	12^0C 75% cloud Light breeze (1) No PPT
Clifton 2	08/10/15	18:31	00:40	02:55	TG	9^0C 20% cloud No wind (0) No PPT
Sandstone	08/10/15	18:31	01:00	02:55	AK	9^0C 20% cloud No wind (0)

Tunnel	Date	Sunset	Start Time	End Time	Surveyor	Weather Conditions
						No PPT
Clifton 1	09/10/15	18:30	01:00	02:30	AK	9^{0}C No cloud No wind (0) No PPT
Pill	09/10/15	18:30	01:30	02:30	RP	9^{0}C No cloud No wind (0) No PPT

Surveyors
AK Anton Kattan MCIEEM licensed consultant ecologist with 14 years of experience
RP Robert Pelc gradCIEEM licensed consultant ecologist with 3 years of experience
TG Tracy Gray gradCIEEM licensed consultant ecologist with 4 years of experience

Weather conditions: PPT = Precipitation; Wind – Beaufort Scale given in Brackets

Daytime Inspection of Tunnels

On the 15th October a daytime inspection of the tunnels was undertaken by Anton Kattan MCIEEM and Clare Williams MCIEEM. The four tunnels on the Portbury Freight line were inspected internally (from the ground) to look for crevices and internal voids that could provide shelter for bats. Close-focusing binoculars and a powerful Clulite torch with a 500m spot beam were used.

Droppings were collected for species identification by DNA analysis. The droppings were sent to Dr. Robin G Allaby at Warwick University School of Life Sciences.

4.5 Pill Station (Disused Platform)

There are two stone arches in a stone retaining wall on the disused platform at Pill Station, shown on the photograph Plate 1. The location of Pill station is shown on Figure 1b. The larger arch (named Arch 1) at the eastern end of the platform is a former store and has a height from floor to ridge of 2m, and a floor plan approximately 3 sqm. A smaller arch (named Arch 2) to the west is 1.25m high, 2m wide and extends back into the stone wall 2.5m. The floor of the arches were earth.

A daytime inspection of the arches was undertaken on the 18th July 2016 by Anton Kattan. An SM2BAT remote, unattended bat detector recording unit was deployed in the each of the arches to monitor the known and potential roost sites. The units were placed at the rear of the arches to minimize the risk of recording bat activity outside and were programmed to record from 1 hour before sunset until 1 hour after

sunrise on a nightly basis. The units were deployed on the 18th July 2016 and monitored bat activity for seven nights. The primary objective was to monitor the structure for horseshoe bats (*Rhinolophus* sp.).

Plate 1. Arches on Pill Station Platform

A dawn survey was undertaken on the 28th September 2016. Two surveyors were positioned on the platform to watch for bats returning to the arches. Details of the dawn survey are given in Table 12.

Table 12. Dawn Survey Pill Station

Date (2016)	**Sunrise (hrs)**	**Survey Period (hrs)**	**Surveyors**	**Weather Conditions**
28t Sept	07:04	05:00-07:10	AK, RP	15^{0}C 10% cloud, Light wind (2) No PPT
Surveyors **AK** Anton Kattan MCIEEM licensed consultant ecologist with 14 years of experience with bats **RP** Robert Pelc gradCIEEM licensed consultant ecologist with 3 years of experience with bats Weather conditions: PPT = Precipitation; Wind – Beaufort Scale given in Brackets				

Surveyors were equipped with Elekon BatloggerM full spectrum bat detectors.

4.6 Avon Road Bridge

A footpath underbridge at ST 52101 76251 between Avon Road and Lodway Close in Pill was assessed as having low bat roost potential because there are gaps between the concrete deck and bridge abutments. The structure, referred to as Avon Road Bridge was surveyed in July and September 2016 for roosting bats, details of which are given in Table 13.

Table 13. Dusk Surveys of Avon Road Bridge

Date (2016)	**Sunset (hrs)**	**Survey Period (hrs)**	**Surveyors**	**Weather Conditions**
12 July	21:23	21:15-22.55	AK, RP	18^0C 30% cloud, Light wind (1) No PPT
13 Sept	19:28	19:13-20:45	AK, RP	21^0C 90% cloud, Light wind (1) No PPT
Surveyors **AK** Anton Kattan MCIEEM licensed consultant ecologist with 14 years of experience with bats **RP** Robert Pelc gradCIEEM licensed consultant ecologist with 3 years of experience with bats Weather conditions: PPT = Precipitation; Wind – Beaufort Scale given in Brackets				

4.7 Evaluation

In order to evaluate the importance of ecological features identified in the desk study and field surveys, a set of standard measures are outlined in guidance produced by the Institute of Ecology and Environmental Management (2016). For each site, habitat and species/assemblages, a summary grade is determined based on the levels of value recommended in the guidance. This places the importance of each feature in a geographical context, using the following hierarchy:

- International;
- National (i.e. England);
- Regional
- County;
- District (or Unitary Authority, City or Borough);
- Local (or Parish);

- Site – within the immediate zone of influence only (the development site and surroundings).

Where possible, formal criteria are used to set features of conservation importance within this geographical context. For example, the Guidelines for the Selection of Biological SSSIs (Nature Conservancy Council, 1989) can be used as a basis for the assessment of features at a National level. Similarly, published guidelines for the selection of SINCs (Sites of Importance for Nature Conservation) can be used as the basis for assessing features of county level importance.

The significance of bat populations has been determined using the principles described in the IEEM *Guidelines for Ecological Impact Assessment in the United Kingdom* (2006). Particular consideration has been given to their distribution and rarity at different geographical levels. For this assessment, reference has been made to:

- The UK Post 2010 Biodiversity Framework (published 2012);
- UK Biodiversity Action Plan[2];
- North Somerset Local Biodiversity Action Plan;
- Distribution Atlas of Bats in Britain and Ireland 1980-1999 (Richardson, 2000);
- Mammals of the British Isles Handbook (Harris and Yalden, 2008);
- The State of the UK's Bats: National Bat Monitoring Programme Populations Trends 2011 (www.bats.org.uk)

4.8 Deviations, Constraints and Limitations

Overview

The methodology adopted for the study has established 2 years of baseline for the the DCO Scheme (MetroWest Phase 1). The study has been undertaken with an emerging scheme design and the scope of bat work has developed as the brief for environmental impact assessment progressed. In conjunction with standard surveys recommended by current industry recognised guidelines (published by the Bat Conservation Trust (Hundt, 2012 and Collins, 2016)), advanced survey methods trapping and radio-tracking bats were employed following the discovery of lesser and greater horseshoe bats during surveys at the end of 2014.

[2] The UK BAP has been superseded by the UK Post-2010 Biodiversity Framework, but many of the tools developed under UK BAP remain of use, including background information about the lists of priority species.

Portbury Freight line is an active railway line and survey methodologies were adapted to take consideration of track safety requirements. To assess the presence or likely absence of breeding roosts in tunnels, trapping surveys close to tunnel portals were used as an alternative to roost exit watches in 2015. Breeding females (of target species) could be radio-tracked to maternity roosts. It is accepted that identifying roosts using this method is more successful near large roosts and more surveys in 2016 with track provided more detailed information on roosts in tunnels.

Where data are limited by the timescale of the study, a precautionary baseline has been built up for subsequent assessment and monitoring during the design and implementation.

Walked Transects

Bat surveys commenced in August 2014 prior to vegetation clearance on the disused railway line. Sections of the route were inaccessible because of dense, continuous bramble scrub. Walked transects between August and October 2014 deviated from the DCO Scheme alignment, but in 2015 the site was cleared and continuous transects along the disused railway line were undertaken between May 2015 and the end of April 2016.

Weather conditions during October 2014 were inclement and the survey on the 20th October was repeated on the 21st October due to heavy rain.

Trapping Surveys

Trapping surveys using harp traps and mist nets are most effective in woodland and sheltered surroundings where bats must navigate cluttered environments and traps can be placed over gaps on flight paths. The disused railway line is a relatively open environment and the trapping was restricted to sheltered areas such as the bridges and areas with mature trees. Acoustic lures are an effective way of increasing capture rates and were used to improve success trapping in the open environment.

Bat Detectors and Datalogger Units

The capabilities of bat detectors vary and the performance of units is not directly comparable. New generations of bat detectors have been developed each year and the lastest systems were used. The systems used for the DCO Scheme were:

- Elekon BatloggerM – a realtime, full-spectrum detector with 312.5 kHz sampling rate.
- Wildlife Acoustic SM4BAT FS – a realtime full spectrum detector with 384kHz sampling rate that captures 16-bit WAV recordings that can be analysed using sound analysis software. SM4BAT FS units were fitted with SMM-U1 omnidirectional microphones.
- Wildlife Acoustic SM2bat – a realtime, full-spectrum detector with 384kHz sampling rate. The SM2bat units were fitted with a SMX-U1 or SMX-UT omnidirectional microphone.
- Titley Anabat SD2 – a frequency division detector with Zero-Crossings Analysis Interface Module hardware.

Wildlife Acoustic's Kaleidoscope Pro 3 analysis software was used for species identification. The software runs a classifier that filters the bat calls in to species groups.

Kaleidoscope Pro 3's classifier was used to sort large batches of data collected on dataloggers into species groups. The bat calls were then verified manually measuring characteristic call parameters such as peak frequency, call duration and interpulse interval.

Static automated bat detectors can capture considerable datasets of common pipistrelle bats. Large datasets of common pipistrelle calls were reviewed by sampling 25% of the data to look for other bat species in the set.

Identification of bat species in the genus *Myotis* sp. cannot be made with confidence because of overlap and similarities in their call parameters.

Standardised Datalogger Monitoring

The standardised datalogger monitoring used fix point locations for monthly monitoring. The exact location for the dataloggers was determined by the availability of trees and structures on which to attach the units. The track was monitored from a single vantage point and positioned to detect bats using the centre of the railway corridor. The datalogger units have omnidirectional microphones, but where bats may deviate from the railway track the units may not detect their echolocation calls.

Tunnel Surveys

Track access to Portbury Freight line required the line to be blocked to prevent train movements during the surveys. Arrangements for track access (for observations)

during autumn swarming surveys at tunnels delayed the survey start time and the duration of the surveys was limited to approximately 2 hours, rather than the recommended 4 hour duration (Hundt, 2012). However, the surveys started approximately 2 hours after sunset and covered optimal survey times.

In addition to observational surveys, static automated bat detectors were deployed in the tunnels. Two units were deployed in each tunnel for the monitoring period. Over the survey period, one datalogger failure to operate occurred on the 9th October at Sandstone tunnel.

5 Baseline

5.1 Ecological Context

The landscape surrounding the DCO Scheme supports a number of woodlands that are within designated conservation areas for nature conservation. The DCO passes through the Avon Gorge Woodlands Special Area of Conservation (SAC), with the disused railway line ending approximately 3km west of the designated area. The Avon Gorge Woodlands are a stronghold for lesser and greater horseshoe bats. Ashton Court Site of Scientific Interest (SSSI), with parkland and woodland is situated 1.2km south of the Portbury Freight line and 4.5km south-east of the disused railway line. Ashton Court SSSI is an important site for bats and supports a large lesser horseshoe maternity roost in Clarkencombe Lodge. A radio-tracking study of lesser horseshoe bats from Clarkencombe Lodge in 2008 (by Greena Ecological Consultancy) identified key foraging areas in Abbots Leigh, which is approximately 3km east-south-east from the disused railway line.

Lesser and greater horseshoe bats are qualifying features of the North Somerset and Mendip Bats SAC, which comprises component SSSI's within the Mendips and the north Somerset hills that provide a range of important breeding and hibernation sites for lesser horseshoe bat and greater horseshoe bat. Of particular note for this study is Brockley Hall Stables SSSI, which supports a greater horseshoe maternity colony. Brockley Hall Stables are approximately 9km south-west of the DCO Scheme (at NGR ST471696).

North Somerset supports a diverse assemblage of British bat species and BRERC holds a number of bat roost records within approximately 2.5km of the DCO Scheme, as shown in Table 14.

Table 14: Summary of BRERC Bat Roosts within Approximately 2.5km

Bat Species	Roost Count*	Date	Grid Reference	Approximate Distance (km)
Lesser Horseshoe Bat	1	2008	ST5273	2.5
Greater Horseshoe	1	1996	ST4574	2.5
Pipistrelle sp.	97	1993	ST4677	1
	80	1994	ST4675	1
	1	2010	ST5376	1
Common Pipistrelle	2	2004	ST4675	0.8
Brown Long-eared	1	2009	ST5075	0.7
Noctule	1	2002	ST4773	>2.5
Noctule	1	2009	ST5075	0.7
Serotine	1	2002	ST4773	2.5
* Roost Count – a record of number of bats recorded at a given roost				

Avon Wildlife Trust hold bat records for bats at Portbury Wharf Nature Reserve, with the following records obtained since 2010:

Roosts	Lesser horseshoe
	Soprano pipistrelle
	Common pipistrelle
	Common pipistrelle
Foraging Activity	Soprano pipistrelle
	Nathusius' pipistrelle
	Noctule
	Serotine
	Brown long-eared
	Myotis spp. (at least 3 species)

5.2 Bat Activity on the Disused Railway Line

The following bat species were recorded on, or immediately adjacent to the disused railway line during walked transects, static automated bat detector ('dataloggers') monitoring and trapping surveys:

- Greater horseshoe bat *Rhinolophus ferrumequinum*;
- Lesser horseshoe bat *Rhinolophus hipposideros;*
- Serotine bat *Eptesicus serotinus*;
- Leisler's bat *Nyctalus leisleri;*
- Noctule bat *Nyctalus noctula;*
- Common pipistrelle *Pipistrellus pipistrellus;*
- Soprano pipistrelle *Pipistrellus pygmaeus*;
- Nathusius' pipistrelle *Pipistrellus nathusii;*
- Brown long-eared bat (*Plecotus auritus*);
- *Myotis* sp.

Walked Transects

August to October 2014

The species recorded on the disused railway line between August and October 2014 on transect walks are listed below, with an overview of the activity in late summer and autumn. Common pipistrelle bats were recorded in all four sections of the disused railway line (defined in Section 2.1) during walked transects and the distribution other bat species is shown on Figures 6a and 6b.

Bat species	Comments
Lesser horseshoe bat	Lesser horseshoe bats were at Portbury Common in August and September, where they appear to be foraging.
Greater Horseshoe bat	Recorded at Portbury Common in August and at the Royal Portbury Dock in August and September.
Myotis species	Recorded at Portbury Common in August. Recorded from the Royal Portbury Dock and to the east of the farmland in September.
Soprano pipistrelle bat	A low to moderate level of activity along the disused railway line, but the distribution of activity appeared patchy. The highest levels of activity were recorded at Royal Portbury Dock and Portbury Common.

Bat species	Comments
Common pipistrelle bat	Recorded at most of the walked transect stops, common pipistrelle bats are considered to be present along the entire length of the disused railway line.

May 2015 to April 2016

Following vegetation clearance along the disused railway line in 2015 a standardized transect route for the walked transects was established. The transect route followed the track alignment with 10 transect listening station stops, as shown on Figure 2b.

The level of activity recorded at transect stops within each section of the disused railway line is characterised according to the following categories:

High	Constant foraging activity or flight behaviour by several bats.
Moderate	Regular passes and foraging activity.
Low	Occasional bat passes or foraging by a single bat.
None	No bat activity.

The results of the monthly transect surveys are presented in Appendix 1 and the distribution of uncommon and rare bat species are illustrated on Figures 7a-c. Common pipistrelle and soporano pipistrelle occurred along the entire transect route and therefore distribution maps for these species are not required.

Static Automated Bat Detectors on the Disused Railway Line 2014 and 2015

Static automated bat detectors ('dataloggers') provide long-term monitoring of the disused railway line between August 2014 and August 2015. Between two and three dataloggers were deployed each month and the rare or uncommon species recorded in each section of the disused railway line are summarized in Table 15. A detailed account of all species by month and datalogger location is provided in Appendix 2. The location of the dataloggers is shown on Figure 3.

Table 15. Number of Nights that Uncommon and Rare Species were Recorded on Sections of the Disused Railway Line by Static Automated Bat Detectors in 2014 and 2015.

Location	**Total No. of Nights**	**Number of Nights Species were Recorded**								
		Pn	**Pa**	**Msp**	**Nl**	**Nn**	**Es**	**Nl/Nn or Es**	**Rh**	**Rf**
Royal Portbury Dock	92	2	1	37	16	50	13	43	17	28
Portbury Common	42	5	7	21	2	12	4	7	6	6
Farmland	79	5	18	53	13	35	19	49	15	36
Total	213	12	26	111	31	97	36	99	38	70
Notes Species key – Pn Nathusius' pipistrelle (*P. nathusii*); Pa Long-eared (*Plecotus sp.)*Msp (Myotis sp); Nl Leisler's (*Nyctalus leisleri)* Nn Noctule (*Nyctalus noctula*); Es Serotine (*Eptesicus serotinus)* Rh Lesser horseshoe (*Rhinolophus hipposideros*); Rf Greater horseshoe (*Rhinolophus ferrumequinum*).										

The data from the static bat detectors were interrogated to determine the frequency species occurred on the disused railway line between August 2014 and August 2015. The approximate time after sunset[3] bats were recorded on the disused railway line was calculated because this can provide an estimate of the time since emergence (from a day roost) the bat activity occurred.

The results of the monthly datalogger monitoring are presented in Appendix 2 and are summarized in Table 16. The assemblage of rare and uncommon bats recorded at datalogger locations along the disused railway line is illustrated on Figures 7a-c.

Table 16. Summary of Datalogger Results for Rare and Uncommon Bat Species in 2014 and 2015

Bat Species	**Datalogger Location (Figure 3)**	**Earliest Registration of the bat Species**		
		Date	**Time after sunset (hrs:mins)**	**Location (Figure 3)**
Lesser horseshoe	S1a, S1b, S2a S3 S4 S5a	28/08/14	01:08	S1b Portbury Common

[3] The calculation of time after sunset is approximate to within 15 minutes.

Bat Species	**Datalogger Location (Figure 3)**	**Earliest Registration of the bat Species**		
		Date	**Time after sunset (hrs:mins)**	**Location (Figure 3)**
	S6a, S6b S7a S9b S8a S10a S11a S12a			
Greater horseshoe	S1a S2b S3 S5a S6a, S6b S7a S8a, S8b S9a, S9b S10a, S10b, S10c S11a, S11b, S11c S12b, S12c	29/07/15	00:41	S11a Royal Portbury Dock
Noctule	S1a S2b S5a S6a, S6b S7a, S7b S8a, S8b S9a S10a, S10b, S10c S11a, S11b S12a, S12b, S12c	09/4/15 18/05/15 31/05/15	00:00 00:00 00:00	S2b, S6b, S7b Royal Portbury Dock
Leisler's	S6b S7b S8b	21/05/15	00:10	S6b Royal Portbury Dock

Bat Species	Datalogger Location (Figure 3)	Earliest Registration of the bat Species		
		Date	Time after sunset (hrs:mins)	Location (Figure 3)
	S9b S10b, S10c			
Serotine	S6b S7b S8b S9b S10b, S10c S11b, S11c S12b,S12c	30/06/15	00:12	S9b Farmland
Myotis sp.	S1a, S1b S2b S5a S6a, S6b S7a, S7b S8a, S8b S9a S10a, S10b, S10c S11a, S11b, S11c S12a, S12b, S12c	28/08/14	00:30	S1b Portbury Common
Nathusius' pipistrelle	S8b S9b S10b, S10c	12/07/15	00:39	S10b Portbury Common

Trapping

Four nights of trapping on the disused railway line were undertaken in June and July 2015. The primary objective was to capture lesser or greater horseshoe bats for radio-tracking. The trapping survey captured one male greater horseshoe bat on the 23rd June. The results of the subsequent radio tracking study are presented in Section 5.2.4.

The trapping surveys were also aimed at identifying breeding colonies that may be using the railway line. The capture results shown in Table 17 confirm that brown

long-eared bats and common pipistrelle bat maternity sites are close to the disused railway line with animals being caught on Portbury Common and farmland near Sheepway. No rare or uncommon breeding female bats were caught.

Table 17. Trapping Survey Results on the Disused Railway Line

Date	**Time (hrs)**	**Location & Trapping Site Ref***	**Species**	**Sex**	**Age**	**Breeding Status**
23/06/15		Station Road, Sheepway				
	22:15	TR1a	Pa	F	A	Non-breeding
	22:15	TR1c	Pa	F	A	Pregnant
	22:55	TR1a	Ppyg	M	A	-
	23:15	TR1d	Pp	M	A	-
	00:20	TR1c	Ppyg	M	A	-
	01:15	TR1b	**Rf**	**M**	**A**	-
24/06/15		Wessex Water Building, off Portbury Hundred				
	23:45	TR2a	Pp	M	A	-
	00:22	TR2a	Ppy	M	A	-
20/07/15		Station Road, Sheepway				
	23:58	TR3a	Ppy	M	A	-
22/07/15		Portbury Common				
	22:00	TR4b	Pp	M	A	-
	22:15	TR4b	Pp	F	A	Lactating
	22:40	TR4b	Nn	M	A	-
	22:45	TR4b	Nn	M	A	-
	23:00	TR4b	Pa	F	A	Lactating

Notes
*Trapping sites shown on Figure 2b
Species key –Pp Common pipistrelle (*P. pipistrellus*); Ppy Soprano pipistrelle *(P.pygmaeus);* Pa Long-eared (*Plecotus sp.)* Nn Noctule (*Nyctalus noctula*); Rf Greater horseshoe (*Rhinolophus ferrumequinum*).
Rf - bold font denotes radio transmitter fitted.
M – Male; F - Female
A – Adult; J – Juvenile

A total of 14 bats and five species were caught during the four nights of trapping on the disused railway line. In addition to the rare greater horseshoe bat, the survey recorded noctule bats, which are considered to be an uncommon species. Common

pipistrelle, soprano pipistrelle and brown long-eared bats are all common and widespread species.

Greater Horseshoe bat Radio-tracking Study

A male greater horseshoe bat was captured on the 23rd June 2015 at NGR ST 49337 75713 where the disused railway line passes through a farmland landscape.

The greater horseshoe bat was fitted with a radio-transmitter (Tag number 2742) and was subsequently tracked every night until the morning of the 27th June, providing 3.5 nights of tracking data.

The bat was initially tracked west and south of the capture location, until the signal was lost south of the M5. A search of the area on the 24th June relocated the bat in the Wraxall area where it returned to roost in an outbuilding in the village of Wraxall.

The following night, the bat emerged at approximately 22:15hrs and flew in woodland/pasture to the north of Wraxall and then various habitats to the north and east of the town of Nailsea. It roosted in an outbuilding within a complex of farm buildings at Deerhurst Farm. This second roost location is south of Nailsea.

On the 26th June, the bat emerged at 22:21hrs and moved along the river corridor to the south and east of Nailsea and in the Wraxall area. The river corridor is characterised by damp, grazed pasture with tree lines and hedges. On the morning of the 27th June the bat roosted in a new location in outbuildings at Brockley Hall SSSI, which is part of the North Somerset and Mendip SAC. Brockley Hall supports a greater horseshoe bat maternity roost and the species is a qualifying feature of the North Somerset and Mendip SAC.

Minimum Convex Polygons (MCP) and cluster analysis showed that the greater horseshoe bat's home range area was 1858.5 ha with a range span of 9.2km. This was also the maximum distance from the capture location. This radio-tracking data are summarised below:

Date Captured	23rd June 2015
Capture Location	NGR ST 49337 75713, approximately 230m from Station Road.
Duration of tracking survey	3.5 days
Number of tracking fixes	61

Maximum distance travelled in one night	5.1km
Home Range Area	1858.5 ha
Range Span (and distance from disused railway)	9.2km

Figures 4a-4c illustrate the bat's home and core ranges in relation to the DCO Scheme. The greater horseshoe bats "outer range" is shown on Figure 4a by the 100% MCP. Cluster analysis for 50% and 75% of the locations on Figure 4b shows where the bat's activity was concentrated over the survey period. Figure 4c provides a representative view of how the bat used the landscape.

5.3 Standardised Static Automated Bat Detector Acoustic Monitoring 2016

The acoustic monitoring at 10 locations along the disused railway line in 2016 provides standardised baseline data of lesser and greater horseshoe bat activity. Data recovered from the five data loggers can be used to generate a database that records the activity of these species at the 10 locations along the line between April and October in 2016 and the survey can be repeated each year thereafter to monitor changes to the railway.

The data loggers provide raw data in the form of individual sound files with a maximum duration of 15 seconds each. The analysed bat calls (using the *Kaleidoscope* software) produce data giving the date, time, location and species of all bat echolocation detected.

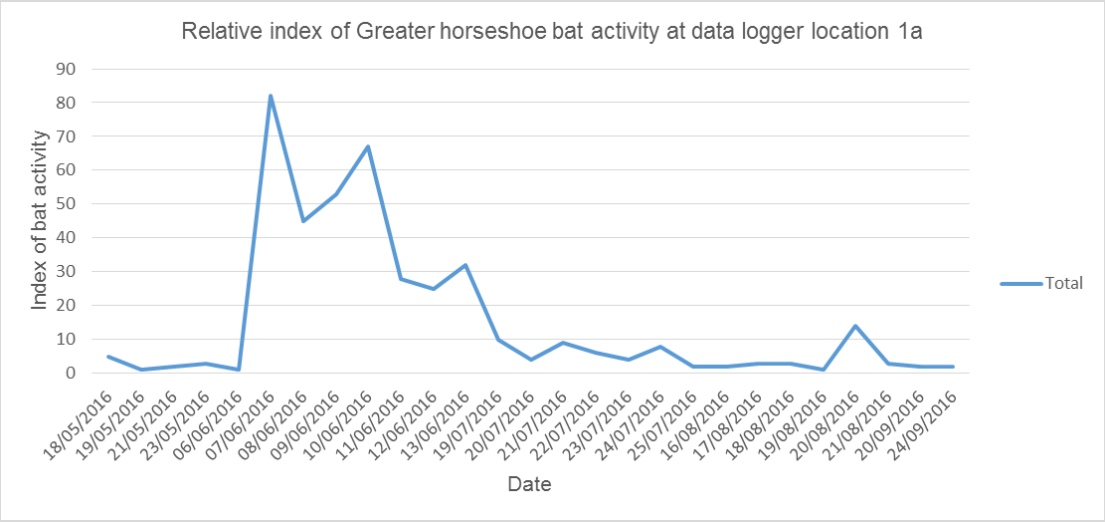
The data loggers provide raw data in the form of individual sound files with a maximum duration of 15 seconds each. Sound files were analysed using the *Kaleidoscope* software to produce data giving the date, time, location and species of each bat echolocation detected.

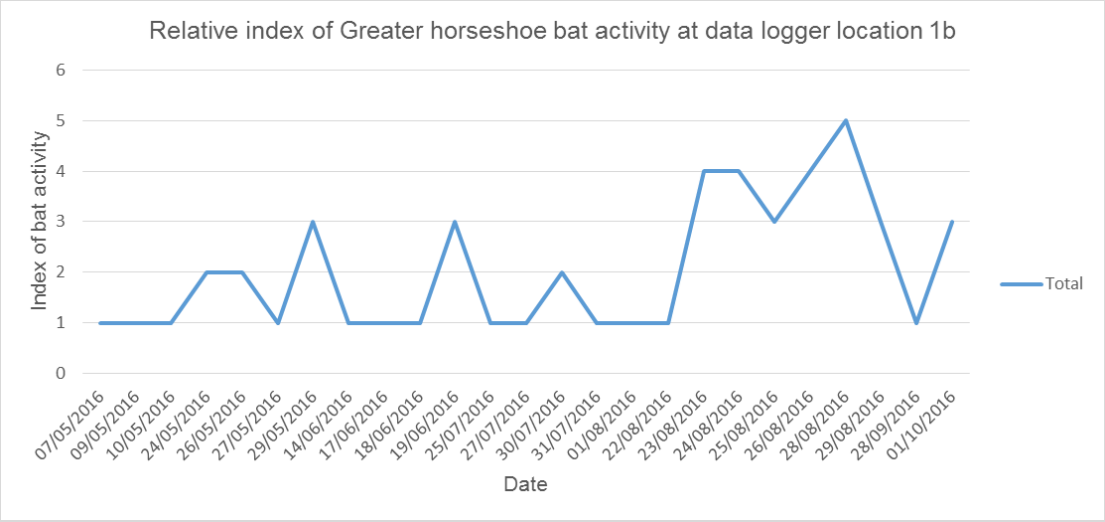
This information will be used to produce a database of bat activity across the study site throughout the April - September study period. In this database, each row represents a discrete time interval during which bat activity is recorded as either present (1) or absent (0). For the purpose of this report the data has been presented as 15 second intervals (but can be adjusted if required). This time interval was selected as the minimum time interval between successive sound recordings from a single data logger in a single night, analysed across the entire data set. This data-driven, non-arbitrary time interval allowed for bat activity to be recorded at the highest temporal resolution achievable under the study conditions.

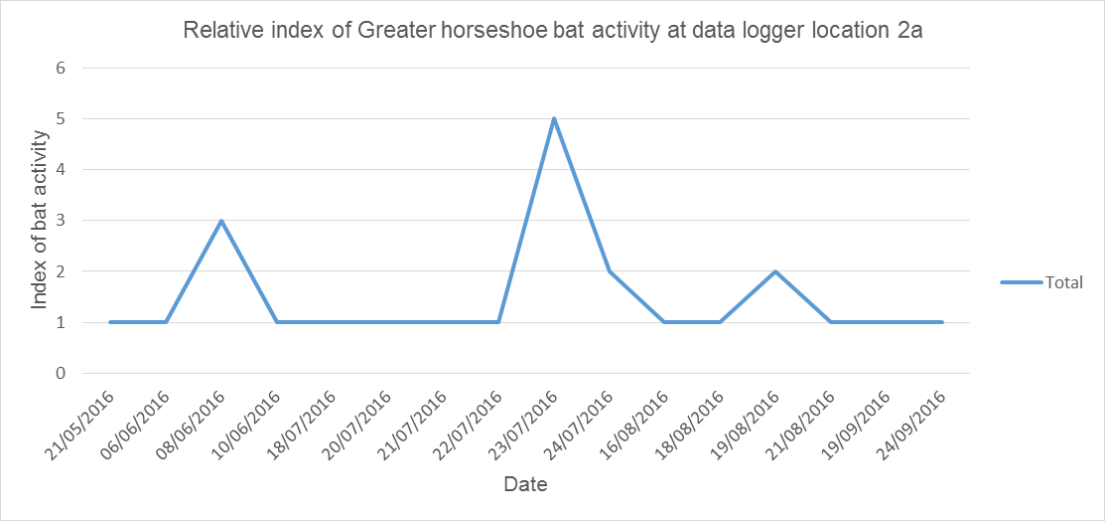
The following graphs display the relative index of lesser and greater horseshoe bat activity at the 10 monitoring locations (shown on Figure 3) to provide a graphical representation of the spatial and temporal patterns of bat activity. There was no lesser horseshoe activity recorded at location 3b (and therefore no graph for this location). The raw data is provided in Appendix 3.

An account of all species by month and datalogger location is provided in Appendix 4.

Greater Horseshoe Bat Activity






Relative index of Greater horseshoe bat activity at data logger location 2a
Index of bat activity
0
1
2
3
4
5
6
21/05/2016
06/06/2016
08/06/2016
10/06/2016
18/07/2016
20/07/2016
21/07/2016
22/07/2016
23/07/2016
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16/08/2016
18/08/2016
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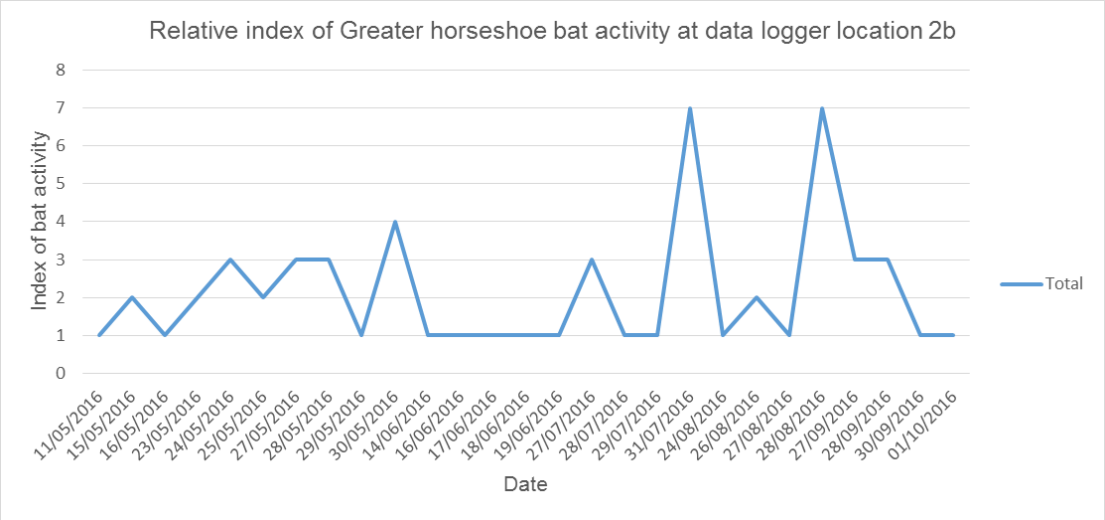
21/08/2016
19/09/2016
24/09/2016
Date
Total


Relative index of Greater horseshoe bat activity at data logger location 2b
Index of bat activity
0
1
2
3
4
5
6
7
8
11/05/2016
15/05/2016
16/05/2016
23/05/2016
24/05/2016
25/05/2016
27/05/2016
28/05/2016
29/05/2016
30/05/2016
14/06/2016
16/06/2016
17/06/2016
18/06/2016
19/06/2016
27/07/2016
28/07/2016
29/07/2016
31/07/2016
24/08/2016
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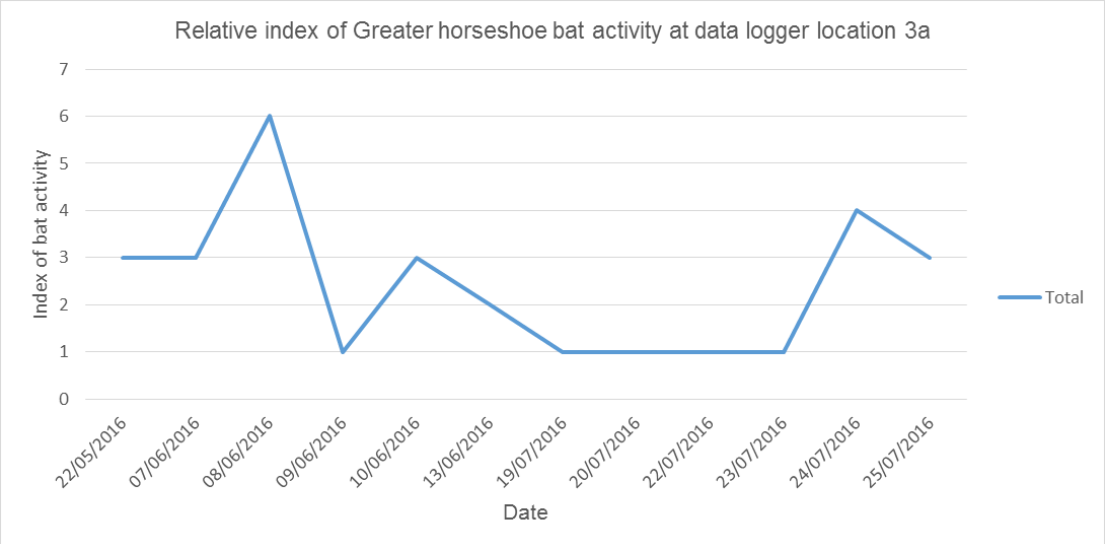
30/09/2016
01/10/2016
Date
Total


Relative index of Greater horseshoe bat activity at data logger location 3a
Index of bat activity
0
1
2
3
4
5
6
7
22/05/2016
07/06/2016
08/06/2016
09/06/2016
10/06/2016
13/06/2016
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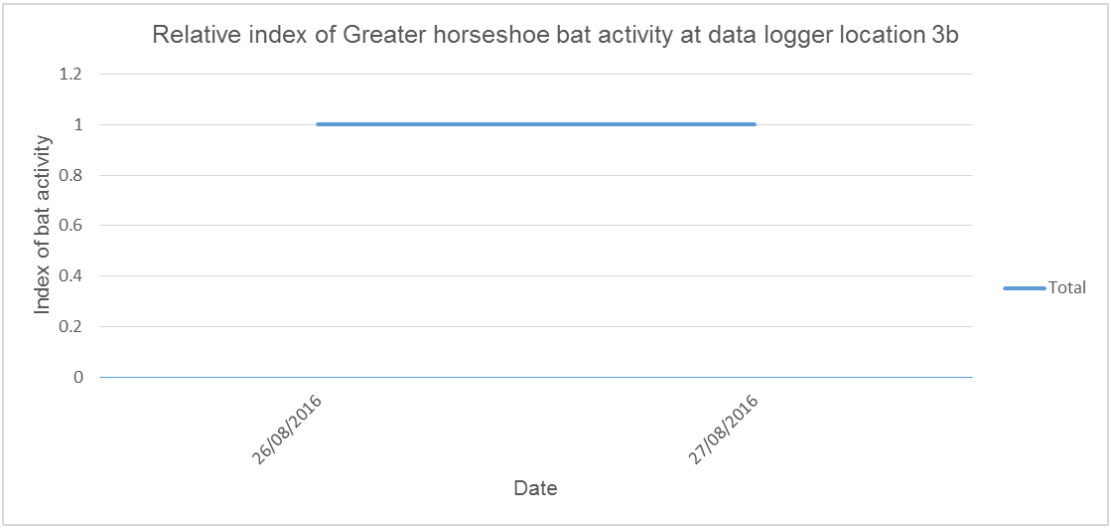
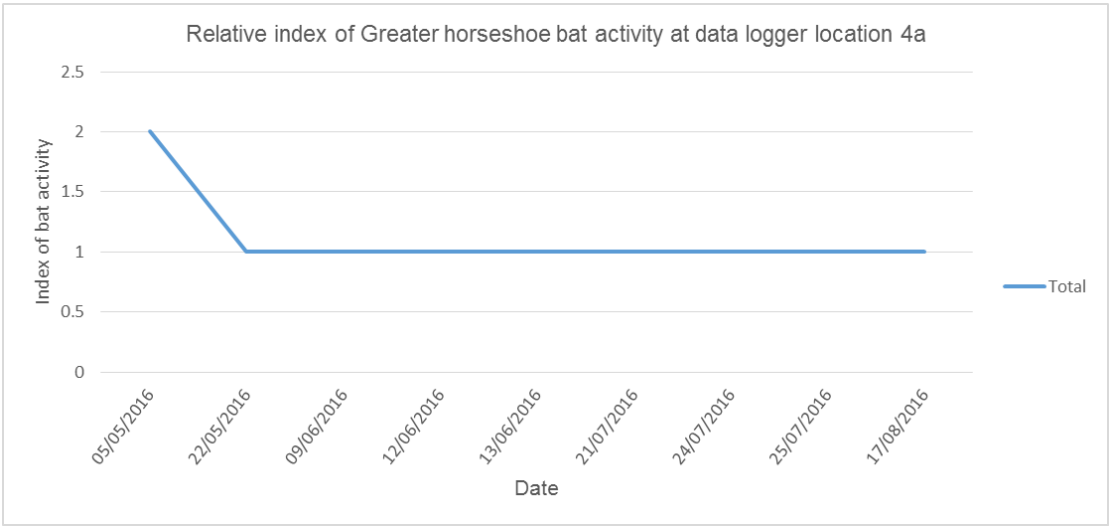
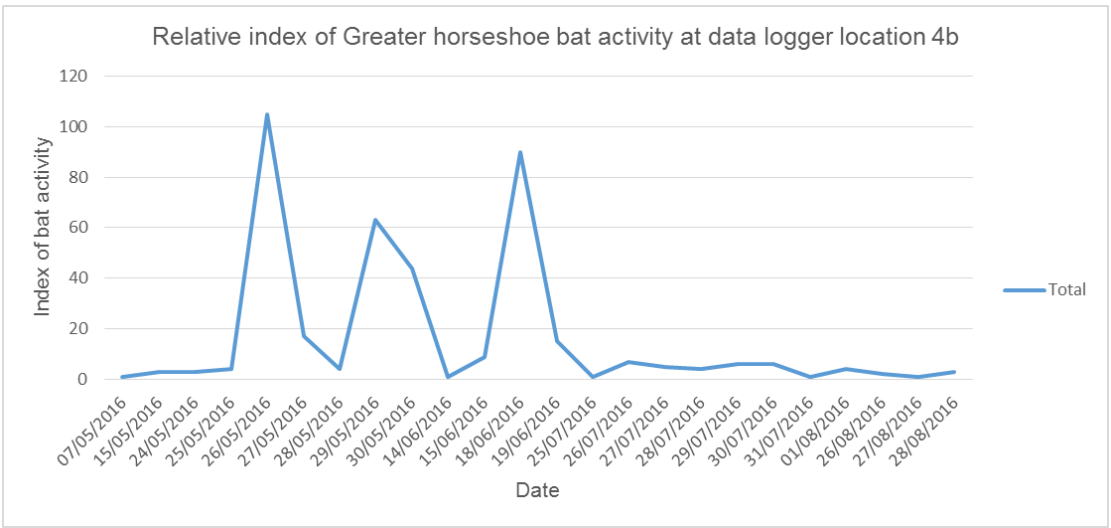
20/07/2016
22/07/2016
23/07/2016
24/07/2016
25/07/2016
Date
Total


Relative index of Greater horseshoe bat activity at data logger location 3b
Index of bat activity
1.2
1
0.8
0.6
0.4
0.2
0
26/08/2016
27/08/2016
Date
Total


Relative index of Greater horseshoe bat activity at data logger location 4a
Index of bat activity
2.5
2
1.5
1
0.5
0
05/05/2016
22/05/2016
09/06/2016
12/06/2016
13/06/2016
21/07/2016
24/07/2016
25/07/2016
17/08/2016
Date
Total


Relative index of Greater horseshoe bat activity at data logger location 4b
Index of bat activity
120
100
80
60
40
20
0
07/05/2016
15/05/2016
24/05/2016
25/05/2016
26/05/2016
27/05/2016
28/05/2016
29/05/2016
30/05/2016
14/06/2016
15/06/2016
18/06/2016
19/06/2016
25/07/2016
26/07/2016
27/07/2016
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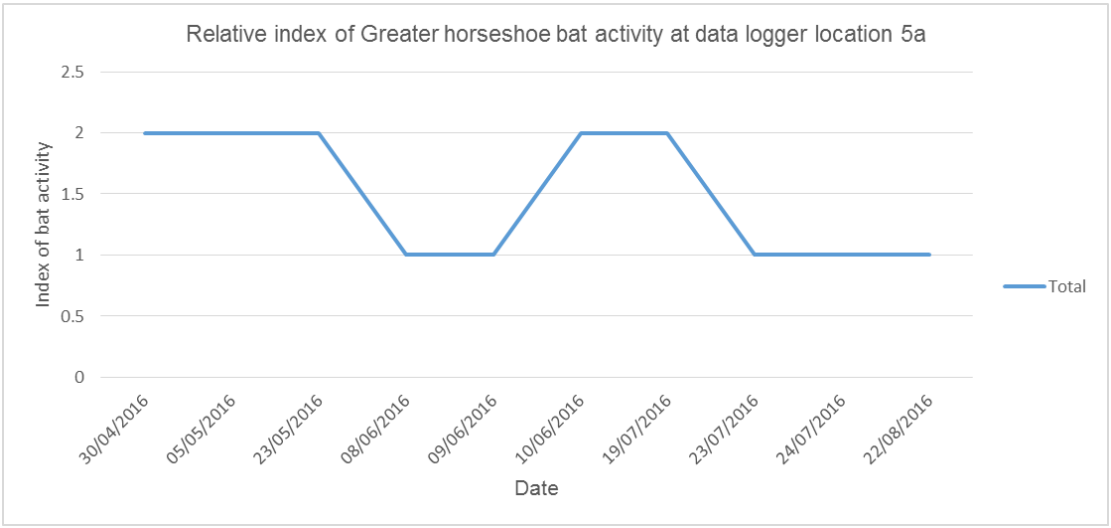
27/08/2016
28/08/2016
Date
Total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Index of bat activity
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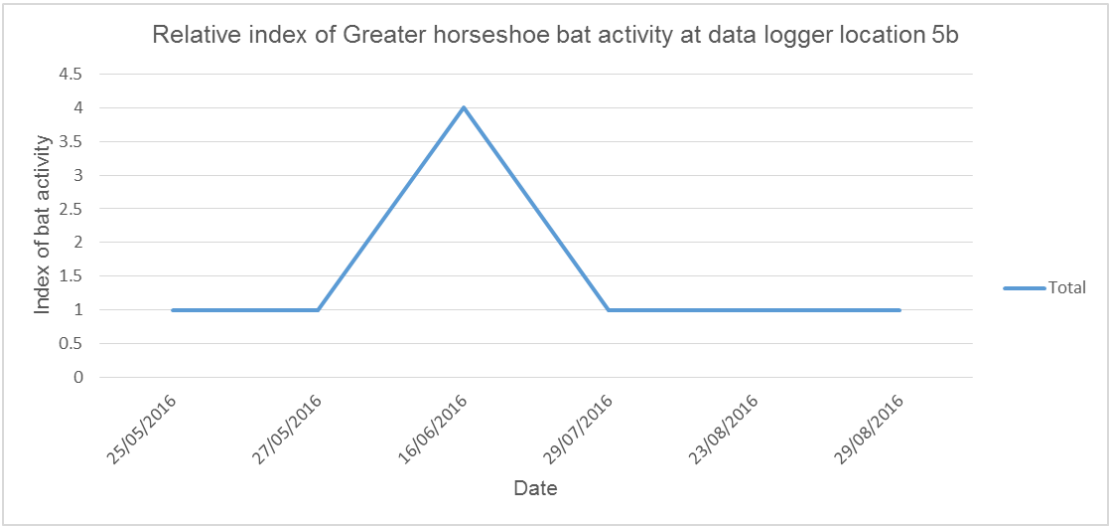
2
1.5
1
0.5
0
30/04/2016
05/05/2016
23/05/2016
08/06/2016
09/06/2016
10/06/2016
19/07/2016
23/07/2016
24/07/2016
22/08/2016
Date
Total


Relative index of Greater horseshoe bat activity at data logger location 5b
Index of bat activity
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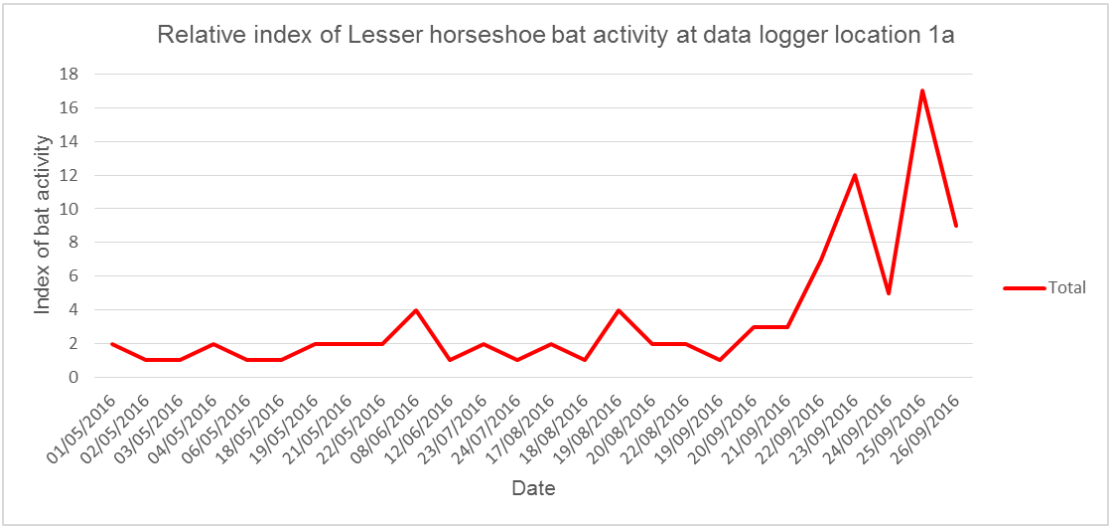
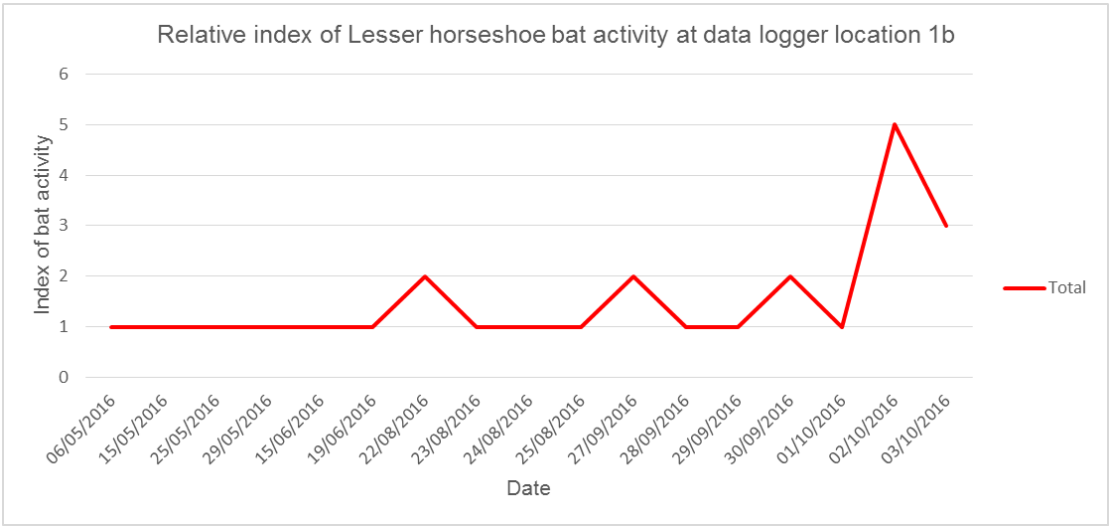
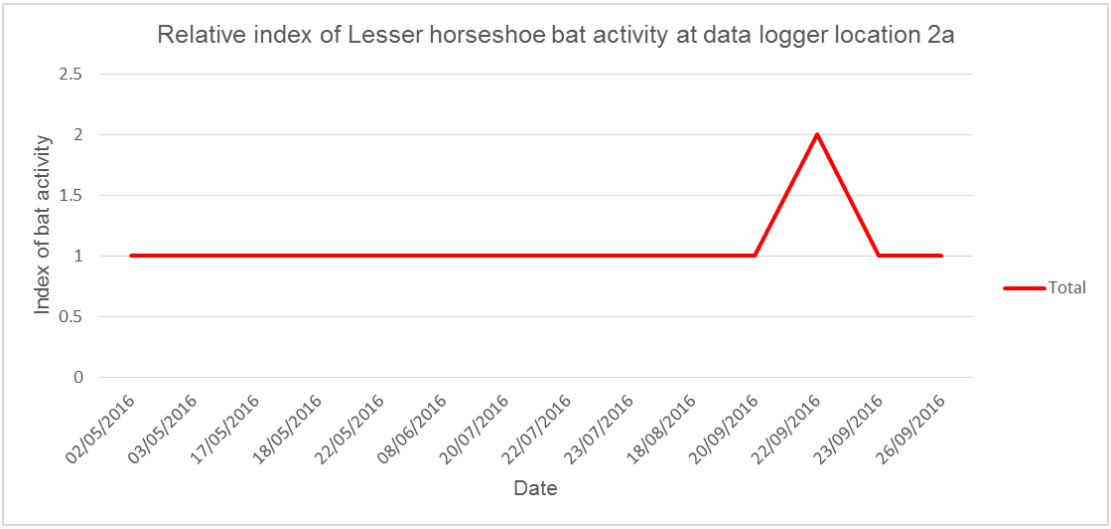
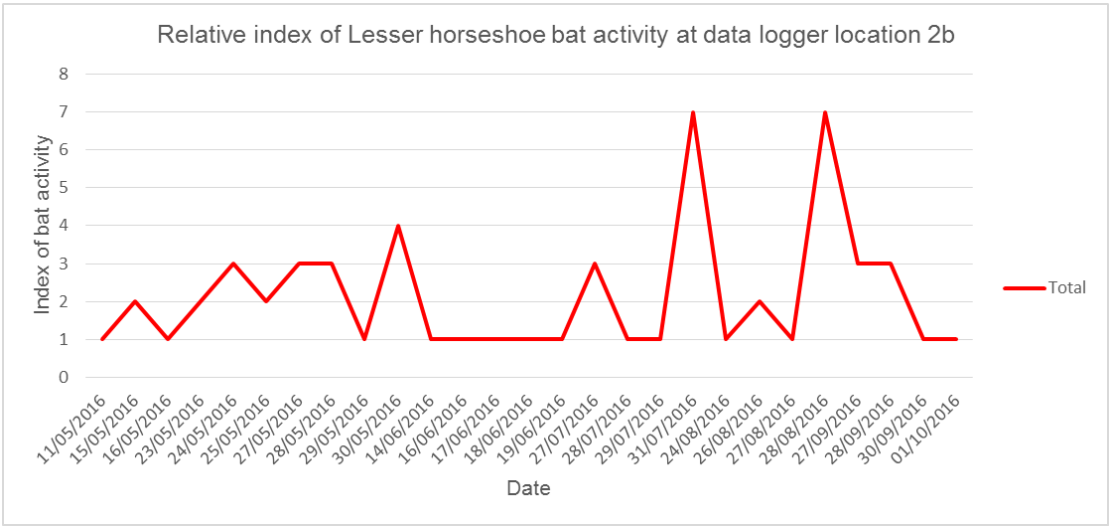
3.5
3
2.5
2
1.5
1
0.5
0
25/05/2016
27/05/2016
16/06/2016
29/07/2016
23/08/2016
29/08/2016
Date
Total

Lesser Horseshoe Bat Activity








Relative index of Lesser horseshoe bat activity at data logger location 2b
Index of bat activity
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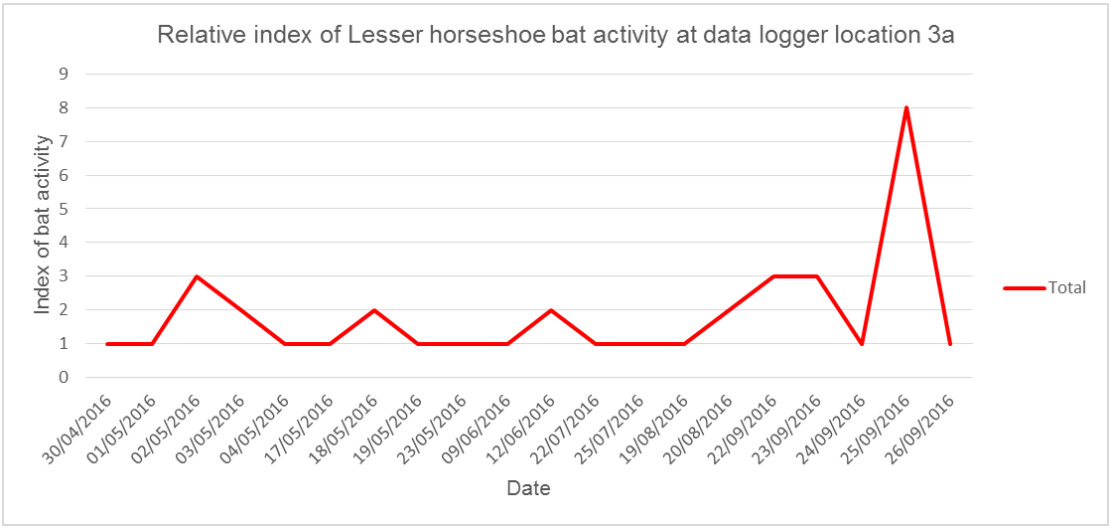
1
2
3
4
5
6
7
8
11/05/2016
15/05/2016
16/05/2016
23/05/2016
24/05/2016
25/05/2016
27/05/2016
28/05/2016
29/05/2016
30/05/2016
14/06/2016
16/06/2016
17/06/2016
18/06/2016
19/06/2016
27/07/2016
28/07/2016
29/07/2016
31/07/2016
24/08/2016
26/08/2016
27/08/2016
28/08/2016
27/09/2016
28/09/2016
30/09/2016
01/10/2016
Date
Total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Index of bat activity
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1
2
3
4
5
6
7
8
9
30/04/2016
01/05/2016
02/05/2016
03/05/2016
04/05/2016
17/05/2016
18/05/2016
19/05/2016
23/05/2016
09/06/2016
12/06/2016
22/07/2016
25/07/2016
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22/09/2016
23/09/2016
24/09/2016
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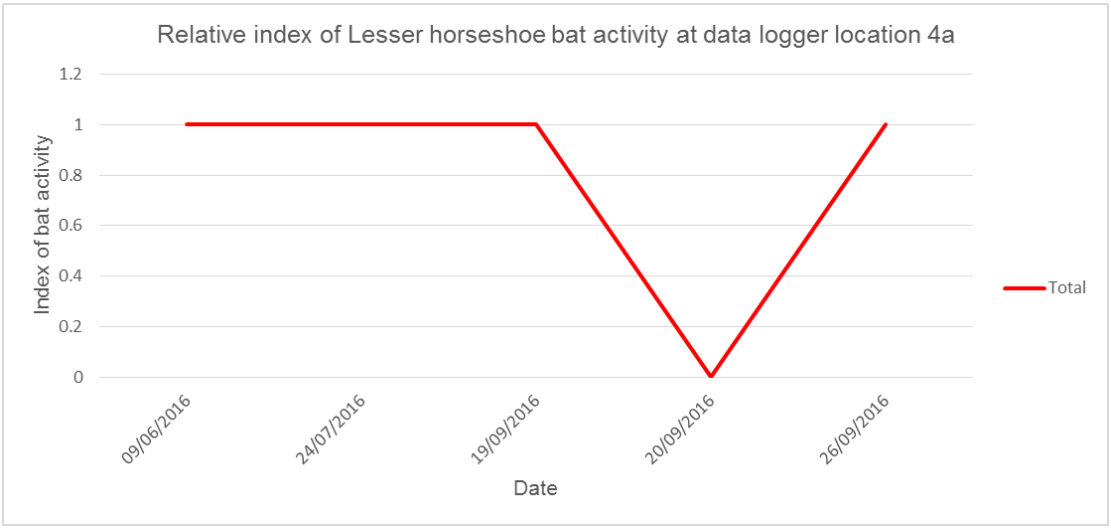
26/09/2016
Date
Total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Index of bat activity
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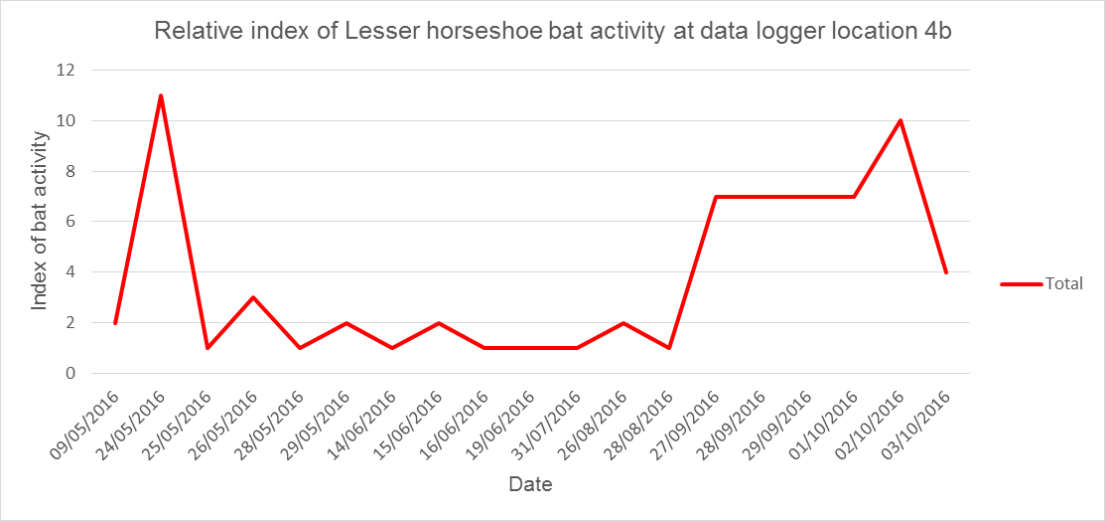
0.4
0.6
0.8
1
1.2
09/06/2016
24/07/2016
19/09/2016
20/09/2016
26/09/2016
Date
Total


Relative index of Lesser horseshoe bat activity at data logger location 4b
Index of bat activity
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2
4
6
8
10
12
09/05/2016
24/05/2016
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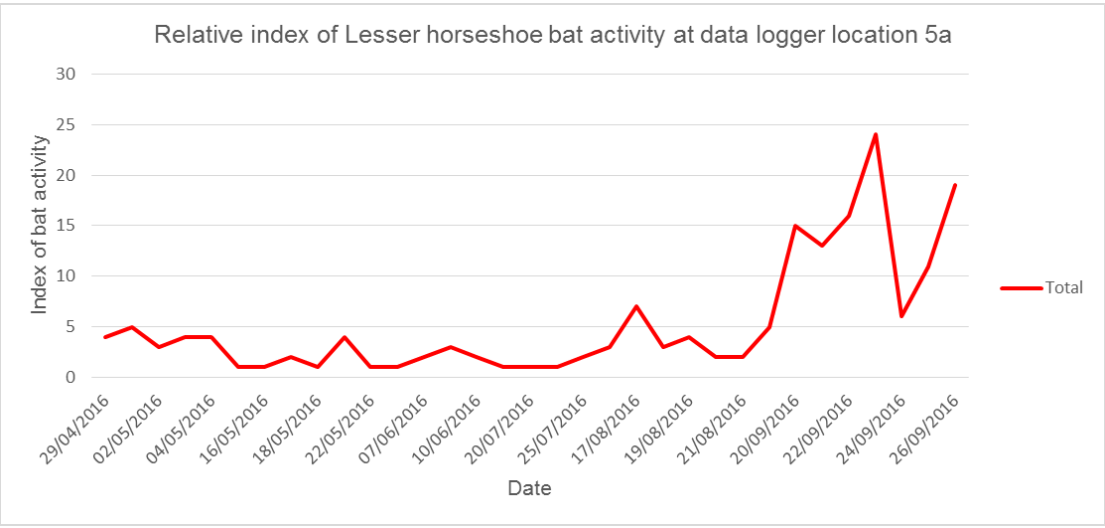
26/05/2016
28/05/2016
29/05/2016
14/06/2016
15/06/2016
16/06/2016
19/06/2016
31/07/2016
26/08/2016
28/08/2016
27/09/2016
28/09/2016
29/09/2016
01/10/2016
02/10/2016
03/10/2016
Date
Total


Relative index of Lesser horseshoe bat activity at data logger location 5a
Index of bat activity
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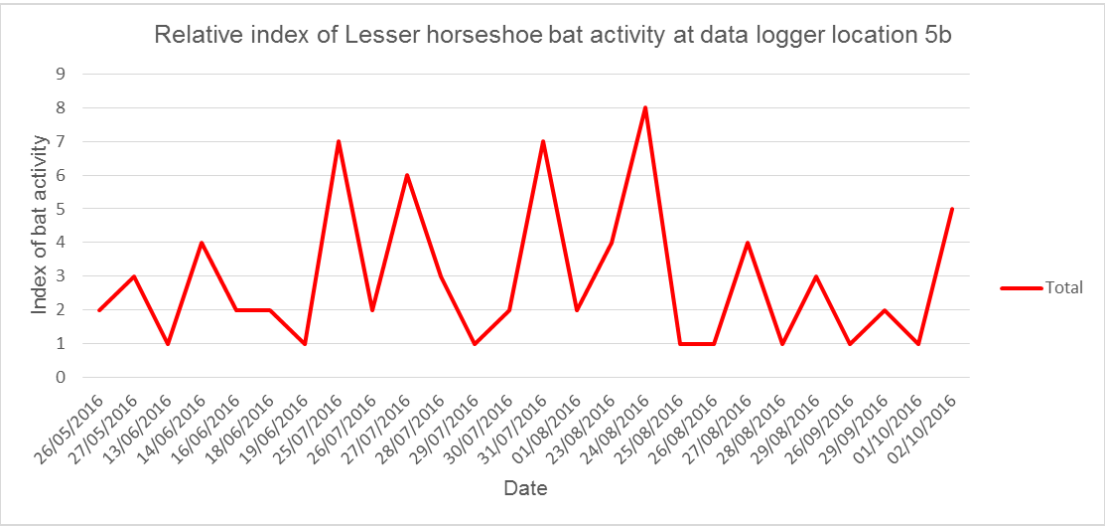
5
10
15
20
25
30
29/04/2016
02/05/2016
04/05/2016
16/05/2016
18/05/2016
22/05/2016
07/06/2016
10/06/2016
20/07/2016
25/07/2016
17/08/2016
19/08/2016
21/08/2016
20/09/2016
22/09/2016
24/09/2016
26/09/2016
Date
Total


Relative index of Lesser horseshoe bat activity at data logger location 5b
Index of bat activity
0
1
2
3
4
5
6
7
8
9
26/05/2016
27/05/2016
13/06/2016
14/06/2016
16/06/2016
18/06/2016
19/06/2016
25/07/2016
26/07/2016
27/07/2016
28/07/2016
29/07/2016
30/07/2016
31/07/2016
01/08/2016
23/08/2016
24/08/2016
25/08/2016
26/08/2016
27/08/2016
28/08/2016
29/08/2016
26/09/2016
29/09/2016
01/10/2016
02/10/2016
Date
Total

5.4 Bat Roosts on the Disused Railway line

Roosts in Structures

The bridge structures and culverts along the disused railway line evaluated as having low to moderate potential for bat roosts were surveyed according to industry standard guidelines.

Two of the seven bridges surveyed (by dusk activity surveys) supported bat roosts. These were:

- Bridge B2 – a brick arch bridge for Sheepway, at the western end of the farmland.
- Bridge B4 – a concrete bridge that takes Portbury Dock Road over the disused railway line.

The bridges are used by low numbers of common pipistrelle and soprano pipistrelle bats as a day roost and have been assessed as being small roosts that would be occupied by males or non-breeding females.

In addition to the two day roosts recorded in bridges over the disused railway line, a probable night roost for lesser and greater horseshoe bats was identified in a small, derelict railway store at NGR ST 49542 75696 close to the bridge at Station Road, Sheepway. The night roost was discovered by the automated static bat detector monitoring surveys (described in Section 4.3.2). Datalogger units S8a (AnabatSD1) and S9b (SM2Bat) deployed at the railway store (between the 9th June and 5th July 2015) recorded regular nightly activity at the building.

The locations of bat roosts on the disused railway line are shown on Figure 5 and the results of the roost surveys are summarised in Table 18. Details of the daytime scoping appraisal and evaluation of structures for bats are provided in Appendix 5.

The culverts under the disused railway line are considered to have negligible to low potential for bats to roost. Culverts were typically small concrete pipes (c.1.5m diameter) with brick buttresses. Several of the culverts were flooded when surveyed in March 2015 and it was evident from high water levels that others are likely to flood too. The culverts are relatively short (spanning the railway embankment) and their construction and design is generally unfavourable for bat roosts because there is limited shelter in the pipes and no voids or crevices in the structures.

Table 18. Confirmed Bat Roosts in Structures

Figure 5 Ref*	Grid Reference	Bat Species	Peak Count	Roost Type	Roost Description
B2	ST48504 76004	Common pipstrelle	1	Day roost – non breeding	Behind ivy vegetation on western aspect of bridge.
B4	ST 50646 75961	Soprano pipistrelle	4	Day roost – probably non breeding	Expansion joint at the top of the south abutment wall.
		Common pipistrelle	1	Day roost – non breeding	Expansion joint at the top of the north abutment wall.
NR	ST 49542 75696	Lesser horseshoe Greater horseshoe	-	Night roost	Small derelict store. The building has no door.

Tree Roosts

The assessment of trees recorded four trees with high potential and seven trees moderate bat roost potential within, or immediately adjacent to the disused railway line land. Detailed inspection of the trees using roped access climbing equipment did not find any evidence of bat roosts in the trees.

Of particular note with regard to potential for bats to roost in trees on the disused railway line are three of the four trees with high potential located at Portbury Common (shown on Figure 5). The three high potential trees (T1, T8 and T9) contain woodpecker holes, a favoured tree feature for noctule bat roosts. Noctule bats were recorded at Portbury Common at sunset and therefore probably roost in trees close to the disused railway line and, although no evidence was found, the possibility this species may roost within the DCO Scheme should not be discounted. Tree roosts can be exceptionally difficult to find because bats will frequently switch roosts, even when nursery colonies are established, and field signs of previous use by bats can disappear quickly.

Details of trees with high and moderate potential for bats is given in Appendix 6 and the location of trees is shown on Figure 5.

5.5 Portbury Freight Line Tunnels

Roosts

Summer Roosts

The trapping surveys at the tunnel portals of Clifton 1, Clifton 2, Sandstone and Pill on Portbury Freight Line in June and August 2016 confirmed that there are no bat maternity roosts in any of the structures. This substantiates the findings of the trapping surveys undertaken in June and July 2015, which did not record any breeding females of rare or uncommon bat species in the vicinity of the tunnels. The results of the trapping surveys are shown in Tables 19a and 19b.

During the trapping surveys, the following records of bats emerging from the tunnels were recorded:

22 June 2015	Clifton 1	1 common pipistrelle bat	Possible emergence from the east portal 12 minutes after sunset
22 June 2015	Clifton 2	2 lesser horseshoe bats	Emerged from the west portal 27 minutes after sunset
23 July 2015	Sandstone	2 Long-eared bats	Emerged from west portal 22 minutes after sunset
2 June 2016	Clifton 1	1 natterer's bat	Adult male bat caught harp trap at north-west portal having emerged from a crevice in the north wall.
17 Aug 2016	Clifton 2	1 daubenton's	Adult male caught in mist net at north portal.
17 Aug 2016	Clifton 2	2 Common pipsitrelle bats	2 adults, 1 male and 1 non-breeding female.

Table 19a. Trapping Survey Results in June and July 2015 near Tunnels on Portbury Freight Line

Tunnel	**Date**	**Time (hrs)**	**Species**	**Sex**	**Age**	**Breeding Status**
Clifton 1	22/06/15	21:50	Ppy	M	A	-
		21:57	Ppy	M	A	
	27/07/15	22:04	Ppy	F	A	Non breeding
		22:17	Ppy	M	A	-
Clifton 2	22/06/15	-	None	-	-	-
	21/07/15	-	None	-	-	-
	23/07/15	-	None	-	-	-
Pill	21/07/15	21:22	Pp	F	A	Lactating
		21:24	Pp	F	A	Lactating
		21:24	Pp	F	A	Lactating
		21:46	Pp	M	A	-
		22:30	Nl	F	A	Non breeding
	27/07/15	22:26	Ppy	F	J	-
Sandstone	23/07/15	21:40	Es	M	A	-
		21:55	Mn	M	A	-
		22:20	Ppy	M	A	-
		22:45	Pa	M	J	-
		23:00	Es	M	A	-
		23:05	Ppy	M	A	-
		23:06	Pp	F	J	-
		23:20	Ppy	F	A	Non breeding
		00:05	Pp	M	A	-

Notes
Species key –Pp Common pipistrelle (*P. pipistrellus*); Ppy Soprano pipistrelle *(P.pygmaeus);* Pa Brown long-eared (*Plecotus auritus)* Nl Leisler's (*Nyctalus leisleri*); Es Serotine *Eptesicus serotinus;* Mn Natterer's (*Myotis nattereri).*
M – Male; F - Female
A – Adult; J – Juvenile

Table 19b. Trapping Survey Results in June and August 2016 at the Tunnel Portals on Portbury Freight Line

Tunnel	**Date**	**Time (hrs)**	**Species**	**Sex**	**Age**	**Breeding Status**	**Roost Emergence from Tunnel**
Clifton 1	2 June	21:43	Mn	M	A	-	Yes
		22:01	Pp	M	A	-	No
		22:16	Ppy	F	A	Non breeding	No
	17 Aug	21:58	Ppy	M	A	-	No
		22:04	Ppy	F	A	Breeding	No
Clifton 2	2 June	21:26	Pa	-M	A	-	No
		21:54	Pp	F	A	Non-breeding	Yes
		22:16	Pp	M	A	-	Yes
	17 Aug	20:45	Py	M	A	Mating	No
		20:45	Py	F	A	Post-lactating	No
		20:45	Pp	F	A	Non-breeding	No
		21:20	Md	M	A	-	Yes
		22:00	Ppy	M	J	-	No
		22:00	Ppy	F	A	Non-breeding	No
		22:00	Ppy	F	J	-	No
		22:30	Pp	F	A	Non-breeding	No
		22:30	Pp	F	A	Non-breeding	No
Pill	2 June	21:54	Pp	F	A	Non-breeding	No
		21:58	Pp	M	A	-	No
		22:16	Md	M	A	-	No
	17 Aug	21:48	Pp	M	A	-	No
		22:06	Pp	F	A	Non-breeding	No
		22:08	Pp	M	A	-	No
		22:23	Pp	M	A	-	No

Tunnel	Date	Time (hrs)	Species	Sex	Age	Breeding Status	Roost Emergence from Tunnel
		22:23	Pp	F	A	Non-breeding	No
		22:32	Pp	M	A		No
		22:43	Pp	M	A		No
		22:43	Pp	M	A		No
		22:50	Pp	F	A	Non-breeding	No
Sandstone	2 June	22:16	Pa	M	A	-	No
		23:34	Pp	M	A	-	No
		23:39	Pp	F	A	Non-breeding	No
	17 Aug	21:18	Rh	F	J	-	No
		22:01	Es	M	A	-	No

Notes
Species key –Pp Common pipistrelle (*P. pipistrellus*); Ppy Soprano pipistrelle *(P.pygmaeus);* Pa Brown long-eared (*Plecotus auritus*; Es Serotine *Eptesicus serotinus;* Mn Natterer's (*Myotis nattereri)*; Md Daubenton's (*Myotis daubentoni).*
M – Male; F - Female
A – Adult; J – Juvenile

Late Summer and Autumn Roosts

A daytime inspection on the 15th October 2015 recorded evidence of bat roosts from droppings in, or around cavities in the walls of two of the tunnels. The survey found the following evidence of bat roosts:

Clifton 2	Deep fracture in the roof of the tunnel, approximately 20m from south portal	Accumulation of 4 droppings	Droppings characteristic of lesser horseshoe bat, but DNA analysis of the sample failed.
Sandstone	Gap in a side refuge arch on the north wall (6th arch from NW portal).	Accumulation of 15 large droppings	Serotine bat droppings confirmed by DNA analysis.

	Accumulation of 10 small droppings	Daubenton's bat droppings confirmed by DNA analysis.

On the 22nd September 2015, two bats were recorded roosting at night in Clifton 2. The bats were observed resting in rock cavities in the roof of the tunnel and were both identified as *Myotis* species. The bats were possibly natterer's bats *Myotis nattereri* (judging by the length of their ears), but formal identification (in the hand) could not be made.

Autumn Swarming Activity

Observational surveys in September and October 2015 and datalogger monitoring between August and October 2015 did not record swarming activity. Conspicuous, swarms of bats were absent during the night surveys and the level of activity recorded on automated bat detectors deployed in the tunnels was lower than would be expected at a swarming site. Surveyors observed solitary or low numbers of bats within the tunnels and bouts of activity were typically short in duration (less than a couple of minutes). There was no sustained activity at any of the tunnels.

The peak levels of activity recorded on dataloggers are shown on the series of graphs in Appendix 7, which display the number of registrations[4] per hour per night at each tunnel portal. The results are summarised in Table 20.

Table 20. Summary of Bat Activity Recorded (number of registrations) by Dataloggers in Tunnels between August and October

Tunnel	**Monitoring Period**	**Portal**	**Species**							
			Rf	**Rh**	**Msp**	**Pa**	**Nn**	**Nl**	**Es**	**Nn/Nl/Es**
Clifton 1										
	19-25 Aug	NW	56	113	74	2	1	0	13	4
		SE	41	23	49	2	2	0	0	75
	1-9 Sept	NW	44	50	24	0	0	0	25	0
		SE	77	141	209	5	4	0	6	0
	16-22 Sept	NW	60	51	74	2	0	0	0	7

[4] A 'registration' is a sequence of bat sound captured on a 15 second sound file and is discrete data used to help characterize levels of bat activity during datalogger monitoring.

Tunnel	Monitoring Period	Portal	Species							
			Rf	**Rh**	**Msp**	**Pa**	**Nn**	**Nl**	**Es**	**Nn/Nl/Es**
		SE	14	0	5	10	0	0	2	14
	28 Sept-	NW	0	0	0	68	0	0	0	4
	5 Oct	SE	0	64	193	36	0	0	10	12
Clifton 2										
	19-25 Aug	N	62	10	46	2	0	0	149	4
		S	143	66	111	3	1	0	241	4
	1-9 Sept	N	125	15	269	6	0	0	0	5
		S	235	46	222	0	6	0	290	12
	16-22 Sept	N	97	139	222	1	0	0	111	3
		S	41	136	597	17	1	0	238	19
	28 Sept –	N	2	35	124	4	0	0	0	8
	9 Oct	S	8	225	254	0	0	0	12	31
Sandstone										
	25 Aug –	NW	42	13	245	1	0	3	126	31
	1 Sept	SE	59	10	123	4	0	0	0	9
	9 -16 Sept	Middle	10	29	326	0	0	0	281	7
	22-28 Sept	NW	5	104	76	0	0	0	4	34
		SE	0	0	10	0	0	0	0	19
	9-14 Oct	NW	3	23	156	0	0	0	4	11
		SE	0	0	6	0	0	0	0	13
Pill										
	25 Aug-	E	16	14	33	0	0	0	138	7
	1 Sept	W	26	45	19	0	0	0	175	8
	9-15 Sept	E	6	89	143	0	0	0	22	23
		W	91	34	34	0	0	0	0	0
	22-28 Sept	E	4	46	521	1	0	0	6	6
		W	17	10	21	0	0	0	0	0
	9-14 Oct	E	0	96	476	0	0	0	7	11
		W	0	9	22	0	0	0	0	0

Although there was no swarming activity at any of the tunnels, social activity was recorded. Surveyors observed bats exhibiting social flight behaviour, with pairs or low numbers of bats following each other. Dataloggers recorded social bat calls, which are produced when bats communicate. They can be distinguished from echolocation (bats use to navigate) when analysed on computer software

(Kaleidoscope) because they are often structurally complex calls. The number of nights social calls were recorded at the tunnels is shown in Table 21.

Table 21. Bat Social Calls Recorded within Tunnels

Tunnel	**Date**	**Number of nights**
Clifton 1	September	4
	October	5
Clifton 2	August	4
	September	10
	October	5
Sandstone	August	2
	September	9
	October	4
Pill	September	6
	October	4

The bats recorded near tunnels during trapping surveys in September are shown in Table 22. Male serotine bats and brown long-eared bats captured at Sandstone tunnel and Clifton 2 tunnel may be gathering for mating activity.

Table 22. Trapping Survey Results in September at Tunnels on Portbury Freight Line

Tunnel	**Date**	**Time (hrs)**	**Species**	**Sex**	**Age**	**Breeding Status**
Pill	17/09/15	21:26	Pp	M	A	-
		21:30	Pp	M	A	-
		21:35	Ppy	M	A	-
		22:00	Rh	-	-	Bat escaped net
		22:35	Pp	M	A	-
Clifton 2	17/09/15	23:25	Pa	M	A	-
		23:26	Pa	M	A	-
		23:26	Pa	M	A	-
		23:26	Pa	M	A	-
		23:30	Pa	F	A	Post-lactating
Sandstone	21/09/15	19:35	Pp	M	A	-
		19:45	Es	M	A	-
		19:55	Es	M	A	-
		19:55	Pa	M	A	-
		20:05	Ppy	M	A	-

Tunnel	Date	Time (hrs)	Species	Sex	Age	Breeding Status
		20:20	Mn	M	A	-
Notes Species key –Pp Common pipistrelle (*P. pipistrellus*); Ppy Soprano pipistrelle *(P.pygmaeus);* Pa Long-eared (*Plecotus sp.);* Es Serotine *Eptesicus serotinus;* Mn Natterer's (*Myotis nattereri)*. Rh Lesser horseshoe (*Rhinolophus hipposideros*). M – Male; F - Female A – Adult;						

5.6 Portbury Freight Line Structures

Pill Station (Disused Platform)

The two stone arches on the disused platform at Pill station are used by a low number of lesser horseshoe bats as a day roost and by both lesser and greater horseshoe bats for night roosting.

The presence of a small lesser horseshoe bat day roost was established from the following field data:

- One lesser horseshoe bat recorded in Arch 1 during the daytime inspection on the 18th July 2016;
- One lesser horseshoe bat returned to Arch 2 during the dawn survey on the 28th September 2016;
- A small accumulation of 50 fresh bat droppings in Arch 1.

The SM2BAT remote, unattended bat detector recorded regular bat activity within Arch 1 and Arch 2 by lesser and greater horseshoe bats. The results of the roost monitoring are summarized in Table 23.

Table 23. Records of Lesser and Greater Horseshoe Bat Activity in the Arches at Pill Station

Species	Location	Dates Species Recorded (2016)	No. of Days with Diurnal Activity	No. of Nights with Nocturnal Activity
Lesser horseshoe	Arch 1	18 -22 July	5	4
	Arch 2	19 -21 July	3	1
Greater horseshoe	Arch 1	20 July	0	1
	Arch 2	20, 22, 23 July	0	3

Common pipistrelle, noctule and a myotid species were also recorded on one occasion, but the data cannot be interpreted for roosting behaviour.

Avon Road Bridge

No bats were recorded roosting within the Avon Road Bridge. The two dusk surveys (July and September 2016) provide sufficient information to confirm the likely absence of bat roosts in the structure.

6 Evaluation

6.1 Disused Railway Line

The disused railway line is a prominent feature within the landscape between Portishead and Pill. The land has been safeguarded in local policy plans and with little intervention from development semi-natural habitats have developed on the railway land. At Portishead, the disused railway line provides a green corridor within the town, which terminates at the proposed Portishead station. The route through countryside between Portishead and Pill is a linear landscape feature of trees and scrub that links semi-natural habitats including Portbury Common and Portbury Wharf Nature Reserve, hedgerows through farmland and wetland habitats at Royal Portbury Dock.

The study confirmed at least 10 bat species were using the disused railway line between 2014 and 2016. The rare lesser and greater horseshoe bats regularly occur between Portbury Common and Royal Portbury Dock and the railway line is considered to be an important passage for movement throughout the activity season. Standardised monitoring between April and October 2016 does show varying patterns of activity along the disused railway line. There are distinct peaks of greater horseshoe bat activity at locations 1a (Portishead) and 4b (Royal Portbury Dock, near Royal Portbury Dock Road) (shown on Figure 3), with the relative index of activity being between 80-100 compared to an index of between 1-8 at other monitoring locations. Peak greater horseshoe bat activity in at location 1a was during June, whilst at location 4b it was slightly earlier being late May to mid-June. Most locations recorded low levels of greater horseshoe bat activity throughout most of the season (April to September). Greater horseshoe bat activity at location 3b was very low, with bats only recorded on 2 nights in late August. The relative index of lesser horseshoe bat activity was more consistent between locations, with an index of between 1 and 24 at most locations. There were no records of lesser horseshoe bats at location 3b (Royal Portbury Dock).

It is recognised that using an activity index does not distinguish between a single bat making multiple passes or multiple bats making a single pass. It is also not possible to determine the different behaviours being used by bats and therefore determine the relevance of a given location to bats using this data alone (e.g. for feeding versus commuting). However, whether a location is used repeatedly by a single (or few) bats for feeding versus being used briefly by a larger number of bats as commuting corridor, the activity index still demonstrates that the given location is of some ecological importance to bats, providing a relative and readily comparable measure of activity over time.

Lesser and greater horseshoe bats have territories several square kilometres in size and the radio-tracking study of a male greater horseshoe bat demonstrates there is movement between the disused railway line and Brockley Hall Stables SSSI and a link with the North Somerset and Mendip SAC. A radio-tracking study of greater horseshoe bats at Brockley Hall Stables SSSI (for English Nature Research Report 442) identified principal foraging areas and flight routes from the maternity colony at the site (Billington, 2002). The study concluded the majority of the foraging areas are within 4km of Brockley Hall Stables and the maximum foraging radius was 6.8km. Various radio-tracking studies of greater horseshoe bats in the UK suggest that good foraging habitat over 10km from the roost is unlikely to be significantly used. However, it is evident that extended distances to foraging areas do occur when bats use alternative day roosts (away from the maternity roost). This has been reported from Brockley Hall Stables SSSI with a range of 10.2km from Brockley Hall Stables by a male greater horseshoe bat that roosted during the day at alternative locations at Cheddar Gorge. The pattern of movement between different day roosts is similar to that observed during this study for the DCO Scheme, with the male greater horseshoe bat tracked 9.2km from the disused railway line to Brockley Hall Stables over 3 nights.

Acoustic monitoring (with bat detectors) on the disused railway line has established that lesser and greater horseshoe bats regularly occur on the site with both species being recorded during every month of survey. The distribution of horseshoe bats extends over most of the disused railway line (as shown on Figures 6a and 7a) and the level of activity is relatively consistent along much of the route, but as discussed earlier standardised monitoring in 2016 has identified peaks in greater horseshoe bat activity and some sections of the railway line appear less favourable for the movement of bats. The results of the acoustic monitoring are consistent with activity by species that are dispersed in the landscape. The study has not detected any activity that would suggest there are key dispersal route from a large roost on the

railway line. The majority of the horseshoe bat activity was recorded a significant time after horseshoe bats typically emerge from their roost, or before they return to their day roost[5]. Horseshoe bats were mostly recorded at the site several hours after sunset (as shown in Appendix 2), and there are no patterns of activity to suggest there is a large communal lesser or greater horseshoe bat roosts close to the disused railway line (e.g. a bat flight line within a few hundred metres of a breeding site). There were however a few early registrations of lesser and greater horseshoe bats (summarized in Table 16, Section 5.2), and there are likely to be small day roosts in the local area. Two small lesser horseshoe day roosts at Pill Station on the Portbury freight line is illustrative of the type of roosting activity that is likely to occur throughout the study area.

The study has established that the disused railway line is an important corridor for movement for lesser and greater horseshoe bats. Habitats within the railway land provide foraging opportunities and lesser and greater horseshoe bats use a derelict store on the disused railway line as a night roost. Greater and lesser horseshoe bats are reluctant to cross open spaces and the disused railway line provides an east west route between Royal Portbury Dock and Portishead with connectivity to good quality foraging areas in the locality. The disused railway line traverses roads, including the M5 motorway that are major barriers to movement for horseshoe bats, and is a corridor for movement around Royal Portbury Dock and Pill to the Avon Gorge (and Avon Gorge Woodlands).

Long-term ringing studies on greater horseshoe bats show that these bats will travel significant distances between their various roosts[6] and that these movements by bats, in the magnitude of 50-100km, are important for genetic interchange between colonies. Features such as the disused railway line are important to enable bats to negotiate obstacles on commuting journeys and the disused railway line may be a link across the M5 motorway to the River Severn, and beyond to important areas such as the Forest of Dean.

The disused railway line is an integral part of a permeable landscape for lesser and greater horseshoe bats and provides a corridor for movement west of the Avon

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[5] The median emergence time of lesser and greater horseshoe bats is 31 and 25 minutes after sunset and both species return to the roost shortly before sunrise, with published data giving times of 5-30 minutes before sunrise (Duvergé and Jones, 1994)

[6] Ringing studies of greater horseshoe bats in the UK has shown that bats can regularly travel to and from roosts that are up to 50 km apart

Gorge Woodlands, a stronghold for these species. It is of consequence to the greater horseshoe bat population of the North Somerset and Mendip Bats SAC, which is of European importance. Its importance as a linear landscape feature is significant at a **regional level** for the movement of bats.

Four bat roosts were confirmed on the disused railway line, with three small day roosts in two of the bridge structures used by common and soprano pipistrelle bats, and a night roost used by lesser and greater horseshoe bats in a derelict store. The Bat Mitigation Guidelines (Mitchell-Jones, 2004) provide guidance on the conservation significance of bat roosts according to the roost status and this has been used to evaluate the roost resource on a geographical scale in Table 24.

Table 24. Evaluation of the Bat Roost Resource on the Disused Railway Line

Roost	**Conservation Significance**	**Evaluation on a Geographical Scale**
Common pipistrelle bats in bridge B2	*Low* **–** a roost that supports individual bats of common species	Site Importance
Common pipistrelle bats in bridge B4	*Low* **–** a roost that supports individual bats of common species	Site Importance
Soprano pipistrelle bats in bridge B4	*Low* – a roost with a small number of bats of a common species: not a maternity site	Site Importance
Lesser and greater horseshoe bats in a derelict store (NR)	*Moderate* – feeding perches of an Annex 2* species	Local Importance
*Species listed on Annex 2 of the Habitats Directive in 1992 **(**Council Directive 92/43/EEC)		

The disused railway line does not support large communal bat roosts, and there are no known maternity roosts of rare or scarce species in the immediate vicinity of the disused railway line. Pregnant and lactating common pipistrelle bats and brown long-eared bats captured on the disused railway line indicates there is almost certainly a breeding roost of these species close to the DCO Scheme. Noctule bats were recorded at sunset on Portbury Common, where there are trees with high bat roost potential. Although no confirmed trees roosts were found during the study it is considered likely that this species is roosting close to the disused railway line.

The proximity of communal roosts is an important factor when evaluating the quality of foraging resources at a site. The area surrounding a communal bat roost

within which habitat availability and quality will have a significant influence on the resilience and conservation status of the colony is usually within 3km to 6km of the roost. The nearest known communal horseshoe bat roost is the lesser horseshoe roost at Ashton Court, which is approximately 5.5km from the disused railway line. A radio-tracking study of this colony in 2008 (Greena Ecological Consultancy, 2008) identified key foraging areas, the nearest of which to the DCO Scheme was an area at Abbots Leigh, which covered Fish Pond Wood, East Tanpit Wood and Three Cornered Wood (at the southern-most end of Leigh Woods). This foraging area is over 3km from the disused railway line.

Radio-tracking studies are required to identify accurately foraging areas of bats, but a broad evaluation of the quality of a site can be obtained from acoustic monitoring and habitat appraisal. The criteria developed for this Scheme are presented in Table 25 and are based on observational data, bat detector records and a habitat appraisal.

Table 25: Evaluation Criteria to Assess Foraging Habitats for Local Bat Populations

Geographic frame of reference	**Criteria**
Regional	A key foraging area within the core sustenance zone of a nationally or internationally designated site for bats.
County	Foraging habitat that is within a core sustenance zone of a communal roost of a rare species and is a high quality habitat that meets the requirements of the species. A feeding area that is integral to maintaining the distribution of a rare species at a county level.
District	A habitat that supports rare and scarce species and is high quality foraging habitat that fulfils specific requirements of the species concerned. Areas with regular and sustained feeding activity by lesser and greater horseshoe bats and an assemblage of scarce or uncommon bat species. A feeding area that is integral to maintaining the distribution of communal roosts (of high conservation significance) and therefore the distribution of rare species at a district level.

Geographic frame of reference	Criteria
Local	Good quality foraging habitat for bats that supports all, or most bat species recorded within the DCO Scheme, including nationally rare species on a regular basis. Sustained activity from bat detectors records indicates bats may be feeding within the habitat. Key foraging habitats such as woodland and wetlands that can support a high biomass of invertebrate prey are present. Used by breeding females or juveniles during the breeding season, the habitat quality is good and may be significant in terms of helping maintaining local populations of locally scarce bat species. The habitat has the potential to support an invertebrate biomass that could fulfil the energetic requirements of breeding female bats.
Site/ immediate zone of influence	Foraging opportunities for bats that use the site, but unlikely support sustained foraging activity. Individual bats foraging, but the habitats are unlikely to be significant in terms of sustaining local bat populations. Habitat provides foraging opportunities for commuting bats using the railway line as a navigational route.

The evaluation of foraging habitats on the disused railway is given below:

Portishead NGR ST 47111 76500 to ST 48134 76136	**Site Value**	Scrub habitat within an urban context that provides foraging opportunities that are exploited by common bat species, and possibly used by locally scarce species.
Portbury Common NGR ST 48134 76136 to ST 48493 76009	**Local Value**	Mature trees and scrub that supports a diversity assemblage of bat species. There is evidence of lesser horseshoe bats foraging along the railway line and breeding female common pipistrelle and brown long-eared bats have been caught

		near Portbury Common. Transitional habitats from grassland to mature trees provide good foraging opportunities for bats. The juxtaposition of railway habitats with semi-natural habitats on Portbury Common and Portbury Wharf Nature Reserve contributes to the mosaic of habitats in the locality.
Farmland NGR ST 48493 76009 to ST 49760 75696	**Site Value**	A diverse range of bat species, have been recorded on the farmland, but there is little evidence of sustained foraging activity, other than by common and soprano pipistrelle bats. The disused railway line through the farmland is characterised by low scrub, and mature trees are very infrequent along the route. The railway line habitat through the farmland lacks structural diversity and sheltered areas many bat species favour when foraging.
Royal Portbury Dock NGR ST 49760 75696 to ST 52012 76279	**Site to Local Value**	Mature trees and scrub that supports a diversity assemblage of bat species, including lesser and greater horseshoe bats. The study recorded regular foraging by common and soprano pipstrelle bats and occasional foraging by myotis bats, but there is no conclusive evidence of sustained activity by other species. The mature trees and woodland are however considered to be favourable foraging habitat and a precautionary evaluation of up to local value has been adopted.

6.2 Portbury Freight Line

Tunnels

The Clifton 1, Clifton 2 and Sandstone tunnels are being used by low numbers of bats as day roosts during summer, but there are no confirmed maternity roosts in any of the tunnels. Clifton 2 has been confirmed as a night roost. The tunnels are not considered to be important swarming sites, but surveys in autumn recorded social activity and bats appear to use the shelter of the tunnels for socialising. The use of the tunnels by bats is summarised and evaluated below. The conservation significance of bat roosts according to roost status provided in the Bat Mitigation Guidelines (Mitchell-Jones, 2004) has been used in the evaluation.

Clifton 1	**Site Value**	A solitary natterer's bat has been recorded roosting in the tunnel during summer and r low numbers of common pipistrelle bats may roost in the tunnel in summer. The roost/s are of low conservation significance. The surroundings around Clifton 1 are relatively well lit at night because of street lighting on Clifton Suspension Bridge and the A4 road. Conditions within the tunnel are degraded (for bats) because the interior is relatively well light throughout the night because of street and urban lighting (in Clifton and on Clifton Suspension Bridge). However, a low level of social activity was recorded in the autumn 2015.
Clifton 2	**Local Value**	During summer, a low number of lesser horseshoe, common pipistrelle and daubenton's bats have been recorded roosting during the day. *Myotis* sp. are also known to use the tunnel as a night roost. The tunnel is considered to be of moderate conservation significance during summer and is evaluated as being of value in a local context for local bat populations. During autumn, Clifton 2 attracts social activity. It is evident from datalogger monitoring that

		there is regular activity and there are peaks in activity during the night, shown in Appendix 7. Whilst the level of activity is significantly lower than would be expected at a swarming site, peaks of activity on an hourly basis suggest that low numbers of bats may be gathering and socialising at the tunnel. Lesser and greater horseshoe bats and *Myotis* bats socialize at Clifton 2 and the tunnel is considered to be important in a local context. Male brown long-eared bats were captured near the tunnel portal in September and were possibly gathering for mating.
Sandstone	**Local Value**	Bat droppings in the tunnel confirm that crevices are being used by serotine bat and Daubenton's bat. The time of year bats are roosting in the tunnel has not been confirmed, but it is possible crevices are being used throughout the year. The number of droppings found in the tunnel suggests low numbers of bats are roosting and Sandstone tunnel is of moderate conservation significance. Surveys in autumn confirm that Sandstone tunnel is important for social activity. It is evident from datalogger monitoring that there is regular activity and peaks in activity during the night, shown in Appendix 7. Whilst the level of activity is significantly lower than would be expected at a swarming site, peaks of activity on an hourly basis suggest that low numbers of bats may be gathering and socialising at the tunnel. Greater horseshoe bats, *Myotis* bats and long-eared bats socialize at Sandstone and the tunnel is considered to be important in a local context. Trapping surveys caught male serotine bats, brown long-eared bats and natterer's bat near

		the tunnel. These adult males may be gathering for mating.
Pill	**Site Value**	No evidence of bats roosting during summer was recorded at Pill Tunnel. During autumn, it is evident that social activity occurs at the site, but the level of activity is lower than other tunnels and peaks in activity (that indicates sustained activity) are less frequent. Where there are occasional peaks in activity, this tends to be by greater horseshoe bats or *Myotis* sp. of bat. Observational data from swarming activity surveys support the assertion that low numbers of bats use the tunnel in autumn.

Pill Station

The stone arches on the disused platform at Pill station are being used as a day roost by lesser horseshoe bats and a night roost by lesser and greater horseshoe bats. Low numbers of bats are using the structures, with observational survey data confirming solitary animals shelter during summer. Acoustic monitoring of the site confirms roosting is frequent and therefore the structures are considered to be important within a local context.

6.3 Summary

The evaluation of ecological receptors identified for bats within the DCO Scheme are summarised in Table 27.

Table 27. Evaluation of Habitats and Features for Bats

Location	Habitat or Feature	Value
Disused railway line		
Portishead	Commuting Route	Site
	Foraging Habitat	Site
	Roost Resource	Negligible
Portbury Common	Commuting Route	Regional
	Foraging Habitat	Local
	Roost Resource	Site to Local

Farmland	Commuting Route	Regional
	Foraging Habitat	Site
	Roost Resource	Site and Local
Royal Portbury Dock	Commuting bats	Regional
	Foraging bats	Site to Local
	Structures	Site
Portbury Freight Line		
Clifton 1	Roost Resource	Site
Clifton 2	Roost Resource	Local
Sandstone	Roost Resource	Local
Pill	Roost Resource	Site
Pill Station	Roost Resource	Local

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Figures

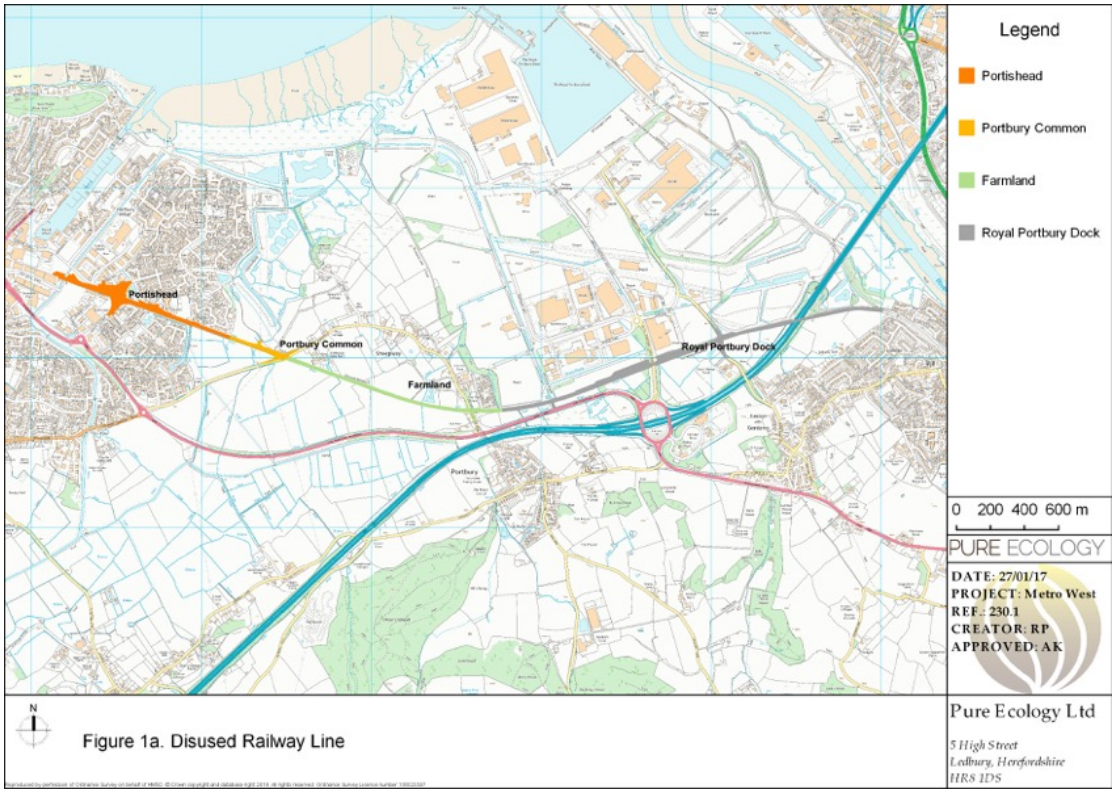


Figure 1a. Disused Railway Line

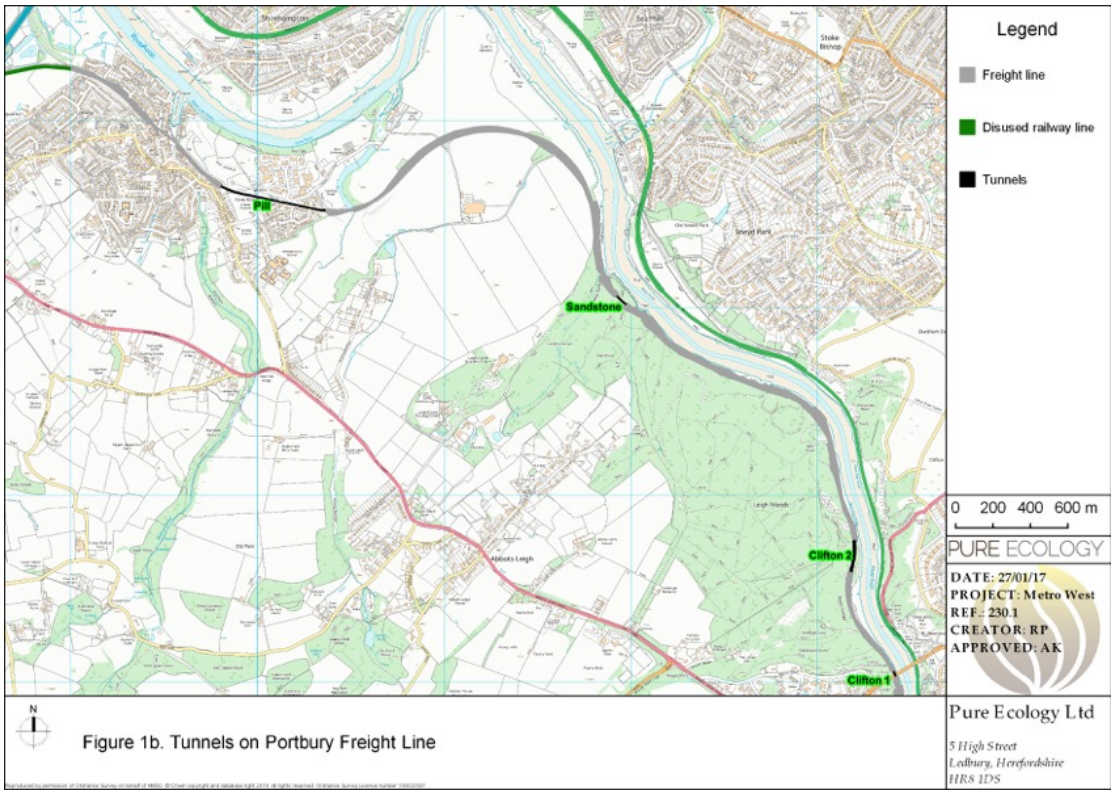


Figure 1b. Tunnels on Portbury Freight Line

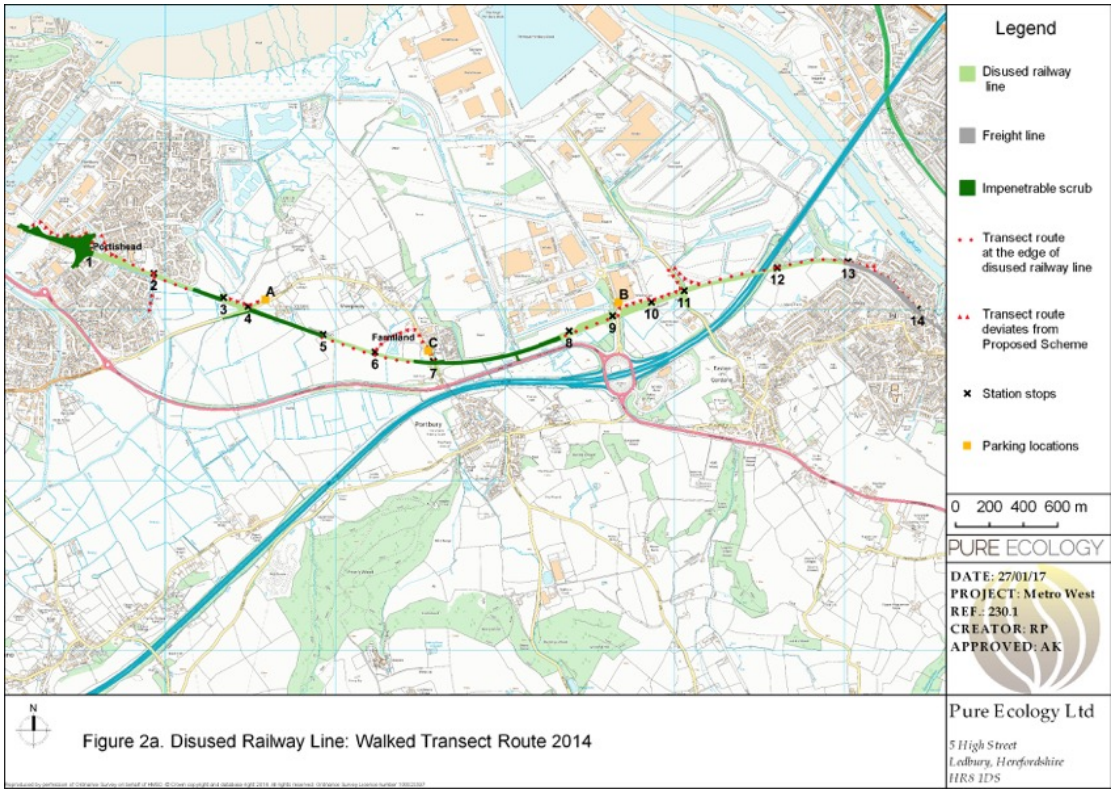


Figure 2a. Disused Railway Line: Walked Transect Route 2014

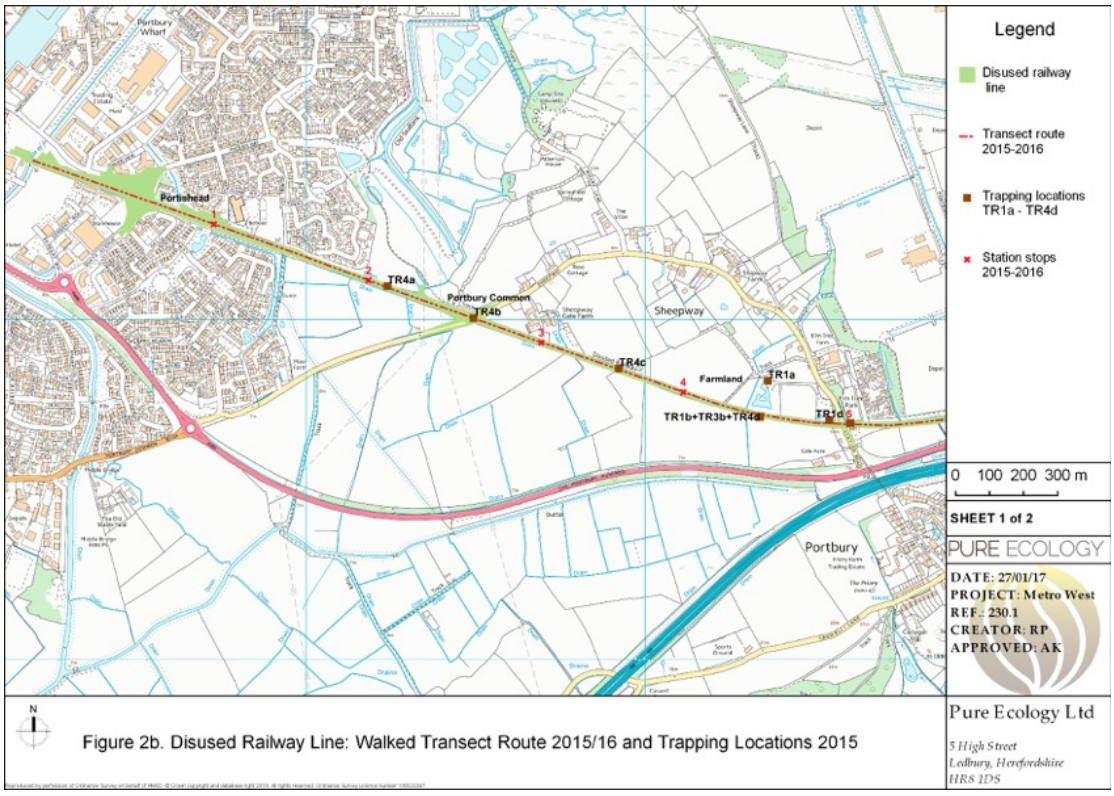
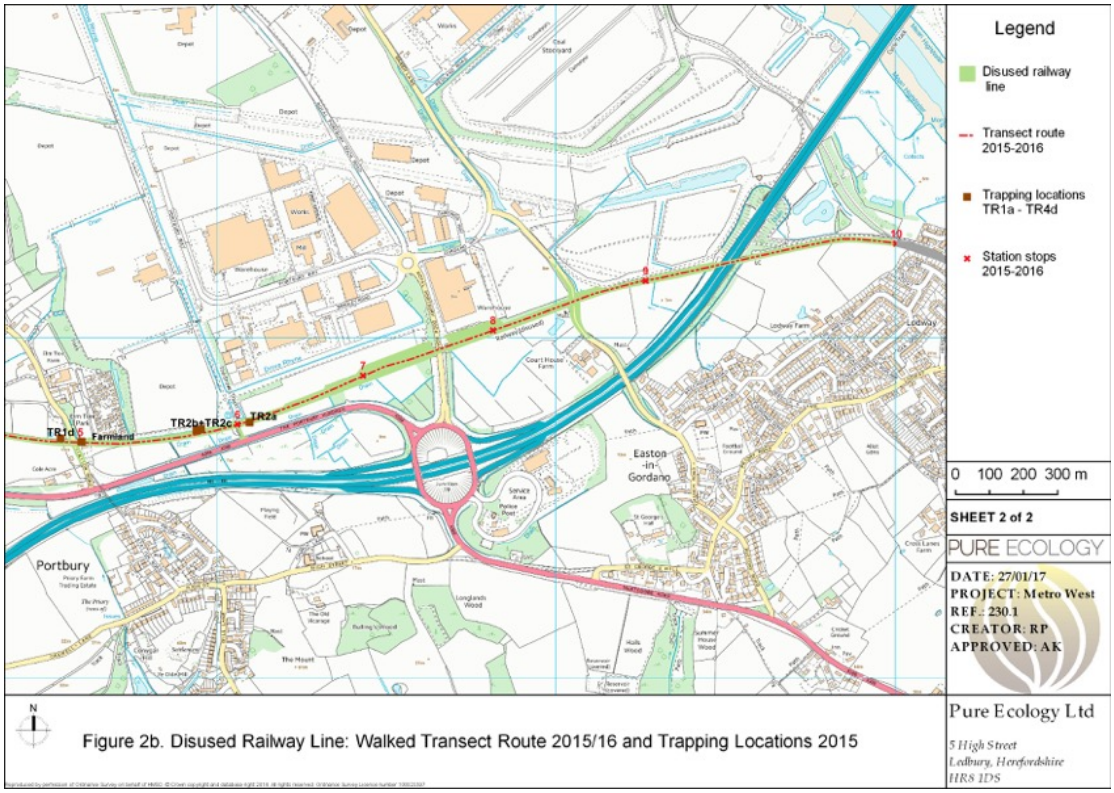


Figure 2b. Disused Railway Line: Walked Transect Route 2015/16 and Trapping Locations 2015



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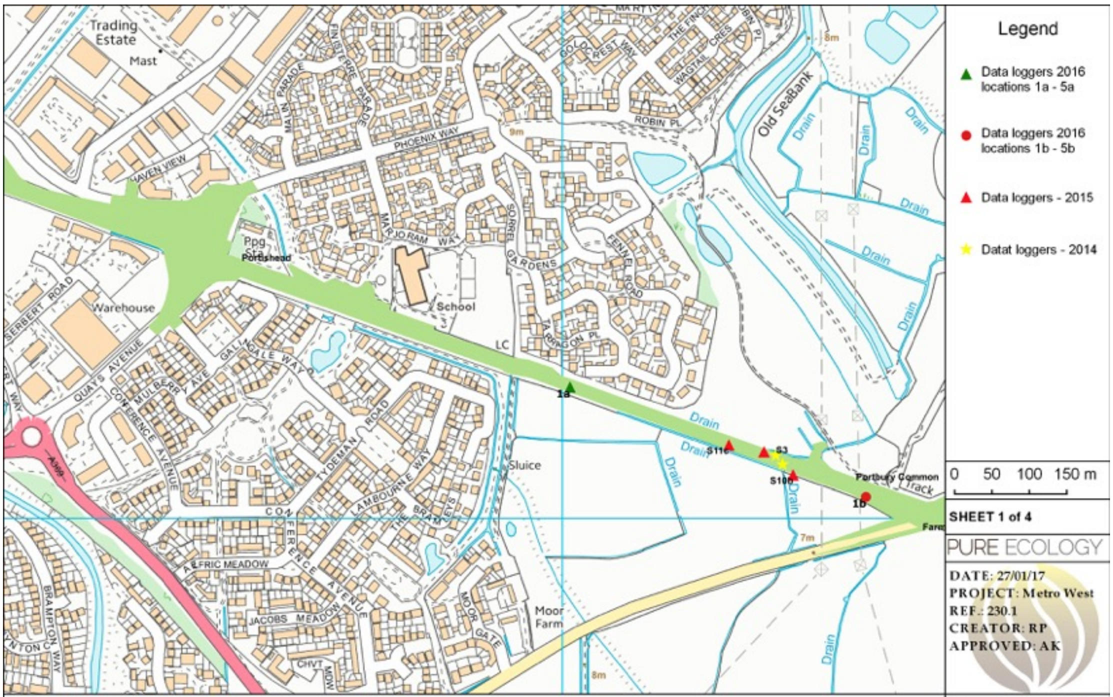
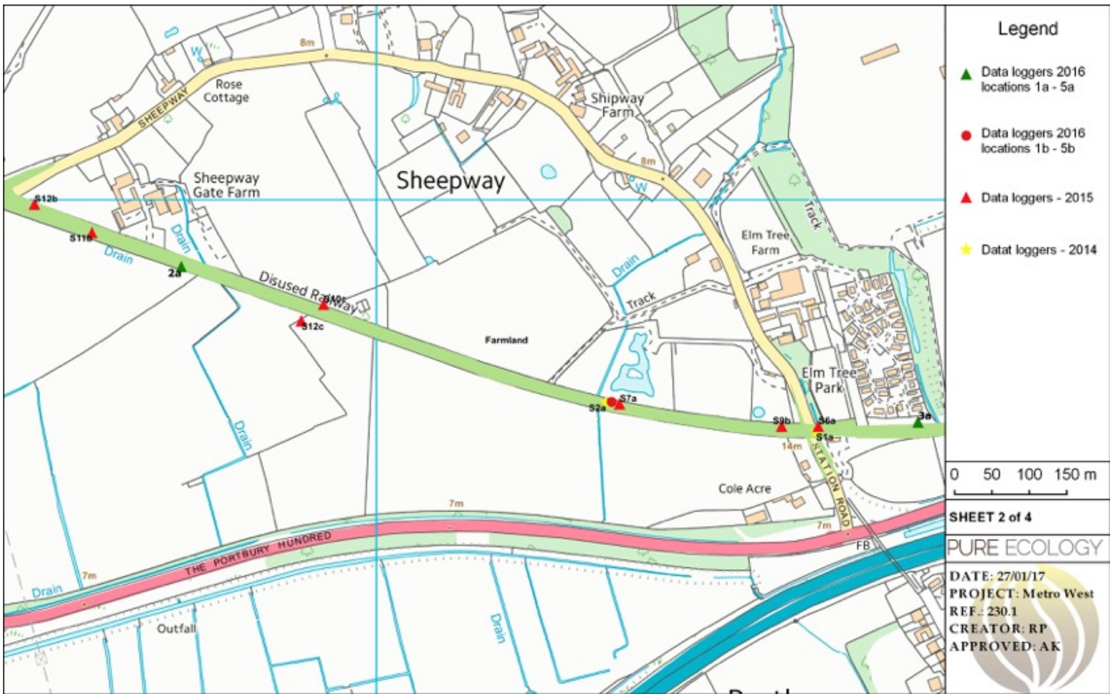


Figure 3. Static Automated Bat Detector Locations



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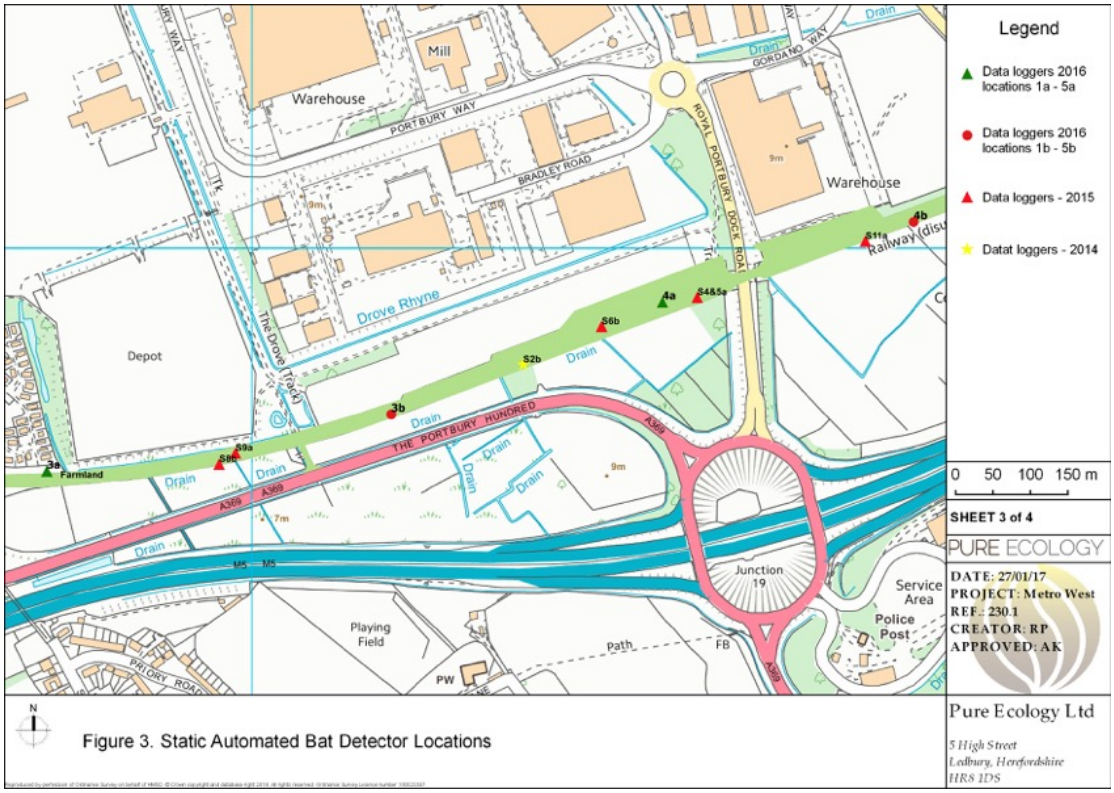

Figure 3. Static Automated Bat Detector Locations

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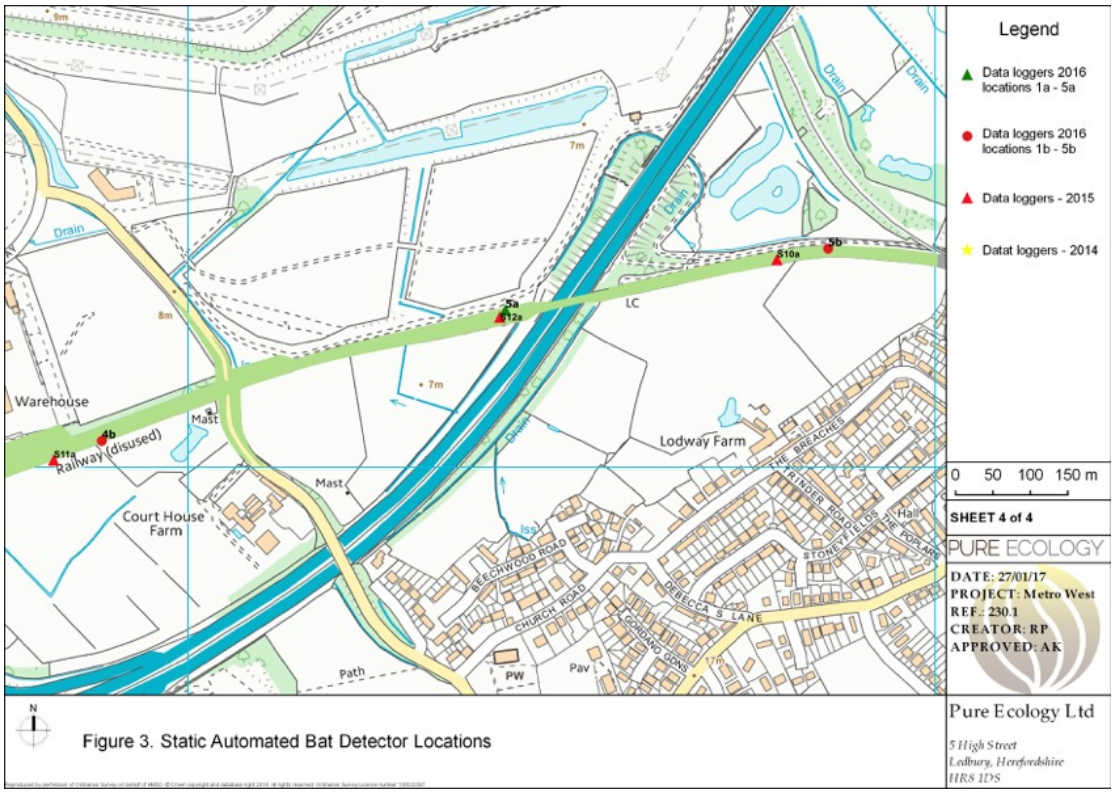
5 High Street
Ledbury, Herefordshire
HR8 1DS



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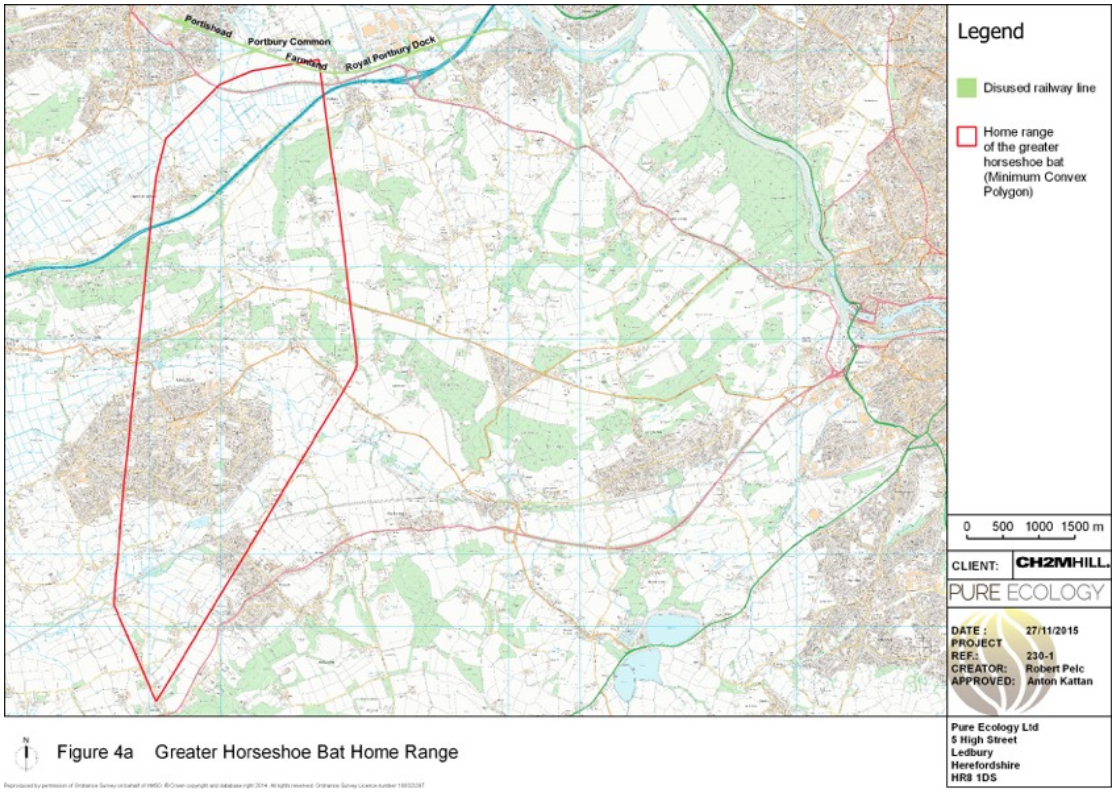


Figure 4a Greater Horseshoe Bat Home Range

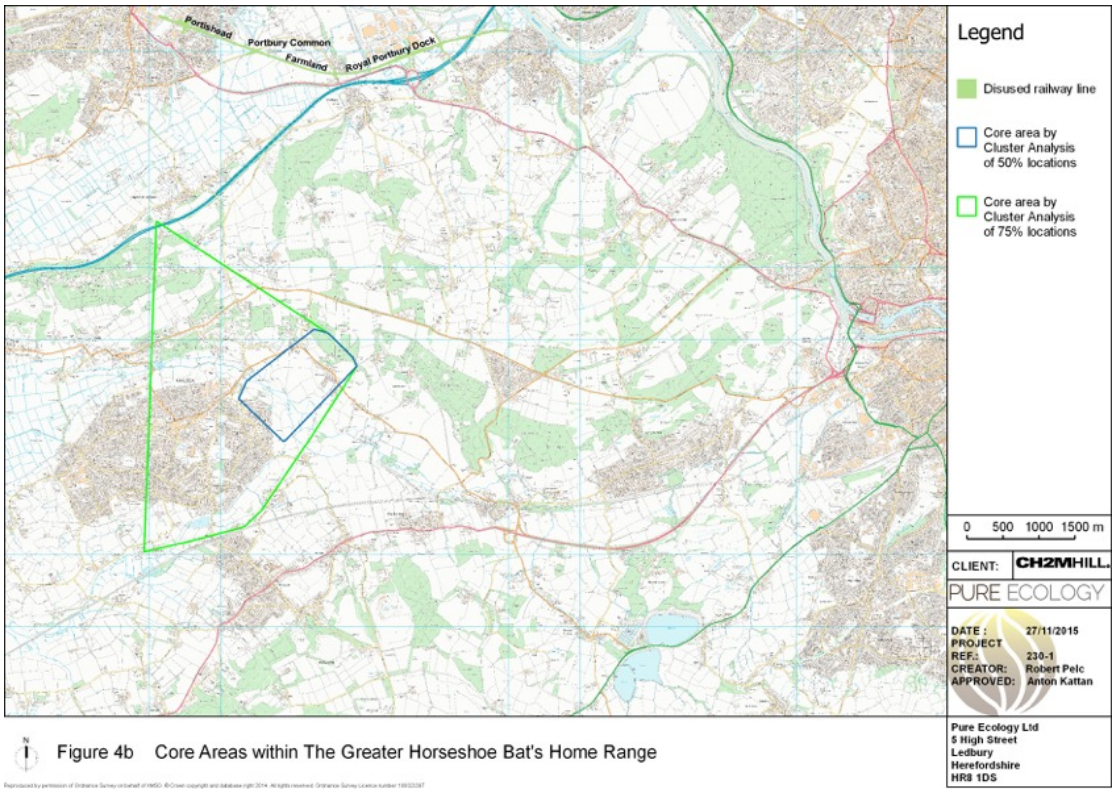


Figure 4b Core Areas within The Greater Horseshoe Bat's Home Range

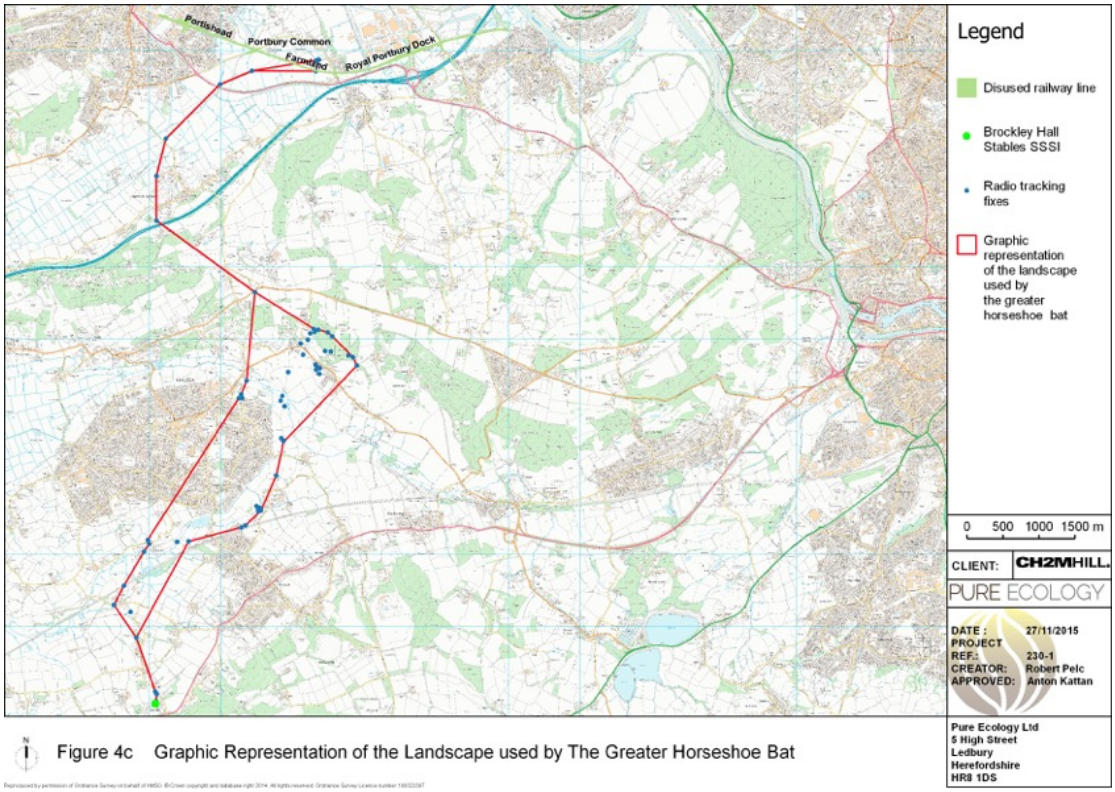


Figure 4c Graphic Representation of the Landscape used by The Greater Horseshoe Bat

Figure 5 Structures and Trees

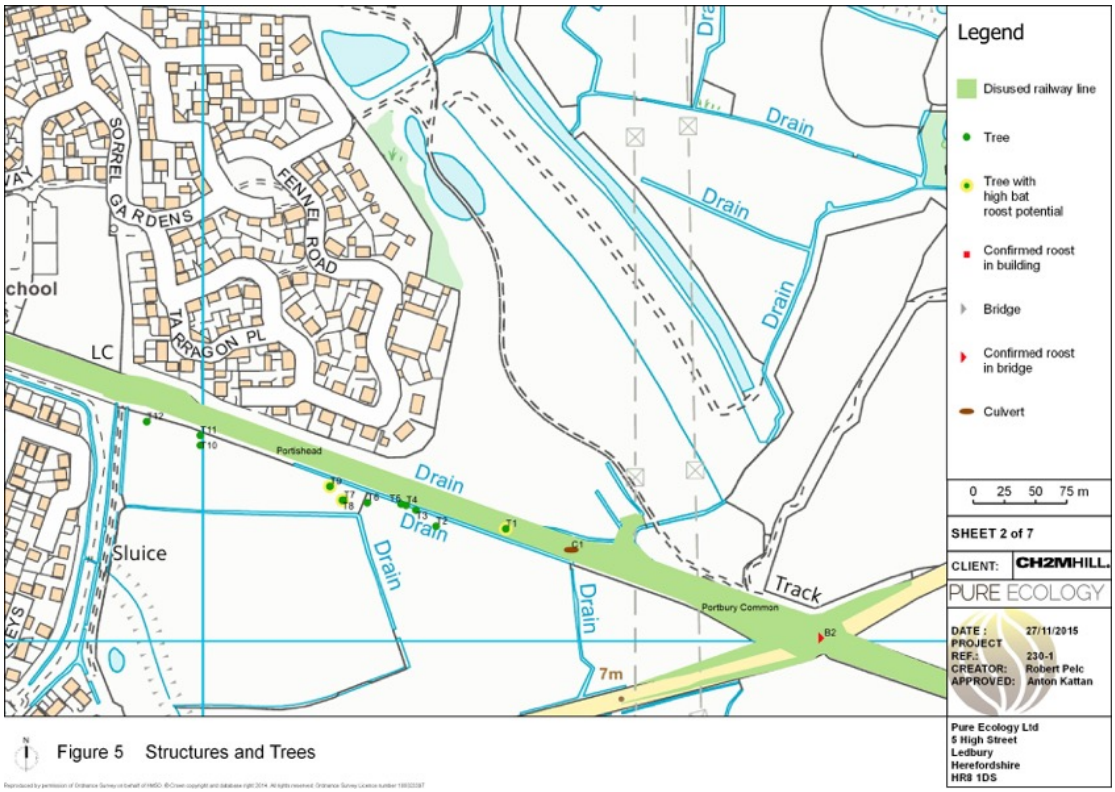
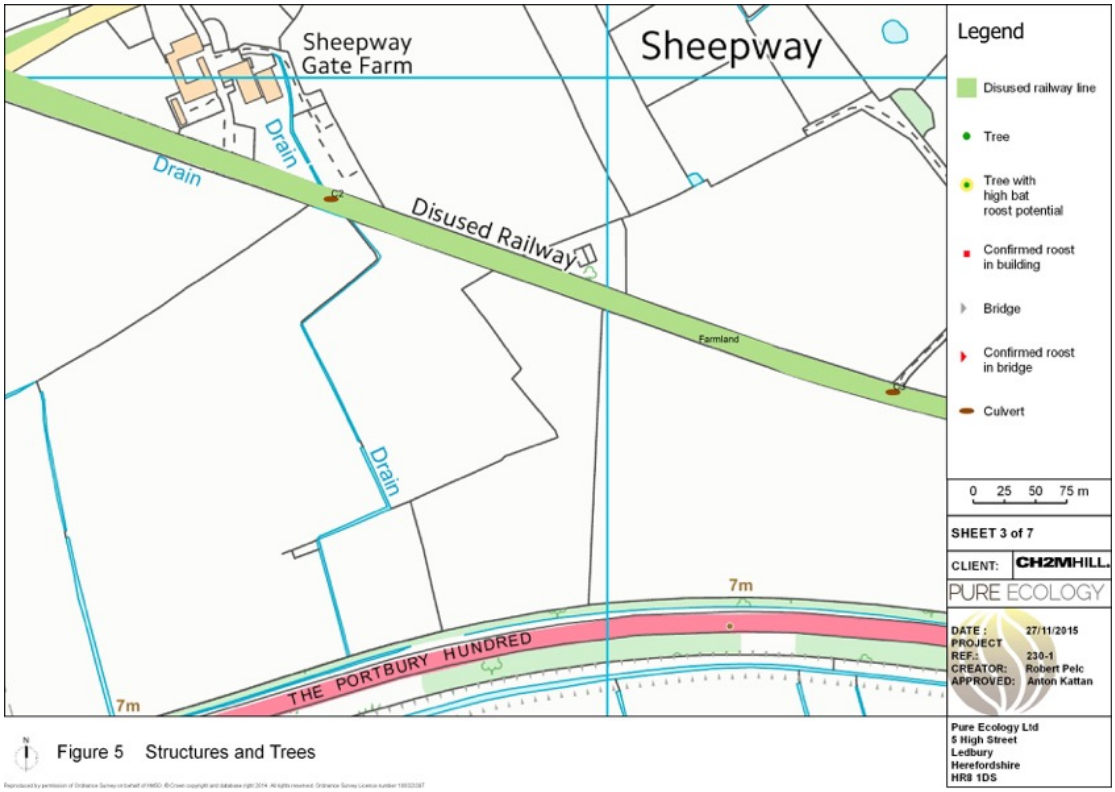


Figure 5 Structures and Trees



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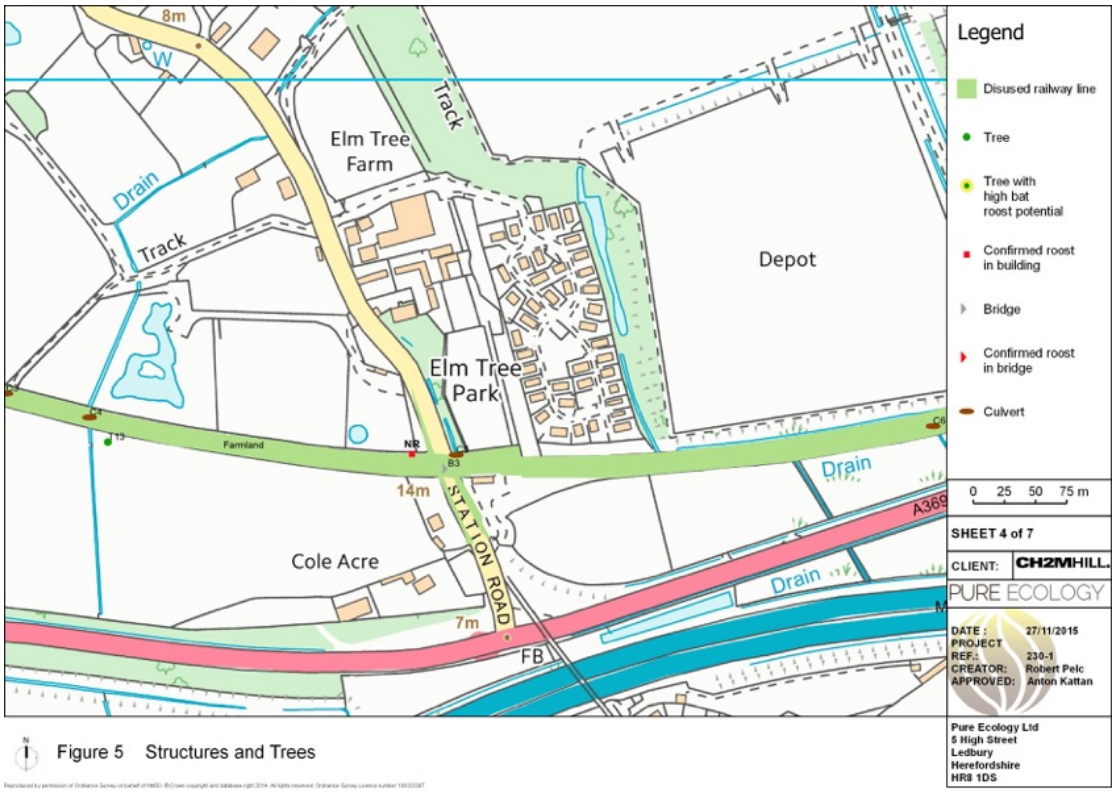

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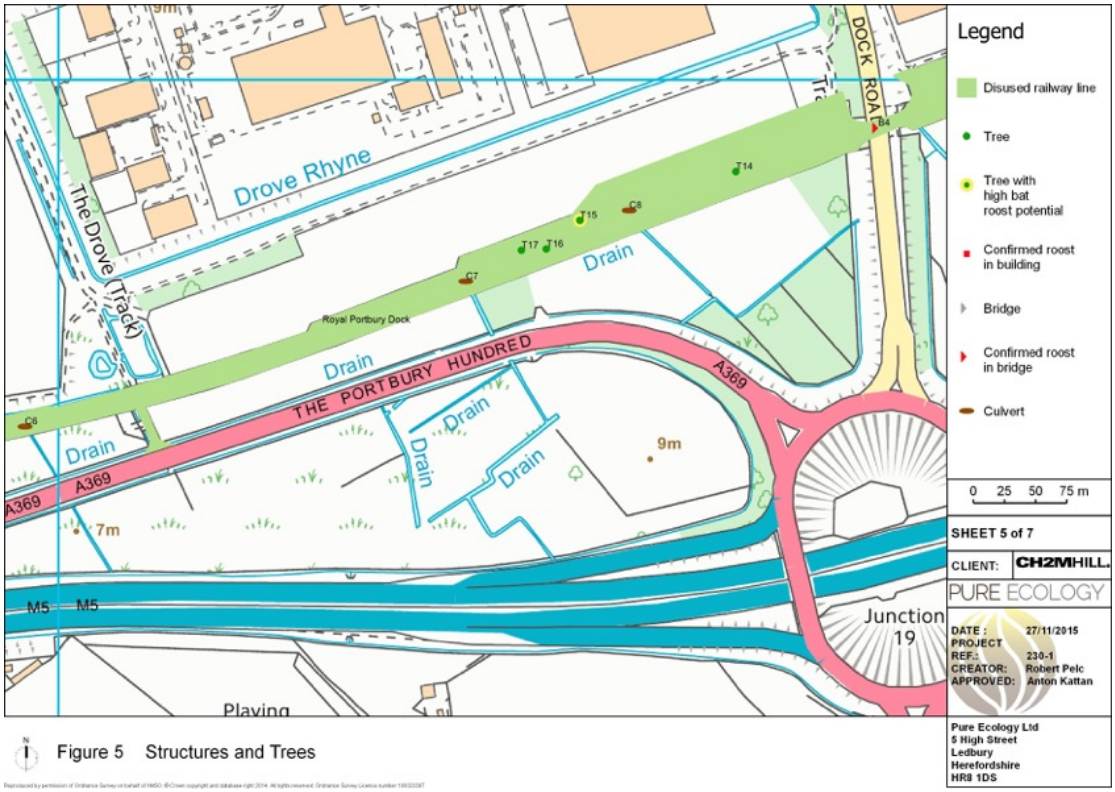

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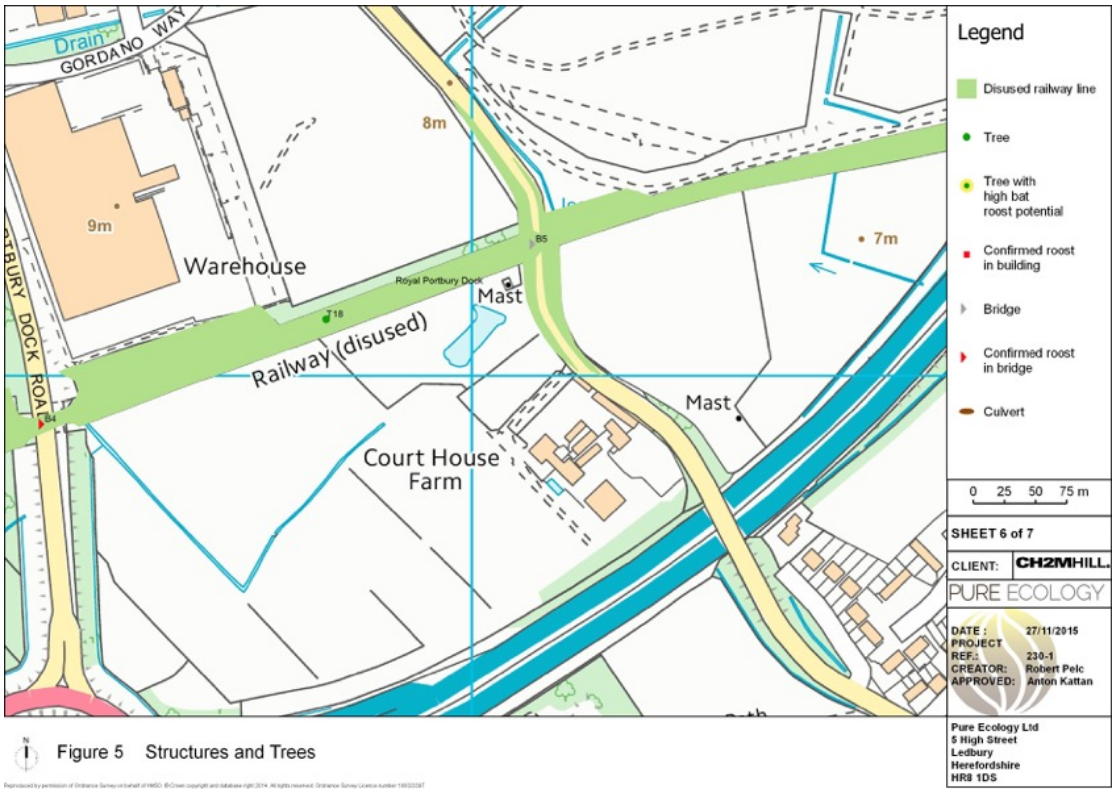

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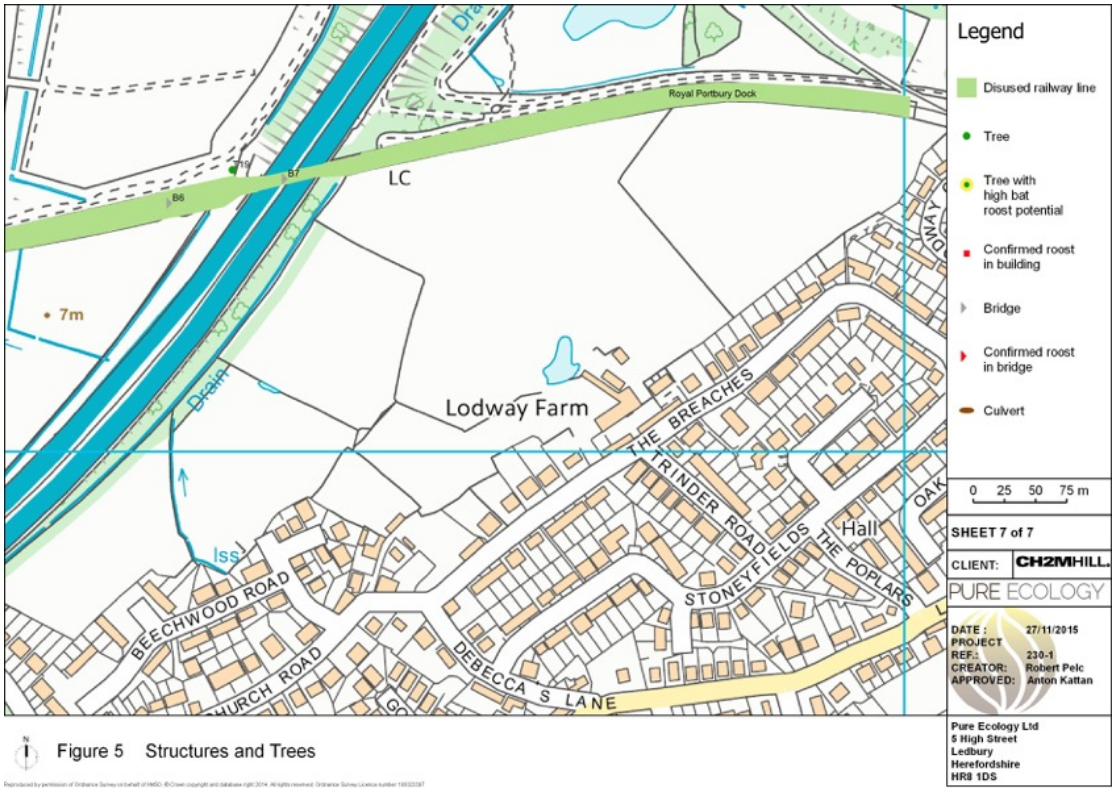

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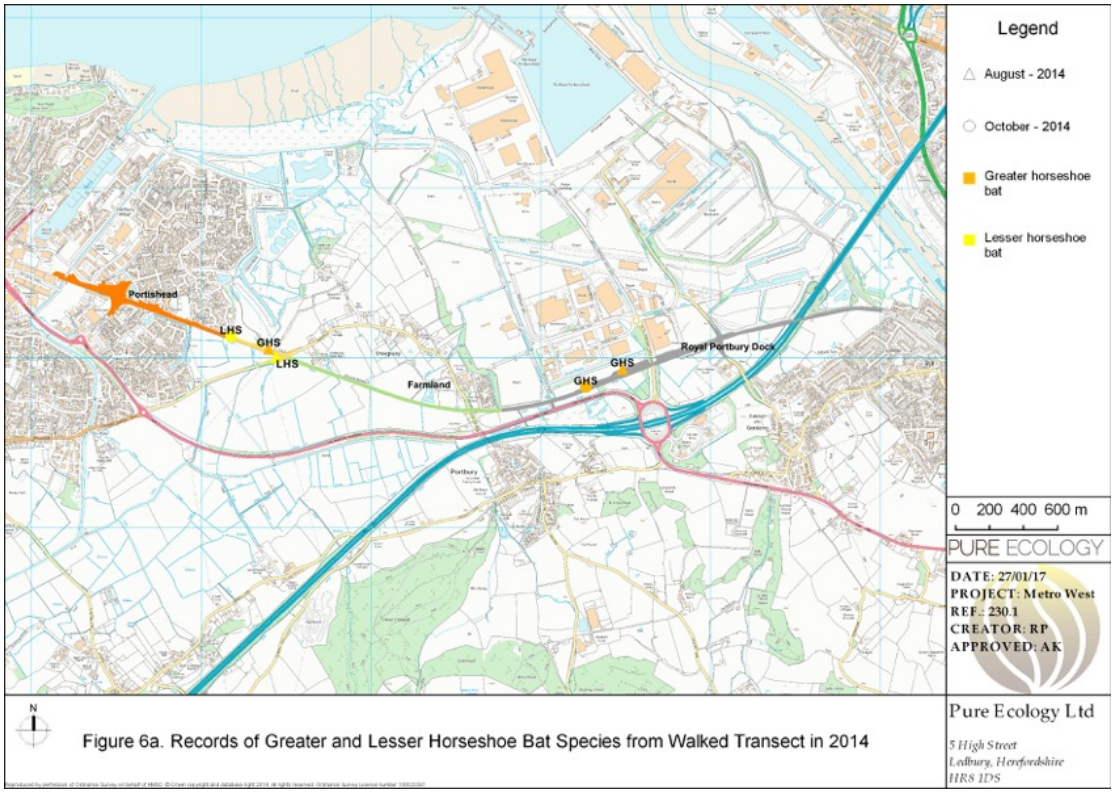

Figure 6a. Records of Greater and Lesser Horseshoe Bat Species from Walked Transect in 2014

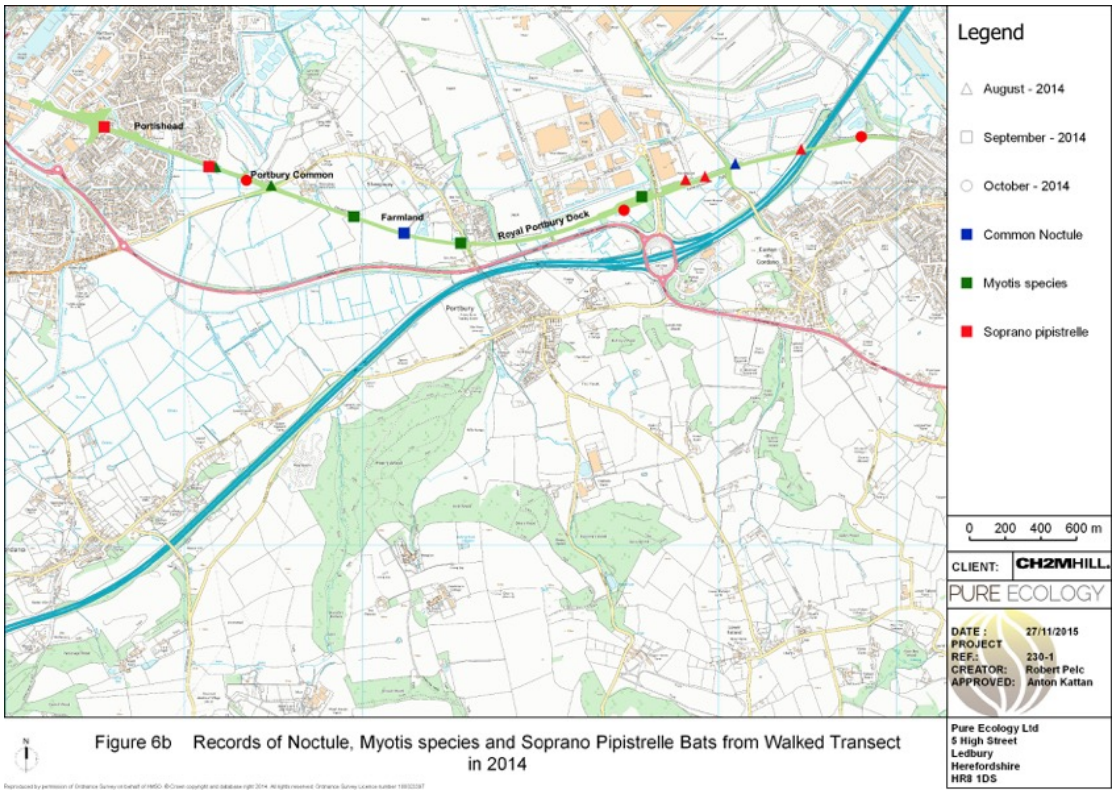

Figure 6b Records of Noctule, Myotis species and Soprano Pipistrelle Bats from Walked Transect in 2014

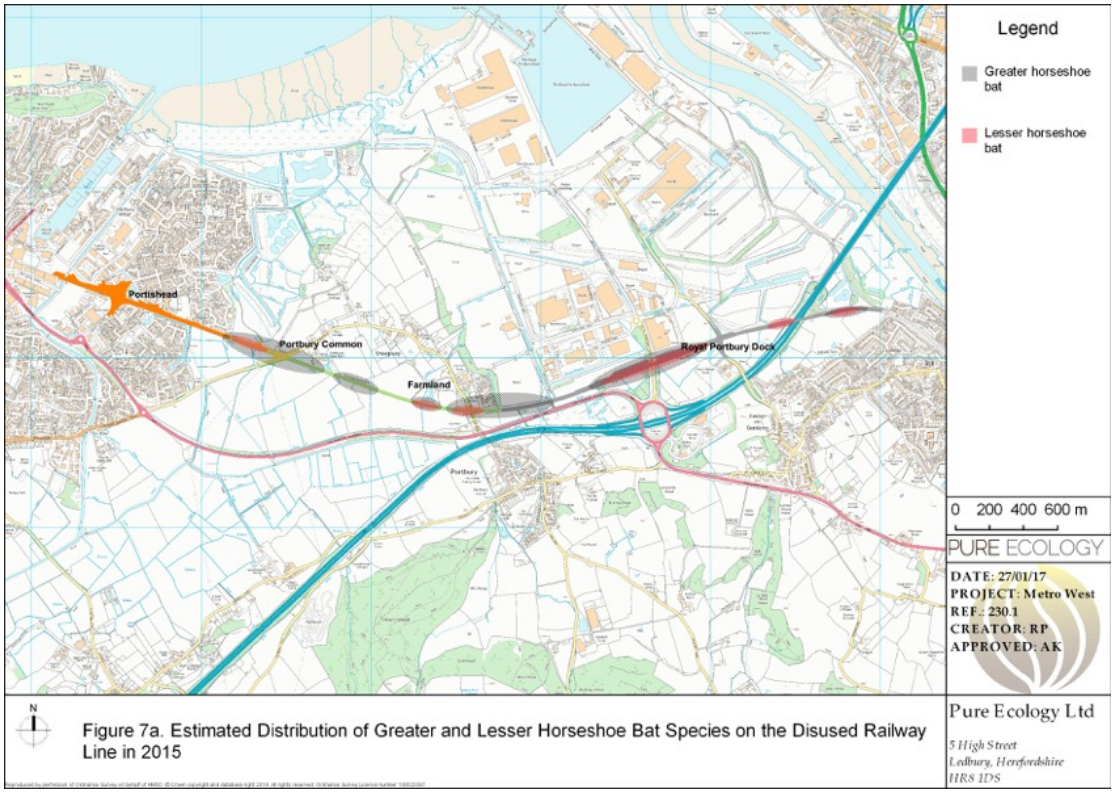

Figure 7a. Estimated Distribution of Greater and Lesser Horseshoe Bat Species on the Disused Railway Line in 2015

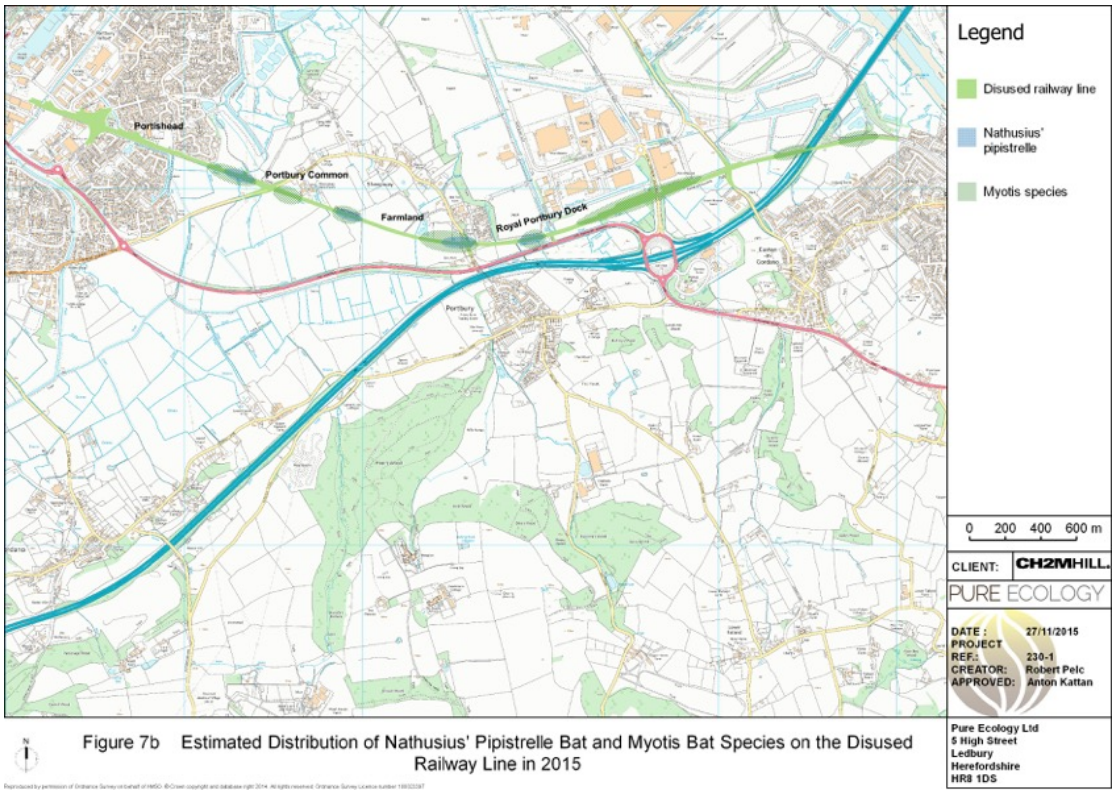

Figure 7b Estimated Distribution of Nathusius' Pipistrelle Bat and Myotis Bat Species on the Disused Railway Line in 2015

Appendix 1. Walked Transect Survey of the Disused Railway Line: May 2015 – April 2016

Transect Survey Results: May 2015 – April 2016

Date	**Transect Section**	**Species**								
		Pp	**Ppy**	**Msp**	**Psp**	**Nn**	**Nl**	**Es**	**Rh**	**Rf**
18/05/15	Portishead	x	x	x	X	x	x	x	x	x
	Portbury Common	L	L	x	X	x	x	x	x	x
	Farmland	L-M	x	x	X	x	L	x	x	x
	Royal Portbury Docks	L-M	x	x	X	x	x	x	x	x
31/05/15	Portishead	L	x	x	X	x	x	x	x	x
	Portbury Common	M	x	x	X	x	x	x	x	x
	Farmland	L-M	x	L	X	x	x	x	x	x
	Royal Portbury Docks	L-M	L	x	X	x	x	x	x	x
08/06/15	Portishead	L	x	x	X	x	x	x	x	x
	Portbury Common	L	L	x	X	x	x	x	x	x
	Farmland	L-M	M-L	x	X	L	x	x	L-M	x
	Royal Portbury Docks	L-M	M	x	X	X	x	M	x	x
23/06/15	Portishead	x	x	x	X	X	x	x	x	x
	Portbury Common	L	x	x	X	L	x	L	x	L
	Farmland	L	L	x	L	L	x	L	L	x
	Royal Portbury Docks	L-M	L	x	X	L	x	x	x	x
08/07/15	Portishead	L	x	x	X	x	x	x	x	x
	Portbury Common	L	x	x	X	x	x	L	x	x
	Farmland	L	L	x	X	x	x	x	x	x

Date	Transect Section	Species								
		Pp	**Ppy**	**Msp**	**Psp**	**Nn**	**Nl**	**Es**	**Rh**	**Rf**
	Royal Portbury Docks	L-M	M	x	X	x	x	x	x	x
20/07/15	Portishead	L	x	x	X	x	x	x	x	x
	Portbury Common	x	x	x	X	L	x	x	x	x
	Farmland	L-M	L	x	L	x	x	L	x	L
	Royal Portbury Docks	L	x	x	X	x	x	x	x	x
04/08/15	Portishead	L	L	x	X	x	x	x	x	x
	Portbury Common	M	L	x	X	x	x	x	x	x
	Farmland	L	L	x	X	L	x	L	x	x
	Royal Portbury Docks	L-M	L-M	x	X	L	L	x	x	L
18/08/15	Portishead	L	x	x	X	x	x	x	x	x
	Portbury Common	M	x	x	X	x	x	x	x	L
	Farmland	L-M	L-M	L	X	x	L	x	x	x
	Royal Portbury Docks	M	L	L	X	x	L	x	x	x
05/04/16	Portishead	L	x	x	x	x	x	x	x	x
	Portbury Common	L	x	x	x	L	x	x	x	x
	Farmland	L	x	L		L	x	x	x	x
	Royal Portbury Docks	L	L	x	x	x	x	x	x	x
18/04/16	Portishead	L	x	x	x	x	x	x	x	x
	Portbury Common	L	L	x	x	x	x	L	x	x
	Farmland	L	L	x	x	x	x	x	x	x

Date	Transect Section	Species								
		Pp	**Ppy**	**Msp**	**Psp**	**Nn**	**Nl**	**Es**	**Rh**	**Rf**
	Royal Portbury Docks	M	L	x	x	x	x	x	x	x

Species

Pp Common pipistrelle; **Ppy** Soprano pipistrelle; **Msp** Myotis sp.; **Psp** Long-eared sp. **Nn** Noctule; **Nl** Leisler's; **Es** Serotine; **Rh** Lesser horseshoe; **Rf** Greater horseshoe.

Levels of bat activity

H – High; **M –** Moderate; **L-** Low; **x –** No bat activity

Appendix 2. Static Automated Bat Detector Monitoring on the Disused Railway Line 2014 and 2015.

Summary of the Number of Nights that Species were Recorded on the Disused Railway Line by Static Automated Bat Detectors.

Figure 3 Ref	**Location**	**Month**	**Duration of Monitoring (No. of nights)**	**Number of Nights Species were Recorded**										
				Pp	**Ppy**	**Pn**	**Pa**	**Msp**	**Nl**	**Nn**	**Es**	**Nl/Nn or Es**	**Rh**	**Rf**
S1a	**Royal Portbury Dock** (ST 49588 75689)	August 2014	3	3	3	0	0	3	0	0	0	0	1	1
S1b	**Portbury Common** (ST 48294 76071)	August 2014	4	4	0	0	0	2	0	0	0	0	1	0
S2a	**Farmland** (ST 49307 75728)	September 2014	1	1	1	0	0	0	0	1	0	0	1	0
S2b	**Royal Portbury Dock** (ST 50362 75844)	September 2014	6	6	0	0	0	3	0	1	0	0	0	2
S3	**Portbury Common** (ST 48285 76083)	October/ November 2014	17	17	12	0	0	8	0	2	0	0	5	1
S4	**Royal Portbury Dock** ST 50595 75934	April 2015	8	8	2	0	0	0	0	4	1	6	3	0
S5a	**Royal Portbury Dock** ST 50595 75934	April 2015	7	7	5	0	0	3	0	1	0	1	6	0
S5b	**Portbury Common** ST 48269 76088	April 2015	9	9	7	0	0	2	0	3	0	1	0	0

Figure 3 Ref	Location	Month	Duration of Monitoring (No. of nights)	Number of Nights Species were Recorded										
				Pp	Ppy	Pn	Pa	Msp	Nl	Nn	Es	Nl/Nn or Es	Rh	Rf
S6a	**Farmland** ST 49591 75696	May 2015	13	13	10	0	0	5	0	4	0	1	1	7
S6b	**Royal Portbury Dock** ST 50467 75895	May 2015	9	9	5	0	1	2	6	9	4	6	1	2
S7a	**Farmland** ST 49325 75726	May/June 2015	9	9	9	0	0	9	0	1	0	2	1	4
S7b	**Royal Portbury Dock** ST 50467 75895	May/June 2015	9	9	7	0	0	1	4	8	5	7	0	0
S8a	**Farmland** ST 49542 75696	June 2015	14	14	14	0	0	6	0	12	0	14	9	8
S8b	**Royal Portbury Dock** ST 49955 75711	June 2015	6	6	6	2	0	2	6	6	3	6	0	3
9a	**Royal Portbury Dock** ST 49977 75726	June/July 2015	14	14	14	0	0	3	0	8	0	3	0	5
9b	**Farmland** ST 49542 75696	June/July 2015	10	10	10	4	10	9	8	0	10	10	3	1
10a	**Royal Portbury Dock** ST 51788 76277	July 2015	7	7	7	0	0	5	0	4	0	3	2	2
10b	**Portbury Common**	July2015	7	7	7	5	5	7	2	6	2	5	0	3

Figure 3 Ref	Location	Month	Duration of Monitoring (No. of nights)	Number of Nights Species were Recorded										
				Pp	**Ppy**	**Pn**	**Pa**	**Msp**	**Nl**	**Nn**	**Es**	**Nl/Nn or Es**	**Rh**	**Rf**
	ST 48308 76057													
10c	**Farmland** ST 48929 75859	July 2015	8	8	7	1	1	8	5	6	1	7	0	6
11a	**Royal Portbury Dock** ST 50820 76009	July August 2015	15	15	15	0	0	8	0	2	0	4	1	13
11b	**Farmland** ST 48619 75955	July 2015	8	8	8	0	2	5	0	2	1	3	0	3
11c	**Portbury Common** ST 48222 76097	July 2015	5	5	5	0	2	2	0	1	2	1	0	2
12a	**Royal Portbury Dock** ST 51417 76200	August 2015	8	8	8	0	0	7	0	7	0	7	3	0
12b	**Farmland** ST 48542 75993	August 2015	8	8	7	0	1	3	0	3	3	4	0	1
12c	**Farmland** ST 48899 75837	August 2015	8	8	8	0	4	8	0	6	4	8	0	6
Total Number of Nights			**213**	**213**	**177**	**12**	**26**	**111**	**31**	**97**	**36**	**99**	**38**	**70**

Notes

Species key –Pp Common pipistrelle (*P. pipistrellus*); Ppy Soprano pipistrelle *(P.pygmaeus);* Pn Nathusius' pipistrelle (*P. nathusii*); Pa Long-eared (*Plecotus sp.)*Msp (Myotis sp); Nl Leisler's (*Nyctalus leisleri)* Nn Noctule (*Nyctalus noctula*); Es Serotine (*Eptesicus serotinus)* Rh Lesser horseshoe (*Rhinolophus hipposideros*); Rf Greater horseshoe (*Rhinolophus ferrumequinum*).

The results of the static automated bat detector (datalogger) monitoring on the disused railway line are presented in chronological order and in tables according to the period of monitoring the dataloggers were deployed.

The data show the number of 'registrations' per species. A registration is the term given to a 15-second sound file that recorded bat calls and represents a single bat, or low number of passes by a bat at a given point. Counting the number of registrations per species is a discrete measure of bat activity at the datalogger locations and that is used to characterise the level of activity.

Datalogger Monitoring Results on the Disused Railway Line for April 2015

Species	**Figure 3 Ref**	**Location**	**Date**	**No of Registrations per night**	**Earliest Registration Past Sunset (hrs:mins)**
Lesser horseshoe	S4	Royal Portbury Dock ST 50595 75934	11/04/15	1	05:22
			13/04/15	22	03:47
			14/04/15	50	02:14
	S5a	Royal Portbury Dock ST 50595 75934	21/04/15	10	03:01
			22/04/15	5	04:07
			23/04/15	1	02:55
			25/04/15	4	05:32
			26/04/15	6	04:33
			27/04/15	1	01:53
Myotis Sp	S5a	Royal Portbury Dock ST 50595 75934	21/04/15	13	01:56
			22/04/15	3	00:54
			23/04/15	7	03:54
	S5b	Portbury Common ST 48269 76088	23/04/15	1	03:40
			24/04/15	1	03:11

Species	Figure 3 Ref	Location	Date	No of Registrations per night	Earliest Registration Past Sunset (hrs:mins)
Noctule	S4	Royal Portbury Dock ST 50595 75934	09/04/15	2	00:00
			13/04/15	1	00:47
			14/04/15	1	10:27
			16/04/15	1	00:23
	S5a	Royal Portbury Dock ST 50595 75934	24/04/15	1	03:21
	S5b	Portbury Common ST 48269 76088	25/04/15	1	04:22
			24/04/15	1	03:37
			23/04/15	1	04:22
Noctule/ Leisler's or Serotine	S4	Royal Portbury Dock ST 50595 75934	10/04/15	4	00:35
			1104/15	1	05:35
			13/04/15	2	05:35
			14/04/15	1	03:14
			15/04/15	2	00:24
			16/04/15	2	01:02
	S5a	Royal Portbury Dock	25/04/15	2	03:53

Species	Figure 3 Ref	Location	Date	No of Registrations per night	Earliest Registration Past Sunset (hrs:mins)
		ST 50595 75934			
	S5b	Portbury Common ST 48269 76088	27/04/15	1	01:18

Datalogger Monitoring Results on the Disused Railway Line for May - June 2015

Species	**Figure 3 Ref**	**Location**	**Date**	**No of Registrations per night**	**Earliest Registration Past Sunset (hrs:mins)**
Lesser horseshoe	S6a	Farmland ST 49591 75696	24/05/15	1	03:34
	S6b	Royal Portbury Dock ST 50467 75895	20/05/15	1	02:20
	S7a	Farmland ST 49325 75726	06/06/15	3	04:55
	9b	Farmland ST 49542 75696	26/06/15	1	05:30
			28/06/15	5	02:09
			29/06/15	2	04:04
Greater horseshoe	S6a	Farmland ST 49591 75696	20/05/15	1	04:09
			21/05/15	31	03:00
			23/05/15	1	02:29
			25/05/15	2	02:24
			27/05/15	4	04:08
			29/05/15	1	04:28
			30/05/15	1	04:01

Species	Figure 3 Ref	Location	Date	No of Registrations per night	Earliest Registration Past Sunset (hrs:mins)
	S6b	Royal Portbury Dock ST 50467 75895	20/05/15	2	03.03
			25/05/15	1	04.39
	S7a	Farmland ST 49325 75726	05/06/15	1	02:53
			06/06/15	2	05:00
			07/06/15	14	04:03
			08/06/15	1	03:01
Long-eared sp	S6b	Royal Portbury Dock ST 50467 75895	19/05/15	1	00:56
Myotis Sp	S6a	Farmland ST 49591 75696	22/05/15	2	01:58
			23/05/15	1	02:42
			24/05/15	2	00:32
			25/05/15	1	03:39
			27/05/15	1	03:08
	S6b	Royal Portbury Dock ST 50467 75895	21/05/15	1	01:46
			22/05/15	3	01:08

Species	Figure 3 Ref	Location	Date	No of Registrations per night	Earliest Registration Past Sunset (hrs:mins)
			23/05/15	2	01:16
			24/05/15	8	02:13
			26/05/15	2	02:56
	S7a	Farmland ST 49325 75726	31/05/15	7	01:11
			01/06/15	1	03:27
			02/06/15	2	04:06
			03/06/15	10	01:03
			04/06/15	8	01:05
			05/06/15	1	01:03
			06/06/15	15	01:31
			07/06/15	2	01:43
			08/06/15	6	02:53
	S7b	Royal Portbury Dock ST 50467 75895	03/06/15	1	01:39
Leisler's	S6b	Royal Portbury Dock ST 50467 75895	20/05/15	2	08:00
			21/05/15	1	00:28
			22/05/15	7	00:13

Species	Figure 3 Ref	Location	Date	No of Registrations per night	Earliest Registration Past Sunset (hrs:mins)
			23/05/15	8	00:10
			24/05/15	4	00:25
			25/05/15	4	00:23
	S7b	Royal Portbury Dock ST 50467 75895	02/06/15	2	00:57
			03/06/15	31	00:18
			05/06/15	4	06:07
			07/06/15	2	01:04
Noctule	S6a	Farmland ST 49591 75696	23/05/15	7	00:10
			24/05/15	3	00:36
			29/05/15	1	00:35
	S6b	Royal Portbury Dock ST 50467 75895	18/05/15	1	00:00
			19/05/15	2	23:54
			20/05/15	2	07:36
			21/05/15	32	00:07
			22/05/15	20	00:01
			23/05/15	19	00:07

Species	Figure 3 Ref	Location	Date	No of Registrations per night	Earliest Registration Past Sunset (hrs:mins)
			24/05/15	16	00:07
			25/05/15	19	00:17
			26/05/15	1	03:05
	S7a	Farmland ST 49325 75726	03/06/15	2	07:10
	S7b	Royal Portbury Dock ST 50467 75895	31/05/15	3	00:00
			01/06/15	39	00:23
			02/06/15	412 (within ½hr period)	04:48
			03/06/15	25	00:19
			04/06/15	10	07:09
			05/06/15	11	00:14
			06/06/15	5	07:09
			07/06/15	7	07:03
Serotine	S6b	Royal Portbury Dock ST 50467 75895	20/05/15	6	00:18
			21/05/15	4	00:24
			23/05/15	2	00:16

Species	Figure 3 Ref	Location	Date	No of Registrations per night	Earliest Registration Past Sunset (hrs:mins)
			25/05/15	2	01:30
	S7b	Royal Portbury Dock ST 50467 75895	31/05/15	1	00:24
			03/06/15	1	00:18
			05/06/15	1	00:39
			06/06/15	1	00:41
			07/06/15	1	00:42
Noctule/ Leisler's or Serotine	S6a	Farmland ST 49591 75696	30/05/15	1	01:11
	S6b	Royal Portbury Dock ST 50467 75895	19/05/15	1	23:59
			20/05/15	11	00:21
			21/05/15	1	07:53
			22/05/15	8	00:13
			23/05/15	15	00:03
			26/05/15	1	04:14
	S7a	Farmland ST 49325 75726	04/06/15	1	01:57
			06/06/15	2	01:06

Species	Figure 3 Ref	Location	Date	No of Registrations per night	Earliest Registration Past Sunset (hrs:mins)
	S7b	Royal Portbury Dock ST 50467 75895	31/05/15	11	00:03
			02/06/15	1	07:46
			03/06/15	11	00:19
			04/06/15	1	00:51
			05/06/15	3	03:36
			06/06/15	1	01:52
			07/06/15	2	01:02

Datalogger Monitoring Results on the Disused Railway Line for June – July 2015

Species	**Figure 3 Ref**	**Location**	**Date**	**No of Registrations per night**	**Earliest Registration Past Sunset (hrs:mins)**
Lesser horseshoe	S8a	Farmland ST 49542 75696	09/06/15	1	02:07
			10/06/15	1	02:31
			12/06/15	4	04:49
			14/06/15	9	02:16
			15/06/15	14	04:17
			16/06/15	2	03:02
			17/06/15	9	03:13
			19/06/15	1	05:38
			20/06/15	5	03:06
	9b	Farmland ST 49542 75696	26/06/15	1	05:30
			28/06/15	5	02:09
			29/06/15	2	04:04
Greater Horseshoe	S8a	Farmland ST 49542 75696	11/06/15	2	03:16
			12/06/15	2	04:01
			15/06/15	1	05:29

Species	Figure 3 Ref	Location	Date	No of Registrations per night	Earliest Registration Past Sunset (hrs:mins)
			16/06/15	1	03:48
			17/06/15	1	04:57
			18/06/15	2	02:07
			20/06/15	1	04:11
			21/06/15	1	04:40
	S8b	Royal Portbury Dock ST 49955 75711	10/06/15	1	04:56
			11/06/15	1	04:32
			12/06/15	3	04:08
	9a	Royal Portbury Dock ST 49977 75726	29/06/15	1	03:09
			01/07/15	1	04:33
			02/07/15	1	04:56
			04/07/15	1	01:21
			05/07/15	1	03:40
	9b	Farmland ST 49542 75696	26/06/15	1	04:14
Long-eared sp	9b	Farmland ST 49542 75696	25/06/15	6	00:32

Species	Figure 3 Ref	Location	Date	No of Registrations per night	Earliest Registration Past Sunset (hrs:mins)
			26/06/15	12	00:54
			27/06/15	2	06:22
			29/06/15	17	00:47
			30/06/15	18	01:00
			01/07/15	9	00:49
			02/07/15	3	02:27
			25/06/15	3	00:57
			03/07/15	3	02:40
			04/07/15	1	03:25
Nathusius'	S8b	Royal Portbury Dock ST 49955 75711	13/06/15	1	00:59
			12/06/15	1	03:22
	9b	Farmland ST 49542 75696	26/06/15	1	01:06
			01/07/15	1	00:44
			02/07/15	1	01:03
			03/07/15	1	02:55
Myotis Sp	S8a	Farmland ST 49542 75696	09/06/15	2	00:43

Species	Figure 3 Ref	Location	Date	No of Registrations per night	Earliest Registration Past Sunset (hrs:mins)
			10/06/15	6	00:43
			11/06/15	5	00:54
			14/06/15	2	01:14
			16/06/15	3	00:56
			20/06/15	2	02:51
	S8b	Royal Portbury Dock ST 49955 75711	11/06/15	2	02:42
			14/06/15	2	03:24
	9a	Royal Portbury Dock ST 49977 75726	25/06/15	1	01:23
			02/07/15	1	02:51
			03/07/15	1	04:11
	9b	Farmland ST 49542 75696	25/06/15	4	00:44
			26/06/15	14	05:26
			28/06/15	1	01:08
			29/06/15	3	00:59
			30/06/15	3	00:13

Species	Figure 3 Ref	Location	Date	No of Registrations per night	Earliest Registration Past Sunset (hrs:mins)
			01/07/15	3	01:05
			03/07/15	2	02:30
Leisler's	S8b	Royal Portbury Dock ST 49955 75711	09/06/15	1	00:38
			10/06/15	4	01:16
			11/06/15	4	00:38
			12/06/15	2	02:13
			13/06/15	2	05:00
			14/06/15	2	04:21
	9b	Farmland ST 49542 75696	25/06/15	5	00:29
			26/06/15	2	06:12
			28/06/15	2	05:55
			30/06/15	4	00:59
			01/07/15	8	00:40
			02/07/15	1	05:44
			03/07/15	4	01:47
			04/07/15	1	02:41
Noctule	S8a	Farmland	09/06/15	5	00:20

Species	Figure 3 Ref	Location	Date	No of Registrations per night	Earliest Registration Past Sunset (hrs:mins)
		ST 49542 75696			
			10/06/15	2	00:54
			11/06/15	9	00:32
			12/06/15	3	00:04
			14/06/15	11	00:13
			15/06/15	2	03:36
			16/06/15	1	01:01
			18/06/15	5	00:48
			20/06/15	4	01:10
			21/06/15	3	05:41
			22/06/15	2	06:17
	S8b	Royal Portbury Dock ST 49955 75711	09/06/15	1	00:31
			10/06/15	5	00:31
			11/06/15	5	01:16
			12/06/15	7	00:21
			13/06/15	4	04:18
			14/06/15	3	05:00
	9a	Royal Portbury Dock	26/06/15	3	03:39

Species	Figure 3 Ref	Location	Date	No of Registrations per night	Earliest Registration Past Sunset (hrs:mins)
		ST 49977 75726			
			27/06/15	3	00:32
			28/06/15	3	02:46
			29/06/15	1	06:37
			30/06/15	4	00:34
			01/07/15	3	00:40
			02/07/15	1	00:32
			04/07/15	2	00:16
Serotine	S8b	Royal Portbury Dock ST 49955 75711	09/06/15	2	01:28
			11/06/15	1	02:29
			12/06/15	1	05:35
	9b	Farmland ST 49542 75696	25/06/15	20	00:32
			26/06/15	30	00:35
			27/06/15	53	00:24
			28/06/15	51	00:40
			29/06/15	117	00:31
			30/06/15	118	00:12

Species	Figure 3 Ref	Location	Date	No of Registrations per night	Earliest Registration Past Sunset (hrs:mins)
			01/07/15	55	00:48
			02/07/15	36	00:34
			03/07/15	36	00:26
			04/07/15	7	02:33
Noctule/ Leisler's or Serotine	S8a	Farmland ST 49542 75696	09/06/15	4	00:59
			10/06/15	6	00:46
			11/06/15	6	00:51
			12/06/15	4	00:15
			13/06/15	4	01:13
			14/06/15	10	00:20
			15/06/15	5	00:38
			16/06/15	8	00:37
			17/06/15	7	00:59
			18/06/15	11	00:36
			19/06/15	15	00:38
			20/06/15	14	00:27
			21/06/15	9	01:02
			22/06/15	9	04:43

Species	Figure 3 Ref	Location	Date	No of Registrations per night	Earliest Registration Past Sunset (hrs:mins)
	S8b	Royal Portbury Dock ST 49955 75711	09/06/15	2	00:28
			10/06/15	9	01:00
			11/06/15	7	00:35
			12/06/15	25	00:05
			13/06/15	7	01:12
			14/06/15	8	03:14
	9a	Royal Portbury Dock ST 49977 75726	28/06/15	1	03:05
			02/07/15	1	02:50
			02/07/15	1	03:02
	9b	Farmland ST 49542 75696	25/06/15	17	00:32
			26/06/15	27	00:54
			27/06/15	50	00:31
			28/06/15	20	00:40
			29/06/15	55	00:41
			30/06/15	62	00:59
			01/07/15	215	00:46

Species	Figure 3 Ref	Location	Date	No of Registrations per night	Earliest Registration Past Sunset (hrs:mins)
			02/07/15	13	00:31
			03/07/15	42	00:48
			04/07/15	11	02:33

Datalogger Monitoring Results on the Disused Railway Line for July-August 2015

Species	**Figure 3 Ref**	**Location**	**Date**	**No of Registrations per night**	**Earliest Registration Past Sunset (hrs:mins)**
Lesser Horseshoe	10a	Royal Portbury Docks ST 51788 76277	09/07/15	1	04:06
			29/07/15	1	02:48
	11a	Royal Portbury Dock ST 50820 76009	11/07/15	1	04:05
Greater Horseshoe	10a	Royal Portbury Docks ST 51788 76277	09/07/15	1	04:06
	10b	Portbury Common ST 48308 76057	11/07/15	1	04:05
			10/07/15	3	04:16
			11/07/15	3	04:08
			14/07/15	2	04:44
	10c	Farmland ST 48929 75859	08/07/15	1	01:17
			09/07/15	2	01:20
			10/07/15	1	01:08
			11/07/15	2	00:56

Species	Figure 3 Ref	Location	Date	No of Registrations per night	Earliest Registration Past Sunset (hrs:mins)
			12/07/15	1	02:08
			14/07/15	2	01:46
	11a	Royal Portbury Dock ST 50820 76009	20/07/15	1	01:20
			21/07/15	4	01:29
			22/07/15	5	00:28
			23/07/15	4	02:32
			24/07/15	5	02:29
			26/07/15	3	03:18
			29/07/15	3	00:41
			30/07/15	2	01:38
			31/07/15	1	01:59
			01/08/15	3	02:02
			02/08/15	1	02:30
			03/08/15	1	04:44
			04/08/15	6	02:31
	11b	Farmland ST 48619 75955	25/07/15	2	01:29
			29/07/15	1	02:11

Species	Figure 3 Ref	Location	Date	No of Registrations per night	Earliest Registration Past Sunset (hrs:mins)
			30/07/15	1	05:14
	11c	Portbury Common ST 48222 76097	29/07/15	8	01:53
			30/07/15	17	03:08
Long-eared	10b	Portbury Common ST 48308 76057	10/07/15	4	04:03
			11/07/15	5	04:18
			12/07/15	1	01:25
			14/07/15	9	01:27
			15/07/15	5	02:39
	10c	Farmland ST 48929 75859	14/07/15	1	04:12
	11b	Farmland ST 48619 75955	23/07/15	2	01:06
			30/07/15	3	05:32
	11c	Portbury Common ST 48222 76097	29/07/15	2	04:15
			30/07/15	2	03:58
Nathusius'	10b	Portbury Common	09/07/15	1	01:52

Species	Figure 3 Ref	Location	Date	No of Registrations per night	Earliest Registration Past Sunset (hrs:mins)
		ST 48308 76057			
			10/07/15	12	06:32
			11/07/15	4	06:19
			12/07/15	1	00:39
			14/07/15	2	00:51
	10c	Farmland ST 48929 75859	09/07/15	4	00:51
Myotis sp	10a	Royal Portbury Dock ST 51788 76277	08/07/15	1	02:29
			11/07/15	1	04:49
			12/07/15	1	05:11
			13/07/15	1	05:18
			15/07/15	1	03:57
	10b	Portbury Common ST 48308 76057	09/07/15	1	01:29
			10/07/15	7	02:14
			11/07/15	8	03:12
			12/07/15	2	01:24
			13/07/15	15	01:32

Species	Figure 3 Ref	Location	Date	No of Registrations per night	Earliest Registration Past Sunset (hrs:mins)
			14/07/15	4	04:20
			15/07/15	3	04:35
	10c	Farmland ST 48929 75859	08/07/15	1	01:15
			09/07/15	14	02:08
			10/07/15	11	01:13
			11/07/15	13	01:38
			12/07/15	10	04:13
			13/07/15	6	02:53
			14/07/15	4	01:16
			15/07/15	2	02:35
	11a	Royal Portbury Dock ST 50820 76009	20/07/15	1	01:06
			21/07/15	4	00:46
			22/07/15	2	03:50
			25/07/15	1	00:11
			27/07/15	1	06:46
			28/07/15	1	00:42
			02/08/15	1	04:42

Species	Figure 3 Ref	Location	Date	No of Registrations per night	Earliest Registration Past Sunset (hrs:mins)
			03/08/15	3	00:29
	11b	Farmland ST 48619 75955	23/07/15	1	02:03
			24/07/15	8	00:53
			25/07/15	2	02:11
			26/07/15	2	03:01
			29/07/15	3	01:11
	11c	Portbury Common ST 48222 76097	27/07/15	10	04:55
			30/07/15	1	03:10
Leisler's	10b	Portbury Common ST 48308 76057	10/07/15	1	03:34
			11/07/15	2	00:29
	10c	Farmland ST 48929 75859	10/07/15	2	01:23
			11/07/15	1	02:42
			12/07/15	1	00:29
			14/07/15	1	00:42
			15/07/15	1	03:48

Species	Figure 3 Ref	Location	Date	No of Registrations per night	Earliest Registration Past Sunset (hrs:mins)
Noctule	10a	Royal Portbury Docks ST 51788 76277	09/07/15	1	00:26
			10/07/15	2	04:03
			11/07/15	3	00:01
			12/07/15	3	00:03
			13/07/15	6	00:14
	10b	Portbury Common ST 48308 76057	09/07/15	1	00:56
			10/07/15	19	00:10
			11/07/15	5	01:50
			12/07/15	14	00:10
			13/07/15	36	00:28
			14/07/15	1	00:26
	10c	Farmland ST 48929 75859	09/07/15	6	02:38
			10/07/15	30	00:28
			11/07/15	38	00:09
			12/07/15	34	00:08
			13/07/15	21	00:14

Species	Figure 3 Ref	Location	Date	No of Registrations per night	Earliest Registration Past Sunset (hrs:mins)
			14/07/15	225	00:01
	11a	Royal Portbury Dock ST 50820 76009	29/07/15	1	05:55
			23/07/15	1	23:28
	11b	Farmland ST 48619 75955	25/07/15	7	00:39
			27/07/15	2	00:18
	11c	Portbury Common ST 48222 76097	29/07/15	1	08:50
Serotine	10b	Portbury Common ST 48308 76057	12/07/15	1	01:28
			14/07/15	5	01:02
	10c	Farmland ST 48929 75859	11/07/15	1	00:48
	11b	Farmland ST 48619 75955	23/07/15	6	00:45
	11c	Portbury Common ST 48222 76097	27/07/15	1	03:32

Species	Figure 3 Ref	Location	Date	No of Registrations per night	Earliest Registration Past Sunset (hrs:mins)
Noctule/Leisler's or Serotine	10a	Royal Portbury Docks ST 51788 76277	10/07/15	2	04:14
			12/07/15	1	00:44
			14/07/15	3	00:44
	10b	Portbury Common ST 48308 76057	09/07/15	5	00:43
			10/07/15	5	00:12
			11/07/15	1	02:37
			12/07/15	6	01:32
			14/07/15	11	00:40
	10c	Farmland ST 48929 75859	09/07/15	1	05:43
			10/07/15	16	00:24
			11/07/15	3	00:56
			12/07/15	8	00:18
			13/07/15	2	02:43
			14/07/15	15	00:33
			15/07/15	2	02:57
	11a	Royal Portbury Dock	22/07/15	1	02:40

Species	Figure 3 Ref	Location	Date	No of Registrations per night	Earliest Registration Past Sunset (hrs:mins)
		ST 50820 76009			
			25/07/15	1	00:40
			26/07/15	1	06:32
			02/08/15	1	00:20
	11b	Farmland ST 48619 75955	25/07/15	5	00:35
			28/07/15	1	02:22
			30/07/15	3	01:01
	11c	Portbury Common ST 48222 76097	27/07/15	1	06:22

Datalogger Monitoring Results on the Disused Railway Line for August 2015

Species	**Figure 3 Ref**	**Location**	**Date**	**No of Registrations per night**	**Earliest Registration Past Sunset (hrs:mins)**
Lesser Horseshoe	12a	Royal Portbury Dock ST 51417 76200	08/08/15	1	03:19
			11/08/15	1	05:07
			12/08/15	1	04:26
Greater Horseshoe	12b	Farmland ST 48542 75993	11/08/15	1	04:39
	12c	Farmland ST 48899 75837	04/08/15	1	01:07
			05/08/15	1	06:36
			06/08/15	1	01:39
			07/08/15	1	00:56
			08/08/15	2	01:22
			11/08/15	1	04:42
Long-eared	12b	Farmland ST 48542 75993	07/08/15	2	00:51

Species	Figure 3 Ref	Location	Date	No of Registrations per night	Earliest Registration Past Sunset (hrs:mins)
	12c	Farmland ST 48899 75837	06/08/15	3	01:54
			08/08/15	1	02:36
			09/08/15	3	01:29
			10/08/15	3	02:12
Myotis sp	12a	Royal Portbury Dock ST 51417 76200	05/08/15	1	02:39
			06/08/15	3	00:32
			07/08/15	1	01:16
			08/08/15	1	00:39
			09/08/15	4	02:44
			10/08/15	5	00:41
			11/08/15	3	01:15
	12b	Farmland ST 48542 75993	07/08/15	4	04:07
			09/08/15	1	04:45
			11/08/15	1	04:40
	12c	Farmland ST 48899 75837	04/08/15	1	02:12

Species	Figure 3 Ref	Location	Date	No of Registrations per night	Earliest Registration Past Sunset (hrs:mins)
			05/08/15	3	01:33
			06/08/15	4	01:25
			07/08/15	5	01:26
			08/08/15	5	01:52
			09/08/15	8	01:11
			10/08/15	9	01:25
			11/08/15	5	01:37
Noctule	12a	Royal Portbury Dock ST 51417 76200	04/08/15	19	00:08
			05/08/15	21	00:07
			06/08/15	2	02:48
			07/08/15	4	00:12
			10/08/15	3	00:16
			11/08/15	3	00:12
			12/08/15	1	06:15
	12b	Farmland ST 48542 75993	04/08/15	1	00:45
			05/08/15	3	00:23
			07/08/15	3	00:04

Species	Figure 3 Ref	Location	Date	No of Registrations per night	Earliest Registration Past Sunset (hrs:mins)
	12c	Farmland ST 48899 75837	04/08/15	6	00:14
			05/08/15	13	00:13
			07/08/15	2	00:43
			08/08/15	8	00:25
			09/08/15	10	00:17
			10/08/15	2	02:18
Serotine	12b	Farmland ST 48542 75993	04/08/15	1	00:52
			05/08/15	1	00:50
			09/08/15	2	02:48
	12c	Farmland ST 48899 75837	05/08/15	2	01:13
			06/08/15	2	01:14
			08/08/15	4	00:51
			11/08/15	4	01:23
Noctule/Leisler's or Serotine	12a	Royal Portbury Dock ST 51417 76200	05/08/15	7	00:31
			06/08/15	3	00:23

Species	Figure 3 Ref	Location	Date	No of Registrations per night	Earliest Registration Past Sunset (hrs:mins)
			07/08/15	1	00:27
			08/08/15	8	00:23
			09/08/15	1	00:19
			10/08/15	7	00:19
			11/08/15	2	00:13
	12b	Farmland ST 48542 75993	04/08/15	4	00:23
			05/08/15	7	00:39
			06/08/15	1	06:46
	12c	Farmland ST 48899 75837	04/08/15	5	00:28
			05/08/15	6	00:27
			06/08/15	4	00:35
			07/08/15	27	00:18
			08/08/15	1	00:51
			09/08/15	42	00:18
			10/08/15	7	00:27
			11/08/15	5	00:21

Appendix 3. Registration of Greater and Lesser Horseshoe Bat Activity on the Disusued Railway Line

Using this high-resolution database, it will be possible to calculate a bat activity index (BAI) for a range of spatial and temporal bandwidths. BAI is analogous to the "acoustic activity index" presented by Miller (2001), providing a simple, standardised relative measure of bat activity in a given area over a given period of time.

BAI can be calculated for hourly, daily, weekly or monthly time intervals at each individual sampling location, spatial sub-sections of the study area, or the study area as a as a whole. Following the methods proposed by Miller (2001), BAI is simply calculated as the sum of the number of time intervals where bat activity was positively recorded divided by the total number of time intervals over a selected temporal period.

Using BAI, it will be possible to create baseline spatial and temporal patterns of bat activity across the study site from 2016.

Greater horseshoe bat					
Location	Date	Time of registration	Location	Date	Time of registration
1a	18/05/16	02:09:48	1b	07/05/16	03:34:22
	18/05/16	02:11:15		09/05/16	03:05:44
	18/05/16	02:48:55		10/05/16	01:12:42
	18/05/16	02:50:17		24/05/16	01:17:09
	18/05/16	22:28:42		24/05/16	01:22:33
	19/05/16	01:13:41		26/05/16	00:05:48
	21/05/16	02:24:22		26/05/16	00:25:31
	21/05/16	02:24:52		27/05/16	02:21:46
	23/05/16	00:48:21		29/05/16	00:32:47
	23/05/16	01:24:51		29/05/16	00:39:20
	23/05/16	01:26:47		29/05/16	02:17:15
	12/06/16	02:42:29		14/06/16	01:10:31
	12/06/16	02:28:02		17/06/16	23:17:38
	06/06/16	21:58:15		18/06/16	01:46:01
	12/06/16	02:27:50		19/06/16	00:59:47

	12/06/16	02:23:45		19/06/16	01:51:21
	12/06/16	01:46:19		19/06/16	02:44:01
	12/06/16	01:43:01		25/07/16	22:56:32
	12/06/16	01:42:00		27/07/16	22:32:07
	12/06/16	01:41:37		30/07/16	22:19:15
	12/06/16	01:39:26		30/07/16	22:53:46
	12/06/16	01:37:50		31/07/16	02:40:40
	12/06/16	01:36:46		01/08/16	02:26:11
	12/06/16	01:25:48		22/08/16	21:36:52
	12/06/16	01:25:42		23/08/16	00:57:49
	12/06/16	01:24:35		23/08/16	05:31:51
	07/06/16	01:32:39		23/08/16	20:47:31
	12/06/16	01:09:11		23/08/16	23:48:17
	12/06/16	00:52:55		24/08/16	00:09:37
	12/06/16	00:52:28		24/08/16	02:03:42
	07/06/16	01:54:27		24/08/16	02:46:13
	07/06/16	01:54:47		24/08/16	22:34:02
	13/06/16	01:34:44		25/08/16	02:27:24
	13/06/16	01:35:01		25/08/16	04:27:30
	13/06/16	01:35:12		25/08/16	23:40:18
	11/06/16	02:42:28		26/08/16	02:41:11
	11/06/16	02:39:38		26/08/16	21:48:32
	11/06/16	02:39:27		26/08/16	22:50:29
	11/06/16	02:31:45		26/08/16	22:59:09
	11/06/16	02:28:11		28/08/16	01:28:36
	11/06/16	02:15:30		28/08/16	01:29:07
	11/06/16	02:14:19		28/08/16	02:05:50
	11/06/16	02:13:11		28/08/16	03:29:34
	11/06/16	02:12:20		28/08/16	03:46:01
	11/06/16	02:09:50		29/08/16	02:22:25
	11/06/16	02:03:32		29/08/16	03:39:54
	11/06/16	01:58:50		29/08/16	03:42:55
	11/06/16	01:58:04		28/09/16	02:13:25
	11/06/16	01:41:59		01/10/16	03:51:22
	11/06/16	01:41:53		01/10/16	06:12:33
	11/06/16	01:36:57		01/10/16	19:15:18
	11/06/16	01:21:57			

	11/06/16	01:21:36
	11/06/16	01:21:16
	11/06/16	01:18:41
	11/06/16	01:12:33
	11/06/16	01:11:44
	11/06/16	01:06:17
	11/06/16	01:06:07
	11/06/16	00:59:03
	11/06/16	00:55:59
	11/06/16	00:55:26
	11/06/16	00:11:46
	11/06/16	00:11:09
	07/06/16	01:55:02
	13/06/16	01:45:55
	13/06/16	01:48:08
	13/06/16	01:48:25
	13/06/16	01:58:38
	13/06/16	02:01:14
	13/06/16	02:03:54
	13/06/16	02:04:25
	13/06/16	02:04:43
	13/06/16	02:04:50
	13/06/16	02:05:02
	13/06/16	02:06:31
	13/06/16	02:09:16
	13/06/16	02:11:33
	13/06/16	02:12:27
	13/06/16	02:15:17
	10/06/16	03:17:49
	10/06/16	03:17:25
	10/06/16	03:16:57
	10/06/16	03:16:04
	10/06/16	03:10:40
	10/06/16	03:06:45
	10/06/16	03:06:32
	10/06/16	03:06:01
	13/06/16	02:17:53

	13/06/16	02:18:42
	13/06/16	02:18:49
	10/06/16	02:42:35
	10/06/16	02:40:53
	10/06/16	02:36:37
	10/06/16	02:35:48
	10/06/16	02:32:31
	10/06/16	02:27:39
	10/06/16	02:27:16
	10/06/16	02:24:48
	10/06/16	02:24:30
	10/06/16	02:24:03
	10/06/16	02:23:49
	10/06/16	02:21:01
	10/06/16	02:18:50
	10/06/16	02:16:34
	10/06/16	02:13:04
	10/06/16	02:09:52
	10/06/16	02:04:31
	10/06/16	02:04:14
	10/06/16	01:59:05
	10/06/16	01:52:22
	10/06/16	01:52:03
	10/06/16	01:51:38
	12/06/16	02:42:45
	10/06/16	01:51:15
	10/06/16	01:50:57
	10/06/16	01:50:34
	10/06/16	01:50:17
	10/06/16	01:50:11
	10/06/16	01:49:50
	10/06/16	01:49:20
	10/06/16	01:48:57
	10/06/16	01:48:51
	10/06/16	01:48:33
	10/06/16	01:48:08
	10/06/16	01:47:46

	10/06/16	01:45:13
	10/06/16	01:45:07
	10/06/16	01:44:50
	10/06/16	01:44:33
	10/06/16	01:44:19
	10/06/16	01:44:03
	10/06/16	01:43:46
	10/06/16	01:43:28
	10/06/16	01:43:09
	10/06/16	01:43:01
	10/06/16	01:42:44
	10/06/16	01:42:26
	10/06/16	01:42:09
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	10/06/16	01:41:34
	10/06/16	01:41:17
	10/06/16	01:41:00
	10/06/16	01:40:43
	10/06/16	01:40:32
	10/06/16	01:40:15
	10/06/16	01:39:58
	10/06/16	01:39:40
	10/06/16	01:39:22
	10/06/16	01:39:09
	10/06/16	01:38:52
	10/06/16	01:38:43
	10/06/16	01:38:20
	10/06/16	01:36:48
	07/06/16	01:55:25
	13/06/16	02:37:56
	13/06/16	02:38:41
	07/06/16	02:04:35
	09/06/16	03:11:05
	09/06/16	03:09:12
	09/06/16	03:02:42
	09/06/16	02:47:05
	09/06/16	02:45:34

	09/06/16	02:45:09
	09/06/16	02:41:55
	09/06/16	02:37:25
	09/06/16	02:36:13
	09/06/16	02:34:35
	09/06/16	02:33:35
	09/06/16	02:32:20
	09/06/16	02:31:25
	09/06/16	02:30:56
	09/06/16	02:29:57
	09/06/16	02:29:04
	09/06/16	02:28:56
	09/06/16	02:28:41
	09/06/16	02:28:00
	09/06/16	02:26:28
	09/06/16	02:24:36
	09/06/16	02:23:36
	09/06/16	02:22:19
	09/06/16	02:21:56
	09/06/16	02:21:39
	09/06/16	02:21:28
	09/06/16	02:21:05
	09/06/16	02:19:42
	09/06/16	02:17:47
	09/06/16	02:17:29
	09/06/16	02:16:37
	09/06/16	02:15:53
	09/06/16	02:15:34
	09/06/16	02:15:19
	09/06/16	02:15:10
	09/06/16	02:15:01
	09/06/16	02:14:38
	09/06/16	02:14:09
	09/06/16	02:13:23
	09/06/16	02:12:47
	09/06/16	02:10:20
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	09/06/16	01:45:14
	09/06/16	01:44:34
	09/06/16	01:44:10
	09/06/16	01:43:53
	09/06/16	01:40:20
	09/06/16	01:26:49
	09/06/16	01:26:09
	09/06/16	01:23:11
	09/06/16	01:05:13
	07/06/16	02:06:58
	07/06/16	02:08:08
	08/06/16	03:11:43
	08/06/16	03:08:30
	08/06/16	03:08:13
	10/06/16	01:51:32
	11/06/16	01:57:04
	08/06/16	02:52:29
	08/06/16	02:49:53
	08/06/16	02:49:02
	08/06/16	02:48:10
	08/06/16	02:45:53
	08/06/16	02:45:27
	08/06/16	02:45:01
	08/06/16	02:44:51
	08/06/16	02:44:03
	08/06/16	02:43:00
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	08/06/16	02:40:49
	08/06/16	02:32:08
	08/06/16	02:31:09
	08/06/16	02:30:43
	08/06/16	02:30:21
	08/06/16	02:29:34
	08/06/16	02:28:26

	08/06/16	02:27:26
	08/06/16	02:26:45
	08/06/16	02:25:42
	08/06/16	02:24:30
	08/06/16	02:11:51
	08/06/16	02:09:04
	08/06/16	02:07:44
	08/06/16	02:06:19
	08/06/16	02:06:07
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	08/06/16	02:05:26
	08/06/16	02:04:55
	08/06/16	02:04:04
	08/06/16	02:02:51
	08/06/16	01:58:44
	08/06/16	01:36:37
	08/06/16	01:31:56
	07/06/16	02:08:32
	07/06/16	00:16:17
	07/06/16	02:09:23
	07/06/16	02:10:14
	07/06/16	02:11:36
	07/06/16	03:22:54
	07/06/16	03:14:38
	07/06/16	03:13:24
	07/06/16	03:12:54
	07/06/16	03:11:53
	07/06/16	03:02:03
	07/06/16	03:00:35
	07/06/16	02:57:05
	07/06/16	02:56:37
	07/06/16	02:56:23
	07/06/16	02:55:38
	07/06/16	02:54:44
	07/06/16	02:54:23
	07/06/16	02:53:38
	07/06/16	02:52:32

	07/06/16	02:51:24
	07/06/16	02:50:14
	07/06/16	02:12:08
	07/06/16	02:49:28
	07/06/16	02:48:15
	07/06/16	02:47:06
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	07/06/16	02:46:25
	07/06/16	02:46:17
	07/06/16	02:46:10
	07/06/16	02:46:00
	07/06/16	02:45:37
	07/06/16	02:45:14
	07/06/16	02:45:03
	07/06/16	02:44:49
	07/06/16	02:44:15
	07/06/16	02:43:47
	07/06/16	02:43:30
	07/06/16	02:43:18
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	07/06/16	02:42:48
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	07/06/16	02:34:58
	07/06/16	02:34:15
	07/06/16	02:33:46
	07/06/16	02:33:23
	07/06/16	02:33:06

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	07/06/16	02:32:34
	07/06/16	02:32:24
	07/06/16	02:32:08
	07/06/16	02:31:50
	07/06/16	02:31:34
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	07/06/16	02:30:37
	07/06/16	02:30:05
	07/06/16	02:29:58
	07/06/16	02:29:53
	07/06/16	02:29:41
	07/06/16	02:29:25
	07/06/16	02:29:05
	07/06/16	02:28:41
	07/06/16	02:28:18
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	07/06/16	02:27:26
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	07/06/16	02:24:37
	07/06/16	02:24:12
	07/06/16	02:22:19
	07/06/16	02:20:29
	07/06/16	02:20:17
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	07/06/16	02:16:19
	07/06/16	02:15:36
	07/06/16	02:13:54
	07/06/16	02:12:38

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	07/06/16	02:17:24
	08/06/16	01:31:25
	08/06/16	01:31:38
	08/06/16	01:32:11
	08/06/16	01:32:41
	08/06/16	01:34:54
	08/06/16	02:05:07
	08/06/16	02:19:37
	08/06/16	02:29:56
	08/06/16	02:34:51
	10/06/16	01:49:04
	10/06/16	01:49:34
	10/06/16	01:51:48
	13/06/16	02:19:01
	13/06/16	02:17:29
	13/06/16	02:16:44
	13/06/16	02:16:12
	13/06/16	02:11:56
	13/06/16	02:06:42
	13/06/16	02:01:58
	13/06/16	01:59:58
	13/06/16	01:58:56
	13/06/16	01:58:13
	13/06/16	01:57:44
	11/06/16	02:27:20
	13/06/16	01:34:24
	12/06/16	00:53:09
	12/06/16	00:59:36
	12/06/16	01:20:05
	12/06/16	01:43:16
	12/06/16	01:49:44
	12/06/16	02:23:24
	12/06/16	02:53:36
	12/06/16	02:53:53
	13/06/16	01:06:01

	10/06/16	01:50:42
	07/06/16	02:17:08
	09/06/16	02:19:36
	10/06/16	01:47:55
	10/06/16	01:39:02
	09/06/16	02:19:04
	09/06/16	02:18:37
	08/06/16	02:28:11
	07/06/16	02:37:04
	07/06/16	02:17:54
	19/07/16	01:41:57
	19/07/16	01:43:25
	19/07/16	01:43:59
	19/07/16	01:54:12
	19/07/16	01:55:02
	19/07/16	02:06:54
	19/07/16	02:08:25
	19/07/16	02:09:12
	19/07/16	02:09:21
	19/07/16	02:11:16
	19/07/16	03:35:26
	20/07/16	02:09:14
	20/07/16	02:10:08
	20/07/16	02:25:00
	20/07/16	22:59:08
	21/07/16	01:00:56
	21/07/16	01:38:54
	21/07/16	01:49:43
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	21/07/16	01:53:52
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	21/07/16	02:00:38
	21/07/16	02:22:09
	21/07/16	02:22:44
	22/07/16	00:37:17
	22/07/16	00:38:01
	22/07/16	01:13:57

	22/07/16	01:14:23
	22/07/16	01:14:42
	22/07/16	01:36:53
	22/07/16	01:37:07
	23/07/16	03:01:25
	23/07/16	23:16:07
	23/07/16	23:39:08
	23/07/16	23:46:13
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	24/07/16	01:44:41
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	24/07/16	02:12:13
	24/07/16	02:14:35
	24/07/16	02:16:57
	24/07/16	02:19:38
	24/07/16	02:20:37
	25/07/16	00:49:22
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	25/07/16	02:11:51
	16/08/16	21:02:07
	16/08/16	23:41:32
	17/08/16	00:58:35
	17/08/16	01:08:47
	17/08/16	01:19:18
	18/08/16	03:23:24
	18/08/16	03:24:27
	18/08/16	22:58:32
	19/08/16	23:51:18
	20/08/16	00:44:06
	20/08/16	00:56:12
	20/08/16	00:57:20
	20/08/16	00:59:00
	20/08/16	01:05:45
	20/08/16	01:33:24
	20/08/16	01:35:29
	20/08/16	01:42:37
	20/08/16	02:06:22

	20/08/16	02:11:34			
	20/08/16	02:12:36			
	20/08/16	02:34:24			
	20/08/16	02:48:59			
	20/08/16	03:46:21			
	21/08/16	01:39:59			
	21/08/16	01:48:39			
	21/08/16	01:49:07			
	20/09/16	06:24:42			
	20/09/16	19:43:09			
	24/09/16	04:32:20			
	24/09/16	04:33:52			
Location	Date	Time of registration	Location	Date	Time of registration
2a	21/05/16	02:27:29	2b	06/05/16	22:39:20
	06/06/16	23:11:22		08/05/16	02:13:27
	08/06/16	00:19:04		09/05/16	03:38:29
	08/06/16	03:03:58		09/05/16	04:22:15
	08/06/16	22:58:37		09/05/16	21:58:47
	10/06/16	02:37:58		14/05/16	22:31:28
	18/07/16	22:44:44		16/05/16	00:10:16
	20/07/16	23:13:15		24/05/16	02:06:18
	21/07/16	22:51:22		26/05/16	00:23:27
	22/07/16	22:41:19		26/05/16	01:15:31
	23/07/16	22:22:22		26/05/16	01:35:33
	23/07/16	22:22:31		26/05/16	01:45:03
	23/07/16	22:22:46		26/05/16	02:53:32
	23/07/16	22:23:02		27/05/16	01:38:53
	23/07/16	22:23:11		27/05/16	01:53:17
	23/07/16	22:23:21		27/05/16	02:05:07
	23/07/16	23:14:14		27/05/16	02:31:27
	23/07/16	23:53:28		28/05/16	00:25:13
	24/07/16	22:53:25		28/05/16	00:44:01
	24/07/16	23:06:19		28/05/16	02:04:18
	16/08/16	23:52:02		28/05/16	02:26:54
	18/08/16	21:34:29		28/05/16	02:34:46
	19/08/16	04:03:23		28/05/16	02:36:44
	19/08/16	22:52:48		29/05/16	01:53:59

	21/08/16	23:04:05
	19/09/16	20:53:42
	24/09/16	21:41:34

	29/05/16	02:02:47
	29/05/16	02:47:27
	29/05/16	02:48:32
	29/05/16	02:55:19
	29/05/16	03:04:22
	29/05/16	03:11:01
	30/05/16	00:07:38
	30/05/16	00:38:24
	30/05/16	00:46:29
	30/05/16	01:03:35
	30/05/16	01:09:57
	30/05/16	01:27:07
	30/05/16	01:31:57
	30/05/16	01:32:36
	30/05/16	01:33:07
	30/05/16	01:33:20
	30/05/16	01:33:38
	30/05/16	01:33:50
	30/05/16	01:40:04
	30/05/16	02:04:57
	30/05/16	02:06:57
	30/05/16	02:08:25
	30/05/16	02:08:59
	30/05/16	02:09:05
	15/06/16	00:56:10
	15/06/16	01:00:48
	15/06/16	01:07:11
	15/06/16	01:24:53
	15/06/16	01:25:52
	15/06/16	01:26:13
	15/06/16	01:26:24
	15/06/16	01:51:12
	15/06/16	01:57:59
	15/06/16	02:30:38
	15/06/16	03:34:44
	16/06/16	01:16:18
	16/06/16	01:17:02

	17/06/16	01:16:28
	17/06/16	02:30:55
	17/06/16	03:09:51
	18/06/16	01:24:46
	18/06/16	01:51:47
	18/06/16	01:51:58
	18/06/16	01:52:13
	18/06/16	01:52:26
	18/06/16	01:52:37
	18/06/16	01:53:07
	18/06/16	01:53:16
	18/06/16	01:53:24
	18/06/16	01:53:50
	18/06/16	01:55:40
	18/06/16	01:57:34
	18/06/16	01:57:42
	18/06/16	01:58:01
	18/06/16	01:58:23
	18/06/16	01:58:55
	18/06/16	01:59:06
	18/06/16	01:59:46
	18/06/16	02:00:07
	18/06/16	02:00:48
	18/06/16	02:00:56
	18/06/16	02:01:07
	18/06/16	02:01:20
	18/06/16	02:01:37
	18/06/16	02:05:39
	18/06/16	02:21:50
	18/06/16	02:22:32
	18/06/16	02:23:25
	18/06/16	02:24:20
	18/06/16	02:31:07
	19/06/16	01:19:02
	19/06/16	01:20:01
	19/06/16	01:20:34
	19/06/16	01:20:54

	19/06/16	01:21:18
	19/06/16	01:21:45
	19/06/16	01:21:54
	19/06/16	01:22:11
	19/06/16	01:27:22
	19/06/16	01:29:01
	19/06/16	02:29:03
	19/06/16	02:33:53
	19/06/16	02:36:55
	25/07/16	22:34:33
	26/07/16	01:00:48
	26/07/16	01:17:05
	26/07/16	01:33:55
	26/07/16	22:34:28
	27/07/16	03:03:24
	28/07/16	01:03:34
	28/07/16	01:26:21
	28/07/16	02:30:23
	28/07/16	22:50:24
	30/07/16	01:26:16
	30/07/16	01:39:19
	30/07/16	01:42:47
	31/07/16	00:46:21
	31/07/16	01:43:59
	01/08/16	01:47:19
	01/08/16	01:53:11
	23/08/16	22:52:40
	24/08/16	01:22:00
	25/08/16	00:22:00
	25/08/16	00:22:17
	25/08/16	22:27:56
	26/08/16	00:52:16
	26/08/16	21:32:43
	27/08/16	00:30:46
	28/08/16	04:50:43
	29/08/16	00:19:15
	28/09/16	23:32:40

				30/09/16	20:33:04

Location	Date	Time of registration	Location	Date	Time of registration
3a	22/05/16	00:37:09	3b	26/08/16	23:43:40
	22/05/16	01:30:06		27/08/16	23:25:37
	22/05/16	02:38:41			
	07/06/16	01:37:26			
	07/06/16	02:21:12			
	07/06/16	02:32:59			
	08/06/16	01:46:15			
	08/06/16	01:51:38			
	08/06/16	01:57:13			
	08/06/16	02:00:09			
	08/06/16	02:02:36			
	08/06/16	02:21:22			
	09/06/16	02:08:23			
	10/06/16	01:15:21			
	10/06/16	01:44:22			
	10/06/16	02:13:39			
	10/06/16	02:13:42			
	13/06/16	01:32:17			
	13/06/16	02:19:41			
	19/07/16	02:48:51			
	20/07/16	23:54:50			
	22/07/16	01:25:08			
	23/07/16	01:01:21			
	24/07/16	00:35:45			
	24/07/16	00:47:29			
	24/07/16	00:49:54			
	24/07/16	22:16:27			
	25/07/16	01:18:41			
	25/07/16	01:26:53			
	25/07/16	01:30:31			

Location	Date	Time of registration	Location	Date	Time of registration
4a	05/05/16	23:08:46	4b	07/05/16	02:55:41
	05/05/16	23:29:02		15/05/16	00:35:04
	22/05/16	01:07:37		15/05/16	01:06:53

	09/06/16	02:22:23
	12/06/16	02:14:56
	13/06/16	02:12:04
	21/07/16	02:13:43
	24/07/16	01:03:25
	25/07/16	02:18:34
	17/08/16	00:44:25

	15/05/16	01:10:11
	24/05/16	01:04:18
	24/05/16	01:17:04
	24/05/16	01:58:11
	25/05/16	01:32:34
	25/05/16	01:34:11
	25/05/16	01:35:11
	25/05/16	01:48:58
	26/05/16	00:58:45
	26/05/16	01:01:02
	26/05/16	01:01:21
	26/05/16	01:01:27
	26/05/16	01:01:33
	26/05/16	01:01:40
	26/05/16	01:01:48
	26/05/16	01:02:01
	26/05/16	01:02:40
	26/05/16	01:04:05
	26/05/16	01:04:53
	26/05/16	01:05:03
	26/05/16	01:05:36
	26/05/16	01:06:11
	26/05/16	01:06:38
	26/05/16	01:07:11
	26/05/16	01:07:54
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	26/05/16	01:09:12
	26/05/16	01:09:21
	26/05/16	01:09:32
	26/05/16	01:09:51
	26/05/16	01:10:37
	26/05/16	01:11:23
	26/05/16	01:11:39
	26/05/16	01:12:26
	26/05/16	01:13:37
	26/05/16	01:13:47

	26/05/16	01:16:13
	26/05/16	01:17:04
	26/05/16	01:32:36
	26/05/16	01:33:02
	26/05/16	01:36:49
	26/05/16	01:46:20
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	26/05/16	01:50:08
	26/05/16	01:50:41
	26/05/16	01:50:48
	26/05/16	01:51:55
	26/05/16	01:53:29
	26/05/16	01:54:03
	26/05/16	01:54:17
	26/05/16	01:54:28
	26/05/16	01:54:35
	26/05/16	01:54:46
	26/05/16	01:54:54
	26/05/16	01:56:44
	26/05/16	01:57:02
	26/05/16	01:57:13
	26/05/16	01:57:30
	26/05/16	01:58:46
	26/05/16	01:59:16
	26/05/16	01:59:54
	26/05/16	02:00:42
	26/05/16	02:00:50
	26/05/16	02:01:02
	26/05/16	02:01:33
	26/05/16	02:02:28
	26/05/16	02:02:39
	26/05/16	02:02:52
	26/05/16	02:03:29
	26/05/16	02:04:05
	26/05/16	02:04:15
	26/05/16	02:04:27
	26/05/16	02:04:34

	26/05/16	02:04:41
	26/05/16	02:04:50
	26/05/16	02:04:57
	26/05/16	02:05:05
	26/05/16	02:05:13
	26/05/16	02:05:26
	26/05/16	02:05:46
	26/05/16	02:06:06
	26/05/16	02:06:29
	26/05/16	02:06:57
	26/05/16	02:07:17
	26/05/16	02:07:40
	26/05/16	02:07:49
	26/05/16	02:07:58
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	26/05/16	02:09:05
	26/05/16	02:09:36
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	26/05/16	02:10:10
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	26/05/16	02:18:48
	26/05/16	02:19:43
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	26/05/16	02:21:58
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	26/05/16	02:26:24
	26/05/16	02:26:57
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	26/05/16	02:28:10
	26/05/16	02:28:18
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	26/05/16	02:35:44
	26/05/16	02:36:07
	26/05/16	02:36:17

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	26/05/16	02:39:16
	26/05/16	02:40:50
	26/05/16	02:40:58
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	26/05/16	02:48:43
	26/05/16	02:48:52
	26/05/16	02:49:02
	26/05/16	02:49:25
	26/05/16	02:49:52
	26/05/16	02:50:06
	26/05/16	02:50:17
	26/05/16	02:50:29
	26/05/16	02:50:40
	26/05/16	02:50:51
	26/05/16	03:00:29
	26/05/16	03:01:52
	26/05/16	03:02:20
	26/05/16	03:20:39
	26/05/16	03:21:21
	27/05/16	00:19:25
	27/05/16	00:23:48
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	27/05/16	00:24:31
	27/05/16	00:25:02
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	27/05/16	00:49:15
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	27/05/16	02:39:34
	27/05/16	02:40:23
	27/05/16	02:46:40
	27/05/16	02:55:18
	27/05/16	03:08:03
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	28/05/16	00:56:32
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	29/05/16	01:14:18
	29/05/16	01:14:29
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	29/05/16	01:33:48
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	29/05/16	02:03:49
	29/05/16	02:04:54
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	29/05/16	02:07:26

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	29/05/16	02:09:02
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	30/05/16	01:05:22
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	30/05/16	02:10:31
	30/05/16	02:10:36
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	30/05/16	02:22:30
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	30/05/16	02:24:35
	30/05/16	02:24:51
	30/05/16	02:25:07
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	30/05/16	03:01:14
	30/05/16	03:01:57
	30/05/16	03:02:07
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	15/06/16	01:36:32
	15/06/16	01:46:54
	15/06/16	01:52:33
	15/06/16	01:56:35
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	15/06/16	02:33:58
	15/06/16	02:34:07
	15/06/16	03:12:28
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	18/06/16	01:30:58
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	18/06/16	01:31:27
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	18/06/16	01:33:06
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	18/06/16	01:33:57
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	18/06/16	01:34:48

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	18/06/16	01:36:55
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	18/06/16	01:40:45
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	18/06/16	01:41:23
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	18/06/16	01:42:07
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	18/06/16	01:42:31
	18/06/16	01:42:48
	18/06/16	01:42:56
	18/06/16	01:43:13
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	18/06/16	01:47:43
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	18/06/16	01:48:41
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	18/06/16	01:49:27
	18/06/16	01:49:45

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	18/06/16	01:50:19
	18/06/16	01:50:29
	18/06/16	01:50:50
	18/06/16	01:51:19
	18/06/16	01:51:33
	18/06/16	01:51:53
	18/06/16	01:52:15
	18/06/16	01:52:33
	18/06/16	01:52:48
	18/06/16	01:52:58
	18/06/16	01:53:37
	18/06/16	01:53:48
	18/06/16	01:53:56
	18/06/16	01:54:09
	18/06/16	01:54:28
	18/06/16	01:54:39
	18/06/16	01:55:01
	18/06/16	01:55:09
	18/06/16	01:55:20
	18/06/16	01:55:36
	18/06/16	01:55:50
	18/06/16	01:55:58
	18/06/16	01:56:15
	18/06/16	01:56:26
	18/06/16	01:56:36
	18/06/16	01:56:47
	18/06/16	01:57:02
	18/06/16	01:57:11
	18/06/16	01:57:26
	18/06/16	01:57:37
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	18/06/16	01:58:02
	18/06/16	01:58:19
	18/06/16	01:58:31
	18/06/16	01:58:50
	18/06/16	01:59:05

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	18/06/16	01:59:45
	18/06/16	01:59:57
	18/06/16	02:00:11
	18/06/16	02:00:31
	18/06/16	02:00:48
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	18/06/16	02:01:46
	18/06/16	02:01:57
	18/06/16	02:02:05
	18/06/16	02:02:20
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	18/06/16	02:02:53
	18/06/16	02:03:11
	18/06/16	02:03:18
	18/06/16	02:03:37
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	18/06/16	02:04:19
	18/06/16	02:04:36
	18/06/16	02:04:53
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	18/06/16	02:05:27
	18/06/16	02:05:43
	18/06/16	02:05:58
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	18/06/16	02:06:53
	18/06/16	02:14:12
	18/06/16	02:14:35
	18/06/16	02:14:53
	18/06/16	02:15:17
	18/06/16	02:15:35
	18/06/16	02:16:01

	18/06/16	02:20:55
	18/06/16	02:21:30
	18/06/16	02:21:54
	18/06/16	02:23:51
	18/06/16	23:32:22
	19/06/16	00:44:03
	19/06/16	01:42:54
	19/06/16	01:46:17
	19/06/16	01:46:42
	19/06/16	01:55:10
	19/06/16	01:58:01
	19/06/16	01:58:16
	19/06/16	01:58:30
	19/06/16	01:58:47
	19/06/16	01:58:57
	19/06/16	01:59:03
	19/06/16	01:59:08
	19/06/16	01:59:17
	19/06/16	01:59:55
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	19/06/16	02:01:48
	19/06/16	02:01:56
	19/06/16	02:02:03
	19/06/16	02:02:15
	19/06/16	02:02:30
	19/06/16	02:02:42
	19/06/16	02:02:53
	19/06/16	02:03:01
	19/06/16	02:03:15
	19/06/16	02:04:02
	19/06/16	02:04:18
	19/06/16	02:04:30
	25/07/16	23:36:22
	26/07/16	00:45:03
	26/07/16	00:45:15

	26/07/16	01:10:25
	26/07/16	01:12:58
	26/07/16	01:23:33
	26/07/16	01:23:40
	26/07/16	01:23:47
	26/07/16	01:42:01
	26/07/16	01:44:02
	26/07/16	02:02:35
	27/07/16	00:19:37
	27/07/16	01:33:05
	27/07/16	01:37:17
	27/07/16	02:28:12
	27/07/16	02:44:22
	27/07/16	02:44:30
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	29/07/16	00:49:08
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	29/07/16	01:49:57
	29/07/16	02:03:16
	29/07/16	02:09:18
	30/07/16	01:29:50
	30/07/16	01:31:23
	30/07/16	01:34:19
	30/07/16	01:36:19
	30/07/16	01:46:45
	30/07/16	01:50:11
	31/07/16	02:04:32
	01/08/16	01:13:11
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	01/08/16	01:18:08
	01/08/16	02:53:00
	26/08/16	23:48:20

				26/08/16	23:53:23
				27/08/16	00:20:32
				27/08/16	00:20:40
				28/08/16	00:12:30
				28/08/16	01:37:50
				28/08/16	02:00:32
Location	Date	Time of registration	Location	Date	Time of registration
5a	30/04/16	21:48:02	5b	25/05/16	23:32:16
	30/04/16	22:07:40		27/05/16	01:21:58
	05/05/16	23:43:09		16/06/16	02:50:45
	05/05/16	23:45:04		16/06/16	02:51:54
	23/05/16	01:31:22		16/06/16	02:52:17
	23/05/16	04:03:29		16/06/16	02:52:55
	08/06/16	02:18:11		16/06/16	02:53:01
	09/06/16	01:41:23		29/07/16	02:07:25
	10/06/16	02:08:02		23/08/16	02:41:34
	10/06/16	02:08:43		29/08/16	02:13:58
	19/07/16	01:23:33			
	19/07/16	01:24:12			
	23/07/16	02:25:58			
	24/07/16	23:05:06			
	22/08/16	02:47:58			

Lesser horseshoe bat					
Location	Date	Time of registration	Location	Date	Time of registration
1a	01/05/16	00:10:42	1b	06/05/16	22:31:43
	01/05/16	22:50:28		15/05/16	23:13:21
	02/05/16	22:31:42		25/05/16	00:39:52
	03/05/16	21:19:01		29/05/16	01:28:54
	04/05/16	22:59:29		15/06/16	01:40:28
	04/05/16	23:01:49		19/06/16	02:36:01
	06/05/16	01:25:25		22/08/16	21:51:01
	18/05/16	23:05:17		22/08/16	22:56:53
	19/05/16	00:49:01		23/08/16	22:09:07
	19/05/16	01:14:12		24/08/16	04:13:11

	21/05/16	23:03:48		25/08/16	05:16:04
	21/05/16	23:41:27		27/09/16	20:41:14
	22/05/16	00:07:36		27/09/16	21:51:49
	22/05/16	23:34:51		28/09/16	03:13:03
	08/06/16	02:57:20		29/09/16	20:39:23
	08/06/16	02:59:20		30/09/16	03:03:19
	08/06/16	02:58:29		30/09/16	23:00:33
	08/06/16	02:25:21		01/10/16	02:55:39
	12/06/16	02:17:17		02/10/16	02:10:10
	23/07/16	00:28:58		02/10/16	02:39:47
	23/07/16	23:47:55		02/10/16	02:52:13
	24/07/16	00:04:09		02/10/16	04:05:20
	17/08/16	00:18:55		02/10/16	04:53:45
	17/08/16	00:32:27		03/10/16	02:29:38
	18/08/16	03:12:51		03/10/16	02:36:49
	19/08/16	20:52:37		03/10/16	02:40:17
	19/08/16	20:56:54			
	19/08/16	22:29:48			
	19/08/16	22:33:01			
	20/08/16	22:35:57			
	20/08/16	22:36:14			
	22/08/16	03:43:13			
	22/08/16	03:46:07			
	19/09/16	22:40:17			
	20/09/16	20:18:45			
	20/09/16	22:07:07			
	20/09/16	22:20:10			
	21/09/16	05:31:31			
	21/09/16	20:58:37			
	21/09/16	22:33:45			
	22/09/16	00:43:47			
	22/09/16	02:38:06			
	22/09/16	03:32:50			
	22/09/16	20:33:42			
	22/09/16	21:41:59			
	22/09/16	21:42:11			
	22/09/16	21:50:17			

	22/09/16	22:30:45
	23/09/16	00:52:41
	23/09/16	02:03:10
	23/09/16	02:34:51
	23/09/16	02:35:16
	23/09/16	02:35:22
	23/09/16	02:35:31
	23/09/16	02:35:42
	23/09/16	04:46:57
	23/09/16	04:47:26
	23/09/16	05:25:08
	23/09/16	21:03:27
	23/09/16	21:10:30
	23/09/16	21:24:38
	23/09/16	21:41:59
	23/09/16	21:56:04
	24/09/16	00:08:34
	24/09/16	00:09:59
	24/09/16	04:21:55
	24/09/16	04:29:44
	24/09/16	21:56:33
	25/09/16	20:49:27
	25/09/16	21:04:57
	25/09/16	21:05:08
	25/09/16	21:59:41
	25/09/16	22:25:55
	25/09/16	22:37:14
	25/09/16	22:43:26
	25/09/16	22:51:33
	25/09/16	23:06:00
	25/09/16	23:06:19
	25/09/16	23:06:27
	25/09/16	23:06:48
	25/09/16	23:07:32
	25/09/16	23:11:55
	25/09/16	23:12:24
	25/09/16	23:13:22

	25/09/16	23:14:02			
	25/09/16	23:14:13			
	25/09/16	23:16:11			
	25/09/16	23:49:04			
	26/09/16	00:15:10			
	26/09/16	00:39:12			
	26/09/16	00:41:37			
	26/09/16	01:09:24			
	26/09/16	01:34:12			
	26/09/16	01:39:07			
	26/09/16	03:43:53			
	26/09/16	03:46:54			
	26/09/16	04:38:33			
Location	Date	Time of registration	Location	Date	Time of registration
2a	02/05/16	01:13:16	2b	11/05/16	23:02:25
	03/05/16	21:39:06		15/05/16	03:09:04
	17/05/16	01:58:52		15/05/16	23:52:57
	18/05/16	23:08:57		16/05/16	00:05:49
	22/05/16	23:00:01		23/05/16	23:09:18
	08/06/16	03:21:48		23/05/16	23:57:35
	20/07/16	23:19:59		24/05/16	01:03:43
	22/07/16	22:38:48		24/05/16	01:47:33
	23/07/16	22:57:11		24/05/16	23:47:01
	18/08/16	22:45:32		25/05/16	23:24:18
	20/09/16	02:56:26		25/05/16	23:56:44
	20/09/16	02:56:33		27/05/16	01:47:22
	22/09/16	03:47:07		27/05/16	03:18:16
	22/09/16	04:22:28		27/05/16	03:18:44
	23/09/16	02:49:14		28/05/16	01:46:03
	26/09/16	03:41:13		28/05/16	02:03:44
				28/05/16	02:05:41
				29/05/16	02:21:40
				30/05/16	02:11:17
				30/05/16	02:21:11
				30/05/16	02:38:02
				30/05/16	03:22:43
				14/06/16	01:04:53

	16/06/16	02:36:18
	17/06/16	23:43:44
	18/06/16	00:33:25
	19/06/16	01:46:22
	27/07/16	01:43:46
	27/07/16	02:05:14
	27/07/16	22:27:52
	28/07/16	22:30:12
	29/07/16	02:40:17
	31/07/16	00:08:20
	31/07/16	00:51:44
	31/07/16	22:25:01
	31/07/16	23:14:34
	31/07/16	23:19:23
	31/07/16	23:48:42
	31/07/16	23:49:57
	24/08/16	01:33:48
	26/08/16	02:05:50
	26/08/16	03:18:32
	26/08/16	03:18:42
	27/08/16	22:00:39
	28/08/16	01:43:36
	28/08/16	03:06:53
	28/08/16	03:07:10
	28/08/16	03:07:18
	28/08/16	03:07:40
	28/08/16	03:08:13
	28/08/16	03:08:21
	28/08/16	03:11:27
	28/08/16	03:11:51
	27/09/16	03:25:39
	27/09/16	03:26:04
	27/09/16	03:33:39
	28/09/16	05:16:52
	28/09/16	19:57:12
	28/09/16	20:15:36
	30/09/16	20:58:32

				01/10/16	04:11:51
Location	Date	Time of registration	Location	Date	Time of registration
3a	30/04/16	22:39:57	3b		No records
	01/05/16	23:22:33			
	02/05/16	21:34:45			
	02/05/16	22:23:02			
	02/05/16	23:03:20			
	03/05/16	23:17:17			
	03/05/16	23:27:06			
	04/05/16	22:41:24			
	17/05/16	00:31:08			
	18/05/16	01:08:30			
	18/05/16	23:54:04			
	19/05/16	00:38:38			
	23/05/16	00:48:47			
	09/06/16	02:33:23			
	12/06/16	00:53:38			
	12/06/16	02:22:02			
	22/07/16	00:15:49			
	25/07/16	01:10:15			
	19/08/16	23:43:52			
	20/08/16	02:58:05			
	20/08/16	03:06:29			
	22/09/16	01:14:36			
	22/09/16	20:44:12			
	22/09/16	21:41:40			
	23/09/16	20:22:38			
	23/09/16	21:17:57			
	23/09/16	23:47:56			
	24/09/16	01:11:09			
	25/09/16	20:07:24			
	25/09/16	20:24:39			
	25/09/16	20:35:46			
	25/09/16	20:37:58			
	25/09/16	21:39:03			
	25/09/16	21:45:24			
	25/09/16	21:52:54			

	25/09/16	22:47:51			
	26/09/16	04:34:42			
Location	Date	Time of registration	Location	Date	Time of registration
4a	09/06/16	01:56:31	4b	09/05/16	01:32:32
	24/07/16	00:19:35		09/05/16	01:34:22
	19/09/16	23:16:16		24/05/16	01:21:07
	20/09/16	01:02:46		24/05/16	01:22:46
	26/09/16	01:02:32		24/05/16	01:23:02
				24/05/16	01:37:28
				24/05/16	01:41:33
				24/05/16	01:42:14
				24/05/16	01:42:24
				24/05/16	01:44:27
				24/05/16	01:46:39
				24/05/16	01:46:49
				24/05/16	02:04:21
				24/05/16	23:27:21
				24/05/16	23:28:55
				25/05/16	01:50:44
				26/05/16	00:54:41
				26/05/16	02:00:57
				26/05/16	02:13:08
				28/05/16	02:55:31
				29/05/16	02:21:54
				29/05/16	02:22:14
				14/06/16	02:45:06
				15/06/16	00:15:32
				15/06/16	00:53:54
				16/06/16	00:14:04
				19/06/16	01:03:32
				31/07/16	02:02:18
				26/08/16	03:04:33
				26/08/16	03:45:31
				28/08/16	04:46:31
				27/09/16	20:56:11
				27/09/16	23:08:33
				27/09/16	23:08:50

	27/09/16	23:09:53
	27/09/16	23:40:15
	27/09/16	23:40:22
	27/09/16	23:48:12
	27/09/16	23:49:07
	28/09/16	00:04:35
	28/09/16	01:24:31
	28/09/16	01:25:34
	28/09/16	01:28:39
	28/09/16	03:27:47
	28/09/16	04:05:12
	28/09/16	05:05:27
	29/09/16	01:30:21
	29/09/16	01:31:46
	29/09/16	03:47:54
	29/09/16	04:10:31
	29/09/16	19:33:50
	29/09/16	23:34:21
	29/09/16	23:39:00
	01/10/16	01:17:47
	01/10/16	01:35:39
	01/10/16	20:14:53
	01/10/16	22:08:43
	01/10/16	22:08:59
	01/10/16	23:36:48
	01/10/16	23:53:04
	02/10/16	01:28:13
	02/10/16	01:47:22
	02/10/16	02:02:23
	02/10/16	03:01:08
	02/10/16	03:01:28
	02/10/16	04:52:22
	02/10/16	05:54:51
	02/10/16	19:53:15
	02/10/16	22:45:43
	02/10/16	23:34:48
	03/10/16	02:16:56

				03/10/16	04:07:12
				03/10/16	04:45:28
				03/10/16	04:54:39
Location	Date	Time of registration	Location	Date	Time of registration
5a	29/04/16	00:15:08	5b	26/05/16	00:20:25
	29/04/16	01:32:17		26/05/16	01:51:39
	29/04/16	21:24:42		27/05/16	01:45:14
	29/04/16	21:38:19		27/05/16	01:50:07
	01/05/16	01:11:07		27/05/16	02:22:23
	01/05/16	20:59:11		13/06/16	22:38:48
	01/05/16	23:41:22		14/06/16	01:04:05
	01/05/16	23:46:26		14/06/16	01:30:41
	01/05/16	23:52:33		14/06/16	02:32:45
	02/05/16	03:31:40		14/06/16	22:38:34
	02/05/16	21:19:03		16/06/16	03:35:33
	02/05/16	21:30:12		16/06/16	03:39:27
	03/05/16	21:43:53		18/06/16	02:37:51
	03/05/16	22:23:21		18/06/16	02:41:12
	03/05/16	22:26:38		19/06/16	03:22:10
	03/05/16	23:17:22		25/07/16	22:31:16
	04/05/16	21:33:01		25/07/16	22:44:36
	04/05/16	22:12:17		25/07/16	22:45:41
	04/05/16	22:13:29		25/07/16	22:45:58
	04/05/16	23:51:16		25/07/16	22:46:16
	06/05/16	00:35:36		25/07/16	22:46:33
	16/05/16	23:42:02		25/07/16	22:46:48
	17/05/16	00:49:13		25/07/16	22:47:00
	17/05/16	02:11:33		25/07/16	22:47:09
	18/05/16	23:43:47		26/07/16	04:13:08
	19/05/16	02:03:21		26/07/16	04:14:56
	19/05/16	02:05:29		27/07/16	22:26:18
	19/05/16	02:30:12		27/07/16	22:26:35
	19/05/16	02:38:34		27/07/16	22:26:52
	22/05/16	22:49:47		27/07/16	22:27:08
	23/05/16	00:28:20		27/07/16	22:27:42
	07/06/16	03:03:57		27/07/16	22:29:01
	07/06/16	03:12:01		28/07/16	00:39:51

08/06/16	02:41:29		28/07/16	01:19:13
08/06/16	03:07:05		28/07/16	23:07:13
08/06/16	03:16:37		29/07/16	22:03:50
10/06/16	00:26:02		30/07/16	00:37:06
10/06/16	03:08:03		30/07/16	03:41:01
11/06/16	01:13:37		31/07/16	00:12:49
20/07/16	23:47:02		31/07/16	02:39:20
21/07/16	02:07:17		31/07/16	03:36:57
25/07/16	02:06:30		31/07/16	03:52:45
25/07/16	02:22:05		31/07/16	22:19:08
16/08/16	22:52:05		31/07/16	22:19:40
16/08/16	23:16:40		31/07/16	22:58:00
16/08/16	23:27:30		01/08/16	03:09:23
17/08/16	01:41:46		01/08/16	04:17:17
17/08/16	02:26:40		23/08/16	00:40:05
17/08/16	04:20:49		23/08/16	00:40:43
17/08/16	22:49:13		23/08/16	00:40:58
17/08/16	23:06:36		23/08/16	00:41:17
17/08/16	23:15:51		23/08/16	00:41:29
17/08/16	23:41:20		24/08/16	00:09:16
18/08/16	04:10:03		24/08/16	02:50:11
18/08/16	23:16:26		24/08/16	03:05:28
18/08/16	23:38:28		24/08/16	04:03:46
19/08/16	01:29:41		24/08/16	04:04:01
19/08/16	03:55:56		24/08/16	04:04:28
19/08/16	22:46:54		24/08/16	04:04:40
19/08/16	23:29:31		24/08/16	04:04:48
20/08/16	00:30:51		24/08/16	04:04:59
20/08/16	04:05:46		24/08/16	04:05:12
21/08/16	22:41:30		24/08/16	04:05:36
21/08/16	23:16:39		24/08/16	04:05:43
19/09/16	19:44:13		24/08/16	04:05:50
19/09/16	20:24:33		24/08/16	05:05:58
19/09/16	22:13:28		25/08/16	22:17:42
19/09/16	23:18:03		26/08/16	02:27:51
19/09/16	23:38:51		27/08/16	23:01:53
20/09/16	00:10:43		27/08/16	23:01:59

20/09/16	00:11:21
20/09/16	00:21:58
20/09/16	01:13:34
20/09/16	02:12:15
20/09/16	03:03:30
20/09/16	03:05:09
20/09/16	04:26:54
20/09/16	05:40:42
20/09/16	19:51:49
20/09/16	20:13:40
20/09/16	20:14:52
20/09/16	20:39:03
20/09/16	20:39:39
20/09/16	23:32:34
21/09/16	00:18:43
21/09/16	01:02:19
21/09/16	01:21:18
21/09/16	01:34:57
21/09/16	02:05:53
21/09/16	03:09:07
21/09/16	03:54:35
21/09/16	04:01:42
21/09/16	05:56:47
21/09/16	19:51:22
21/09/16	19:52:16
21/09/16	20:09:14
21/09/16	20:19:20
22/09/16	00:10:12
22/09/16	00:41:35
22/09/16	01:13:01
22/09/16	01:15:28
22/09/16	01:44:10
22/09/16	01:44:17
22/09/16	01:53:32
22/09/16	02:09:18
22/09/16	02:12:44
22/09/16	03:35:43

27/08/16	23:02:12
27/08/16	23:02:32
27/08/16	23:03:45
27/08/16	23:03:53
27/08/16	23:34:28
28/08/16	23:13:33
28/08/16	23:13:43
28/08/16	23:13:55
29/08/16	02:34:40
29/08/16	02:41:06
29/08/16	03:45:25
26/09/16	21:41:17
29/09/16	05:06:15
29/09/16	21:55:57
01/10/16	22:46:48
02/10/16	01:45:19
02/10/16	03:21:46
02/10/16	03:49:52
02/10/16	03:56:14
02/10/16	04:01:15

22/09/16	03:46:55
22/09/16	05:32:48
22/09/16	19:45:39
22/09/16	20:33:13
22/09/16	20:33:33
22/09/16	22:25:10
22/09/16	23:11:04
23/09/16	00:54:15
23/09/16	01:45:51
23/09/16	04:30:01
23/09/16	04:53:14
23/09/16	05:13:55
23/09/16	05:23:41
23/09/16	05:33:10
23/09/16	05:34:09
23/09/16	06:08:43
23/09/16	19:39:32
23/09/16	19:47:19
23/09/16	19:53:33
23/09/16	19:55:41
23/09/16	20:05:56
23/09/16	20:11:26
23/09/16	20:26:45
23/09/16	20:28:02
23/09/16	20:37:09
23/09/16	21:47:25
23/09/16	22:07:54
23/09/16	22:19:08
23/09/16	22:52:26
23/09/16	23:13:38
23/09/16	23:39:56
24/09/16	00:44:51
24/09/16	02:37:33
24/09/16	04:24:18
24/09/16	04:24:55
24/09/16	20:14:54
24/09/16	21:04:15

	25/09/16	05:13:56
	25/09/16	05:25:54
	25/09/16	19:36:33
	25/09/16	19:38:31
	25/09/16	19:43:27
	25/09/16	19:50:37
	25/09/16	19:53:34
	25/09/16	20:38:24
	25/09/16	20:51:55
	25/09/16	21:24:27
	25/09/16	21:41:45
	26/09/16	00:20:40
	26/09/16	00:59:41
	26/09/16	01:10:32
	26/09/16	01:11:37
	26/09/16	01:53:42
	26/09/16	02:26:23
	26/09/16	02:31:05
	26/09/16	02:42:37
	26/09/16	02:46:01
	26/09/16	03:15:47
	26/09/16	03:15:56
	26/09/16	03:53:48
	26/09/16	04:17:59
	26/09/16	04:18:11
	26/09/16	04:32:18
	26/09/16	04:32:34
	26/09/16	05:28:49
	26/09/16	05:34:12
	26/09/16	05:38:49
	26/09/16	05:47:02
	26/09/16	06:23:28

Appendix 4. Static Automated Bat Detector Monitoring on the Disused Railway Line 2016.

The Number of Nights that Species were Recorded on the Disused Railway Line by Static Automated Bat Detectors.

Figure 3 Ref	**Month**	**Duration of Monitoring (No. of nights)**	**Number of Nights Species were Recorded**										
			Pp	**Ppy**	**Pn**	**Pa**	**Msp**	**Nl**	**Nn**	**Es**	**Nl/Nn or Es**	**Rh**	**Rf**
1a	April	10	10	4	3	1	2	0	6	0	2	4	0
1b			10	10	3	4	8	4	8	2	6	2	3
2a			6	5	1	0	4	0	3	0	6	2	0
2b			10	10	0	10	9	5	9	7	4	3	6
3a			10	9	2	0	6	0	1	0	7	5	0
3b			10	10	0	1	4	6	10	2	1	0	0
4a			7	5	0	1	5	6	4	3	5	0	1
4b			10	10	0	0	7	3	7	1	3	1	2
5a			7	4	3	0	8	3	2	1	2	6	2
5b			10	8	2	0	4	3	6	6	5	0	0

Notes

Species key –Pp Common pipistrelle (*P. pipistrellus*); Ppy Soprano pipistrelle *(P.pygmaeus);* Pn Nathusius' pipistrelle (*P. nathusii*); Pa Long-eared (*Plecotus sp.)*Msp (Myotis sp); Nl Leisler's (*Nyctalus leisleri)* Nn Noctule (*Nyctalus noctula*); Es Serotine (*Eptesicus serotinus)* Rh Lesser horseshoe (*Rhinolophus hipposideros*); Rf Greater horseshoe (*Rhinolophus ferrumequinum*).

Figure 3 Ref	Month	Duration of Monitoring (No. of nights)	Number of Nights Species were Recorded										
			Pp	Ppy	Pn	Pa	Msp	Nl	Nn	Es	Nl/Nn or Es	Rh	Rf
1a	May	7	7	5	1	1	4	2	2	1	1	3	4
1b			7	7	3	0	5	1	5	3	7	2	4
2a			7	4	1	0	3	0	4	0	3	3	1
2b			7	7	1	4	7	2	6	7	6	6	6
3a			7	7	0	0	1	3	5	6	6	3	1
3b			7	7	0	4	2	4	6	0	3	0	0
4a			7	7	1	0	4	3	3	1	0	0	1
4b			7	7	0	0	7	0	4	4	3	5	7
5a			7	7	1	0	7	0	0	0	1	5	1
5b			7	6	0	0	5	3	5	4	5	2	2

Notes

Species key –Pp Common pipistrelle (*P. pipistrellus*); Ppy Soprano pipistrelle *(P.pygmaeus);* Pn Nathusius' pipistrelle (*P. nathusii*); Pa Long-eared (*Plecotus sp.)*Msp (Myotis sp); Nl Leisler's (*Nyctalus leisleri)* Nn Noctule (*Nyctalus noctula*); Es Serotine (*Eptesicus serotinus)* Rh Lesser horseshoe (*Rhinolophus hipposideros*); Rf Greater horseshoe (*Rhinolophus ferrumequinum*).

Figure 3 Ref	Month	Duration of Monitoring (No. of nights)	Number of Nights Species were Recorded										
			Pp	**Ppy**	**Pn**	**Pa**	**Msp**	**Nl**	**Nn**	**Es**	**Nl/Nn or Es**	**Rh**	**Rf**
1a	June	7	7	7	2	6	7	3	6	3	3	2	7
1b			7	7	7	0	6	0	7	0	6	2	3
2a			7	7	5	0	7	4	7	5	4	1	4
2b			7	7	0	5	7	3	4	4	6	4	4
3a			7	7	0	0	3	2	7	4	5	2	5
3b			7	7	0	0	4	1	6	2	1	0	0
4a			7	7	0	1	7	3	6	2	3	1	3
4b			7	7	0	0	7	1	5	0	3	4	4
5a			7	7	2	2	7	0	5	0	4	4	3
5b			7	7	0	0	4	3	6	3	2	5	1

Notes

Species key –Pp Common pipistrelle (*P. pipistrellus*); Ppy Soprano pipistrelle *(P.pygmaeus);* Pn Nathusius' pipistrelle (*P. nathusii*); Pa Long-eared (*Plecotus sp.)*Msp (Myotis sp); Nl Leisler's (*Nyctalus leisleri)* Nn Noctule (*Nyctalus noctula*); Es Serotine (*Eptesicus serotinus)* Rh Lesser horseshoe (*Rhinolophus hipposideros*); Rf Greater horseshoe (*Rhinolophus ferrumequinum*).

Figure 3b Ref	Month	Duration of Monitoring (No. of nights)	Number of Nights Species were Recorded										
			Pp	**Ppy**	**Pn**	**Pa**	**Msp**	**Nl**	**Nn**	**Es**	**Nl/Nn or Es**	**Rh**	**Rf**
1a	July	7	7	7	4	7	6	2	6	1	5	2	6
1b			7	7	6	3	7	0	3	0	2	0	4
2a			7	6	4	0	5	3	7	3	2	3	6
2b			7	7	0	5	7	5	6	5	3	5	7
3a			7	7	2	6	3	6	6	5	5	2	6
3b			7	7	0	3	0	4	6	5	0	0	0
4a			7	7	1	3	7	5	6	4	5	1	3
4b			7	7	1	3	6	2	3	2	1	1	7
5a			7	7	3	0	7	3	5	2	7	2	3
5b			7	7	0	3	4	4	5	1	6	7	1

Notes

Species key –Pp Common pipistrelle (*P. pipistrellus*); Ppy Soprano pipistrelle *(P.pygmaeus);* Pn Nathusius' pipistrelle (*P. nathusii*); Pa Long-eared (*Plecotus sp.)*Msp (Myotis sp); Nl Leisler's (*Nyctalus leisleri)* Nn Noctule (*Nyctalus noctula*); Es Serotine (*Eptesicus serotinus)* Rh Lesser horseshoe (*Rhinolophus hipposideros*); Rf Greater horseshoe (*Rhinolophus ferrumequinum*).

Figure 3 Ref	Month	Duration of Monitoring (No. of nights)	Number of Nights Species were Recorded										
			Pp	Ppy	Pn	Pa	Msp	Nl	Nn	Es	Nl/Nn or Es	Rh	Rf
1a	August	6	6	6	0	4	6	0	3	0	2	5	5
1b		7	7	7	3	3	7	0	5	3	5	3	7
2a		6	6	5	2	0	5	4	4	3	4	1	4
2b		7	7	7	0	6	7	6	5	7	4	3	6
3a		6	6	6	0	5	3	2	4	4	4	1	0
3b		7	7	7	0	0	3	0	5	1	3	0	2
4a		6	6	6	1	0	5	2	3	3	2	0	1
4b		7	7	7	0	0	7	3	6	3	2	2	2
5a		6	6	6	0	0	6	0	3	2	1	5	1
5b		7	7	7	0	1	6	1	7	5	4	4	2

Notes

Species key –Pp Common pipistrelle (*P. pipistrellus*); Ppy Soprano pipistrelle *(P.pygmaeus);* Pn Nathusius' pipistrelle (*P. nathusii*); Pa Long-eared (*Plecotus sp.)*Msp (Myotis sp); Nl Leisler's (*Nyctalus leisleri)* Nn Noctule (*Nyctalus noctula*); Es Serotine (*Eptesicus serotinus)* Rh Lesser horseshoe (*Rhinolophus hipposideros*); Rf Greater horseshoe (*Rhinolophus ferrumequinum*).

Figure 3 Ref	Month	Duration of Monitoring (No. of nights)	Number of Nights Species were Recorded										
			Pp	**Ppy**	**Pn**	**Pa**	**Msp**	**Nl**	**Nn**	**Es**	**Nl/Nn or Es**	**Rh**	**Rf**
1a	September	7	7	6	2	5	6	1	1	1	2	7	3
1b			7	6	1	3	7	0	1	0	0	4	3
2a			7	7	3	3	7	0	1	1	0	4	2
2b			7	7	3	6	7	3	3	3	1	4	2
3a			6	7	4	7	6	2	4	3	4	4	0
3b			7	7	3	1	4	0	3	0	3	0	0
4a			6	7	4	1	7	1	1	0	2	2	0
4b			7	7	0	3	7	0	4	0	3	6	0
5a			6	7	2	1	7	0	1	0	2	7	0
5b			7	7	2	0	5	2	2	0	0	4	0

Notes

Species key –Pp Common pipistrelle (*P. pipistrellus*); Ppy Soprano pipistrelle *(P.pygmaeus);* Pn Nathusius' pipistrelle (*P. nathusii*); Pa Long-eared (*Plecotus sp.)*Msp (Myotis sp); Nl Leisler's (*Nyctalus leisleri)* Nn Noctule (*Nyctalus noctula*); Es Serotine (*Eptesicus serotinus)* Rh Lesser horseshoe (*Rhinolophus hipposideros*); Rf Greater horseshoe (*Rhinolophus ferrumequinum*).

Appendix 5. Bat Roost Appraisal of Structures

The walkover survey identified nine bridges and four culverts along the disused railway line. Following vegetation clearance in 2015, access to a further two culverts and a derelict railway store building was possible.

The bridges did not have any obvious structure defects on the exterior and the majority of the potential shelter for bats was in expansion joints and small crevices in bricked arches/stone abutments. Culverts were typically small concrete pipes with brick buttresses. Several of the culverts were flooded during inspections of these features in winter, which precludes them from being suitable for hibernation. Details of the daytime surveys of structures are given below. The location of structures is shown on Figure 5.

Evaluation of Potential Roosts in Structures

Ref*	Grid Reference	Description of Structure	Bat Roost Potential	Evaluation+
B1	ST 47191 76468	Brick arch	Dense vegetation cover over the structure. Possible gaps under bridge deck	Low potential
B2	ST48504 76004	Brick arch carrying Sheepway unclassified road	The brick work is in good condition, but there are a low number of small crevices from missing mortar in brickwork under arch. Ivy cover on abutments is fairly sparse.	Confirmed Roost (Common pipistrelle bat)
B3	ST 49587 75688	Brick arch carrying Sheepway unclassified road	2 drainage pipes 30cm deep in the roof of the arch. Low number of small gaps c.10cm deep in the stone abutment walls.	Low potential
B4	ST 50646 75961	Concrete bridge with 10m span carrying Royal Portbury Dock Road	Expansion joints at the top of the abutment walls and between concrete floor beams across the span.	Confirmed (Common and soprano pipistrelle bat)
B5	ST 51057 76112	Brick arch bridge with stone abutments	Small crevices between bricks and stonewalls from missing mortar.	Low potential

Ref*	Grid Reference	Description of Structure	Bat Roost Potential	Evaluation+
B6	ST 51404 76207	Small brick arch bridge over an agricultural pass.	The brick work is complete and there are no obvious gaps in the fabric of the structure. The bridge is small with a 4m wide and 3m high arch span and could be closely inspected.	No potential
B7	ST 51544 76226	Concrete motorway bridge	Expansion joints at the top of walls.	Low potential
B8	ST 51978 76283	Low concrete bridge over cyclepath.	No bat roost features	No Potential
B9	ST 52098 76246	Small bridge with brick abutments and a concrete deck.	Expansion joints at top of the walls	Low potential
NR	ST 49542 75696	Small, derelict brick store covered with ivy. It is a single storey building with pitched roof and chimney at one end. It measures approximately 3m (L) by 2m (W) and is 3m to the ridge of the roof. There is a door and window opening on one side.	Capped chimney provides enclosed void. Interior space	Confirmed night roost.

Ref*	Grid Reference	Description of Structure	Bat Roost Potential	Evaluation+
C1	ST 48301 76072	Small brick culvert for agricultural drainage ditch	Comprehensive scoping assessment	No bat roost potential because culvert pipe floods.
C2	ST 48771 75904	Small brick culvert for agricultural drainage ditch	Comprehensive scoping assessment	No bat roost potential because culvert pipe floods.
C3	ST 49233 75752	Brick culvert with a vertical chamber with steel grating.	Comprehensive scoping assessment	Limited access for bats and no cavities or voids.
C4	ST 49307 75737	Brick embankment and 1.5m wide concrete pipe.	Visual inspection from embankment	Brick work and concrete pipe appear to be solid with no obvious defects.
C5	ST 49591 75691	Brick culvert with a vertical chamber with steel grating.	Comprehensive scoping assessment	Limited access for bats and no cavities or voids.
C6	ST 50344 75841	Brick embankment and 1.5m wide concrete pipe.	Visual inspection from embankment	Brick work and concrete pipe appear to be solid with no obvious defects.
C7	ST 50317 75845	Brick embankment and 1.5m wide concrete pipe.	Visual inspection from embankment	Brick work and concrete pipe appear to be solid with no obvious defects.
C8	ST 50418 75887	Brick embankment and 1m wide concrete pipe.	Visual inspection from embankment	The design of the culvert is considered to limit potential roost features, but there may be defects in the 18m long concrete pipe.

Ref*	Grid Reference	Description of Structure	Bat Roost Potential	Evaluation+
				Water level is high (with only 30cm air clearance through pipe) and culvert is likely to flood.
Notes *Reference is shown on Figure 5. **B** denotes Bridge**; C** denotes Culvert; **NR** denotes night roost building.				

Appendix 6. Tree Roost Resource on the Disused Railway Line

Trees with bat roost potential are shown on Figure 5.

Evaluation of Potential Roosts in Trees

Tree Ref	Grid Reference	Tree Species	Habitat Description	Roost Description	Height Above Ground Level	Evaluation
T1	ST 48243 76090	Italian Black Poplar	Portbury Common. Woodland, pasture and semi-natural habitats.	Rot hole in main limb on north side	6m	High
				Woodpecker hole on east side	7m	
				Damaged and loose bark on north side of main limb	8m	
T2	ST 48187 76092	Italian Black Poplar	Portbury Common. Woodland, pasture and semi-natural habitats.	Broken limb on south side with possible cavities	6m	Low
				Large scar on north side of trunk	6m	
T3	ST 48171 76105	Italian Black Poplar	Portbury Common. Woodland, pasture and semi-natural habitats.	Horizontal split on underside of small limb on east side of tree	8m	Low
T4	ST 48163 76109	Italian Black Poplar	Portbury Common. Woodland, pasture and semi-natural habitats.	Rot hole in the end of a small branch on the south side of the tree	4m	Low
				Scar with flaking bark on south side of the tree trunk	5m	
T5	ST 48159 76110	Italian Black Poplar	Portbury Common.	Scar with rot hole c.20cm wide on north side of tree trunk	10m	Moderate

Tree Ref	Grid Reference	Tree Species	Habitat Description	Roost Description	Height Above Ground Level	Evaluation
			Woodland, pasture and semi-natural habitats.			
				Dead limb with splits on north side of tree	15m	
T6	ST 48132 761112	Italian Black Poplar	Portbury Common. Woodland, pasture and semi-natural habitats.	Large broken limb with flaking bark on south-east side	5m	Moderate
				Flaking bark around small broken limb on north side	6m	
				Ivy cover over decayed timber	9m	
T7	ST 48113 76113	Italian Black Poplar	Portbury Common. Woodland, pasture and semi-natural habitats.	Woodpecker hole on east side of trunk	5m	Moderate
				Flaking bark on dead limb on east side	6m	
				Rot hole in small branch on south-east side	9m	
T8	ST 48112 76113	Italian Black Poplar	Portbury Common. Woodland, pasture and semi-natural habitats.	Dying, tree has a beheaded trunk with a woodpecker hole on north side	5m	High

Tree Ref	Grid Reference	Tree Species	Habitat Description	Roost Description	Height Above Ground Level	Evaluation
T9	ST 48102 76124	Italian Black Poplar	Portbury Common. Woodland, pasture and semi-natural habitats.	Beheaded main branch with woodpecker hole on north-east side	10m	High
				Flaking bark and decay on broken limb	6m	
T10	ST 47998 76157	Italian Black Poplar	Close to housing estate and adjacent to pasture.	Small areas of damage on west side	12m	Low
				Flaking bark on south side	Various	
T11	ST 47998 76158	Italian Black Poplar	Close to housing estate and adjacent to common land	Beheaded main branch with cracks	Top of tree	Moderate
T12	ST 47955 76176	Italian Black Poplar	Close to housing estate and adjacent to pasture.	Hole in trunk on west side	2m	Low
T13	ST 49311 75709	White Poplar	Arable and pasture farmland	Large limb on south side with split in barn	5m	Moderate
				Split in limb (goes all the way through the branch) on south side	10m	
T14	ST 50543 75926	Italian Black Poplar	Secondary woodland along railway line at edge of industrial estate with countryside	Rot hole in trunk on south side	4.5m	Moderate

Tree Ref	Grid Reference	Tree Species	Habitat Description	Roost Description	Height Above Ground Level	Evaluation
T15	ST 50418 75887	Poplar	Secondary woodland along railway line at edge of industrial estate with countryside	Dying tree with ivy cover over decayed timber	Various	High
				Rot hole on north side of trunk	1m	
T16	ST 50391 75864	Oak	Secondary woodland along railway line at edge of industrial estate with countryside	Horizontal split in limb on north side of tree	3m	Moderate
T17	ST 50371 75863	Birch	Secondary woodland along railway line at edge of industrial estate with countryside	Thick stem ivy	Various	Low
T18	ST 50883 76045	Birch	Urban edge with arable and pasture farmland	Twin stem tree with thick stem ivy over deadwood	Various	Low
T19	ST 51461 76226	Oak	Green corridor and cyclepath at the edge of town	Mature tree with ivy and dead wood in canopy of tree	Various	Low

Appendix 7. Datalogger Monitoring of Tunnels on Portbury Freight Line between August and October

The results of the datalogger monitoring between August and October 2015 are presented on a series of charts to show the data captured on each datalogger deployed at the tunnel portals. The graphs display:

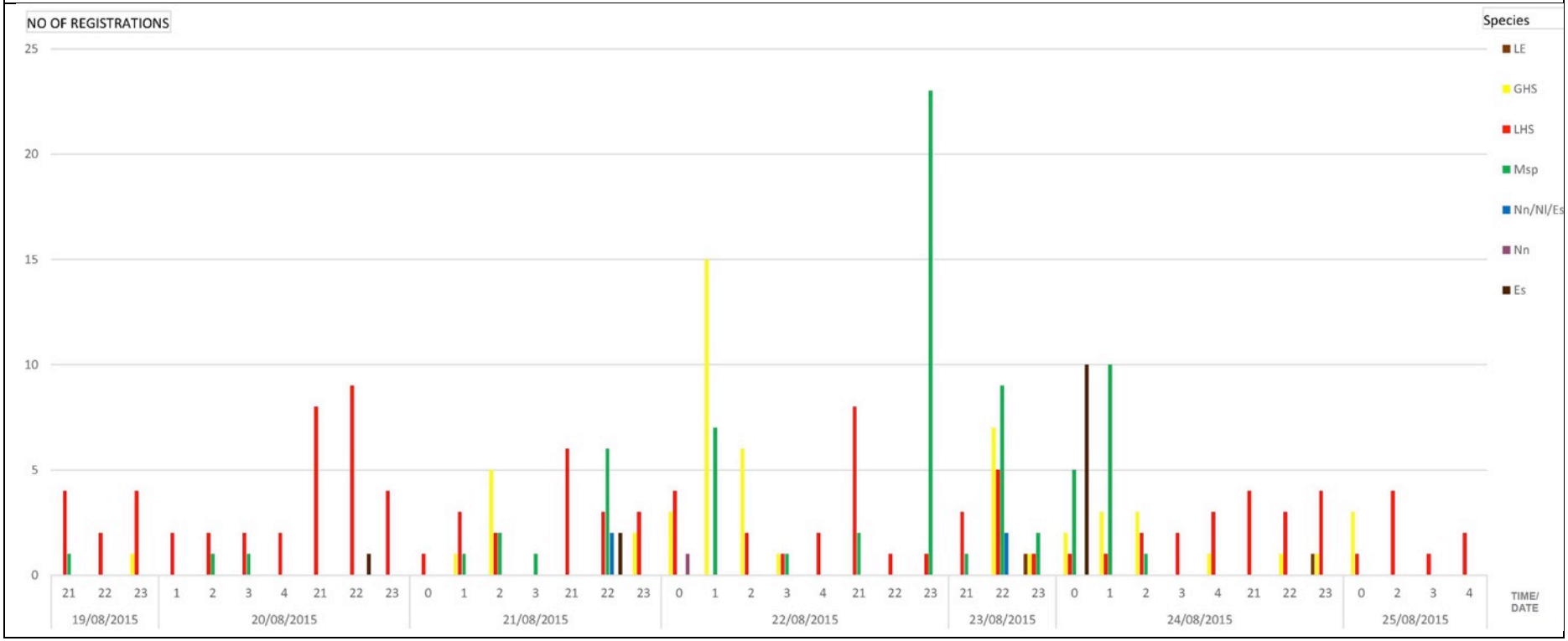
- The monitoring period on the horizontal axis;
- The hour of time shown on the horizontal axis – abbreviated 24hour clock (e.g 21:00hrs shown as 21);
- Total number of registrations per species per hour.

Species Key	
ES	Serotine bat *Eptesicus serotinus*
GHS	Greater horseshoe bat *Rhinolophus ferrumequinum*
LE	Long-eared bat *Plecotus sp*
LHS	Lesser horseshoe bat *Rhinolophus hipposideros*
Msp	Myotis species
Nl	Leisler's bat *Nyctalus leisleri*
Nn	Noctule bat *Nyctalus noctula*
Nn/Nl/Es	Noctule, Leisler's or Serotine bat

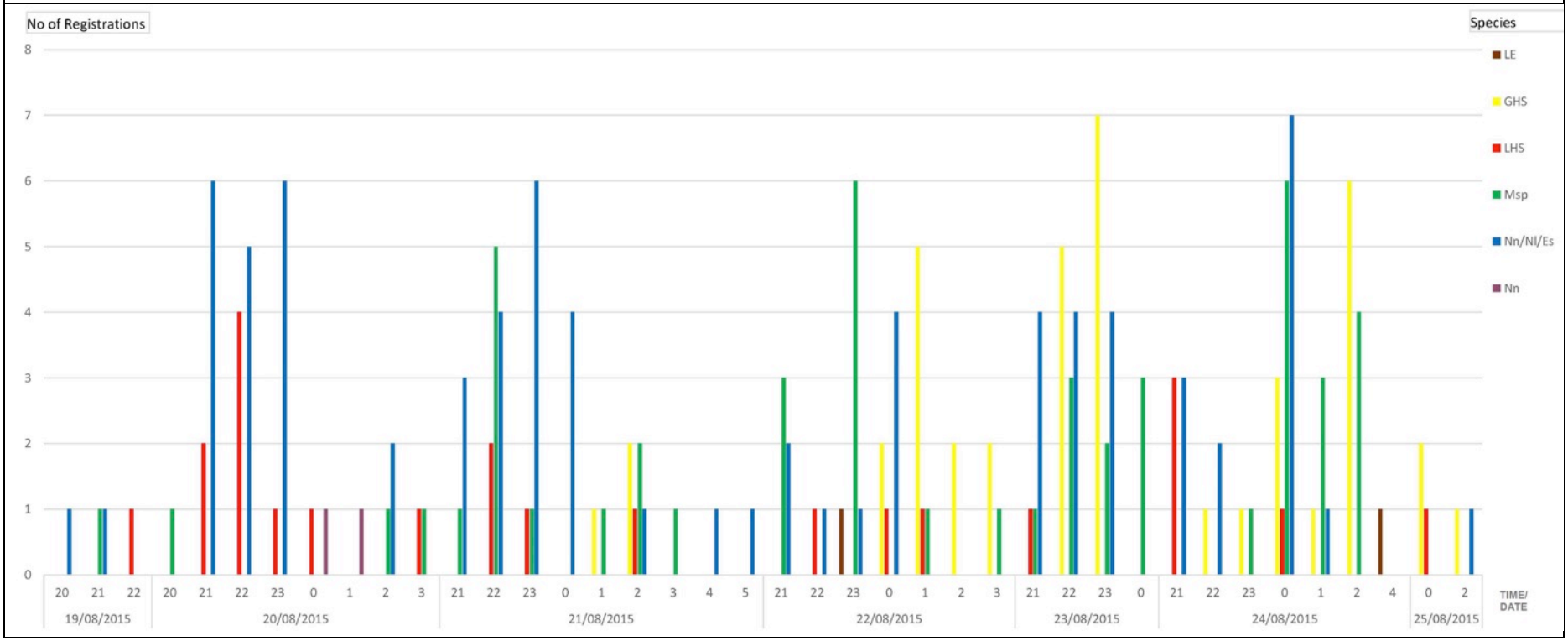
Social calls from bats interacting within the tunnels are shown as a discrete entry on the charts as they cannot be assigned to an individual species with sufficient certainty. .

Clifton 1.

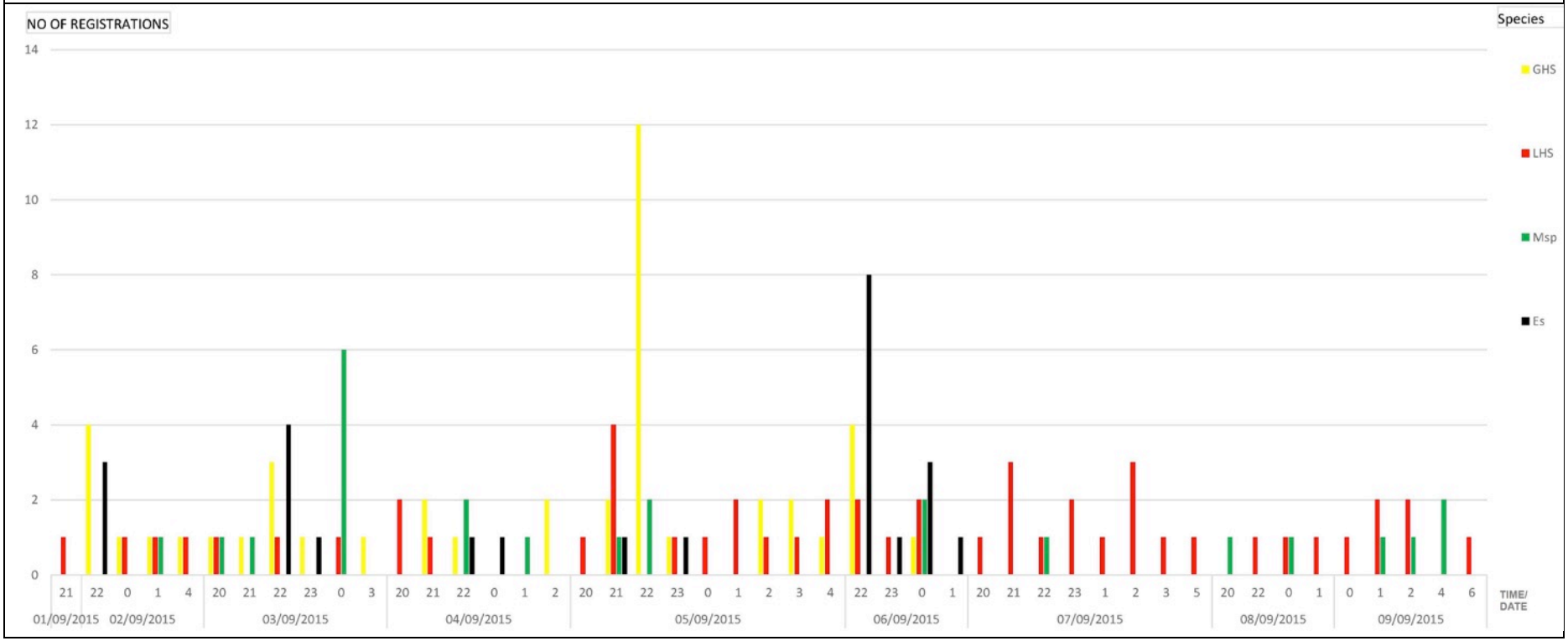
North-West Portal: 19th August, 6 nights monitoring



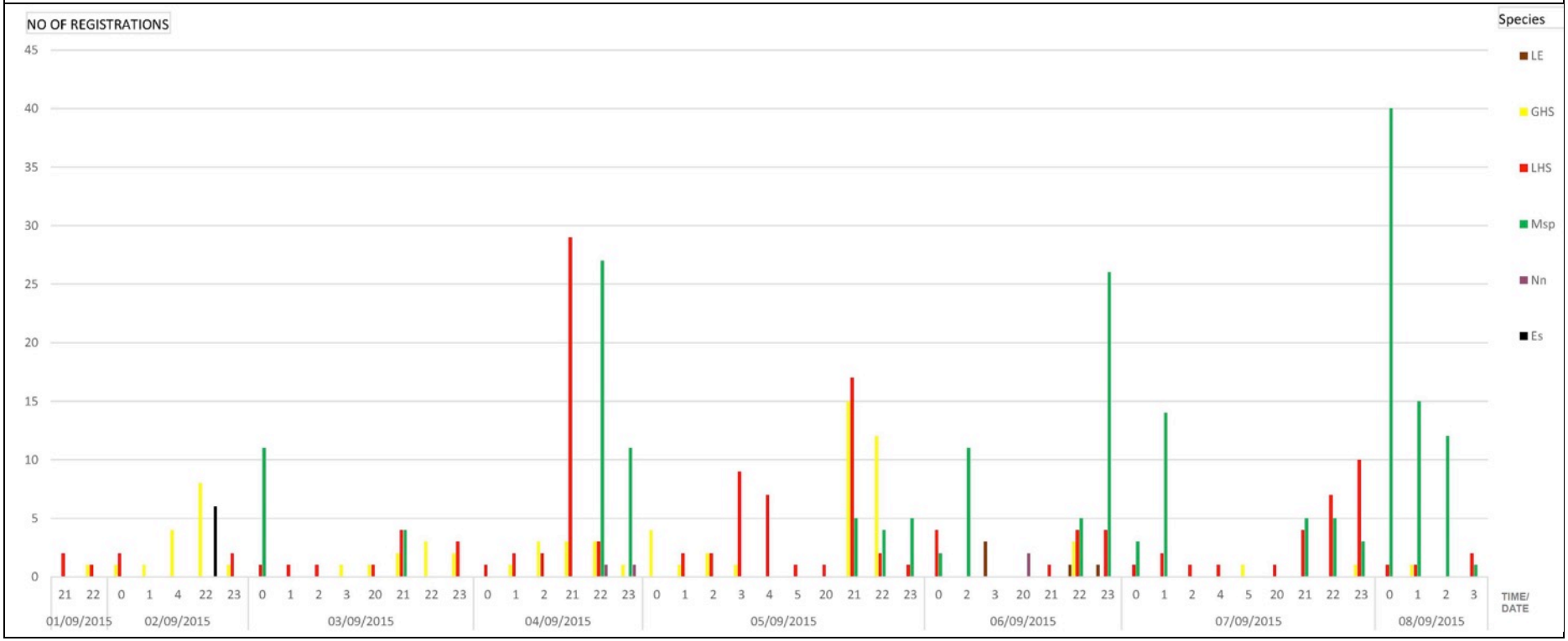
South_East Portal: 19th August, 6 nights monitoring



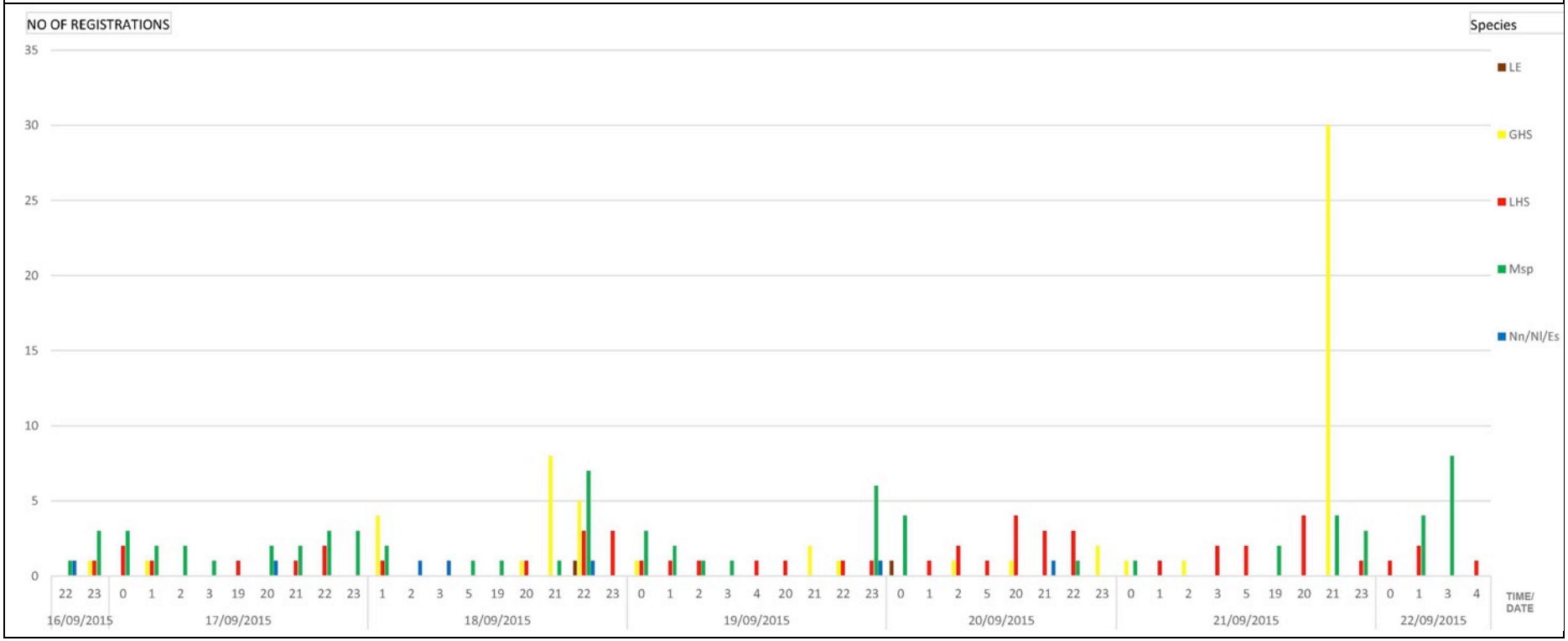
North-West Portal: 1st September, 7 nights monitoring



South-East Portal: 1st September, 7 nights monitoring



North-West Portal: 16th September, 6 nights monitoring



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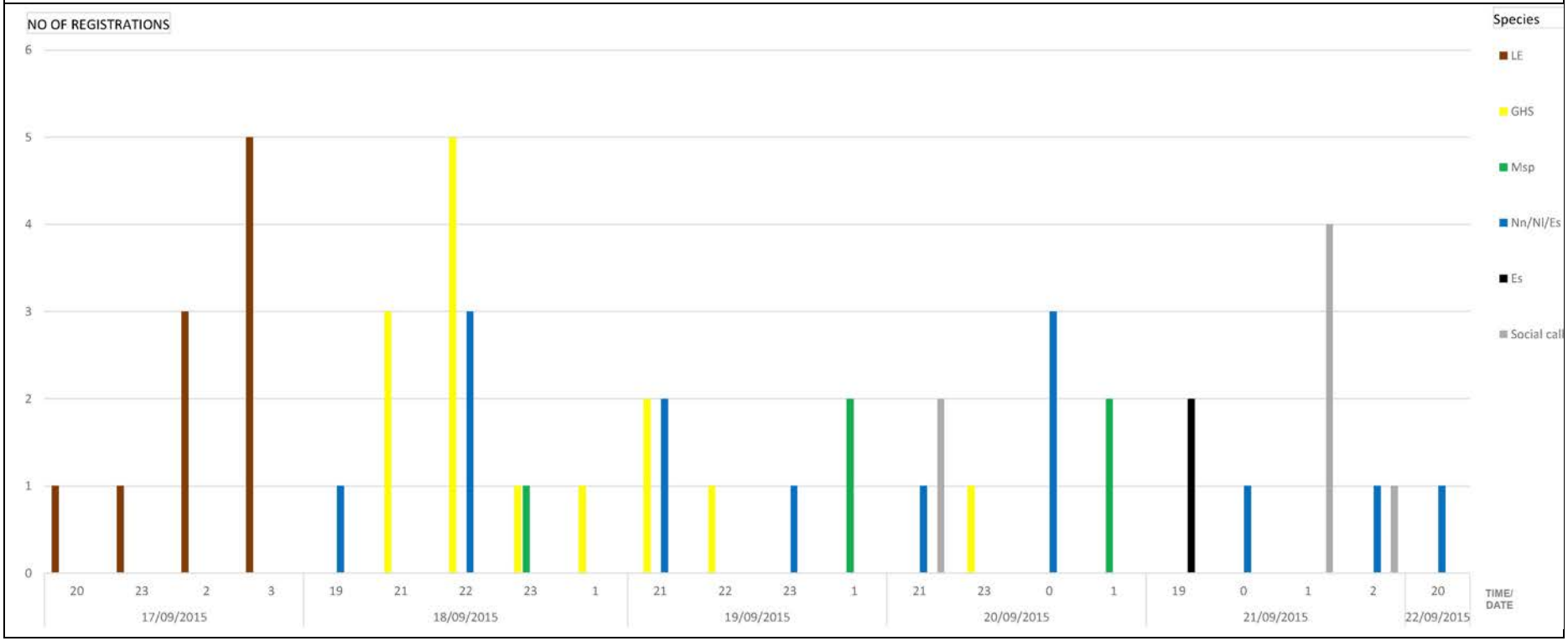
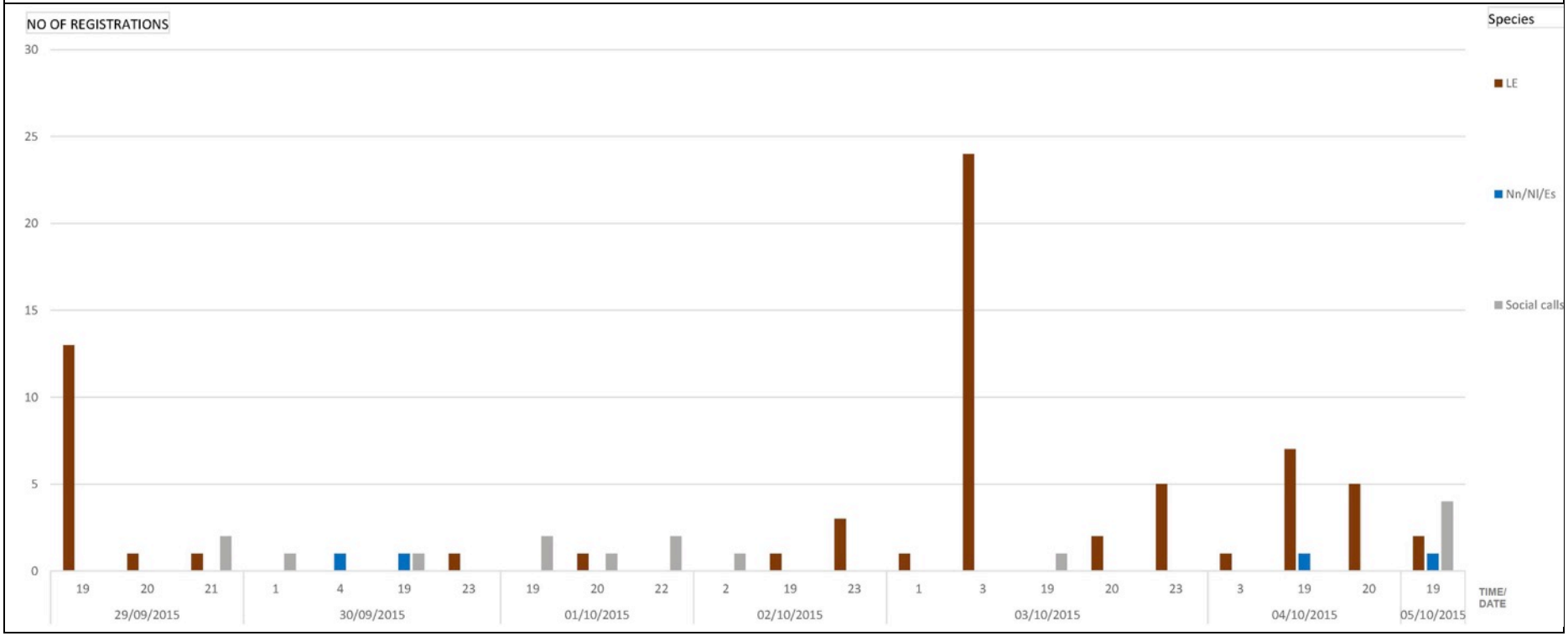


North-West Portal: 28th September, 6 nights monitoring



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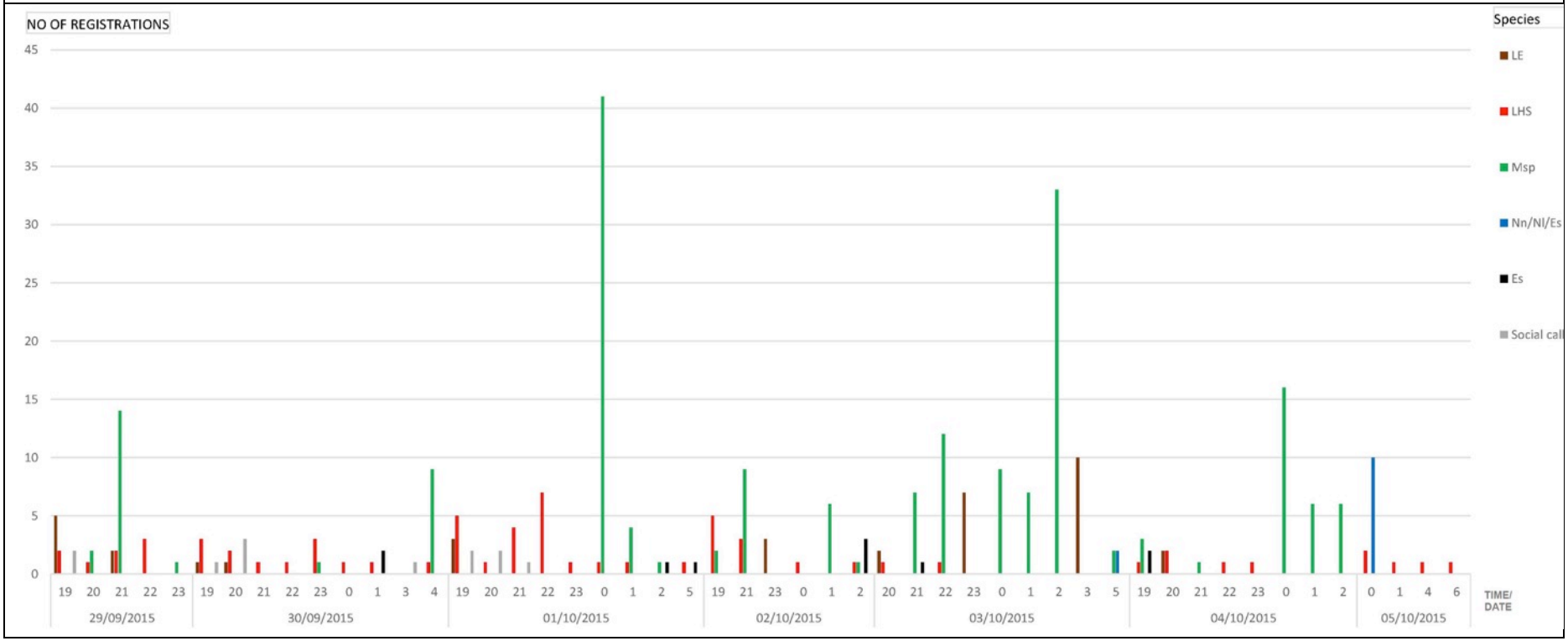

Clifton 2

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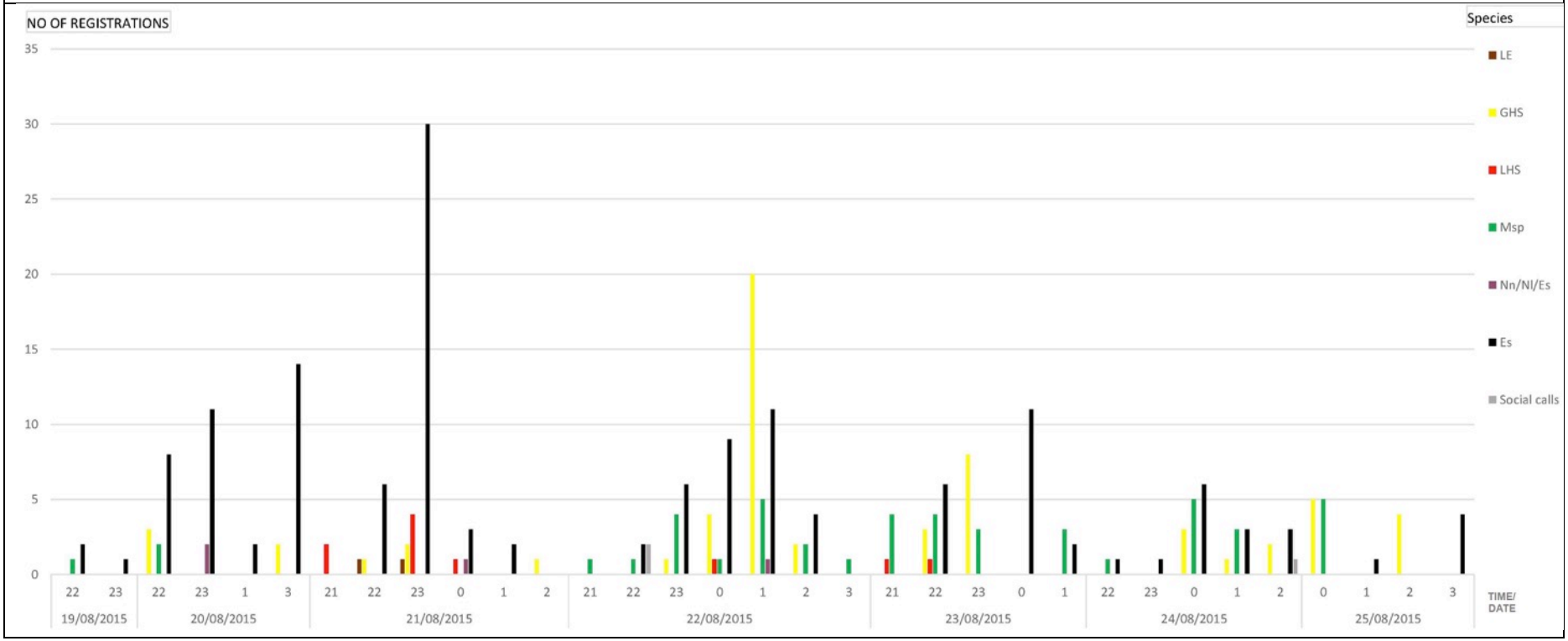
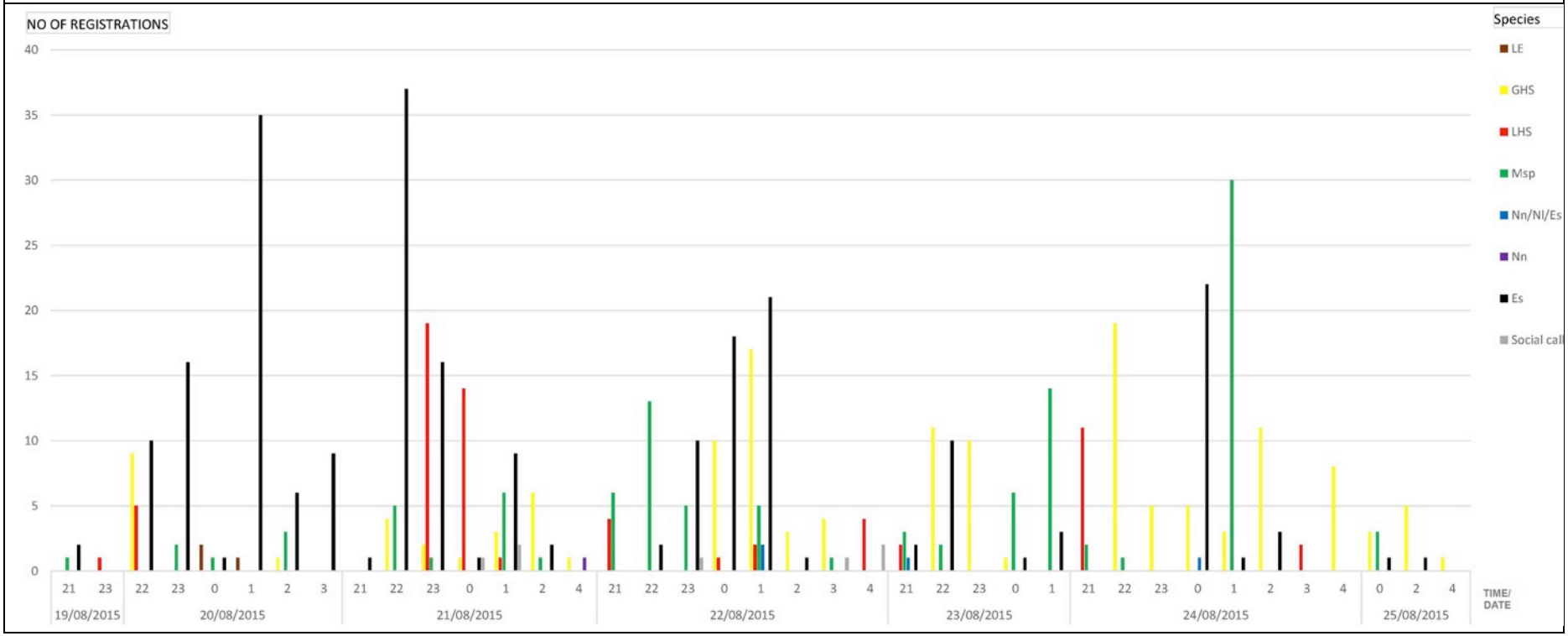
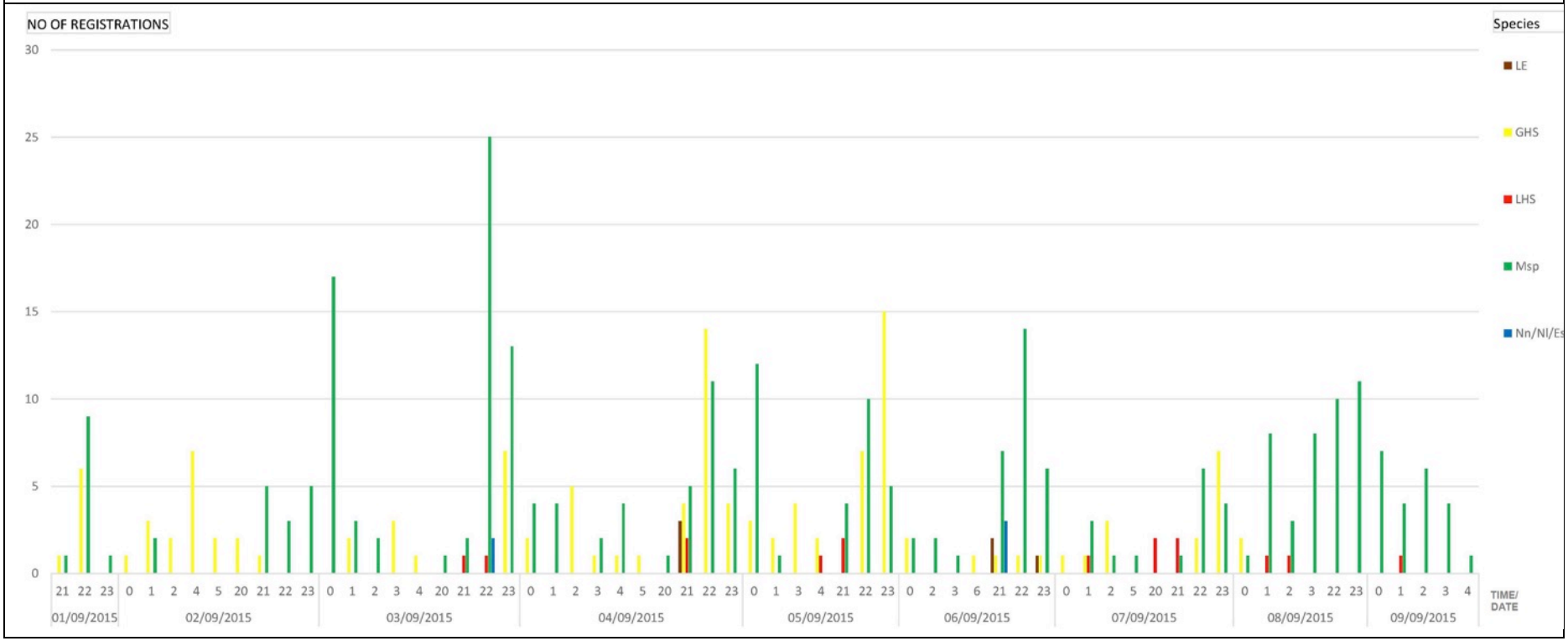


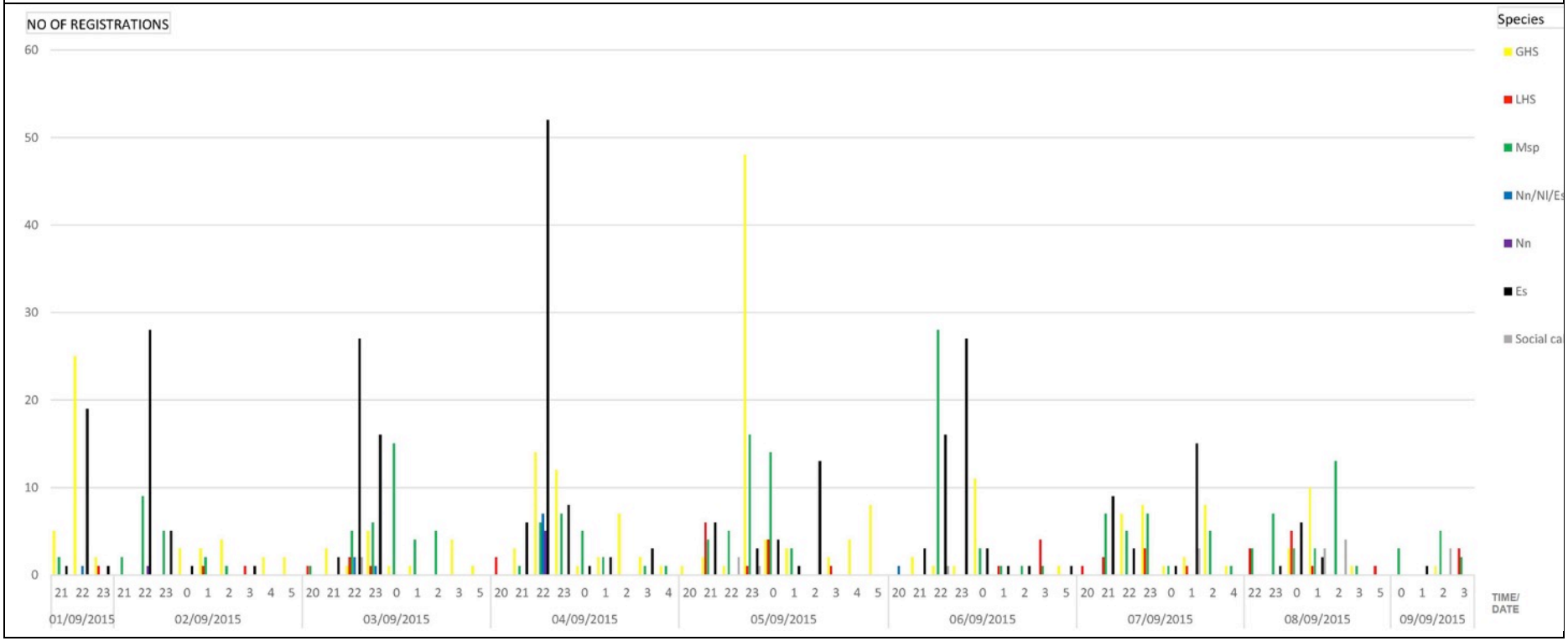
South Portal: 19th August, 6 nights monitoring



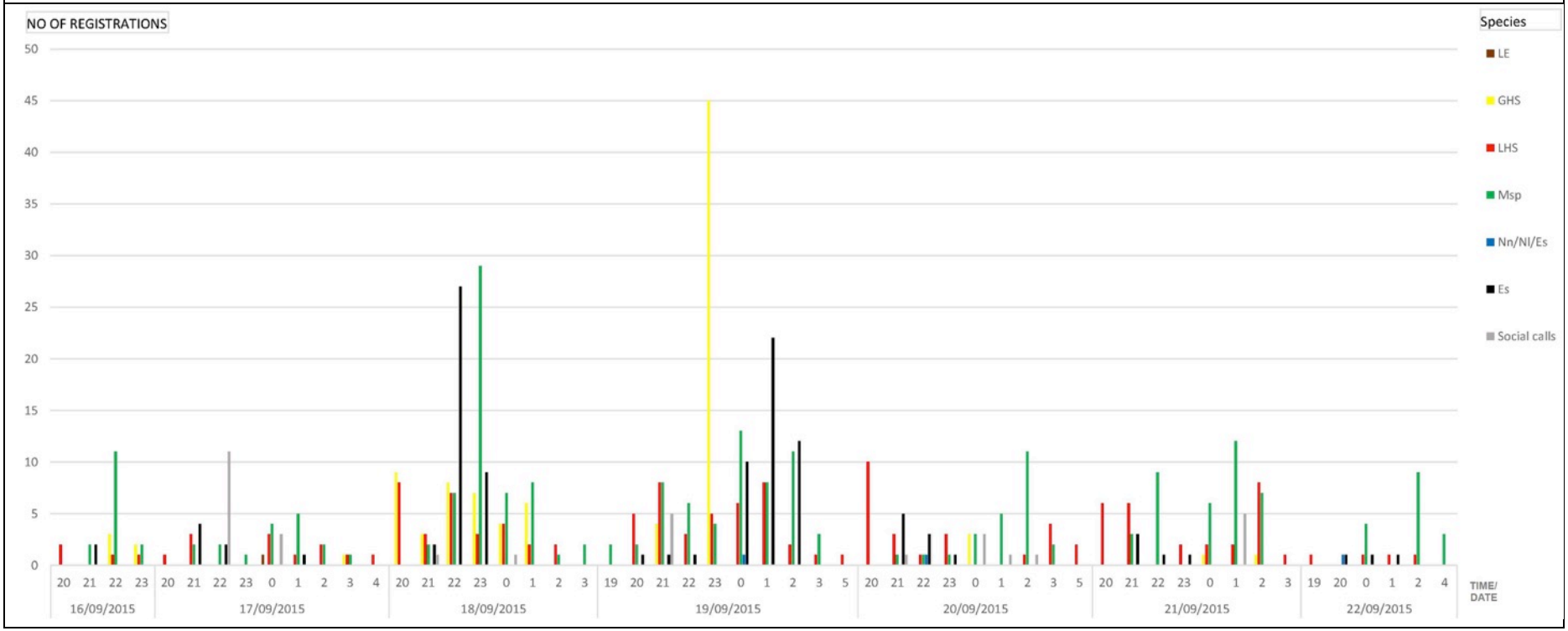
North Portal: 1st September, 8 nights monitoring



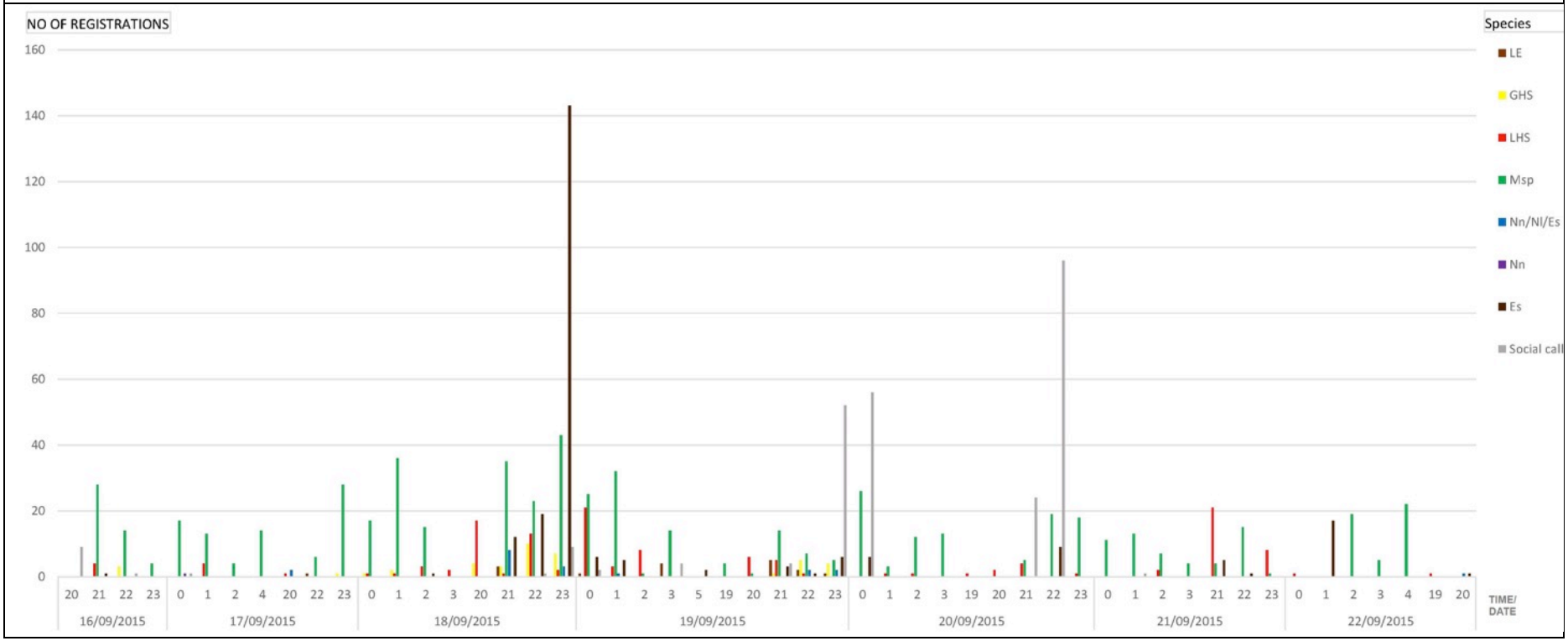
South Portal: 1st September, 8 nights monitoring



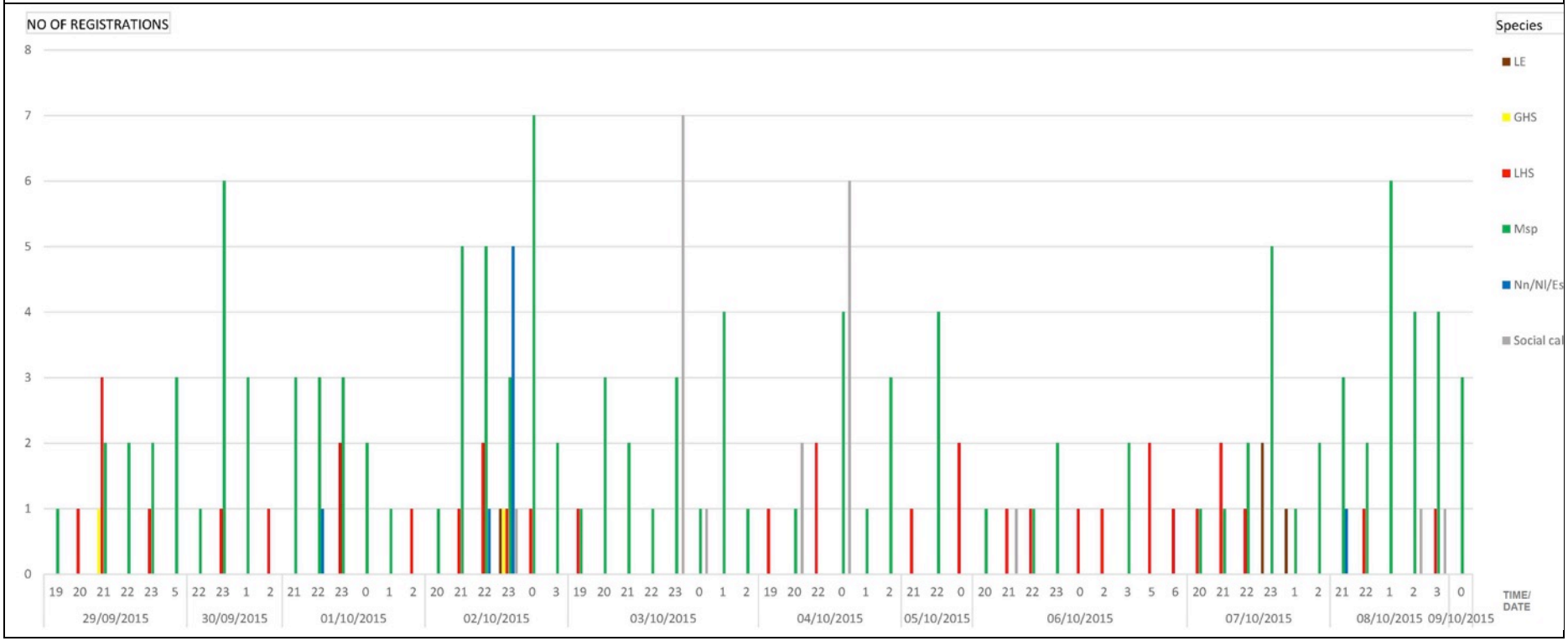
North Portal: 16th September, 7 nights monitoring



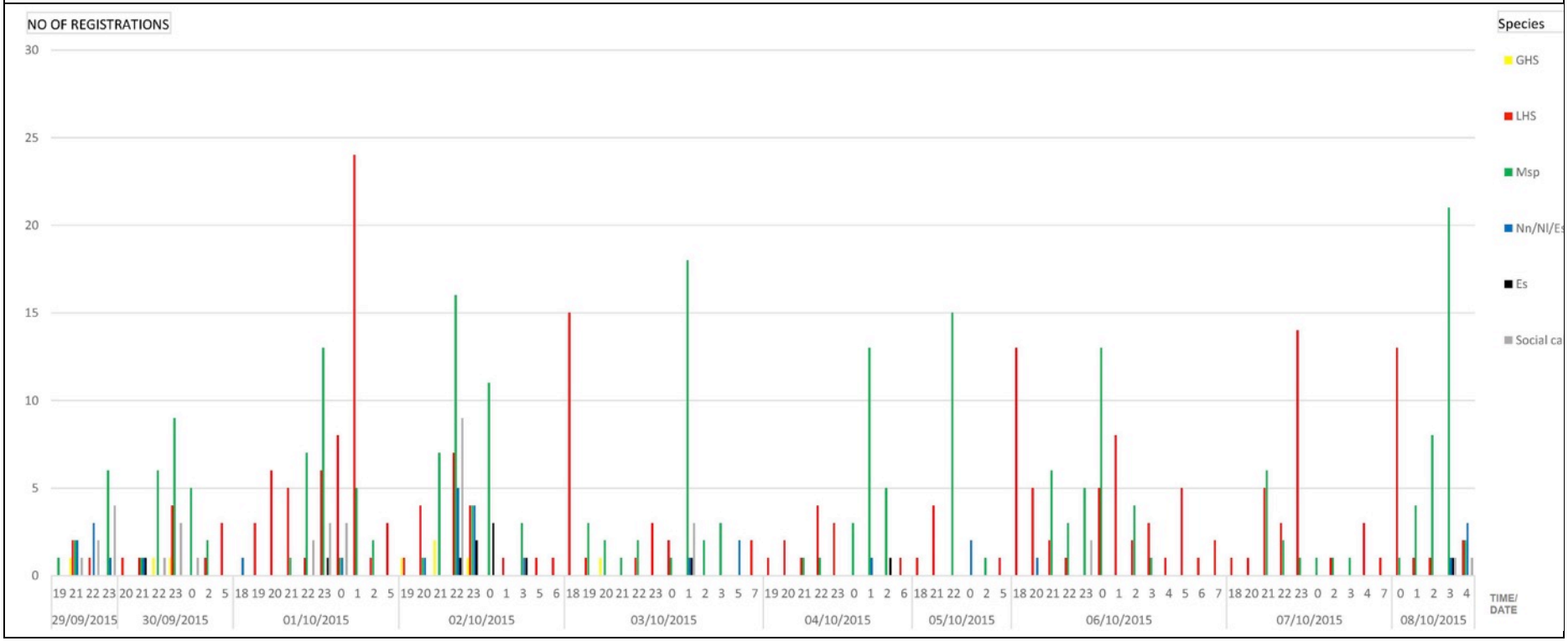
South Portal: 16th September, 6 nights monitoring



North Portal: 28th September, 10 nights monitoring

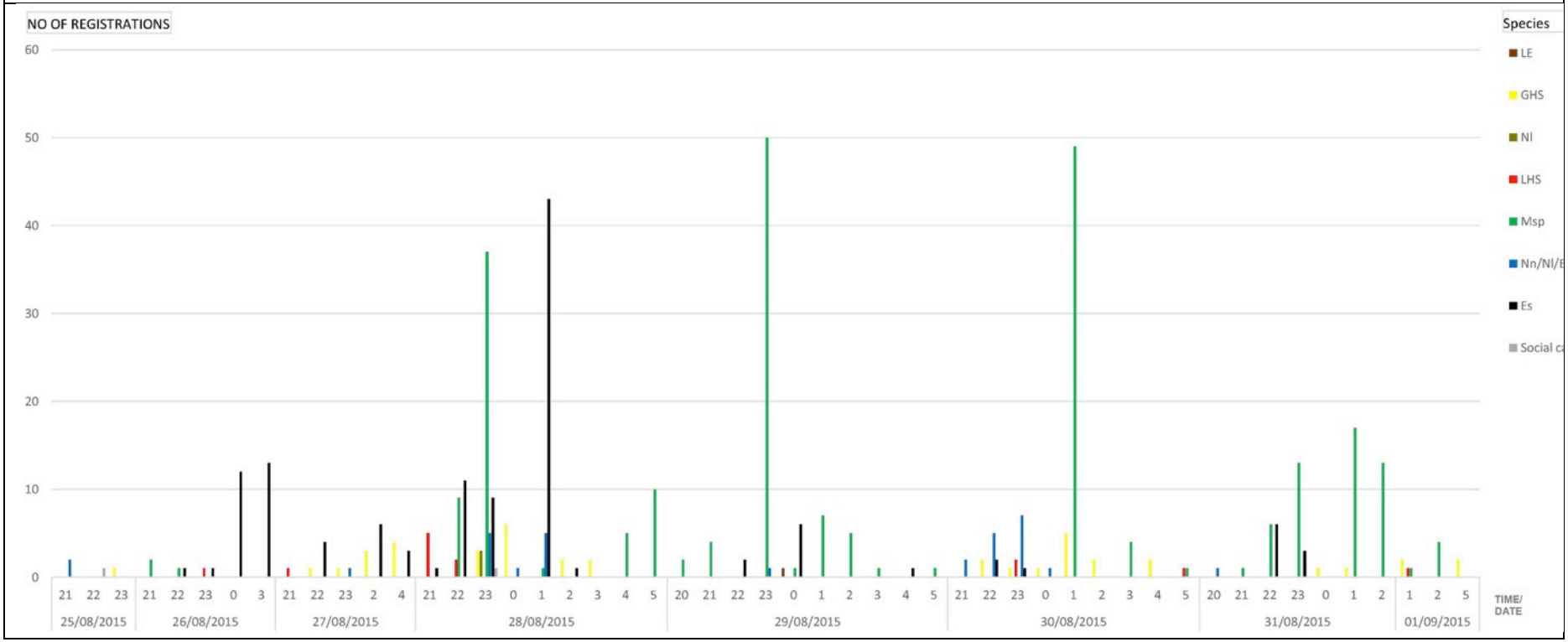


South Portal: 28th September, 9 nights monitoring

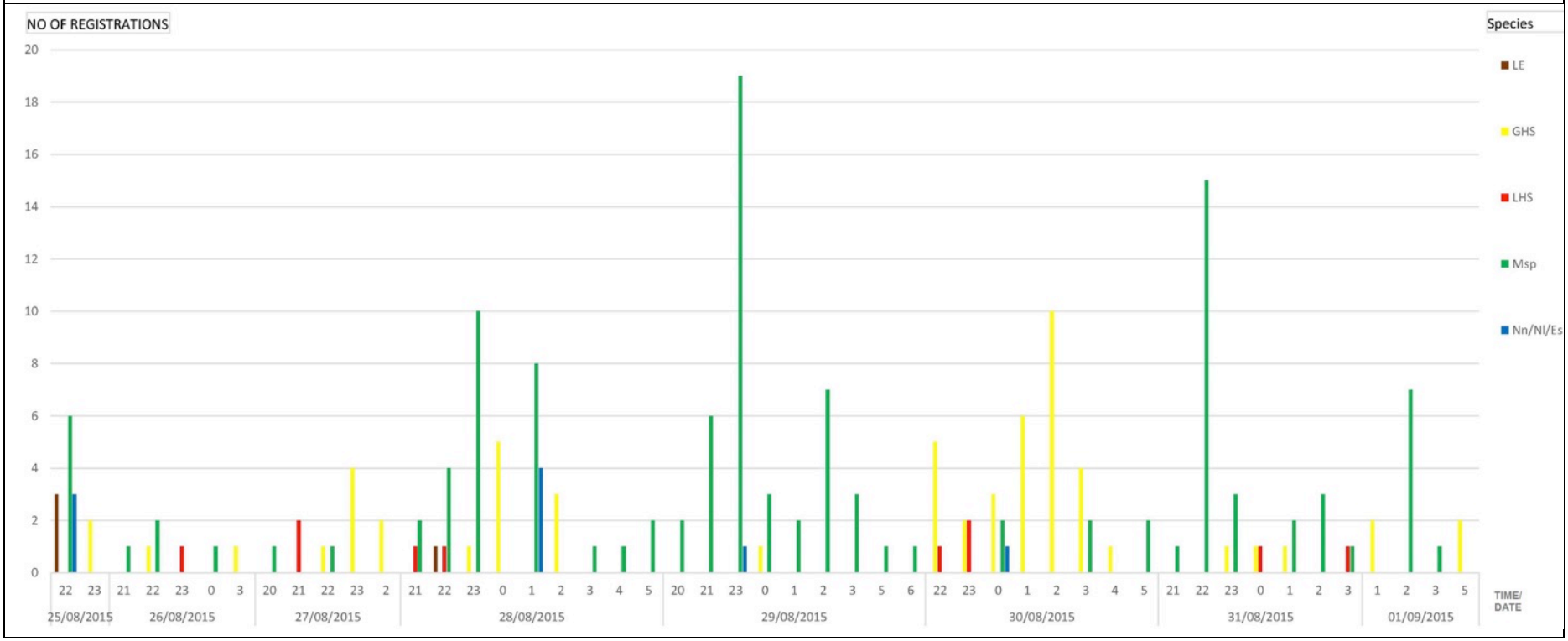


Sandstone

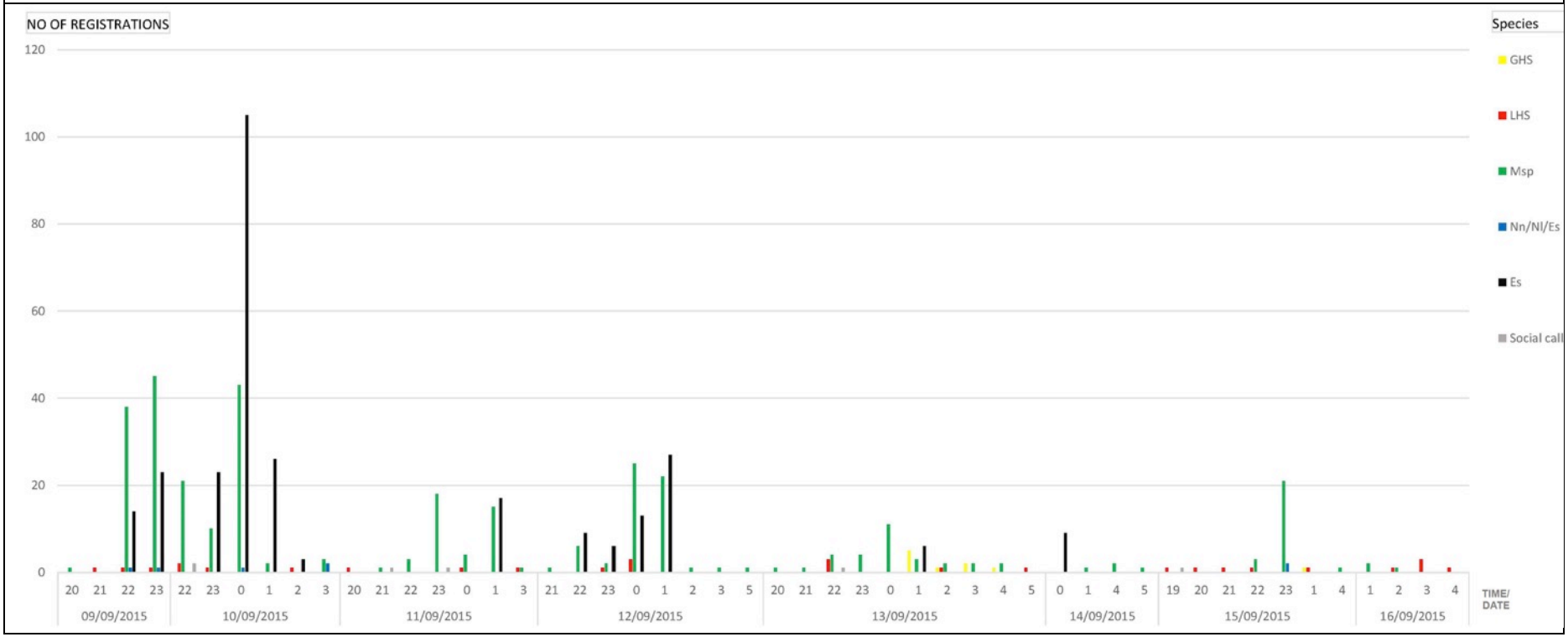
North-West Portal: 25th August, 7 nights monitoring



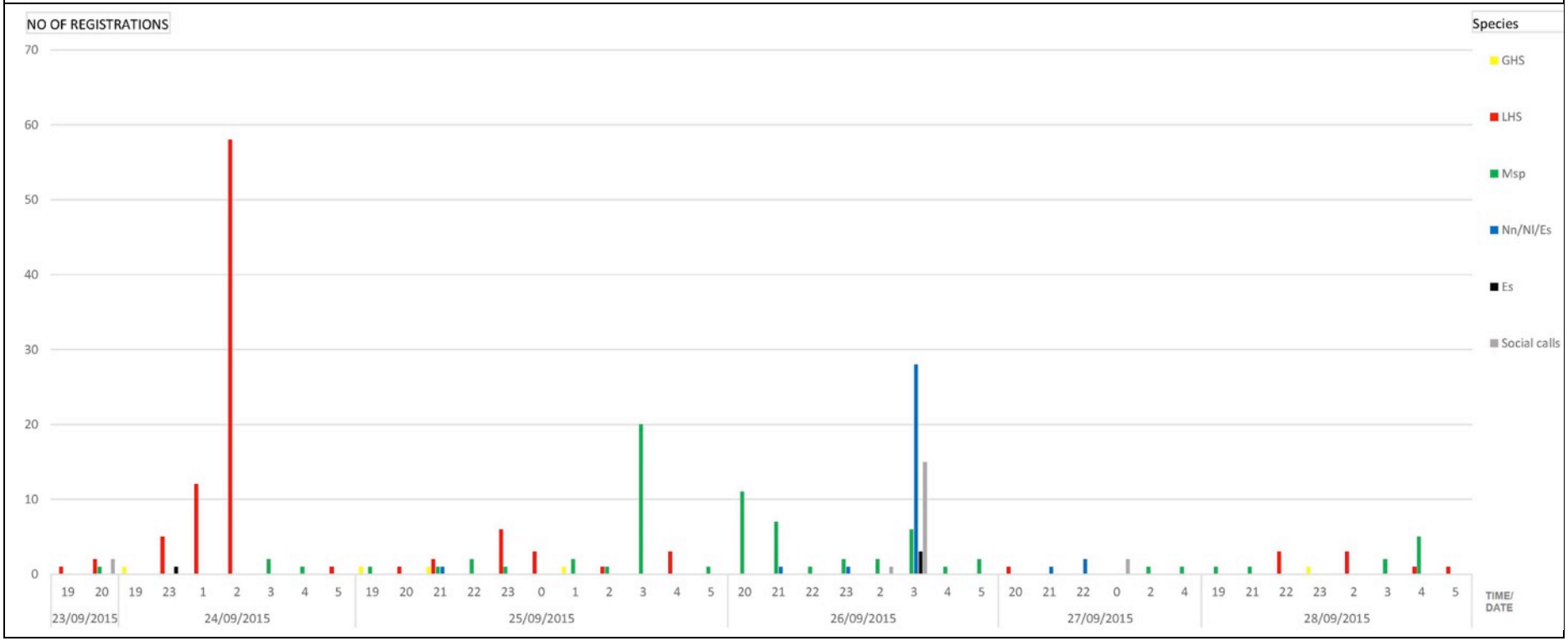
South-East Portal: 25th August, 7 nights monitoring



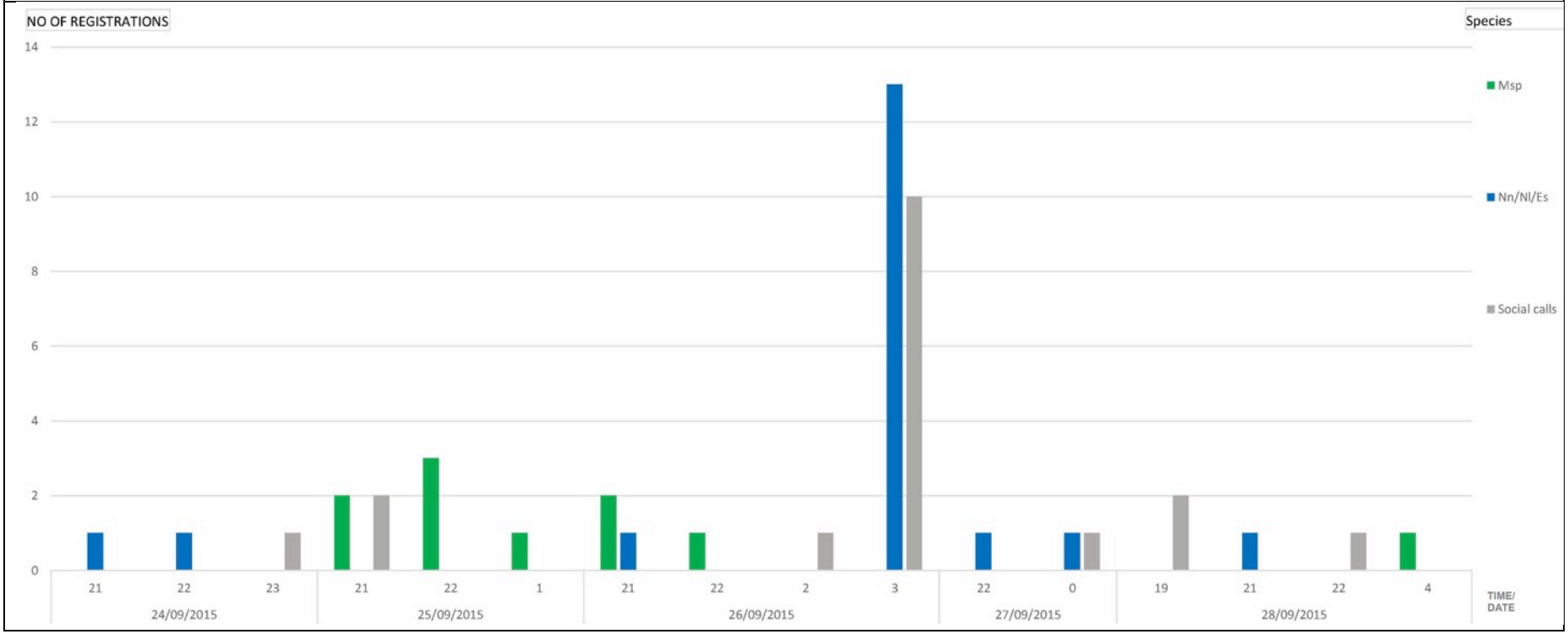
Centre of Tunnel: 9th September, 7 nights monitoring



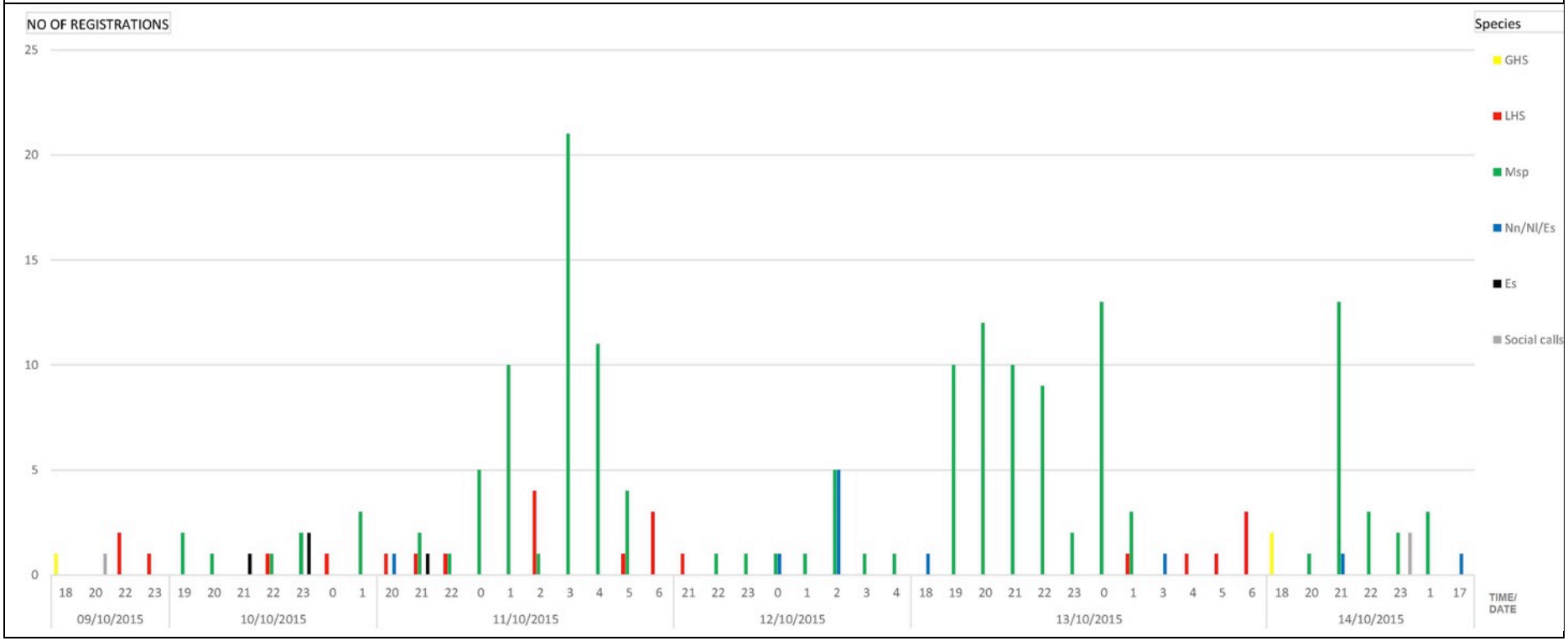
North-West Portal: 22nd September, 6 nights monitoring



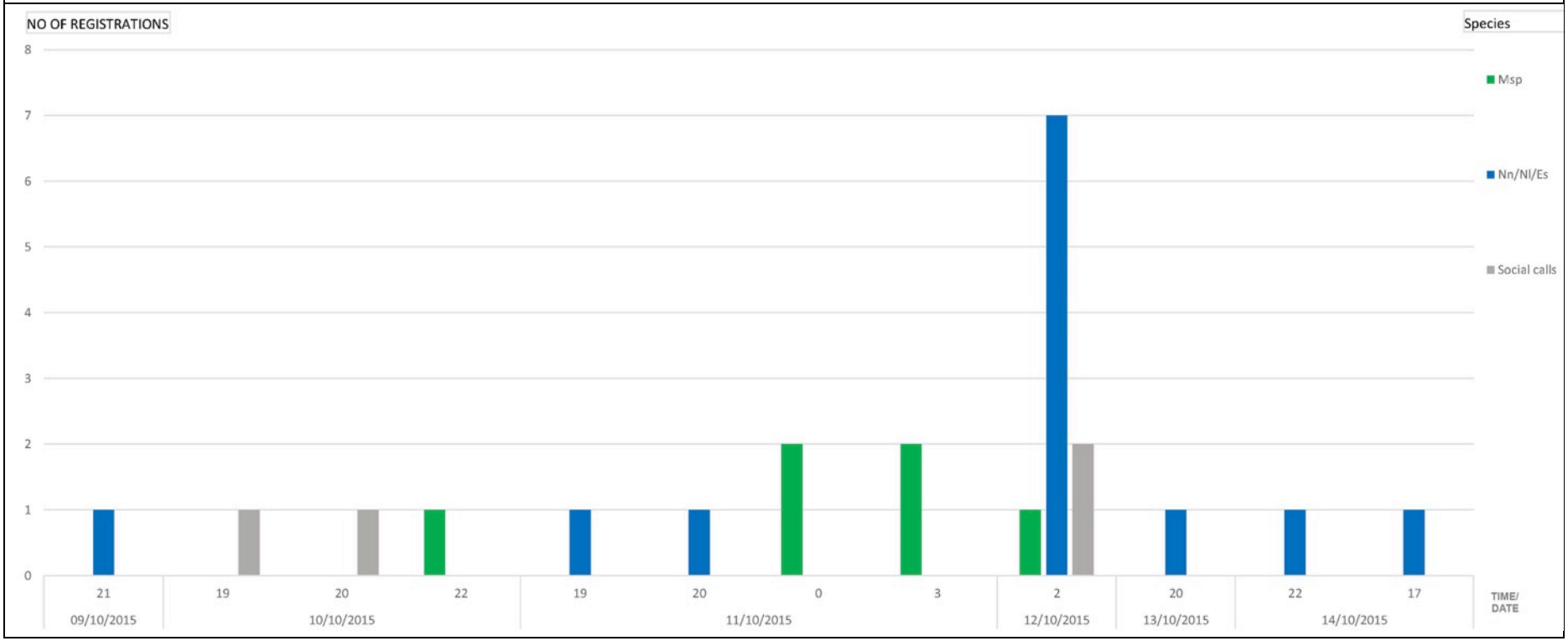
South-East Portal: 22nd September, 7 nights monitoring
(No activity recorded on the 22nd and 23rd September)



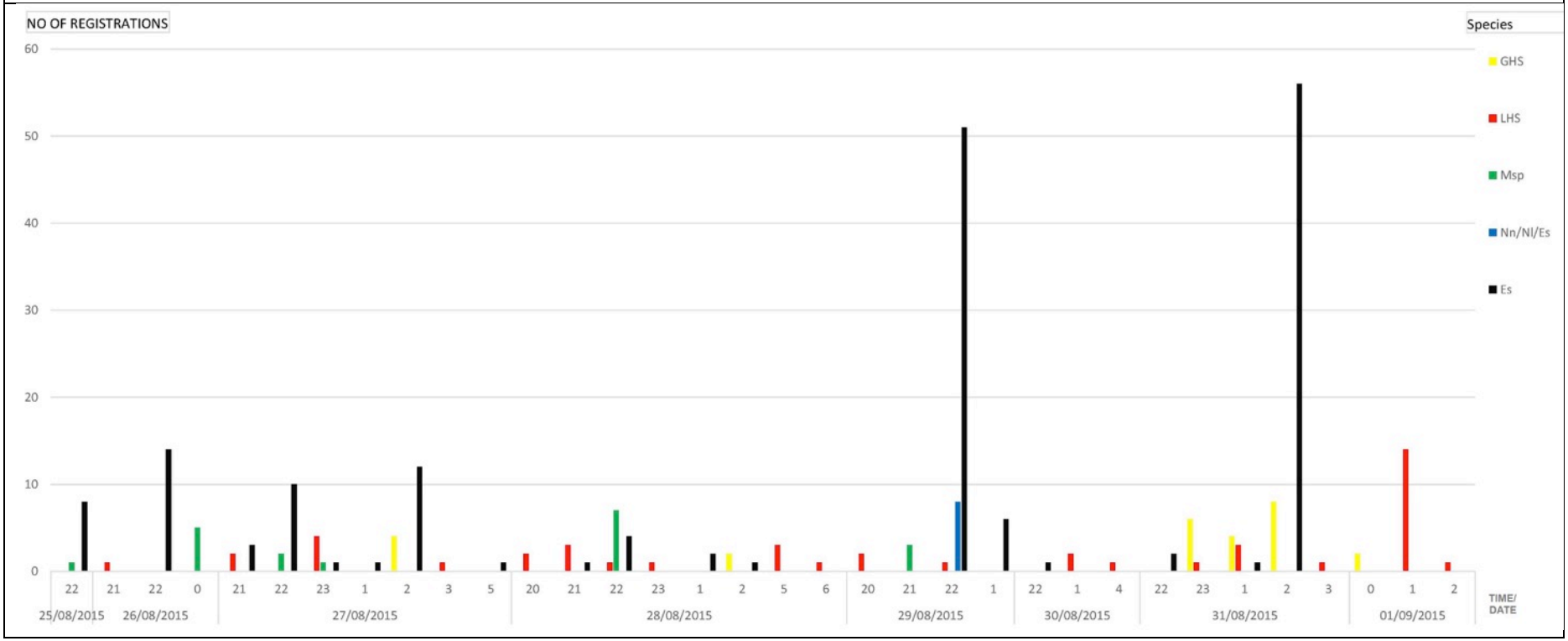
North-West Portal: 9th October, 6 nights monitoring



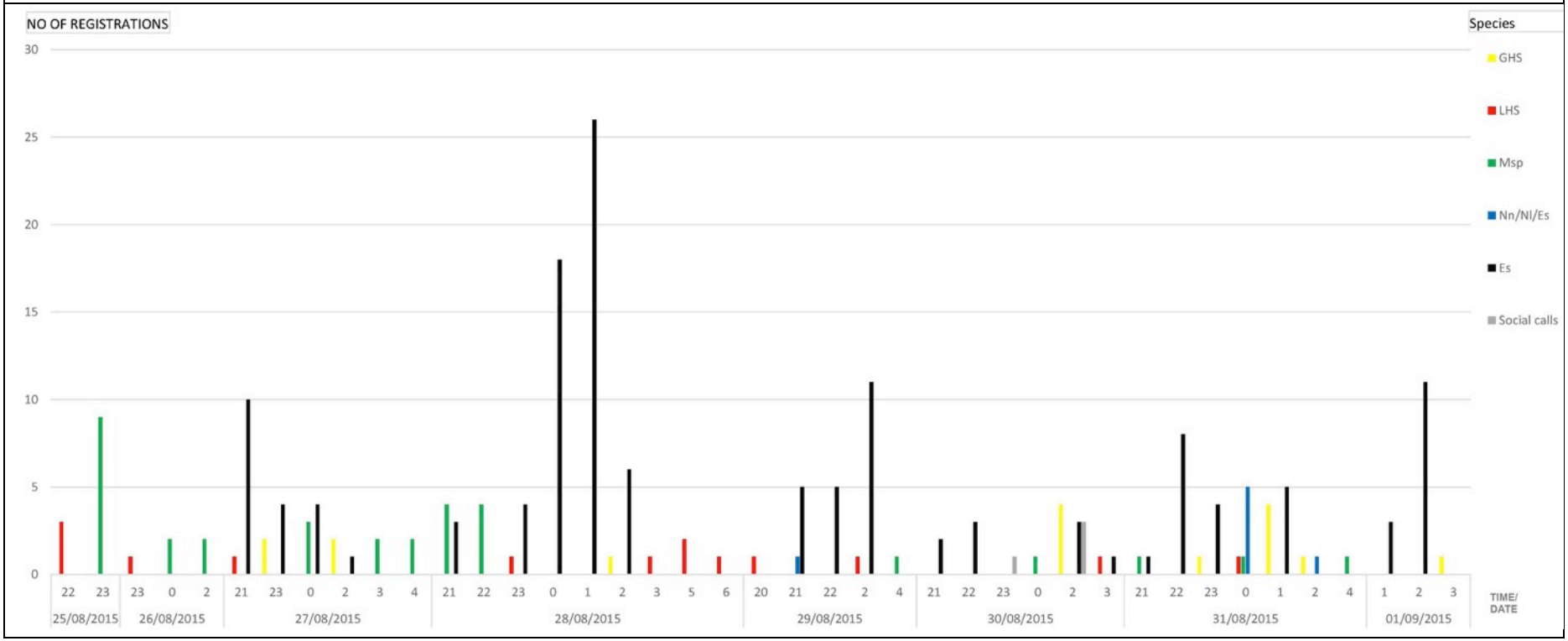
South-East Portal: 9th October, 6 nights monitoring



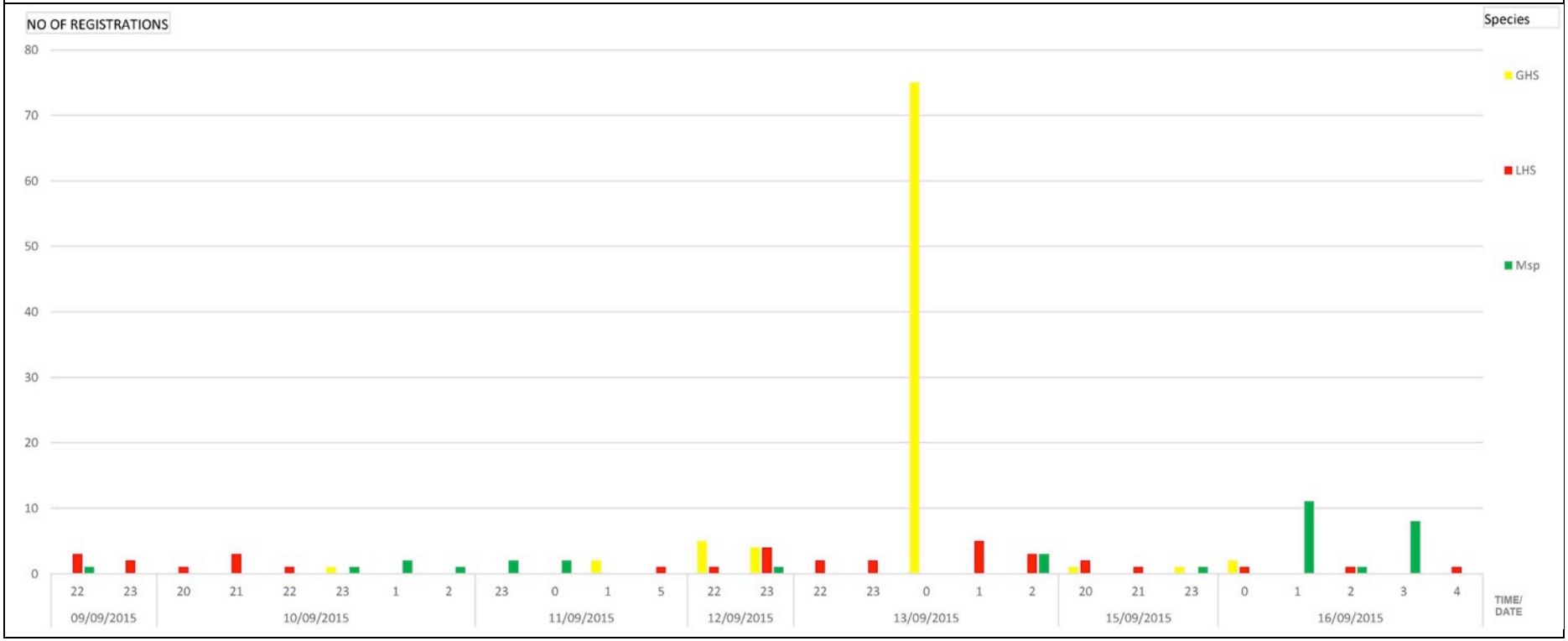
Pill
West Portal: 25th August, 7 nights monitoring



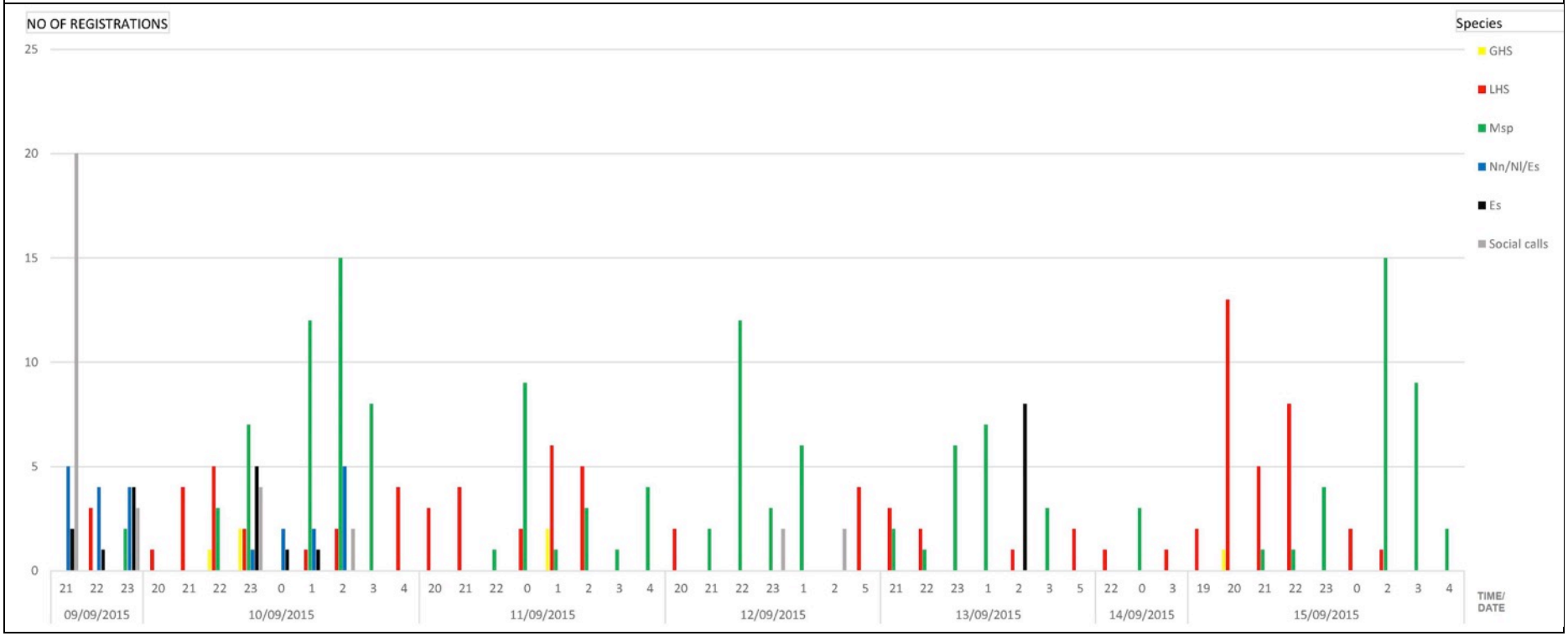
East Portal: 25th August, 7 nights monitoring



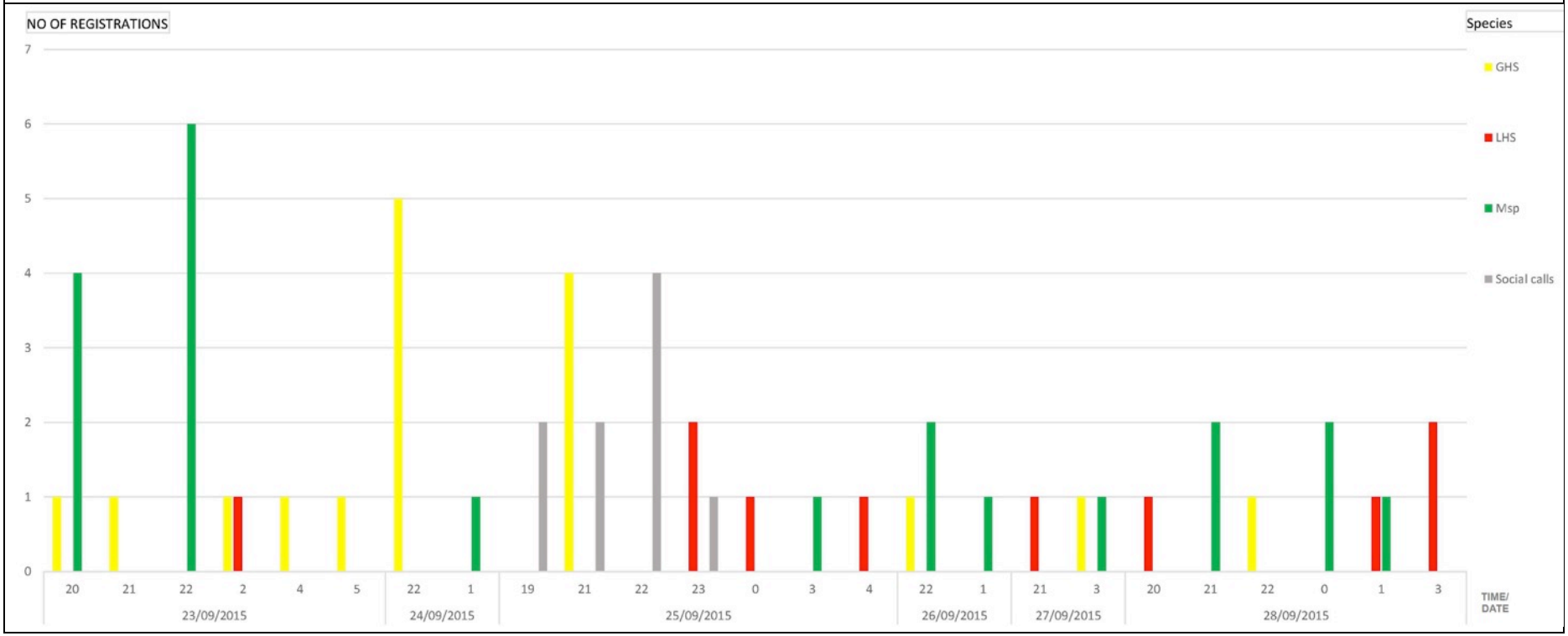
West Portal: 9th September, 6 nights monitoring



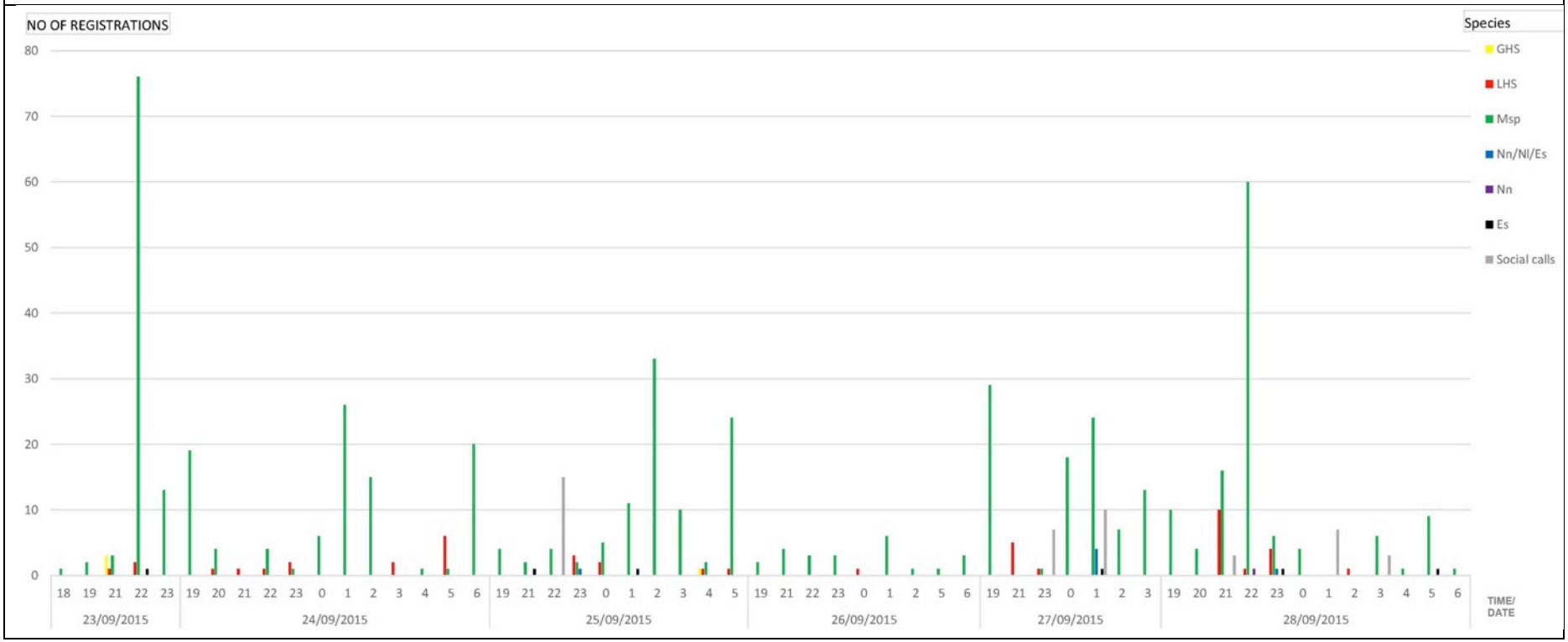
East Portal: 9th September, 7 nights monitoring



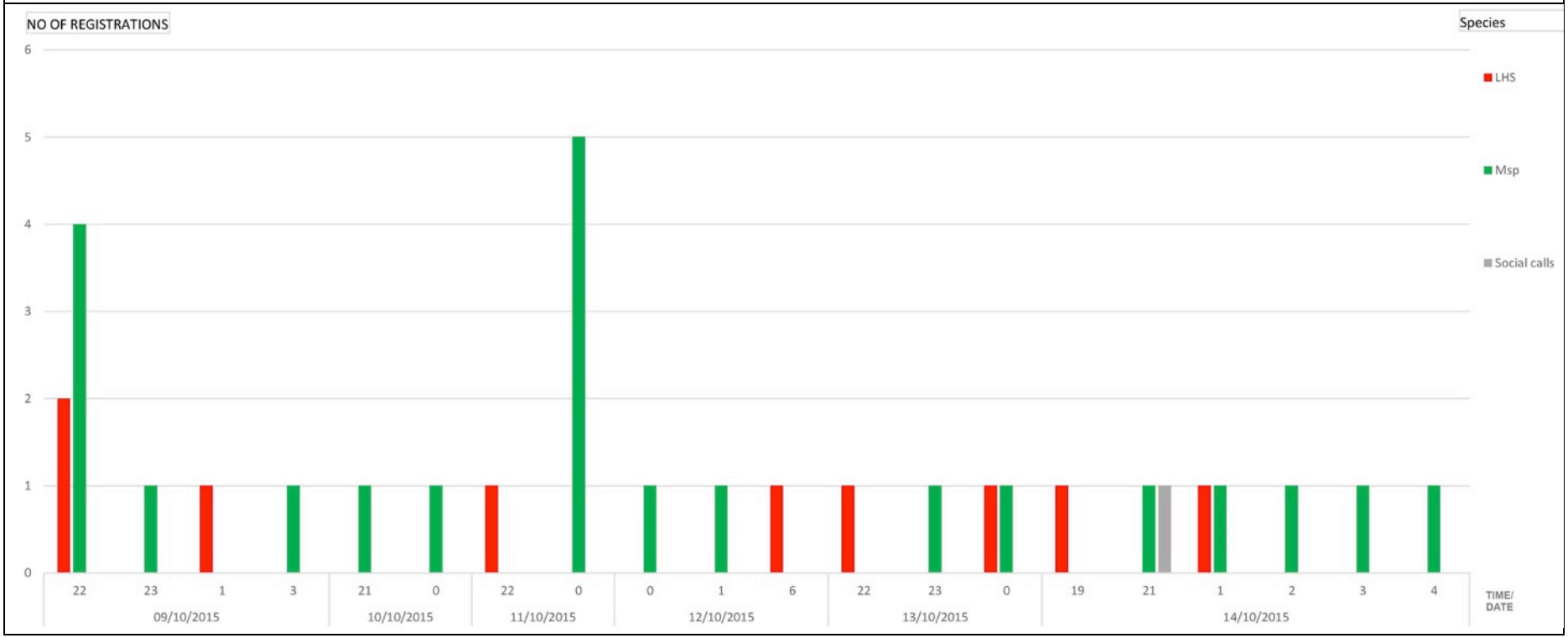
West Portal: 22nd September, 5 nights monitoring



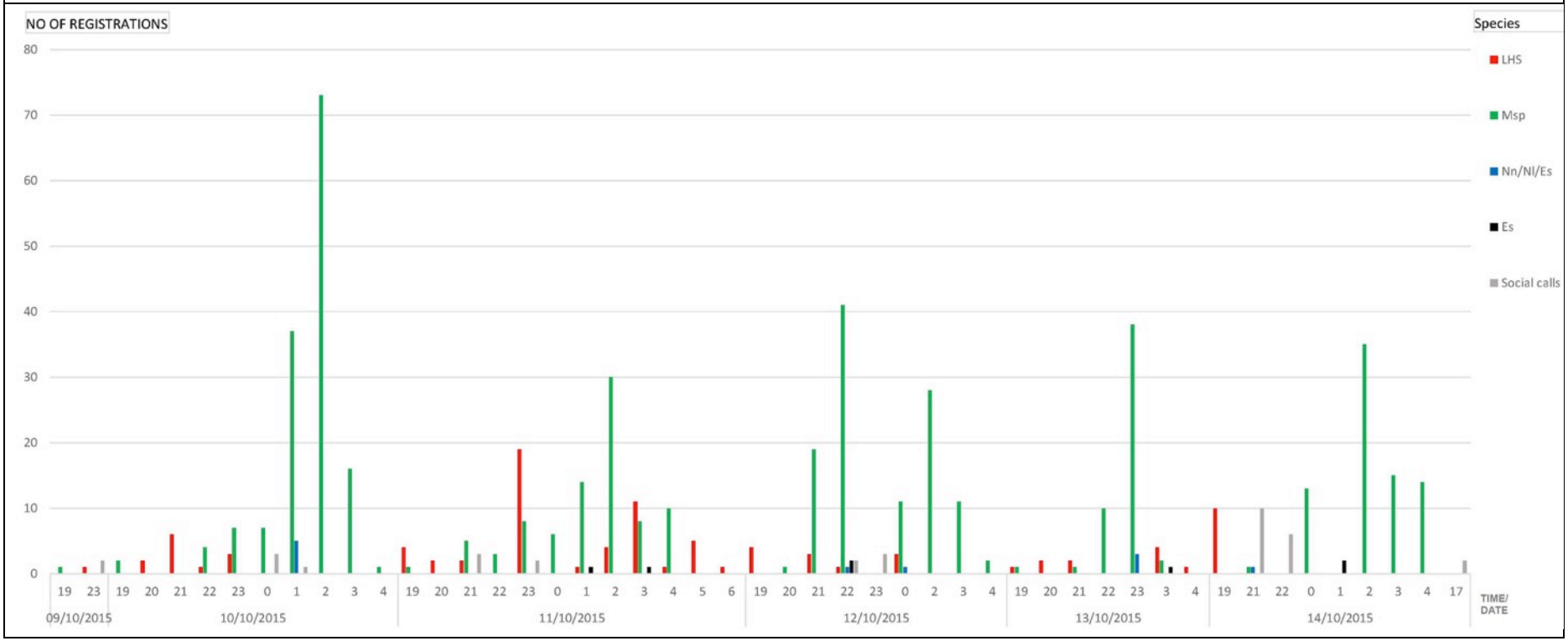
East Portal: 22nd September, 5 nights monitoring
(No activity recorded on the 22 September)



West Portal: 9th October, 6 nights monitoring



East Portal: 9th October, 6 nights monitoring



Appendix 8. Personnel

The bat surveys were undertaken by a team of experienced professional ecologists, all of whom are members of the Chartered Institute for Ecology and Environmental Management (CIEEM) and hold relevant licences for the bat surveys undertaken.

The walked transects were undertaken by Anton Kattan MCIEEM and Robert Pelc gradCIEEM, both of whom are experience bat ecologist registered with Natural England to use Class 2 survey licences. Anton Kattan is a consultant ecologist with 14 years of experience and has specialist knowledge and training in bat ecology and survey. Robert Pelc is a consultant ecologist with over 3 years of experience.

The tree climbing survey was carried out by Anton Kattan MCIEEM and Edward Bodsworth MCIEEM, both of whom are experienced and licensed bat ecologists. They are also Lantra qualified in tree-climbing and aerial rescue (NPTC level 2 certification).

The trapping surveys in 2015 were undertaken by a team of four surveyors. Dr. Ian Davidson-Watts of Davidson-Watts Ecology Ltd. was the principal ecologist for the trapping survey and was licensed by Natural England under project licence 2015-9664-SCI-SCI-1. Dr. Davidson-Watts has been researching bats since 1995 and mist netting bats and training bat-workers for licensed activities since 1996. Dr. Davidson-Watts MCIEEM led a team of three surveyors. Anton Kattan, a consultant ecologist with 14 years of experience, with 3 years of experience and training for capturing bats using mist netting and harp traps was lead ecologist and Robert Pelc and Christopher Greenland were assistant ecologists. Dr. Davidson-Watts and Mr. Kattan were responsible for the removal and welfare of bats trapped for the 2015 study.

Trapping surveys at Portbury freight line tunnels in 2016 were undertaken by a team of five surveyors led by Dr. Ian Davidson Watts. The survey team comprised Dr. Davidson-Watts, Mr. Kattan, Mr. Pelc and Dr. Matt Zeale, with assistance from Mr. Owen Crawshaw. Dr. Zeale is an employee of Davidson-Watts Ecology Ltd and Research Collaborator in bat ecology and behaviour at Bristol University. Owen Crawshaw was a field assistant for trapping at Pill tunnel.

The radio tracking was undertaken by a team of four surveyors. The study was coordinated by Dr. Ian Davidson-Watts with the assistance of surveyors Anton Kattan, Robert Pelc and Christopher Greenland.

Clare Williams is a senior ecologist with CH2MHILL and project coordinator for the DCO Scheme. Clare has a Natural England Class 2 bat survey licence.