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**New England Resource Recovery Centre
Nr. Lee Mill, Devon**

Technical Appendix 12.4 – Bat Survey Results

The logo for Viridor, featuring the word 'Viridor' in a green, serif font. The letter 'V' is significantly larger and more ornate than the other letters. A thin green horizontal line is positioned below the text.

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1.0 INTRODUCTION

1.1 Background

Viridor Waste Management Limited (Viridor) has commissioned SLR Consulting Limited (SLR) to carry out bat surveys of New England Quarry, south of Lee Mill, Devon (National Grid Reference: SX 596545) as part of a wider ecological assessment associated with the proposed redevelopment of the site. The aim of the survey was to:

- Establish the current level of use of the site by bats in terms of roosting, commuting and foraging activity;
- Identify and quantify any anticipated impacts associated with the development proposals on the local bat population;
- Inform the mitigation scheme¹ for the development, in order that any negative impacts can be designed out at an early stage, mitigated or compensated for;
- Provide recommendation in respect of site enhancements;
- Provide legal advice on any necessary licensing requirements; and
- Provide sufficient information to inform the Environmental Statement in respect of bats and facilitate determination of the planning application.

The main site is a former quarry, which has been disused since the 1980's. A new access road is proposed to the north and east. The road would cross over a river and pass through mature woodland and grassland habitats. Several small buildings associated with the former processing plant area are present in the south-east corner of the site and three tunnels are also present on the southern edge. The River Yealm runs north-south along the eastern side of the main site, forming a wooded valley linking Dartmoor to the north and Wembury Bay to the south. Due to the presence of a mosaic of semi-natural habitats, buildings, tunnels, rock faces and trees, the potential exists for roosting, foraging and commuting bats to occur; hence a comprehensive bat survey of the site was considered necessary.

1.2 Scoping / Consultation

Prior to commencing the survey work, a scoping report was prepared and submitted to the Local Planning Authority (Devon County Council), which was subsequently issued to statutory consultees. In the scoping responses, several consultees highlighted the need for ecological survey work to inform the application, particularly for BAP and protected species. Natural England's response also specifically mentioned the need to address the potential impacts of lighting upon bats. In their response, Devon County Council (DCC) also recommended that the assessment should be carried out following published survey guidelines for bats.

1.3 Legislative Background

1.3.1 Bats Roosts

The Wildlife & Countryside Act 1981 (WCA) was the first legislation to provide protection for all bats and their roosts in England, Scotland and Wales (earlier legislation gave protection

¹ Please note that the mitigation strategy for the development is provided in Chapter 12 of the Environmental Statement

to horseshoe bats only.). It was amended several times with the most significant amendment being made by the Countryside and Rights of Way Act 2000 in England and Wales. These acts strengthened the WCA by adding the word 'recklessly' to the offences of intentional damage, destruction or obstruction of a roost, and to disturbance of a bat.

In 1992, the European Union's Council Directive (92/43/EEC) on The Conservation of Natural Habitats of Wild Fauna and Flora (better known as the Habitats Directive) came into effect, covering a range of plant and animal species, and all EU countries had to implement this. This Directive gave rise to stronger protection for all UK bats, roosts, and the wider habitats of some bat species too. In England, Scotland and Wales this Directive was implemented by The Conservation (Natural Habitats, &c.) Regulations 1994, better known as the Habitats Regulations.

In combination, the legislation makes it an offence to:

- Deliberately capture, injure or kill a bat;
- Intentionally or recklessly disturb a bat in its roost or deliberately disturb a group of bats*;

- Damage or destroy a bat roosting place**;
- Possess or advertise/sell/exchange a bat (dead or alive) or any part of a bat; and
- Intentionally or recklessly obstruct access to a bat roost.

*The disturbance offence is absolute under the Habitats Regulations (Regulation 39(1)) i.e. no defenses, this applies in particular to any disturbance which is likely—

(a) to impair their ability—

(i) to survive, to breed or reproduce, or to rear or nurture their young; or

(ii) in the case of animals of a hibernating or migratory species, to hibernate or migrate; or

(b) to affect significantly the local distribution or abundance of the species to which they belong.

Under the WCA the disturbance offence still applies at all levels down to individual animals, however 'low level' disturbance still has a defence under the Act, where '*the action is the incidental result of an otherwise lawful operation*'.

**Bat roosts are protected at all times, whether bats are present or not.

1.3.2 Foraging and Commuting Habitats

The regulations provide strict protection of bat and their roosts, however, guidance from the Environment Directorate-General of the European Commission (EDGE²) advises that Article 12.1(d) of the parent Directive should be understood as '*aiming to safeguard the ecological functionality of breeding sites and resting places*'. In this respect the Directive aims to protect not just the physical structure used as '*a place of rest or shelter*', but those habitats i.e. foraging and commuting features, which allow the population to exist at that locality.

² Environment Directorate-General of the European Commission (2007). *Guidance Document on the Strict Protection of Animal Species of Community Interest Provided by the 'Habitats' Directive 92/43/EEC*. European Union.

2.0 METHODOLOGY

The following published best practice guidance was consulted in order to establish the scope of the bat survey work for the Site:

- Bat Mitigation Guidelines (English Nature, 2004);
- Bat Workers Manual (Joint Nature Conservancy Committee, 2004); and
- Bat Surveys: Good Practice Guidelines (Bat Conservation Trust, 2007).

The scope of the bat survey was refined by an experienced bat worker following a site visit and initial site assessment. The final methodology comprised the following elements:

- A desk study for archived records of bats in the surrounding area;
- Review of existing bat survey information for the site;
- Transect surveys at dusk and dawn once per month throughout the active season (May – September inclusive, totalling 125 hours);
- Inspections of all buildings in the former processing areas;
- Inspections of all tunnels along New England Hill; and
- An assessment of the potential for tree roosting bats to occur.

2.1 Desk Study

2.1.1 Archived Records

Devon Biological Records Centre (DBRC) were contacted and a search of their databases requested for records of bats, including detector records, sightings, roost visits, dead and injured bats and field signs of roosting within 2km of the site. It is understood that DBRC do not regularly exchange records with Devon Bat Group (DBG), therefore the local bat group was also contacted for additional data. Please note that DBRC do not permit their data to be directly reproduced or released to third parties; this information is therefore summarised in the text below, but is not provided in full.

2.1.2 Previous Bat Surveys

The former quarry site was surveyed by Kingsmoor Bat Consultancy in August / September 2006. This involved internal inspections of the buildings in the former processing area and the tunnels along New England Hill, and dusk transects of the site.

2.2 Habitat Assessment

Prior to commencing the survey work, the site was subject to a brief walkover by a licensed bat ecologist; the aim of this survey was to inform the scope of the survey work, and identify those features likely to require further investigation for potential use by foraging, commuting and roosting bats. No detailed assessment of the potential for individual trees to support roosting bats was undertaken, given the large number of trees present and the changing design scheme. The latter made it very difficult to specifically identify those trees which could be directly affected by the works. A general assessment was therefore made of the overall tree roosting resource present within the woodland blocks occurring in the site.

The habitat assessment was carried out in April 2008 by Jon Taylor CEnv MIEEM of SLR; an experienced, licensed, bat ecologist (licence number 20091285) with over five years of experience in designing, implementing, analysing and interpreting bat surveys for development projects.

2.3 Transect Surveys

2.3.1 Transect Routes

For the purposes of the transect survey the site was divided into distinct areas:

- A. The former processing area;
- B. Southwood Woods (east);
- C. The eastern edge of the quarry void and former stockpile areas;
- D. The bottom of the quarry void;
- E. The quarry benches;
- F. The top of the quarry void (west);
- G. Challonsleigh Planatation;
- H. Swainstone Hams (2008 only); and
- I. The River Yealm

The area of semi-improved, species-poor, grassland through which the northern end of the proposed access route will pass was not surveyed; this area is less diverse in terms of species and structure than the rest of the site. The loss of small areas of species-poor grassland is considered highly unlikely to have a significant impact upon commuting / foraging bats. Survey effort was therefore focussed on those areas of the site with the greatest potential to support bats and / or areas of proposed habitat loss (A-H).

Circular transects were established within each of these areas (see Plan 1) and broadly repeated during each of the activity surveys. The changing layout resulted in some alterations to transect routes between the 2008-09 surveys, while low-lying areas of Southwood Woods were also too wet to effectively survey. Transect routes included the potentially most valuable foraging / commuting / roosting features, paying particular attention to waterbodies, woodland edges, grassland / scrub interfaces, woodland openings / glades, mature trees, buildings and rock faces. Transect routes also focussed on areas of potential habitat loss according to the design scheme at the time. Each of these areas and the approximate route of each transect is shown on Plan 1.

2.3.2 Recording Protocol

During each survey, five surveyors continuously walked from ten minutes before dusk until three hours after sunset, with the exception of the June 2009 survey when six surveyors were used. At dusk surveyors paid particular attention to potential roost features including buildings, mature trees and rock faces for bats emerging from their roosts. Surveys commenced again two hours before dawn, with surveyors walking the same transects until sunrise, however, surveyors focussed on areas where swarming activity was noted in order to detect roosts. All surveyors were equipped with broadband and / or time-expansion bat detectors (Batbox Duet and Pettersson D240), and digital recording devices (MP3 recorders, Edirol R-09HR and Zoom H4), recording the time, direction of flight, behaviour and species of all bats, where this information could be ascertained. Recorded calls were later subject to spectrographical analysis using Batsound 3.31 to aid species identification.

2.3.3 Weather

All surveys were carried out during periods of suitable weather for bat activity work, being generally mild, calm and dry. Start / finish temperature, wind speed, cloud cover and precipitation were all recorded during the survey; details of these weather conditions are detailed in Table 1 below.

Date	Temperature (°C)		Wind (Beaufort)		Cloud (/8)		Precipitation	
	Start	Finish	Start	Finish	Start	Finish	Start	Finish
03/07/08	10	8.5	0	0	1	1	0	0
04/07/08	7	7	0	0	0	0	0	0
07/08/08	16	12.5	0	0	1	1	0	0
08/08/08	9	9	0	0	7	7	0	0
23/09/08	12	12	1	1	6	6	0	0
24/09/08	7	7	1	1	6	6	0	0
12/05/09	12	12	0	1	8	6	0	0
13/05/09	12	10	8	8	1	3	0	0
22/06/09	16	11	0	0	2	0	0	0

Table 1 – Weather Conditions During the Transect Surveys

A total of nine transect surveys were carried out between July 2008 and June 2009 active bat seasons, to provide data once a month for each month of the active season (May – September inclusive), surveys were carried out at dusk and dawn for every survey with the exception of June 2009 (dusk only).

2.3.4 Personnel

Surveys were led by Jon Taylor, assisted by a team of experienced ecologists proficient in undertaking bat activity surveys including Niall Lusby, Laura Moody, Lee Mould, Simeon Smith, Tereza Rush, Jane Watson, Brady Roberts and James Sweetman.

2.3.5 Constraints

The design scheme for the development changed several times during the course of the survey, particularly with respect to the proposed route of the access road. Nevertheless, the transect areas A – I have all been surveyed in each month and it is considered that the dataset gathered is sufficiently robust to inform the assessment.

The New England Fields County Wildlife Site in the north-west corner of the site was not surveyed during the transects as this was only included in the design scheme after the survey work was complete. This area was surveyed in September 2006 by the Kingsmoor Bat Consultancy; only common pipistrelle bats were recorded in this area during the survey, indicating that it did not support a diverse range of species at that time.

Due to the timescales for the project, the transect surveys were carried out over two separate survey seasons (2008 and 2009); this may have caused some disparity between datasets for the two years, as population levels can alter between years due to changes in recruitment and loss, while activity distributions can also change between years as maternity

colonies move between available nursery roosts. Nonetheless, it is considered that the dataset used in the analysis is sufficiently robust to establish relative species compositions and identify significant foraging / commuting features.

2.4 Internal Inspections

The majority of buildings in the former processing area were internally inspected six times during the survey period. Buildings A, C and G were locked and only accessed internally once in July 2008. The tunnels on New England Hill were surveyed a total five times during the survey period.

2.5 Tree Assessments

Given that the design scheme was subject to change during the survey period, individual trees were not assessed, mapped and tagged. Instead, woodland blocks were assessed for their potential to support roosting bats, based on the frequency of potential roost trees and the typical features found on these trees. Woodland habitats within the site and surrounding area are categorised as having High, Medium and Low potential to support bats based on the following criteria:

- High – generally mature woodland, good quality roost features noted frequently throughout (hollow trunks / branches, woodpecker holes, splits, tears, rot holes), possible signs of use noted e.g. staining;
- Medium – generally mature woodland or younger stands with mature standards, occasional high quality roost features noted and / or less suitable features (dense ivy, flaking bark) more frequently; and
- Low – generally semi-mature woodland with little or no rot / decay, a few less suitable roost features noted, but trees also of sufficient size to potentially support roost features caused by damage e.g. splits, woodpecker holes.

The current assessment is considered to be sufficient to assess the likelihood and scale of potential impacts, however, it is intended that any individual trees for removal / pruning would be subject to detailed assessment and survey including visual assessment, evening / dawn surveys, and climb and / or inspect survey prior to any felling / pruning works.

3.0 DESK STUDY

3.1 SWBRC Data

DBRC and DBG returned relatively few records within the 2km search area, however, it is understood that this is an under-recorded area of the county. Most of the records returned by DBG relate to the surveys carried out by Kingsmoors Bat Consultancy in 2006, which are discussed below in Section 3.1.2, however other archived records received are summarised in Table 2 below.

Species	Total No. of Records	Closest Record	Year	Type
Unidentified bat	5	Within the site boundary (quarry weighbridge office)	1993	Unknown
Common pipistrelle (<i>Pipistrellus pipistrellus</i>)	5	Within the site boundary (quarry)	1998	Unknown
Nathusius pipistrelle (<i>Pipistrellus nathusii</i>)	1	600m west	2006	Bat found on road
Lesser horseshoe (<i>Rhinolophus hipposideros</i>)	1	1km grid square north of site	2002	House roost

Table 2 – Summary of Records Returned by DBRC and DBG

3.2 Kingsmoor Bat Consultancy Report (2006)

The site was subject to buildings inspections and evening detector transects by the Kingsmoor Bat Consultancy in September 2006³. The inspections confirmed small roosts of lesser horseshoe, greater horseshoe, common pipistrelle and brown long-eared bats in several of the buildings in the former weighbridge area in the south-east of the site. A common pipistrelle maternity roost behind the fascias of the former site office was also reported to be active at this time (droppings recorded under a fascia board). Tunnels along New England Hill were also reported to be suitable for roosting bats, although no bats or evidence of roosting activity was recorded during this inspection.

Detector surveys of the site recorded nine species of bat foraging and commuting over the site (common pipistrelle, soprano pipistrelle, greater horseshoe, lesser horseshoe, whiskered / Brandt's, natterer's, daubentons, barbastelle and noctule). The most significant activity was recorded along the River Yealm corridor, the former weighbridge area and within the quarry void.

³ Shaw, C.A. and Shaw, H.D. (2007) New England Quarry: Initial Site Investigation and Detector Survey

4.0 HABITAT ASSESSMENT AND ROOST INSPECTIONS

4.1 Roosting

Several abandoned buildings are present in the former weighbridge around the site entrance for the quarry in the south-east corner of the site. These are predominately single skinned, open structures, with the exception of a prefabricated flat roofed office. Descriptions of each building and evidence of bats recorded are provided in Table 3 below.

Building	Description	Evidence
A	An electricity transformer building of concrete block construction with a flat concrete roof. Internally the walls and roof are solid concrete, with no cracks or crevices noted. Small 50mm ventilation slits (unmeshed) open out onto woodland to the rear of the building, but otherwise no access points noted.	In 2006 brown long-eared droppings recorded on the transformer floor. In July 2008 a pile of >100 droppings (mainly fresh) were noted with three piles of moth wings. A brown long-eared bat was also present in September 2008. A small number of lesser horseshoe droppings were noted in the adjacent transformer casing in 2006 and in 2008.
B	A small (3x3m) concrete building with a flat concrete roof (Plate 1). An open door provides free flight access, but rather bright and exposed internal conditions.	Two piles of greater horseshoe droppings (approximately 100 each) were recorded in the building in all visits in 2006 and 2008/09. A smaller pile of lesser horseshoe droppings was also noted in the corner of the building on all visits. A common pipistrelle bat was also recorded roosting on top of a wall in 2006. Solitary greater horseshoe bats were recorded hanging up in this building during evening surveys.
C	A small concrete shed with a corrugated tin roof and bat access over the door.	Brown long-eared droppings recorded in 2006. Building inaccessible in 2008/09. Greater horseshoe reported to have emerged in 2006 evening surveys.
D	A brick built former pump house with a single skinned concrete asbestos roof. Windows boarded up in 2006, but had been removed prior to 2008/09 inspections.	Several piles of >100 lesser horseshoe droppings recorded in 2006. Small piles of lesser horseshoe and brown long-eared droppings recorded in 2008/09.
E	A concrete block built shed with a corrugated iron roof on the western bank of the River Yealm surrounded by trees. Free flight access is available through an open door.	A greater horseshoe bat was recorded roosting in 2006, and both lesser and greater horseshoe droppings were also noted. No evidence of bats was recorded in 2008/09.
F	A disused fuel tank raised off the	Lesser horseshoe droppings were noted

Building	Description	Evidence
	ground by a steel frame which is clad with metal sheets, but open on one side and surrounded by trees.	beneath the tank in 2006, however no evidence was recorded during the 2008/09 visits.
G	A prefabricated building with a flat bitumen roof (Plate 2). Holes in the wooden fascias offer access to the soffits. It is believed to have been a former site office, but is now boarded up and only used occasionally by the Plymouth University Diving Club.	This is reported to have supported a common pipistrelle maternity roost since 1993 and fresh droppings were recorded in September 2006 indicating that it was still active at that time. Only a small number of old droppings recorded in 2008/09, with cobwebs formed over most potential access points.

Table 3 – Building Descriptions and Evidence of Bats Recorded

A further building outside the application boundary is known as New England Bungalow, situated immediately south of the former quarry site, on the opposite side of New England Hill. This is a single storey, plastered building with a pitched tile roof and hanging tiles on the gable ends. The roof is in generally good condition, however several loose hanging tiles provide access points and roosting opportunities for bats. Close inspections of hanging tiles on the eastern face of the building recorded several fresh droppings of a size and shape consistent with those of pipistrelle bats, and this is considered likely to have been an active roost in 2008.

Three manmade horizontal tunnels lead back into the hill below New England Plantation, which believed to have been associated with quarrying activities. These are constructed of concrete, with a square cross-section of approximately 1.8m diameter, open to New England Hill at the entrance, and a solid blind end at a depth of approximately 10m (Plate 3). Several corroded metal supports provide perching features for open roosting bats along the length of the tunnels. No evidence was recorded in these features in 2006, however piles of fresh and old lesser and greater horseshoe droppings were recorded in all three tunnels during inspections in 2008/09. Lesser horseshoe bats were also found to use these tunnels throughout the year, with less frequent use by greater horseshoe; numbers of bats recorded roosting are shown in Table 4 below.

Date	Bats Recorded
24/09/08	1xLHS
17/12/08	1xLHS
16/04/09	1xLHS
	1xLHS
13/05/09	1xGHS
23/06/09	Nil

Table 4 – Bats Recorded Roosting in the Tunnels

The rock faces in the quarry void are variable in condition, with solid faces on the more recent lower benches, while the older faces on the upper benches have cracks, fractures and fissures with potential to support crevice dwelling bats. Some of these older faces are becoming colonised by vegetation making crevice features rather inaccessible, however most are open and accessible to bats.

Trees within the former quarry site are generally of limited value to roosting bats in the vicinity of the former worked areas which are dominated by scrub and semi-mature woodland which have colonised on spoil heaps, although the trees in New England Plantation are now well established and becoming mature. More mature specimens are present along the River Yealm and the woodland along its western bank, where occasional very mature specimens of beech, oak and ash support rot holes, splits and tears. To the east of the River Yealm, the area of woodland which the proposed access road will pass through (Challonsleigh Plantation) is generally semi-mature and of limited value to roosting bats, with the exception of mature trees along the river bank which could be affected by the proposed bridge crossing. Elsewhere within this woodland block, very mature specimens with rot holes, hollow trunks, woodpecker holes and splits are much more common, particularly along the eastern bank of the River Yealm and within Swainstone Hams to the south (Plate 4).

Plan 2 shows confirmed roosts at the site and features with potential to support roosting bats including woodland.



Plate 1 – Building B (Supporting Greater and Lesser Horseshoe, and Common Pipistrelle Bats)



Plate 2 – Building G (Reported to Support a Common Pipistrelle Maternity Roost)



Plate 3 – Showing One of the Tunnels on New England Hill



Plate 4 – Showing a Woodpecker Hole in a Tree

4.2 Foraging

The main site includes extensive areas of secondary woodland and scrub habitats on the margins of the former quarry areas, while habitats beyond this comprise of more established mature wet and dry woodland to the north and east (Southwood Woods). A former haul road running through this feature also provides a sheltered glade feature running through in a north – south direction. East of the River Yealm, Challonsleigh Plantation is dominated by a canopy of semi-mature ash / sycamore, and while this lacks structural diversity, a rich groundflora indicates that it is likely to provide good quality foraging habitat (Plate 5).

The River Yealm runs through the site from north – south and provides a sheltered and dark corridor (Plate 6). The channel is unmodified and includes deep still pools, fast riffles and sand banks, and is flanked along its length by overhanging over-mature trees.

Freshwater habitats are also represented in the quarry void, where two waterbodies are present; the first is a very deep cutting down into the rock, while a smaller shallow waterbody lies to the south of this. Both waterbodies are devoid of vegetation, however, the water appears very clear and numerous aquatic invertebrates were visible during the inspection.

The surrounding topography of the quarry faces provides very sheltered conditions for flying insects and foraging bats.

The mosaic of species-rich grassland, scrub, standing and flowing water, ephemeral vegetation, woodland / scrub margins within the site creates a varied habitat which is likely to provide a wide range of prey in a variety of environmental conditions, with good linear features throughout (Plate 7).



Plate 5 – Showing the Open Structure of Challonsleigh Plantation



Plate 6 – Showing the River Yealm



Plate 7 – Showing Habitat Mosaic within the Quarry Void

4.3 Commuting

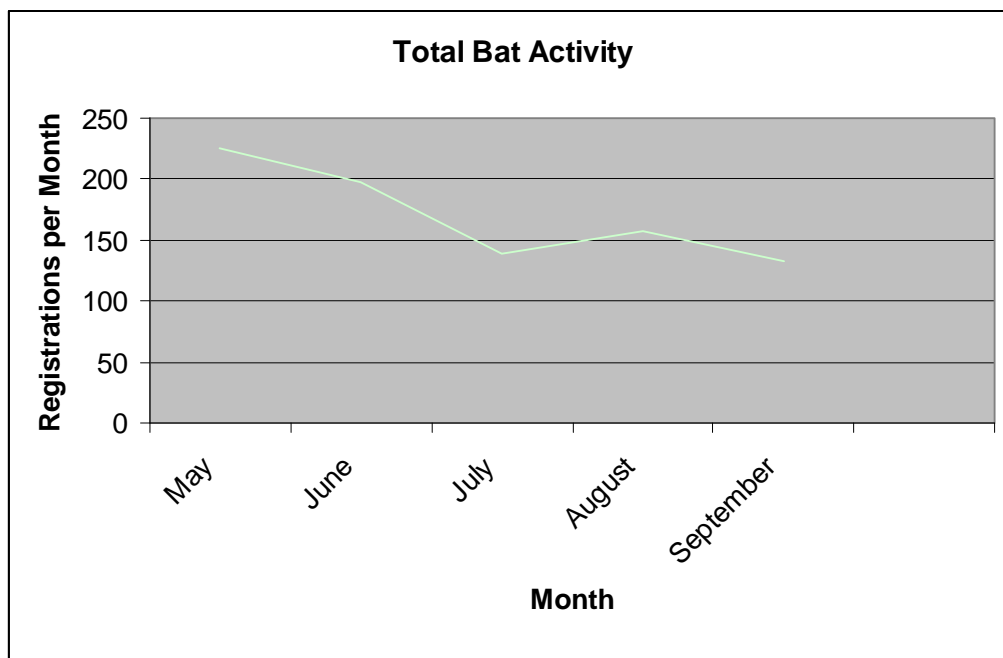
The River Yealm runs through the site, and is a significant wildlife / habitat corridor at a landscape scale linking further areas of woodland habitat along its length from Dartmoor to the north down to Wembury to the south. Within a site context, a number of linear features run through the site in a north / south direction including the former haul road through Southwood Woods, the more recent haul road which forms a woodland / scrub edge along the eastern edge of the quarry void, and quarry benches on the western side of the quarry void. These features form sheltered, dark and well vegetated corridors for bats through the site in a north / south alignment.

5.0 TRANSECT SURVEYS

5.1 Overall Activity

5.1.1 Trends over Active Season

Bat activity was significantly higher during the first half of the active season, suggesting that bats tend to utilise onsite habitats much more intensively early in the active season. However, this trend could also be attributed to differences in bat activity between the 2008 and 2009 seasons. A particularly wet summer was experienced in 2008, with many maternity colonies abandoning their roosts and dispersing much earlier in the year than is normal; this may explain an approximate 30% increase in registrations between these years.



Graph 1 – Overall Bat Activity over the Active Season (2008-09)

5.1.2 Species Composition

At least twelve bat species were confirmed using the site over the 2008-09 active periods. Please note that although at least three species of *Myotis* sp. bats have been confirmed at the site (Daubenton's, whiskered / Brandts and natterer's), given that the call parameters of these species overlap significantly and cannot always be reliably separated to species level, they have been grouped together in the analysis. Four species (or species groups) were regularly recorded throughout the active period; namely common pipistrelle, brown long-eared, noctule and *Myotis* sp. Other species (soprano pipistrelle, lesser horseshoe, greater horseshoe, barbastelle, serotine and Leisler's) were recorded only occasionally as solitary passes (see Table 5).

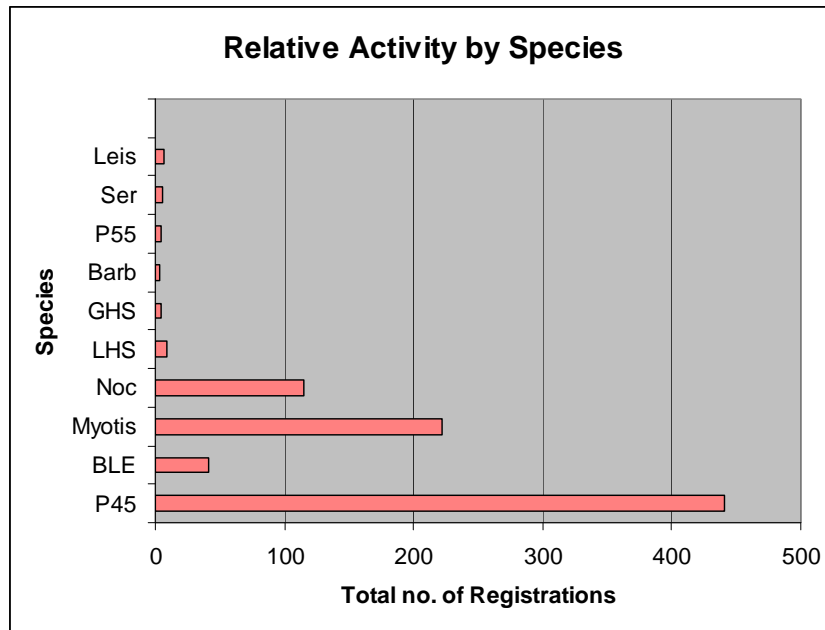
A single suspected call of nathusius pipistrelle was recorded during the August survey; the peak frequency of this call was 41kHz. However, it was not possible to categorically confirm

the identity of this species due to the overlap of call parameter with other species. *Nathusius pipistrelle* is known to be present in the local area and it is feasible that a local population occasionally uses the site, however, given the solitary and unconfirmed nature of this record it has been omitted from the analysis. The potential implications arising from the presence of this species at the site are however considered in Section 6.

Survey	C.pip	BLE	Myotis	Noc	GHS	LHS	Barb	S.pip	Ser	Leis	Total
May	144	5	60	13	1	2	-	-	-	-	225
June	86	4	36	69	1	2	-	-	-	-	198
July	70	8	27	23	1	2	1	3	1	3	139
August	96	14	33	7	1	-	2	-	4	-	157
September	45	10	66	3	-	3	-	1	1	4	133
Total	441	41	222	115	4	9	3	3	6	7	

Table 5 – Summary of Bat Activity by Species

Of the four regularly occurring species, common pipistrelle was by far the most active species during the study period, followed by *Myotis* sp. and noctule. Brown long-eared registrations were considerably lower, however, this species has relatively soft echolocation calls and is often under-represented in transect surveys as a result; the actual proportion of brown long-eared bats is therefore considered to be significantly higher than that represented in Graph 2. Other species were not regularly recorded and were generally considered to be individual bats of these species commuting through the site.



Graph 2 – Total Bat Activity by Species

5.2 Species Trends

A summary of the transect survey results are presented below for the four species recorded regularly throughout the study period. A species account is provided for each of these in terms of:

- The location and nature of their most significant foraging areas;
- Significant commuting corridors and the direction of flight at dusk; and
- Changes in activity over the course of the active season.

For these species, activity patterns have been mapped on a monthly basis and are presented as a series of plans (Plans 3 – 6).

All other species records are occasional and it is not possible to infer the most significant habitat features or trends in activity on the basis of the data available; these data sets are therefore not separated into monthly sub-sets, however, activity during the study period is shown in Plan 7. The general activities of these species are reported below and an assessment made of the potential value of the site based on their known habitat requirements for commuting and foraging.

5.2.1 Common Pipistrelle

Roosting

Solitary common pipistrelle roosts were confirmed in the faces of the quarry void and two of the onsite buildings (Buildings B and G), while a suspected pipistrelle roost was also recorded in an offsite building to the south of the site (New England Bungalow).

A solitary common pipistrelle bat was also recorded re-entering a roost in a rock crevice during the August 2008 dawn survey and two common pipistrelle bats were also recorded

re-entering cracks in a similar area of the rock face before dawn during the May 2009 survey. While only a small number of cracks in the rock faces were confirmed as being in active use during the 2008-09 seasons, several other cracks and fissures also appear suitable for this species and other crevice dwelling species. Pipistrelle bats are highly nomadic and it is likely that solitary or low numbers of this species utilise numerous suitable features in these rock faces over the course of the year.

Building G was reported to support a maternity colony of common pipistrelle bats between 1993-2006, however, the survey evidence indicates that this building was not used as a nursery roost in 2008-09; common pipistrelle bats are highly nomadic and it is possible that the colony used an alternative roost in the vicinity during these years. Indeed it is feasible that the colony used the nearby roost on the gable end of New England Bungalow during these years, as this was confirmed as being in active use during this period (through fresh field signs).

A solitary common bat pipistrelle bat was recorded using Building B only once in 2006; subsequent visits did not record this species or signs of its presence during 2008-09, and it is considered that this building supports an occasional roost for a solitary bat.

Foraging

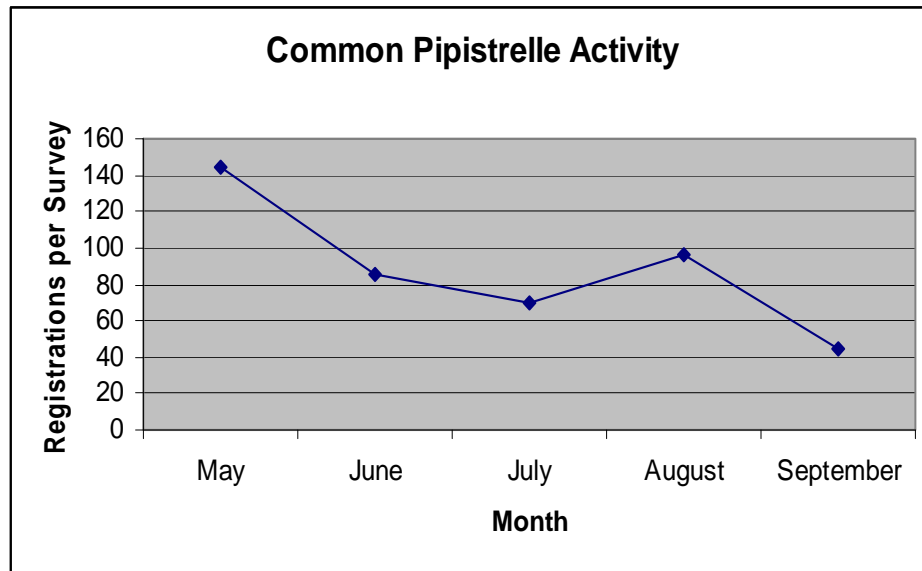
Common pipistrelle was recorded foraging over all habitat types throughout the site, as would be expected of this generalist species (see Plan 3). However, the most significant foraging activity was noted within the quarry void; this was generally shortly after dusk, becoming very intense along the western edge of the void for approximately 30-40 minutes before declining again, although lower levels of activity were constant throughout the survey periods. Intense feeding activity very shortly after dusk indicates that this is an important foraging area for a nearby large roost (probably maternity) of common pipistrelle bats. The quarry itself is unlikely to be suitable to support a maternity colony, as cracks and crevices appear more suitable for solitary bats and are unlikely to retain sufficient heat for a pipistrelle colony, which tend to seek out warm roosts for breeding. Bats were noted flying into the quarry from the direction of New England Bungalow during the 2008/09 surveys and this further indicates that the local maternity colony of common pipistrelle bats may have moved to this roost during these years.

Further registrations were concentrated along the River Yealm throughout all surveys indicating that this is also an important foraging area for common pipistrelle bats. In September 2008 intense foraging activity was also noted along a tributary of the River Yealm which runs through Strashleigh Hams to the east, although this does not appear to be used as regularly as the River Yealm itself or the quarry void.

Commuting

Linear features most notably used by common pipistrelle bats during the surveys were the tree line on the eastern edge of the former weighbridge area, the River Yealm and its tributary through Strashleigh Hams. Bats were noted flying in both directions along these features and much of this activity is likely to have been attributable to foraging bats, however, they are also likely to act as commuting features for this species.

Activity Trends



Graph 3 – Common Pipistrelle Activity at the Site over the Active Season

Graph 3 indicates that activity was significantly higher in May, suggesting that common pipistrelle bats tend to use the site for foraging most intensively early in the season, particularly the quarry void. Activity was relatively stable over the remainder of the summer, although this dropped off in September; likely to be as a result of roosts dispersing and bats becoming generally less active in the autumn period.

5.2.2 *Myotis. sp*

Foraging

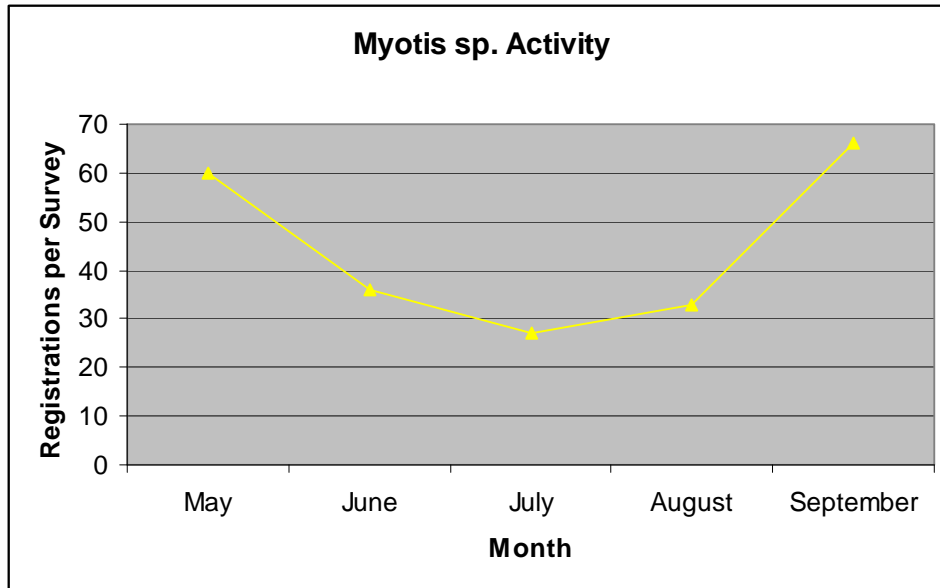
Myotis sp. bats foraging was consistently focussed along the River Yealm throughout the active season (see Plan 5). Although it was not possible to confirm the species of all *Myotis* sp. bats recorded during the survey, in instances where visual contact was made it was possible to infer likely species based on the size, shape and behaviour of the bat combined with call analysis information. Daubentons, whiskered / Brant's, and natterers are considered to have been present, with daubentons appearing to be the most frequent species along the river; this species composition is not analysed herein, due to the uncertainty involved in species identification and the small number of bats visually recorded. These three species were also reported by Kingsmoor Bat Consultancy in 2006.

Other important features for *Myotis* sp. bats appear to have been used more periodically, such as the former haul road through Southwood Woods which was used more significantly in May, and the quarry void which was used more significantly in June and September.

Commuting

No significant trends in commuting activity were noted from the results, with individual bats generally recorded flying in opposing directions where they were observed indicating foraging behaviour. Nonetheless, *Myotis* sp. bats were recorded very early along the River Yealm (sometimes at or just after sunset) indicating that this darkened corridor provides a safe place for bats to emerge early, commute and forage.

Activity Trends



Graph 4 – *Myotis* sp. Activity at the Site over the Active Season

Graph 4 demonstrates significantly higher activity by *Myotis* sp. bats early and late in the season with a decline during the mid-summer period. The high activity values in May are associated with a concentration of *Myotis* sp. activity along the former haul road during this period, while the increase in September is associated with intense foraging activity in the quarry void during this period. Both peaks are likely to be associated with non-breeding bats, and the decrease during the mid-summer period suggests that some of these bats (pregnant and lactating females) may move to a maternity colony further from the site during this period.

5.2.3 *Noctule*

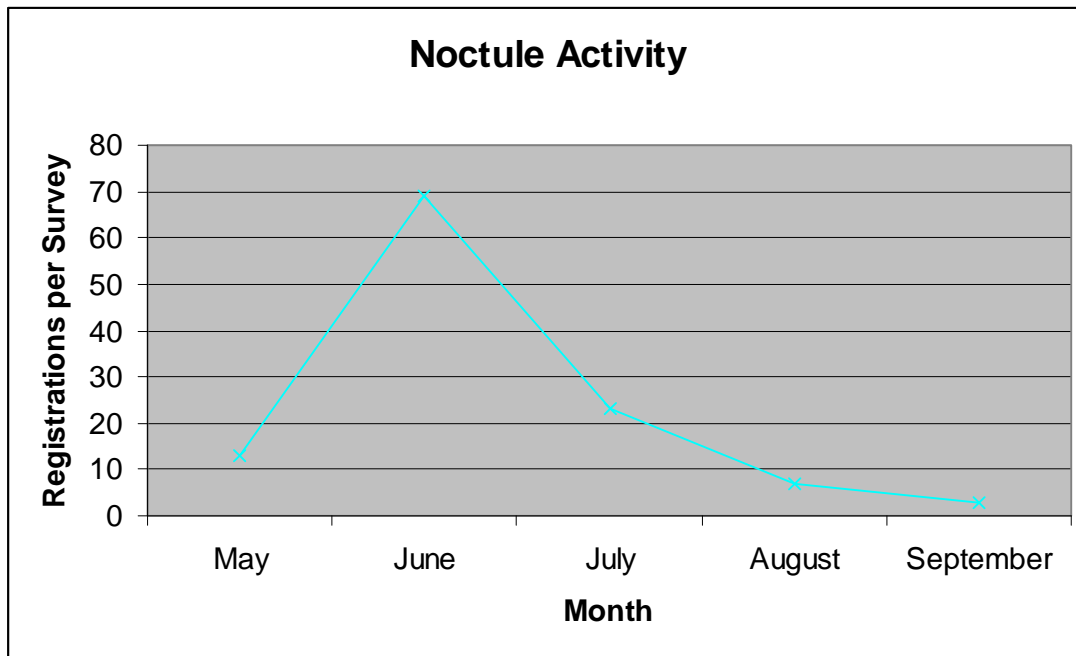
Foraging

Noctule activity was focussed almost exclusively over the quarry void and former weighbridge area, with bats generally observed circling high above these areas and dive-bombing while foraging.

Commuting

Commuting bats were noted flying high above the site early in the evening during several of the surveys, however, no trend in the direction of movement of these bats was noted.

Activity Trends



Graph 5 – Noctule Activity at the Site during the Active Season

Activity at the site increased significantly in June, strongly associated with bats foraging over the quarry void. This species is very long-ranging and it is likely to utilise available food sources over a large area as they become available. The strong activity increase associated solely with this month and the focus of activity in the quarry void indicate that these bats may have been utilising a temporary food source at this time e.g. emergence of a certain species of insect.

5.2.4 Brown Long-eared

Roosting

A brown long-eared bat was recorded entering Building A (the former transformer building) during the dawn survey in August 2008, while another bat (or probably the same bat) was also recorded warming up inside the building at dusk during the September 2008 evening transect. Two brown long-eared bats were also recorded returning to this building at dawn in May 2009.

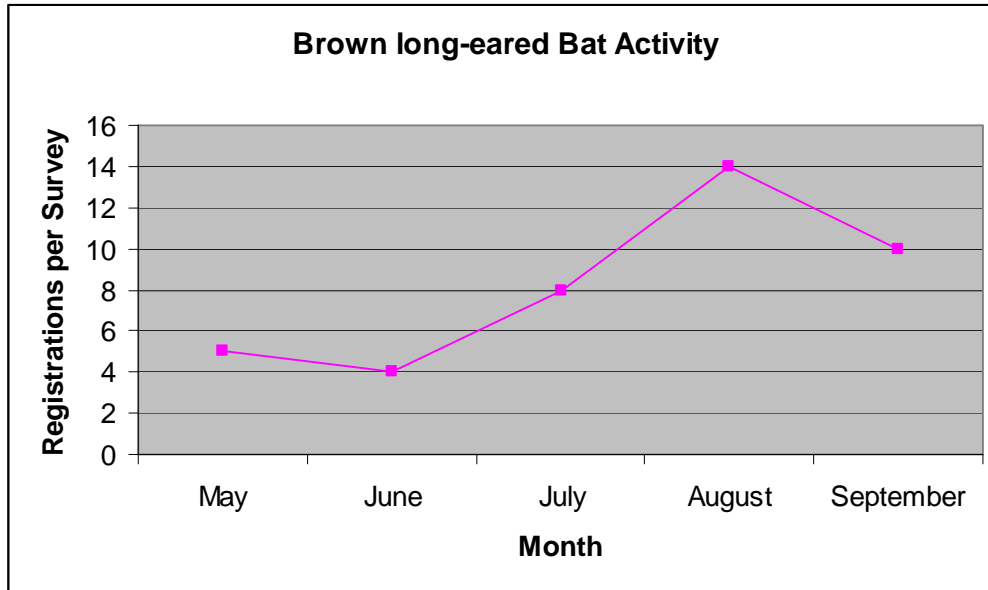
Foraging

Foraging activity was strongly focussed around woodland / scrub edges around the former quarry site, particularly in the southern half of this area (see Plan 6). Less frequent registrations were also recorded along the River Yealm and the tributary running through Strashleigh Hams. A notable change in activity was recorded in August, when activity was strongly focused on the quarry void; this is an atypical habitat for the brown long-eared bat which is generally associated with well vegetated corridors. It is likely that these bats were modifying their behaviour to utilise a temporary source of food which was available in the quarry void at this time.

Commuting

Brown long-eared bats were rarely observed due to their behaviour of emerging late from their roosts and flying close to vegetation and it was therefore difficult to ascertain their direction of flight and infer any commuting routes.

Activity Trends



Graph 6 – Brown Long-eared Activity at the Site over the Active Season

Brown long-eared activity remained relatively low throughout the first half of the active season, becoming higher later in the season, possibly due to juveniles dispersing from a nearby maternity roost and foraging before hibernation. The peak in August is also associated with brown long-eared bat’s increased use of the quarry void at this time.

5.2.5 Other Species

Lesser Horseshoe

Solitary lesser horseshoe bats were recorded only recorded briefly on nine occasions during the study period, and were generally associated with the quarry void and the River Yealm. Given the number and nature of registrations it is considered that solitary bats may commute through the site, however, such routes are unlikely to be significant commuting corridors for this species and it does not appear to forage within the site or surrounding habitats. The bats recorded are likely to be those associated with the roosts in the former weighbridge area and tunnels in New England Hill.

Greater Horseshoe

Solitary greater horseshoe bats were only recorded a total of five times during the study period. These bats were generally associated with the former haul road, the weighbridge area and the quarry void. These bats appear to have been commuting along edges of the quarry void and along the haul road, while a bat recorded in the weighbridge area is likely to have been flying to / from one of the night roosts in this area. No significant foraging activity was noted.

Serotine

This species was occasionally recorded during the July – September period and was generally associated with the quarry void and its margins. These were generally solitary passes likely to have been associated with commuting bats, however four passes recorded in the August survey indicates the presence of a foraging bats at this time.

Leisler's Bat

Leisler's bats were recorded during the July and September surveys only and were generally associated with the margins of the quarry void and the former stockpiling area to the north. Activity on these evenings indicate the presence of solitary foraging bats at the site.

Soprano Pipistrelle

A total of 11 soprano pipistrelle registrations were recorded during the survey period; these were strongly associated with the River Yealm and its tributary through Strashleigh Hams, but also with the margins of the quarry void. Activity was fairly constant and low throughout the year and it is considered to have been associated with solitary commuting and / or foraging bats.

Barbastelle

This species was only recorded three times in July / August. In July a commuting bat was recorded flying along the former haul road in Southwood Woods before dawn, while in August two passes were recorded in the same part of the quarry void 45 minutes apart indicating that a solitary bat was foraging in the quarry on that evening. No other registrations were recorded during the survey period.

6.0 CONCLUSIONS

6.1 Confirmed Species

Bat activity varies considerably within the site, over the course of the year and between species. This is summarised in Table 6 and in the individual species accounts below.

Species	Foraging	Commuting	Roosting
Common pipistrelle	Quarry Void		Rock faces (multiple solitary)
	River Yealm	Weighbridge Area	Building B (solitary)
	Yealm tributary (September)	River Yealm	Building G (maternity)
<i>Myotis</i> sp. (including at least three species)	River Yealm		
	Former haul road (May)		None confirmed
	Quarry Void (June and September)	River Yealm	Trees and rock faces suitable
Brown long-eared	Woodland edges (NEQ)		Building A (two bats)
	Quarry Void (August)	None confirmed	Buildings C and D (solitary)
Noctule	Quarry Void (particularly June)		None confirmed
	Weighbridge Area	None confirmed	Trees suitable
Lesser horseshoe	No significant areas	River Yealm (?)	Buildings A, B, D, E and F
		Former haul road (?)	Tunnels
Greater horseshoe	No significant areas	Quarry benches (?)	
		Former haul road (?)	Building B, C and E
Serotine	Margins of quarry void (solitary bats)	None confirmed	None confirmed
Soprano pipistrelle	River Yealm and tributary (solitary bats)	River Yealm and tributary (?)	None confirmed
			Rock faces and Building

Species	Foraging	Commuting	Roosting
			G suitable
Barbastelle	Quarry (solitary bats)	void River Yealm	None confirmed Mature trees suitable
Leisler's	Margins of quarry void (solitary bats)	None confirmed	None confirmed Trees suitable

Table 6 – Summary of Activity Types by Species

6.2 Unconfirmed Species

The following species have not been confirmed at the site, however their potential presence is discussed briefly here for completeness.

6.2.1 Nathusius Pipistrelle

A single suspected nathusius pipistrelle call was recorded in the quarry void in the August survey, however, it was not possible to positively confirm this species identification due to the overlap of the call parameters with other species. Given the confirmed record of a dead nathusius pipistrelle recorded 600m from the site in 2006, it is considered likely that the bat recorded in August was a nathusius pipistrelle.

No other recorded calls were considered to likely to have been made by nathusius, indicating that this species did not regularly use the site through the 2008-09 survey period. The results of the survey therefore indicate that the site does not provide any significant foraging, commuting or roosting features used by this species, and its use of the site is likely to be limited to occasional passes by solitary bats.

6.3 Habitats

The most significant habitat features for bats appear to be the quarry void, the River Yealm and the weighbridge area. The quarry void is a significant foraging resource for local populations of common pipistrelle, *Myotis* sp. and noctule bats, while providing a foraging area for lower numbers of other bat species on a less regular basis. This feature also supports solitary common pipistrelle bat roosts, however, suitable crevices are also present for use by *Myotis* sp. bats.

The River Yealm provides a significant foraging resource for common pipistrelle and *Myotis* sp. while also supporting a range of other species; this feature is also likely to be a significant commuting feature for bats well beyond the context of the site itself, linking several areas of woodland to the north and south.

The weighbridge area and tunnels support multiple solitary roosts of lesser horseshoe, greater horseshoe and brown long-eared bats, while Building G is reported to also support a maternity roost of common pipistrelle bats.

Other habitats used by bats include the woodland and scrub margins, areas of species-rich grassland on the tops of the quarry void, and the former haul road through Southwood

Woods. While the total diversity and proximity of these habitat features also has synergistic effects on the total value of the site to bats.

7.0 CLOSURE

This report has been prepared by SLR Consulting Limited with all reasonable skill, care and diligence, and taking account of the manpower and resources devoted to it by agreement with the client. Information reported herein is based on the interpretation of data collected and has been accepted in good faith as being accurate and valid.

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