



BRYMBO HERITAGE SITE MACHINE SHOP, PATTERN SHOP AND FOUNDRY AREA

PRELIMINARY ROOST ASSESSMENT, EMERGENCE SURVEYS AND BIRD SURVEY

DATE	ECOLOGIST	APPROVED	VERSION	COMMENTS
12/03/2020	Lucy Boyett	Rhian Hughes	1	
13/07/2020	Rhian Hughes	Lucy Boyett	2	Emergence surveys added
01/06/2022	Lucy Boyett	Rhian Hughes	3	PRA update 2022
02/08/2023	Richard Cutts	Dr Katy Read CEcol MCIEEM Cenv DipSM	4	Emergence survey update 2023

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Brymbo Heritage Site: Machine Shop, Pattern Shop and Foundry Area - Preliminary Roost Assessment, Emergence Survey and Bird Survey

Executive Summary

Site	Brymbo Heritage Site (Machine Shop, Pattern Shop, Foundry Area and Robertson Square)	Postcode and grid ref	LL11 5AX SJ 29470 53475
Surveyors	Lucy Boyett		
Proposed work	Renovation works to the Machine Shop, Pattern Shop, Foundry area and Robertson Square to create a visitor and interpretation centre, creation of stage areas, cider brewery and WC facilities.		
Type of survey	Preliminary Roost Assessment for bats, Emergence Survey and Bird Survey		
Results of survey	- No evidence or signs of bats were found during the PRA within the Machine Shop, Pattern Shop, Foundry Area or Robertson Square areas. During follow up surveys in 2020 and repeat visits in May 2022 and July 2023, lesser horseshoe droppings were observed in one of the recesses, and a lesser horseshoe was seen within another recess. - A number of potential roosting features were identified, including cracks and crevices in the stonework across the site and there were a number of dark recesses within the Pattern Shop and Foundry areas. - Emergence surveys confirmed roosts used by at least two lesser horseshoe bats. - Emergence surveys confirmed at least one brown long-eared bat is using the small building in the north-western corner of the site. - Emergence surveys strongly suggest that an individual/low numbers of common pipistrelles are roosting in crevices in the exterior walls of the Pattern Shop. - There was a mine adit entrance under the south-western corner of the Pattern Shop. A static detector was left within the entrance between 19/02/2020 and 04/03/2020. Lesser horseshoe activity was detected on 23/02/2020. - There were many gaps and crevices within the stone work across the site, which would be suitable for nesting birds. Swallows are known to nest within the Machine Shop and jackdaws are known to nest within the northern retaining wall. A barn owl has also been seen within the site.		
Survey conclusions	- The surrounding area, particularly to the southern and western edges of the site, has 'highly suitable' habitat for commuting and foraging bats with good connectivity to further suitable habitat areas. - No potential roosting features were identified within the Machine Shop and therefore was found to be of negligible suitability for bats (Collins, J., 2016). - The Foundry Area was found to be a day roost for a small number of lesser horseshoe bats. - The small building in the north-western corner was being used by an individual brown long-eared bat - It is highly likely that an individual/low number of common pipistrelles are roosting in crevices in the exterior wall of the Pattern Shop. - It is likely that an unknown number of lesser horseshoe bats are using the mine adit as a hibernation roost. - All buildings and walls within the site provide opportunities for nesting birds.		
Recommendations	As bats have been found to be using a minimum of two recesses within the Foundry Area, the blast furnace, and the small building in the north-		

	western corner of the site, a licence will be needed before works can commence in these areas. • Bats are highly likely to be using the exterior wall of the Pattern Shop, and a licence will also be needed before works can commence in these areas. • As it has been shown that the mine adit is used as a hibernation roost by lesser horseshoe bats, any form of potential disturbance during the months of hibernation (October to April) or changes to the mine adit entrance will require a licence from NRW. • The recess where the lesser horseshoe was observed will be retained and enhanced as a bat mitigation feature – full details are provided in Section 9. • There is potential for birds to be nesting throughout the site, therefore if works were to be conducted within bird nesting season (from March to September inclusive) then a thorough search for any nesting birds should take place immediately prior to the commencement of works. Any nesting / nest-building birds should be allowed to fledge before works commence. • General mitigation measures and enhancement recommendations have been made, see Section 9 for further details.
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1.0 Introduction

- 1.1 Enfys Ecology Limited were originally commissioned by TACP Architects in 2020 on behalf of Brymbo Heritage Trust, to undertake an Ecological Appraisal of the Machine Shop, Pattern Shop and Foundry Area at The Brymbo Heritage Trust site, Brymbo.
- 1.2 The proposed works comprise renovation works to the Machine Shop, Pattern Shop, the Foundry area and Robertson Square, to create a visitor and interpretation centre, creation of stage areas, a cider brewery and WC facilities.
- 1.3 In 2017, the Machine Shop was assessed for use by bats in liaison with Wrexham County Borough Council and it was agreed that a bat survey would not be needed for the works to this building, as it had negligible potential (in accordance with Collins, 2016 guidelines). An update to this assessment is given within this report.
- 1.4 A nesting bird survey of the Machine Shop was undertaken on 18th July 2017 (Enfys Ecology, 2017). Although no active bird nests were found, the building was found to have high potential with many nesting features present.
- 1.5 The current survey was commissioned to determine whether the proposed works would affect protected species: specifically, bats and nesting birds. A Preliminary Roost Assessment for bats was undertaken on 4th March 2020 and an emergence survey was carried out on 6th May 2020 with a follow up on 3rd June 2020. Repeat visits to update the PRA were undertaken on 24th May 2022 and 12th July 2023; an additional emergence survey was undertaken on 12th July 2023. This report is valid for a period of eighteen months from this date (July 2023) in accordance with best practice.
- 1.6 All British bats (and roost sites) are protected under the Wildlife and Countryside Act (WCA) 1981 (as amended). In addition, all bats are classified as European Protected species by The Conservation of Habitats and Species Regulations 2017 (as amended). Under this legislation, it is an offence to kill, injure or disturb a bat, or to destroy any place used as a shelter by bats.
- 1.7 All birds (and their nests) are legally protected under the Wildlife and Countryside Act 1981 (as amended) and it is an offence to intentionally take, damage or destroy the nest of any wild bird while it is in use or being built (as well as kill or injure wild birds or their eggs).
- 1.8 Should evidence of bats be found and it is deemed likely that they will be disturbed by the proposed works; a licence from Natural Resources Wales (NRW) must be obtained.

2.0 Site Description

- 2.1 The site is in a rural area approximately 250m south of Brymbo village (approximate grid reference SJ 29479 53536) (Figures 2.1 and 2.2). The wider area is a mixture of residential buildings, agricultural fields and a large network of linear broadleaved woodlands. Broadleaved woodland ran along the southern and western sides of the site, connecting to further woodlands in the area. There are numerous small ponds to the west of the site with the nearest approx. 80m.
- 2.2 There is one statutory designated site within a 1km radius, which is Brymbo Fossil Forest Site of Special Scientific Interest (SSSI). This site is designated for its geological interest.
- 2.3 Mount Zion Wildlife Site and Brymbo Pony Fields Wildlife Site are two non-statutory designated sites within a 1km radius. These are not designated for bats.



*FIGURE 2.1. AERIAL VIEW OF THE LOCATION AND SURROUNDINGS.
THE SURVEYED AREA IS SHOWN IN RED. © GOOGLE 2020*



*FIGURE 2.2. AERIAL VIEW OF THE LOCATION AND SURROUNDINGS.
© GOOGLE 2020*

3.0 Methodology

3.1 *Preliminary Bat Roost Assessment (PRA)*

- 3.1.1 The buildings were assessed for any signs of bats; these include droppings, feeding remains, and other indicative marks, plus features of potential use to bats such as crevices, cracks and other holes, and any potential access points into the building. High-powered torches were used to inspect any identified features, and an endoscope was used to investigate any gaps or crevices, where appropriate.
- 3.1.2 The original building inspection was carried out on the 4th March 2020, and subsequently updated on 24th May 2022 and 12th July 2023 by ecologist Lucy Boyett (accredited agent under NRW bat licence number S090407/1 [2020-2022] and S092545/1 [2023]). Building and potential roost assessments were carried out following the guidelines set by the Bat Conservation Trust Good Practice Guidelines (Collins, 2016). Photographic evidence was taken where necessary.

3.2 *Static Detector*

- 3.2.1 An Anabat express was left within a mine adit entrance, in the north-western corner of the Pattern Shop, to determine if bats were using the mine for hibernation. The detector was set on 19th February 2020 and data was collected on 4th March 2020. The detector was set to night-only recording mode, which records 30 minutes before sunset until 30 minutes after sunrise.

3.3 *Emergence Surveys*

- 3.3.1 The original bat emergence surveys were carried out on the Foundry area on 6th May 2020 and 3rd June 2020, both of which are within the peak bat survey months of May to August (inclusive).
- 3.3.2 During these emergence surveys, the area was monitored by seven surveyors. Records were taken of any bats observed emerging from the buildings, and of any other bat activity taking place in the area during the survey. The surveyors used Batbox Duet detectors and Anabat Express bat detectors were positioned around the buildings to record any bat calls for further analysis. As per the guidelines (Collins, 2016) the dusk emergence survey began approximately 30 minutes before sunset and continued for approximately 90 minutes after sunset.
- 3.3.3 An additional emergence survey was completed on 12th July 2023, to determine whether there had been any changes to the bat species present and their activity levels; the survey focussed on the Pattern Shop and Foundry Area, and

did not cover the Machine Shop. Five surveyors used Anabat Scout bat detectors with Anabat Express detectors positioned around the Foundry Area.

- 3.3.4 A night vision aid (NVAs) was used to support the 2023 emergence survey, as per current guidance from the Bat Conservation Trust (2022); these NVAs can allow bats to be observed which would otherwise not be visible to the surveyors. A Canon XA60 video camera in infrared (IR) mode was used to record footage throughout the survey, with a combination of IR floodlights and spotlights used to illuminate the building. These IR lights do not produce visible light and cause no disturbance to emerging bats. Following the emergence survey, the footage was reviewed by an ecologist and any observations from the footage are reported in Section 7.4, below.

3.4 *Limitations (Bat Surveys)*

- 3.4.1 Due to the height of the Machine Shop, and the structure within, it was not possible to inspect all areas. There were many ledges present within the building, which could not be viewed properly.
- 3.4.2 It was not possible to survey within the inside walls of the Pattern Shop, due to health and safety issues. It was also not possible to fully survey the mine adit due to safety concerns.
- 3.4.3 Bats are a difficult group to survey, and as they are highly mobile animals, it is possible that they could move into a building after the survey has occurred. Therefore, it cannot be guaranteed that bats will not move into the building following the survey.

3.5 *Nesting Bird Surveys*

- 3.5.1 The site, including interiors of the buildings, was assessed for any signs of nesting birds, previous nests, or other signs of bird activity such as droppings or feeding remains. Features of potential use to nesting birds, such as crevices, cracks and other holes, were also noted and (where accessible) high-powered torches were used to inspect them. Observations were made of bird activity within the site during each of the visits.

3.6 *Limitations (Bird Surveys)*

- 3.6.1 The original site inspection was carried out on the 4th March 2020, at the start of the main nesting season; while some birds may have been nesting at the time, bird nesting activity was likely to be lower than it would have been later in the year.
- 3.6.2 As with the bat surveys (Sections 3.4.1 and 3.4.2), several areas of the site were unsafe or too inaccessible to be directly inspected.

4.0 Building Description

4.1 Table 4.1 below, describes the buildings and structures including the Machine Shop, Pattern Shop, Foundry area and Robertson Square.

TABLE 4.1. BUILDING DESCRIPTIONS

Building Description	Photograph
<i>Machine Shop</i> A large brick-built building, with a corrugated metal roof and large windows under the eaves, running the length of the building (Photo 4.1). Internally, it was open plan with some in-built meeting rooms, offices and toilets. It was open to the full height of the roof and had a lower ground floor level covering approximately one third of the building's footprint.	 <i>PHOTO 4.1. NORTHERN SIDE OF THE MACHINE SHOP.</i>
<i>Pattern Shop</i> A large two storey building, which had no roof (Photo 4.2). Along the northern external side of the building, at ground level, were four entrances. The first (eastern-most) was a doorway, which led into a ground floor room, which due to safety reasons, was not entered. Two entrances led into brick lined arched recesses, which were approximately five metres deep and three metres in height. One of the alcoves was bare brick and the other was clad in a foam like material (Photo 4.3). The fourth entrance (western-most) led to a mine adit (Photo 4.4). The tunnel was approximately one metre high by one metre wide, and the length is unknown.	 <i>PHOTO 4.2. NORTHERN SIDE OF THE PATTERN SHOP.</i>

	 <i>PHOTO 4.3. ARCHED RECESS CLAD WITH FOAM-LIKE MATERIAL.</i>  <i>PHOTO 4.4. MINE ADIT ENTRANCE.</i>
<i>Foundry Area</i> This former foundry comprised a rear wall (Photo 4.5), blast furnace to the north and a front wall to the east (Photo 4.6). The walls were predominantly unrendered stone with brick supports and some entrances had been bricked up. There were three open recesses along the back wall. Two housed the cupola furnaces and were tall open spaces with large open entranceways (Photo 4.7). Another recess was accessed through an open doorway and	 <i>PHOTO 4.5. REAR WALL.</i>

led to a small stone- and brick-lined room with a low arched roof.

There was also a small section, which appeared to be used as a store, to the north of the foundry area.



PHOTO 4.6. FRONT WALL AND BLAST FURNACE.



PHOTO 4.7. CUPOLA FURNACE.

Robertson Square

Along the northern side of the site there was a large stone retaining wall with brick supports.

There was a small concrete, flat roofed building in the north-western corner of the site, which was built into the slope.



PHOTO 4.8. RETAINING WALL.



PHOTO 4.9 SMALL BUILDING.

5.0 Survey Results: Building Inspection

5.1 *Machine Shop*

- 5.1.1 The walls were in good condition and there were no cracks or crevices identified within the brickwork. Internally, it was very light and with a large number of window panes missing, there was a moderate airflow.
- 5.1.2 No bats or signs of bats were seen during the inspection.
- 5.1.3 Due to time of year, no active bird nests were present during the 2020 survey; a member of staff had observed swallows (*Hirundo rustica*) nesting high within the metal roof structure, but noted that the numbers had decreased over the last few years.

5.2 *Pattern Shop*

- 5.2.1 In places the stone work was in a poor condition, with many large holes, cracks and crevices, where mortar was missing. The ground floor room, appeared to be relatively large, with low light levels, and with the open doorway, the airflow was likely to be low to moderate. The brick- and foam-lined recesses were light and draughty and did not look to have any cracks or crevices within the walls. The mine adit was dark as it went further in and the airflow was low.
- 5.2.2 No bats or signs of bats were seen during the inspection.
- 5.2.3 Due to time of year, no active bird nests were present and no past nests were observed during the original surveys. There were many gaps and crevices within the stone work, which would be suitable for nesting birds. A bird (species not identified) was observed entering a hole at the base of the southern chimney during the 2023 emergence survey.

5.3 *Foundry Area*

- 5.3.1 There were many large cracks and crevices within the walls throughout the Foundry Area. Along the back wall, the two recesses with the cupola furnaces were darker within the higher areas but in general had moderate light and airflow levels. The small stone- and brick-lined room had many crevices within the stone work, some of which were deep. The light levels and airflow were moderate.
- 5.3.2 No bats or signs of bats were seen during the initial PRA, however during the emergence survey visits in 2020 a lesser horseshoe was observed hanging up in one of the recesses and a small number of lesser horseshoe droppings were present in one of the recesses (which had a door on).

- 5.3.3 During the repeat visit on 24th May 2022, a lesser horseshoe was found hanging up in the same recess as seen in 2020 and a small number of lesser horseshoe droppings were also found in the same location as previously.
- 5.3.4 During the visit on 12th July 2023, no bats were observed but a small number of lesser horseshoe droppings were also found in the same location as previously.
- 5.3.5 No active bird nests were observed during any of the site visits, and no past nests were observed. There were many gaps and crevices within the stone work, which would be suitable for nesting birds. Six swift boxes were erected on the northern wall of the Pattern Shop in 2017, however it is not known if they have been used.
- 5.4 *Robertson Square*
 - 5.4.1 The large retaining wall had a number of large holes and cracks present. The small concrete building on the slope had a large open doorway and missing windows to the front which resulted in high light and airflow levels.
 - 5.4.2 No bats or signs of bats were seen during the inspection.
 - 5.4.3 During the original survey there was a lot of activity from jackdaws (*Corvus monedula*), within the larger holes in the retaining wall and a staff member recalled there being nesting birds within the wall during the nesting season. The staff member also recalled seeing a barn owl flying down from the wall and had also seen one flying from the small concrete building. Jackdaws were observed using the holes on subsequent visits.
- 5.5 Table 5.1 provides examples of the potential roosting features identified.

Brymbo Heritage Site: Machine Shop, Pattern Shop and Foundry Area - Preliminary Roost Assessment, Emergence Survey and Bird Survey

TABLE 5.1. DESCRIPTION AND PHOTOS OF POTENTIAL ROOSTING FEATURES (SHOWN IN RED)

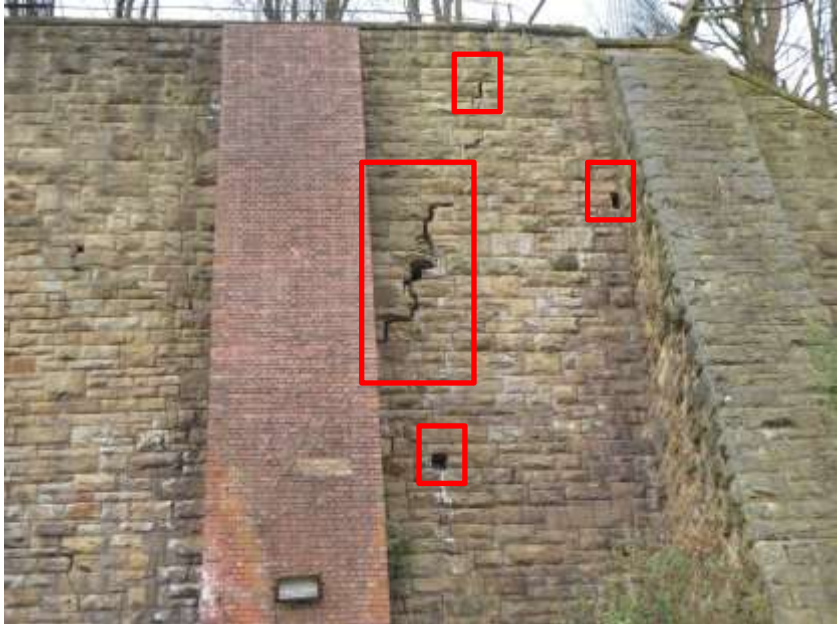
Building/ Area	Description of Potential Roosting Features	Photograph
<i>Machine Shop</i>	There were no potential roosting features present	
<i>Pattern Shop</i>	Crevices and cracks within stone work	 <i>PHOTO 5.1. NORTHERN WALL OF PATTERN SHOP.</i>
<i>Pattern Shop</i>	Brick-lined recess	 <i>PHOTO 5.2. BRICK-LINED RECESS.</i>

<i>Pattern Shop</i>	Mine adit entrance within the north-western corner of the Pattern Shop, leading out into the Foundry Area	 <i>PHOTO 5.3. MINE ADIT ENTRANCE.</i>
<i>Foundry Area</i>	Crevices and cracks within stone and brick work	 <i>PHOTO 5.4. WESTERN BACK WALL.</i>

<i>Foundry Area</i>	Cupola furnaces	
<i>Foundry Area</i>	Small stone- and brick-lined room with deep crevices within the stone wall.	

PHOTO 5.5. CUPOLA FURNACE.

PHOTO 5.6. SMALL STONE AND BRICK-LINED ROOM.

<i>Foundry Area</i>	Bat droppings on barrels in store room	 <i>PHOTO 5.7. STORE ROOM WITH DROPPINGS.</i>
<i>Robertson Square</i>	Large holes and cracks within the northern retaining wall	 <i>PHOTO 5.8. NORTHERN RETAINING WALL.</i>

6.0 Survey Results: Static Detector

- 6.1 The Anabat Express positioned within the mine adit entrance, recorded during the night for two weeks from 19/02/2020 to 03/03/2020. Table 6.1 below details the sunset and sunrise times and also the approximate minimum night temperature.

TABLE 6.1. SUNSET AND SUNRISE TIMES AND APPROXIMATE NIGHT TIME LOW TEMPERATURES

Date	Sunset	Sunrise	Approx. Min Night Temperature (°C)
19/02/2020	17:29	07:21	10
20/02/2020	17:31	07:19	5
21/02/2020	17:33	07:17	10
22/02/2020	17:35	07:14	6
23/02/2020	17:37	07:12	6
24/02/2020	17:39	07:10	7
25/02/2020	17:41	07:08	3
26/02/2020	17:42	07:06	3
27/02/2020	17:44	07:03	2
28/02/2020	17:46	07:01	10
29/02/2020	17:48	06:59	4
01/03/2020	17:50	06:57	3
02/03/2020	17:52	06:54	2
03/03/2020	17:54	06:52	2

- 6.2 On 23/02/2020, lesser horseshoe bats were recorded with near constant activity between the times of 19:38 and 19:42 (17 recordings) followed by one last call at 20:14.

7.0 Survey Results: Emergence Surveys

7.1 Following on from the Preliminary Roost Assessment, two emergence surveys were carried out. Table 7.1 summarises the survey conditions.

TABLE 7.1. SUMMARY OF SURVEY DETAILS

Survey	Survey type	Date	Start time	Sunset/sunrise time	End time	Temp. at start	Weather
1	Dusk emergence	06/05/2020	20:20	20:50	22:20	12.5°C	Dry, still, mild
2	Dusk emergence	03/06/2020	21:01	21:31	23:01	10.7°C	Overcast, rained until early evening

7.2 Bat emergence survey 1

7.2.1 The first survey was undertaken on 6th May 2020 with seven surveyors, led by Rhian Hughes (NRW licence number S087351/1), Tony Medcalf (NRW licence number S085611-1) and five assistants.

7.2.2 The first bat to be seen was a common pipistrelle (*Pipistrellus pipistrellus*) at 21:09, which was heard across the site. Table 7.2 summarises the bat emergences and general bat activity recorded on the site.

TABLE 7.2. SUMMARY OF RESULTS FROM SURVEY 1

Time	Species	Comments	
21:12	Lesser horseshoe	Emerged through an open doorway into the recess	

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Time	Species	Comments	
21:17	Lesser horseshoe	Emerged through an open doorway into the recess	
General activity		Very little activity throughout the survey, first bat to be heard was a common pipistrelle at 21:09, which was heard throughout the site. The only emergences recorded were two lesser horseshoe bats out of a recess in the foundry area. One <i>Myotis</i> heard at 21:53. Two barn owls observed emerging from wall to the rear of the foundry area.	

7.3 Bat emergence survey 2

- 7.3.1 The second bat survey was undertaken on 3rd June 2020, it had rained during the day but cleared up for the evening. The survey was again undertaken with seven surveyors, led by Rhian Hughes (NRW licence number S087351/1), Tony Medcalf (NRW licence number S085611-1), Lucy Boyett, Keymar Wake and Peter Kneen, all accredited on (NRW licence number S087351/1).
- 7.3.2 The first bat to be seen was a common pipistrelle to the south west of the site at 21:51. Table 7.3 summarises the bat emergences and general bat activity recorded on the site.

TABLE 7.3. SUMMARY OF RESULTS FROM SURVEY 2

Time	Species	Comments	
22:04	Lesser horseshoe	Emerged through an open doorway into the recess. It was observed hanging up inside prior to the start of the survey	
General activity		Very little activity throughout the survey, the first bat to be heard was a common pipistrelle at 21:50 to the south-west of the site and a noctule at 21:53, which was commuting high above the site. There was some common pipistrelle activity throughout the evening to the south-west and a faint brown long-eared bat pass at 22:29. There was no bat activity recorded to the east of the site. Two barn owls observed emerging from wall to the west of the foundry area.	

7.4 A further emergence survey was carried out in 2023 to determine whether there had been any changes to the bat species present and their activity levels. Table 7.4 summarises the survey conditions.

TABLE 7.4. SUMMARY OF SURVEY DETAILS

Survey	Survey type	Date	Start time	Sunset/sunrise time	End time	Temp. at start	Weather
3	Dusk emergence	12/07/2023	21:03	21:33	23:03	14°C	Dry, light breeze

7.4.1 The third bat survey was undertaken on 12th July 2023, with five surveyors led by Lucy Boyett (accredited agent under NRW bat licence number S092545/1), Keymar Wake (NRW licence number S092545/1), Ash Payne and Jane Kingsley (both accredited on S092545/1).

7.4.2 Due to lack of potential roost features and limited bat activity in the vicinity on previous surveys, the Machine Shop was not specifically observed during the survey. A Night Vision Aid (NVA) was positioned to monitor the recesses in the Pattern Shop, where lesser horseshoe bats had previously been observed.

7.4.3 The first bat to be seen was a common pipistrelle to the south west of the site at 21:48. Table 7.5 summarises the bat emergences and general bat activity recorded on the site.

TABLE 7.5. SUMMARY OF RESULTS FROM SURVEY 3

Time	Species	Comments	
21:48	Common pipistrelle	Possibly emerged from a gap in the wall on the south-western side of the Pattern Shop; emergence could not be confirmed with confidence due to partial vegetation cover and the large number of gaps in this section of the building.	
22:15; 22:18; 22:20	Lesser horseshoe	Emerged and re-entered the blast furnace, emerged again a few minutes later. Observed flying in and out of the furnace entrance again after a few minutes.	
22:36	Brown long-eared	A brown long-eared bat was observed flying around inside the small building and entering openings in the walls.	

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Time	Species	Comments
General activity		Very little activity throughout the survey, the first bat to be heard was a common pipistrelle at 21:48; common pipistrelles were heard occasionally throughout the survey, with most of the activity around the Pattern Shop and south-western end of the Foundry Area. A lesser horseshoe was observed exiting and re-entering the blast furnace. A brown-longed bat was also observed flying around inside the small building in the north-western corner of the site. One <i>Myotis</i> was recorded but not seen in the vicinity of the Pattern Shop at 22:39.

8.0 Conclusions

8.1 *Bats*

- 8.1.1 The proposed works comprise renovation works to the Machine Shop, Pattern Shop, the Foundry area and Robertson Square, to create a visitor and interpretation centre, creation of stage areas, a cider brewery and WC facilities.
- 8.1.2 Under the Bat Conservation Trust 'Bat Surveys for Professional Ecologists Good Practice Guidelines' (Collins, 2016), the surrounding area, particularly to the southern and western edges of the site, has 'highly suitable' habitat for commuting and foraging bats with good connectivity to further suitable habitat areas.
- 8.1.3 No potential roosting features were identified within the Machine Shop and therefore was found to be of negligible suitability for bats (Collins, 2016).
- 8.1.4 The Pattern Shop, Foundry Area and northern retaining wall had numerous deep cracks and crevices within the stone work and dark areas within the recesses and therefore have the potential to be used by bats during the summer and for hibernation. Considering the potential roosting features identified and the high suitability of the surrounding habitat, these areas have moderate suitability for roosting bats (Collins, 2016). An individual lesser horseshoe was found to be using one of the recesses as a day roost in 2020 and 2022. It has been reported that lesser horseshoes were also observed roosting here within the last few years (personal observations in 2017 or 2018 by Emma Broad). Another recess had a scattering of lesser horseshoe droppings present (2020, 2022 and 2023), however, no bats were observed emerging from this and likely to be used occasionally by an individual/low number of bats.
- 8.1.5 Lesser horseshoe bats, likely just one individual, were observed entering and re-entering the blast furnace during the 2023 survey. It is likely to be used occasionally by an individual/low number of bats.
- 8.1.6 A single brown long-eared bat was observed within the small building in the north-western corner of the site; again, it is likely that an individual/low number of bats are occasionally using this building.
- 8.1.7 A single common pipistrelle may have emerged from crevices in the wall of the Pattern Shop. While this observation could not be verified, the crevices provide suitable roosting spaces and the survey results from across the site support the first bat emerging in this vicinity; therefore, it is safe to assume that a bat did emerge from this area and an individual/low number of bats are using the exterior wall of the Pattern Shop.

- 8.1.8 Lesser horseshoe bats were also detected within the mine entrance two hours after sunset, during one evening of the two weeks that the detector was recording in February 2020. This evening had followed several nights of slightly warmer temperatures and also as it is nearing the end of hibernation season, the bats are likely to have emerged from the mine to feed. Lesser horseshoe bats are well known to use disused mines and caves for hibernation. It is therefore likely that an unknown number of lesser horseshoe bats are using the mine adit as a hibernation roost.
- 8.1.9 As it has been shown that bats are using the site, no works can take place which will affect the areas where bats are roosting until a bat licence from NRW has been applied for and is in place; this can only be applied for once planning permission has been granted. The known bat roosting locations are:
- The recess where the lesser horseshoe was hanging up (and emerged from)
 - The store to the north of the foundry area
 - The blast furnace
 - The mine adit which appeared to be being used as a hibernation roost by lesser horseshoe bats
 - The building in the north-western corner of the site
 - The south-western wall of the Pattern Shop (roost not verified, but highly likely to be present)
- 8.1.10 Any form of potential disturbance to the adit must be avoided during the months of hibernation (October to April). Work to the recesses can take place at any time of the year following reasonable avoidance measures, as it was a single individual lesser horseshoe bat, which was observed in 2020 and again in 2022 and a low number of bats observed prior to this, therefore not a maternity roost, however works would be best carried out in April or September. The impact is classed as low as the roosts will be retained and enhanced.
- 8.1.11 The licence will include details regarding the construction works and also public access to areas nearby and additional lighting. The licence will also cover any changes to the mine adit or mine entrance including fitting a grill which will prevent human disturbance in the adit area, and a door with an opening suitable for lesser horseshoes on the recess. It is important that the environmental conditions are kept as unaltered as possible (including temperature, humidity and air flow) to both the recess and the adit. Grilles to protect sites (usually underground site) allow free access for bats but limit human access – grilles are usually made of horizontal bars with a 150mm gap and vertical bars spaced at between 450 and 750mm (Bat Conservation Trust, 2007).
- 8.1.12 The proposed works to the adit and recess are low impact; these areas will be retained and where possible enhanced for bats and secured. With regards to the

adit, the exact location of where the bats use is unknown, therefore prior to the works, continued monitoring during the preceding winter will need to take place to understand this – however, access is limited due to health and safety reasons. As part of the ongoing aims of the project, lighting is desired on a sensor/push button to illuminate part of the adit, it therefore has to be determined that this would not have an impact on bats using the adit.

8.2 Nesting Birds

- 8.2.1 The buildings and walls within the site provide numerous opportunities for nesting birds; swallows are known to regularly use the Machine Shop for nesting and jackdaws are known to nest within the northern retaining wall. All birds (and their nests) are legally protected under the Wildlife and Countryside Act 1981 (as amended) and it is an offence to intentionally take, damage or destroy the nest of any wild bird while it is in use or being built (as well as kill or injure wild birds or their eggs). Any works will be constrained by the bird nesting season, or require checks by an ecologist immediately prior to works.
- 8.2.2 Nesting barn owls were also observed in the wall to the west of the site and must be taken into consideration, especially with regards to lighting. If this area is to be disturbed a licence will also be required.
- 8.2.3 Mitigation and enhancement measures for nesting birds are detailed in Section 9.

9.0 Reasonable Avoidance Measures and Enhancements

9.1 From the results of the bat emergence surveys, it can be determined that lesser horseshoes are using two of the recesses (however only in low numbers), one where lesser horseshoes were observed and have previously seen emerged, and the second where droppings were present. Lesser horseshoes are also using the blast furnace in low numbers. No other bat species were observed emerging from the Foundry Area. An individual brown long-eared bat was observed using the small building to the north-west, and an individual/low numbers of common pipistrelles are likely using the exterior wall of the Pattern Shop.

9.2 As the site is used by birds and bats, general Reasonable Avoidance Measures and enhancements have been included below.

9.3 *Mitigation measures*

- Prior to the start of works, a toolbox talk will be given to everyone involved in the project and a log of this will be kept.
- Timings of works will be dependent on the specific work being undertaken; full details will be provided in the bat licence application, however, in general, work in the adit and general repointing works to avoid winter months (November – February), when bats may be in hibernation, it is likely that an ecologist must inspect the hole with an endoscope prior to it being filled in, or a survey undertaken immediately prior to the planned works.
- There is potential for birds to be nesting on or within the Machine Shop and also within holes and crevices within the stone work across the site. If works were to be conducted within bird nesting season (from March to September inclusive) then a thorough search for any nesting birds should take place immediately prior to the commencement of works. If any active nest is recorded then all works to that section would have to cease until the chicks have fledged. It is an offence to intentionally take, damage or destroy the nest of any wild bird whilst it is in use or being built with unlimited fines and/or imprisonment.
- It is recommended that the swift boxes on the northern wall of the Pattern Shop are taken down before nesting season, which is March to September (inclusive) and put back up once the works are complete.

9.4 *Enhancements*

- Some crevices in the stonework should be retained, or created where possible, for crevice dwelling bats. Crevices will only be left where the

natural crevice continues to a minimum depth of 10cm. The crevices should be 18-25mm x 50mm in size and this can be created by inserting a piece of timber of this size into the gap, tilting downwards for drainage. After pointing, the timber can then be removed creating roosting points.

- Suitable crevices left unsealed can also provide potential for nesting house sparrows, and bird boxes can be erected in the area to provide extra nesting opportunities.
- The recess where the lesser horseshoe was observed using as a day roost will be retained for bats and enhanced, interpretation will be provided with regards to bats. A wooden door will be fitted with an entrance provided for lesser horseshoe, this will be a letter box size, 30 x 20cm, this door will be locked to prevent unauthorised access. The adit will also be enhanced through the provision of further perching locations, bat boxes and panel boxes will also be erected internally to enhance the area for crevice dwelling bats. A camera may be set up to allow visitors to view the bats.
- The adit will also be retained for use by bats, as described above a grille will be fitted to ensure the site is secure and no disturbance.
- Four bat boxes will be erected, two on the southern wall of the Machine Shop and two on the southern wall of the Pattern Shop – these boxes can be inbuilt or external woodcrete style boxes.
- A hedge and feature trees are to be planted along the eastern boundary of the site and additional trees planted next to the entrance. This will enhance the site for foraging and commuting bats by creating a connection between the woodland areas to the south and north of the site. No lighting should be focused on this feature as it will deter bats from using it.
- To mitigate for the loss of swallow nesting sites within the Machine Shop and to enhance the site for swallow, swallow nest cups will be put up around the site within appropriate areas. Swallows prefer to nest in covered structures and so to provide nesting opportunities, swallow nest cups should be installed within structures such as the cupola furnaces, or within any of the bricked-up spaces by leaving a gap at least the size of a house brick to allow access. The location of the nest cups must be agreed with an ecologist.
- Examples of swallow nesting cups can be found online from several suppliers including NHBS website (www.nhbs.com), the RSPB, and others. The following is one example of a nest cup suitable for the mitigation work:

<https://www.nhbs.com/browse/search?q=swallow+nest&qtview=194571>

- Bird nest boxes should also be erected – as the project is a community project with volunteers bird boxes could be made as part of the site activities, and erected around the site. A minimum of ten boxes should be made, a mix of open fronted, 28mm hole and 35mm hole boxes.

9.5 *Lighting*

9.5.1 Further investigation is required for the use of the adit during winter to inform the lighting required to illuminate the adit for visitors. Lighting on the site will avoid any of the bat mitigation areas (such as the bat boxes and the recess, which will be maintained as bat mitigation). The lighting required onsite will be in the carpark area to the east of the foundry area, general guidance and points to consider when forming the lighting plan are given below and some feature lighting, the position of this lighting will be in discussion with the ecologist.

9.6 *General Lighting Guidance*

- During the construction phase, works should be avoided within 1 hour of dawn and dusk to avoid disturbance to nocturnal animals (especially during the time when bats are active April – October). If works outside this time are needed, all lighting should be directional and be directed away from the woodland edges to the south and west and any other sensitive areas identified during the emergence surveys.
- There must be no lights focused on individual trees, woodland edge, or the planted hedge along the eastern boundary.
- During the months of October to April, the mine adit entrance and immediate area must remain dark. There must also be a dark corridor running from the mine adit entrance to the tree lines and woodland to the south and west.
- The times during which the lighting is on should be limited to provide some dark periods during the night.

The following luminaire specifications are provided by Bat Conservation Trust and Institute of Lighting Professionals (2018) and must be incorporated into the lighting plan for the proposed development.

- All luminaires should lack UV elements when manufactured. Metal halide, fluorescent sources should not be used.

- LED luminaires should be used where possible due to their sharp cut-off, lower intensity, good colour rendition and dimming capability.
- A warm white spectrum (ideally <2700Kelvin) should be adopted to reduce blue light component.
- Luminaires should feature peak wavelengths higher than 550nm to avoid the component of light most disturbing to bats.
- Internal luminaires can be recessed where installed in proximity to windows to reduce glare and light spill.
- The use of specialist bollard or low-level downward directional luminaires to retain darkness above can be considered. However, this often comes at a cost of unacceptable glare, poor illumination efficiency, a high upward light component and poor facial recognition, and their use should only be as directed by the lighting professional.
- Column heights should be carefully considered to minimise light spill.
- Only luminaires with an upward light ratio of 0% and with good optical control should be used.
- Luminaires should always be mounted on the horizontal, i.e. no upward tilt.
- Any external security lighting should be set on motion-sensors and short (1min) timers.
- As a last resort, accessories such as baffles, hoods or louvres can be used to reduce light spill and direct it only to where it is needed.

10.0 Legislation

10.1 *Bats*

10.1.1 The Wildlife and Countryside Act (WCA) 1981 (as amended) forms the key legislation protecting habitats and species in the UK. All UK bat species are fully protected under the 1981 Act through inclusion on Schedule 5. All bats are also listed under Schedule 2 of the Conservation of Habitats and Species Regulations (2017) which transcribes the EC Habitats Directive into UK law. In combination, this legislation makes it an offence to:

- Deliberately or recklessly take, injure or kill a bat;
- Deliberately or recklessly damage or destroy a place or structure used by bats for shelter or protection;
- Deliberately or recklessly obstruct access to a bat roost; or
- Deliberately or recklessly disturb bats while occupying a roost.

10.1.2 Bat roosts are protected under these laws whether the animals are present at the time of survey or not. Under both laws Natural Resources Wales are empowered to issue licences to carry out work to bat roosts for reasons of overriding public interest. It is not illegal to tend to a disabled bat pending recovery.

10.2 *Birds*

10.2.1 Under the Wildlife and Countryside Act, 1981 (as amended) and the Countryside and Rights of Way Act 2000, all wild birds, their nests and eggs are protected during the breeding season (typically March to August inclusive). This makes it an offence to:

- Intentionally kill, injury or take any wild bird.
- Take, damage or destroy the nest of a wild bird included in Schedule ZA1.
- Take, damage or destroy the nest of any wild bird while that nest is in use or being built.
- Take or destroy an egg of any wild bird.

11.0 References and Useful Information Sources

Collins, J. (ed.), 2016. *Bat Surveys for Professional Ecologists: Good Practice Guidelines* (3rd edn). The Bat Conservation Trust, London. ISBN-13 978-1-872745-96-1

Bat Conservation Trust, 2018. 'Bats and artificial lighting in the UK - bats and the built environment series'.

Bat Conservation Trust, 2022. 'Interim Guidance Note: Use of night vision aids for bat emergence surveys and further comment on dawn surveys'.

Bat Conservation Trust, 2007. 'Bats Underground'. Specialist Support Series.