

St Helen's Site, Finnstown, Lucan Co. Dublin

Bat Report

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This report describes work commissioned by Henry Crowley, by an email dated 03/03/2020. William Mulville and Malin Lundberg of JBA Consulting carried out this work.

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Purpose

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Executive Summary

JBA Consulting was commissioned by Timothy and Henry Crowley to undertake a preliminary bat roost and habitat suitability survey and emergence and transect surveys with accompanying report for a proposed residential development at St Helen's, Finnstown, Lucan, Co. Dublin.

The preliminary bat roost assessment identified several of the buildings on site to have low to high bat roost suitability. Emergence and activity surveys were carried out, however due to COVID-19 restrictions these surveys were undertaken during September 2020, which is the end of the active bat season (normally May to September).

Three bat species were recorded regularly using the site for foraging and commuting (Common Pipistrelle, Soprano Pipistrelle and Leisler's Bat). These were frequently recorded during both the emergence surveys, activity (transect) surveys and the static detector recordings. *Myotis* spp. bats were recorded on two occasions, one in the woodland area and one foraging along the stables.

The emergence survey identified one transitional roost in one of the buildings on site used by Common Pipistrelle. As a roost was confirmed on site, a derogation licence from the NPWS is required. This will require further surveys to confirm roost type and inform specific mitigation prior to application for licence.

While bats were not identified as emerging from any of the other buildings, the presence of a maternity roost active during the summer months cannot be ruled out. Due to the surveys only being conducted during the month of September, there is the possibility that some of the other buildings on site are also being used as roosts earlier in the season.

The impact assessment, mitigation and compensation measures included in this report consider worst case scenario where maternity roost may be present on site. Mitigation and compensation measures include a replacement maternity roost which will be located along the south-east boundary of the site where there is an existing commuting flight line for bats and trees are being retained. The Lighting Design and Landscape Master Plan are incorporating sensitive lighting with dark corridors and treelines into the design to provide for commuting and foraging bats and maintain connectivity of the replacement roost with the wider landscape.

A precautionary approach has been applied in the impact assessment and design of mitigation. The mitigation measures provided consider worst case scenario, where it is possible that a maternity roost with high conservation significance is present on site. However mitigation measures will be reviewed and revised following further surveys.

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Abbreviations

BCI	Bat Conservation Ireland
BCT	Bat Conservation Trust
NBDC	National Biodiversity Data Centre
NPWS	National Parks and Wildlife Services
NRA	National Roads Authority

1 Introduction

1.1 Background

JBA Consulting Engineers and Scientists Ltd. (hereafter JBA) was commissioned by Timothy and Henry Crowley to undertake a preliminary bat roost and habitat suitability survey and emergence and transect surveys with accompanying report for a proposed residential development at St Helen's, Finnstown, Lucan, Co. Dublin.

1.2 Legislative Context

Bat surveys are required at this site as all bat species are protected under the Wildlife Act (1976) and Wildlife [Amendment] Act (2000) in Ireland and bats are likely to be present on-site. Under international legislation, bats are further protected under the Convention on the Conservation of European Wildlife and Natural Habitats (Bern Convention 1982), which, in relation to bats, exists to conserve all species and their habitats. The Convention on the Conservation of Migratory Species of Wild Animals (Bonn Convention 1979, enacted 1983) was instigated to protect migrant species across all European boundaries. The Irish government has ratified both these conventions. Also, the EC Directive on The Conservation of Natural Habitats and of Wild Fauna and Flora (EU Habitats Directive 1992), seeks to protect rare species, including bats, and their habitats and requires that appropriate monitoring of populations be undertaken. All bat species are protected under Annex IV of the EU Habitats Directive.

A bat survey was undertaken to determine the usage of the proposed development site by bats in view of the fact that all bat species are protected under Irish national, EU and international legislation. This report describes, assesses, and presents the survey results.

1.3 Proposed project site

The proposed development will be located along Tandy's Lane, just off Adamstown Park Road (Figure 1-1). The R120 lies approximately 500m to the east of the site, running north-south; and crossing over the Dublin to Cork railway line, which passes 300m south of the proposed site. Approximately 250m north of the site lies the Laraghcon Stream (EPA-naming); and equidistant to the east lies Adamstown Stream, with both of the above watercourses being tributaries of the River Griffeen. The site is currently under mixed residential and agricultural use along with large green areas and woodland patches.



Figure 1-1: Site location (Source: EPA, 2020, Google Satellites and Open Streetmap)

1.4 Proposed Project

The development will consist of the: demolition of the 3 No. existing dwelling houses in addition to farm structures and outbuildings and the construction of 113 No. residential units comprising 70 No. two storey dwelling houses (comprising 61 No. three bed units and 9 No. four bed units ranging in size from 109 sq m to 148 sq m), 30 No. duplex units (comprising 16 No. two bed units and 14 No. three bed units ranging in size from 94 sq m to 110 sq m) and 13 No. apartments (comprising 8 No. one bed units and 5 No. two bed units ranging in size from 50 sq m to 73 sq m). The duplexes and apartments will be accommodated in three 4 No. storey blocks which will include balconies/terraces facing north-west and south-east.

The development will also comprise of: a vehicular and pedestrian connection from the subject lands to Adamstown Way to the south and to Tandy's Lane to the north; a vehicular and pedestrian connection to the north-western boundary of the site to allow for a future link to Adamstown Park (pending the future development of adjacent Third Party lands to the north-west); internal routes including new north-south avenues linking Tandy's Lane with Adamstown Way and an east-west avenue which will link to Adamstown Park (pending the future development of adjacent lands); pedestrian connection from the subject lands to Adamstown Park along Tandy's Lane; 145 car parking spaces including on-curtilage and on-street spaces; bicycle parking; bin storage; plant; sedum roofs; boundary treatments; lighting; hard and soft landscaping including 833 sq m public open space and 737 sq m communal open space; changes in levels; and all other associated site works above and below ground.

See Appendix A for the site layout within the Landscape Masterplan.

2 Methodology

This report provides details of the survey methodology used, the relevant guidelines followed, any relevant existing data and conclusions were determined based on the above and on empirical evidence gained in the field bat surveys.

The survey methods were based on Collins (2016) and the following documents were referenced in support of the study:

- Bat Surveys for Professional Ecologists: Good Practice Guidelines (3rd Edition). Bat Conservation Trust (Collins, 2016);
- Bat Mitigation Guidelines for Ireland. Irish Wildlife Manuals, No. 25. National Parks and Wildlife Service, Department of Environment, Heritage and Local Government, Dublin, Ireland (Kelleher and Marnell, 2006);
- A conservation plan for Irish vesper bats, Irish Wildlife Manual No. 20. National Parks and Wildlife Service, Department of Environment, Heritage and Local Government, Dublin, Ireland (McAney, 2006);
- The status of EU protected habitats and species in Ireland: Conservation status in Ireland of habitats and species listed in the European Council Directive on the Conservation of Habitats, Flora and Fauna 92/43/EEC. National Parks and Wildlife Service, Department of Environment, Heritage and Local Government (NPWS, 2019);
- Bats and Appropriate Assessment Guidelines. Bat Conservation Ireland (Bat Conservation Ireland, 2012); and
- Best Practice Guidelines for the Conservation of Bats in the Planning of National Road Schemes. National Roads Authority.(NRA, n.d).

2.1 Desk Study

Data on previous records of bats within the 2km and 10km grid of this area have been collected from the following sources:

- National Parks and Wildlife Service (NPWS) website (NPWS, 2020).
- National Biodiversity Data Centre (NBDC) Biodiversity Maps (NBDC, 2020).

This data provides background information on previous bat recordings within the Lucan area and the general density and population trends of these bats.

2.2 Preliminary Bat Roost Assessment – Buildings and Trees

Structures and trees likely to be impacted by the proposed works were inspected to determine the potential for bat roosts to be present, using the methods specified in the Bat Conservation Trust (BCT) guidelines (Collins, 2016).

Structures and trees on the site were categorised as having either 'negligible', 'low', 'moderate' or 'high' roosting potential and this was determined by applying the definitions given within the BCT Guidelines (see Table 2-1). Evidence of bat activity associated with potential roost sites includes bat droppings, urine staining, feeding remains, scratch marks and dead/alive bats.

Furthermore, the suitability of habitats across the site to support commuting and foraging bats was assessed in terms of habitat type, abundance, connectivity and distribution. These were categorised as having either 'negligible', 'low', 'moderate' or 'high' suitability for bats which was determined by applying the categories given within the BCT Guidelines (Table 2-1).

Table 2-1 Guidelines for assessing the potential

Suitability	Roosting habitats	Commuting and foraging habitats
Negligible	Negligible habitat features on site likely to be used by roosting bats.	Negligible habitat features on site likely to be used by commuting or foraging bats
Low	A structure with one or more potential roost sites that could be used by individual bats opportunistically. However, these potential roost sites do not provide enough space, shelter, protection, appropriate conditions and/or suitable surrounding habitat to be used on a regular basis or by larger numbers of bats (i.e. unlikely to be suitable for maternity or hibernation).	Habitat that could be used by small numbers of commuting bats such as a gappy hedgerow or unvegetated stream, but isolated, i.e. not very well connected to the surrounding landscape by other habitat. Suitable, but isolated habitat that could be used by small numbers of foraging bats such as a lone tree (not in a parkland situation) or a patch of scrub.
Moderate	A structure with one or more potential roost sites that could be used by bats due to their size, shelter, protection, conditions and surrounding habitat but unlikely to support a roost of high conservation status (with respect to roost type only – the assessments in this table are made irrespective of species conservation status, which is established after presence is confirmed).	Continuous habitat connected to the wider landscape that could be used by bats for commuting such as lines of trees and scrub or linked back gardens. Habitat that is connected to the wider landscape that could be used by bats for foraging such as trees, scrub, grassland or water.
High	A structure with one or more potential roost sites that are obviously suitable for use by larger numbers of bats on a more regular basis and potentially for longer periods of time due to their size, shelter, protection, conditions and surrounding habitat	Continuous, high-quality habitat that is well connected to the wider landscape that is likely to be used regularly by commuting bats such as river valleys, streams, hedgerows, lines of trees and woodland edge. High-quality habitat that is well connected to the wider landscape that is likely to be used regularly by foraging bats such as broadleaved woodland, treelined watercourses and grazed parkland. Site is close to and connected to known roosts.

2.3 Field Surveys

The methodology for the field surveys was based on Collins (2016). However, due to COVID-19 restrictions, the methodology was modified and surveys were only carried out during September 2020, thus not covering the full active bat season (May –

September). Due to health and safety issues relating to access of the buildings and restricted view due to vegetation, static detectors were used to record potential emergence of bats in some locations. These detectors were only up for the same period of time as the surveyors conducted the emergence survey.

The emergence surveys were conducted to identify if the buildings with bat roost potential are used as roosts. The emergence viewpoints targeted the potential exit and entrance locations for bats on the buildings. The transect routes recorded the activity of bats at the site and the usage, i.e. commuting or foraging, of the treelines, woodland, orchard and grassland.

Bat emergence surveys and transect surveys were carried out at five occasions during the end of the active bat season: 1st September, 7th September, 10th September, 17th September and 21st September 2020. The surveys were carried out at dusk, starting 15 minutes before sunset and undertaken for 1.5-2 hours. Handheld bat detectors (Magenta 5 Heterodyne) were used for identifying bats. This data was recorded and visual observations were noted throughout the surveys to identify usage of the site by bats.

At each survey occasion, a static bat detector was installed and left for a minimum of five nights to record bat activity. These recorded the usage of the different habitats by bats. Data collected by the static bat detectors was analysed by Malin Lundberg and William Mulville using AnalookW software, with all results quality checked by Colm O'Leary for consistency. Quality control was carried out by JBA Bat Specialist Tanya Slattery.

2.4 Objectives of the report and surveys

The objectives of the survey were to identify any potential bat roost, commuting routes and feeding/foraging areas within the proposed site. This information is required to carry out an impact assessment of the proposed development relative to bats that may be using the site, and to inform the design of appropriate mitigation measures that may be needed as a result of the proposed development.

2.5 Limitations and constraints

The conclusion of this report necessarily relies on some assumptions and it is inevitably subject to some limitations. Most of these would not affect the conclusion but the following points should be taken into consideration during the assessment to ensure the basis of the assessment is clear:

- In order to achieve the objectives of the report and surveys within the time period of the commissioning of work and the planning submission, assumptions (e.g. use of treelines and hedgerows for at least commuting activity) are made as to the usage of the site by bats outside of the activity survey period. The precautionary principle is used at all times, i.e. the absence of physical evidence cannot fully rule out the presence of bats within the habitat, e.g. commuting or foraging within suitable bat habitats will leave no physical evidence for surveyors to record during preliminary surveys.
- The preliminary assessment of bat roost potential of trees was only from the ground and roosting features may have been missed so the precautionary principle is used;
- Weather conditions may affect bat activity, but weather conditions during the surveys were within the optimal window;
- Bat detectors can only provide an index of activity rather than absolute numbers of bats;
- Bat detectors may not pick up all bats using the area as bat species may be using the site but may not always use echolocation when passing the static bat detector.

- When analysing data from static detectors used to record emergence of bats, it can't be certain how many bats that have been recorded. Depending on weather, bats can emerge and re-enter, hence the bat would be counted each time it emerges and re-enters.
- Due to COVID-19 restrictions during the bat survey season (i.e. April to September) the surveys were restricted to the month of September and the time between surveys was less than as per the guidelines (minimum 2 weeks). This limits the assessment of how bats use the site throughout the season. Bats can change roosting site during the period of their active season; therefore, the results can only be certain for the month of September.

The impact assessment and design of mitigation measures will take all the above limitations into consideration.

3 Results

3.1 Desk Study

The historical records from the NBDC website (2020) identified five bat species being recorded within 2km radius around the proposed site within the past 10 years, namely Leisler's Bat *Nyctalus leisleri* (2km); Common Pipistrelle *Pipistrellus pipistrellus* (2km); Soprano Pipistrelle *Pipistrellus pygmaeus* (2km); Daubenton's Bat *Myotis daubentonii* (2km); and Brown Long-eared Bat *Plecotus auratus* (2km).

Records of bats within 1km of the site was requested from Bat Conservation Ireland and was received on 23-11-2020. The records are from 2008 and 2009 and include the same species as registered on the NBDC website. Two bat roosts has been recorded within the 1km radius of the site.

Below are descriptions of the bat species which are likely to be in the local area and potentially using the site.

3.1.1 Leisler's Bat

The largest of the Irish bats, Leisler's Bat has distinctive level flight at greater heights than the other Irish species, from which it dives down after dung flies and beetles, with its echolocation frequency calls operating primarily within 20-30kHz. It can be seen soon after sunset flying over open spaces such as parks and fields, as well as woodlands and river valleys. Leisler's Bat is rare in Britain and the rest of Europe, but it is relatively common in Ireland. For this reason, the Irish population of Leisler's Bat is considered to be of International Importance. The population is monitored by the Car-based Bat Monitoring Scheme and its annual population trend has shown significant increases since 2003 (IUCN, 2020; BCI, 2020).

3.1.2 Common Pipistrelle

The smallest of Ireland's bat species, the Common Pipistrelle forages in a variety of habitats including open woodland and woodland edges, shrubland, farmland, rural gardens and urban areas. It has a rapid, twisting flight as they pursue their small prey items of midges, mosquitoes and small moths. Their echolocation frequency calls typically fall within the 40-50kHz range. They are most likely to be seen flying around soon after dusk in both urban and rural areas. The population is monitored via the Car-based Bat Monitoring Scheme, which suggests the Common Pipistrelle has seen a notable population increase since 2003 (IUCN, 2020; BCI, 2020).

3.1.3 Soprano Pipistrelle

Equal in size to the Common Pipistrelle, the Soprano Pipistrelle typically forages around open woodland and woodland edges, shrubland, farmland, rural gardens, urban areas and wetlands, and is more closely associated with water than the Common Pipistrelle. It's diet and foraging technique is similar to that of the Common Pipistrelle, but with a preference for small Diptera species (especially aquatic midges) and a higher frequency echolocation call, which generally ranges from 50-60kHz. The Soprano Pipistrelle populations is monitored through the Car-based Bat Monitoring Scheme. The data recorded from the scheme suggests that the population has increased significantly since 2003 (IUCN, 2020; BCI, 2020).

3.1.4 Daubenton's Bat

Often referred to as the 'water bat', Daubenton's Bat is easily recognised in flight by its low, level flight a few centimetres above the surface of lakes, slow-moving rivers and canals. The bat skims above the surface of the water in search of caddisflies, mayflies and midges, and may even scoop prey from the water surface using its large feet or scooping them up using its tail membrane. Daubenton's Bat can be detected between the frequencies of 35-70kHz. The Daubenton's Bat annual trend is monitored

using a volunteer-based programme – the All Ireland Daubenton's Bat Waterways Survey. This scheme has been ongoing since 2006 and the Daubenton's bat population trend has been reasonably stable since this time (IUCN, 2020; BCI, 2020).

3.1.5 Brown Long-eared Bat

The notable ears of this bat species are its most distinctive feature as they are almost as long as its body. The Brown Long-eared Bat prefers habitats that are sheltered, fairly open deciduous and coniferous woodland and parkland or well-wooded gardens. Brown Long-eared Bats use a foraging method known as foliage gleaning which means they pick up their prey directly from the leaves of trees and shrubs and in some cases off the ground. Their prey includes spiders, caterpillars, beetles, moths and earwigs which they locate with their sensitive ears and by sight. Another notable feature about this species is that they emit their quiet echolocation sounds through their nose at frequencies ranging from 25–50kHz. A scheme for monitoring this species at its roosts was developed in 2007 (the Brown Long-eared Bat Roost Monitoring Scheme); and thus far the population has been considered stable (IUCN, 2020; BCI, 2020).

3.2 Preliminary Bat Roost Assessment

A walkover of the site was conducted on the 29th May 2020 by JBA Ecologist, William Mulville to assess the site for roosting, commuting and foraging suitability.

At the time of the survey the site comprised of three residential buildings with associated amenity garden areas. The southern section of the site contained agricultural storage buildings, which varied in age and condition. To the west of the site lay a small, unmanaged woodland patch. The majority of the site was encompassed by treeline boundaries. Trees were assessed from ground level by direct inspection of the exterior. The mature trees were generally in good condition and had negligible value as roosts for bats. Some trees were identified to be covered by Ivy *Hedera Hibernica*, however the extent of Ivy was limited and the trees were considered to be of negligible value. Two of the residential buildings were determined to be of negligible suitability due to the absence of any potential access points for bats. The buildings assessed to have negligible – high bat roost suitability are shown in Figure 3-1 and a summary of potential roosting features and roosting potential is in Table 3-1.

The site was assessed as having moderate suitability as foraging and commuting habitat. The presence of treelines provided commuting corridors for bats. The grassland, woodland and scrub provided foraging habitat. The site was connected with the wider area outside of the site via treelines and hedgerows, however with urban development underway around the site there is a risk of losing this connectivity by fragmentation. The site is relatively close to Griffeen River which provide an important corridor for commuting and foraging bats.

Table 3-1: Potential Roosting Features and Suitability in Buildings

Building	Potential Roosting Features present	Overall Bat Roost Potential of building
1	Derelict house with roof space present but could not be accessed by surveyor. Access from outside via cracks under roof, broken window.	High
2	Derelict stable. Easy access via open stable doors. Big open space inside, roof space present but could not be accessed by surveyor.	Moderate
3	Farm building with one possible access point	Low

Building	Potential Roosting Features present	Overall Bat Roost Potential of building
	in south-west end of building with large open entrance for machinery. Roof space present under corrugated iron roof which can be accessed by bats.	
4	Derelict house with roof space present but could not be accessed by surveyor. Entrance via cracks in the wall, missing roof tile, broken window.	High
5	Old barn with access via open windows and door. Crevices in ceiling.	High
6	Derelict shed with access via open door entrance. Very limited suitable roost features.	Low
7	Farm building with possible access via corrugated iron roof. Very limited suitable roost features.	Negligible
8	Old shed, much of the walls and roof were no longer present. Crevices in chimney provide limited suitable roost features.	Low
9	Uninhabited domestic dwelling. Presence of attic. Access to roof space from outside via cracks in window frame. Staining visible from outside. Internal inspection found a bird nest blocking the possible entrance for bats to access the roof space. No other possible access points were identified and no evidence of bats was recorded. Thus, it was confirmed that the house was not used as roost for bats.	Negligible

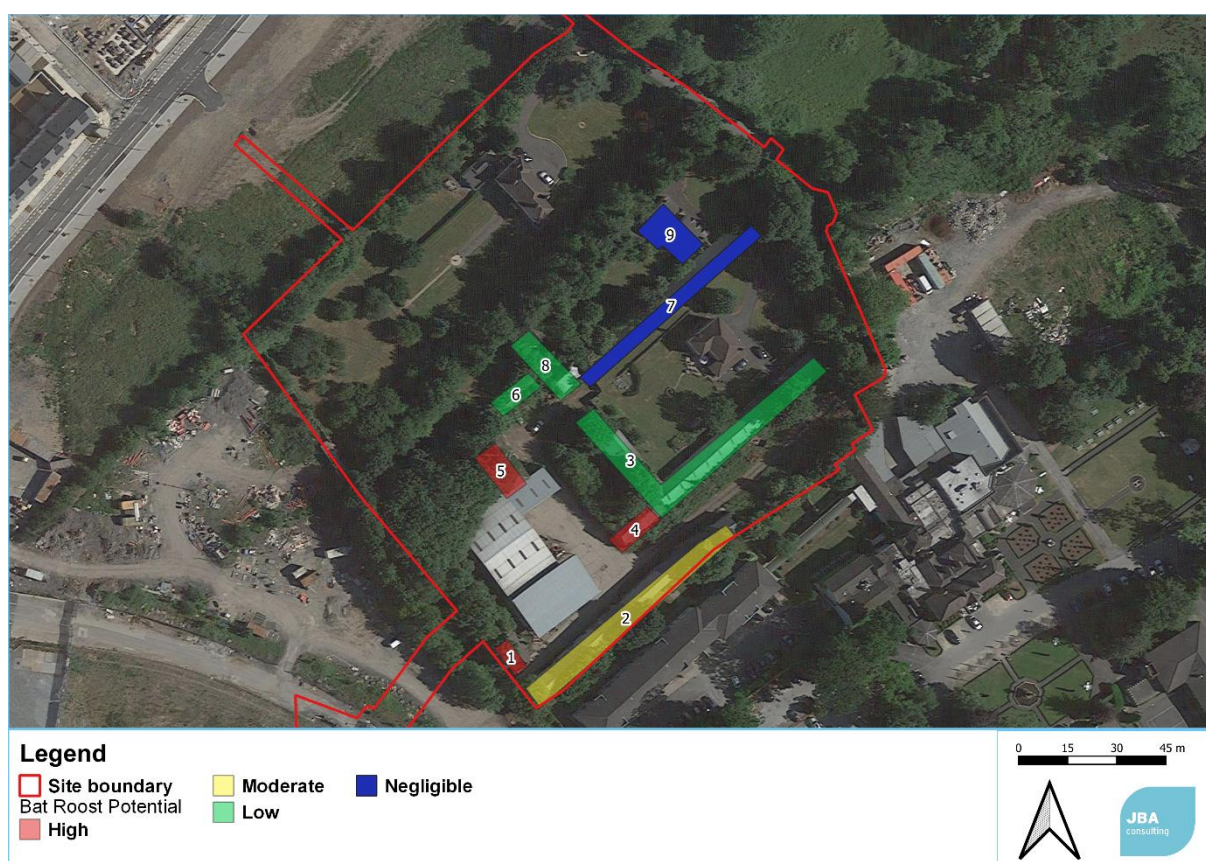


Figure 3-1: Buildings on-site with bat roost potential

3.3 Emergence and transect surveys

Maps showing viewpoints for the emergence survey, transect route for activity survey and location of static bat detectors are provided in Appendix A.

Bats were recorded emerging from building 5, the old barn. The surveyors observed 2 and 5 Common Pipistrelle emerge from the barn on the 14th and 21st September respectively (Table 3-2). No bats were recorded emerging from any of the other buildings. However, bats were foraging and commuting around all the buildings.

Table 3-2: Results from bat emergence surveys carried out during the month of September 2020.

Date	Viewpoint	Species	No. of records	Observation
01/09/2020	1 and west end of 2	Common Pipistrelle	7	not seen
		Leisler's Bat	4	foraging
		Unidentified bat	1	not seen
		Soprano Pipistrelle	8	not seen, fast
	East end of 2	Common Pipistrelle	2	foraging and commuting along driveway
		Soprano Pipistrelle	4	foraging

Date	Viewpoint	Species	No. of records	Observation
		Leisler's Bat	3	not seen
07.09.2020	1 and west end of 2	Common Pipistrelle	5	foraging in front of 1 and commuting
		Soprano Pipistrelle	3	foraging, one entering stable
	East end of 2	Leisler's Bat	6	foraging at end of stable, flying over stable
		Common Pipistrelle	2	not seen
10/09/2020	8	Common Pipistrelle	3	foraging
		Soprano Pipistrelle	6	mainly foraging, commuting
	4	Common Pipistrelle	4	foraging
		Soprano Pipistrelle	4	foraging, commuting
		Leisler's Bat	8	mainly commuting, foraging
14/09/2020	5	Leisler's Bat	23	flying high over building
		Common Pipistrelle	34	minimum 5 emerging from building, foraging
		Soprano Pipistrelle	2	foraging
		Pipistrelle	4	foraging
	4	Leisler's Bat	9	commuting, foraging
		Common Pipistrelle	29	commuting, foraging
		Unidentified bat	3	
17/09/2020	east side of 1	Leisler's Bat	2	foraging beside stable
		Common Pipistrelle	3	foraging beside stable, flying over rooftop
		Soprano Pipistrelle	2	foraging
	west side of 1	Leisler's Bat	4	not seen
		Common Pipistrelle	2	foraging
		Soprano Pipistrelle	4	foraging
21/09/2020	5	Leisler's Bat	5	
		Common Pipistrelle	25	2 emerging from building, foraging

Date	Viewpoint	Species	No. of records	Observation
		Soprano Pipistrelle	5	
		Pipistrelle	2	
	8	Leisler's Bat	9	most not seen, some seen flying high
		Common Pipistrelle	9	foraging
		Soprano Pipistrelle	6	most not seen, one seen foraging

The results from the static recorders used for the emergence surveys are provided in Table 3-3. Bats were recorded at building 8, 3 and 6, with the highest activity at building 6. Both building 6 and 3 had a high number of bat calls recorded. No bats were recorded on the static detector put up in building 3 on the 1st September or on the static detector put up in building 5 on the 7th September.

Table 3-3: Results from static recorders used for emergence surveys.

Date	Location	Species	No. of records	Comment
01/09/2020	8	Common Pipistrelle	16 passes	25 social calls from Pipistrelle recorded
		Leisler's Bat	4 passes	
		Pipistrelle	6 passes	
07/09/2020	3	Common Pipistrelle	16 passes	
		Soprano Pipistrelle	8 passes	
		Pipistrelle (<i>Pipistrellus</i> spp.)	39 passes	
		<i>Myotis</i> spp.	1 pass	
10/09/2020	6	Common Pipistrelle	1 pass	4 social calls from Pipistrelle recorded
		Pipistrelle (<i>Pipistrellus</i> spp.)	1 pass	

The transect surveys recorded bats foraging and commuting around the east end of the stable (building 2) and around the small woodland and grassland area north of the barn (building 5). The centre transect, which included the woodlands on the site, a less intensively managed grassland patch and the amenity grassland around the residential house (building 9), recorded bats foraging in all habitats. Only one bat was recorded along the north-western transect. A summary of the results from the transect surveys is provided in Table 3-4.

Table 3-4: Results from bat activity (transect) surveys carried out during the month of September 2020.

Date	Transect	Species	No. of records	Observation
01/09/2020	South-east	Common Pipistrelle	6	commuting and foraging, main activity at east end of stable (2) and north of barn (5)
		<i>Myotis</i> spp.	2	
		Soprano Pipistrelle	5	
		Leisler's Bat	1	
		Unidentified bat	1	
07/09/2020	North west	Soprano Pipistrelle	1	by greenhouse west of residential building
10/09/2020	Centre	Soprano Pipistrelle	7	foraging north and south of residential house (9)
		Leisler's Bat	10	foraging north and south of residential house (9), grassland area and woodland
		Common Pipistrelle	8	foraging in grassland area and woodland

3.3.1 Static detector recordings

The static detector put up at the east end of the stable recorded bat passes in the grassland area east of the stable. The recordings were restricted to three nights due to technical issues the last two nights (Table 3-5). A total of 467 passes of bats occurred during the first two nights, Soprano Pipistrelle being the species most frequently recorded. No bats were recorded on the 3rd September.

Table 3-5: Recordings from east end of stables (building 2).

Species	Date			Grand total
	01-09-2020	02-09-2020	03-09-2020	
Common Pipistrelle	46	13	0	59
Soprano Pipistrelle	202	153	0	355
Leisler's Bat	22	31	0	53
Grand total	270	197	0	467

The static detector put up in front (north) of the barn recorded a total of 812 passes of bats during the course of seven nights (Table 3-6). The most frequently recorded was Common Pipistrelle with 596 recordings.

Table 3-6: Recordings in front of barn (building 5).

Species	Date							Grand total
	01-09-2020	02-09-2020	03-09-2020	04-09-2020	05-09-2020	06-09-2020	07-09-2020	
Common Pipistrelle	127	110	107	81	1	149	21	596
Soprano Pipistrelle	21	13	30	21	0	29	1	115
Leisler's Bat	26	29	15	13	0	16	2	101
Grand total	174	152	152	115	1	194	24	812

The static detector put up in the woodland area recorded a total of 291 passes of bats during eight nights (Table 3-7). Common Pipistrelle and Soprano Pipistrelle were more frequent than Leisler's Bat. A *Myotis* species bat was recorded on one occasion, it was not possible to identify this bat to species. This was the only individual *Myotis* spp. bat recorded from all the static detector recordings.

Table 3-7: Recordings from the woodland area.

Species	Date								Grand total
	17-09-2020	18-09-2020	19-09-2020	20-09-2020	21-09-2020	22-09-2020	23-09-2020	24-09-2020	
Common Pipistrelle	40	2	21	3	23	24	6	1	120
Soprano Pipistrelle	53	11	18	40	2	5	6	1	136
Leisler's Bat	16	2	2	3	3	4	3	1	34
<i>Myotis</i> spp.	0	1	0	0	0	0	0	0	1
Grand total	109	16	41	46	28	33	15	3	291

A static recorder was put up in the orchard area in the south-west corner of the site during the period 10th – 17th September 2020. Only one bat was recorded during the full period, a Leisler's Bat on the 16th September.

3.3.2 Discussion of Results

Three bat species were recorded regularly using the site (Common Pipistrelle, Soprano Pipistrelle and Leisler's Bat). These were frequently recorded during both the emergence surveys, activity (transect) surveys and the static detector recordings. *Myotis* spp. bats were recorded on two occasions, one in the woodland area and one foraging along the stables.

From the results of the emergence survey it is confirmed that the old barn (building 5) is used as a transitional roost by Common Pipistrelle. However, given the timing of the surveys (late in the season), the presence of a maternity roost active during the

summer months cannot be ruled out. Due to the surveys only being conducted during the month of September, there is the possibility that the other buildings on site are also being used as roosts earlier in the season.

Building 3 had potential roost suitability in the south-western end and a static detector was put up at two occasions to record emergence. Nothing was recorded on the first occasion and a total of 63 passes were recorded on the second occasion. However, the area around the south-western end of building 3 consists of a small woodland and grassland and bats were recorded foraging in this area by surveyors. The static was placed under the roof of the building and the entrance for machinery had no door, hence bats passing by outside are most likely recorded.

One static detector was placed inside of building 6 where the only access point was via a doorway. Two echolocation calls were recorded, one Common Pipistrelle and one Pipistrelle which could not be identified to species, a further four social calls were recorded as well. Given that the recorder was placed inside of the building, there would be very little chance of bats passing by the building on the outside to be picked up by the recorder. Therefore, it is likely that bats recorded were inside the building and it is a potential roost. Given the restricted survey period, it cannot be ruled out that building 6 is a potential roost.

Building 8 is missing roof and much of the walls, the only potential of the building to hold a roost is in crevices into the chimney which would only provide for a few numbers of individuals. The building was surveyed by both surveyors and a static recorder. No bats were observed emerge, though there was a lot of foraging bats in the grassland beside the building. Building 8 is not considered to hold any bat roost.

Building 1 and 4 were classified as having high bat roost suitability, however no bats were recorded emerging from these buildings. The survey was restricted to the month of September and due to the status of the buildings, it was not possible to access them for an interior inspection. Given the presence of possible entrances, the fact that there is very little disturbance from humans in these buildings and the presence of bats utilising the whole site for foraging and commuting, it cannot be ruled out that these buildings could provide bat roosts earlier in the season.

Building 2 (the stables) was not recorded to have any bats emerge. It was classified as moderate suitability due to being highly accessible via open stable doors, however the roosting features inside were limited. However, given the restricted survey period, it cannot be ruled out that.

The northern end of the site which included a residential house and garden, an orchard to the rear and a treeline along the boundary. This site was not identified to have a high usage of commuting and foraging bats, one single bat was recorded during the transect survey and one bat was recorded on the static detector which was up for seven nights. The weather during the period the static was installed was around optimal despite being late in the season. There was one night with some strong winds and one night when the temperature went down to 8 degrees. For the other nights the general temperature was between 10-20 degrees and no rain, which is within the optimal window. Therefore, it is unlikely that the few recordings are due to the weather. It could be less insects in the area as the lawn is regularly mown, thus fewer flowering herbs present for insect, which is a food resource for bats. Given the presence of apple trees, there is potential for the site to be more used by foraging bats early in the season, when the trees are in flower and thus attracts insects.

The static detector placed in front of the old barn (building 5) had recorded a high number of calls from Common Pipistrelle (596 calls) during a seven-night period. This can be explained by Common Pipistrelle roosting in the old barn and thus flying a lot of back and forth in the area and foraging nearby.

In terms of foraging habitat, the woodland and the less intensively managed grasslands at the centre of the site and east of the stables are highly used by foraging bats.

As a roost was confirmed on site, a derogation licence from the NPWS is required in order for the development to proceed lawfully. Details of type of bat roost (maternity / transition roost) and location are needed for the application of a derogation licence. Due to the surveys being restricted to the month of September, which is a transition period for bats before they go into hibernation in October/November, it could not be ruled out that some of the buildings are also used as roosts earlier in the season with the possibility to support maternity roosts. Therefore, further surveys during the active bat season (May to September) are needed before a derogation licence is applied for. Where there is potential for use of buildings as maternity roosts, at least some surveys should be completed during the core summer season (mid-June to early-August). The impact assessment and mitigation measures outlined in this report considers the worst case scenario which is the potential for a maternity roost with high conservation significance to be present on site.

3.3.3 Summary

The survey results can be summarised as:

- The site is frequently used for foraging by Common Pipistrelle, Soprano Pipistrelle and Leisler's Bat;
- Building 5 is a confirmed transitional roost used by Common Pipistrelle;
- Building 6 has potentially a roost. The restricted survey could not fully confirm the presence of a roost;
- No bats were recorded to emerge from buildings 1, 2 or 4. Given their high and moderate roost suitability and the restricted survey period, it cannot be ruled out that the buildings are used as roosts earlier in the season;
- The static detector placed in building 3 recorded activity during one of the two survey occasions. The restricted survey could not fully confirm the presence or absence of a roost;
- Building 7, 8 and 9 are confirmed to not have any bat roosts;
- The main usage of the site by bats is for foraging around the woodland and the less intensively managed grassland areas at the centre of the site and east of the stables; and
- A derogation licence must be obtained from the NPWS and will require further surveys.

4 Potential impacts of the proposed development

Should the proposed development be given permission and proceed to the construction and operational phases without any pre-planned mitigation, the bat species using the site would be adversely impacted. The impact assessment considers the worst case scenario where it is possible that a maternity roost with high conservation significance is present on site.

4.1 Impacts During Construction

The demolition of all the existing buildings on the site would result in the direct loss of a confirmed transitional bat roost in the old barn (building 5), a potential roost in building 6 and loss of a potential maternity roost. The loss of a maternity roost would have a significant impact on the local bat population.

The removal of vegetation on site, including woodland, treelines and grassland will impact on bats commuting and foraging in the area.

Other potential impacts are likely to be through constructional disturbance and lighting disturbance. Noise effects associated with the works would be temporary during diurnal parts of the day and no significant nocturnal noise effects are anticipated. Given the presence of treelines and parkland outside of the site which would provide alternative commuting and foraging habitats for bat, temporary impacts are not anticipated to be significant. However, lighting used incorrectly could also impact on surrounding habitats.

4.2 Impacts During Operation

Impacts are likely to be through operational disturbance and lighting disturbance. Lighting during the hours of darkness would reduce the quality of foraging and roosting habitat for bats. It is important to maintain connectivity with the wider landscape and the Griffeen River, thus the development's lighting design and planting plan must compliment the current potential commuting routes (vegetated dark corridors).

Noise disturbance associated with the operation of the development would increase significantly but would mainly be associated with daytime hours.

5 Recommended Mitigation Measures

Mitigation measures are proposed below to avoid or minimise impacts to bat species using the site. It is important to note that, for works to proceed lawfully, it is necessary to apply for and obtain a bat derogation licence from the NPWS. To apply for a bat derogation licence, detailed information is needed regarding type of bat roost (maternity roost / transition roost) and location. This requires further surveys during the core summer season (mid-June to early-August).

The mitigation measures provided below considers worst case scenario where it is possible that a maternity roost with high conservation significance is present on site.

5.1 Construction Phase Mitigation

Demolition of Buildings

Prior to any demolition works or vegetation clearance, further survey work must be completed to fully evaluate the buildings and habitats on site and their value to both roosting and foraging bats.

Prior to demolition of any buildings on site a bat roost derogation licence will be required from the NPWS, and suitable compensatory features and mitigation agreed.

Demolition of buildings with bat roosts should take place in spring or autumn when bats are more mobile and moving between hibernation roost and maternity roost.

Maternity Roost Replacement

A replacement roost will be placed along the south-east boundary of the site (Figure 5-1). The location is chosen due to the trees in this area that will be retained and there is an existing commuting flight path for bats. There will be least activity in this area during construction works and it is also where there will be low levels of general activity and light when the residential properties are fully occupied.

The design incorporates the following requirements:

- The minimum footprint of the translocated roof should be 5m x 4m and the total height a minimum of 5m.
- A steeply pitched roof (42° is optimum) with one pitch facing south. This is to provide high temperatures in summer that maternity sites require.
- There should be no shading of the roost.
- To prevent vandalism and discourage trespass, thorny shrub should be planted around the bat roost.
- There should be no lighting in the area of the roost, i.e. along the south-eastern internal road adjacent to the site boundary. If lighting is necessary, it should be sensory/motioned triggered and to remain off during the hours of darkness. Street lighting along the residential properties must be directional lighting with baffles to avoid overspill in the direction of the bat roost along the site perimeter.

The roost can be designed in detail following further surveys in May and June 2021 but should include roosting features for the species recorded on site including crevice features integrated into the exterior fabric of the building for bat species such as Common Pipistrelle *Pipistrellus pipistrellus* and roof spaces with access points for void roosting species such as Leisler's Bat *Nyctalus leisleri* and Natterer's Bat *Myotis nattereri*.

A rocket bat box will be installed in the public open space at the centre of the site. Trees planted along the road will prevent light pollution in this area.

Lighting

In order to minimise disturbance during the construction phase of the project, night working should be avoided. Lights should be turned off or minimised on-site. If night

working is required, lighting should be cowled and directed away from vegetation bordering the site to maintain a dark corridor.

5.2 Operation Phase Mitigation

Post-development Monitoring of Replacement Roost

Follow-up monitoring of the replacement roost will be undertaken for a minimum of 2 years. The monitoring will assess the success of the roost being used by bats.

Lighting Design

The lighting design should in general follow the guidance provided by Bat Conservation Trust and the Institution of Lighting Professionals – *Bats and artificial lighting in the UK* (BCT and ILP, 2018). Specifically, the mitigations outlined below should be adhered to.

Hours of illumination:

Site lighting should be switched off or at lower light output during inactive site hours, this would benefit the bats foraging and/or commuting in the locality. Additionally, lighting should be controlled by occupancy / motion sensors so that it will remain off / low if there is no pedestrian traffic nearby.

Light levels and type:

Site lighting that meets the lowest light levels permitted under health and safety would be preferable for bats in the vicinity. The specification and colour of light treatments, such as single bandwidth lights and no UV light are essential. LED luminaires are ideal and should be used where possible due to their sharp cut-off, lower intensity, and dimming capability. A warm white spectrum (2700K – 3000K) should be used to reduce the blue light component. The LED luminaires could also feature peak wavelengths higher than 550nm to avoid the component of light most disturbing to the Bats.

Column heights of lamp posts:

As Bats most likely forage in the unlit areas surrounding the site, the introduction of new lighting as a result of the new development, with accompanying light spillage, is anticipated to result in the bats becoming averse to commuting and foraging within the proposed site and potentially the adjacent habitats also. In order to reduce the amount of light spillage where it is not needed, the height of lamp columns should be restricted. A height of 6m or less is necessary to avert lighting impacts.

Dark corridors:

Taking into consideration all of the above recommended mitigation measures, a dark corridor (lit in a bat-friendly manner) leading from one end of the site to the other, should be maintained for bats at all times. This will allow for bats commuting through the site to do so safely. It is proposed that a dark corridor is maintained along the south-east boundary along the rear gardens and the south-west boundary (Figure 5-1). There will be no lighting in the area of the roost, i.e. along the south-eastern internal road adjacent to the site boundary, if lighting is necessary it should be sensory/motion triggered and to remain off during the hours of darkness. Street lighting along the residential properties must be directional lighting with baffles to avoid overspill in the direction of the bat roost along the site perimeter.

The Lighting Design is provided in Appendix C.

Landscape Design

Bats use linear features, such as treelines / hedgerows, for navigation and commute along these. In order to retain a suitable habitat for bats within the site, it is proposed that the treeline in the east corner of the site is thickened and extended down the south-east boundary along the rear gardens and the south-west boundary

Additional trees will be planted through the centre of the proposed development (east-west) to create further continuous treelines and to compensate for commuting routes lost elsewhere across the site.

Native tree species included in the planting scheme are Silver Birch *Betula pendula*, Pedunculate Oak, Holly *Ilex aquifolium*, Hazel *Corylus avellane*, Hawthorn *Crataegus monogyna* and a pollinator friendly herbaceous mix will be used for ground cover.

The Landscape Master Plan is provided in Appendix B.

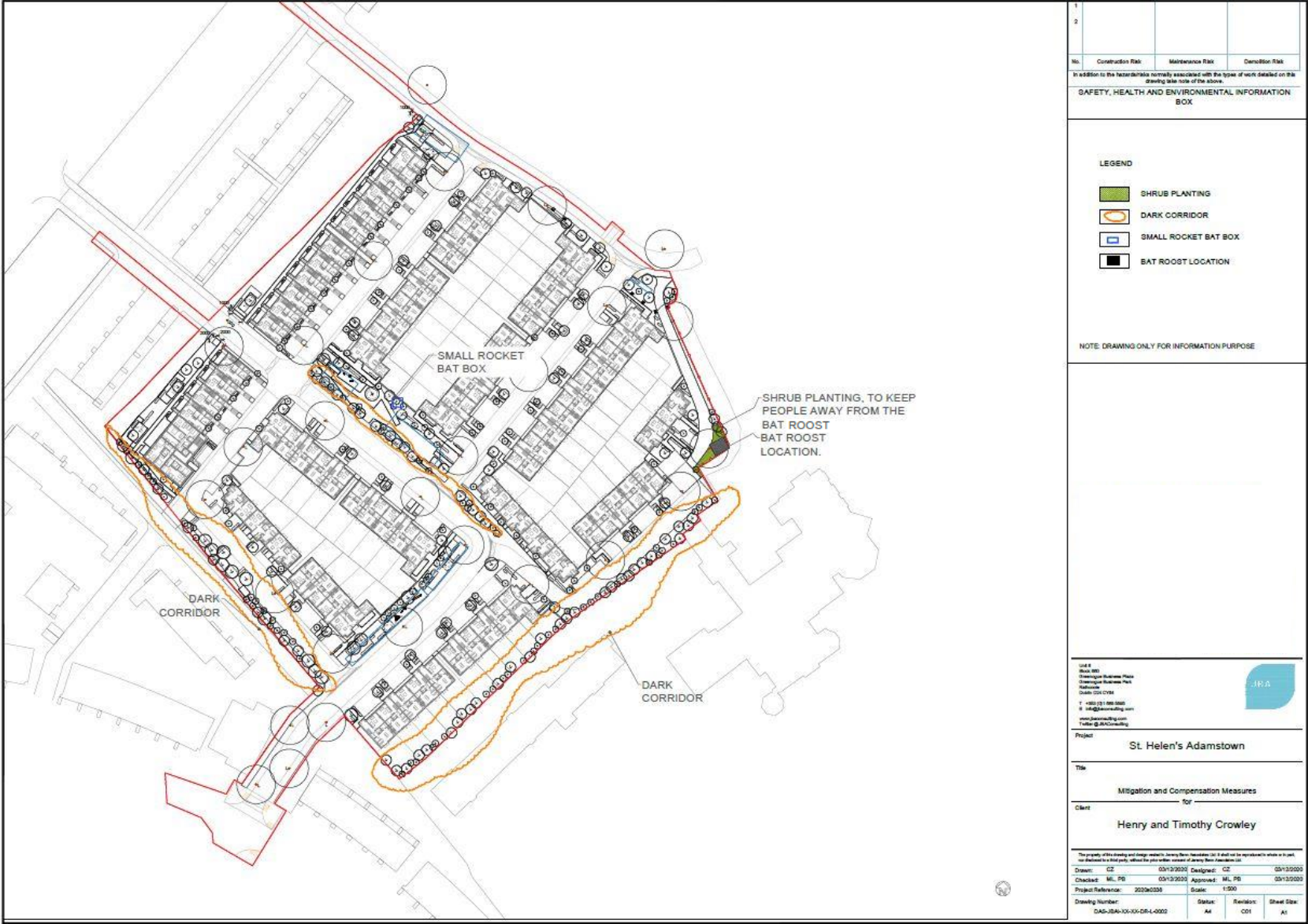


Figure 5-1: Location of bat roosts and vegetated dark corridors for commuting and foraging bats.

6 Residual Impacts

With the construction of compensatory maternity roost (in worst case scenario) and replacement of transitional roost with bat boxes, there will be no net loss of roosting features within the site.

Effects on bat commuting and foraging activity

There will be a net loss of foraging habitat within the site with the removal of woodland and grassland on site. This is expected to have a slight negative impact on a local level, but this is not expected to affect the conservation status of bat populations in the area. The proposed planting of treeline along the south-eastern and south-western boundary in combination with retaining a dark corridor will allow for bats to commute and forage along the site to some extent.

7 Conclusions

The proposed development site is frequently used by three species of bat. Common Pipistrelle is roosting in one of the buildings on site and a further four buildings could potentially provide maternity roost for bats. Common Pipistrelle, Soprano Pipistrelle and Leisler's Bat are foraging around the woodland and grasslands within the site and the boundary treelines provide commuting corridors. Two individuals of *Myotis* spp. were recorded during the surveys. In the absence of mitigation, the development will have a negative impact on the bats using the site.

The precautionary principal has been used, considering worst case scenario, when designing mitigation and compensation measures. A replacement maternity roost will be located along the south-east boundary of the site. The Lighting Design and Landscape Master Plan are incorporating dark corridors and treelines into the design to provide for commuting and foraging bats and maintain connectivity of the replacement roost with the wider landscape.

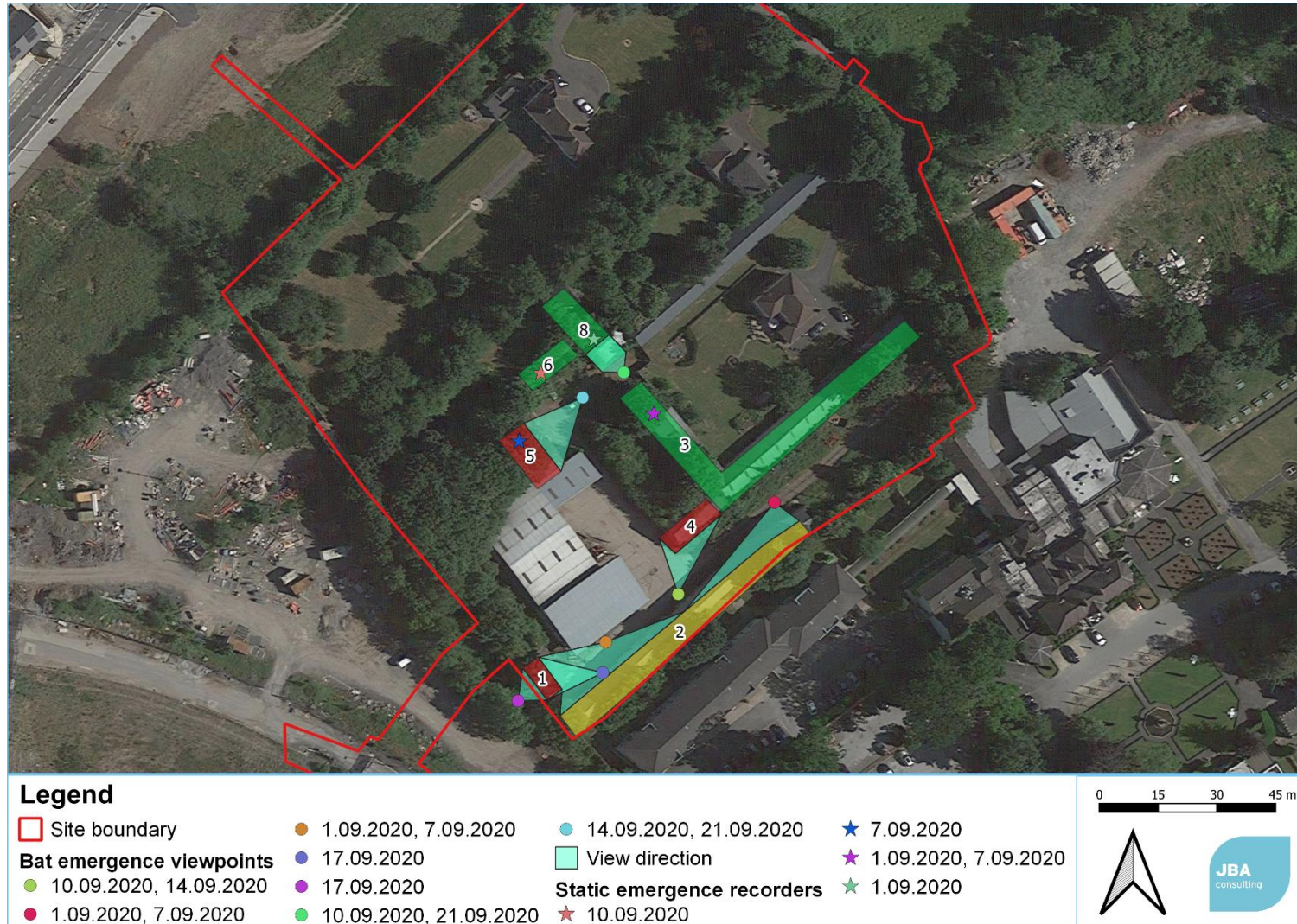
A bat derogation licence will have to be applied for and obtained by the NPWS before demolition of buildings with bat roosts. Further surveys are needed to determine the type of bat roost (maternity roost / transition roost) and location, which will inform the derogation licence application.

A precautionary approach has been applied in the impact assessment and design of mitigation. The mitigation measures provided consider a worst case scenario, where it is possible that a maternity roost with high conservation significance is present on site. Mitigation measures will be reviewed and revised following further surveys.

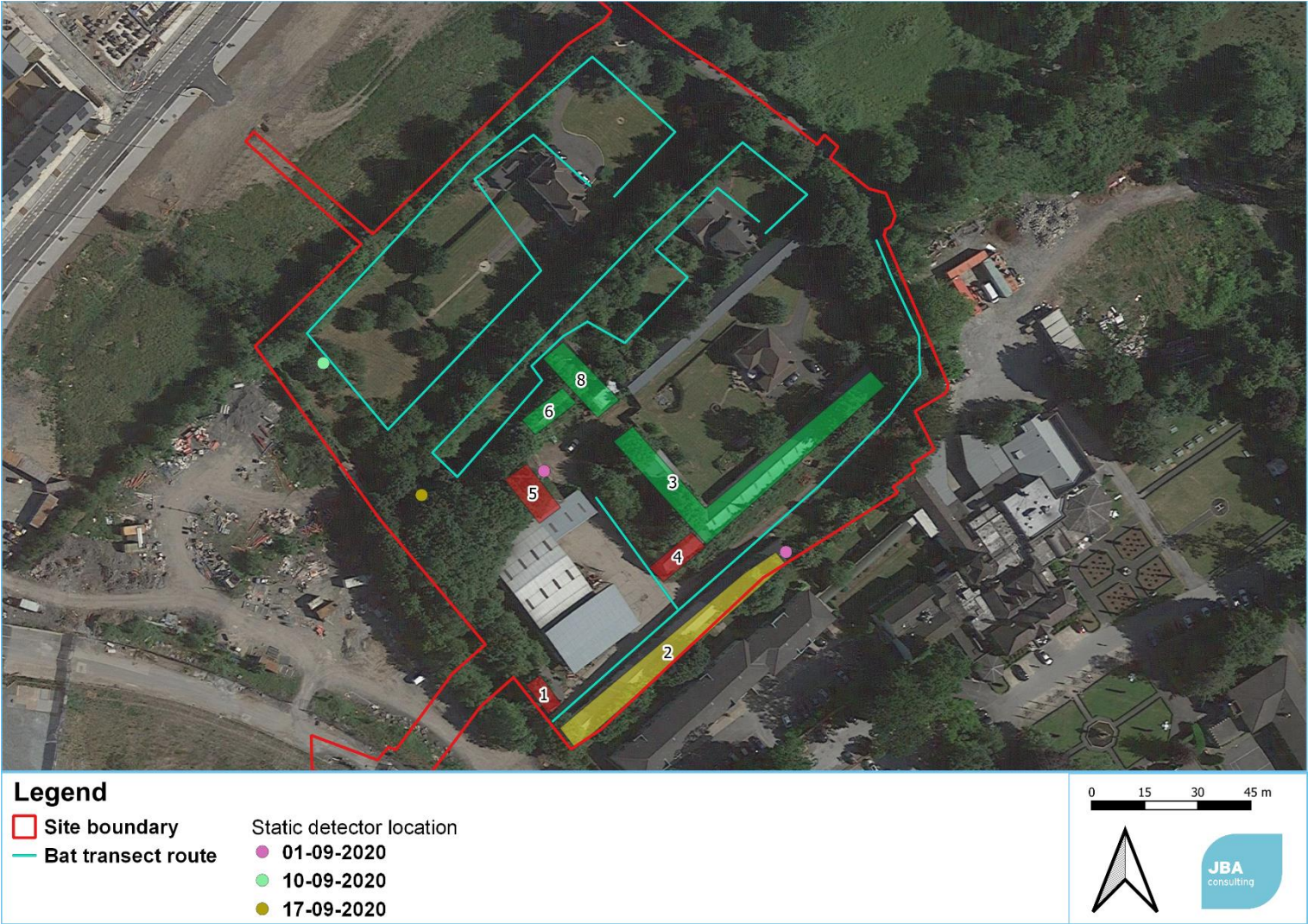
Appendices

A Emergence and activity survey locations

A.1 Viewpoints of the emergence survey and the location of the static recorders used for emergence surveys.



A.2 Transect survey routes and location of static recorders which were installed for a minimum of five nights.





Legend and Schedule of Materials

- PLANNING APPLICATION SITE BOUNDARY.
- PROPOSED BITUMINOUS MACADAM TO ENGINEERS SPECIFICATION.
- PROPOSED BITUMINOUS MACADAM WITH BUFF COLOUR CHIP TO ENGINEERS SPECIFICATION.
- PROPOSED IN-SITU CONCRETE WITH SELECTED FINISH.
- PROPOSED SELECTED PERMEABLE BLOCK PAVING.
- PROPOSED SELECTED LARGE FORMAT NATURAL STONE PAVING.
- PROPOSED SELECTED SMALL FORMAT PRECAST CONCRETE PAVING.
- PROPOSED SELF BINDING AGGREGATE PATH. AREAS WITH NO-DIG TREE ROOT PROTECTION SHOWN WITH PURPLE HATCH.
- PROPOSED SEATING.
- PROPOSED PUBLIC LIGHTING COLUMN. 6m CLEAR ZONE SHOWN IN DASHED LINE.

- ATTENUATION TANK BELOW GROUND TO ENGINEERS SPECIFICATION.
- PROPOSED LAWN.
- PROPOSED PRIVATE REAR GARDENS.
- PROPOSED UNMOWN GRASS WITH 20 WEEK FLOWERING BULB PLANTING MIX.
- PROPOSED GROUNDCOVER AND HERBACEOUS PLANTING.
- PROPOSED CLIPPED HEDGE PLANTING.
- PROPOSED NATIVE HEDGEROW PLANTING.
- PROPOSED TREE PLANTING.
- EXISTING TREE RETAINED AND PROTECTED IN ACCORDANCE WITH BS5837:2012 ORANGE DASHED LINE REPRESENTS RPA (ROOT PROTECTION AREA). PLEASE REFER TO TREE SURVEY AND ARBORICULTURAL IMPACT STATEMENT BY ARBORIST.

Schedule of Proposed Planting

Ref:	Quantity:	Species:
Pc	36	<i>Pyrus calleryana</i> 'Chanticleer' 4 x tr., wrb., 16-18cm g., clearstem 1.8m.
Bp	54	<i>Betula pendula</i> 4 x tr., wrb., 16-18cm g., clearstem 1.8m.
Qr	26	<i>Quercus robur</i> 3 x tr., wrb., 14-16cm g., standard.
Ps	33	<i>Pinus sylvestris</i> 4 x tr., wrb., 2m h., 1.5 m s.
Ia	25	<i>Ilex aquifolium</i> 3 x tr., wrb., 14-16cm g., feathered.
Ca	9	<i>Corylus avellana</i> 3 x tr., wrb., 1.8 - 2m h., multistem.
Cm	24	<i>Crataegus monogyna</i> 3 x tr., wrb., 1.8m - 2m h., multistem.
Ee	19	<i>Euonymus europaeus</i> 3 x tr., wrb., 1.2m - 1.5m h., multistem.
Rt	23	<i>Rhus typhina</i> 3 x tr., wrb., 1.2m - 1.5m h., multistem.

Ref:	Quantity:	Species:
Pa	7	<i>Prunus 'Accolade'</i> 3 x tr., wrb., 1.2m - 1.5m h., multistem.
Al	8	<i>Amelanchier lamarkii</i> 3 x tr., wrb., 1.2m - 1.5m h., multistem.
Psu	5	<i>Prunus subhirtella</i> 'Autumnalis' 3 x tr., wrb., 1.2m - 1.5m h., multistem.
Mk	15	<i>Magnolia kobus</i> 3 x tr., wrb., 14-16cm g., standard.
Qrs	1	<i>Quercus robur</i> (specimen) 6 x tr., wrb., 6m h., 40-45cm g., clear stem min. 2.2m

GROUNDCOVER AND HERBACEOUS MIX ALL-IRELAND POLLINATOR PLAN FRIENDLY, TYPICALLY:

- Anemone x japonica* 2 ltr cg.
- Dryopteris filix-mas* 2 ltr cg.
- Bergenia cordifolia* 2 ltr cg.
- Geranium* spp. 2 ltr cg.
- Hebeboris foetidus* 2 ltr cg.
- Luzula sylvatica* 2 ltr cg.
- Luzula nivea* 2 ltr cg.
- Echinacea purpurea* 2 ltr cg.
- Rudbeckia* spp. 2 ltr cg.
- Sedum* 'Autumn Joy' 2 ltr cg.
- Fragaria vesca* 2 ltr cg.

HEDGE PLANTING, TYPICALLY:	
Proposed clipped hedging planted at 300mm centres in single rows and 450mm centres in double staggered rows.	
<i>Fagus sylvatica</i> 900-1200mm h. <i>Carpinus betulus</i> 900-1200mm h. <i>Buxus sempervirens</i> 300mm h.	
Proposed native hedgerow to be planted as double staggered row at 1m centres. Species to be dispersed randomly within hedge:	
%	SPECIES:
40	<i>Crataegus monogyna</i> , 8-10cmg, min 2m h, feathered
15	<i>Corylus avellana</i> , 8-10cmg, min 2m h, feathered
15	<i>Prunus spinosa</i> , 8-10cmg, min 2m h, feathered
15	<i>Rosa canina</i> , 5lt cg.
15	<i>Prunus padus</i> , 8-10cmg, min 2m h, feathered

BULB PLANTING SPECIES, TYPICALLY:

- Narcissus* spp.
- Crocus* spp.
- Tulipa* spp.
- Galanthus nivalis*
- Hyacinthoides non-scripta*

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NOTES:

DATE	REV	DESCRIPTION	DRAWN BY	CHECKED BY
17.11.2020	A	Wide wide amendments.	ck	sc
30.11.2020	B	Wide wide amendments incorporating ecologists comments.	ck	sc

DERMOT FOLEY LANDSCAPE ARCHITECTS					
MALPAS STREET BLACKPITTS D08 D056 IRELAND T: +353 1 4545148 WWW.DERMOTFOLEY.COM					
CLIENT: HENRY AND TIMOTHY CROWLEY			ISSUE STATUS: PLANNING		
PROJECT: ST. HELEN'S ADAMSTOWN			DRAWING NO. REVISION		
DRAWING: LANDSCAPE PLAN			Cr.04-DR-201 B		
PROJECT NO	SCALE	SHEET SIZE	DRAWN BY	CHECKED BY	1st ISSUE
Cr.04	1:500	A1	ck	ks	06.11.2020



PROPOSED ESB
SUBSTATION
LOCATION

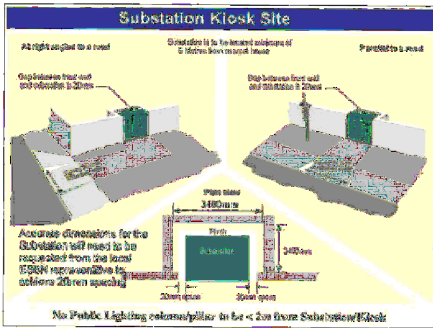
COMMUNAL OPEN SPACE WITH
INFORMAL SEATING AND PLANTING

PUBLIC OPEN SPACE
WITH LARGE
SPECIMEN TREE
PLANTING SEATING
INFORMAL PLAY FOR
TODDLERS AND
PLANTING

BAT ROOST
LOCATION. REFER TO
ECOLOGISTS
INFORMATION.

PUBLIC OPEN SPACE
WITH SEATING,
INFORMAL PLAY FOR
CHILDREN AND
PLANTING.

Key
● Luminaire C Column
● Luminaire D Column
● Beam Aiming Target
□ Photometric Centre
All dimensions in metres



General Notes:

- This drawing was designed to the following classes:
Class P2 for Generic Roadways
Class C3 for "Conflict Zones" i.e. Housing Estate entrance/exit
- Each lighting class is based on EN13201:2015 Standard for Road Lighting
- Luminaires & classes chosen were based on SDCC Public Lighting Specification 2016.
- All fittings are LED with dimming control as per SDCC requirements.
- All column types to be tubular type by Pilltown Engineering and shall be as per SDCC requirements.
- Pillar / ESB cabinet locations have not been included in this drawing as they are subject to NCA application and subsequent coordination with the ESB upon receipt of application.
- The contractor is to be aware that some elements contained in this drawings may be better viewed in colour and is intended to be viewed in colour.

REV	DATE	PLANNING ISSUE	SS	CD
01	12/20	AMENDMENT	DRN	CHK

PLANNING ISSUE

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Client: St. Helens, Adamstown

Project: Site Plan
Roadway Lighting Layout

Dwg. No: STH-AXE-22-22-08-E-60102

Job No: 20083

Scale: 1:500 @ A0

Status: -

Revision: **P01**

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