



ECOLOGICAL MONITORING AND SUPERVISION REPORT

MARLAY PARK CONCERTS 2018

MARLAY PARK, RATHFARNHAM, CO. DUBLIN.

Produced for Dún Laoghaire-Rathdown County Council

Project No.	Draft	Status	Author	Reviewed By	Approved By	Issue Date
180024	D01	Final	CC	PS	PS	26/10/2018

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1. INTRODUCTION AND SCOPE

1.1. OVERVIEW

Scott Cawley Ltd. ecological consultants were commissioned by Dún Laoghaire-Rathdown County Council to undertake ecological monitoring and supervision services within Marlay Park (see Figure 1) to facilitate the protection of ecological features during concerts at Marlay Park in 2018.

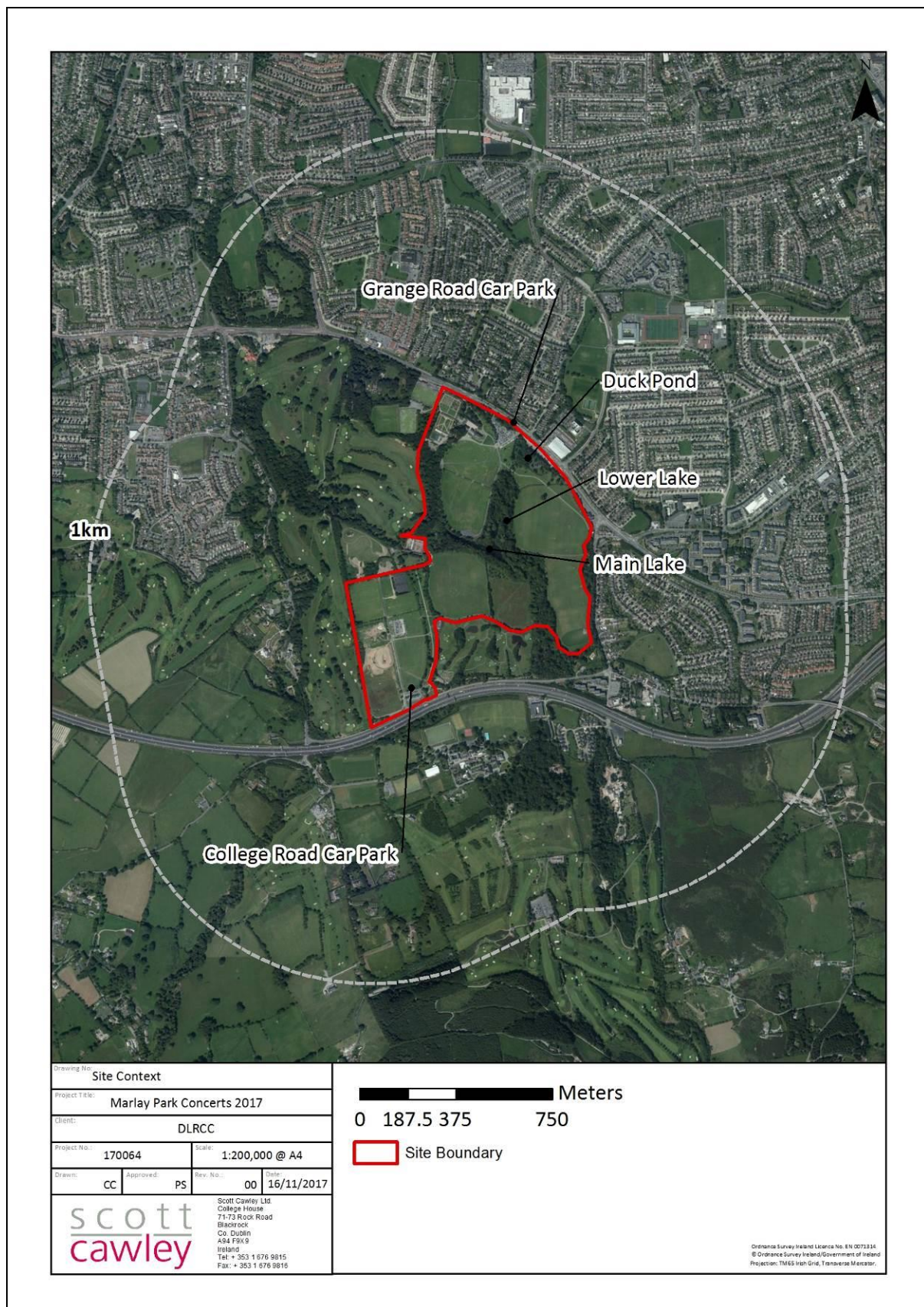
The ecological monitoring and supervision services were undertaken to comply with recommendations made within the previous report *Ecological Monitoring and Supervision Report Longitude 2017* (Scott Cawley, 2017). The services were also undertaken to ensure compliance with legislation protecting wildlife and minimise any potential impacts arising from the event.

1.2. SCOPE

The scope of the monitoring and supervision services in 2018 comprised the following:

1. Undertaking breeding bird checks within the Main Lake prior to the installation of pontoons crossing the lake;
2. Ongoing monitoring of nesting birds within the Main Lake before, during and after the concerts;
3. Supervision of the installation, relocation and removal of pontoons crossing the Main Lake;
4. Inspection of flood lighting orientation and organise re-orientation where necessary;
5. Survey of buildings and structures in the park for presence/absence of roosting bats;
6. Monitoring of bat activity before, during and after concerts by undertaking manual transects and filming bat activity at the Main Lake;
7. Monitor usage of bat boxes and installation of additional bat boxes within the park;
8. Checks of potential mammal resting places (badger setts and/or otter holts) for signs of activity and provision of recommendations to avoid any potential disturbance.

Figure 1: Event boundary in the context of Marlay Park and its surroundings.



2. BACKGROUND

Scott Cawley Ecologists monitored the event area throughout set-up, during and decommissioning of previous summer concert events in 2015, 2016, and 2017 within Marlay Park to ensure all environmental measures relevant to the ecological features were delivered.

Specifically, the following services have carried out the following since 2015:

- Baseline surveys over three years (2015 – 2017 inclusive) to establish the key ecological receptors of Marlay Park;
- Held meetings with the event organisers prior to the concerts to provide input to the design of the events to avoid significant impacts on the key ecological receptors;
- Site staff are advised of existing / new constraints each year by Scott Cawley;
- Provided recommendations in relation to protecting the key ecological receptors which have been implemented by Dún Laoghaire-Rathdown County Council and the event organisers;
- Provided monitoring of the key ecological receptors pre- and post-events on an ongoing basis;
- Carried out assessments of impact of the events on the key ecological receptors.
- Consulted with NPWS in relation to the assessments and monitoring.
- Liaised with Dún Laoghaire staff including Marlay Park staff.

The following recommendations with regards to event management, supervision and monitoring were made after the completion of monitoring surveys of Marlay Park Concerts in 2017 (Scott Cawley, 2017):

- Any further expansion of the events will be in open grassed areas rather than woodland to minimise need to fell trees or erect safety lighting close to previously undisturbed areas;
- Where an event requires lighting, an ecologist will be consulted for recommendations on suitability of lighting schemes at the pre-licencing stage. During the event set-up, an ecologist will be on-site to inspect lighting orientation and liaise with organisers to re-orient luminaries if required. Timing of lighting will be a consideration, and it is recommended that lighting be switched off outside of event hours. These measures are proposed in order to minimise potential impacts of lighting on bats within the park;
- Where events coincide with the season of peak activity for bats (*i.e.* between May and August), it is considered appropriate that an ecologist undertake manual surveys along the east woods, west woods and car parks transects on two nights prior to the proposed event, on the nights of the proposed event and on two nights subsequent to the proposed event. The purpose of this recommendation is to assess if the events are having any measurable effect on bat activity within the park. While previous surveys within the park found no evidence of changes to bat activity in response to events, it is considered appropriate to continuously analyse activity of these protected species;
- An ecologist will undertake video monitoring of Daubenton's bat activity on the main lake prior, during and after any proposed event to assess if the event if there is any change to species foraging behaviour;

- Breeding bird checks will be undertaken at least twice in advance of the set-up of any future events;
- Where nesting birds are identified within or adjacent to the footprint of proposed works (e.g. a temporary pontoon is required to be constructed within the Main Lake, and where nesting birds are within the vicinity), works will not be permitted until birds and their young have vacated their nests and breeding activity has ceased;
- Monitoring of breeding birds will be undertaken over the course of any future events;
- Consideration will be given to trimming back overhanging trees and removing aquatic plants near the pontoons to reduce the risk of waterfowl establishing nests in proximity to the pontoons; and,
- Opaque screening material will be erected along the sides of each of the pontoon fencing to prevent concert goers being seen from the lake.
- Checks and video monitoring of holes in river banks adjacent to works areas will be undertaken in the months prior to the commencement of events. It is recommended that these checks be undertaken at least one month in advance of any event to allow enough time to monitor for otter or badger activity;
- No works will be permitted within 50m of the resting place of a mammal protected under the *Wildlife Acts (as amended)* and/or the *Birds and Habitats Regulations (2011)*;

3. MONITORING OF LOCAL BAT POPULATIONS IN 2018

3.1. SURVEYS OF POTENTIAL ROOST SITES

In the 2017 survey season, internal inspections and roost presence/absence surveys were undertaken on several buildings within the vicinity of the concert events, including Marlay House, Laurelmere Cottage, and the Coffee Shop at the entrance to the Regency gardens. No evidence of roosting bats was identified during these surveys, nor indeed during previous surveys undertaken in 2015 and 2016.

In order to update the baseline information for the Park and to ensure that any potential sensitivities were identified before the events in 2018, pre-dawn roost presence/absence surveys were undertaken on other buildings within the park, namely Marley Grove House, Smith's Lodge, Stud Lodge and the Council Depot, and two stone bridges east and south of the main lake. Roost presence/absence surveys were repeated on Marlay House. Surveys were undertaken by Paul Scott and Colm Clarke of Scott Cawley in June 2018.

High levels of activity of Daubenton's bat *Myotis daubentonii* was noted at the stone arch bridge at the south-eastern corner of the main lake on 29th June 2018. While bats were not observed returning to the bridge on this occasion, the high levels of activity close to sunrise indicates that the bridge may be used as a roost by this species at other times. The bridge is outside the footfall of concerts and is not illuminated by artificial lighting for the duration of the events. No evidence of roosting bats was noted at any other structures or buildings within the Park in the 2018 season.

3.2. LIGHTING CHECKS

Bats are sensitive to increased illumination (Bat Conservation Ireland, 2010) and may avoid foraging in areas of strong lighting or may react adversely to lighting near roosts. In accordance with recommendations, an ecologist undertook inspections of lighting arrangements for the event in order to ensure minimisation of light pollution in potential foraging habitats (*i.e.* in woodlands and close to watercourses).

Lighting inspections were undertaken during set-up on 2nd and 8th July 2018, and adjustments of directionality of lights on the pontoon (illustrated in Plate 1) over the main lake were supervised. Light spill from a single pontoon light pointing east over the main lake was noted to correspond with a change in foraging activity of Daubenton's bats on the night of 8th July 2018. On this occasion, Daubenton's bats were noted to avoid foraging near the pontoon bridge in contrast to activity noted in 2016 and 2017. Following this observation, further adjustments were made to lighting on the pontoon in advance of concerts on 12th July 2018, and foraging activity of Daubenton's bat over the lake resumed to background levels near the pontoons.

Plate 1: Illumination of eastern pontoon in Marlay Park



3.3. MANUAL TRANSECT SURVEYS

As per previous years of ecological monitoring, manual transects of bat activity were undertaken within Marlay Park before, during, and after concerts to determine if bats are active within the same

areas as previous years, and to determine if the event is resulting in displacement of bats during concert nights.

Manual transect surveys were undertaken along three routes within the park. The routes were identical to those undertaken in 2016 and 2017 and are illustrated in Figure 2, Figure 3 and Figure 4 along with point data for surveys. They comprise the following:

1. East Woods – A 1km route beginning at the “duck pond” adjacent to the Grange Road car park in the north of the park, moving southwards past the lower lake, and skirting the main lake before ending in woods just west of the dog park in the southern part of the park;
2. West Woods – An 800m route beginning just south of Marlay House, passing through woods past Laurelmere and the main lake, before ending just south of the main lake; and,
3. Car Parks – A 700m route beginning south of the entrance to the model train track, passing west to the western boundary of the park, skirting this boundary and that of the current playground before ending at north of the entrance from the College Road.

Surveys commenced 30 minutes after sunset and were walked at a slow and steady pace (less than 3km/hour). The transects were undertaken by Colm Clarke and Maeve Maher-McWilliams. Surveyors used Elekon Batlogger M detectors, which record bat calls in addition to GPS information and temperature data.

Surveys were undertaken on:

- 28th, 29th June 2017,
- during the nights of the event on 14th, 15th and 16th July 2017,
- post-event on 27th July 2017,
- post-event on 30th August 2017.

The results for each transect have been summarised within Table 1.

Table 1: Results of manual transects in Marlay Park.

Location	Pre-Event		Event					Post-event			
	27 th June 2018	28 th June 2018	8 th July 2018	12 th July 2018	13 th July 2018	14 th July 2018	15 th July 2018	26 th July 2018	2 nd August 2018	29 th August 2018	30 th August 2018
East Woods	2 species	4 species	3 species	2 species	4 species	5 species	4 species	2 species	4 species	1 species	2 species
	22 passes	17 passes	51 passes	47 passes	28 passes	45 passes	17 passes	25 passes	39 passes	25 passes	13 passes
West Woods	2 species	4 species	2 species	Data not available	2 species	4 species	3 species	3 species	4 species	3 species	3 species
	9 passes	15 passes	6 passes		19 passes	23 passes	25 passes	17 passes	7 passes	5 passes	13 passes
Car Parks	-	1 species	2 species	Data not available	1 species	3 species	1 species	-	3 species	1 species	3 species
		4 passes	6 passes		5 passes	23 passes	15 passes		5 passes	3 passes	5 passes

Details of each survey are presented in Appendix 1 of this report.

Transect results have been organised by timing and illustrated in Figure 2, Figure 3, and Figure 4. Results are described in detail as follows:

1. East Woods

○ Pre-event nights:

- 27th June 2018: Two species of bat were recorded, with a total of 22 bat passes. Soprano pipistrelle bat *Pipistrellus pygmaeus* was most frequently encountered and accounted for 20 bat passes. Activity of this species was dotted along the transect route and concentrated between the Grange Road Car Park and the Lower Lake. Two passes of Leisler's bat *Nyctalus leisleri* were recorded in the southern part of the transect. This species is believed to have been foraging in the adjacent open space to the east of the woods.
- 28th June 2018: A minimum of four species¹ of bat were recorded with a total of 17 bat passes. Leisler's bat was most commonly encountered, with nine passes. It occurred in the area around the duck pond at the Grange Road Car Park and near the lower lake. Common pipistrelle bat *Pipistrellus pipistrellus* (two passes) were recorded close to the start of the transect adjacent to Marley Grove House. Soprano pipistrelle bat (three passes) were recorded at the duck pond beside the Grange Road Car Park, and again at the eastern end of the main lake. Three bat passes were attributed to species of the genus *Myotis*, of which two were most characteristic of Natterer's bat, while a single pass had affinities to whiskered bat.

○ Nights of the events:

- 8th July 2018: Three species with a total of 51 bat passes. Leisler's bat was the most commonly encountered species, with 42 passes occurring over most of the transects length. Soprano pipistrelle (seven passes) was recorded in the woods between the Grange Road Car Park and the main lake, and again towards the southern end of the transect. Calls with characteristics of whiskered bat (two passes) were recorded between the lower lake and the main lake.
- 12th July 2018: Two species of bat were recorded, with a total of 47 bat passes. Twenty-seven passes were attributed to Leisler's bat, which was recorded over clearings in the woods in the northern part of the transect. Twenty passes were attributed to soprano pipistrelle bat, and this species was noted in the area between the lower lake and the main lake, and again in the southern part of the transect.
- 13th July 2018: Four species and 28 passes. Seventeen passes were attributed to Leisler's bat, with activity concentrated on the area of the

¹ Natterer's bat *Myotis nattereri* and whiskered bat *Myotis mystacinus* are difficult to distinguish to species level based on call analysis and are therefore grouped together as 'bat species of the genus *Myotis*'.

transect between the lower lake and the main lake. Soprano pipistrelle bat (eight passes), was also encountered in this area of woodland, although with fewer passes. A single pass has been attributed to a species of the genus *Myotis* near the lower lake. Two passes were attributed to Daubenton's bat, which was observed foraging over the surface of the main lake.

- 14th July 2018: Five species were recorded, with 45 bat passes. Seventeen bat passes were attributed to Leisler's bat, with these recordings largely occurring in the southern half of the transect route, particularly on the eastern side of the main lake. Thirteen passes were attributed to common pipistrelle bat, the majority of which were recorded beside the duck pond south of the Grange Road Car Park, with a single pass at the southern end of the transect. Thirteen passes were attributed to soprano pipistrelle bat, with activity concentrated close to the Grange Road Car Park and again at the main lake. A single pass was attributed to Daubenton's bat and was recorded at the main lake. A single pass recorded at the southern end of the transect was identified as having characteristics of Natterer's bat.
- 15th July 2018: Four species were recorded, with a total of 17 bat passes. Eight bat passes were attributed to common pipistrelle bat. Activity for this species was recorded between the lower lake and the main lake, with some more activity recorded in the southern part of the transect. Four bat passes were attributed to soprano pipistrelle bat, occurring in similar locations to common pipistrelle bat.
- Post-event nights:
 - 26th July 2018: Two species of bat were recorded, with a total of 25 bat passes. Seventeen passes were attributed to soprano pipistrelle bat, with activity concentrated south of the duck pond near the Grange Road Car Park, and a second area of activity east of the lower lake. Eight passes of Daubenton's bat were recorded, all of which were from the eastern end of the main lake.
 - 2nd August 2018: Up to five bats species were recorded with 16 passes attributed to soprano pipistrelle bats, 5 common pipistrelle bat passes; 6 Leisler's bat passes, 10 Daubenton's bat passes and 2 *Myotis* species bat passes. Most bat activity was concentrated south of the duck pond near the Grange Road Car Park and near the viewing platform over the main lake.
 - 29th August 2018: Soprano pipistrelle bat was the only species encountered along the transect, with 25 passes. Recordings were made along the length of nearly the entire transect, commencing north of the lower lake. Activity was most frequent in the southern part of the transect.
 - 30th August 2018: Two species of bat were recorded, with a total of 13 passes. Twelve passes were attributed to soprano pipistrelle bat, with the species being noted at the between the lower and main lakes and in the southern part of the transect. A single bat pass was attributed to a species of

the genus *Myotis*, with characteristics of whiskered bat. This was recorded close to the end of the transect in the far south of the park.

2. West Woods

- Pre-event nights:
 - 27th June 2017: Two species of bat were recorded, with a total of nine passes. Eight of the nine passes were attributed to soprano pipistrelle bat and were recorded along the transect with concentrations near Laurelmere cottage. A single pass was identified as being Daubenton's bat *Myotis daubentonii*, which was recorded along the central part of the main lake.
 - 28th June 2018: Four species of bat were recorded, with a total of 15 passes. Five passes were attributed to soprano pipistrelle bat, which was recorded adjacent to the council depot, and again at the eastern end of the main lake. Common pipistrelle bat (1 pass) and a bat species with calls intermediate between common pipistrelle bat and soprano pipistrelle bat (two passes) were recorded within the vicinity of Laurelmere Cottage. Leisler's bat (five passes), was recorded at the start of the transect south of the regency gardens, and again towards the end of the transect. Two passes were attributed to a species of bat of the genus *Myotis*. These passes most closely resemble calls of whiskered bat and were recorded within woodland adjacent to the main lake.
- Nights of the event:
 - 8th July 2018: Two species of bat were recorded with a total of six passes. Seven passes were attributed to Leisler's bat, with activity at the start of the transect adjacent to the main stage of the concerts, and again near the main lake. A single pass attributed to common pipistrelle bat was recorded close to the end of the transect at the main lake.
 - 12th July 2018: Due to issues with the detector used on the west woods transect on 12th July 2018, recordings were not logged. Descriptions of bat activity here are based on observer notes. Activity along the west woods transect was low, with a single Leisler's bat noted near Laurelmere cottage, and a soprano pipistrelle foraging over the main lake at the end of the transect.
 - 13th July 2018: Two species of bat were recorded with a total of 19 bat passes. Twelve passes were attributed to soprano pipistrelle bat. There was a cluster of activity in the woods north of Laurelmere Cottage, and a second cluster of activity along the western part of the main lake. Seven bat passes were attributed to Daubenton's bat, which was observed foraging over the main lake.
 - 14th July 2018. Four bat species were recorded along the transect, with a total of 23 bat passes. Common pipistrelle (one pass) was recorded close to the start of the transect, while soprano pipistrelle (17 passes) was recorded

near Laurelmere Cottage. Leisler's bat (two passes), and Daubenton's bat (three passes) were recorded foraging over the main lake.

- 15th July 2018: Three species were recorded along the transect, with 25 passes. Thirteen bat passes were attributed to Leisler's bat, with activity concentrated along the western boundary of the park close to the start of the transect. Three passes were attributed to soprano pipistrelle bat, and the remaining nine passes were identified as being common pipistrelle bat. The recordings of both these species corresponded to the western part of the main lake.
- Post-event nights:
 - 26th July 2018: Three species of bat were recorded, with a total of 17 bat passes. Seven bat passes were attributed to soprano pipistrelle bat, and were recorded near Laurelmere cottage, and at the western end of the main lake. Recordings of Daubenton's bat (10 passes) were noted where the transect skirted the southern shore of the main lake.
 - 2nd August 2018: Four species of bat were recorded, with a total of seven bat passes. Two bat passes were attributed to Leisler's bat, which was recorded near Laurelmere house and foraging over the main lake. A single soprano pipistrelle bat pass and a single common pipistrelle bat pass were recorded near Laurelmere at the western end of the main lake. The remaining three calls were attributed to Daubenton's bat, which was observed foraging over the main lake surface.
 - 29th August 2018: Three bat species were recorded along the transect. Activity was located close to Laurelmere cottage and again at the main lake. A single brown-long eared bat pass was recorded in woodland south of the main lake, while two bat passes attributed to a species of the genus *Myotis* was recorded from the same locality.
 - 30th August 2018: Three species, with a total of 13 passes were recorded. Nine passes were attributed to soprano pipistrelle bats, with activity north of Laurelmere, and along the banks of the main lake. A single pass was recorded for brown long-eared bat adjacent to the main lake, and three passes were attributed to Daubenton's bat, recorded in the same area.

3. Car Parks

- Pre-event nights:
 - 27th Jun 2018: No bats recorded along the transect.
 - 28th June 2018: Four bat passes of common pipistrelle bat were recorded on this occasion and relates to activity along the western boundary of the park.
- Nights of the event:
 - 8th July 2018: Two species and a total of six passes were recorded. Four passes were assigned to soprano pipistrelle bat, with activity concentrated

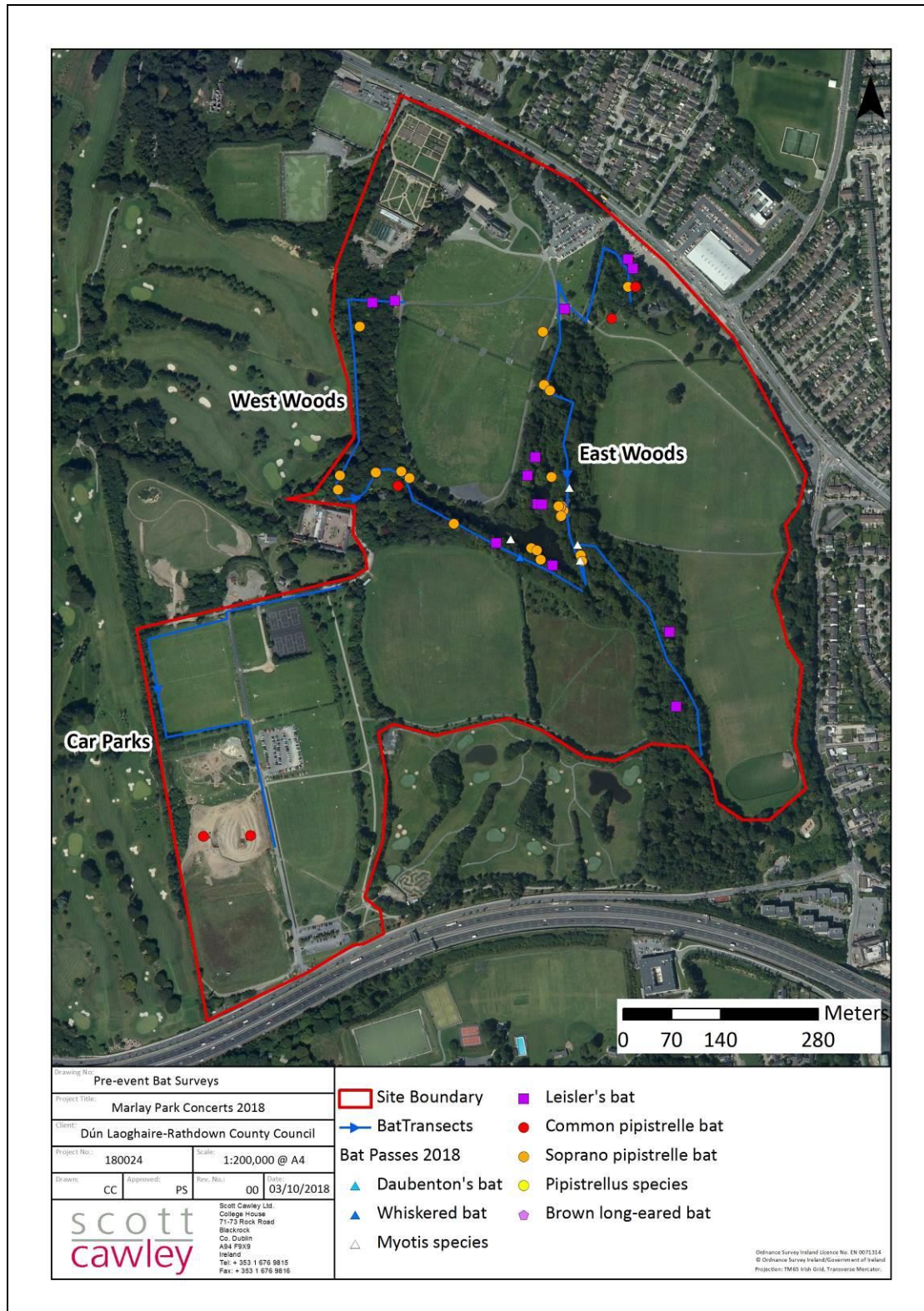
- between the tennis courts and the model railway. Two passes were assigned to Leisler's bat, with a single pass at the start of the transect close to the model railway, and a second pass along the western boundary of the park.
- 12th July 2018: Due to issues with the detector used on the west woods transect on 12th July 2018, recordings were not logged. Activity in the car park transect was confined to Leisler's bat activity over the car parks. No other species were heard along the route.
 - 13th July 2018: All five bat passes were attributed to Leisler's bat, which was foraging above the temporary car park.
 - 14th July 2018: Three species were recorded with a total of 23 bat passes. A single soprano pipistrelle bat pass was recorded at the start of the transect south of the council depot. Twenty bat passes were attributed to Leisler's bat, which were recorded flying over the temporary car park in the western part of the park. Two bat passes were attributed to common pipistrelle bats, which were noted foraging along the hedgerows that demarcates the western boundary between the park and Grange Golf Club.
 - 15th July 2018: One species, Leisler's bat, was recorded, with a total of 15 bat passes. Activity was concentrated in two clusters: Along the western boundary of the park with the neighbouring Grange Golf Club; and, adjacent to the playground in the southern part of the transect.
- Post-event nights:
 - 26th July 2018: No bats recorded along the transect.
 - 2nd August 2018: Three species of bat were recorded, with a total of five bat passes. All three species were recorded along the northern section of the transect, along a former roadway leading towards Whitechurch Road.
 - 29th August 2018: Three passes of soprano pipistrelle bat were recorded south of the model railway. No other species were recorded along the transect.
 - 30th August 2018: Three species were recorded, with a total of five bat passes. Two passes each were attributed to soprano pipistrelle and common pipistrelle bat. These recordings were located south of the model railway at the start of the transect. A single pass attributed to Leisler's bat was recorded along the western boundary of the park with the Grange Golf Club.

Visual observation of bats during the events was an important datum to collect, as "bat passes" is not an indication of numbers of bats or their behaviour. In the case of the East Woods transect, it was noted that small numbers (1-2) of pipistrelle bats were consistently found around the pond closest to the Grange Road and crossing the path towards the southern end of the transect, whilst Daubenton's bats were observed flying over the surface of the Main Lake on several occasions. At the West Woods transect, soprano pipistrelle bats were observed foraging at the start of the transect and close to Laurelmere Cottage and over the main lake. Daubenton's bat were frequently recorded foraging over the main lake on this transect.

In the case of the Car Park transect, activity was lower relative to other transects, with occasional pipistrelle bats foraging along hedgerows and other boundaries, particularly along the hedgerow separating Marlay Park from the Grange Golf Club.

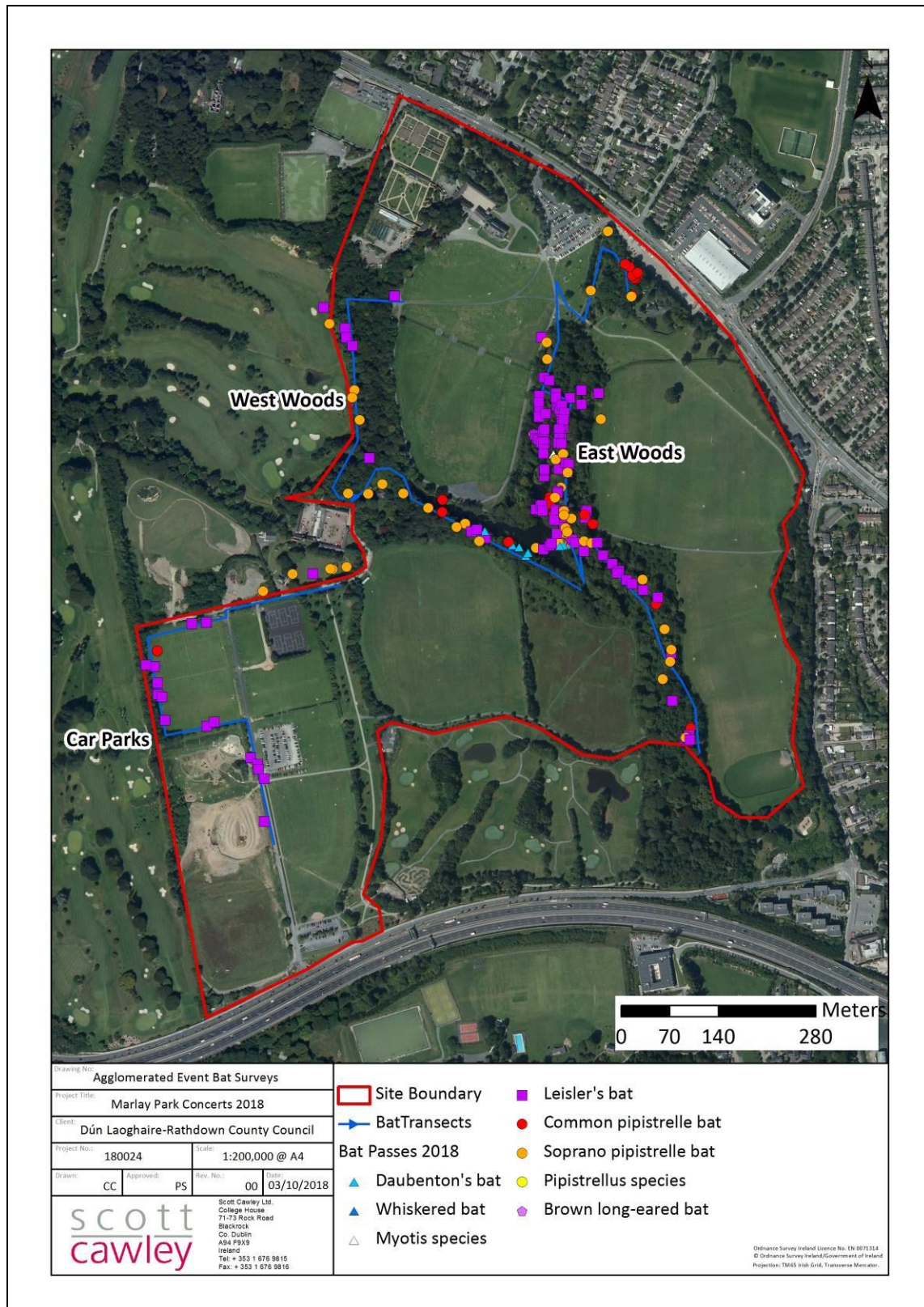
The levels of activity and areas of primary activity were similar to activity recorded in both 2016 and 2017 (pers. obs.), although the level of activity of Leisler's bat was high over the concert nights relative to pre-concert and post-concert nights.

Figure 2: Pre-event bat manual transect survey results (summation of data collected over two nights)²



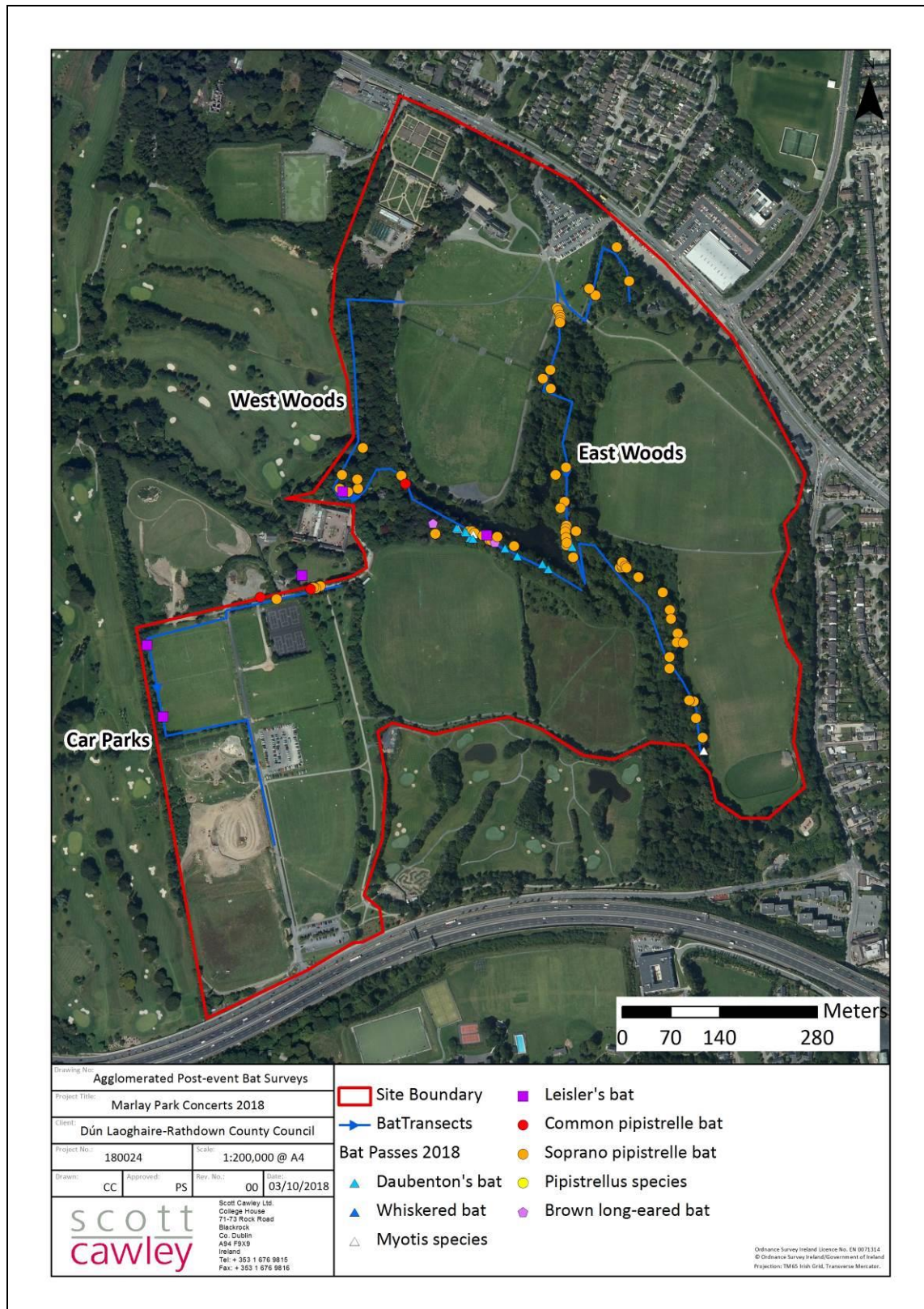
² It should be noted that some records are unmapped due to lack of GPS data accompanying point records. Additionally, several points have low-accuracy GPS data and therefore appear outside of the transect route area.

Figure 3: Results from the five event nights³



³ It should be noted that some records are unmapped due to lack of GPS data accompanying point records. Additionally, several points have low-accuracy GPS data and therefore appear outside of the transect route area.

Figure 4: Agglomeration of results of post-event manual transects (four nights)⁴.



⁴ It should be noted that some records are unmapped due to lack of GPS data accompanying point records. Additionally, several points have low-accuracy GPS data and therefore appear outside of the transect route area.

3.4. VIDEO MONITORING OF DAUBENTON’S BATS

The purpose of video monitoring was to inform the lighting design of the concert, and to ensure that lighting is not affecting foraging activity of Daubenton’s bat, a light-sensitive species, at the main lake within the park.

Bat activity was filmed under licence 013/2016 from the National Parks and Wildlife Service (NPWS) using a Canon XA20 with infrared illuminators and with the aid of a Batlogger M bat detector for the acoustic playback of bat echolocation calls. Filming was undertaken immediately after the completion of manual transects (*i.e.* commencing approximately one hour after sunset) on 28th June 8th, 12th, 13th, 14th, and 15th, July 2018 and 30th August 2018. Video footage was analysed, and activity has been converted into passes per fixed time (see Table 2). This consists of the number of times a bat entered the camera frame and is an indication of the overall level of activity recorded on the lake. Additional observations of activity are tabulated within Appendix 3 of this report.

Daubenton’s bats were observed feeding above the surface of the Main Lake on all survey nights, with between one and three bats observed feeding at the same time. Activity was relatively low on most survey nights, with the exception of 14th and 15th July 2018. Low levels of activity on 8th July 2018 may be partially explained by position of pontoon lighting, which resulted in some light spill onto the main lake. The direction of these lights was adjusted in the days following this, and there was an increase in activity observed on the following concert night (12th July 2018).

Table 2: Bat passes per 15 minute recording of Daubenton’s bat activity on Main Lake.

Pre-Event	Event				Post-Event	
28 th June 2018	8 th July 2018	12 th July 2018	13 th July 2018	14 th July 2018	15 th July 2018	30 th August 2018
2 passes	3 passes	8 passes	3 passes	15 passes	33 passes	5 passes

3.5. BAT SAMPLING

Following on from surveys in 2016 and 2017 (Scott Cawley, 2016; Scott Cawley, 2017), it was recommended that bat sampling be undertaken within woodland in the park to attempt to confirm the presence of certain bat species. Manual acoustic transects tend to under record species with quieter calls such as species of the genus *Myotis* and brown long-eared bat.

One night of sampling using a single harp trap and acoustic lure (Sussex Autobat playing a variety of synthetic calls) (under Section 35 Wildlife Act licence from the National Parks and Wildlife Service Ref 026/2016) was undertaken on 29th August 2018 following the completion of manual transects. The aim of this survey was to sample the local bat population to determine the age, sex and species of bats using the Park.

The surveys recorded soprano pipistrelle bat, Daubenton's bat, and Leisler's bat. All three species were male. The soprano pipistrelle bat which was caught at 21:45, was determined to be a non-breeding male based on its size, as was the Daubenton's bat, which was caught at 22:00. The Leisler's bat which was caught at 22:25, was a breeding male.

All three species were commonly encountered on surveys within the park over the 2018 season, and in previous years. While only three species were caught in traps on 29th August, it should be noted that this does not necessarily indicate absence of other species from the locality, rather it reflects the sample effort employed.

3.6. CONCLUSION ON IMPACT OF CONCERTS ON BATS

Based on the results of manual transects, video monitoring and bat sampling, there is no evidence of the concerts having a significant negative effect on bat activity within Marlay Park. Bats were observed to forage in similar areas of the park along transects before, during and after the concerts. Leisler's bat activity was elevated over the nights of the concerts when compared with nights before and after the concerts. Activity of other species was broadly similar throughout the survey period.

Surveys of the park undertaken in 2018 and in previous years have not identified the presence of any bat roosts within the concert area, *i.e.* roosts which could potentially be negatively impacted by lighting or other activities associated with the concerts. As concerts ceased at approximately 23:00 in 2018 and in previous years, and as the concerts occur close to the summer solstice, the amount of overlap between bat activity and the concerts is relatively short – approximately one hour. Furthermore, both acoustic and video evidence of bats foraging in areas close to the events indicate a degree of tolerance to the changes in lighting and noise associated with the events.

4. MONITORING OF BIRDS

4.1. PRE-EVENT SURVEYS

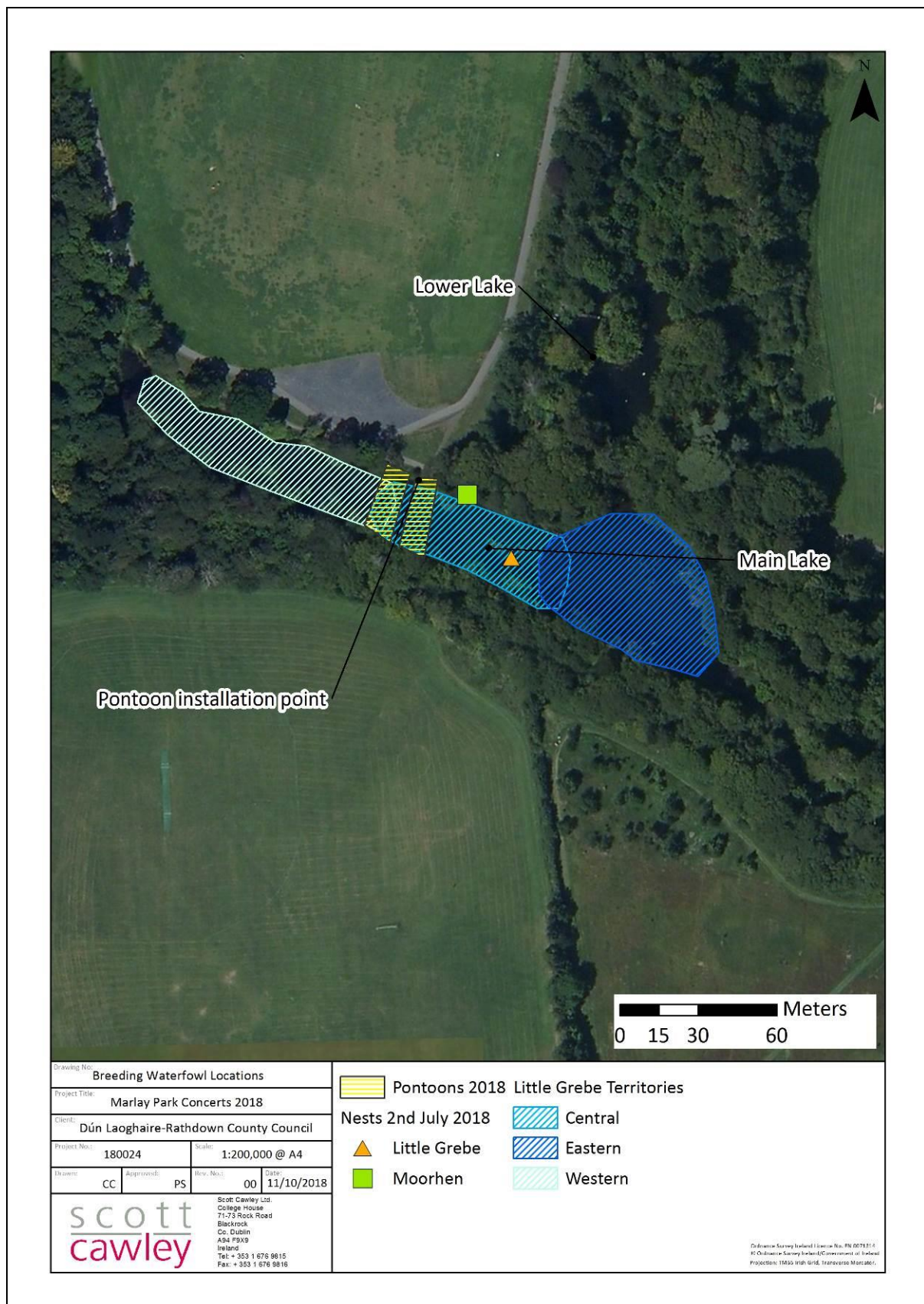
It was a recommendation of previous monitoring programmes that an ecologist undertake breeding bird checks at least twice in the three weeks prior to installation of pontoons crossing the Main Lake for the 2017 event. This recommendation was made to inform the positioning of infrastructure at the main lake for the 2018 event, and in light of the timing of works within the bird breeding season.

Pre-event bird activity at the Main Lake was recorded using a combination of direct sightings and identification of songs and calls on 29th March, 18th April, 21st June and 2nd to 8th July 2018.

Marlay Park hosts a range of bird species, including wetland species that forage and/or nest in the vicinity of the two artificial lakes in the centre of the park. Mallard, tufted duck, moorhen, coot and little grebe are resident or frequently occur on the lakes in the park and all except for tufted duck, breed with regularity in the park. As per previous years, three little grebe territories were identified on the Main Lake in 2018 (see Figure 5). Two pairs, those at the eastern and western ends of the lake, had hatched chicks by 2nd July 2018 and were no longer using any specific nest. The eastern pair were noted to be feeding a single well-advanced chick on 2nd July, while the western pair were observed with two well-advanced, albeit slightly smaller chicks. The central little grebe pair were observed performing courtship displays on 21st June 2018, and nest building in the middle of the lake on 2nd July 2018. This nest was located c. 30m east of the temporary pontoons erected for the concerts.

Two pairs of moorhen were noted nesting within the vicinity of the main lake. One nest was located in the northeast corner of the main lake beside a dry weir, while the second nest was in a willow tree adjacent to the concert pontoon. Chicks fledged from the nest beside the weir by the 2nd July 2018.

Figure 5: Location of nesting waterfowl and grebe territories in Marlay Park on 2nd July 2018.



4.2. MONITORING AND SUPERVISION OF WORKS ON THE MAIN LAKE

As previously recommended, ecologists supervised the installation, relocation and removal of temporary pontoons installed at the Main Lake for the event to ensure the protection of birds and their nests. The results of monitoring are presented in detail as a bird observation diary in Appendix 4 of this report, and are summarised below:

Ecological monitoring consisted of observations of activity on and adjacent to the lakes between 2nd July and 18th July 2018 considering the presence of nesting birds close to the pontoon crossing location. Further checks were undertaken on 26th July and 2nd August 2018.

On the days of the concerts, mallard and other waterfowl on the main lake moved towards the eastern shore, away from the concert area, suggesting a response to noise and/or increased human activity. The number of birds on the lake remained stable over the period of the concerts. Pedestrian movement on the pontoons was screened from birds on the main lake by the installation of opaque hoarding to a height of 1.8m.

Several moorhen pairs successfully raised chicks within the main lake in the 2018 nesting season, including a pair that nested immediately adjacent to the pontoon.

With regards to the little grebes nesting on the lake, the central pair were closest to the pontoons crossing the lake, having nested within 30m of the pontoon location. The installation of the pontoons on 10th July 2017 did not appear to result in a negative response from the adult birds. A pair of eggs were observed within the nest on 10th July 2018, and it is likely that these were laid during on either 9th or 10th July 2018 *i.e.* between the first and second concert dates. The grebes remained on the nest throughout the concert setup, operation and decommissioning. The nest remained active until after the pontoons were removed from the site on 18th July 2018, with adult birds sitting on eggs. However, checks of the lake undertaken on 26th July 2018 and 2nd August 2018 failed to locate the nest, and it is considered likely that the nest was abandoned or failed for reasons unknown in the days immediately after decommissioning of the pontoons on the lake. Considering the birds' occupancy on the nest throughout the setup and removal of pontoons, it is considered unlikely that disturbance from activity associated with the concerts contributed to the failure of the nest.

Following the outcomes of bird monitoring surveys, recommendations have been made for any potential future events in the park, which will further reduce the risk of causing disturbance to nesting birds.

5. MONITORING OF OTHER MAMMALS

Scott Cawley Ecologists have recorded signs of otters within Marlay Park including sprainting posts (territorial scent marking locations) and have recorded otter on camera between the Main Lake and the Lower Lake in 2016 and 2017. Holes along river banks in the park were monitored by camera prior to the commencement of the event in 2018, however no otter activity was recorded at any of these and therefore no otter holts (underground resting places) have been confirmed from within the park in recent years.

Active badger setts (underground resting places) are known from three locations within the park and feeding signs have also been recorded from the park.

Both species are afforded protection in Ireland under the *Wildlife Acts (as amended)*, and additionally through the *Birds and Habitats Regulations (2011)* in the case of otter.

5.1. VIDEO MONITORING OF OTTERS

To assess use of the site by otter over the concert period and in accordance with previous recommendations, passive video monitoring of otter activity was undertaken between the Main Lake and the Lower Lake before, during, and after the concert.

Remote infrared motion-triggered cameras (one Bushnell HD Trophy Camera, and One Spyware Camera) were deployed at two locations within the park that are known to be otter sprainting posts:

1. Under the concrete bridge north of the Lower Lake; and,
2. Under a bridge separating the Main Lake and the Lower Lake.

Cameras were deployed for 59 nights between 2nd July 2018 and 30th August 2018.

An otter was recorded on the camera between the Main Lake and the Lower Lake on three nights over the survey period. These were 10th August 25th August and 29th August 2018. On these occasions, an individual otter was observed marking territory either by sprainting (defecating) or by rubbing its scent glands against rocks. Otter were not recorded at the location at any other time over the survey period.

Based on evidence from both 2016, 2017 and 2018, when cameras were deployed for an extended period, otter appear to only occasionally visit sprainting posts within the park. In Ireland, otter are known to hold territories along rivers of between 1.5km to 12.3km length (Reid *et al.*, 2013). It is possible that the territory within the park represents a small part of an otter territory within which otter are only intermittently active.

5.2. SUPERVISION OF WORKS IN RELATION TO PROTECTED MAMMALS

To ensure that security barriers inserted in-stream were passable for otters, they were inspected by an Ecologist. Checks of otter holts and badger setts prior to the event were also undertaken to verify that no new resting places are present and that no works be undertaken within 50m of any badger setts. An inspection was undertaken by Colm Clarke of Scott Cawley on 12th July 2018 to check the temporary bridge in the East Woods. All bridges inspected had Heras fencing secured to the deck area only, with no impediments to passage along the stream below.

No new setts or holts were identified within the park. All works within the park were in excess of 50m of badger setts.

6. CONCLUSIONS

As a result of the pre-event baseline surveys and implementation of mitigation measures before and during the event in Marlay Park in 2018, it was concluded that there were no significant adverse effects on the biodiversity within the Park. Impacts were recorded at a temporary, localised individual scale with reactions from certain waterfowl temporarily negatively reacting to concert goers. It was clear that after the event had finished there was a swift restoration to normal

behaviour and distribution of birds. Similar to previous years, bat populations did not seem to be adversely affected with bats feeding and flying in the same areas before, during and after the event. The diversity of bird and mammal species using the Park (several of which would be sensitive to disturbance) would also suggest that there are unlikely to have been long-term impacts from previous events.

7. RECOMMENDATIONS

Whilst it was concluded that there were no significant adverse effects on the biodiversity within the Park, it was considered appropriate that a set of recommendations be made in relation to any future events to be undertaken within the park in order to further protect wildlife. In particular how short-term acute disturbance during specific times in the events can be minimised or avoided altogether.

7.1. PROTECTION OF BATS

Monitoring surveys undertaken in 2018 found that bats continued to use the park throughout the concert nights, including Daubenton's bat, which was observed foraging on the Main Lake adjacent to a temporary illuminated pontoon. The following recommendations are considered appropriate for the protection of bats during future events at the Park:

- Any further expansion of the events will be in open grassed areas rather than woodland to minimise need to fell trees or erect safety lighting close to previously undisturbed areas;
- Where an event requires lighting, an ecologist will be consulted for recommendations on suitability of lighting schemes at the pre-licencing stage. During the event set-up, an ecologist will be on-site to inspect lighting orientation and liaise with organisers to re-orient luminaries if required. Timing of lighting will be a consideration, and it is recommended that lighting be switched off outside of event hours. These measures are proposed in order to minimise potential impacts of lighting on bats within the park;
- While there does not appear to be any adverse significant effects on bat activity during concerts, there may be some benefit to continuing manual surveys along the east woods, west woods and car parks transects to gain long-term data on bat activity within the park.

7.2. PROTECTION OF BREEDING BIRDS

Surveys of the park prior to the event in 2017 identified several birds nesting within the Main Lake, including a pair of little grebes which nested within 30m of a pontoon constructed for the 2018 event. Notwithstanding their proximity to the pontoon, the activity associated with the concerts did not appear to have an adverse effect on the nesting grebes. Nonetheless, and considering the protected status of birds and their nests, the following recommendations are made:

- Breeding bird checks will be undertaken at least twice in advance of the set-up of any future events;
- The location of bird's nests within the main lake will inform the design and location of pontoons within the lake;
- Monitoring of breeding birds will be undertaken over the course of any future events;

- Consideration will be given to trimming back overhanging trees and removing aquatic plants near the pontoons to reduce the risk of waterfowl establishing nests in proximity to the pontoons; and,
- Opaque screening material will be erected along the sides of each of the pontoon fencing to prevent concert goers being seen from the lake.

7.3. PROTECTION OTHER MAMMALS

Surveys of the park undertaken in 2017 found no evidence of otter resting places, and no changes to badger resting places. The following recommendations are considered appropriate for continued compliance with legislation protecting mammals and their resting places during future events:

- Checks and video monitoring of holes in river banks adjacent to works areas will be undertaken in the months prior to the commencement of events. It is recommended that these checks be undertaken at least one month in advance of any event to allow enough time to monitor for otter or badger activity;
- No works will be permitted within 50m of the resting place of a mammal protected under the *Wildlife Acts (as amended)* and/or the *Birds and Habitats Regulations (2011)*;

8. REFERENCES

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APPENDIX 1: BAT SURVEY DATES AND SURVEYORS

Survey Date	Sunset Time	Transect Walked	Start	Finish	Surveyor	Bat Detector	Temperature (degrees Celsius)
27/06/2018	21:57	East Woods	22:27	22:53	Laura Higgins	Batlogger 2578(M)	17-18C
27/06/2018	21:57	West Woods	22:27	22:43	Colm Clarke	Batlogger 3081(M)	16-18C
27/06/2018	21:57	Car Parks	22:50	23:05	Colm Clarke	Batlogger 3081(M)	16C
28/06/2018	21:57	East Woods	22:27	22:53	Paul Scott	Batlogger 3081(M)	19-20C
28/06/2018	21:57	West Woods	22:27	22:43	Colm Clarke	Batlogger 2578(M)	19-20C
28/06/2018	21:57	Car Parks	22:47	23:02	Colm Clarke	Batlogger 2578(M)	19-20C
08/07/2018	21:52	East Woods	22:22	22:52	Lauren Shinkwin	Batlogger 2486(M)	20-21C
08/07/2018	21:52	West Woods	22:22	22:35	Shea O'Driscoll	Batlogger 3074(M)	21-23C
08/07/2018	21:52	Car Parks	22:37	22:55	Shea O'Driscoll	Batlogger 3074(M)	20-21C
12/07/2018	21:49	East Woods	22:19	22:52	Colm Clarke	Batlogger 2578(M)	17-18C
12/07/2018	21:49	West Woods	22:19	22:38	Kate-Marie O'Connor	Batlogger 3081(M)	17-18C
12/07/2018	21:49	Car Parks	22:50	23:05	Kate-Marie O'Connor	Batlogger 3081(M)	17-18C
13/07/2018	21:48	East Woods	22:18	22:50	Lauren Shinkwin	Batlogger 2486(M)	15-16C
13/07/2018	21:48	West Woods	22:18	22:40	Shea O'Driscoll	Batlogger 2578(M)	15-16C
13/07/2018	21:48	Car Parks	22:43	22:54	Shea O'Driscoll	Batlogger 2578(M)	14-15C
14/07/2018	21:47	East Woods	22:17	22:42	Caroline Kelly	Batlogger 2486(M)	20-21C
14/07/2018	21:46	West Woods	22:17	22:34	Colm Clarke	Batlogger 2578(M)	20-21C
14/07/2018	21:46	Car Parks	22:40	22:52	Colm Clarke	Batlogger 2578(M)	20C
15/07/2018	21:46	East Woods	22:16	22:43	Lauren Shinkwin	Batlogger 2486(M)	17-18C
15/07/2018	21:46	West Woods	22:16	22:32	Shea O'Driscoll	Batlogger 2578(M)	18-19C
15/07/2018	21:46	Car Parks	22:36	22:44	Shea O'Driscoll	Batlogger 2578(M)	19C
26/07/2018	21:31	East Woods	22:01	22:30	Lauren Shinkwin	Batlogger 2486(M)	19C
26/07/2018	21:31	West Woods	22:01	22:17	Maeve Maher-McWilliams	Batlogger 2578(M)	20C
26/07/2018	21:31	Car Parks	22:21	22:35	Maeve Maher-McWilliams	Batlogger 2578(M)	19
02/08/2018	21:19	East Woods	21:49	22:14	Paul Scott	Batlogger 2578(M)	22C
02/08/2018	21:19	West Woods	21:49	22:04	Colm Clarke	Batlogger 3081(M)	22C
02/08/2018	21:19	Car Parks	22:06	22:19	Colm Clarke	Batlogger 3081(M)	21-22C
29/08/2018	20:22	East Woods	21:00	21:26	Colm Clarke	Batlogger 2578(M)	16-19C
29/08/2018	20:22	West Woods	21:00	21:21	Maeve Maher-	Batlogger 2486(M)	14-15C

					McWilliams		
29/08/2018	20:22	Car Parks	21:26	21:38	Maeve Maher-McWilliams	Batlogger 2486(M)	13C
30/08/2018	20:19	East Woods	20:49	21:12	Colm Clarke	Batlogger 2578(M)	15C
30/08/2018	20:19	West Woods	20:49	21:03	Maeve Maher-McWilliams	Batlogger 2486(M)	14C
30/08/2018	20:19	Car Parks	21:06	21:19	Maeve Maher-McWilliams	Batlogger 2486(M)	13-14C

APPENDIX 2: MANUAL TRANSECT DATA


APPENDIX 3: ANALYSIS OF VIDEO FOOTAGE OF DAUBENTON'S BAT ON MAIN LAKE

Date Recording	& Time	Recording and description
28/06/2018	01:43-01:48	Pipistrelle bat flies towards camera and exits at centre
	02:35-02:38	Pipistrelle bat heard but not visible on screen
	03:39-03:42	Pipistrelle bat heard but not visible on screen
28/06/2018	00:38-00:40	Pipistrelle bat heard but not visible on screen
	01:50-01:55	Daubenton's bat heard but not visible on screen
	02:07-02:12	Two Daubenton's bats enter from right and pass over camera. One pipistrelle bat heard but not viewed.
	03:30-03:38	Pipistrelle bat heard but not visible on screen
	04:25-04:32	Leisler's bat heard but not visible on screen
08/07/2018	02:55-03:00	Single Daubenton's bat flies from left of screen to right towards pontoon
	03:40-03:50	Single Daubenton's bat flies from right frame across to left of camera
	04:20-04:25	Single Daubenton's bat flies from right of camera to left of camera.
	04:40-04:50	Pipistrelle bat heard off camera
	05:18-05:21	Daubenton's bat heard but not seen on camera
	05:30-05:32	Leisler's bat heard off camera
	05:45-05:48	Daubenton's bat heard off camera
	06:20-06:25	Daubenton's bat heard off camera
	06:40-06:50	Daubenton's bat heard off camera
12/07/2018	00:18-00:23	Single Daubenton's bat flying towards pontoon from left of camera
	00:50-01:10	Single Daubenton's circling over lake in front of camera and adjacent to pontoon.
	01:15-01:20	Single Daubenton's bat flies towards camera from centre of frame.
	03:10-03:15	Daubenton's bat flies across screen from left to right.
	03:40-03:50	Daubenton's bat heard off camera
	03:55-04:10	Pipistrelle bat heard off camera
	08:01-08:08	Single Daubenton's bat flies from left to right across frame
	08:20-08:26	Single Daubenton's bat flies from left to right across frame
	08:52-08:56	Single Daubenton's bat flies from left to right across frame
	13:30-14:01	Daubenton's bat heard off camera initially, before briefly coming into field of view on left side of frame.
13/07/2018 MVI_0090.MP4	00:00-00:005	Daubenton's bat flies from centre frame to left of camera
	01:20-01:55	Leisler's bat heard off camera
	02:00-02:17	Leisler's bat heard off camera
	03:00-03:20	Single Daubenton's bat flying over water in centre of frame before exiting at right.

		Concurrently, Leisler's bat heard off camera
	03:55-04:10	Leisler's bat social calls heard off camera
	04:38-04:45	Leisler's bat heard off camera
	05:55-06:15	Daubenton's bat heard off camera
	06:25—06:34	Daubenton's bat flies from right background to centre frame, and then exits above frame. Leisler's bat can also be heard off camera.
	07:05-07:22	Leisler's bat heard off camera
	08:40-08:47	Leisler's bat heard off camera
	09:05-09:10	Daubenton's bat heard off camera
	12:30-12:38	Single Daubenton's bat foraging over lake in centre frame before exiting at left.
	13:20-13:28	Daubenton's bat heard off camera
	14:00-14:20	Pipistrelle and Leisler's bat calls heard off camera
14/07/2018	01:10-01:22	Single Daubenton's bat flies from left frame to right frame and returns.
	02:25-02:35	Daubenton's bat heard off screen
	02:38-02:42	Leisler's bat heard off screen
	04:00-04:12	One, and then two Daubenton's bats cross in front of camera and forage between camera and pontoon
	05:40-06:00	Single Daubenton's foraging over lake between camera and pontoon
	06:25	Daubenton's bat heard off camera
	09:14-09:25	Daubenton's bat heard off camera
	10:25-10:35	Single Daubenton's bat foraging above lake in background
	11:40-11:50	Single Daubenton's bat foraging over lake moving from right to left across screen
	12:15-12:25	Leisler's bat heard off camera
	13:15-13:20	Single Daubenton's bat foraging
	13:50-14:00	Leisler's bat heard off camera
15/07/2018	00:00-00:25	Leisler's bat heard off camera
	00:37-00:40	Daubenton's bat heard off camera
	00:47-00:54	Daubenton's bat initially only heard, then enters camera at left before looping back at centre screen and exiting at left
	01:05-01:20	Daubenton's bat heard off camera
	02:40-02:45	Daubenton's bat heard off camera
	02:55-03:15	Two Daubenton's bats fly across lake in front of camera and loop and return twice
	05:47-05:58	Single Daubenton's bat flies into frame, loops around lake and exits frame at left
	06:52-07:00	Single Daubenton's bat circling lake
	07:35-07:42	Leisler's bat call heard off camera
	08:15-08:18	Leisler's bat call heard off camera

	10:05-10:39	Two Daubenton's bats circle over lake in front of camera, exiting frame to right before returning and exiting to left.
	10:52-11:38	Two Daubenton's bat foraging circling over lake in front of camera
	12:30-13:42	Single Daubenton's bat flies across screen from right to left. Leisler's bat also heard.
30/08/2018	00:00-02:40	Single pipistrelle heard off camera then appears several times over the course of the recording. Ongoing social calling.
	06:20	Daubenton's bat heard briefly but not observed foraging over lake.
	06:44-07:20	Two Daubenton's bat circle in front of camera several times from left of frame

APPENDIX 4: BIRD OBSERVATION DIARY

Date	Observation
29/03/2018	<p>Six little grebes on main lake. Birds observed protecting same territories as previous years, <i>i.e.</i> western, central and eastern territories.</p> <p>29 Mallard, two tufted duck, one black-headed gull and six moorhens observed on main lake.</p> <p>Lower lake contained two mute swans, three mallard and two moorhen.</p> <p>Rooks observed setting up nests in trees around main lake, particularly in vicinity of Laurelmere Cottage.</p> <p><i>Plate 2: Tufted ducks on main lake, 29th March 2018</i></p> 
18/04/2018	<p>Western grebe pair have nesting platform in dense vegetation approximately 40m west of proposed pontoon location. Pair are not sitting on nest, but were observed performing courtship display. Single adult of central pair observed on this occasion only, displaying within area of proposed pontoons.</p> <p>37 mallard counted on lake, as well as two tufted duck, and three moorhens. No signs of eastern pair of little grebes.</p> <p>Rooks and jackdaws are nesting extensively in trees around the lakes.</p>
21/06/2018	<p>Six little grebes observed on main lake. Eastern pair nesting near end of fallen tree at southern side of the lake close to a former coot nest from 2017. One hatched chick observed. Probably only a day or two old, as not leaving the nest and staying under parents wings.</p> <p>Wester little grebe pair noted with two chicks on their back. Being fed by parents and periodically entering the water. Central pair still courtship displaying although no signs of any chicks or a nest.</p> <p>Moorhen noted nesting in the northeast corner of the main lake near a dry weir. The nest is shrouded by dense vegetation. A second pair of moorhens is nesting in a tree east of the proposed pontoon location although there are no signs of chicks.</p> <p>Approximately 45 mallard counted in the main lake, along with one heron.</p>

02/07/2018	<p>Three Pairs of Little Grebe present (same as last year) and holding territory. One pair attending two well-advanced young at west end and a pair attending one well-advanced young at east end. Middle pair noted to be constructing a nest platform about 30m east of proposed pontoon position, considerably further away from pontoon than their site last year, nest sited in open area about 12 metres out from bank towards middle of lake. Two Moorhen pairs attending two young each, one pair at west side and another pair at east side, again these Moorhen young are fairly well grown. In the adjacent smaller lake with Island a Moorhen pair present with three fledged and fully grown young.</p> <p>Mallard numbers fairly consistent through day with 51 noted at 10.30hrs and 55 noted at 12.30hrs. Three fledged young Mallard with the flock, indicating successful breeding from earlier in season. Two Mute Swan on main lake staying mainly towards east end (Non-breeding males). Also one Male Tufted Duck, 2 Grey Heron present on lake. Other bird species recorded included Treecreeper, Black-headed Gulls (peak count of 13), Bullfinch, Blackcap, Woodpigeon, Robin, Dunnock, Coal Tit and Blue tits.</p>
03/07/2018	<p>Middle Little Grebe pair noted during day to be sitting on nest platform, and still nest building, nest still empty. Still three Little Grebe chicks between east and west ends and being attended by parents. Moorhen pairs with 2 chicks each still present west and east ends. Being attended by parents. Male Tufted Duck still present and peak count of 60 Mallard at 09.45hrs. Two Mute Swan still at east end. Three well-grown Moorhen chicks noted in smaller lake. Other species noted during day, Grey Wagtail, Treecreepers, peak numbers of Gulls being four Herring Gull and 11 Black-headed Gull at lunchtime. Floating pods were entered into the pontoon area by crew later in evening.</p>
04/07/2018	<p>Construction of decking etc. placed over pods started at 8.00 am, this possibly caused the two Little Grebe chicks and attendant parents to move farther down to the west end due to the associated noise. However seemingly doing fine. Middle pair still placing nest material on nest platform during the day. East end pair still feeding single chick. Two Moorhen chicks and parents still present either side of pontoon area and seemingly not put off by pontoon construction. Peak Mallard count 62 at 11.15hrs. Two Mute Swan and male Tufted Duck still present. Railings added to pontoon later in day, construction largely finished.</p>
05/07/2018	<p>At west end Little Grebe chicks and parents still present and doing well, also Moorhen pair and two chicks (even feeding between the two pontoon gangways!). A Moorhen was noted possibly nest building under the overhanging vegetation in very west end corner. One male Tufted Duck west end also. At east end central Little Grebe pair sitting on nest for periods. Little Grebe pair still attending chick at east end. Peak Mallard count of 56 at 10.50hrs. Two Mute Swan and a Grey Heron also at east end. In lower lake three well-grown Moorhen young and two adults still present. Other bird species noted included Treecreeper, Blue tit, Blackcap, Woodpigeon, Black-headed gull (peak count of six) and one Lesser black-backed Gull. A flyover Raven also seen.</p>
06/07/2018	<p>Moorhen pairs with two chicks still present east and west of pontoon, as were the Little Grebe pairs attending two chicks at the west end and one chick at the east end. Pair still in middle at nest platform. Peak Mallard count of 62 at 14.40hrs. Other bird species noted during day included the two Mute Swan, two Crossbill feeding in Scot's Pine, one Redpoll and a Treecreeper. No works on pontoon during the day until the evening when screening (black tarp largely obscuring activity on pontoon from lake sides) and extra Heras fencing erected.</p>

	No significant disturbance noted. After tarp screening was erected it was notable that birds started feeding closer to pontoon.
07/07/2018	Little Grebes still attending young on either sides of pontoon. And middle pair occasionally sitting on nest platform. Also the two Moorhen pairs with their two chicks each present. Notable again was the close proximity the Little Grebes fed to the pontoon during the day since tarp erected, coming within just a couple of metres of it. Male Tufted Duck still west end. Other species noted included the two Mute Swans, one Grey Heron, Magpie, Hooded Crow, Coal Tit, Mistle Thrush, two Grey Wagtail, Woodpigeon, Robin, Raven (1), Treecreeper, Crossbill (2), Swallow, Long-tailed Tit, a single Coot was a new arrival at the east end.
08/07/2018	<p>On site from 13.00hrs to 21.00hrs. Scott-Cawley staff also outside these time attending to bat surveys etc.</p> <p>Both Moorhen pairs with their respective two chicks present at east and west ends, as were both Little Grebe pairs with two chicks at west end and one at east end. Two Mute Swan still at east end. Peak Mallard count of 41 noted (drop in number probably due to the now restriction of public access around lake and thus reduction in feeding.</p> <p>16.45hrs Public access across pontoon opened, 17.02hrs middle pair of Little Grebes leave nest, due in probability to the public pausing on pontoon causing some disturbance, however bird returned to nest platform within three minutes.</p> <p>17.10hrs Notable on west side that the Moorhen pair and chicks and Little Grebe pair and chick were feeding with 10m of pontoon despite all the new activity on pontoon.</p> <p>17.18hrs Middle birds more settled, less signs of stress (neck stretching <i>etc.</i>) despite heavy traffic of people crossing.</p> <p>17.40hrs Birds left nest, again returned in three minutes.</p> <p>17.45hrs Little Grebe pair on west side still feeding within 10m of pontoon.</p> <p>17.58hrs Music commences, no noticeable reaction from birds on either side of pontoon.</p> <p>18.15hrs Birds on west side still settled (this side is closest to music volume).</p> <p>18.30hrs Mallard count of 48 on site (birds not appearing to leave site so far).</p> <p>1900-2000hrs Middle pair of Little Grebes still attending nest, sitting <i>etc.</i>, seemingly not put off by concert activities.</p> <p>20.30hrs Birds still close to pontoon on west side, one adult even noted to be roosting. Middle pair still at nest and east end pair attending chick.</p>
09/07/2018	Forty-five mallard observed on eastern side of pontoon. Approximately 10 mallard west of pontoons. Eastern little grebe pair observed feeding their one chick. Central pair on nest, occasionally adding additional material to the nest. Western little grebe pair feeding two chicks right next to the pontoons.
10/07/2018	<p>Central little grebe pair with two eggs on nest. Spotted by CC at 17:40 during changeover between birds. Western little grebe pair feeding two chicks close to the pontoons. Eastern little grebe pair still with single chick.</p> <p>Moorhen family with two well-grown chicks feeding within vicinity of pontoons. Peak count of 54 mallard on main lake.</p>
11/07/2018	Central little grebe pair remain on nest and changeover periodically. Eastern and western little grebe pairs observed feeding chicks throughout day. Peak count of 54 mallards on main lake.

<p>12/07/2018</p>	<p>Middle Little Grebe pair have since last visit laid two eggs, Colm noticing these first on 10/07/18.</p> <p>13.30hrs bird incubating, covering nest/eggs with vegetation when occasionally briefly leaving nest (of own accord).</p> <p>Two Mallard chicks noted by earlier in day on west side were new arrivals. Located at 14.05hrs on west side and present thereafter.</p> <p>14.30hrs Count of 47 Mallard noted, mainly east end.</p> <p>Both Little Grebe pairs east and west with attendant chicks noted throughout.</p> <p>One Moorhen chick at east end being attended by parents, also two Mute Swan still.</p> <p>16.00hrs Two eggs visible in middle Little Grebe pair's nest.</p> <p>16.30hrs Count of 46 Mallard noted.</p> <p>16.37hrs Noise levels on site increasing substantially, Middle Little Grebe on nest showing some signs of stress, neck stretching etc.</p> <p>16.50hrs Now three Moorhen chicks at west end being attended by three adults (appears the east end chicks got spilt up). Single Moorhen chick still at east end.</p> <p>17.15hrs Pontoon access opened to public.</p> <p>17.30hrs Switch over at middle Grebe nest noted. No obvious signs of disturbance noted.</p> <p>19.00hrs two Little Grebe chicks resting on bank on west side midway down and settled. Two Mallard feeding 6m west of pontoon. Thirty-three Mallard counted on site.</p> <p>20.00hrs Middle Little Grebe pair still settled at nest.</p> <p>21.10hrs Main stage a loud pyrotechnics display caused disturbance to crow roost in trees along west end (c.1000 mixed flock of Rook and Jackdaw). Birds appear to leave site. Grebes etc. unaffected.</p> <p>Some other species noted during day include nine Crossbill, Treecreeper and Goldcrest feeding young around lake.</p>
<p>13/07/2018</p>	<p>13.20hrs Count of 47 Mallard on the site.</p> <p>13.30hrs Public start crossing pontoon, Little Grebe on nest platform settled.</p> <p>14.25hrs Heineken stage to the west starts up, now noise levels high from both sides. Little Grebe on nest platform showing some signs of stress, however remains on nest. Now three Mallard present at west end.</p> <p>15.00hrs Both Little Grebe pairs attending young at east and west ends normally. Middle pair still attending nest and settled.</p> <p>16.50hrs Count of 47 Mallard again on site. East end Little Grebe pair building a platform, and still attending single chick.</p> <p>17.15hrs Moorhen pair feeding a single chick at west end (second chick not seen), and two Mallard still at west end.</p> <p>18.15hrs Middle Little Grebe pair still settled at nest.</p> <p>20.15hrs Changeover at middle Little Grebe nest observed. No major disturbance incidences noted during evening. Other bird species noted include a Grey Heron, two Mute Swan, a Grey Wagtail. Peak count of 8 Black-headed Gulls</p>
<p>14/07/2018</p>	<p>Pontoon opens to public traffic at 13.30hrs. Little Grebe pair and two chicks still west end,</p>

	<p>and pair with single chick east end. Colm filming middle pair on nest to 14.45hrs, changeover observed at 14.48hrs, no significant disturbance issues to report. A single Mallard chick still at west end. Moorhen pair at east end attending a single chick now.</p> <p>15.30hrs Little Grebe attending two young 15m west of pontoon, during period of very heavy traffic over pontoon. Female Mallard attending one west end also.</p> <p>15.38hrs Moorhen pair attending 2 young 20m west of pontoon.</p> <p>14.50hrs Security staff reported to me that they observed a Magpie predate a Mallard chick at the lookout platform at east end.</p> <p>15.57hrs Mallard count of 54 birds. A female now attending five newly appeared chicks at east end.</p> <p>16.20hrs Little Grebe pair attending one young still east end and Moorhen pair attending one young east end. two Mute Swan still at east end.</p> <p>16.40hrs Mallard count of 58 noted.</p> <p>19.00hrs Middle Little Grebe pair still incubating no disturbance issues, count of 59 Mallard noted.</p> <p>19.40hrs Mallard count of 70 noted.</p> <p>20.15hrs Little Grebe on nest incubating, all looking okay.</p>
15/07/2018	<p>13.30hrs Pontoon opens, Little Grebe pair incubating looking relaxed. Three Grey Heron at east end and two Mediterranean Gulls dropped in briefly to main lake.</p> <p>14.30hrs Both Little Grebe pairs with young west and east end looking fine, no disturbance issues. One Mallard chicks still at west end.</p> <p>15.25hrs Changeover noted at Little Grebe nest, all okay. Two Moorhen with one well-grown young in small lake. Two Mute Swan still main lake.</p> <p>17.30hrs Count of 49 Mallard. Little Grebes at nest still settled and other two pairs feeding young. Moorhen still tending one young west end. Some Moorhen young not located today but possibly in cover.</p> <p>18.15hrs Female Mallard with five chicks now in small lake.</p> <p>19.40hrs Mallard count of 49 on site. All three Little Grebe pairs behaving normally.</p> <p>20.35hrs Grebe pairs all still settled.</p> <p>Other bird species noted, Goldcrest (family group), Treecreeper, peak count of seven Black-headed Gull.</p>
17/07/2018	<p>Central little grebe pair still sitting on nest although no signs of chicks hatching. Spotted checking eggs at 16:00. Pontoon removal commences at 14:00 with removal of decking from western pontoon first. One adult and one chick of western little grebe pair noted at 15:45 near pontoon. Other chick and adult at far western end of lake. No signs of mallard chicks.</p> <p>Eastern pair of little grebes noted feeding their single chick. Peak count of 39 mallard at 16:13, although some may be out of view under trees. Moorhen pair with three chicks east of pontoon. Tufted duck female observed diving west of pontoons.</p> <p>16:19 Works begin on east pontoon with removal of part of opaque screen. Little grebe on nest with head raised and alert. Remains on nest throughout works.</p> <p>16:40 Removal of heras fencing – some head movement of grebe but remains on nest throughout.</p> <p>17:00 Removal of decking on eastern pontoon. Bird (little grebe) appears to be acclimatised</p>

	to presence of humans. Head tucked into chest.
18/07/2018	11:00 Central little grebe pair remain on nest. Western pair feeding right up to pontoon edge. Only pontoon floats for eastern pontoon remain and are removed by lunchtime.
02/08/2018	Count of 52 mallard on main lake. Lake levels have risen relative to the concert period. Central grebe pair holding territory although nest has been abandoned and there are no signs of chicks, suggesting that the nest failed or the chicks were lost. Of western little grebe pair, only a single adult is noted, although chicks are likely to have fledged at this stage. Five moorhen noted in lake, including single well-grown juvenile.