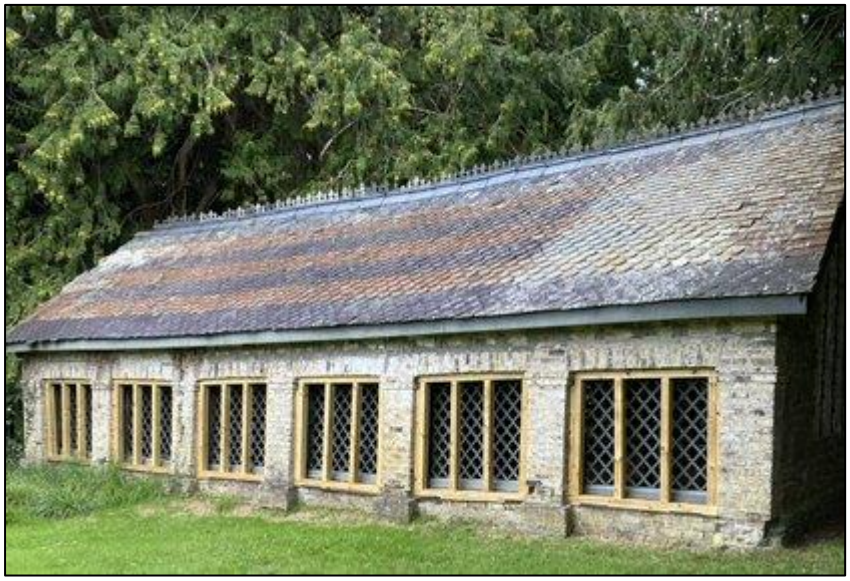
November 2024

Bat Survey Report

In support of a Derogation Licence for Restoration Works on an Unstable Building Structure



On behalf of

Comhlacht na Feirme Ltd.

at Abbeyleix Estate, Abbeyleix, Laois

MALONE O'REGAN ENVIRONMENTAL

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In support of a Derogation Licence for Restoration Works on an Unstable Building Structure

Comhlacht na Feirme Ltd.

at Abbeyleix Estate, Abbeyleix, Laois

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1 INTRODUCTION

1.1 Background

Malone O'Regan Environmental ('MOR Environmental') was commissioned by Comhlacht na Feirme Ltd. ('the Applicant') to undertake an assessment of the boathouse building ('the Boathouse') due to be restored and reconstructed at Abbeyleix Estate, Abbeyleix, Co. Laois (OS Reference ITM 641910 683159) (Planning Ref: 23/65). This assessment was carried out based on the results of a report prepared by Russell Environmental & Sustainability Services ('RESS') in October 2021, which found a bat roost present in the Boathouse and concluded that a derogation licence would be required before construction works could commence.

Table 1-1 outlines the relevant observations / recommendations for this report.

Table 1-1: Observations from RESS, 2021 [1]

Subject	Observations / Recommendations
Bat Survey Results	*'Bats were found in the building itself and bats were seen to exit from under the slates and eaves at dusk and after with re-entry at dawn. >15 Soprano Pipistrelles Bats were identified with the Echo Meter Touch 2 and seen to light sample in the house at dusk and dawn. A number of other bat species were seen in the environs. Leisler`s bat (Nyctalus leisleri), Common Pipistrelle (Pipistrellus pipistrellus) and Daubenton`s Bat (Myotis daubentoni).*
Bat Roost Presence	*'Roost location: In roof apex/under slates.'* *'There is evidence that bats are currently present in the building and in the roof apex and there are a number of other species present in the environs.'*

1.2 Purpose of this Report

Conditional planning permission was granted by Laois County Council on 23rd April 2023 for the deconstruction and reconstruction of the Boathouse (Planning Ref: 23/65) (the 'Development').

A building inspection and desk-based review in February 2023 confirmed the potential for roosting bats within the Boathouse. A derogation licence was applied for the Development in May 2023, and rejected due to 'insufficient data to support the issuing of a licence'.

This report details the data that has been collected since May 2023 to aid in determining suitable mitigation measures for bats potentially impacted by works associated with the Proposed Development.

The location of the Development ('the Site') is shown in Figure 1-1.

Figure 1-1: Site Location

1.3 Reasons for the Restoration Works

The Boathouse is a registered protected structure (RPS No.: 090_N) and a listed structure on the National Inventory of Architectural Heritage ('NIAH', Ref No.: 12802949). The Boathouse is a freestanding six-bay single-storey boathouse that was in circa ('ca.') 1850, with yellow brick piers and open gable ends located within the Abbeyleix demesne, along the River Nore [2]

Due to subsidence, the Boathouse is not in use and is structurally unsound with leaning walls, as described in the Structural Condition Survey Report and Proposed Methodology prepared by PUNCH Consulting Engineers in 2023. This report further states that immediate intervention is required to prevent the collapse of this structure.

The Development is required to ensure the preservation of this protected structure. These works will also ensure that the Boathouse can provide a long-term suitable habitat for bats.

1.3.1 Description of the Reconstruction and Restoration Works

The restoration and reconstruction works will consist of the deconstruction of the existing above-ground structure (including shallow foundations) and the reconstruction of the structure, including:

- Construction of a new piled limecrete ground beam;
- Installation of new supporting steel sub-structure;
- Reconstruction of masonry sub-structure and timber roof structure by reusing existing materials;
- Re-roofing using new clay tiles to match existing;

- Refurbishment of porch door;
- New window timber latticework;
- New land drains along perimeter of walls;
- Refurbishment of iron railings; and,
- Associated site works.

The Development will aim to be completed in ca. 4-6 months. The Boathouse is in urgent need of intervention in order to prevent the potential collapse of this structure. Should the Boathouse collapse without appropriate measures in place, this could result in debris entering the adjacent channel and River Nore, which could potentially impact European sites adjacent and downstream of the Site and their conservation objectives, as well as result in the loss of the protected structure. A revised schedule of works is proposed, and works are to be scheduled within the winter months.

1.4 Relevant Legislation

All Irish bat species are protected by law under the Wildlife Act 1976 and its subsequent amendments. They are afforded full protection under this act, which makes it a criminal offence for anyone without a licence to:

- Kill, injure or handle a bat;
- Possess a bat (whether alive or dead);
- Disturb a roosting bat; and,
- Damage, destroy or obstruct access to any place used by bats for shelter, whether they are present or not.

In addition to domestic legislation, bats are also protected under the EU Habitats Directive (92/43/EEC). All Irish bats are listed in Annex IV of the Habitats Directive, and the lesser horseshoe bat is further listed under Annex II, which makes it an offence to:

- Deliberately capture, injure or kill any bat; o
- Deliberately disturb a bat, in particular any disturbance which is likely:
    - (a) To impair their ability:
        - (i) To survive, to breed or reproduce, or to rear or nurture their young; or,
        - (ii) To hibernate or migrate.
    - (b) To significantly affect the local distribution or abundance of the bat species; or,
- Damage or destroy a breeding site or resting place of a bat.

Therefore, the destruction, alteration or evacuation of a known bat roost is a notifiable action under current legislation and a derogation license must be obtained from the National Parks and Wildlife Service (‘NPWS’) before works can commence.

Furthermore, it should also be noted that any works interfering with bats and especially their roosts, including, for instance, the installation of lighting in the vicinity of the latter, may only be carried out under a license to derogate from Regulation 23 of the Habitats Regulations 1997, (which transposed the EU Habitats Directive into Irish law) issued by NPWS.

1.5 Statement of Authority

This report was reviewed and approved by Mr. Dyfrig Hubble, Associate Director – Ecologist. Dyfrig has a B.Sc. (Hons) in Tropical Environmental Science and an M.Sc. in Environmental Forestry. Dyfrig is a full member of the Chartered Institute of Ecology and Environmental Management. Dyfrig has over 18 years' experience working in the ecological consultancy sector including habitat appraisals and specialist species specific surveys. Dyfrig has extensive experience in undertaking a variety of bat surveys including dawn / dusk surveys, transects, static monitoring, harp trapping, Lesser Horseshoe roost counts. Dyfrig has also worked on numerous projects that have required supervision of building demolition and tree removal works under licence. These projects have included work both in the UK and Ireland.

Stephanie Lonergan, Environmental Consultant, has a B.A. (Mod) (Hons) in Environmental Science. Stephanie is a qualifying member of the Chartered Institute of Ecology and Environmental Management ('CIEEM') with a particular interest in bat ecology and conservation. Stephanie has completed courses on bat ecology, identification, handling, biometrics and mitigation with CIEEM and Bat Conservation Ireland. Stephanie has undertaken training run by Wildlife Acoustics for analysis of bat calls in Kaleidoscope Pro Software and regularly uses this programme within her role at MOR Environmental. Stephanie has experience undertaking bat surveys and tree / building assessments and regularly attends events held by local bat groups.

1.6 Description of Irish Bat Species

There are eleven recorded bat species in Ireland, nine of which are considered resident and two which are considered vagrants [3] (Please see Table 1-2 below).

Table 1-2: Status of Irish Bat Species

Bat Species	Irish status	European Status
Resident Bat Species		
Soprano Pipistrelle *(Pipistrellus pygmaeus)*	Least Concern	Least Concern
Brown Long-eared Bat (*Plecotus auritus)*	Least Concern	Least Concern
Common Pipistrelle (*Pipistrellus pipistrellus)*	Least Concern	Least Concern
Lesser Horseshoe Bat (*Rhinolophus hipposideros)*	Least Concern	Near Threatened
Whiskered Bat *(Myotis mystacinus)*	Least Concern	Least Concern
Daubenton's Bat *(Myotis daubentonii)*	Least Concern	Least Concern
Lesser Noctule *(Nyctalus leisleri)*	Least Concern	Least Concern
Nathusius' Pipistrelle *(Pipistrellus nathusii)*	Least Concern	Least Concern
Natterer's Bat *(Myotis nattereri)*	Least Concern	Least Concern
Vagrants		
Brandt's bat (*Myotis brandtii*)	Data Deficient	Least Concern

Greater Horseshoe Bat (*Rhinolophus ferrumequinum)*	Data Deficient	Near Threatened

1.6.1 Types of Bat Roosts

Bats were originally cave and tree-dwelling animals, but many now use buildings to roost within. Buildings are highly important as roosting sites for all Irish bat species as they use buildings for all roost types. Most significant in terms of roosts in buildings are maternity roosts, but cellars and attics can serve as hibernation sites for bats. Roosts within buildings can far exceed the numbers encountered in trees, bridges, caves or cliffs and roosts of over 1,000 bats have been recorded in buildings [4].

Bats are social animals, and most species congregate in large colonies during the later spring / summer. These colonies consist mostly of females, with some juvenile males from the previous year. Male bats normally roost individually or in small groups meeting up with the females in the late autumn, when it is time to mate. In summer, bats seek warm dry buildings in which they can give birth and suckle their young. In winter, they seek out places with a constant low temperature and high humidity where they can become torpid and hibernate during adverse weather conditions. However, bats do not hibernate continuously during winter and will wake and hunt during mild nights when there are insects available, and it is energetically advantageous to forage [5].

One purpose of daytime tree or building inspections is to determine the potential of bat roosts within the survey area. Due to the transient nature of bats and their seasonal life cycle, there are a number of different types of bat roosts. Where possible, one of the objectives of the surveys is to be able to identify the types of roosts present, if any.

Bats in Ireland feed exclusively on insects, and in the summer months (May – September), they generally emerge from their roosts around sunset to feed. Bats are known to use a number of different foraging sites in the same night and move between them to locate areas of high insect concentrations. They are also known to exhibit site loyalty and will return to the same foraging sites night after night [6].

Table 1-3 below defines the various types of bat roosts.

Table 1-3: Bat roost types (definitions written by the NE Earned Recognition Project) [7]

Roost Type	NE Definition
Day Roost	A place where individual bats or small groups, rest or shelter in the day during the summer.
Night Roost	A place where bats rest or shelter in the night but are not found in the day. May be used by a single individual on occasion, or it could be used regularly by the whole colony.
Feeding Roost	A place where individual bats, or few individuals, rest or feed for short periods during the night but are not present by day.
Transitional Roost	A place used by a few individuals or occasionally small groups for generally short periods of time on waking from hibernation or in the period prior to hibernation.
Maternity Site	A place where female bats give birth and raise their young to independence. In some species males may also be present in the maternity roost.
Hibernation Site	A place where bats may be found individually or together during winter. They have a constant cool temperature and high humidity.

Roost Type	NE Definition
Satellite Roost	An alternative roost found in close proximity to the main nursery colony used by a few individuals to small groups of breeding females throughout the breeding season.

1.7 Purpose of Survey Work

The implication of these legislative policies is that the Development needs to take into account the potential effects on bats.

Survey work can enable appropriate mitigation measures to be incorporated into the Development and to ensure that there is no harm or adverse effects on the conservation status of the bat species utilising the Site.

2 METHODOLOGY

The methodologies used to establish the presence / potential presence of bats are summarised below.

2.1 Desk-Based Studies

A desk-based study was undertaken to identify records of bats within the survey area. The following sources of information were reviewed:

- The National Parks and Wildlife Service ('NPWS') website was consulted to obtain the most up to date detail on conservation objectives for the Natura 2000 sites relevant to this assessment [8];
- Aerial mapping was reviewed to identify any habitats and features likely to be used by bats. Maps and images of the Study Area and general landscape were examined for suitable foraging or commuting habitats including woodlands and forestry, hedgerows, treelines and watercourses;
- The National Biodiversity Data Centre ('NBDC') website was consulted with regard to bat species distributions and bat habitat suitability index [9]; and,
- A review of the previous ecological surveys conducted by RESS in 2021 [1].

2.1.1 Review of Previous Ecological Surveys

A pre-dusk, dusk and post-dusk and pre-dawn, dawn and post-dawn examination of the site was undertaken by RESS on the 23rd of September 2021:

'The presence or absence of cavities in the building, suitable for bats, was used as an indicator of likely bat presence. Where suitable cavities were found a further visual examination of the area was undertaken using infra-red imaging equipment and a Ciel Electronique CDB 301 HD/FD Bat detector and an Echo Meter Touch 2 (for Android) Bat detector with software app on Samsung Galaxy GT along with both a "V-Scope" flexible fibre borescope and a fibre optic video camera capable of looking into small cavities.

A vantage point within the area allowed visual confirmation of possible bat, owl or squirrel entrance/exit points in the buildings under examination. A Magellan Explorist handheld GPS unit was used to mark the location of items of interest on-site. Heavy tree cover may compromise the accuracy of GPS locations. Digital cameras (Canon 1000D and Canon IXUS 185) were used to document items of interest.'

2.2 Field-Based Studies

The building assessment was informed by previous experience and the following publications:

- *Best Practice Guidelines for the Conservation of Bats in the Planning of National Road Schemes* [4];
- *A Conservation Plan for Irish Vesper Bats* Irish Wildlife Manual No. 20 [10];
- *UK Bat Mitigation Guidelines: A guide to impact assessment, mitigation and compensation for developments affecting bats* [11]*;*
- *Bat Mitigation Guidelines for Ireland*. Irish Wildlife Manuals, No. 25 [6] a publication by the NPWS; and,
- *Bat Surveys for Professional Ecologists - Good Practice Guidelines* (4th ed.): The Bat Conservation Trust [7].

2.2.1 2023 Walkover and Building Assessment

The Site was assessed during a daytime walkover survey on the 13th of February 2023 by two suitability-qualified and experienced MOR Environmental ecologists. The Site was examined for any changes in bat roost features, with extra consideration given to the location of the roost as identified by RESS in previous surveys. Figure 2-1 below highlights the survey area.

Figure 2-1: Building Inspection Survey Area

2.2.2 2024 Walkover and Building Assessment

The Site was assessed before the dusk bat surveys. All cracks, crevices, and voids were inspected using a Magnusson Inspection Camera (an endoscope with 4 LED lights and adjustable brightness). As bats can crawl deep into crevices and cracks, their presence can be hard to determine; therefore, cracks, crevices, and voids were also inspected for the presence of any droppings and oil staining.

2.2.3 2024 Dusk Emergence Surveys

The Site was subject to three dusk emergence surveys, in line with the '*Bat Surveys for Professional Ecologists - Good Practice Guidelines* (4th ed)' recommendations for number of survey visits for sites with high bat roosting potential.

Table 2-1: Recommended minimum number of survey visits for presence/absence surveys to give confidence in a negative result for structures [7]

Low roost suitability or PRF-I	Moderate roost suitability	High roost suitability or PRF-M
One survey visit. One dusk emergence survey (structures).	Two separate dusk emergence survey visits.	Three separate dusk emergence survey visits.

The dusk emergence surveys took place on 20th August, 29th August and 12th September 2024. As the Site was surveyed in August and September, the optimum survey period for surveying both maternity roosts and transitional roosts has been covered [7].

The surveys commenced 15 minutes before sunset and ended 2 hours after sunset, therefore encompassing the typical emergence times of Irish bat species. The vantage points ('VPs') took place for two hours and fifteen minutes and were designed to get the best viewshed of the Boathouse so it could be monitored for bat emergence.

A combination of visual observation and listening to ultrasonic bat calls were used during the emergence and nighttime bat walkover ('NBW') survey. The surveys used between two and three HIKMICRO Lynx 2.0 Pro Thermal Monoculars as a night vision aid ('NVA') to aid in monitoring the Boathouse for bat emergence. A combination of different viewsheds were used by the NVAs across the three emergence surveys to monitor different locations of the Boathouse for bat emergence. Plates 2-1 to 2-8 below show the different NVA viewsheds from the emergence surveys.

Plate 2-1: NVA viewshed of the roof outside Boathouse

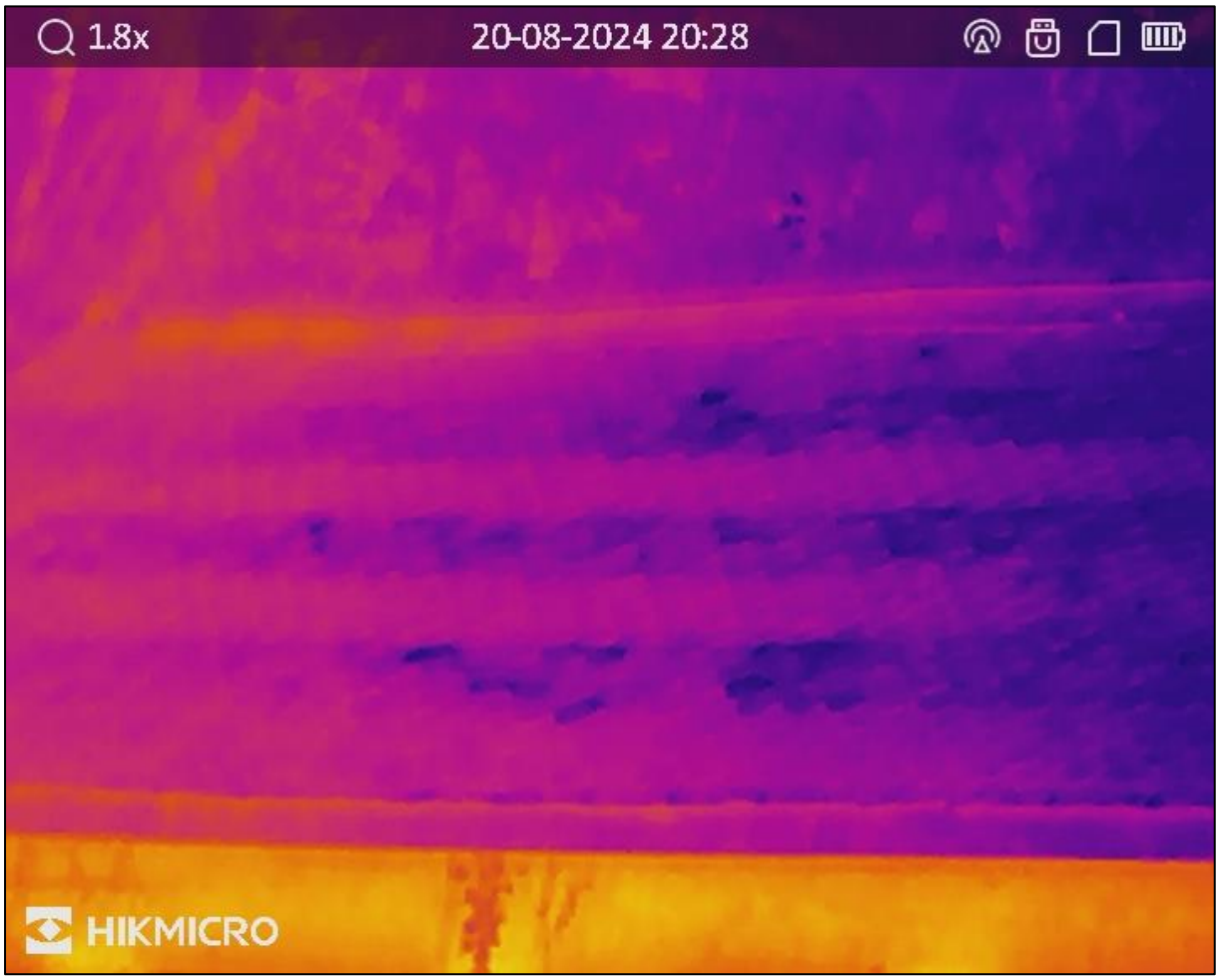


Plate 2-2: NVA viewshed of the roof outside Boathouse

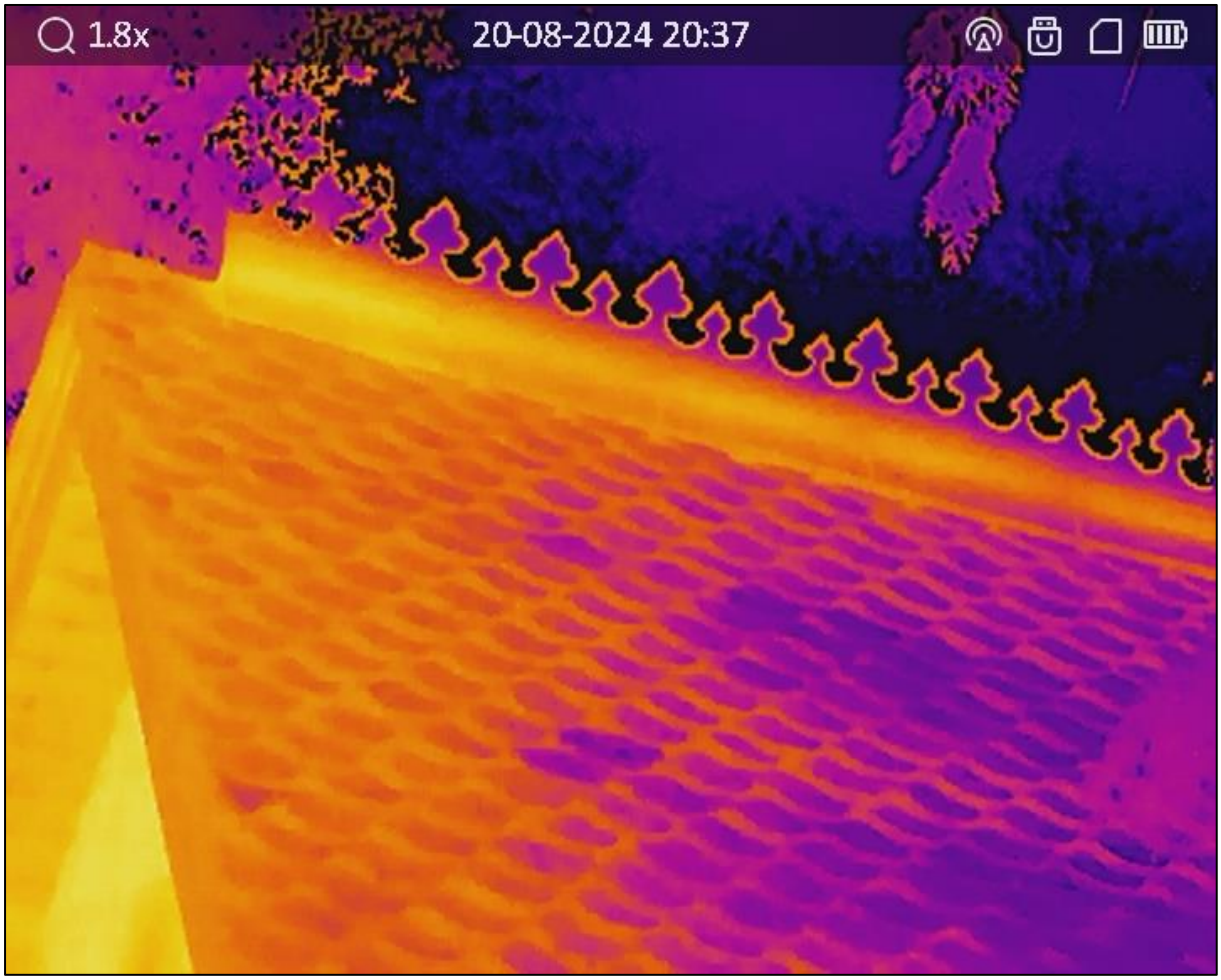


Plate 2-3: NVA viewshed of eaves under the Boathouse

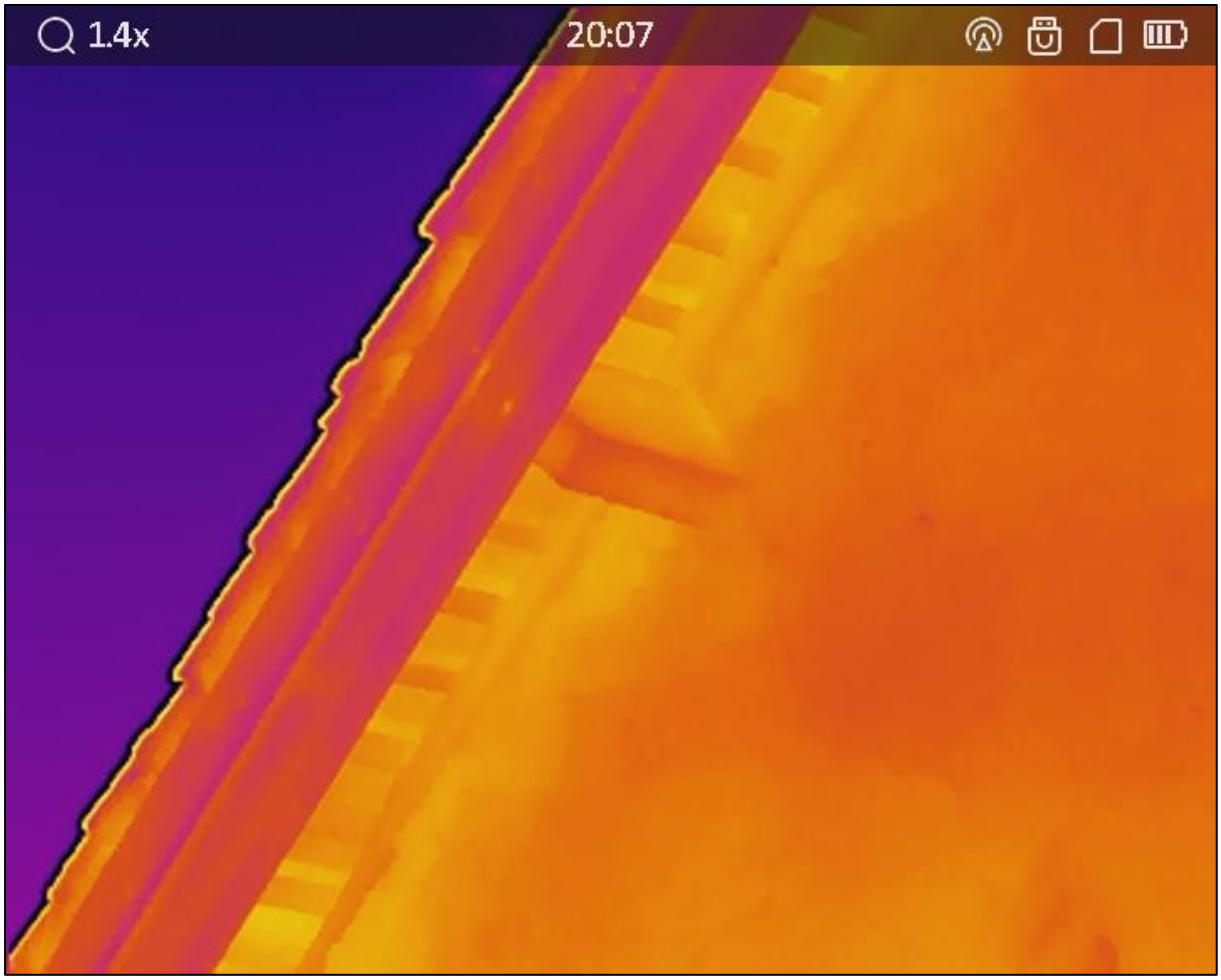


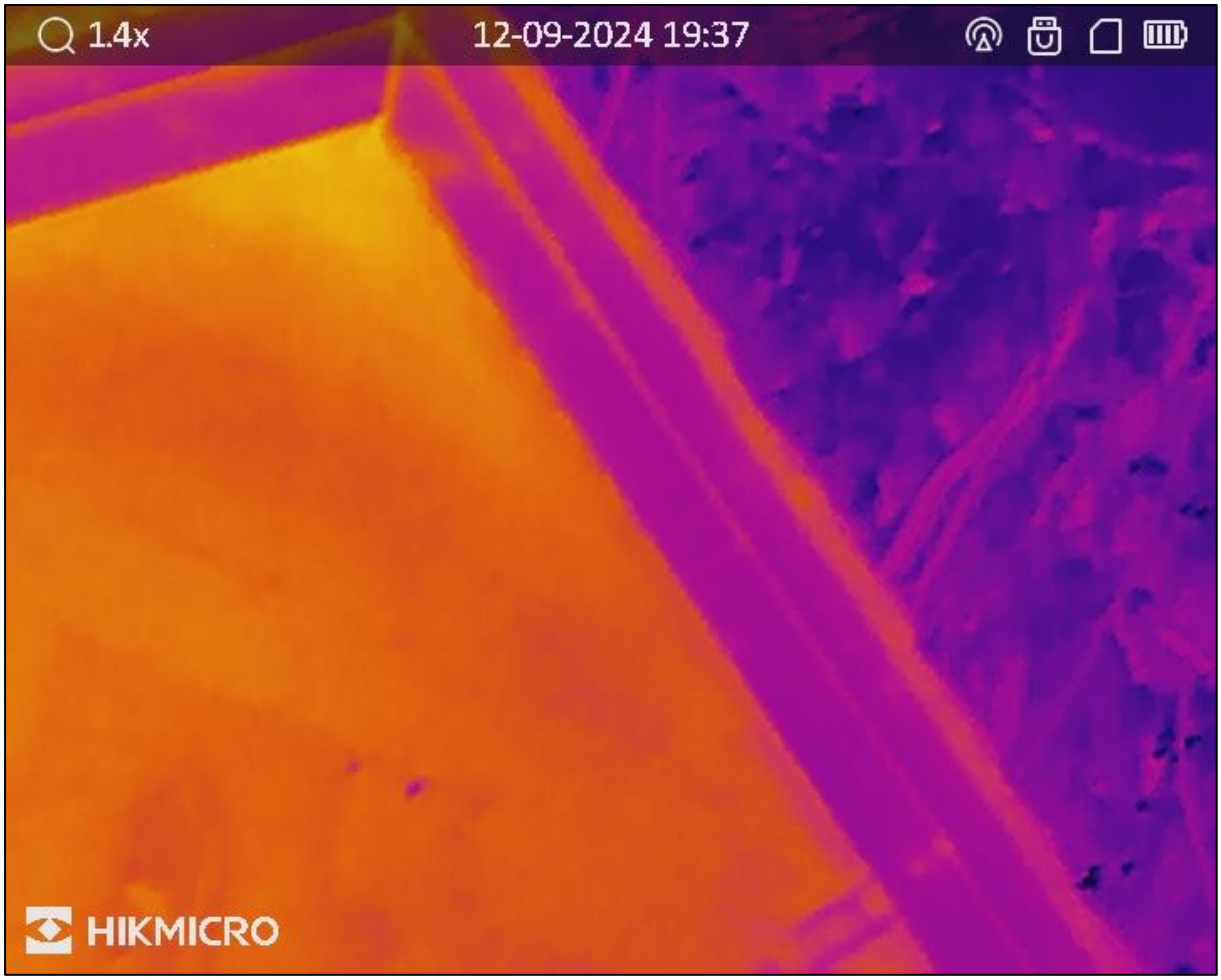
Plate 2-4: NVA viewshed of peak outside the Boathouse

Plate 2-5: NVA viewshed of roof and wall inside the Boathouse

Plate 2-6: NVA viewshed of roof and beams inside the Boathouse

Plate 2-7: NVA viewshed of wooden storage structure inside the Boathouse

Plate 2-8: NVA viewshed of peak outside the Boathouse



During the emergence surveys the surveyors used an Echo Meter Touch2 Pro to listen for bat calls. These bat calls were recorded using this Echo Meter Touch2 Pro and stored on the EchoMeter App.

2.2.4 Data Analysis

The bat recordings taken during the surveys were analysed using the software KaleidoscopePro to aid in the identification of bat species present. A combination of the visual observations taken during the survey and the number of bat passes[1] identified on the recordings were used to determine bat activity levels within the area.

All sound file data recorded during the bat surveys was analysed using Kaleidoscope Pro Software. The 'auto-ID' function was used to batch assign the top auto-ID species for each sound file. This approach allows identification of bats to genus level for *Myotis* species, and to species level for other bats found in Ireland. Separation of *Myotis* species is complicated by the high degree of overlap between call characteristics. This software can also automatically sort sound files that contain only noise ('non-bat') from sound files that contain bat passes.

All non-noise recordings taken on the surveys were manually checked by a capable bat acoustic analyst.

[1] It is important to acknowledge that bat calls provide a measure of bat activity rather than the number of individuals in a population. In practice, bat activity (as, for example, represented by 100 recordings) could be from 100 bats passing the detector or one bat passing 100 times [7].

The video footage taken from the NVAs on the emergence surveys was also reviewed for recordings of bat emergence from within or outside of the Boathouse.

2.3 Survey Limitations

No survey limitations were encountered.

3 RESULTS

3.1 Desk-Based Results

Prior to conducting the field surveys, a desk-based review of information sources was completed.

The NBDC holds records of the following bat species within 2km of the Site in the past 10 years [9]: brown long-eared bat, Leisler's bat, Nathusius' pipistrelle, Natterer's bat, soprano pipistrelle, whiskered bat and Daubenton's bat. This represents seven of the nine resident bat species found in Ireland.

Table 3-1 provides details of the habitat suitability index for the study area [9]. The habitat suitability index identifies the geographical areas that are suitable for individual species. The index ranges from 0 to 100, with 100 being the most favourable to bats. The index presented is for all species combined, in addition to the individual species indices within the Site.

From the indices, it can be established that the study area has an overall high habitat suitability index range of 28 - 36. All Irish bat species have a moderate to very high habitat suitability index for the area, with the exception of the lesser horseshoe and Nathusius' pipistrelle. Therefore, all of the other listed species are likely to occur within the area.

Table 3-1: Habitat Suitability Index

Bat Species	Suitability Index Range	Suitability Index Level
All Bat Species	28 – 36	High
Soprano Pipistrelle *(Pipistrellus pygmaeus)*	39 – 45	Moderate
Brown Long-eared Bat (*Plecotus auritus)*	50 – 79	Very High
Common Pipistrelle (*Pipistrellus pipistrellus)*	48 – 72	Very High
Lesser Horseshoe Bat (*Rhinolophus hipposideros)*	0 - 4	Very Low
Whiskered Bat *(Myotis mystacinus)*	32 - 44	High
Daubenton's Bat *(Myotis daubentonii)*	30 - 38	High
Leisler's Bat *(Nyctalus leisleri)*	47 – 71	High
Nathusius' Pipistrelle *(Pipistrellus nathusii)*	0 – 5	Very Low
Natterer's Bat *(Myotis nattereri)*	37 – 48	High

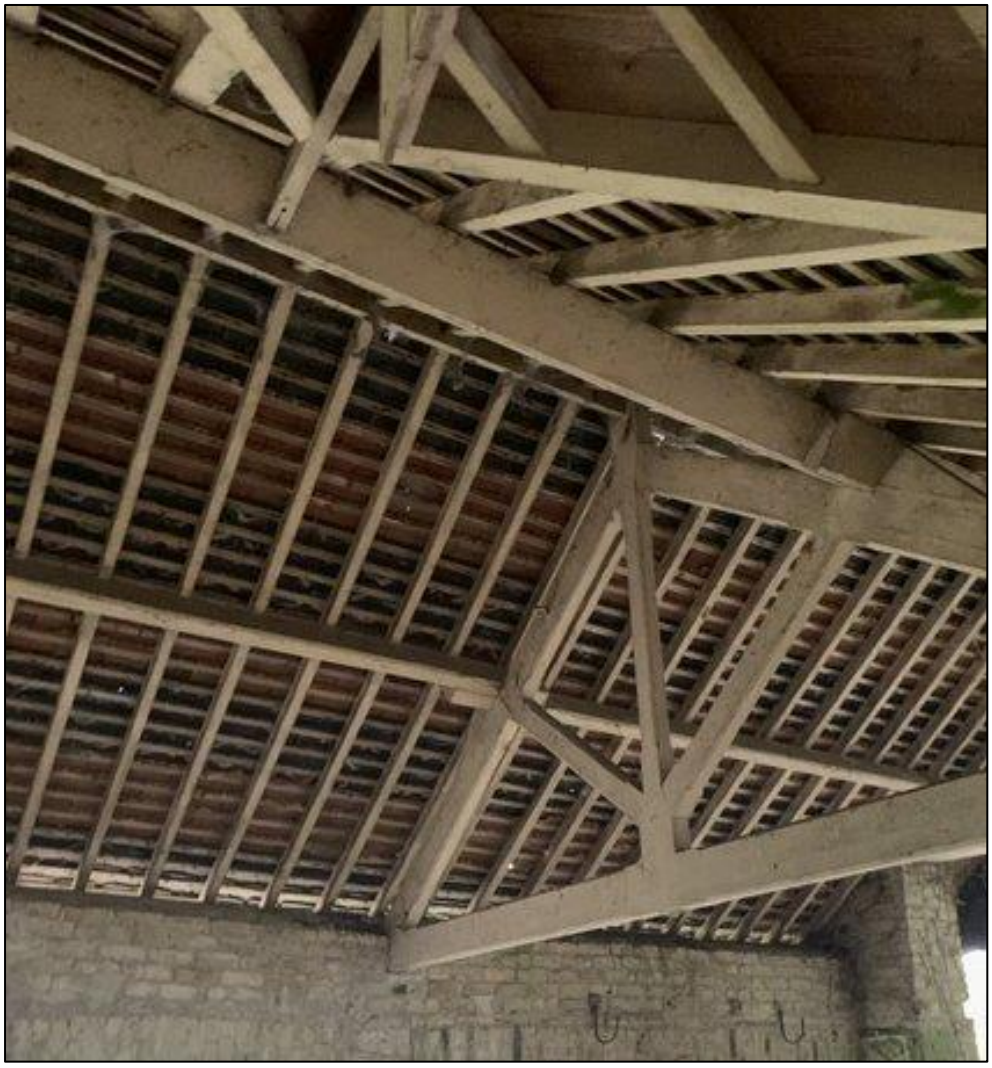
3.2 Field Based Results

3.2.1 2023 Walkover and Building Assessment

No evidence of bats roosting (bat droppings, oil staining or feeding remains) were found in the building. However, consistent with previous surveys conducted by RESS, the Boathouse was found to have multiple features suitable for roosting bats. Gaps in the roof slates provide space for bats to exit and enter the building (Plate 3-1), and the wooden beams are suitable for free-hanging bat species (Plate 3-2).

Plate 3-1: Slated roof structure on the Boathouse (photo taken 13th February 2023)

Plate 3-2: Interior roof structure (photo taken 13th February 2023)



3.2.2 2024 Walkover and Building Assessment

Consistent with the findings of the 2023 building assessment and the previous survey conducted by RESS, the Boathouse has multiple features suitable for roosting bats but no evidence of bats in the form of bat droppings, oil staining or feeding remains were found onsite. In addition, the endoscope survey did not identify any bats roosting within the building.

Plate 3-3: Outside of the Boathouse (photo taken 20th August 2024)

3.2.3 RESS Bat Survey 2021

The bat survey conducted by RESS in 2021 observed >15 soprano pipistrelles exiting from under the roof slates and eaves of the Boathouse at dusk and re-entering at dawn. This roost type was not classified.

3.2.4 Dusk Emergence Results

During the bat surveys undertaken at the Site by MOR Environmental Ecologists on 20th August, 29th August and 12th September 2024, no bat roost was identified within the Boathouse, and no bats were observed emerging from or re-entering under the roof slates and eaves of the Boathouse.

3.2.4.1 Dusk Emergence 20/08/2024

Sunset was at 20:44.

The first bats recorded on 20th August were 10 minutes after sunset. Soprano pipistrelle were the most frequently recorded species during this survey, and were observed almost constantly commuting from north to south around the Boathouse to forage over the grassland and the River Nore within close proximity to the Site. Soprano pipistrelle were also observed commuting from south to north around the Boathouse towards the extensive woodland within the vicinity of the Site. Common pipistrelle, brown long-eared bat and Leisler's bat calls were also recorded during this survey. A review of the NVA footage from this survey did not record any bats emerging from or commuting through the Boathouse.

3.2.4.2 Dusk Emergence 29/08/2024

Sunset was at 20:23.

The first bats recorded on 29th August were two minutes after sunset. Soprano pipistrelle were the most frequently recorded species during this survey, and were observed commuting from north to south around the Boathouse to forage over the grassland and the River Nore within close proximity to the Site. The surveyor present inside the boathouse also observed soprano pipistrelle and *Myotis* species bats commuting through the Boathouse and foraging over the water in the Boathouse. Common pipistrelle, brown long-eared bat and Leisler's bat calls were also recorded during this survey. A review of the NVA footage from this survey did not record any bats emerging from the Boathouse.

3.2.4.3 Dusk Emergence 12/09/2024

Sunset was at 19:38.

The first bats recorded on 12th September were 30 minutes after sunset. Similar to previous surveys, soprano pipistrelle were the most frequently recorded species and observed almost constantly commuting around the Boathouse towards the River Nore, grassland and woodland within the vicinity of the Site. A review of the NVA footage from this survey did not record any bats emerging from the Boathouse, but similar to the survey on 29th August bats were recorded commuting through and foraging within the Boathouse. Soprano pipistrelle and brown long-eared bats were recorded within the Boathouse, and common pipistrelle, Leisler's bat and *Myotis* species were recorded foraging and commuting within the vicinity of the Site. Plate 3-4 below shows a brown long-eared bat gleaning off the inside wall of the Boathouse.

Plate 3-4: Brown long-eared bat gleaning off the wall of the Boathouse

3.3 Conclusions

Based on the results of the 2024 dusk emergence surveys and a review of the previous surveys carried out onsite, the following can be concluded:

- A soprano pipistrelle roost was present in the Boathouse in 2021 and identified by RESS. The exact number of bats present in this roost, or the roost type was not identified;
- Three updated emergence surveys carried out by MOR Environmental in 2024 did not identify any bats roosting within the Boathouse; and,
- Bats were observed commuting through and foraging within the Boathouse. This indicates that the Boathouse is being used as a temporary shelter when bats are foraging and commuting at night.

4 IMPACT ASSESSMENT AND MITIGATION

An assessment undertaken by RESS in 2021 identified the presence of a soprano pipistrelle roost within the Boathouse. However, no bats were observed roosting within the Boathouse during the 2024 surveys. As bats were recorded foraging and commuting within the Boathouse, the urgent structural works that are required to ensure the Boathouse does not collapse will ensure that bats can continue using this structure for foraging and commuting. Mitigation measures will be incorporated into the construction works to ensure that bats are not impacted by the Development. Additionally, enhancement measures will be incorporated into the Development to result in a net positive impact on bats. These enhancement measures also aim to increase the suitability of the Boathouse for roosting bats.

4.1 Potential Impacts on Bats

There will be no loss of any bat roosting habitat as a result of the Development. Additionally, there is no lighting as part of the Development, so there will be no impacts on bats associated with this. However, while the Boathouse is being deconstructed and reconstructed to its historic state, bats will temporarily not be able to use the Boathouse for sheltering and foraging. However, as the works are scheduled to take place in the winter months (November 2024 to April 2025) when bats are typically hibernating, it is considered that this is the optimum time for the works on the Boathouse to take place as bats will not use this structure over this period.

Given the condition of the Boathouse and the nature of the restoration required, works may extend into the end of May 2025. This is because lime render requires temperatures above 8^{o}C and dry weather conditions to set and seal. The restoration works will be completed by the end of May 2025 at the alatest, so bats will be able to use the Boathouse for roosting, foraging and sheltering for the rest of the active bat season.

Additionally, bat enhancement measures will be included as part of the Development.

4.2 Mitigation Measures for Bats during the Development

No bat roost was identified within the Boathouse during the 2024 surveys. However, due to the previous presence of a soprano pipistrelle bat roost in the Boathouse in 2021, the following mitigation measures will be included as part of the Development to protect bats:

- The aspects of the Development that involve the deconstruction of the masonry sub-structure and roof shall be supervised by the Project Ecologist;
- Any bat(s) identified during the reconstruction works will be captured and released into the woodlands surrounding the Site at night. Should night-time temperatures be considered to be unsuitable, the bat(s) will be placed into bat boxes erected onsite/in the woodlands (see Section 4.3.2);
- All personnel involved in the construction works will be made aware of the legal status of bat species in Ireland and the role Project Ecologist;
- Only bat-safe compounds shall be used during the chemical treatment of roof timbers;
- Cracks, crevices and cavities currently within the structure of the Boathouse shall not be filled or sealed unless impacting the structural integrity of the structure; and,
- No rodenticide usage will be permitted within the vicinity of the Boathouse.

4.3 Bat Enhancement Measures

In addition to the above mitigation measures, a number of bat enhancement measures will be implemented as part of the Development. These measures will ensure that the Boathouse and the area surrounding the Site continue to provide suitable sheltering, foraging and commuting

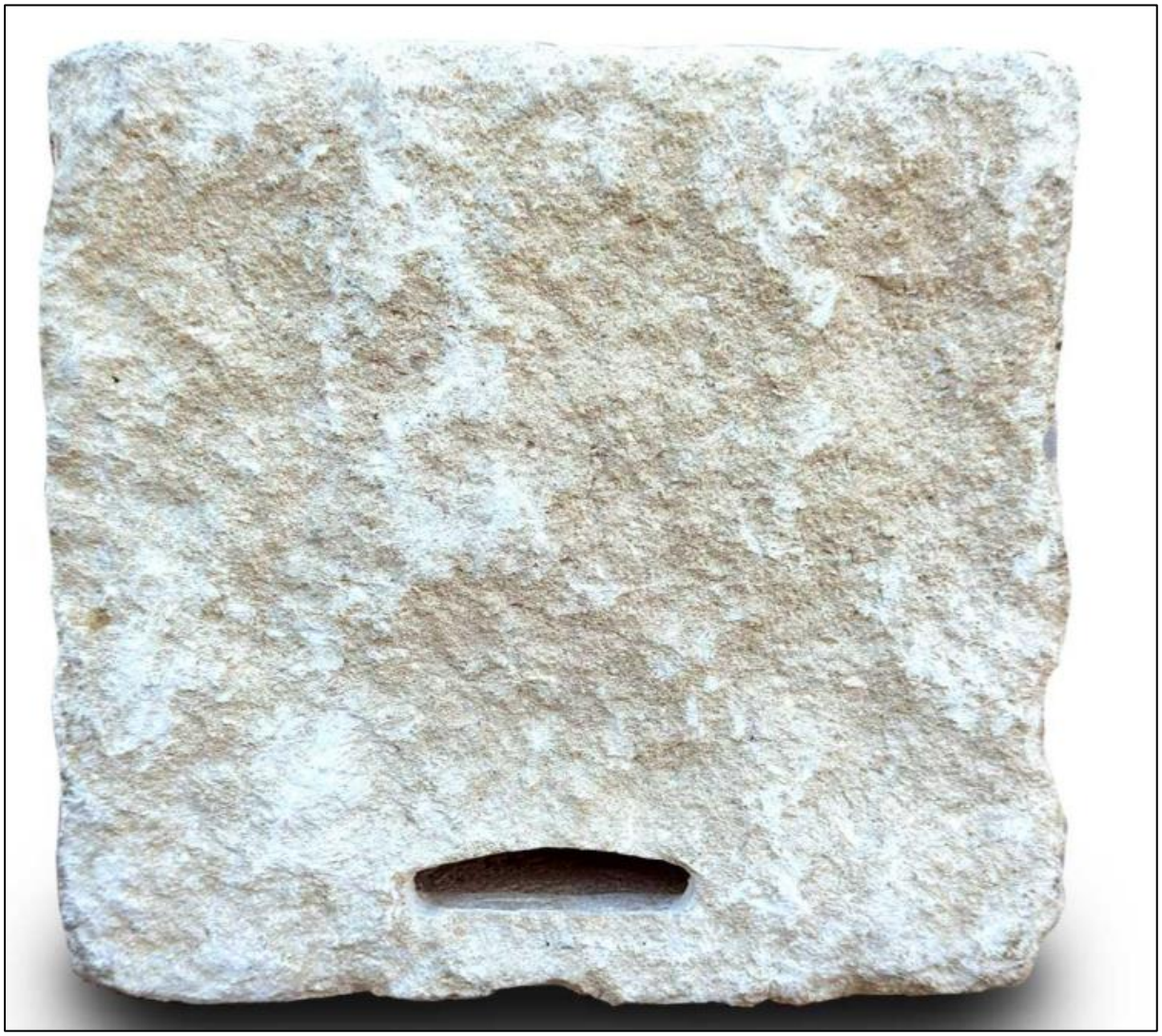
habitat for bats. Additionally, these bat enhancement measures will include the new provision of features suitable for roosting bats (see Section 4.3.1 below), which will act as an overall net improvement for bat species within the area.

4.3.1 Provision of New Suitable Bat Roost Space

As mentioned in Section 1 above, a soprano pipistrelle roost was identified in the Boathouse in 2021 by RESS. The three dusk emergence surveys undertaken by MOR Environmental in 2024 did not identify any bats roosting within the Boathouse. However, as part of the Development a new bat brick / roost space (see Plate 4-1 below) for soprano pipistrelle will be incorporated into the restoration works to enhance the Boathouse for roosting bats. The bat roost feature will be designed to ensure that it is in keeping with the architectural heritage of the building. The roof will be reconstructed using the same materials and in the same way, thus ensuring that features used by bats will be similar in nature once restored.

The building will continue to have an open design and thus provide several access and egress points for bats.

Plate 4-1: Example of a Bat Brick



4.3.2 Bat Boxes

Three bat boxes were installed onsite in February 2023 under the supervision of the Project Ecologist, to provide additional roosting habitat for bats within the local area (see Plate 4-2 and 4-3 below).

Plate 4-2: Bat boxes installed in woodland in proximity to the Boathouse

Plate 4-3: Bat boxes installed in woodland in proximity to the Boathouse

These bat boxes will provide additional roosting sites for soprano pipistrelles and a variety of other crevice-dwelling bats to utilise.

4.3.3 Creation of Additional Suitable Habitat for Bats within the Estate

As part of the management of the estate, a Forest Inventory & Management Plan covering 2022-2031 has been prepared by Purser Tarleton Russell Ltd for Abbeyleix Estate, and is attached as Appendix A. This plan emphasises the importance of protecting and enhancing the value of the 270 hectares of woodland in Abbeyleix Estate, allowing them to obtain a high conservation status. Bats will utilise all forest types, from semi-natural to broadleaf and conifer plantations [12]. Abbeyleix Estate Forest Management Plan prioritizes facilitating natural regeneration of woodlands on site and promoting native species and diversity. This will create additional suitable foraging and roosting habitats for bats. Furthermore, this Forest Management Plan will ensure that these habitats are protected in the long term and provide vital habitats for bats within the vicinity of the Site.

4.4 Monitoring

An Ecological Clerk of Works ('ECoW') / Project Ecologist will be appointed for the duration of the works and will undertake the necessary monitoring works as required to ensure the implementation of the ecological mitigation measures.

The following monitoring works will take place to ensure that the works comply with the recommendations detailed in this report:

- An updated dusk emergence bat survey will be undertaken at the Site to ensure that the Boathouse and the surrounding habitats are still being utilised by bats.

5 CONCLUSIONS

Bat assessments undertaken at the Boathouse included a bat survey by RESS in 2021, a building inspection by MOR Environmental in February 2023, an updated building inspection including an endoscope survey in 2024 and three dusk emergence surveys in 2024 by MOR Environmental. The bat survey conducted by RESS in 2021 observed >15 soprano pipistrelle exiting from under the roof slates and eaves of the Boathouse at dusk and re-entering at dawn. This roost type was not classified. The dusk emergence surveys in 2024 by MOR Environmental did not identify any soprano pipistrelle emerging from the Boathouse, and it was confirmed that there is no bat roost present in the Boathouse. Bats were identified to be using the Boathouse for foraging and commuting, and as a temporary shelter throughout the night.

The structural integrity of the Boathouse is compromised, and if left without intervention it could collapse and result in the permanent loss of this structure that bats are using for foraging, commuting and sheltering. The Development will result in the temporary loss of this structure suitable for bats as the Boathouse masonry sub-structure and timber roof structure will be taken down and reconstructed. Given the temporary loss of this site, appropriate mitigation measures will be put in place, including supervision of construction works and timing of construction works during the bat hibernation period.

Furthermore, bat enhancement measures will be incorporated as part of the Development in the form of bat access points into the Boathouse and bat boxes. These measures will ensure that the Site itself and the area surrounding the Site continue to provide optimal foraging, commuting and roosting habitats for bats.

The Development will not result in the loss of an active bat roost. As the Boathouse will be deconstructed and reconstructed to its historic state, there will be no loss of suitable roosting bat habitat. The long-term benefits of these works will ensure the protection of the Boathouse as both a building of architectural importance and provide new suitable bat roosting spaces within the Boathouse.

It is considered that if the measures presented within this report are followed, the permanent or long-term potential impacts on bats will be negligible, and the restoration of the Boathouse will ensure the long-term protection of the structure and the availability of suitable bat roosting habitat in the area.

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APPENDICES

APPENDIX A

Abbey Leix Estate

Abbeyleix, Co. Laois

Forest Inventory & Management Plan 2022 - 2031

VISION

The long term forest management vision for Abbey Leix is to protect and enhance the ecological value of the woodlands allowing them to obtain a high conservation status. This will be achieved through the adoption of a Continuous Cover Forestry Management system using close to nature silvicultural techniques.

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Contents

1. Introduction

Abbey Leix forest Estate contains 270 hectares (667 acres) of mixed broadleaved and conifer forest and a further undefined area of tree cover in the form of boundary planting, parkland, copses and other trees.

The woods have a significant ecological value and also considerable economic value. The Park Hill Woodlands in the western edge of the estate, close to the River Nore, are listed as Ancient Woodland in Perrin, P.M. & Daly, O.H. (2010*) "A provisional inventory of ancient and long-established woodland in Ireland"*[1] . Ancient woodland refers to those woods that have had a continuous history of cover since before the period when planting became common practice (mid-1600s). Such ancient woodlands are important in terms of their biological, ecological and cultural value, and may even form links with prehistoric wildwoods. Park Hill woodlands on the estate are recognised nationally as being particularly unique and reflecting this, the National Parks & Wildlife Service (NPWS) have designated protected sites in the woodlands including within the River Barrow and River Nore Special Area of Conservation (SAC) and the River Nore Special Protection Area (SPA). The formal River Nore SAC designation specifically notes that, *"The best examples of old oak woodlands are seen in the ancient Park Hill woodland in the estate at Abbey Leix";* and also: *"Abbey Leix Woods is a large tract of mixed deciduous woodland which is one of the only remaining true ancient woodlands in Ireland".* This highlights the national importance and profile of Abbey Leix woodlands with their unique ecological and environmental value. Outside of the core ancient woodland areas there are also extensive areas of conifer and mixed forest on the estate which act as an extremely important buffer and expansion area. The appropriate management of these is also of great importance to the sustainability of the core ancient woodland areas.

In addition to the ecological value described above, Abbey Leix House, gardens and demesne are set amidst some of the most attractive woodland scenery in Ireland and this must be at the forefront in forest management planning for the estate.

This plan sets out a vision for the future of forests at Abbey Leix Estate. For management purposes, the forest has been stratified into 65 separate plots and these are shown on the accompanying photo-map. Stratification is based on parameters such as woodland type, species, age, required management etc. Inventory details and / or descriptions are provided and a 10 year management prescription and plan is proposed for each of these plots. A cash-flow forecast associated with this plan has also been prepared.

The prescriptions in the plan are summary prescriptions, but these are supported by more detailed discussions on the guiding forest management principles associated with a range of issues pertaining to the estate, which are also presented here as part of the plan.

2. Long Term Forest Management Vision

The long term forest management vision for Abbey Leix is to protect and enhance the ecological value of the woodlands allowing them to obtain a high conservation status. This will be achieved through the following:

- The adoption of a Continuous Cover Forestry (CCF) Management system using close to nature silvicultural techniques i.e.:
    - the cessation of clear-felling as a management intervention;

[1] Irish Wildlife Manuals, No. 46. National Parks and Wildlife Service, Department of the Environment, Heritage and Local Government, Dublin, Ireland

  - the facilitation and promotion of natural regeneration;
  - the thinning of conifer woods and mixed broadleaved woods to promote native species and diversity;
  - the retention of deadwood, both standing and fallen, as an important micro-habitat;
  - the control and eradication of invasive species from the estate, primarily laurel and rhododendron;
- The preparation of specific native woodland conservation plans for the ancient woodland areas on the western side of the estate along the River Nore;
- The management of invasive deer on the property such that they are not impacting adversely on the sustainable management of the woodlands, including development and recruitment of natural regeneration;
- The replacement of felled conifer areas with native woodland;
- Continuity of the management approach over a sustained period.

3. Interventions in Native Woodland Areas

For existing areas of important native woodland, it is proposed to develop specific native woodland conservation plans. These will follow the template required by the Forest Service (FS) and supported by the National Parks and Wildlife Service (NPWS) for entry into the Native Woodland Conservation Scheme (NWCS). These plans are prepared jointly by qualified native woodland managers and ecologists in consultation with the woodland owners. There is no obligation to enter the NWCS but it will provide a funding source / support mechanism for any proposed interventions. This scheme would be suitable for use in Plots 1, 5, 11, 14 & 15 totalling 73.18 hectares. From the walkover assessment carried out at Abbey Leix, these interventions are likely to include:

- **Enrichment planting and maintenance** – Enrichment planting is the introduction of planted trees into woodland areas to help the development of an understorey and to introduce diversity of species where it is not possible to do so naturally. There has been some enrichment planting conducted over the last decade that requires maintenance but an enhanced programme is required. While natural regeneration is the preferred means of woodland development at Abbey Leix, it is suggested that a local seed collection and nursery programme be developed in the garden of the estate to provide transplants for an enrichment planting programme throughout the estate (**Section 14**). While it is intended to reduce deer impact on the woodlands to a sustainable level (**Section 6**), there is a short to medium term need to protect enrichment planting from browsing by deer using a combination of individual tree guards and (very) small deer fence exclosures.
- **Specific Surveys** – Some dedicated specialist surveys may be required to record and monitor ancient woodland indicators in the form of bryophytes, lichens, fungi, ground flora, insects and other invertebrates. The requirement for such surveys will be identified in the native woodland conservation plans.
- **Treatment of Invasive Species** – in the context of the ancient woodland areas at Abbey Leix, this does not only mean rhododendron and laurel but also Beech which, due to its relative shade tolerance, has the potential to dominate the area over time. The native woodland conservation plans will propose measures that will create standing (through ring-barking) and fallen (through felling) deadwood habitat out of large beech trees and in so doing, create lighter conditions in the wood for oak regeneration while also creating deadwood habitat for a range of specialist fungi, invertebrates and birdlife. The role of Spanish chestnut which also is found throughout the ancient woodland will also need to be considered although it is not invasive.
- **Promotion of Natural Regeneration** – the need for supportive interventions for natural regeneration such as scarification or the provision of seed banks for Jay distribution will be considered.
- **Deer Management** – dealt with separately in **Section 6**

- **Access** – while the maintenance of certain access to native woodland areas is desirable, this should be restricted to low impact tracks with no importation of stone and kept for low density recreational / management / research purposes. It is not appropriate to develop roadways through the high value / ancient native woodland areas using imported stone as this has the potential to alter the soil chemistry either side of the roadway and consequently the flora that will grow there.

4. Thinning Interventions in Other Woodland Areas

In many areas, thinning work is necessary to aid the long term transformation to native woodland, these thinnings will be conducted using the following general silvicultural principals:

- Specific harvest plans will be required for each harvest site in advance of operations.
- Long term permanent racks to be installed at approx. 20-25m intervals – these do not require stone like a road but are permanent and dedicated routes for machinery used for harvesting and extracting timber. At each harvest they will be dressed with lop and top to create a brash mat to help carry machinery and minimise soil damage.
- No machinery will be allowed access outside of the dedicated routes described above leaving the zones between routes un-impacted.
- Marking of selected trees for thinning will be carried out professionally by a qualified forester with experience in CCF management.
- Trees of important biodiversity value (e.g. veteran trees or rare species) and future trees of high quality and potential value will be identified in order that they can be protected and favoured during thinning operations.
- Marking and thinning operations will seek to retain trees that meet the following criteria:
    - Native species;
    - Stable trees with good root architecture and viable crowns;
    - Diverse species that are compatible with the long term transformation process;
    - Quality trees with future market potential;
    - Trees of high ecological value, including standing deadwood and veteran trees.
- Initial thinnings will aim to engender stand and individual stem stability (while favouring native and diverse species) and transferring growth on to stems of better quality. This will continue on a regular cycle to be determined for each compartment during marking.

Continuity in thinning practice in CCF is important, particularly given the lack of experienced CCF practitioners in Ireland, and a long term relationship with a harvesting contractor in this regard should be developed

5. Management of Recently Clear-felled Areas

While there is a new policy at Abbey Leix that there will be no further use of clear-felling as a forest management intervention, there are some existing clear-felled areas that require restocking and management. These are plot numbers 10 (where restocking was carried out but has largely failed), 18 & 38 comprising approx. 14 hectares. It is proposed that these areas are wind-rowed, invert mounded, deer fenced and restocked as native woodland. The native woodland type will be oak dominated with hazel, birch, alder and other native species. These trees should also be of native provenance. A standard restock cost for native woodland of €5,000 per hectare in year 1 and €1,000 per hectare for three maintenance years has been used in the cashflow forecast. It is expected that there will be significant natural regeneration on these sites, particularly once deer fencing is in place. This regeneration will be gladly accepted amongst the replanted trees as it will help to diversify structure and engender resilience in the newly establishing forest.

6. Deer Management

There is an unsustainably high population of deer (largely invasive Fallow Deer) present at Abbey Leix. This is having a detrimental effect on woodland ecology and regeneration. This is indicated by the low levels of natural regeneration and evidence of damage to small trees and the shrub layer in existing woodlands. High deer populations will result in considerably higher costs for managing the woodlands at Abbey Leix. Operations such as reforestation will require protection from grazing in the form of deer fencing and/or individual tree guards. Unsustainable deer populations can also have a considerable negative impact on farming, through grazing of pastureland and damaging fences etc. For the goals of sustainable forest management and close to nature silviculture to be achieved, it is imperative that a plan to systematically reduce deer densities is established. Such a plan is understood to be in place in conjunction with Dr. Tim Burkitt. Apart from the ecological damage to woodlands, deer cause physical damage to trees in three different ways:

- **Browsing** – the grazing of regenerating trees so as they either die, are deformed or never get past the herb layer.
- **Fraying** – the rubbing of antlers against young lignified stems causing the removal of tender bark and resulting in tree damage or death.
- **Stripping** – the pulling of bark, particularly in Spring and Summer, away from the stem resulting in tree damage or death and an entry point for other pathogens.

This plan includes measures for the rejuvenation and conservation of some of the ancient woodland with grant assistance from the FS through the NWCS. These plans will include proposals for deer fencing of exclosures and/or using individual deer shelters to provide protection for enrichment planting. The exclosures and shelters will allow free passage for deer to move through the estate to and from the adjoining bog which borders the property. The proposed exclosures do not obstruct the passage of deer and are less likely to be breached as deer will go past or around them.

7. First Thinnings

There are 46.27Ha of woodlands at Abbey Leix scheduled to undergo first thinning treatment as part of this plan. First thinning is an essential operation to facilitate management and also improving biodiversity. It consists of the creation of “racks” which is the removal of all trees within a row of trees and a “selection” of trees between the racks. The racks are used to facilitate the long term access and movement of machinery. When the machines move along these designated racks they also remove a proportion of the trees each side of the rack which are within the machine’s reach, this is the selection.

First thinning will:

- Produce pulpwood which can be utilised in the planned wood chip boiler for internal heat generation within the estate, along with other more valuable products such as stake or pallet which can be sold to local sawmills.
- Create permanent designated access to these woodlands through racks, which are in line with the “close to nature” management system of CCF.
- Greatly improve the biodiversity of the site through creating open space’s within the forest which will allow access of light and the stimulation of ground vegetation.

The first thinning will be carried out in line with the general thinning policies as outlined in **Section 4**. The plots scheduled to undergo first thinning treatment are indicated within the woodland management plan and are spread across the planning period due to their varying ages and stages of development. Areas which are not licensed for first thinning will require a Tree Felling Licence (TFL) which can be applied for from the Forestry Division of the Department of Agriculture, Food & the Marine (DAFM)

8. Tree Marking

Tree marking is where individual or groups of trees are professionally marked for removal or retention in a forest before it undergoes thinning treatment. Tree marking is used to ensure that the right trees are being removed and for the right reasons. Marking is essential to ensure that the woodlands are being managed in line with the short and long term goals of the property. Marking ensures efficacy of the silvicultural treatment that has been prescribed. It also provides a monitoring opportunity, and an important way of protecting veteran trees or trees of high biodiversity value which may otherwise be removed or damaged. All plots at Abbey Leix which are due to undergo treatment will require some level of marking. It is proposed that the ProSilva Ireland Marking Protocol be adopted for use at Abbey Leix. This is a standard approach to tree marking in forests managed under CCF as endorsed by ProSilva Ireland, the advocacy group for CCF / Close to Nature Silviculture in Ireland.

9. Rhododendron and Laurel Control

Large areas of invasive rhododendron and laurel were identified throughout the estate. A significant amount of work has already occurred with regard to controlling these invasive species through different combinations of excavating, cutting and chipping. Most of the most "choked" areas have now been treated and follow up will be required in these areas for a number of years to treat any regrowth that will emerge. For much of the rest of the estate there are sporadic pockets of rhododendron and laurel, often in sensitive areas. A lighter touch approach to the treatment of these pockets is recommended using smaller machinery or simple motor-manual cutting or notching and immediate stump or stem treatment with glyphosate.

It is suggested that a sustained programme over 10 years be put in place. Treatment involves the preparation of a 14% glyphosate herbicide mix using Roundup Bioactive and add a non-toxic colouring dye. Using an axe or chainsaw, cut 2-3 notches around *Rhododendron* stems below the first leaf. Spray small amount of herbicide mixture directly into the cuts. This should be repeated annually until the stem is dead.

10. Access

The harvesting of timber requires good access for machinery and timber haulage. Considerable investment is currently being made in improving such access throughout the estate. This activity is largely down the eastern side of the estate where most of the forest harvesting activities will take place. Some additional stacking and turning points may be required in order to reduce disruption to other estate activities and to improve logistics for haulage operations. These can be prescribed and agreed as part of specific harvest operations. In terms of access for timber haulage vehicles to the estate road network, it is recommended that this be via the southern access point adjacent to Plots 26 & 27.

While the maintenance of certain access to native woodland areas is desirable, this should be restricted to low impact tracks with no importation of stone and kept for low density recreational / management / research purposes. It is not appropriate to develop roadways through the high value / ancient native woodland areas using imported stone as this has the potential to alter the soil chemistry either side of the roadway and consequently the flora that will grow there. It will also lead to greater disturbance levels in these areas which are best kept as undisturbed as possible.

11. Attitude to Non Native Species such as Beech and Chestnut

In the native woodland areas there are large veteran specimens of non-native species such as European Beech (*Fagus sylvatica*) and Spanish Chestnut (*Castanea sativa*). These species while of individual ecological value, do not belong as part of the native woodland flora. They are not invasive and as such they are not an immediate threat to the viability of the native woodland. However, the shade tolerant nature of the beech in particular means that it has the ability to alter the native woodland dynamic over time. This may become more pronounced as the new deer management regime progresses and there are greater opportunities for natural regeneration to progress. While dead-wooding through ring barking of some of these trees is an obvious measure that can be easily implemented, consultation with the NPWS will be required to agree a strategy for the phasing out of these and other non-native species from the core native woodland areas. It is suggested that this be done in the context of a Native woodland conservation scheme application to the Forest Service.

12. Tending in young stands (pre-commercial thinning)

There are 60.86 hectares (Plots 12, 13, 17, 24, 49, 60, 61 & 62) where tending is prescribed. Tending is a low intensity pre-commercial thinning that is carried out by chainsaw following marking (**Section 8**). The purpose of this is to intervene in young stands (and sometimes the understorey of older stands) to favour particular desired trees that may not progress without such an intervention. Typically tending involves halo thinning around these selected trees to allow their progression to a more advanced stage when first thinning (**Section 7**) will take place. Timber cut during tending operations is generally not extracted from the wood but can be removed if accessible / practical.

13. Enrichment Planting (including through laurel chip)

Enrichment planting is the introduction of planted trees into woodland areas to help the development of an understorey and to introduce diversity of species where it is not possible or where natural processes associated with regeneration have failed. There has been some enrichment planting in the native woodland areas over the last decade that requires maintenance but an enhanced programme is required. While natural regeneration is the preferred means of woodland development at Abbey Leix, enrichment planting is required in the short to medium term. Also, while it is intended to reduce deer impact on the woodlands to a sustainable level (**Section 6**), there is also a short to medium term need to protect enrichment planting from browsing by deer using a combination of individual tree guards and (very) small deer fence exclosures. Enrichment planting is prescribed in Plots 7, 11, 12, 13, 35 & 49 totalling 76.67 hectares. This is a low intensity operation and not carried out at normal afforestation rates (which are typically 3,300 per hectare for broadleaves). Stocking should instead be irregular (unevenly spaced), opportunistic (following canopy gap opportunities) and sporadic (in pockets across the wood).

14. Development of a Seed Collection and Nursery Programme

It is recommended that Abbey Leix Estate develop a capacity for raising native trees (and other plants) that can be used for enrichment planting in the estate. This work should focus on the less successfully regenerating species in the woodlands, such as Sessile oak, Scots pine, Yew and Cherry and other species that may be identified as required in the native woodland conservation scheme plans. This function should include locally sourced seed / cutting collection to ensure, where possible, local provenances are utilised. The Forest Service regulates such activities and it will be necessary to engage with them to:

- Register as a supplier of forest reproductive material (both as seed collectors and nursery producers / suppliers)

- Utilise existing seed stands at Abbey Leix and potentially register further seed stands where seed is collected and can be traced through Official Certificates of Provenance

15. Archaeological Features / Walls

Abbey Leix Estate is characterised by the presence of many cultural features in the form of old walls, entrances, engineering works etc. In the preparation of individual harvest and access plans, care must be taken to preserve these. In some instances, old stone walls may need to be breached or entrances may need to be widened in order to develop permanent access to timber. Such operations need to be planned and implemented carefully to ensure there is no significant loss in heritage value.

16. Potential Grant Aid from the Forest Service

The Native Woodland Conservation Scheme has already been discussed as a potential source of grant aid for conservation measures in native woodland areas. There are also other grant aid schemes which may be utilised to assist with the forest management at Abbey Leix. These are set out as follows:

Grant Scheme	Description	Grant & Premium Rates	Curraghmore Potential
Afforestation Scheme	Supports the afforestation of new ground. There are a number of different categories and different grants and premiums apply to each.	This varies per species / category but in general the afforestation grant will cover 100% of afforestation costs. The premium also varies per category but is likely to be approx.. €500 / ha. / annum for 15 years.	Not considered as part of this plan but available should additional new areas be planted.
Forest Road Scheme	Supports the development of new forest roads associated with impending harvest operations	€40 / linear meter and capped at 25 m / ha.	Most roads are in place but could be utilised for any future roading requirements
Tending / Thinning of Broadleaves	Supports early intervention (first and second thinning) into broadleaved stands which can be otherwise uneconomic	€750 / ha. for 1st thinning and €500 / ha. for 2nd thinning	Plots 2, 3, 12, 13, 16, 17, 24, 34,
Native Woodland Conservation Scheme	Supports the development and enhancement of native woodland – ecological focus. Plans need to be developed jointly between suitably qualified foresters and woodland ecologists	€5,000 / ha. in 2 instalments plus a premium of €350 / ha. for 7 years Note there is a 12 ha. per annum per applicant limit to entries into the scheme	Plots 1, 5, 11, 14 & 15
Woodland	Supports the	€750 / ha. in years 1, 6	Throughout Abbey Leix

Improvement CCF Scheme	implementation of a CCF focused plan over a max. of 10 ha. although more than one application is possible	& 12 of a 12 year plan.	Estate

17. Felling Licence Requirements

A felling licence (GFL20622) is currently in place at Abbey Leix that was obtained by the previous owner / managers that was for the clearfelling of Plots 6, 18, 36, 37, 38, 40, 42, 45, 47 & 57. Of these, Plot 18 was clearfelled but the remainder are still standing and will not be clearfelled. These now have new prescriptions and will be transformed to permanent forest using CCF management. The same licence included areas for thinning and this will allow thinning to take place in 2022 in Plots 29, 30, 33, 43, 51, 56 & 59 (totalling 19.64 hectares). The licence expires in February 2028. Most areas are therefore either not licenced at all or are inappropriately licenced for clearfelling and not thinning. A new felling licence is therefore required and this will now be applied for on the basis of this plan. It is expected that this licence will be in place for 2023 and will run for 10 years.

18. Production Forecast

This management plan prescribes thinning operations for each plot (where thinning supports the management objectives) over the 10 year planning period. Thinning volumes have been forecast per hectare as part of this prescription. The timber production forecast per plot is presented separately in the spreadsheet that accompanies this plan but the overall production forecast is as follows:

Year	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031
Production Forecast (m^3)	1528	241	1795	34	1879	0	1715	409	2145	94

Some smoothing of this can be expected to accommodate availability of labour / contractors and to regularise energy wood production for the house and ancillary buildings.

19. Energy Wood Production Potential

The project team at Abbey Leix have raised the possibility of using timber sourced from the woods on the estate for heating / energy creation at the main house and ancillary buildings. While the focus of forest management will be on delivering on the biodiversity and landscape objectives, timber production is a secondary (albeit important) consideration and as part of the plan development a forecast for energy wood production has been prepared as follows:
This is the methodology I have used in producing a potential energy wood forecast for the estate:

1. For each plot there is a prescription, along with a scheduled potential timber production forecast per hectare for the period 2022 – 2031. Some areas will have zero interventions in terms of timber production while others will produce timber regularly as part of their transition to native woodland using “close to nature” Continuous Cover Forestry (CCF) techniques.
2. These per hectare figures are scaled in accordance with the gross area (hectares) per plot. The forecast was then adjusted to account for the fact that, even in productive plots, not all areas will be productive –a netting figure across the board of 80% has been used in this regard.
3. For each plot, an estimate has been made of the percentage energy wood component of the thinnings, these fall into one of 3 broad categories:
    a. 100% for early broadleaved interventions
    b. 50% for 1st thinning in conifer dominated stands

c. 25% for later thinnings in conifer and mixed stands

4. This provides a total energy wood production forecast in m3 (volume) per annum which has been converted to green tonnes using a typical volume/weight conversion factor of 1.15

The forecast is based on the silvicultural prescriptions assigned as part of the survey. Obviously this means that there are productive years and lean years. However, this can / will be smoothed if a good energy wood inventory and storage system is put in place. Below are the figures associated with the completed draft plan

Year	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031
Volumes (m^3)	589	174	524	27	438	0	348	309	491	19
Convert to green tonnes	512	151	456	24	381	0	303	268	427	16

The average annual green tonne energy wood production is 253 tonnes / annum. The above figures assume a smooth transition to a new felling licence. In the absence of same, the currently licenced thinning figures are forecast to yield the following energy wood volumes up to the expiry of the licence in 2028:

Year	2022	2023	2024	2025	2026	2027	2028
Volumes (m^3)	285	0	117	0	125	0	82
Convert to green tonnes	247	0	102	0	109	0	71

20. Indicative Cash Flow Forecast Associated with Plan

The cashflow forecast is a very general outline forecast associated with implementing the forest management plan. Obviously, more specific market prices will be agreed at the time of each thinning intervention. General volume and value figures have been applied as follows in generating the forecast:

- The Native Woodland Conservation Scheme is used for works in the Native Woodland areas and these operations are cost neutral with the exception of the cost of plan preparations which are budgeted at €2,000 per plan.
- The native woodland conservation premium is drawn on grant aided areas @ €350 / ha. for 7 years
- Broadleaved thinnings are cost neutral (with use of Woodland Improvement Grant) and extracted timber is provided as wood energy for the house and ancillary buildings.
- Early conifer thinnings are cost neutral (from sale of pallet wood) and extracted timber provided as wood energy for the house and ancillary buildings.
- Semi-mature conifer thinnings yield €20 / tonne after harvest costs.
- Mature conifer thinnings yield €40 / tonne after harvest costs.
- Enrichment Planting budget of €500 / ha. in 1st year and €100 / ha. in subsequent 3 years
- Restocking costs of €6,000 / ha in 1st year and €1,000 / ha. in subsequent 4 years
- Sporadic motor manual, low impact, Rhododendron and Laurel Control costs of €1,000 / ha. for 2 years – note this is only for the areas where these invasive species are occasionally clumped and not for the main control areas which have largely been completed / are in hand.
- Annual Forest Management Fees of €80 / ha. to cover all management input including implementation of plan, marking of thinnings, supervison of work, liaison with estate team, preparation of applications to the Forest Service etc.

	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031
Revenues	€36,650	€4,820	€58,721	€8,943	€69,551	€17,343	€74,081	€18,583	€85,603	€13,606
Costs	€132,365	€54,910	€42,448	€41,120	€38,671	€21,903	€21,571	€21,571	€21,571	€21,571
Difference	**-€95,715**	**-€50,090**	**€16,273**	**-€32,178**	**€30,879**	**-€4,561**	**€52,509**	**-€2,989**	**€64,031**	**-€7,966**

Plot Details				Species Details				Prescription	
Plot No	Land Use Type	Area (Ha)	Year Planted	Species Name	Canopy %	Environmental Designation	Current Licence (Y/N)	Management Prescription	Forest Service Grant Potential
1	BHF	9.42	1800 / 1870	Oak, Ash, Adb - Additional broadleaves & some scrub	70	SAC, SPA along river		Prepare Native Woodland Conservation Plan	NWCS
2	BHF	6.25	2002	Oak, Scots Pine (SP)	80			Thin to favour oak and diversity	WIS
3	BHF	3.59	2002	Oak	70			Thin to favour oak and diversity	WIS
4	CHF	0.62	2002	NS - Norway spruce	90			Selective thin	
5	BHF	4.13	1918	Ash, Beech - BE, Sycamore - Syc, SS & Adb	70	SAC, SPA along River Nore		Prepare Native Woodland Conservation Plan	NWCS
6	CHF	0.76	1974	NS & Japanese larch - JL	65	SAC		Selective thinning 2024, 2030	
7	BHF	2.53	1945	Ash	80	SAC		Selective thinning 2024 & 2030. Enrichment planting in open area's	
8	CHF	1.91	1974	JL, NS	60	SAC		Selective thinning 2024 & 2030 - good understorey development	
9	U/P	2.17	Unplanted	Unplanted		SAC		Bog Area, No intervention. Area is colonising with Bl, Ald & Whitethorn along eastern boundary.	
10	MHF	4.09	2018	NS, Oak, Adb, Scrub	50	SAC		Restock has failed - replant with native woodland. Deer fencing required.	
11	BHF	22.19	1800 / 1925	Oak, BE, SP, Cherry -Ch, Adb	60	SAC		Prepare Native Woodland Conservation Plan Enrichment planting and phased removal of beech to favour oak and other natives	NWCS
12	BHF	2.99	2002	Birch - Bi, Ash, Willow, Scrub, Oak, Poplar - POP	50	SAC, SPA along River Nore		Tending and Enrichment Planting	WIS
13	BHF	2.39	2004	Bl, Scrub, Adb	60	SAC		Tending and Enrichment Planting	WIS
14	BHF	18.62	1800	Oak, Ash, Adb	70	SAC, SPA along River Nore		Prepare Native Woodland Conservation Plan	NWCS
15	BHF	18.82	1800 / 1970 / 1997	Oak, Adb, Oak understorey in WIS c.2000	70	SAC, SPA along River Nore		Prepare Native Woodland Conservation Plan Leave alone, phased ringbarking of exotic species, invasive control required.	NWCS
16	BHF	2.47	1800 / 1997	Oak, Adb	80	SAC		Depending on access - thin 2023 & 2029 favouring quality Oak stems	WIS
17	BHF	2.29	1997	Oak, Alder - Ald, Syc, Adb	50			Tending to favour Oak in 2025, wet site, thin in 2030	WIS
18	CHF	8.25	1980	SS	80	Part SAC, SPA along River Nore		Restock with native woodland, windrow & inverted mounding needed. Deer fence also required.	
19	BHF	2.04	1800 / 1997	Oak, Adb, Scrub		SAC, SPA along River Nore		Wet woodland, leave for planing period	
20	BHF	2.91	2004	Ash, Ald, Adb				Leave alone, ring bark confiers	
21	BHF	1.69	2005	Syc, Ash, Bl regeneration, Ald & Scrub				Rack and thin in 2023 & 2029, fell DF out of plot.	
22	MHF	0.48	1961 & 2002	Douglas Fir - DF, Adb				Broadleaves beginning to become dominant, leave alone	
23	MHF	1.43	1961 & 2000	DF, NS & Adb				Being used for game keeping.	
24	MHF	8.88	1914 / 1998	Ash, Syc, BE, DF, SP, Scrub (sections)		SAC, SPA along River Nore		Tending 2023, thinning 2029, good structure within woods	WIS
25	MHF	0.63	1800 / 1920 / 1962/63	NS, DF, European Larch - EL, Oak, Grand Fir - GF				Selective thin 2024 & 2028	
26	MHF	7.98	1800 /1920 / 1962/63	Oak, Western Hemlock - WH, GF, NS, JL & DF		SAC		Rack & select, halo thinning favouring native species 2025 & 2030	
27	MHF	8.15	1800 / 1964	Oak, Ash, DF		SAC		Upderplant ash and replant open area's, Selective think 2028, road access is provided to the south	

Plot Details				Species Details				Prescription	
Plot No	Land Use Type	Area (Ha)	Year Planted	Species Name	Canopy %	Environmental Designation	Current Licence (Y/N)	Management Prescription	Forest Service Grant Potential
28	MHF	1.88	1920	EL, BE, GF				Mark & thin 2024 & 2031	
29	MHF	1.39	1987	SS, Oak, BE			Y	Rack & thin 2024 & 2028.	
30	CHF	2.31	1986 /87	SS, some DF, with Oak & BE along roadside			Y	Rack & thin 2024 & 2028.	
31	MHF	1.68	1975	EL, DF, Ash, Lawsons, Adb				Rack & thin 2024 & 2028.	
32	MHF	2.04	1840	Oak, BE, Western Red Cedar - WRC, SP				No thinning treatment, control laurel & rhodo	
33	CHF	3.53	1977	DF & SS, veteran Oak			Y	Rack & thin 2024 & 2028.	
34	BHF	1.59	2000	Oak, some Noble Fir - NF				Rack and halo thin 2024 & 2030, high prune Oak.	WIS
35	BHF	8.78	1800 / 1820	Oak, BE, Adb				Enrichment planting required in open spaces i.e. laurel controlled areas.	
36	CHF	3.45	1977	SS				Selective thinning 2024 & 2028.	
37	CHF	2.46	1962	SS, WH				Selective thinning 2024 & 2028. Already structural development.	
38	CHF	1.89						Clearfelled. Restock with Native Woodland, Oak will need to be planted in tubes or a deer fence erected. Treatment plan for control of rhododendron required.	
39	CHF	4.92	1964	SP, Adb				Rhodo control, no thin on raised bog, WH to be removed on a phased basis before becoming invasive	
40	CHF	2.18	1959	NS, some SP, understorey of beech, holly, WH & Hazel				Selective thin 2024 & 2028, rhodo control.	
41	CHF	1.11	c.2000	DF, SS SP, BI				First thin 2022, second thin 2028, focus on best stems and diversity, rack and selection. DF is poor, soil is too wet.	
42	CHF	1.97	1964	SP, NS, BI & Adb				Rhodo control, no thinning treatment. Largely consisting of raised bog.	
43	CHF	1.91	c.2000	SS			Y	First thin 2022, Second thin 2026, Third thin 2030. Selective treatment plan for control of pockets of laurel and rhododendron	
44	CHF	4.39	2000	SS, DF, Adb				First thin 2026, Second thin 2030.	
45	CHF	0.46	1962	DF				Selective thin 2022, selective thin 2028	
46	CHF	1.82	1992	SS, DF, Syc				First thin 2022, second thin 2026, third thin 2030. Mark and select, favour diversity.	
47	CHF	4.43	1978	SS				First thin 2022, second thin 2026, third thin 2030. Mark and select, favour diversity. Control rhododendron.	
48	MHF	2.61	1820 / 2000	Oak, DF				First thin 2022, second thin 2028, focus on best stems and diversity, rack and selection. DF is poor, soil is too wet.	

Plot Details				Species Details				Prescription	
Plot No	Land Use Type	Area (Ha)	Year Planted	Species Name	Canopy %	Environmental Designation	Current Licence (Y/N)	Management Prescription	Forest Service Grant Potential
49	BHF	37.79	1770	Oak, Adb				No thin - Annual treatment of laurel and Rhododendron for three years, enrichment planting of Oak where light and opportunities arise, Tending of thicket stage regeneration to favour Oak in 2027, judicious removal of conifers (DF, GF, WH)	
50	CHF	0.35	1993	SS				First thin in 2022, favour species for diversity (Bi/Ash etc), second thin in 2026	
51	CHF	4.06	1993	SS			Y	First thin in 2022, favour species for diversity (Bi/Ash etc), second thin in 2026	
52	CHF	0.68	1963	WRC				Thin in 2026	
53	CHF	1.38	1998	NS, Adb				Thin in 2022,2026 & 2030	
54	CHF	1.28	1970	NS, Adb				Thin in 2022,2026 & 2030	
55	MHF	1.12	1978	JL, BE, Adb				Thin in 2022,2026 & 2030	
56	CHF	4.12	1990	NS			Y	First thin in 2022, Second thin in 2026	
57	MHF	0.88	1963	NS,BE, SP				Develop Access, Selective thin 2024, Control Laurel	
58	BHF	0.52	1920	BE, Oak, SP, EL				No intervention, Control Laurel & WH	
59	BHF	2.32	1957	BE			Y	Selective thin 2022, second thin 2029, Occasional Oak located throughout to be favoured during selection. Mark permanenent racks to reduce machinery movement.	
60	CHF	1.92	1962	JL & SP (overstorey), Syc, Ash, Be (understorey)				No thin of overstorey, shade tolerant understorey requires tending to waste in 2026, needs to be marked beforehand. Mark permanenent racks to reduce machinery movement.	
61	CHF	1.02	1967	NS, JL				Thin of overstorey in 2026, shade tolerant understorey requires tending to waste in 2026, needs to be marked beforehand. Mark permanenent racks to reduce machinery movement.	
62	CHF	3.58	1966	NS, JL, Spanish Chestnut - SC				Thin of overstorey in 2026, shade tolerant understorey requires tending to waste in 2026, needs to be marked beforehand. Mark permanenent racks to reduce machinery movement. Control rhododendron.	
63	CHF	1.43	1965	NS, Adb				Thin 2026, moderate understorey try to retain during operations. Mark permanenent racks to reduce machinery movement.	
64	MHF	0.79	1971 / 1957	JL, some NS, BE				Tidy up blown JL, underplant using Oak where light and opportunities arise.	
65	MHF	1.92	2015	Adb, scrub				Harvested in recent years, coppice regrowth of cut stumps	

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Plot No	Land Use Type	Area in Ha.	Year planted	Species Name
1	BHF	9.42	1800/1870	Oak, Ash, Adb - Other Broadleaves, & some Scrub
2	BHF	6.25	c 2002	Oak, some SP - Scots Pine
3	BHF	3.59	c 2002	Oak
4	CHF	0.62	c 2002	NS - Norway Spruce
5	BHF	4.13	1918	Ash, Beech - Be, Sycamore - Syc, some SS, & Adb
6	CHF	0.76	1974	NS & Japanese Larch - JL
7	BHF	2.53	1945	Ash
8	CHF	1.91	1974	JL, NS
9	UP	2.17	Unplanted	Unplanted
10	MHF	4.09	1975/1870	NS, Adb, Scrub
11	BHF	22.19	1800/1925	Oak, Be, SP, Ch - Cherry, Adb
12	BHF	2.99	c 2002	Birch, Ash, Willow scrub, some Oak & Poplar
13	BHF	2.39	c 2006	Mainy Birch regrowth & scrub & Adb
14	BHF	18.62	1800	Oak, Ash, Adb
15	BHF	18.82	1800/1970/ 1997	Oak, Adb, Oak planted as understorey in WIS c. 2000
16	BHF	2.47	1800/1997	Oak, Adb
17	BHF	2.29	1997	Syc, Alder, Birch, Adb
18	CHF	8.25	1980	SS
19	BHF	2.04	1800/1997	Oak, Adb, Scrub
20	BHF	2.91	c 2004	Ash, Alder, Adb
21	BHF	1.69	c 2005	Ash, Birch regeneration, Alder, Syc & scrub
22	MHF	0.48	1961 & c 2002	DF & Adb
23	MHF	1.43	1961 & c 2000	DF, NS & Adb
24	MHF	8.88	1914/1998	Ash, Syc, Be, DF, SP, Scrub sections
25	MHF	0.63	1800/1920/ 1962/1963	NS - Norway Spruce, EL - European Larch OAK - Oak, GF.
26	MHF	7.98	1800/1920/1962 /1963	Oak, WH, GF, NS, JL & DF
27	MHF	8.15	1800/1964	Oak, Ash,- Some Douglas Fir
28	MHF	1.88	1920	EL - European Larch, Be - Beech
29	MHF	1.39	1987	SS, Oak, Be
30	CHF	2.31	1986/1987	SS with Oak & Be along roadside
31	MHF	1.68	1975	DF, Ash, Adb
32	MHF	2.04	1840	Oak, Be, WRC, SP
33	CHF	3.53	1977	SS
34	BHF	1.59	c 2000	Oak, some NF
35	BHF	8.78	1800/1820	Oak, Be, Adb
36	CHF	3.45	1977	SS
37	CHF	2.46	1962	SS WH
38	CHF	1.89	1980	NS - Norway Spruce, some GF
39	CHF	4.92	1964	SP - Scots Pine, Adb
40	CHF	2.18	1959	NS, some SP
41	CHF	1.11	1961	NS - Norway Spruce, SP - Scots pine
42	CHF	1.97	1964	SP & Adb
43	CHF	1.91	1961	SS
44	CHF	4.39	c 2000	SS
45	CHF	0.46	1962	DF
46	CHF	1.82	1992	SS - Sitka Spruce, DF - Douglas Fir, Syc
47	CHF	4.43	1978	SS
48	MHF	2.61	1820/2000	Oak, DF
49	BHF	37.79	1770	Oak, Adb
50	CHF	0.35	1993	SS - Sitka Spruce
51	CHF	4.06	1993	SS - Sitka Spruce
52	CHF	0.68	1963	WRC - Western red cedar
53	CHF	1.38	1998	NS & Adb
54	CHF	1.28	1970	NS - Norway Spruce & Adb
55	MHF	1.12	1978	JL - Japanese Larch, Be & Adb
56	CHF	4.12	1990	NS - Norway Spruce
57	MHF	0.88	1963	NS, Be, SP
58	BHF	0.52	1920	Be, Oak, SP
59	BHF	2.32	1957	Be -Beech
60	CHF	1.92	1962	Japanese Larch & SP - Scots Pine
61	CHF	1.02	1967	NS, JL
62	CHF	3.58	1966	JL NS
63	CHF	1.43	1965	NS, Adb
64	MHF	0.79	1971/1957	NS - Norway Spruce/Be - Beech
65	MHF	1.92	1962	Ash, Beech, SS, scrub Adb
Total Area		269.64		