APPENDIX 5-1

BIODIVERSITY ENHANCEMENT MANAGEMENT PLAN

Planning and Environmental Consultants

Biodiversity Enhancement Management Plan

Proposed Quarry Extraction and Restoration, Ballyquin, Co. Clare

DOCUMENT DETAILS

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Project Number:	**211137**
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Planning and Environmental Consultants

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03	Draft	12.11.2024	CT	RW

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1. INTRODUCTION

1.1 Background

This Biodiversity Enhancement and Management Plan (BEMP) has been prepared in support of the Environmental Impact Assessment Report (EIAR) produced for the Proposed Development.

The BEMP has been prepared to mitigate the loss of Sand Martin (*Riparia riparia)* burrows and suitable breeding habitat, 104m of Hedgerow (WL1) and 186m of Treeline (WL2) habitat. The BEMP will provide additional suitable breeding habitat for Barn Owl (*Tyto alba),* which were recorded nesting onsite. See Figure 3-1 for the loss of linear habitat onsite and Figure 2-3 for the location of the Sand Martin burrows within the Proposed Development site.

The BEMP will also provide additional roosting and nesting opportunities within the Proposed Development for bat and passerine bird species, provide nesting habitat for species that currently use the Proposed Development site to forage that have no suitable nesting habitat onsite, such as Kestrel (*Falco tinnunculus)*, and will provide hibernating and refugia areas for invertebrates, amphibians and reptiles.

The BEMP outlines methods of control for non-native invasive species recorded onsite. This report details the provision of additional roosting structures for bats within the Proposed Development site.

1.1.1 Project Description

The Proposed Development being applied for under this planning application includes for the extraction, processing and washing of sand and gravel from an area measuring approximately 16.3 hectares (ha) which will allow for the extraction of approximately 1,428,571 tonnes of material.

The development proposals also include for the infilling and restoration of an existing and future quarry void back to original land contour levels. It is proposed to fill the void with either inert soil and stone waste (imported inert greenfield and non-greenfield soils and stone, and river dredge spoil) which will be a soil recovery facility and require a waste management licence or soil and stone by-product (i.e., essentially virgin soil or equivalent to virgin soil and stone, and river dredge spoil) which will be notified to the Environmental Protection Agency (EPA) as an Article 27 by-product. The quantity of soil and stone material required for restoration has been estimated to be approximately 4,471,200 tonnes.

The Proposed Development also includes for the construction of a soil inspection shed, refuelling area, settlement ponds, road improvements, drainage network and environmental berms.

A detailed description of the Proposed Development is provided in Chapter 3 of the EIAR.

1.1.2 Objectives of BEMP

The objectives of this Biodiversity Management Plan are as follows:

- To offset the loss of Hedgerow (WL1) and Treeline (WL2) habitat during the construction phase of the Proposed Development by bolstering and creating new hedgerows within the Proposed Site Boundary.
- To restore the habitats within the Proposed Development site to their original condition (prior to extraction works) as agricultural grassland and hedgerow habitats, where the grasslands will be sown with tussocky species creating foraging areas for raptor species that utilize the Proposed Development site.
- To mitigate the loss of Sand Martin (*Riparia riparia)* nesting habitat by providing alternative nesting structures for the species. In addition to providing alternative suitable breeding habitat for Barn Owl (*Tyto alba)* located away from areas that may cause disturbance.

- To provide site specific best practice guideline measures for the control and management of the non-native invasive species within the Proposed Development site and provide additional roosting habitat for bat species.

1.1.3 Statement of Authority

Baseline ecological surveys of the site were undertaken on the 30th of March 2023, 25th of April 2023, 18th of May 2023, 28th of August 2023 and 17th of April 2024 by Brónagh Boylan (BSc. Env), Rachel Minogue (BSc. Env), Aran von der Geest Moroney (BSc. Eco), and David Culleton (BSc. Zoology, M.Sc. Conservation Behaviour). Sara Fissolo (BSc. Eco) and David Culleton (BSc., M.Sc.) undertook bat surveys of the site. All surveyors have extensive experience in ecological assessment and surveying. Cora Twomey (B.Sc. Eco) is the author of this report. Rachel Walsh (B.Sc. Env) has reviewed this report. Rachel has over 5 years of experience in ecological consultancy.

2. ECOLOGICAL BASELINE

Dedicated surveys of the areas within the Proposed Development were undertaken on the 30th of March 2023, 25th of April 2023, 18th of May 2023, 17th of July 2023, 28th of August 2023 and 17th of April 2024 by Brónagh Boylan (BSc.), Aran von der Geest Moroney (BSc.), Rachel Minogue (BSc.) and David Culleton (BSc.).

2.1 Habitats and Flora

The habitats recorded during the site visit are described below (See habitat map below Figure 2-1).

Table 2-1 Habitats recorded at the Proposed Development Site

Habitat	Fossitt Code
Buildings and artificial surfaces	BL3
Active quarries/mines	ED4
Spoil and bare ground	ED2
Depositing/lowland river	FW2
Scrub	WS1
Reed and large sedge swamp	FS1
Recolonising bare ground	ED3
Immature woodland	WS2
Exposed sand, gravel or till	ED1
Other artificial lakes and ponds	FL8
Marsh	GM1
Drainage ditch	FW4
Dry meadows and grassy verges	GS2
Hedgerow	WL1
Improved agricultural grassland	GA1
Treeline	WL2

The site entrance, weighbridge within the site boundary, existing buildings and old quarrying equipment, and hardstand areas are classified under **Buildings and artificial surfaces (BL3)**. The Proposed Development site is an existing quarry that has not operated for a number of years. As a result of previous extraction procedures, there are stockpiles of sand and gravel on site classified under **Active quarries/mines (ED4)**. Areas of the site have been classified as active quarries, despite inactivity within the quarry for several years, as areas of the site have remained uncolonized during the inactive years, and due to the high levels of unconsolidated stockpiles within the quarry. There are multiple unconsolidated roads running through the site classified as **Spoil and bare ground (ED2).**

A **Depositing/lowland river (FW2)** borders the southeast and north of the Proposed Development site. The southern watercourse is heavily encroached by vegetation, primarily bramble (*Rubus fruticosus agg.*) with little standing water and no flow present in the section of the watercourse bordering the grasslands to the southeast of the site. The watercourse continues to the west of the entrance road of the site. The watercourse was bordered by **Scrub (WS1)** habitat. The water was turbid and moderate flowing at the time of the survey with a watercourse width of 1-2m.

To the west of the entrance to the Proposed Development site, is an area of **Reed and Large swamps (FS1)**. The habitat is dominated by common reed (*Phragmites australis*) and bulrush (*Typha latifolia*) in an area of standing water. In areas of the north-west, southeast and centre of the site, areas of **Recolonising bare ground (ED3)** were documented. Species within these areas included colt's foot (*Tussilago farfara*), nettle (*Urtica dioica*), willow herb (*Epilobium* spp.), shepherd's purse (*Capsella bursa-pastoris*), dandelion (*Taraxacum* spp.), common gorse (*Ulex europaeus*), scatterings of conifer & willow saplings (*Sitka* spp.) (*Salix* spp.), hawksbeard (*Crepis capillaris*), daisy (*Bellis perennis*) and ragwort (*Jacobaea vulgaris).*

The majority of the northwest and easternmost extent of the site contained **Immature Woodland (WS2)**, particularly along the west and eastern boundaries of the site. Species of this habitat found on site

included Birch (*Betula* spp.), Willow (*Salix* spp.), with some common gorse (*Ulex europaeus*). Ground flora included: nettle (*Urtica dioica*), foxglove (*Digitalis purpurea*), herb Robert (*Geranium robertianum*), hard shield fern (*Polystichum aculeatum*), ivy (*Hedera hibernica*), bramble (*Rubus fruticosus agg.*).

At times across the site, **Immature Woodland (WS2)** was bordered by **Scrub (WS1)** vegetation with Scrub (WS1) vegetation dominating the south-western corner of the site. Additionally, **Scrub (WS1)** vegetation had recolonised areas between existing sand and gravel piles with common gorse (*Ulex europaeus*) heavily present on site. **Scrub (WS1)** species found within the Proposed Development site included willow (*Salix* spp.), Birch (*Betula* spp.), gorse (*Ulex* spp.), Blackthorn (*Prunus spinosa*), bracken fern (*Pteridium aquilinum*), bramble (*Rubus fruticosus agg.*), nettle (*Urtica dioica*), thistle (*Cirsium vulgare*) and Himalayan Knotweed (*Persicaria wallichii*).

Across the site, there are multiple areas of **Exposed sand, gravel or till (ED1)** in the form of exposed sand cliff faces and earth/gravel till stockpiles. The exposed sand cliff faces were often colonised by gorse and willows and offer suitable nesting habitat to Sand Martin (*Riparia riparia*).

Other artificial lakes and ponds (FL8) are present in the west and north of the Proposed Development with two small ponds found in the south-east of the Proposed Development within the proposed extraction area. Vegetation documented surrounding these ponds included soft rush (*Juncus effusus*), hard rush (*Juncus inflexus*), bulrush (*Typha latifolia),* marsh thistle (*Cirsium palustre*), fire weed (*Chamaenerion angustifolium*), and marsh horsetail (*Equisetum palustre*). The pond present in the northwest of site was heavily encroached by the stockpiles of sand and gravel located to the east of the pond as there is no barrier present between the pond and stockpiles. Additionally, the pond had a muddy substrate with a low number of small rocks/cobbles present and was 0.5 m in depth.

The pond in the far north of site within an associated area of **Marsh (GM1)** was approx. 1m in depth with large boulders present in the water. Surrounding the pond was a high number of both soft rush (*Juncus effusus*) and hard rush (*Juncus inflexus*) with approximately 30% coverage of algae at the surface of the pond. The large pond present to the east of the site was surrounded by bull rush (*Typha latifolia)* and previously listed **Scrub (WS1)** vegetation. As previously stated, the area to the far north of the site is dominated by **Marsh (GM1).** Vegetation recorded in this habitat included watercress (*Nasturtium officinale*), hairy bittercress (*Cardamine hirsute*), soft rush (*Juncus effusus*), marsh horsetail (*Equisetum palustre*), common water-starwort (*Callitriche stagnalis*), yarrow (*Achillea millefolium*), marsh pennywort (*Hydrocotyle vulgaris*), marsh cinquefoil (*Potentilla palustris*), *Calliergon* moss, horsetails (*Equisetum* spp.) bog chickweed (*Stellaria alsine*), and water figwort (*Scrophularia auriculata*).

A **Drainage Ditch (FW4)** is present in the north-west of the Proposed Development site, bordered on both sides by immature woodland (WS2). The **Drainage Ditch (FW4)** had no flow and was heavily encroached by vegetation. The **Drainage Ditch (FW4)** had stagnant water in which pondweed (*Potamogeton natans*), marsh horsetail (*Equisetum palustre*), marsh woundwort (*Stachys palustris*), bull rush (*Typha latifolia*), willow (*Salix* spp.) and beech (*Fagus sylvatica*) were present.

Grasslands recorded as **Dry meadows and grassy verges (GS2)** were present in the south-west of the Proposed Development site separated from one another and the wider site by **Hedgerows (WL1).** Species found in these grasslands were meadow foxtail (*Alopecurus pratensis*), cock's foot (*Dactylis glomerata*), Yorkshire fog (*Holcus lanatus*), germain speedwell (*Veronica chamaedrys*), nettle (*Urtica dioica*), pignut (*Conopodium majus*), clovers (*Trifolium* spp.), lesser stitchwort (*Stellaria graminea*), red fescue *(Festuca rubra*), soft rush (*Juncus effusus*), yarrow (*Achillea millefolium*), and creeping buttercup (*Ranunculus repens*). **Hedgerow (WL1)** lines were comprised of Blackthorn (*Prunus spinosa*), hawthorn (*Crataegus monogyna*), Holly (*Ilex aquifolium*), bramble (*Rubus fruticosus agg.*), elder (*Sambucus nigra*), oak saplings (*Quercus* spp.), willow (*Salix* spp.), birch (*Betula* spp.), common gorse (*Ulex europaeus*), nettles (*Urtica dioica*) and bracken (*Pteridium aquilinum.*).

Grasslands present to the far southeast of the site and northwest of the Proposed Development boundary were classified as **Improved agricultural grassland (GA1)** due to the species composition present and the presence of livestock grazing within them. Species recorded within these fields included yorkshire fog (*Holcus lanatus)*, ribwort plantain (*Plantago lanceolata)*, white clover (*Trifolium repens)*, red clover (*Trifolium pratense)*, soft rush (*Juncus effusus*), perennial rye grass *(Lolium perenne)*, creeping buttercup (*Ranunculus repens*), meadow buttercup (*Ranunculus acris*), smooth hawk's-beard (*Crepis vesicaria*), ragwort (*Jacobaea vulgaris)*, yarrow (*Achillea millefolium),* sheep's sorrel (*Rumex acetosella*), fescue

(*Festuca* spp.), *vulgare*), broadleaved dock (*Rumex obtusifolius)*, sweet vernal grass (*Anthoxanthum odoratum*), knapweed (*Centaurea nigra*), common vetch (*Vicia sativa),* and bracken (*Pteridium aquilinum*.).

Within the field in the northwest, the **Treeline (WL2)** habitat surrounding the grassland was bordered by Hawthorn (*Crataegus monogyna*) with ground flora within the treeline consisting of native bluebell (*Hyacinthoides non-scripta)*, lesser celandine (*Ficaria verna*), and wood anemone (*Anemone nemorosa*).

Surrounding the boundary of the Proposed Development site in the northeast of the site and the northern agricultural grassland, **Treelines (WL2)** are present. **Treelines (WL2)** identified bordering the boundary of the Proposed Development site consist primarily of ash (*Fraxinus excelsior*) trees, with the agricultural grassland to the north of the site surrounded by ash (*Fraxinus excelsior*), hazel (*Corylus avellana*) and oak (*Quercus petraea*).

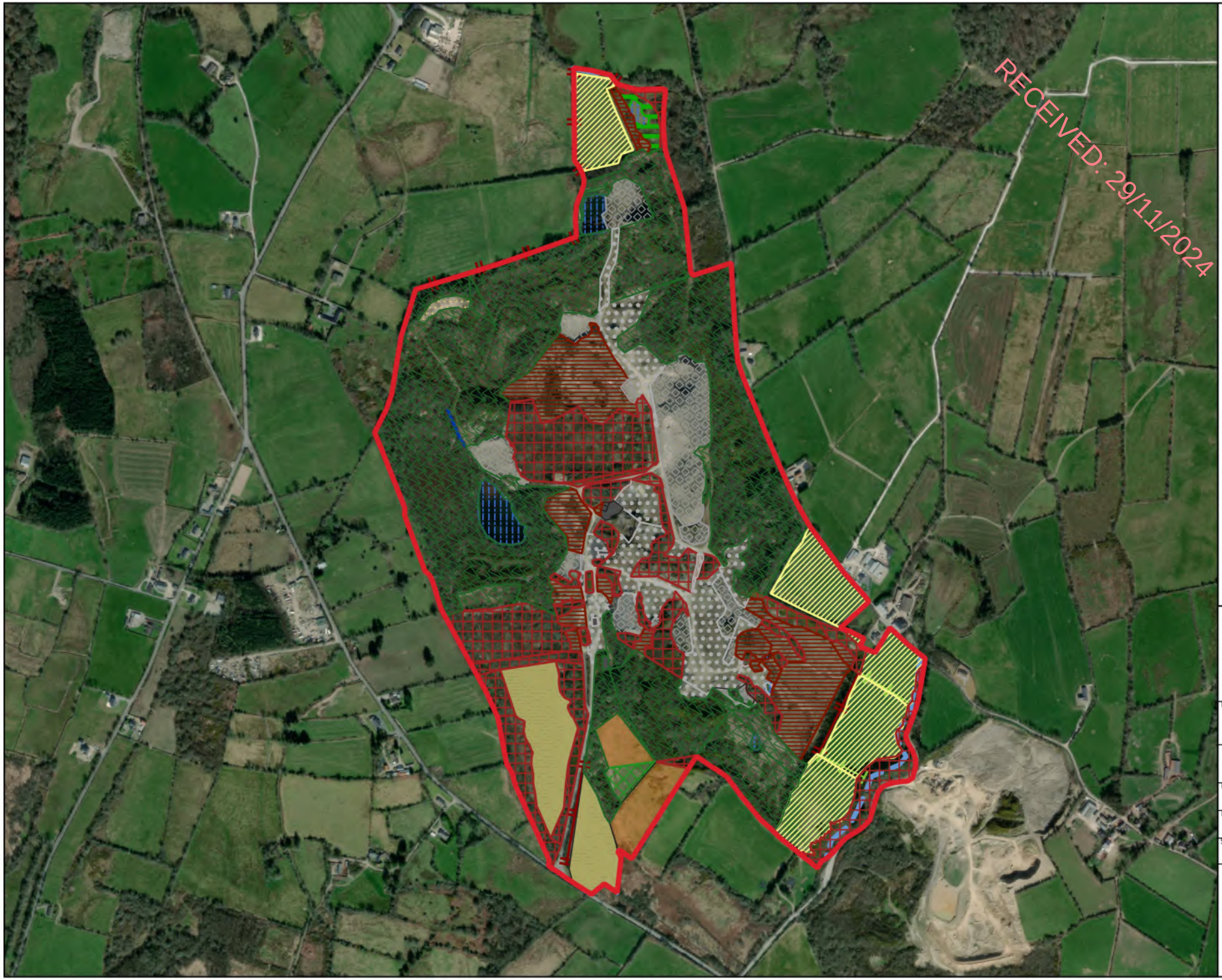
None of the habitats within the Proposed Development site proposed for extraction, infill and restoration conform to habitats listed under Annex I of the EU Habitats Directive.

No botanical species protected under the Flora (Protection) Order (2022) were recorded during the survey.

2.1.1 Invasive species

Himalayan Knotweed (*Koenigia polystachya)*, listed on the Third Schedule of Invasive Species, was recorded within the Proposed Development site boundary. The species will be impacted upon during the works, as there are two stands present within the proposed infill boundary. A further stand was found north of the man-made pond onsite and is outside of any proposed works footprint. Any works within 7m of these stands onsite may cause disturbance to the invasive species and may result in the potential further spread of the Third Schedule species onsite. An Invasive Species Management Plan for this species has been prepared and is included in Appendix 5-3 of the EIAR.

The non-native species Buddleia (*Buddlejia davidii)* was recorded within the Proposed Development site. Control and removal methods are outlined in Section 3.1.5 below to avoid potential impacts associated with the introduction and spread of invasive alien plant species.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Recolonising bare ground
Active quarries and mines
Other artificial lakes and ponds
Reed and large sedge swamps
Improved agricultural grassland
Marsh
Dry meadows and grassy verges
Wet grassland
Scrub
Immature woodland
Depositing/ Lowland Rivers (FW2)
Drainage Ditches (FW4)
Hedgerows (WL1)
Treelines (WL2)
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211137
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Figure 2-1
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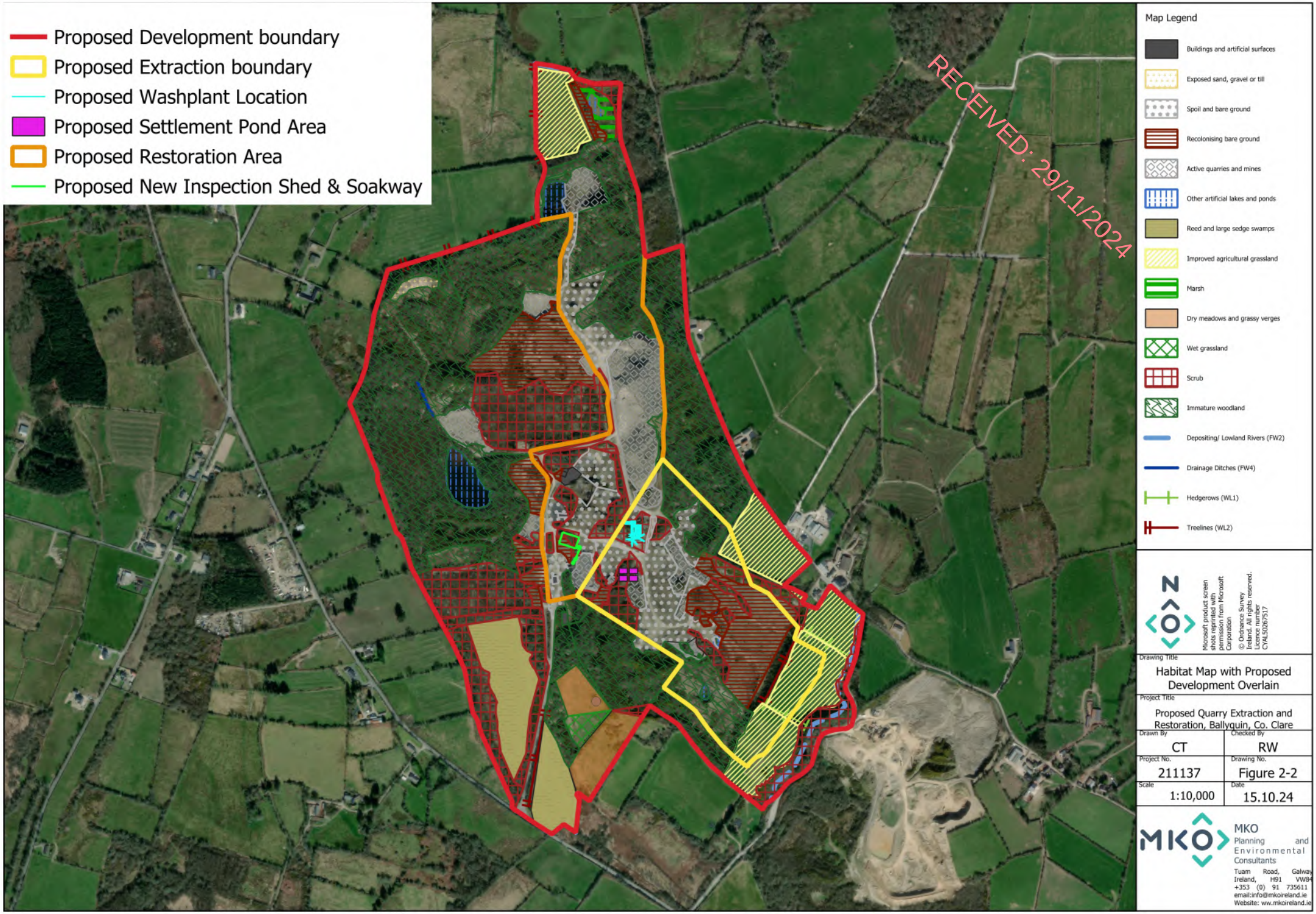
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Proposed Extraction boundary
Proposed Washplant Location
Proposed Settlement Pond Area
Proposed Restoration Area
Proposed New Inspection Shed & Soakway
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Buildings and artificial surfaces
Exposed sand, gravel or till
Spoil and bare ground
Recolonising bare ground
Active quarries and mines
Other artificial lakes and ponds
Reed and large sedge swamps
Improved agricultural grassland
Marsh
Dry meadows and grassy verges
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Immature woodland
Depositing/ Lowland Rivers (FW2)
Drainage Ditches (FW4)
Hedgerows (WL1)
Treelines (WL2)
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Project Title
Proposed Quarry Extraction and Restoration, Ballyquin, Co. Clare
Drawn By
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Checked By
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Project No.
211137
Drawing No.
Figure 2-2
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2.2 Fauna

2.2.1 Badger survey

While some mammal trails, paw prints and snuffle holes were recorded within the site, no indication of significant badger activity was recorded, and no setts were identified within or adjacent to the EIAR Study Area boundary. The EIAR Study Area boundary does, however, provide suitable supporting habitat for this species and it is likely to occur within the site, at least on occasion.

2.2.2 Otter survey

The Bridgetown watercourse present at the southeast boundary of the Proposed Development site offers surface water connectivity to the Lower River Shannon Special Areas of Conservation (SAC), in which otter is a Qualifying Interest (QI). As such, the watercourse was assessed and surveyed for potential foraging and commuting habitat to otter.

No sign of otter was observed. No sign of otter spraints, scat, prints, slides, trails, couches and holts was observed. The watercourse to the southeast was heavily encroached with vegetation primarily bramble, containing a low level of standing water with no flow at the time of survey.

2.2.3 Bat surveys

A detailed bat survey report is provided in Appendix 5-2 of the EIAR. This document provides a detailed description of all survey methodologies as undertaken at the site during 2023. Full details of the survey times and dates and the methodologies followed are provided in the Bat Survey Report, included as Appendix 5-2, along with details of all the surveyors.

2.2.3.1.1 *Bat Habitat Appraisal*

A bat walkover and inspection survey were conducted on the 27th of July 2023. Details of the assessment of existing man-made structures for their suitability to host roosting bats are presented below. Trees within the Proposed Development footprint are also assessed in more detail.

2.2.3.1.2 *Preliminary Roost Assessment*

Potential Roost Features (PRF) Structures

Four structures were identified and inspected as part of the roost assessment effort, the weighbridge office, a large shed, a water pump building and a hopper. The weighbridge office was also the subject of roost emergence surveys. Details of the emergence survey are presented in 2.2.3.1.3.

Weighbridge Office

This structure is an unused office building with a tiled roof (ITM X 562602 669150). The structure is located north of the site entrance gate, and west of the proposed extraction boundary. The building has a separate attic space. Access points were identified underneath gaps in the fascia board, and underneath roof tiles. Bat droppings and feeding remains were found inside the building. It was assigned a *Moderate* roosting potential. The shed was subject to a dusk emergence survey on 27th of July 2023.

Large Shed

The large shed is a corrugated iron structure located southeast of the weighbridge office (ITM X 562622 Y 669067). Panels on the walls and roof illuminate it during the daylight hours. However, the northern end of the building has rooms that are dark throughout. Within these rooms, evidence of feeding bats was found, along with droppings. A single dead bat was found in an old disused toilet during the 27th of July 2023 inspection. No identification (ID) was possible on the carcass. A second dead bat impossible to

ID was found in the same location on the 28th of August. A single feeding bat was also seen inside the structure during the same night following a barn owl survey. The bat's behaviour was indicative of a brown long-eared bat, however no ID was possible. The shed is in regular use by bats, but was assigned a *Low* roosting potential, as it is likely favoured for limited opportunistic roosting, particularly feeding and night roosting.

Water Pump Building

The water pump building is a flat roof concrete building located east of the weighbridge office (ITM X 562631 Y 669182). Numerous access points were identified in the structure, such as gaps in the concrete exterior and open windows. A large number of droppings and feeding remains were found inside the structure. No bats were found. Whilst evidence of bats using the building was evident, there is no capacity for hosting regular or significant roosting, and the building is likely in use as a feeding perch or night roost. It was assigned a *Low* roosting potential.

Hopper

The hopper is a small concrete building once used for funnelling sand and gravel. It is located to the east of the water pump building (IG Ref: ITM X 562654 Y 669205). The interior of the structure is exposed and overgrown. However, a single Leisler's bat was found roosting between the northern wall and concrete support beam. The structure was assigned a *Low* roosting potential.

PRF Trees

The site comprised a network of treelines and hedgerows in the agricultural fields to the southwest of the site. Conifer plantations bordering existing tracks and roads dominated the other areas of the site. These were assessed as having *Negligible* roosting potential for bats. Deciduous treelines identified throughout the site were assessed for their potential to host roosting bats. The majority of linear features comprised hedgerows with sparse, immature trees with *No* potential roosting features.

A number of trees within the site boundary were assessed. Four trees assessed presented, or were likely to present, features suitable for roosting bats. Most of the trees were observed with binoculars and were located in inaccessible areas: the assessment was provided as a precaution. Details of the assessment are presented in Table 2-2. In all four cases, no potential roost features were visible due to heavy ivy cover. Two of the assessed trees (Trees 2 and 3 in Table 2-2) are proposed to be felled as part of the development. Therefore, in the event that felling is required, further assessment will be needed to establish if potential roosting features are present.

Table 2-2 Tree Inspection Results

#	Species	Potential	IG Reference	Notes
1	Unknown	Low	R 63028 69219	Old tree with old ivy covering trunk
2	Unknown	Moderate	R 63073 69148	Mature tree with old ivy cover.
3	Unknown	Low	R 63143 68923	Mature tree with old ivy cover.
4	*Fraxinus spp.*	Moderate	R 62583 69884	Mature trees with heavy ivy cover.

2.2.3.1.3 Bat Activity Surveys

Manual Surveys

Dusk Emergence Survey

Four structures were identified within the site. Bat use was confirmed within three of the structures during the initial inspections carried out on 27th July 2023 and further surveys were not deemed necessary at early design stages. Roosting was also confirmed within the weighbridge office, however as the attic space was not sully accessed, a dusk emergence survey was also carried out. Table 2-3Table 2-3 summarises the survey effort in relation to dusk emergence survey carried out to identify and classify potential roosts. Individual surveys are described below.

Table 2-3 Manual activity surveys at PRFs.

PRF	IG Ref.	Date	Survey Type	Results
Weighbridge Office	R 62647 69121	27th July 2023	Dusk Emergence	Single Leisler's bat emerged at 21:50.

Weighbridge Office

One dusk emergence survey was carried out at the weighbridge office located 500 metres north of the main entrance gate. During the survey, one Leisler's bat was observed emerging from the southwest corner of the office. Leisler's bats, *Myotis* spp. and soprano and common pipistrelles were also recorded foraging during the survey by both surveyors, which were located at the north and south of the office. In particular, social calling by Leisler's bats was recorded, and bats were observed continuously flying in circles above the site's car park early during the survey. Bat activity reduced once barn owls were spotted flying across the site and above the office.

Night Walkover Survey

The manual activity survey also comprised of a night walkover transect at dusk. The night walkover survey followed the dusk emergence survey undertaken on the 27th of July 2023. The survey began at 23:00 and was completed at 00:28. Regular bat activity was recorded on the survey, with a total of 231 bat passes (Table 2-4Table 2-4).

Table 2-4 Night Walkover survey results

Date	Km	Common pipistrelle	Soprano pipistrelle	Leisler's bat	Brown long-eared bat	*Myotis* spp.	Lesser Horseshoe bat
27/07/2023	4.1	94	91	35	3	2	6

The walkover survey was aimed at assessing the use of linear features and other habitats by bats. The survey followed existing roads throughout the site. Bat activity was dominated by common and soprano pipistrelles. Common pipistrelles were predominantly recorded at the west of the site where immature conifer plantation was abundant. Soprano pipistrelles were principally found at the south of the site. Six Lesser horseshoe bat passes were also recorded during the walkover survey in the southwest of the site.

Static Detectors Surveys

Six SM4 static detectors were deployed on the site for a minimum 10-day period. Three detectors were deployed on 17th July 2023. They were moved on 27th July 2023 to three new locations and were collected on 15th August 2023. These detectors allowed a specified look into species composition, commuting and foraging activities within the site. Locations were chosen to represent areas of likely bat activity.

In total 25,368 bat passes were recorded. Analysis of the detector recordings positively identified five bats to species level with *Myotis* genus also present. Common pipistrelle (*Pipistrellus pipistrellus*) made up the vast majority of the activity recorded within the site (n=15,005), followed by Soprano pipistrelle *(Pipistrellus pygmaeus*) (n=7,842). Leisler's bat (n=1,779) and *Myotis* spp. (n=526) were less frequently recorded, followed by brown long-eared bats (n=151). 65 instances of lesser horseshoe bat were recorded at the site. The Site is located within the current known range for this species. Plate 2-1 shows total bat species composition recorded at the site.

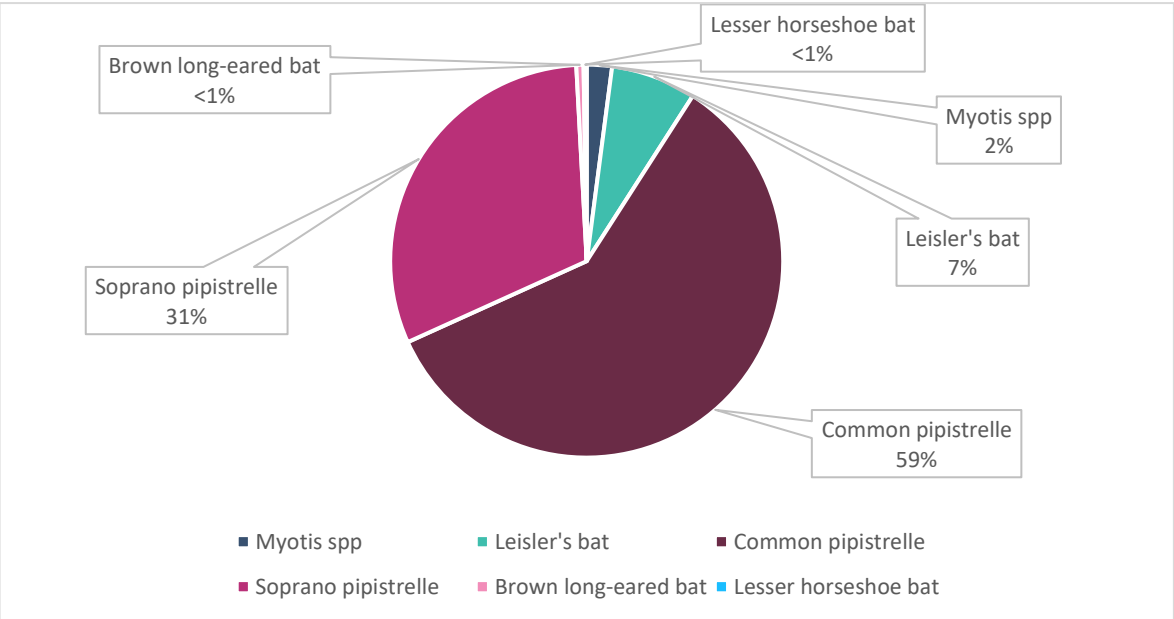


Plate 2-1 Total bat species composition.

The plate below shows total bat passes per detector, which are summarised in Table 2-5.

Table 2-5 Static detector results, total bat passes

Detector	Common Pipistrelle	Soprano Pipistrelle	Leisler's Bat	Brown Long-eared Bat	*Myotis* spp.	Lesser Horseshoe Bat
D01	2066	2435	108	10	214	1
D02	836	312	96	19	68	11
D03	2415	306	190	5	27	11
D04	5882	1973	248	23	72	18
D05	989	2204	941	58	91	24
D06	2817	612	196	36	54	0

Species composition was varied across the detectors. Common pipistrelles were recorded more frequently at locations D02, D03, D04 and D06. Soprano pipistrelle were recorded in higher numbers at D01 and D05, though instances of common pipistrelle were still high. Leisler's bat activity was highest at

D05. Instances of brown long-eared bats (n=151) were rare at across the site. *Myotis* spp. was recorded more often at D01 that at any other location.

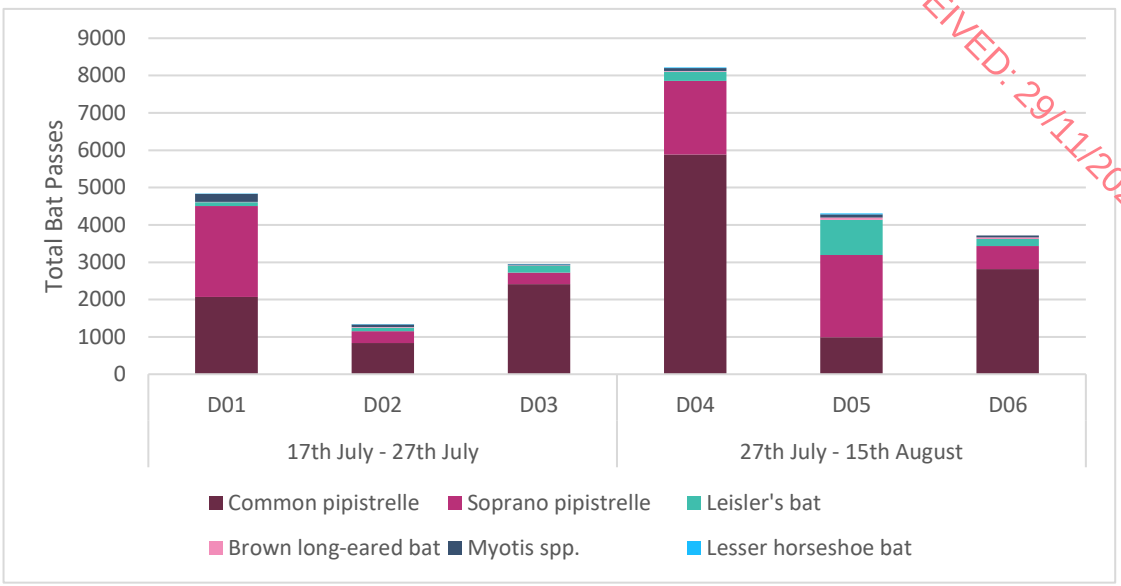
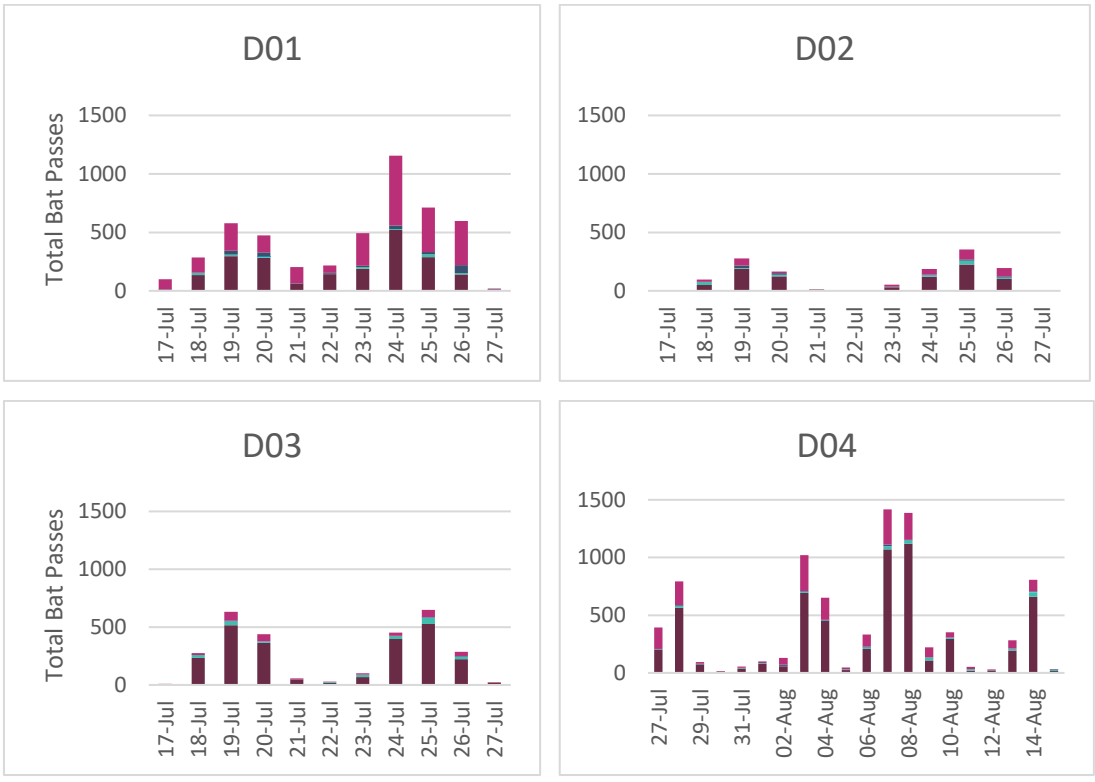


Plate 2-2 Total bat passes per detector.

Analysis of the detector recordings also highlighted the total bat passes per night, per detector. Species composition per night is shown in Plate 2-3 Total Bat Passes per Night, per Detector Location. Activity varied between locations and between nights during the two deployments. Species composition was dominated by common pipistrelles at D02, D03, D04 and D06. D01 and D05 activity was predominantly soprano pipistrelles, though Leisler's bat was more prevalent at this location than at any other. Lesser horseshoe bat was recorded at all detectors, with the exception of D06. Occasional increases in activity were recorded for all other species. The highest activity was recorded at D04 on the 7th and 8th of August.



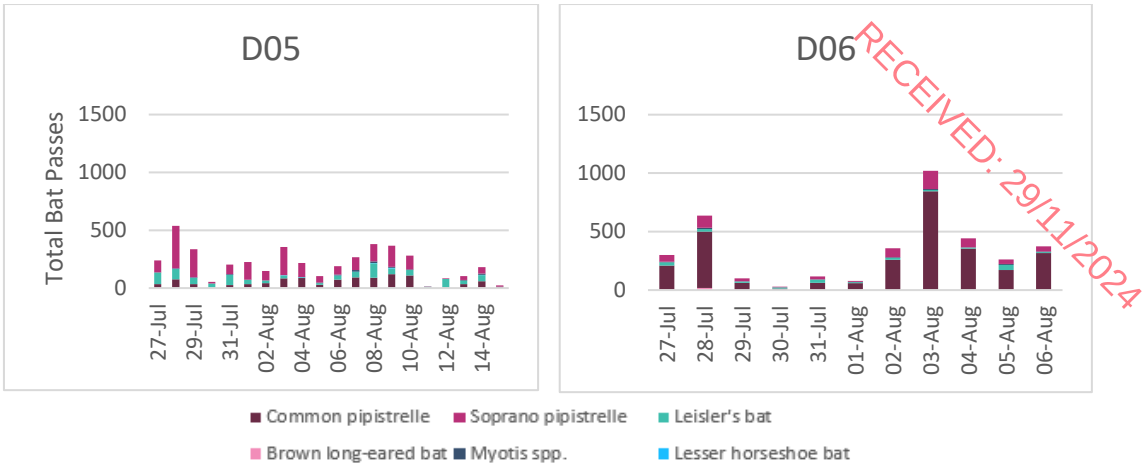


Plate 2-3 Total Bat Passes per Night, per Detector Location

2.2.4 Barn Owl Survey

During the manual bat surveys, an incidental sighting of barn owl was recorded. A barn owl was recorded flying south by the existing office building, and subsequently flying back north to the historical quarry plant. In total, a minimum of three barn owls could be heard calling and flying over the quarry plant and current void.

As a result, a barn owl survey was carried out, to determine the use of the site by barn owl and the potential breeding success of the species within the Proposed Development site. A barn owl survey was undertaken on the 28th of August 2023 by Brónagh Boylan (BSc.), Sara Fissolo (BSc.), Aran von der Geest Moroney (BSc.) and David Culleton (BSc.) of MKO. Each surveyor was positioned at a different vantage point within the site to provide the best scope for identifying the use of the site by the species.

The site infrastructure that the barn owls were recorded flying overhead during the bat surveys was inspected. Signs of barn owl occupancy was recorded in the form of active whitewash located beneath a large cavity within a concrete wall. Pellets were also recorded adjacent to the infrastructure onsite.

The survey began at 20:07 and concluded at 21:50.

A kestrel was spotted by two surveyors at 20:29 and 20:31 flying to the east of the existing quarry plant. At 20:42 the kestrel was seen flying from east to south.

At 21:10 one barn owl was seen flying out from existing quarry plant and resting on a piece of machinery. It then flew off of the machinery in an eastern direction. At 21:13 a second barn owl flew in a southeast direction. At 21:11, 21:18, 21:19, and 21:22, calls from the barn owl were heard by surveyors coming from an eastern direction.

Potential breeding activity by barn owl at this site was therefore recorded.

2.2.5 Other Faunal Species

2.2.5.1 Mammals

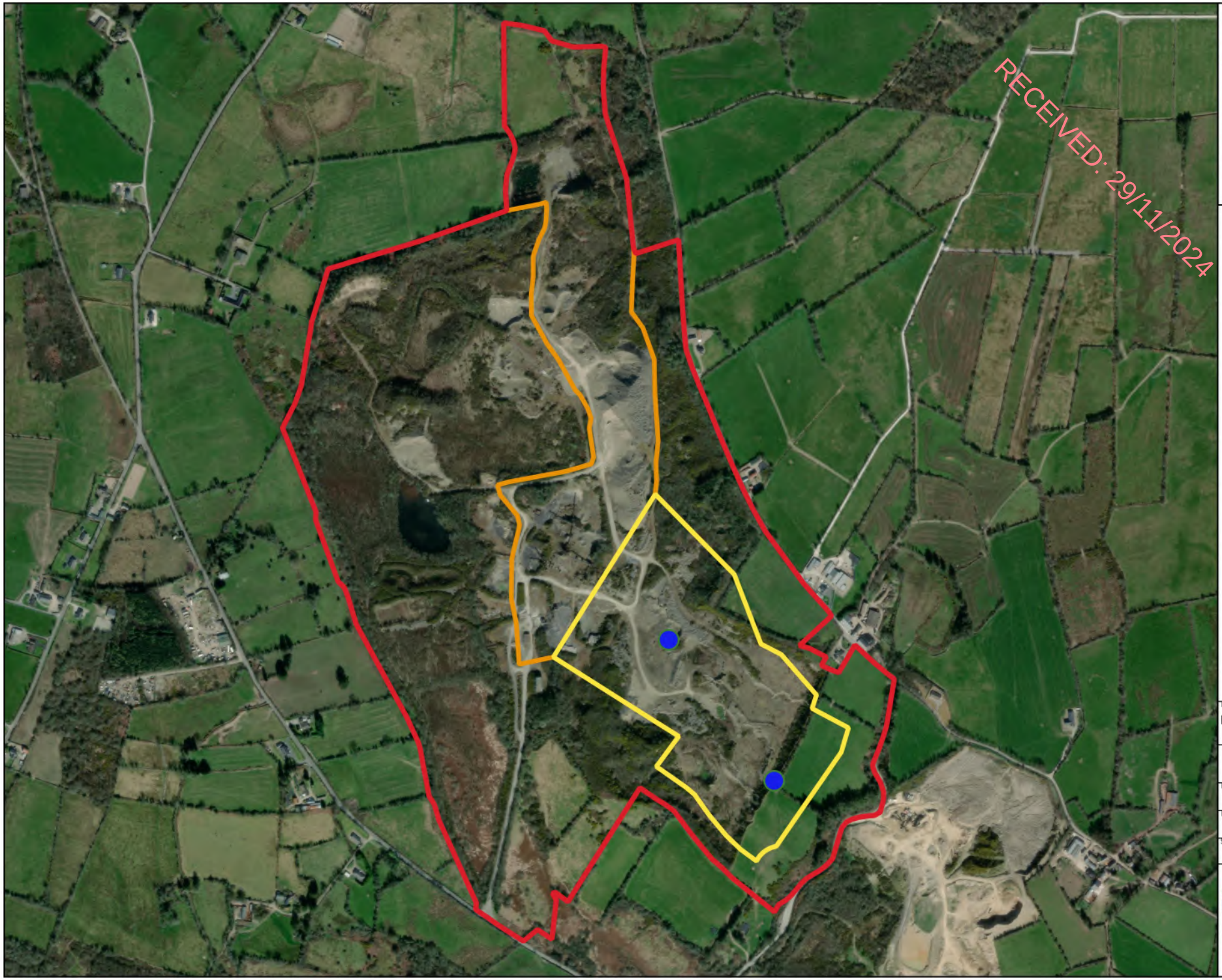
Fox (*Vulpes vulpes*) prints were recorded within the Proposed Development site. Fallow deer (*Dama dama*) were sighted within the EIAR Study Area boundary in addition to deer prints often adjacent or within woodland habitat. Droppings likely to be of pine marten (*Martes martes*) or Irish stoat (*Mustela erminea hibernica*) given the small size (relative to badger), black colour and coiled, discrete shape were

recorded. These scats contained seeds of ivy and blackberry, which are known to make up to 30% of the pine marten's diet (Lynch et al. 2007[1]).

2.2.5.1.1 Invertebrates

A number of invertebrates were recorded within the EIAR Study Area boundary. A small heath (*Coenonympha pamphilus*) caterpillar was recorded, in addition to an orange-tip butterfly (*Anthocharis cardamines*). Furthermore, a peacock butterfly (*Aglais io*), small tortoiseshell (*Aglais urticae*), and emperor dragonfly (*Anax imperator*) were recorded.

[1] *Lynch, Á. B., & McCann, Y. (2007). The Diet Of The Pine Marten (Martes Martes) In Killarney National Park. Biology and Environment: Proceedings of the Royal Irish Academy, 107B(2), 67–76.c*



Map Legend

- Proposed Development boundary
- Proposed Extraction boundary
- Proposed Restoration boundary
- Sand Martins burrowing nests

N

Drawing Title

Location of the Sand Martin Nests Onsite

Project Title

Proposed Quarry Extraction and Restoration Ballyquin, Co. Clare

Drawn By	Checked By
CT	RW
Project No.	Drawing No.
211137	Figure 2-3
Scale	Date
1:9,000	07.11.24

MKO

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3. BIODIVERSITY MEASURES

3.1 Habitats and Flora

3.1.1 Loss of Hedgerow (WL1) and Treeline (WL2) during the Construction Phase

There is a proposed loss of 104 linear metres of Hedgerow (WL1) and 186 linear metres of Treeline (WL2) habitat associated with the Proposed Development. The proposed loss is to facilitate the construction phase clearance of vegetation and topsoil on top of the sand cliff at the south of the proposed extraction boundary. This area will be the location of the excavation works during the operational excavation phase of the Proposed Development.

It is proposed to offset the loss of hedgerow and treeline habitat during the construction phase through infilling current hedgerows and through the creation of new hedgerows along agricultural fields at the southeast of the Proposed Extraction Boundary at the beginning of the operational phase of the Proposed Development. In order to mitigate the loss of hedgerow and treeline habitat as started above, there will be a total of 313 linear metres proposed to infill and bolster current hedgerows onsite and 493 linear metres of hedgerows habitat are proposed for replanting. As this habitat replacement would not be a like for like replacement and would take time to establish and mature into the same condition as that of the habitat being lost, it is proposed to replant trees and shrub specimens of a semi-mature nature to ensure connectivity gains are obtained as soon as possible. All plant species proposed for replanting will be indigenous to the local area. This will result in an increase of linear connectivity and will result in a net gain in this habitat within the Proposed Development Boundary prior to proposed construction works.

3.1.2 Planting of Hedgerow (WL1) and Treeline (WL2) during the Operational Phase

The operational phase of the Proposed Development will result in the replanting of 2,756 linear metres of hedgerow and 160 linear metres of treeline habitat within the proposed restoration boundary. The restoration proposal measures will see the site returning to agricultural use similar to the land use prior to quarrying, with agricultural grasslands delineated by hedgerows and treelines. Whips/bare root stock are recommended for the operational phase planting due to the establishment success rates[2]. The restoration replanting once matured will significantly improve the connectivity onsite in all directions and will provide connecting corridors between the immature woodlands (which will have matured over the 22 years during the operational phase) from the south, west, east and north of the Proposed Development. This gain of habitat onsite will open new shelter, refuges and nesting areas of fauna that utilise the site. All plant species proposed for replanting will be indigenous to the local area.

See Figure 3-1 below for the Landscape Mitigation Plan that includes the location of proposed hedgerow and treeline planting during the operational phase.

3.1.3 Proposed Operational Phase Replanting

3.1.3.1 Replanting New Hedgerows

Planting will be of semi-mature native specimens for the extraction phase to ensure connectivity gains are immediate and will be indigenous to the local area. Bare root plant specimens/whips will be adequate for the operational phase replanting if semi-mature specimens are too costly. Such species include hawthorn (*Crataegus monogyna)*, Blackthorn (*Prunus spinosa)*, Hazel (*Corylus avellana)* which will typically make

[2] *Hedging plating: answers to 18 common questions. Natural England 2008.*

up 60% of a native hedgerow mix[3]. The other 40% will be made of native shrub species found within the local area, that are known to thrive on the soils in the locality[4]. Other species present within the EIAR Study Boundary will be included in the proposed new hedgerows. Such species included:

- Hawthorn (Crataegus monogyna)
- Blackthorn (Prunus spinosa)
- Hazel (Corylus avellana)
- Pedunculate Oak (Quercus robur)
- Sessile Oak (Quercus petraea)
- Downey Birch (Betula pubescens)
- Silver Birch (Betula pendula)
- Elder (Sambucus nigra)

Spindle (*Euonymus europaeus),* Holly (*Ilex aquifolium)*, Wild Cherry (*Prunus avium),* Crab Apple (*Malus sylvestris),* Grey Willow (*Salix cinerea)* and Goat Willow (*Salix caprea)* were not recorded within the EIAR Boundary however these species will be included within the proposed replanting mix due to their importance in supporting pollinators, insects and in some cases mammals.

When planting a new hedgerow, cultivating the ground is recommended, and plant in a double staggered row, which creates extra shelter for wildlife when compared to single hedgerows. Distancing between rows will be a maximum of 50cm for semi-mature plants, and 30-40cm for bare root plants. There will be 4-6 plants sown per metre, and larger trees will be planted 10-15 metres apart, and a grass margin a minimum of 1m away from the hedgerow will be created to allow suitable habitat provisions for ground-nesting birds and for foraging areas. Stakes will be required for any specimens that are over 1m in height and will be required for the first year only.

Should any replanting specimens die within the initial years, new specimens will replace the dead ones to prevent any gaps in the hedgerow forming. The new hedgerow will need to be protected from grazing by livestock, through the erection of a new stockproof fencing, where required, which should be at least 3m away from the hedge, to allow the hedgerow to mature to 2m in width and allow the 1m setback for the grass margin to remain. The placing of the stockproof fence 3m out, allows for easier management, and enables space to reach over the fence to cut grassy verges every few years and the hedgerow. In the hedgerow's initial few years, regular light trimming is encouraged to form dense growth of plants. Mulch (woodchips, composed bark, sheep wool mats and/or straw) or hand cutting with a hand-held hook is recommended to prevent some species from competing with the hedgerow.

3.1.3.2 Infilling of Hedgerows with Shrub Species

The proposed infill of current hedgerows is proposed to screen the site entrance and a locally utilised walking track from the Proposed Development. This hedgerow bolstering covers the distance of 313 linear metres and will be composed of the following species:

- Hawthorn
- Blackthorn
- Hazel
- Wild Cherry
- Crab Apple
- Grey Willow
- Goat Willow

Infilling specimens will be of semi-mature native shrub specimens to ensure the screening effect upon the local walking track will be immediate and species proposed for replanting will be indigenous to the local area. Semi-mature specimens will be replanted every 10-15 metres apart.

[3] *Hedgerows Ireland (https://hedgerows.ie/hedgerow-management/)*
[4] *Hedgerow Planting: Answers to 18 common questions. Natural England (2008),*

When infilling the current hedgerow, care must be taken to ensure the new shrub plants are not shaded by pre-existing species, The All-Ireland Pollinator Plan[5] promotes hedge laying as the recommended choice which retains the flowers on the cut back vegetation which will also reducing shade to the new planted infill specimens. Coppicing the immediately surrounding trees or large shrubs is the alternative recommended method if hedge laying is not feasible. Flailing is not recommended as a form of cutting back surrounding vegetation such as hawthorn, which is common within the EIAR Study Boundary and the wider area, as this species relies on the previous year's growth to produce flowers.

3.1.3.3 Maintenance of Newly Planted and Infilled Hedgerow and Tree Planting

In order to facilitate the successful establishment of the new hedgerow and trees to be planted within the site, and to promote the biodiversity value of the new hedgerow the following maintenance measures are proposed:

- New hedgerow shrub planting will be kept weed and litter free until the new plants are established, particularly from ruderal weeds. Healthy growth will be maintained by allowing the plant to occupy as much of the planting areas as possible to allow them to achieve as close their natural form as possible;
- During spring and autumn maintenance periods all trees and plants will be checked and adjusted/replaced as required, soil firmed, and any dead wood present removed back to healthy tissue and mulch added if required. Where tree stakes and ties are no longer required these will be removed to avoid damage to the tree;
- During the first growing season, all standard trees/ semi-mature trees will be watered regularly during any prolonged dry periods during the growing season (i.e. in April, May, June, July and August). During the second growing season the trees will be kept well-watered as often as required, particularly during June, July and August.
- New hedgerows should be cut annually, with the cutting height raised by 10-15cm each year. This will allow the plants to flower and produce berries whilst preventing the height of the hedgerow from increasing too rapidly.
- Any tree, hedge or shrub that is removed, uprooted, destroyed or that becomes seriously damaged, defective diseased or dead shall be replaced in the same location with another plant of the same species and size as that originally planted. All such replacements shall be carried out within the first planting season following the loss.

3.1.4 Creation of a Grassland Mosaic during the Operational Phase

The proposed restoration phase will see the quarry voids infilled and reprofiled to previous topographic levels prior to excavation. The proposal for restoration is to return the site to previous land uses prior to quarrying, which will see the creation of agricultural grassland bordered by hedgerows and treelines. There is a proposal to create of 15.8ha of agricultural grassland within the Proposed Restoration Boundary. The grassland that will be created will be a mosaic of Dry calcareous and neutral grasslands (GS1) and Dry meadows and grassy verges (GS2), with the establishment of swards with good diversity of grass species. Such grasslands are not currently observed within the Proposed Development boundary and will increase the heterogeneity of habitats within the Proposed Development site and will increase the diversity of species found therein. The grassland will take 1-3 years to establish and once done so, the nature of the species comprising the swards will allow for tussocky grass species to form and create refuges and foraging areas for species that currently breed onsite or forage within the Proposed Development site.

See Figure 3-3 below for the Landscape Mitigation Plan that includes the locations of proposed grassland mosaics during the operational phase.

[5] *All-Ireland Pollinator Plan 2021-2025. National Biodiversity Data Centre Series No. 25, Waterford. March 2021.*

3.1.4.1 Establishing New Grassland Swards

The establishment of new grassland habitats within the Proposed development site will be comprise of a mosaic of species from both Dry calcareous and neutral grasslands (GS1) and Dry meadows and grassy verges (GS2) classified under the Heritage Council's *'Guide to Habitats in Ireland'* (Fossitt, 2000[6]).

The species recommended for sowing into the proposed new grassland areas include:

Grass Species:

- Cock's-foot (Dactylis glomerata)
- Red Fescue (Festuca rubra)
- Yorkshire Fog (Holcus lanatus)
- Creeping Bent Grass (Agrostis stolonifera)
- Sweet Vernal Grass (Anthoxanthum odoratum)
- Crested Dog's Tail (Cynosurus cristatus)
- False Oat Grass (Arrhenatherum elatius)

Broadleaf Species:

- Ribwort Plantain (Plantago lanceolata)
- Red Clover (Trifolium pratense)
- White Clover (Trifolium repens)
- Common Mouse-ear Chickweed (Cerastium fontanum)
- Knapweed (Centaurea nigra)

These grass species will provide a tussocky nature to the new grasslands, especially if *Arrhenatherum elatius* dominates the sward, which will provide a litter layer for small mammals and rodents to shelter within. This is important for the operational phase of the Proposed Development as these grasslands will provide foraging habitat for the breeding raptors currently onsite and colonising species within the wildlife tower and cumulatively the barn owl and kestrel nesting boxes permitted for the Fahy Beg Wind Farm. This proposed tussocky grassland habitat will provide cavities and microhabitats for pollinators such as bumblebees to shelter in and allow for pollinators to burrow or mine. The habitat will allow pollinators to feed and shelter for larvae, which long term will help keep the plant species diverse and abundant[7].

- Establishment of this grassland will be achieved by seeding the infilled and reprofiled quarry voids with the above-mentioned species mixture with certified Irish provenance seed from certified suppliers that conform to suitable agri-environmental schemes, such as Agri-Climate Rural Environmental Scheme (ACRES). Strip seeding is recommended for seeding the swards, due to the success of germinating following this sewing strategy that limits seed removal by foraging species. This strategy is also economically preferred as less seeds are required for seeding, and the method is further beneficial as once the grassland is established, the seeded species will disperse overtime and seed unseeded areas of the sward[8]. Any areas of the infill topsoil that contain compact soils must be removed prior to seeding.

3.1.4.2 Grassland Management Recommendations

This habitat will be managed as a rough grassland to establish a litter layer within the sward of tussocky grass species, this will ensure there is shelter for tunnelling habitats for pollinators and small mammals year-round within the Proposed Development site boundary. In Ireland, these grasslands are threatened

[6] *Fossitt, J. A. (2000). A Guide to Habitats in Ireland. Dublin: The Heritage Council.*
[7] *Creating wild pollinator nesting habitat. All-Ireland Pollinator Plan, How-to-guide 1. National Biodiversity Data Centre Series No. 5. Waterford. May, 2016, updated October 2022*
[8] *Rayburn, A.P. and Laca, E.A., 2013. Strip-seeding for grassland restoration: past successes and future potential.* Ecological Restoration, 31 *(2), pp.147-153.*

by abandonment and improvement. Management of the grasslands is required to prevent unwanted scrub species from encroaching into the new habitat onsite. If scrub species become dominant within the sward this could see a transition of the sward from grassland to scrub and potentially to woodland in the longer-term. Any intense grazing regime, spread of fertiliser or reseeding with highly productive non-native species would see a reduction in species diversity. Therefore, long-term management is required to maintain the litter layer while also eliminating scrub species.

In order to facilitate the successful establishment of the new grasslands to be seeded within the site, and to promote biodiversity value of the new grasslands the following options for management are proposed:

- Low density (0.3-0.4 livestock unit/hectare) cattle grazing of the grasslands will be implemented from late summer to late winter, with caution taking to not overgraze and lose the entire litter layer structure.
- If cattle grazing is not possible, topping of the sward may take place. Max depths of topping must not interfere with the litter layer and therefore the topping height must not be lower than 130mm (4-5inches).
- An alternative topping method includes alternative strip topping of the sward in late July/August. This entails splitting of the field up into equal strips and topping the alternative strips at a height of 80mm one year and repeating the process but cutting the uncut strips from the year before and not cutting the previous year's cut strips. This ensure each strip is cut every two-year cycle.
- If the above methods are not feasible for agricultural purposes, 6m wide riparian strips around all hedgerows and field boundaries will be established and cut to a height of 80mm every second year.

Shrub

Botanical Name	Common Name
Crataegus	Hawthorn
Prunus spinosa	Blackthorn
Ilex aquifolium	Holly
Malus sylvestris	Crab Apple
Prunus avium	Wild Cherry
Salix cinerea	Grey Willow
Salix caprea	Goat Willow

Trees

Botanical Name	Common Name
Crataegus	Hawthorn
Prunus spinosa	Blackthorn
Malus sylvestris	Crab Apple
Prunus avium	Wild Cherry
Salix cinerea	Grey Willow
Salix caprea	Goat Willow
Corylus	Hazel
Sambucus	Elder
Quercus robur	Pedunculate Oak
Quercus petraea	Sessile Oak
Betula pubescens	Downey Birch
Betula pendula	Silver Birch

Infill hedgerow & planting by entrance:

Botanical Name	Common Name
Crataegus	Hawthorn
Prunus spinosa	Blackthorn
Corylus	Hazel
Malus sylvestris	Crab Apple
Prunus avium	Wild Cherry
Salix cinerea	Grey Willow
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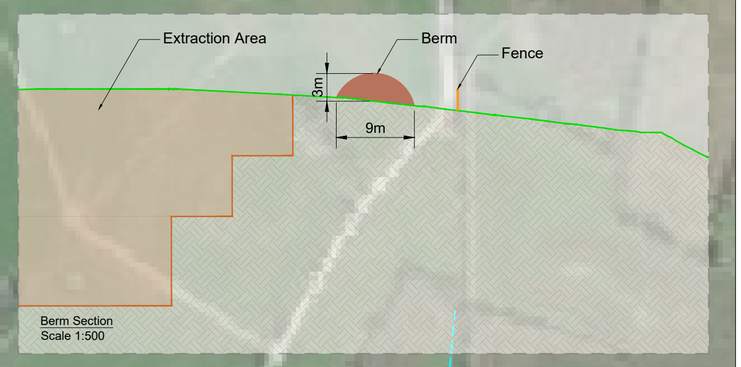

Agricultural Lands

Settlement Pond

Settlement Pond

Wheelwash

Settlement Pond

Office

Proposed Settlement Ponds

Weighbridge

Settlement Pond Pipe

Processing Area

Stockpiling Area

Quarry Entrance

LEGEND

- Site Boundary
- Landowners Boundary
- Existing Mature Hedgerows to be retained
- Existing Mature Hedgerows to be removed
- **Proposed Native Infill Hedgerow Planting** Gaps in hedgerow alignment to be filled with native vegetation similar to existing species on site. Areas shown correspond to alignments where existing screening is scarce and requires additional planting. Some areas comprise of a dense yet low hedge alignment, therefore existing low hedges on site to be grown to a min. of 2m height.
- **Proposed Native Hedgerow** To screen the Proposed Development from view from adjacent visual receptors. Hedgerow to be planted in double or triple staggered rows as required, with forms, sizes, centres and percentages. Hedgerows are expected to grow to approximately 2.5m in 3-5 years. However, growth is dependent on plant quality, planting conditions, soil and weather, and therefore may be subject to change. The hedgerows within the site are to be maintained to a height of not less than 2 metres and up to 3 metres. Having continuous hedgerows assists the movement of bats and provides additional nesting and feeding opportunities for birds and other animals.
- Proposed Acoustic Barrier
- Fencing
- River
- Existing Scrub to be retained
- Existing Scrub to be removed
- Existing Immature Woodland to be retained
- Existing Immature Woodland to be removed
- Extraction Area
- Existing Grasslands Area to be retained
- Existing Grasslands Area to be removed
- Existing Treelines to be retained
- Existing Treelines to be removed
- Proposed Treelines
- Recolonising Bare Ground
- Bearm

DRAWING TITLE:
Landscape Mitigation Measures during Extraction

PROJECT TITLE:
Roadstone - Ballyquin Sand EIAR & PA

DRAWING BY: GO	CHECKED BY: SF
PROJECT No.: 220125	DRAWING No.: Figure 3-1
SCALE: 1:2,500 @ A1	DATE: 10.06.2024

MKO Planning and Environmental Consultants

Agricultural Lands

Settlement Pond

Wheelwash
Settlement Pond
Office
Proposed Settlement Ponds
Weighbridge
Settlement Pond Pipe

Processing Area

Stockpiling Area

Quarry Entrance

Shrub

Botanical Name	Common Name
Crataegus	Hawthorn
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Ilex aquifolium	Holly
Malus sylvestris	Crab Apple
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Salix cinerea	Grey Willow
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Infill hedgerow & planting by entrance:

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Corylus	Hazel
Malus sylvestris	Crab Apple
Prunus avium	Wild Cherry
Salix cinerea	Grey Willow
Salix caprea	Goat Willow

Grassland areas:

Botanical Name	Common Name
Dactylis glomerata	Cock's foot
Festuca rubra	Red fescue
Holcus lanatus	Yorkshire Fog
Agrostis stolonifera	Creeping Bent Grass
Anthoxanthum odoratum	Sweet Vernal Grass
Cynosurus cristatus	Crested Dog's Tail
Plantago lanceolata	Ribwort Plantain
Trifolium pratense	Red Clover
Trifolium repens	White Clover
Cerastium fontanum	*mouse*-ear chickweed
Centaurea	Knapweed
Arrhenatherum elatius	False Oat Grass

LEGEND

- Site Boundary
- Landowners Boundary
- Existing Scrub to be retained
- Existing Immature Woodland to be retained
- **Existing Mature Hedgerows** To be retained and protected
- Fencing
- River
- River Buffer 20m
- Infill Areas
- Restoration Area
- Existing Grasslands Area to be retained
- Existing Treelines to be retained
- Proposed Treelines
- Proposed Acoustic Barrier

Proposed Native Hedgerow

To screen the Proposed Development from view from adjacent visual receptors.

Hedgerow to be planted in double or triple staggered rows as required, with forms, sizes, centres and percentages. Hedgerows are expected to grow to approximately 2.5m in 3-5 years. However, growth is dependent on plant quality, planting conditions, soil and weather, and therefore may be subject to change. The hedgerows within the site are to be maintained to a height of not less than 2 metres and up to 3 metres. Having continuous hedgerows assists the movement of bats and provides additional nesting and feeding opportunities for birds and other animals.

DRAWING TITLE:
Landform Restoration During Infilling

PROJECT TITLE:
Roadstone - Ballyquin Sand EIAR & PA

DRAWING BY:	GO	CHECKED BY:	SF
PROJECT No.:	220125	DRAWING No.:	Figure 3-2
SCALE:	1:2,500 @ A1	DATE:	10.06.2024

MKO Planning and Environmental Consultants

Agricultural Lands

Settlement Pond

Wheelwash
Settlement Pond
Office
Proposed Settlement Ponds
Weighbridge
Stockpiling Area
Processing Area
Quarry Entrance

Settlement Pond Pipe

Shrub

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Plantago lanceolata	Ribwort Plantain
Trifolium pratense	Red Clover
Trifolium repens	White Clover
Cerastium fontanum	*mouse*-ear chickweed
Centaurea	Knapweed
Arrhenatherum elatius	False Oat Grass

LEGEND

- Site Boundary
- Landowners Boundary
- **Existing Mature Hedgerows** To be retained and protected
- Existing Grasslands Area to be retained
- Grassland to be restored
- Proposed Grassland
- Fencing
- River
- Restoration Area
- Existing Treelines to be retained
- Proposed Treelines
- River Buffer 20m
- **Proposed Native Infill Hedgerow Planting** Gaps in hedgerow alignment to be filled with native vegetation similar to existing species on site. Areas shown correspond to alignments where existing screening is scarce and requires additional planting. Some areas comprise of a dense yet low hedge alignment, therefore existing low hedges on site to be grown to a min. of 2m height.
- Vegetation Naturally
- **Proposed Native Hedgerow** To screen the Proposed Development from view from adjacent visual receptors. Hedgerow to be planted in double or triple staggered rows as required, with forms, sizes, centres and percentages. Hedgerows are expected to grow to approximately 2.5m in 3-5 years. However, growth is dependent on plant quality, planting conditions, soil and weather, and therefore may be subject to change. The hedgerows within the site are to be maintained to a height of not less than 2 metres and up to 3 metres. Having continuous hedgerows assists the movement of bats and provides additional nesting and feeding opportunities for birds and other animals.
- Existing Scrub to be retained
- Existing Immature Woodland to be retained
- Proposed Acoustic Barrier

DRAWING TITLE:
Landcover Restoration and Proposed Planting After Infilling

PROJECT TITLE:
Roadstone - Ballyquin Sand EIAR & PA

DRAWING BY:	GO	CHECKED BY:	SF
PROJECT No.:	220125	DRAWING No.:	Figure 3-3
SCALE:	1:2,500 @ A1	DATE:	10.06.2024

MKO Planning and Environmental Consultants

3.1.5 Management of Invasive Species

Himalayan Knotweed, listed on the Third Schedule of the S.I. No. 477/2011 - European Communities (Birds and Natural Habitats) Regulations 2011 was recorded within the Proposed Restoration Boundary. Details on the management and eradication of Himalayan Knotweed can be found within the Invasive Species Management Plan (ISMP) along with this application (Appendix 5-3 of Chapter 5).

Another non-native invasive species recorded on site was butterfly bush (*Buddleja davidii*). Although an invasive species, it is not listed on the Third Schedule, it is recommended to eradicate this species within the Proposed Development Boundary were found, and can be adequately managed during the construction and operational phases of the proposed project. The following measures will be implemented:

- All excavated topsoil will be stored onsite thereby preventing spread of vector material of the species to other sites. The seeds are relatively short-lived in the soil, rarely lasting longer than four years (TII 2020[9]).
- Plants are to be uprooted after flower heads have dried, the plants will be covered with plastic bags before uprooting to prevent spreading falling seeds.
- The uprooted plants themselves should be stored onsite to prevent spread of vector material to other sites. The branches of Buddleia are capable of rooting as cuttings, so care will be taken to ensure material is disposed of in a manner to avoid this risk.

The following measures have been drawn up to avoid potential impacts associated with the introduction and spread of any invasive alien plant species:

- Good construction site hygiene will be employed to prevent the introduction and spread of problematic invasive alien plant species (e.g. Himalayan Balsam, Japanese Knotweed etc.) by thoroughly washing vehicles prior to leaving any site.
- All plant and equipment employed on the construction site (e.g. excavator, footwear, etc.) will be thoroughly cleaned down using a power washer unit prior to arrival on site to prevent the spread of invasive plant species.
- Wheel washing facilities will be provided at the site entrance. All washing must be undertaken in areas with no potential to result in the spread of invasive species.
- All infill material required at the site will be sourced from a stock that has been screened for the presence of any invasive species and where it is confirmed that none are present.
- Should despite these measures any invasive alien species be introduced to site, these shall be dealt with in accordance with guidelines issued by the TII - The Management of Invasive Alien Plant Species on National Roads – Technical Guidance GE-ENV-01105 (December 2020).

[9] *TII. (2020). The Management of Invasive Alien Plant Species on National Roads – Technical Guidance GE-ENV-01105. Transportation Infrastructure Ireland, December 2020.*

Plate 3-1 Butterfly Bush. Image Source: TII 2020

3.2 Fauna

3.2.1 Loss of Sand Martin Nesting Habitat

To facilitate the operational phase, there will be a loss of a total of 27 burrow entrances within a stockpile of sand, earth and gravel and an exposed sandy cliff face within the extraction boundary. Given the nature of sand and gravel quarries and the opportunistic nesting behaviour of sand martin, alternative nesting habitat will be made available to the species in the form of temporary stockpiles of sand and fine gravel, as well as sand cliff faces. This habitat will be available for the species for the duration of the lifetime operations within the quarry (approx. 22 years), however as restoration progresses suitable sand martin nesting habitat will be reduced. Therefore, it is proposed to provide long-term suitable habitat for sand martin within the Proposed Development site. This alternative nesting habitat will be provided for the species by utilising a man-made sand martin wall. The sand martin wall will provide permanent stable nesting habitat for sand martin when compared to temporary habitat that becomes available through quarrying activities. The temporary habitat has the potential to result in tunnel collapse with potential direct mortality of adults, eggs, chicks or fledglings. There is also a potential for disturbance to the temporary nesting habitat through quarrying activities and active machinery, however this alternative permanent habitat will provide a stable nesting location for the colony without the chance of tunnel collapse and disturbance, as the sand martin wall will be located away from areas of the quarry with high disturbance levels.

The location of the sand martin colonies onsite can be found in Figure 2-3.

3.2.1.1 Mitigations for Loss of Sand Martin Nesting Habitat

The loss of 27 active burrows within the Proposed Extraction Boundary will be offset by providing alternative suitable nesting habitat elsewhere within the Proposed Development site boundary for this species.

3.2.1.1.1 *Proposed Sand Martin Wall*

Sand martins (*Riparia riparia)* are migratory birds and arrive in Ireland to breed during the summer months from March to September before returning to overwinter in the Sahel. Sand martin are burrowing birds, that construct nesting tunnels in sandy or peat cliff faces of riverbanks, peatlands and

quarries. The birds feed on flying insects mainly over waterbodies. Sand martin are an Amber Listed Species under the Birds of Conservation Concern Ireland (BoCCI).

Quarry sites, especially sand quarries, are very important breeding grounds for this species[10]. Sand martins were recorded feeding within the quarry boundary during the surveys and were also recorded nesting in the sand cliff face at the south of the proposed extraction boundary. The 27 burrows within the stockpile and cliff face will be lost as a result of the Proposed Development. Therefore, it is proposed that alternative roosting and breeding habitat is provided for sand martin within the Proposed Development site boundary. This alternative habitat will be provided in the form of a sand martin wall. This structure can provide capacity for a multitude of burrowing nest chambers, and within the Proposed Development site boundary the wall will host 50 individual burrowing entrances and nests.

The 'Do nothing' impact of this Proposed Development on sand martin would result in the suitable habitat within the site currently diminishing due to vegetation regrowth and soil compaction which hinders tunnel formation.

Albeit suitable habitat will become available to the species during the operational phase of the Proposed Development in the form of temporary sand and gravel stockpiles, the sand martin wall will futureproof suitable nesting habitat onsite for the species following the cease of quarrying within the Roadstone Ballyquin Quarry, as the structure will remain in place during and following the restoration works and restoration of the site.

Naturally this species constructs tunnel entrances within vertical faces, away from areas of regular flooding and out of direct prevailing winds to avoid rain. Sand Martins require wide open spaces in front of nests to fly and forage, with direct access to the tunnel entrances. Furthermore, direct sightlines to foraging areas are hugely beneficial for the success of this species occupying the sand martin wall. For Ballyquin this is the man-made pond onsite, therefore the removal of vegetation is recommended for direct sightlines to the open waters onsite. The removal of 20 linear metres to accommodate the sand martin wall is outlined in Figure 3-1.

Given the nature of sand martin burrows and nests they are prone to tunnel collapse, predation and vegetation growing over banks[11], however, the sand martin wall as it is man-made, will provide security for these circumstances if appropriately maintained (See Section 3.2.1.1.2 below for maintenance measures of the sand martin wall).

The sand martin wall will consist of a double row of cement blocks up to a height of 1.5m, where thereafter, PVC piping will be placed within cavity blocks and surrounded by concrete to set in place to create the tunnels entrances. The blocks with the tunnels are lain on top of the outside row of cement blocks, with cavity blocks placed on the second row to create the nesting cavities. The tunnels to the burrows will be a length of approximately 57cm. The back of the cavity nest will be sealed with timber sheets with cut outs to match each cavity nest for easy access for monitoring the of the sand martin wall, and for cleaning and ringing of the bird species. Blocks will be laid surrounding the wall to form a small walk in room. Plastic or metal sheeting will be placed on top to cover the building and a door or metal sheet will be used to keep any mammals or birds away from accessing the nesting cavities.

The proposed location of the sand martin wall can be found in Figure 3-4.

An NPWS licence[12] for the use of lures will be required for the first breeding season after construction for the broadcast of sand martin calls and songs played from the sand martin wall in mid-March during the first breeding since after construction, to entice the returning sand martin to utilise the nesting cavities.

Predation is the main threat to sand martin walls; therefore, anti-predator measures will be instated to minimise direct predation of the species within the nests. Steel or aluminium sheets will be placed on the cement blocks underneath the tunnel entrances and 1m around the sides of the wall front to hinder predators climbing up the wall and accessing the tunnels and nests. Masonry fittings will be used to hold

[10] *Heneberg, P., 2007.* Sand martin (Riparia riparia) in the Czech Republic at the turn of the millenium. *na.*
[11] *Rohrer, Z., Rebollo, S., Andivia, E., Franco Goyena, J. and Rodriguez Urquia, C., 2020. Restoration and management for cliff-nesting birds in Mediterranean mining sites: the Sand Martin case study.* Restoration Ecology, 28*(3), pp.706-716.*
[12] https://www.npws.ie/licencesandconsents/hunting

the sheeting in place. Vegetation must also be cut back within a 2m radius of the sand martin wall front, particularly of scrub and bracken which rodents can climb onto to gain entry to the nests. Furthermore, a small pond is recommended to be instated directly in front of the sand martin wall. This provides a further deterrent for any potential predators entering the sand martin wall, as any predators will need to swim and climb vertically to access the structure.

A number of case studies where Sand Martin Walls were successfully established in Ireland have been reviewed, and the main findings have been briefly outlined below.

Sand Martin Wall and Extension at Dermot Doran's Thomastown House Project, Co. Kildare

The initial sand martin wall was built in 2019 with a capacity of 32 nesting cavities. The wall overlooks a man-made lake within Dermot Doran's farm, the lake was constructed two years prior to the wall. By 2021 all nests were occupied within the wall and a vast extension took place during the migratory absence of the species in the winter of 2021 and saw the increase of 108 nesting cavities, totalling 140 before the 2022 breeding season.

The design included cement blocks, cavity blocks, recycled sealant tube of sizes 45mm and 50mm to create tunnel mould, and concrete. The wall is vertical which is a preference for sand martin nesting natural in banks and faces of peat or sand. All tunnels were located a minimum of 1.5m from the ground, and tunnels were built to a length of 22cm. The tunnels took into account that natural nests occur at a slope uphill and this was replicated at every other tunnel within Thomastown House. Cavity blocks were lined with 5cm of builder's sand to create the nesting cavity. The sand martin wall at Thomastown House has a passage accessing the back of the nests, the passage is surrounded by walls and is covered with a waterproof membrane and capping stones to keep water out of the nests with corrugated metal secured overhead. The back of the nests are closed off with individual timber planks doors to allow ease of access when cleaning. At Thomastown House, the nests are monitored and inspected, with individual birds ringed onsite. Anti-predator defences in the form of metal sheeting are laid over all the 1.5m layer of cement blocks. The cost of the materials for the extension in 2022 totalled €2,500 approximately, not including digger hire and labour costs.

Further information on this case study can be found in Appendix 1 of this BEMP.

Sand Martin Wall at Harpers Island, Co. Cork

A sand martin wall with a capacity of 24 burrows was constructed at Harpers Island Wetland in 2021, on a grassy bank overlooking the waters at the estuary at the mouth of Lough Mahon, within Cork Harbour SPA. The wall is facing a southernly direction and out of the direct prevailing winds reaching Harpers Island at a southeasterly direction and the tunnel entrances were built approximately 300mm vertically and horizontally apart. The wall follows a design of three rows and 8 columns of tunnels. The design was composed of timber frames, PCV pipe tunnels, Marine Ply, and recycled plastic sheeting and plaster. Each pipe entrance and burrow was 1m in length. Builders sand was inserted into half fill the pipes, and the plaster created a tip at the burrow entrances to retain sand at the burrows.

Flooding measures were considered in the design of this structure, and the back PVC pipe was tilted downwards (5-10°) to prevent the burrow from flooding, and a drainage hole drilled into the pipe just inside the burrow entrance of the wall.

Swift call boxes were used to play looped sand martin songs and call recordings at the end of March in 2022. The recordings were powered by a 12V car battery.

Sand martin colonised the wall and successfully nested within the wall the following breeding season in 2022. An examination of the nesting success took place on the 19th of November 2022 and concluded that all 24 burrows were utilised. Cleaning of the nests took place after the 2022 breeding season, and refilling of builder's sand. The findings of the nesting behaviour during the breeding season included the following:

- 20/24 nests signs were located at the end of the tunnels, and the remaining four nests were based 60-64cm from the tunnel entrance.
- Nesting material included plant material like dead grass, and limited numbers of feathers were found across all 24 nests, however two nests were composed predominantly of feathers as nesting material.
- 21 nests were empty
- Two hatch shells were recorded in one burrow and another three eggs were found unhatched.
- A dead sand martin was found within one nesting cavity. The bird carcass possessed flight feathers, and it is hypothesized that the bird was juvenile but not confirmed.
- Three of the nests had two nest cups directly in from of the other, all other nests had a single cup present.

Further information on this case study can be found in Appendix 2 of this BEMP.

3.2.1.1.2 Maintenance of the Sand Martin Wall

In order to facilitate the successful establishment of the sand martin colony within the sand martin wall, the following maintenance measures are proposed:

- Cleaning of all nesting material will take place after the breeding season (March-September inclusive) for sand martin.
- All signs of breeding and/or use will be recorded at the end of season with data sent to Birdwatch Ireland.
- Prior to the breeding season (March) every year, all vegetation within 2m of the front and sides of the sand martin wall will be removed to limit predation chances.
- All metal/aluminium sheeting will be inspected concurrently, and all repairs of sections will occur place prior to the breeding season each year.

Fresh builders sand will be placed into the nests each year in February prior to the breeding season commencing in March.

3.2.2 Works in proximity to Barn Owl Nest

A Barn Owl nest was recorded onsite within an existing quarry plant. The nest location is located approximately 75m from the proposed extraction boundary. The construction and operational phase of the Proposed Development will result in significant indirect effects on the in-situ nest location, through disturbance to the species from earth movement, noise, concrete and cement pouring, extraction works and an increase in activity onsite, although all work will be carried out between the hours of 7am-7pm. Therefore, alternative nesting habitat for this species will be provided onsite located away from any potential areas of disturbance. This alternative habitat will be provided within a Wildlife Tower, which has a dedicated barn owl cavity, entrance and ledge for the species. The Wildlife Tower will be built at the north of the Proposed Restoration Boundary, within an agricultural field which is located over 650m from the proposed extraction boundary.

The restoration of the Proposed Development will involve the total provision of 15.8 ha of agricultural grasslands and hedgerows and 2,756 linear metres of hedgerows and 160 linear metres of treeline habitat planted on the Proposed Restoration Boundary of the current and future quarry void. The berms which contain a pre-existing natural seedbank from the topsoil, will be spread back over the regraded and re-profiled quarry voids. Additional species are recommended to be sown into the new swards, these species will create tussocky grasslands with a rich litter layer, under grassland management provisions, which will create rodent and small mammal habitat and shelter which will provide foraging opportunities for barn owl post quarry operations and restoration.

The location of the barn owl nest can be found in Confidential Appendix 1.

3.2.2.1 Mitigations for Works in Proximity to a Barn Owl Nest

Barn owl were recorded breeding and nesting within a cavity within an existing quarry plant. During the impact assessment for barn owl, significant impacts due to disturbance were identified, the provision of alternative habitat in the form of a wildlife tower with a dedicated barn owl entrance, cavity and ledge is required to mitigate the impacts to barn owl within the Proposed Development.

3.2.2.1.1 *Proposed Wildlife Tower*

Barn owls are resident and typically sedentary birds in Ireland, located mainly in the midlands and south of the country. This species breeding population is declining significantly and barn owls are categorised as a red listed species on the Birds of Conservation Concern Ireland, with the European populations also following the same declining trend. In Ireland over the last 40 years there has been a 39% decrease in the breeding range, and barn owls can no longer be found breeding in vast sections of the west, east and north of the country[13],[14]. The decline of barn owls in Ireland, follows that of other agricultural bird species, and is contributed by intensification of agriculture leading to the loss of species-rich foraging habitat, increased use of rodenticides and pesticides that bioaccumulate in the food chains[15].

This species breeds in large historical ruins and old derelict buildings, and occasionally in outhouses and large cavities in mature trees. Nest sites can be used for successive breeding seasons, and many suitable nesting sites may also provide nesting opportunities for other species such as Kestrel (*Falco tinninculus),* Raven (*Corvus corax)*, Peregrine falcon (*Falco peregrinus)*, and Jackdaw (*Corvus monedula)* and including many bat species. Despite being able to nest and roost in close proximity to other species, barn owl are highly sensitive to disturbance, and are rarely found breeding in locations of high human activity.

As the Proposed Development will see an increase of human activity and works proposed within approximately 75m of the site plant containing the nest, alternative nesting/roosting habitat will be provided onsite for the barn owl that utilise the Proposed Development site. The alternative habitat will be provided through a Barn Owl Trust wildlife tower. The tower will contain two floors and be 2m width x 2m length x 4.5m in height, which is proposed to be instated at the northern field within the Proposed Restoration Boundary. The floor of the barn owl nest box within the proposed wildlife tower will be located a minimum of 500mm below the access entrance. The dimensions of the barn owl access hole and floor chamber will be 1000m wide x 400mm deep x 500mm high, with an inspection panel. The proposed wildlife tower will provide a barn owl hole that is 150mm width x 250mm in height and will provide a ledge for barn owls to perch directly outside of the barn hole entrance. A tray 2 inches by 2 inches will be fixed to the wall outside the barn owl cavity, slung across the purlins, to aid with monitoring, cleaning and ringing. The barn owl hole will be facing the east, and as a result of the proposed location onsite there will be adequate distance and space for a fly path into the hole and ledge. The tower itself will be located away from all areas of human disturbance onsite during both the excavation and operational phases and is situated away from onsite access tracks and public roadways.

The wildlife tower will not only provide habitat for barn owl, but can also support Kestrel, numerous bat species, passerine bird species, and invertebrates.

- Bat species (both crevice and cavity dwellers) will be accommodated at the north facing walls for cold bat spaces for hibernating and overwintering and south facing walls of the tower for maternity and roosting colonies. Bat slots will be installed into the tower through the stone facing and inner blockwork (but not the roof), with dimensions of 150mm x 350mm. These bat access hole provisions will need to be higher on the north facing wall and lower on the southern facing wall, as shown in Appendix 3 in BTO drawing labelled 'Scheme'. The cold bat space dimensions at the north facing wall will be 250mm in depth x 1350mm in height with the width being as wide as space will allow. The cold space blockwork will have ply inspection panels and roofing tiles over and the bat hole at the top to allow entry and exit. The hot bat spaces at the

[13] *Bird Atlas 2007-11: The Breeding and Wintering Birds of Britain and Ireland.*
[14] *https://birdwatchireland.ie/birds/barn-owl/*
[15] *Lusby, J. and O'Clery, M. 2014 Barn Owls in Ireland: information on the ecology of barn owls and their conservation in Ireland. Kilcoole. BirdWatch Ireland.*

southern wall will be 300mm in width x 1100mm high and as wide as space allows up to the rafters, with a slate instated internally above the cold bat space provision. The hot space specifications will be made with plywood and insulated with celotex also acting as an inspection panel, with a bat hole at the bottom. Hession sacks will be placed around eaves on the inside of the tower to reduce drafts and draped on one side of the provision. 2FN Woodcrete bat boxes will then be instated within the plywood cavity inside the south facing wall. This will allow for warm air to rise. Both hot and cold roost provisions will be made flush to the door frame. Scored untreated rough sawn timber planks will be erected 25mm from the wildlife tower ceiling which will provide space for space for crevice dwelling bat species and roost locations for cavity dwellers. Two 2FN Woodcrete bat boxes will then be erected, one on the north wall and the second within the hot space provision within the tower. All bat boxes will be instated over 3m from ground level. Slates will be placed on end around the internal base of the wildlife tower.

- To accommodate kestrel, a trapezoid access hole 250mm wide (top) x 400mm wide (bottom) x 350mm in height will be created and a stone landing platform and perch will be located directly outside the access hole for kestrel. The kestrel nesting box will be 1000mm wide x 350 mm deep, with the nest floor just below the access hole. Space to the apex will be allocated as kestrel typically nest where they can see out of the nest sites. The nesting box will be made from 12mm plywood that will be fixed to the timber baton that is attached to the blockwork. An inspection panel will be provided through a wooden beam under the nest to aid with cleaning and ringing. The perching stone located on the outside of the wildlife tower will be 400mm wide x 350mm projection from the wall and 50mm in thickness. The kestrel access hole will need to face west. Note the kestrel internal nesting box will be built after the rafters/plywood cavity for bat provisions.
- Multiple cavities of differing sizes and depths within the external blockwork will be incorporated into all walls, with particular focus to the southern wall when building the wildlife tower to provide shelter and nesting opportunities for insects and passerine bird species.

Successful breeding is strongly correlated to suitable prey availability. Barn owls main prey consumption are the invasive Greater White Toothed Shrew (*Crocidura russula)* and Bank Vole (*Myodes glareolus)* and rely heavily and in some cases solely on established populations of these species[16],[17],[18]. Small mammals and occasionally amphibians (frogs) play a key role in barn owl diets when this prey is not available. Barn owls typically forage within 1-2km of the nest site during the breeding season but can travel up to 6km for food[19]. The proposed restoration of the Proposed Development will result in the creation of grassland of a tussocky nature, especially if *Arrhenatherum elatius* dominates the sward. This new habitat will provide a litter layer for small mammals and rodents to shelter within. This is important for barn owls (and other raptors utilising the site or colonising kestrel within the wildlife tower) as these grasslands will provide small mammal rich foraging habitats, which cumulatively will benefit any colonising barn owls and kestrel nesting boxes permitted for the Fahy Beg Wind Farm.

Monitoring measures for the wildlife tower can be found in Section 4.4 below. The proposed location of the wildlife tower can be found in Figure 3-4. See below Figure 3-5 for the proposed wildlife tower layout, and Appendix 3 for drawings and the layout of the bat and kestrel provisions within the wildlife tower.

3.2.2.1.2 Maintenance of the Wildlife Tower

In order to facilitate the successful establishment of breeding habitat of barn owl within the proposed wildlife tower, the following maintenance measures are proposed:

[16] *Lusby, J., Watson, D. and O'Halloran, J. 2008 The ecology of the barn owl Tyto alba in Ireland, with special reference to two introduced small mammal species; the bank vole Myodes glareolus and the greater whitetoothed shrew Crocidura russula. Irish Birds 8, 462.*
[17] *Lusby, J., McCarthy, A., O'Clery, M., Tosh, D., Watson, D., Nagle, T., Lawton, C. and O'Halloran, J. 2017. Using top predators to assess impacts and changes in small mammal communities. Irish Birds 10, 624.*
[18] *Smiddy, P., 2018. Dominance of invasive small mammals in the diet of the Barn Owl Tyto alba in county Cork, Ireland.* In Biology and Environment: Proceedings of the Royal Irish Academy *(Vol. 118, No. 1, pp. 49-53). Royal Irish Academy.*
[19] *Lusby, J. and O'Clery, M. 2014 Barn Owls in Ireland: information on the ecology of barn owls and their conservation in Ireland. Kilcoole. BirdWatch Ireland.*

- Cleaning of all nesting material will take place in November/December each year after the breeding season (March-September inclusive) for barn owl.
- All signs of breeding and/or use will be recorded at the end of season with data sent to Birdwatch Ireland.

Map Legend

- Proposed Development boundary
- Proposed Extraction boundary
- Proposed Restoration boundary
- Location of the Proposed Wildlife Tower
- Location of the Proposed Sand Martin Wall

N

Drawing Title	Location of the Proposed Wildlife Tower and Sand Martin Wall
Project Title	Proposed Quarry Extraction and Restoration, Ballyquin, Co. Clare
Drawn By: CT	Checked By: RW
Project No.: 211137	Drawing No.: Figure 3-4
Scale: 1:10,000	Date: 16.10.24

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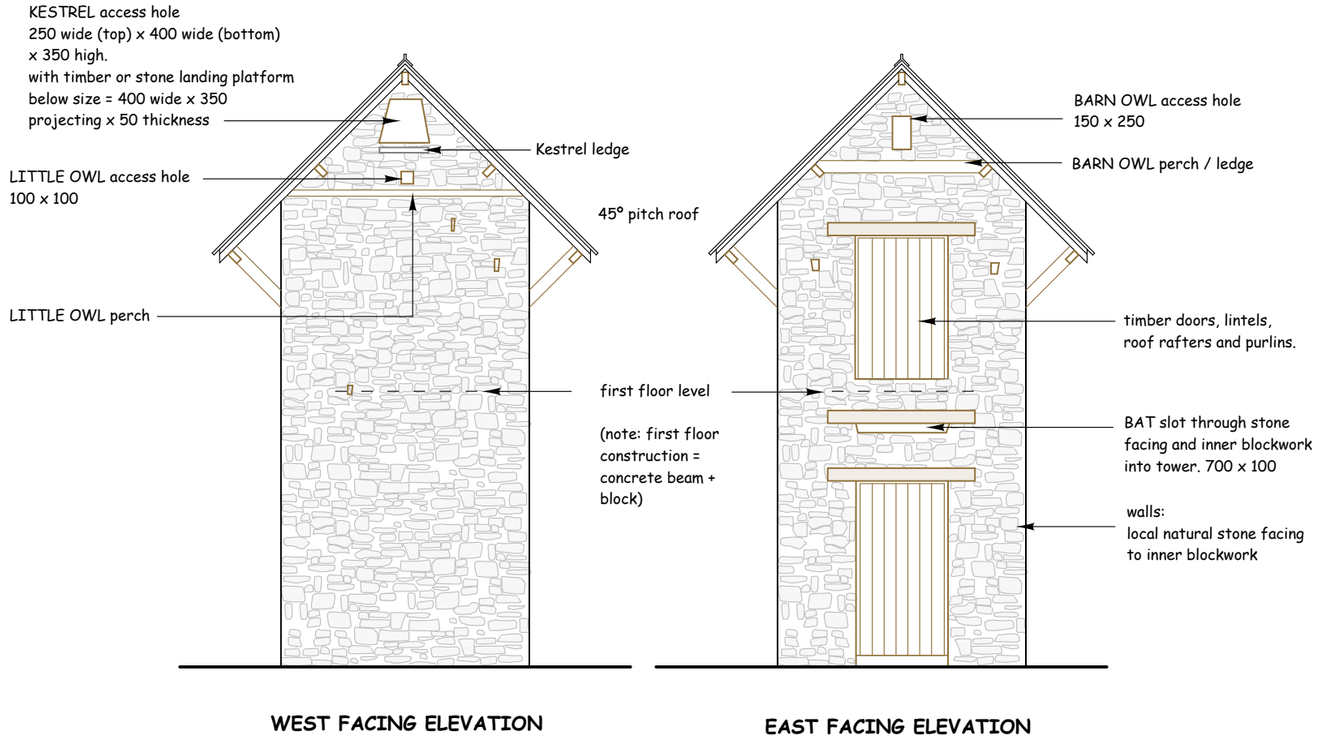
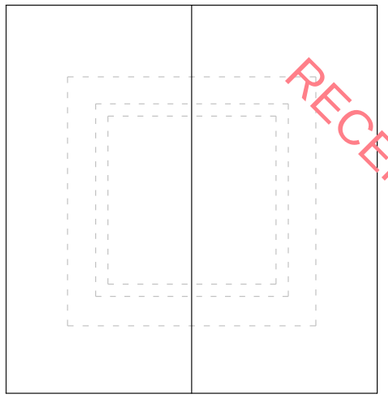


WEST FACING ELEVATION

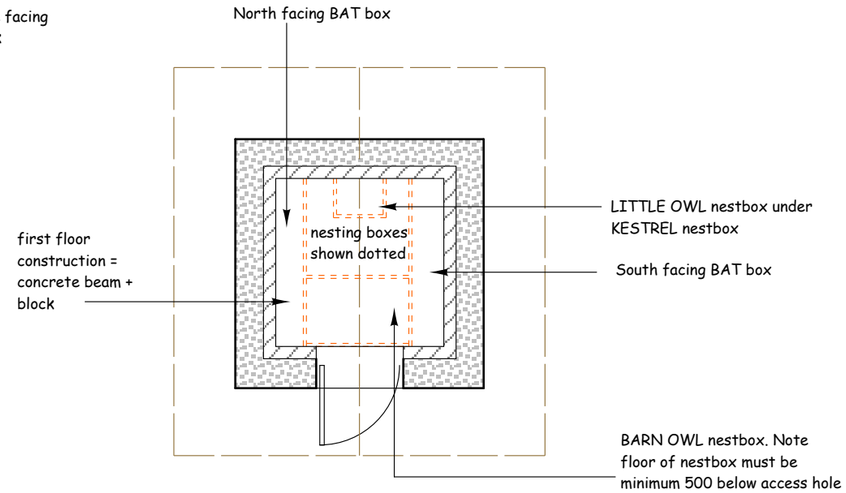
EAST FACING ELEVATION



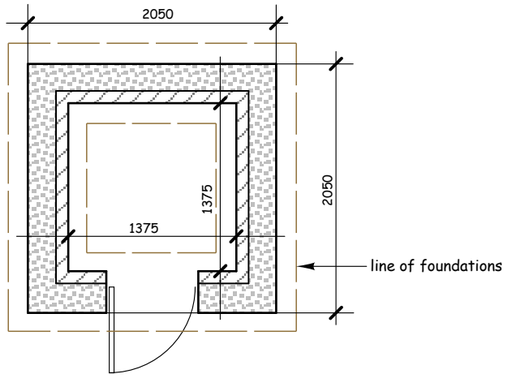
ROOF PLAN

NOTE

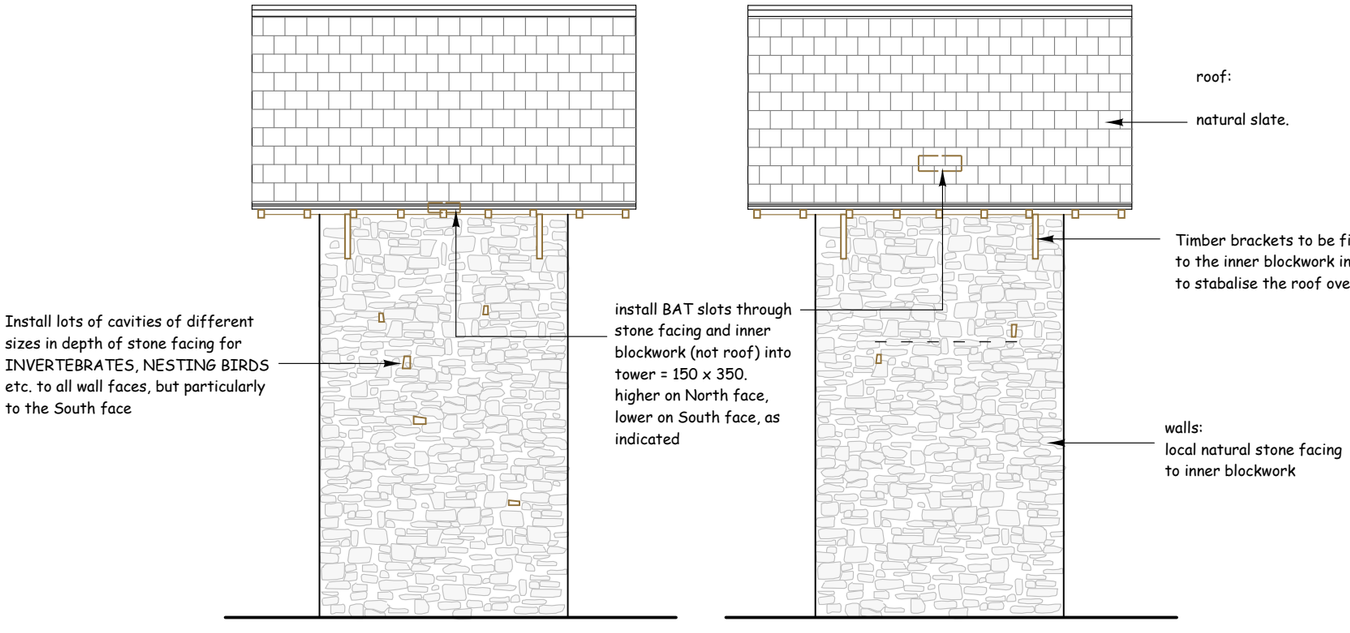
generous roof overhang at each gable end provides required shelter for safe fledging of young birds



FIRST FLOOR LEVEL



GROUND FLOOR LEVEL



SOUTH FACING ELEVATION

NORTH FACING ELEVATION

ALL DIMENSIONS IN MILLIMETRES

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project
BARN OWL TRUST
Proposed Wildlife Tower

drawing
Figure 3-5

project no.	drawing no.	
	04B	

scale	date	drawn
1-50	27 Oct 2010	MDF.

3.2.3 Bat Boxes

Four no. 2FN Woodcrete bat boxes will be erected on mature trees throughout the site to provide additional bat roosting opportunities. Bat boxes should have a southerly orientation and be positioned at least 2m from the ground (ideally 3m), away from artificial lighting. They will be placed adjacent to retained vegetation features such as treelines and hedgerows to ensure they are close to existing flight paths and can avoid wide open spaces (Collins, 2023). The exact location of the bat boxes will be determined by a qualified ecologist; however, they will be placed within the south-eastern area of the site where tree loss is expected. The proposed restoration of the quarry to grassland with hedgerows habitats will also provide improved foraging habitat for bats.

- A minimum of four no. 2FN Woodcrete bat boxes will be installed on suitable trees in accordance with best practice – at least 3m high on mature trees, away from lighting and at various aspects.
- The placement of the boxes is to be agreed with a suitably qualified Ecologist, following best practice guidelines (Kelleher & Marnell 2022, NRA 2006[20]).
- 2FN Schwegler Woodcrete bat boxes are recommended.
- The bat boxes will be placed adjacent to retained vegetation features such as treelines and hedgerows to ensure they are close to existing flight paths and can avoid wide open spaces (Collins, 2023)[21].

Plate 3-2 2FN Schwegler Woodcrete bat box. Image source: NHBS.com

[20] Marnell, F., Kelleher, C. & Mullen, E. (2022) Bat mitigation guidelines for Ireland v2. Irish Wildlife Manuals, No. 134. National Parks and Wildlife Service, Department of Housing, Local Government and Heritage, Ireland
[21] *Collins, J. (2023) Bat Surveys for Professional Ecologists: Good Practice Guidelines (4th Edition). Bat Conservation Trust, London.*

4. MONITORING

4.1 Monitoring of Replanting and Infilled Hedgerow (WL1) and Treeline (WL2)

To confirm that habitat creation and enhancement has been successful, all areas of replanting as shown in Figure 3-3 will be monitored post-restoration. These areas will be inspected following the main growing season (i.e. in September) for the first five years of growth. This will be undertaken in partnership between the developer and the Project Ecologist. The proposed management actions will be conveyed to the developer, and management alterations implemented as required to achieve the targets of the management plan.

Hedgerows and replanted trees will be inspected following the main growing season (i.e. in September) for the first five years of growth, where the requirement for replacement planting will be assessed. If any shrubs are dead or damaged these will be replaced using the same species within the next planting season. Recommendations for ongoing or remedial management required will be specified within an Annual Environmental Report. Inspections of the replanted hedgerows and trees will be carried out once per year around September in years 1, 2, 3, 4 and 5.

4.2 Monitoring of Grassland Establishment

Monitoring should be carried out for the first three years post seeding or until the grassland has been sufficiently established and has given consistent results.

Monitoring will involve the following:

- The extent of the grassland establishment
- Percentage of ground-coverage
- Percentage of bare patches
- Percentage of scrub encroachment (if present)
- Condition of the grassland
- Presence/absence and percentage cover of the litter layer
- Success of the grazing regime

Monitoring is required to inform the grazing regime. Alterations to the grazing regime may be required depending on the condition of the grassland and the litter layer, which offers habitat for prey species of raptors.

4.3 Monitoring of Sand Martin Wall

A post consent monitoring schedule for years 1, 2, 3, 5 and 10 of the sand martin wall will be undertaken by a suitably qualified ornithologist/ecologist.

Monitoring inspections will:

- Quantify the number of nesting cavities that showed signs of occupation and non-occupation.
- Measure the distance that the nests are located from the tunnel entrance.
- Document the bedding material used in each occupied tunnel.
- Record any evidence of hatched eggshells or unhatched eggs .
- Evidence of any dead sand martin chicks, fledglings, juveniles or adults.
- All nesting cavities will be cleaned out after the monitoring inspections have been completed.

- Bespoke maintenance recommendations will be made by the ornithologist/ecologist following the completion of the monitoring surveys and prior to the following breeding season.

All monitoring will take place at the end of the breeding season in the months of October to December, concurrently with the wildlife tower (See Section 3.4). Monitoring results will be shared with Birdwatch Ireland prior to the beginning of the following breeding season.

4.4 Monitoring of Wildlife Tower

Monitoring will be primarily focused the barn owl cavity of the tower, however all species accommodated for will be monitored.

Two dedicated breeding surveys for barn owl following CIEEM and SNH[22] best practice guidelines will be undertaken by a suitably qualified ornithologist/ecologist. Surveys will take place between mid-June to early August in operation years 1, 2, 3, 5, and 10 to check for fledged juveniles. Although it is rare, a second clutch may take place in July and caution must be taken as barn owls are very sensitive to disturbance while breeding. Signs of nest occupancy (whitewash, pellets, evidence of feathers etc.), signs of breeding behaviour (prey pass, or prey brought to the nest etc.) and activity will be monitored during the surveys.

Monitoring inspections will also include:

- Concurrent with the barn owl surveys, the determination of occupation within the kestrel nesting cavities following SNH guidelines will take place and signs of non-occupation will be recorded if required.
- All raptor cavities will be inspected at the end of the breeding season (October to December) by a suitably qualified ornithologist/ecologist concurrently with the sand martin wall. Inspection will include maintenance checks and recommendations will be outlined if required.

Monitoring results will be shared with Birdwatch Ireland prior to the beginning of the following breeding season.

[22] *Hardy, J, Crick, H, Wernham, C, Riley, H, Etheridge, B and Thompson, D. (2009). Raptors: A field guide for surveys and monitoring. Scottish Natural Heritage (SNH), Inverness, UK.*

5. CONCLUSION

This Biodiversity Enhancement Management Plan sets out the measures to be implemented to ensure that the Proposed Development results in the generation of habitats that maximise benefit for local biodiversity. This BEMP has set out measures to be implemented during the monitoring period after restoration and instatement of alternative breeding habitat for barn owl and sand martin, to ensure that the measures are successful, as well as monitoring by an ornithologist/ecologist to ensure the success of the breeding habitat and restoration measures.

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https://www.npws.ie/licencesandconsents/hunting

https://birdwatchireland.ie/birds/barn-owl/

APPENDIX 1

DERMOT DORAN'S THOMASTOWN HOUSE PROJECT - STEP BY STEP GUIDE HOW TO BUILD A SAND MARTIN WALL

HOW TO BUILD A NESTING WALL FOR SAND MARTINS

Step-by-Step Guide

(based on Dermot Doran's Thomastown House Project)

Dermot Doran and his Thomastown House Sand Martin Nesting Wall

This publication is based on the successful Thomastown House Sand Martin Nesting Wall Project created by Dermot Doran on his farm in Co. Kildare with help from Feargal Ó Cuinneagáin and Anthony Mooney.

The information provided has been written and compiled by Lynda Huxley (Nature of Ireland) in close collaboration with Dermot Doran in August 2022. It is aimed at providing guidance to anyone who wants to build a Sand Martin nesting wall but no responsibility can be taken for any such projects. Before undertaking your project you may wish to consult a registered builder and/or a civil engineer.

Cover: photos of Sand Martins © Declan Doran
Photos marked M.P. courtesy of Mike Pearson

Table of Contents

M.P.

About the Sand Martin

Sand Martins *Riparia riparia* are the smallest member of the European hirundine family, which also includes Swallows and House Martins. They are migratory birds that come here to breed from mid-March to September, spending the rest of the year in sub-Saharan Africa.

They feed on flying insects, mainly over wetlands. They will perch on wires and branches. They are colonial nesters and normally breed in burrows dug into riverbanks, peat banks or quarries.

In Ireland, Sand Martins are now classified as an amber-listed bird of Conservation Concern and so providing secure nest sites in purpose-built Sand Martin nesting walls will help with the conservation of this beautiful bird.

M.P.

About the Thomastown Sand Martin Nesting Wall

The Thomastown House Sand Martin nesting wall is built at one end of a man-made lake constructed on Dermot Doran's farm in 2017. You don't need to have a lake to build a Sand Martin wall because many natural colonies are built where there is no lake, however, you must ensure it is safe from predators. The nest entrances for all walls should be at least 1.5 metres above ground level and a sheet of steel added below the entrances (see page 17).

The initial wall was built in 2019 and contained 32 nest chambers. By 2021 all these nest chambers were occupied by Sand Martins so, in the winter of 2021 a further 108 nest chambers were added to give a total of 140 for the 2022 season. When the Sand Martins returned in spring 2022, they immediately adopted the new nest chambers and the colony increased.

The structure is composed of:

- a front wall made up of two rows of cement blocks. Solid blocks up to 1.5 metres and above that an outer row of cavity blocks containing the entrance tunnels and an inner row of cavity blocks containing the nest chambers - see diagram on page 7.
- a passage which runs between the front wall and the back wall. This passage allows the nest sites to be accessed for cleaning, maintenance and research.
- a back wall
- a roof covering the whole structure

Sand Martins are colonial nesters, therefore, we strongly recommend that anyone building a nesting wall for them should provide a minimum of 30 nest chambers and many more if your space and budget allow.

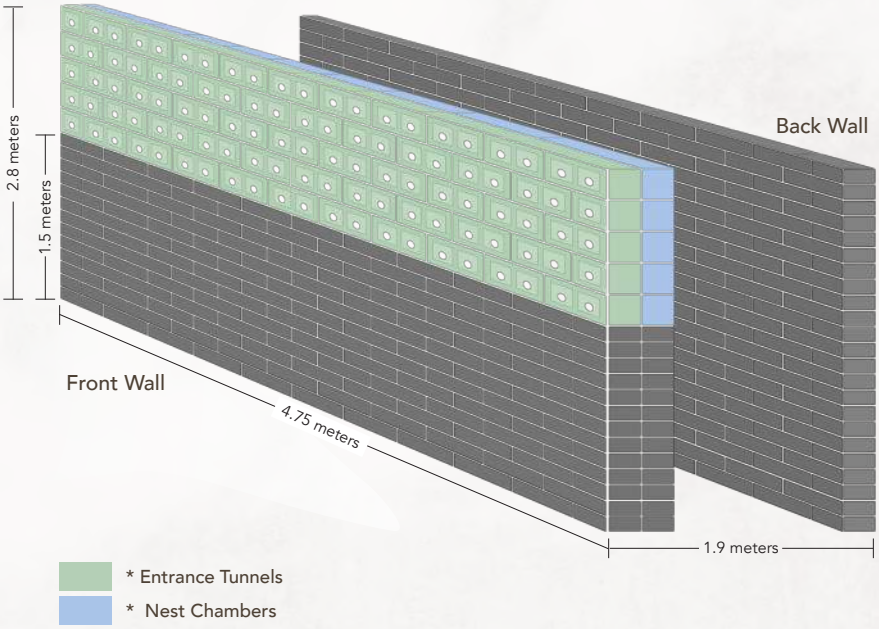
Steps of the wall building process

1) Pre-prepare the nest chamber entrance tunnels in cavity blocks using plastic tubes and cement. One tunnel is needed for every nest cavity e.g. 140 in the case of the Thomastown project.
2) Dig and lay foundations.
3) Build nesting wall using a double row of cavity blocks. The outer row has the cavity blocks with the pre-prepared entrance tunnels and the inner row has the nest chamber.
4) If required, leave a passage way (to enable access the nest chambers) and then build the back wall.
5) Put roof over the whole structure to make it weatherproof.

Dimensions of the Wall

The dimensions of the wall after it was extended in the winter of 2021 are:

- Length: 15.6ft / 4.75 metres
- Height: 9.2 ft / 2.8 metres
- Depth: 1.9 metres (this includes the space for the passage)



Materials used to Build the Thomastown Wall

- Solid cement blocks for base layers of the nesting wall and the parallel back wall
- 9" (215mm) wide cavity blocks for the rest of the wall

Step 1 – Making the Nest Chamber Entrance Tunnels

In the wild Sand Martins build their entrance tunnel so that it slopes slightly uphill, this is to prevent any water entering the nest chamber. At Thomastown House every other tunnel was sloping uphill whilst the one in between was more or less horizontal. It was built in this way to give the wall entrances a more random appearance and so look more like a natural colony.

Pre-prepare the nest chamber entrance tunnels in the cavity blocks before starting any building work. Make as many tunnels as you need e.g. 60 nest chambers equals 60 tunnels.

Entrance Tunnel Dimensions

Tunnel Diameter: two different sizes of silicone sealant tube were used at the Thomastown project 45 and 50mm to make the tunnel.
Note: Instead of silicone sealant tubes you can use 50mm pvc pipe cut to length.

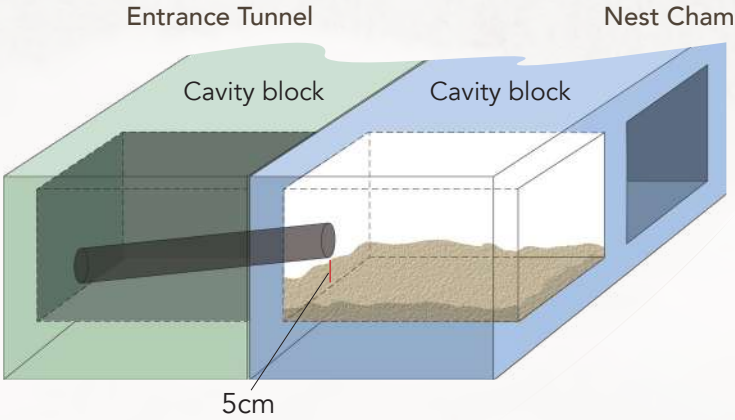
Tunnel Length : 9 inches / 22cm

How to make the Tunnel

1) Place a silicone sealant tube or piece of pvc pipe in a cavity block.

   NOTE: For a sloping tunnel, one end of the tube should be flush with the bottom of the block and then tilted slightly towards the nest chamber. The end result is that the when the tunnel reaches the nest chamber it is approx. 5cm above it and you will have to fill the nest chamber with builders sand until is it at the same level as the tunnel.

2) Make up a quantity of concrete - approx. 5 parts sand to 1 part cement – see instructions on the cement packet. Carefully fill the space around the tube with the concrete to hold the tunnel tube in place – as specified under 1) above.



Cement placed around the tube

3) Before the concrete has fully set remove plastic tube leaving a perfect tunnel with a diameter of 45 or 50 mm depending on the size of tube you have used. Both diameters are being used at the Thomastown project with no obvious preference so far.

Step 2 - Foundations

Dimensions

Dig and lay foundations to the following dimensions :

- length 5.5 m
- width 2.5 m
- depth 0.3m

NOTE: The dimension of the foundations will vary depending on the size of wall you want to build and the terrain you are building on e.g. peaty, rocky, sandy etc. The Thomastown House Project foundations were made to accommodate a nesting wall made up of two rows of cavity blocks, an access tunnel in the centre and a solid back wall, capped off with a corrugated roof. You may wish to get a registered builder to lay the foundations of your own wall depending on size and location of your project.

Step 3 – Building the Nesting Wall

- The face of the wall must be vertical (Sand Martins prefer vertical walls because they know there is a reduced risk of predators being able to access the nest sites)
- Once the base is cured build two rows of solid cement blocks until you reach 1.5 metres above ground level
- From that point onwards use the cavity blocks - see Step 4.

several layers of cement block to 1.5 metres above ground level

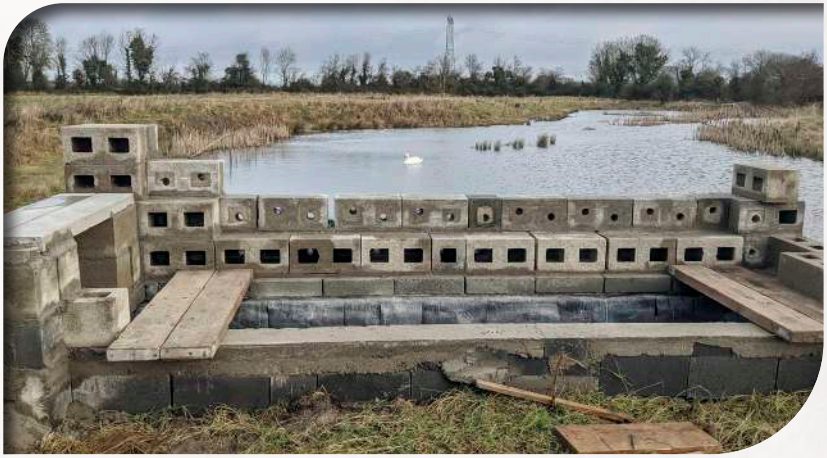
Above 1.5 metres use the cavity blocks

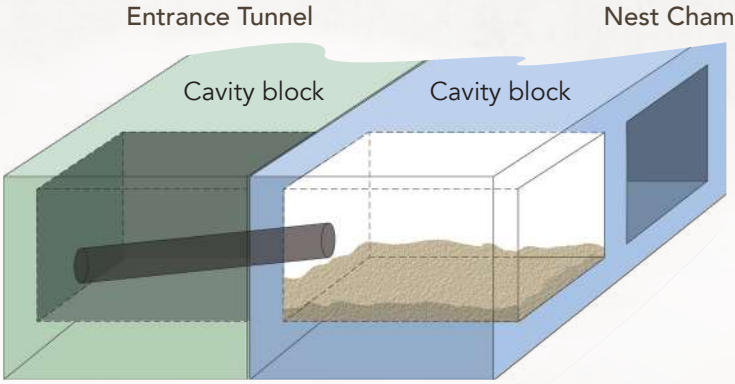
Step 4 – Placement of tunnels and nest chamber

Where to start the first row:
The first row of tunnels should be at least 1.5 metres above ground level or the highest water level.

Outer Cavity Blocks
The outer row is composed of the pre-prepared cavity blocks that contain the entrance tunnels - as per Step 1.

Inner Cavity Blocks
The inner row is composed of the cavity blocks which will be used as the nest chambers - see image below.





The Nest Chamber

Line the floor of the nest chamber with 2"/5 cm of builders sand so that it is level with the bottom of the tunnel.

Closing off the Nest Chamber

- The back of the nest chambers is closed off with a 9x1" timber plank which is fixed securely in place.
- Some of the Thomastown nest chambers have their own individual door which allows access to the nest chamber for cleaning, inspection, ringing and monitoring *(carried out under NPWS licence).*

Small door gives access to one of the nest chambers.

Step 5 – Passage and Rear Wall

If you want to have a passage so that you can access the nest chambers then you'll need to build a parallel wall using solid cement blocks to the same height as the nesting wall.

Passage way

Step 6 – Top of Wall and Front of Wall

TOP OF WALL

Cover the top of the nesting wall with waterproof membrane and capping stones.

FRONT OF WALL

Sheets of steel are fixed to the bottom of the wall (from ground level or the highest water level) to the first row of tunnels - the smooth surface of the sheets makes it difficult for predators to climb up to the nest entrances. Masonry fixings are used to fix the sheets of steel to the wall.

Original wall built in 2019
with the sheets of steel in place under nest entrances

Step 7 - Roof

Place a piece of corrugated sheeting or something similar to act as a roof. This is purely to keep the structure weatherproof and is not for carrying any weight. This should be secured in place.

Approximate cost of the project

The approximate cost for the materials in 2022 was €2,500 which excludes labour and digger hire.

Attracting Sand Martins to the Wall

You can play attraction calls to catch their attention. Don't forget to apply for an NPWS lure licence if you play calls https://www.npws.ie/licencesandconsents

You can download a call from the internet and load it onto a USB stick https://www.xeno-canto.org/species/Riparia-riparia

With Power Source :

If you have a power source at your wall you can :

- play the call from a CD player
- or an amplifier system as used for swift attraction calls

  http://www.swiftconservation.ie/wp-content/uploads/2020/04/2020-Notes-on-sound-system-for-playing-swift-attraction-calls-by-Lynda-Huxley.pdf
- or an old laptop with speakers or any suitable device than can play calls through a speaker

No Power Source :

If you don't have a power source at your wall you can use a battery operated or chargeable device such as multi-media player. For example ;

- Auna multimedia waterproof speaker https://www.hifi-tower.ie/HiFi-TV/Multimedia-Home-Audio/Wireless-Speakers/Bluetooth-Speakers/Beachboy-Portable-Bluetooth-Speaker-USB-SD-AUX-FM-Blue-Blue-L.html?gclid=EAIaIQobChMI88X81O_G8AIVgdPtCh0dKQndEAQYBSABEgIH4PD_BwE

More Information

If you'd like more information you can contact Dermot Doran @ dermot1970.dd@gmail.com

In March 2022 Dermot and his Sand Martin Nesting Wall featured on RTE News. It is available to view on YouTube https://www.youtube.com/watch?v=eZJdmXRo-qY

Additional Notes

- This publication has been prepared to provide advice and guidance only and you may wish to seek professional advice before undertaking your own project.
- Whilst every care has been taken in compiling this document, no responsibility can be taken for any other such Sand Martin Wall projects. Please note that access to nest chambers for research and photographing of birds must be carried out under NPWS licence.
- If you plan to build a Sand Martin nesting wall in a protected area please consult NPWS prior to commencing any work to get their approval.
- Planning permission was not required for the Thomastown House project. However, in certain situations it may be necessary for you to obtain planning permission. Consult your local planning office if you are unsure.
- The methods used in the Thomastown Sand Martin nesting wall Project have been hugely successful. However, we can give no guarantee that Sand Martins will use other such projects – but it's always worthwhile trying because Sand Martins need safe and secure places to nest.

M.P.

M.P.

OPW Oifig na nOibreacha Poiblí Office of Public Works

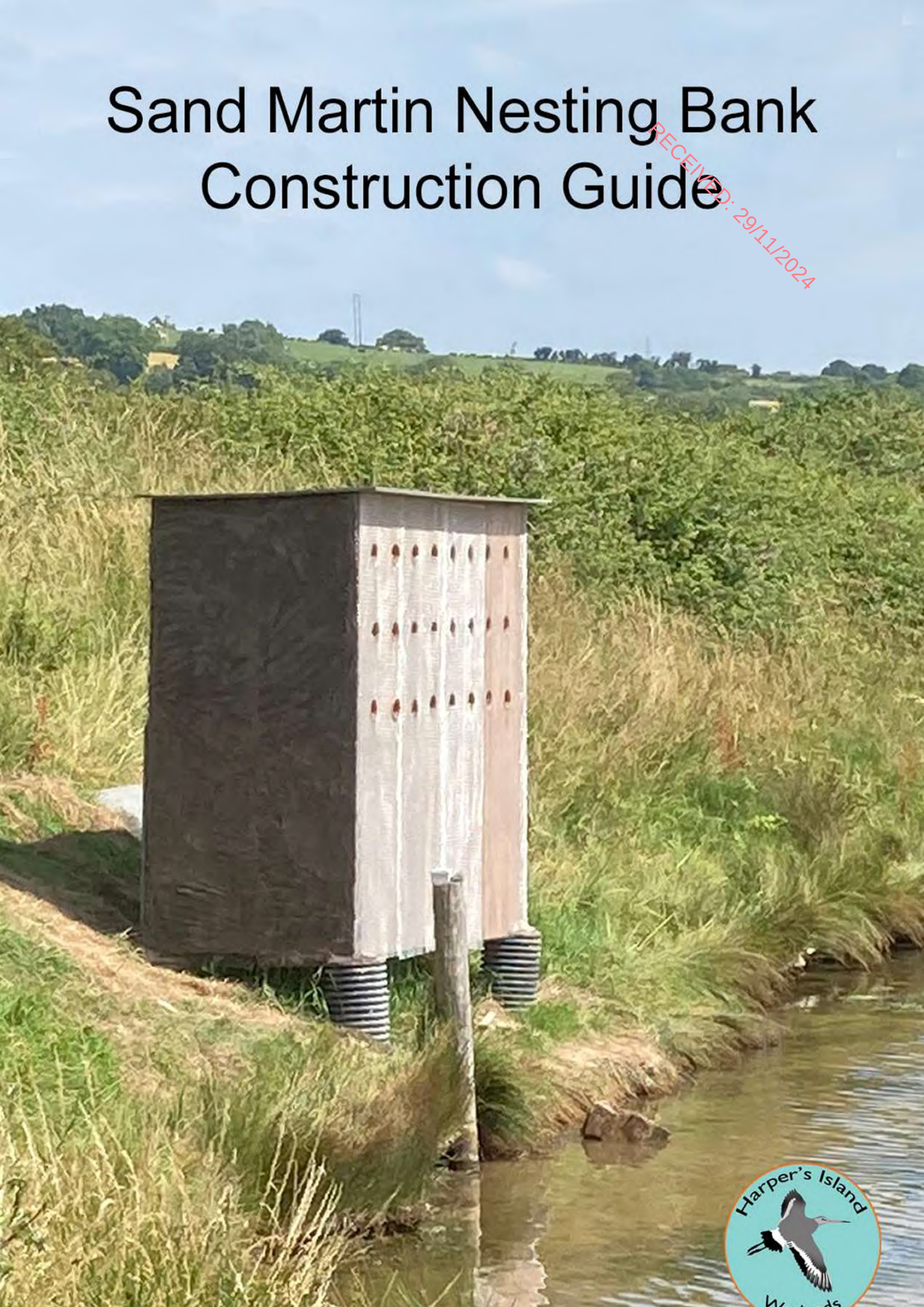
Printing of this leaflet has been made possible with support from the Office of Public Works

Design & Print Bridge Signs, Ballinrobe, Co. Mayo.

APPENDIX 2

HARPERS ISLAND – SAND MARTIN WALL CONSTRUCTION GUIDE

Sand Martin Nesting Bank Construction Guide



Introduction

We built our Sand Martin nesting bank in 2021 and it was used by the birds the following year. This guide describes our own design based on information on the construction of artificial Sand Martin banks found on-line. There are other designs out there which use different materials etc.

Materials

1. Marine Ply six 2440mm x 1220mm x 25mm (8ft x 4ft x 1inch) sheets.
   With the price of marine ply going up a cheaper alternative is cement board. This can also be plastered without the need for wire mesh.

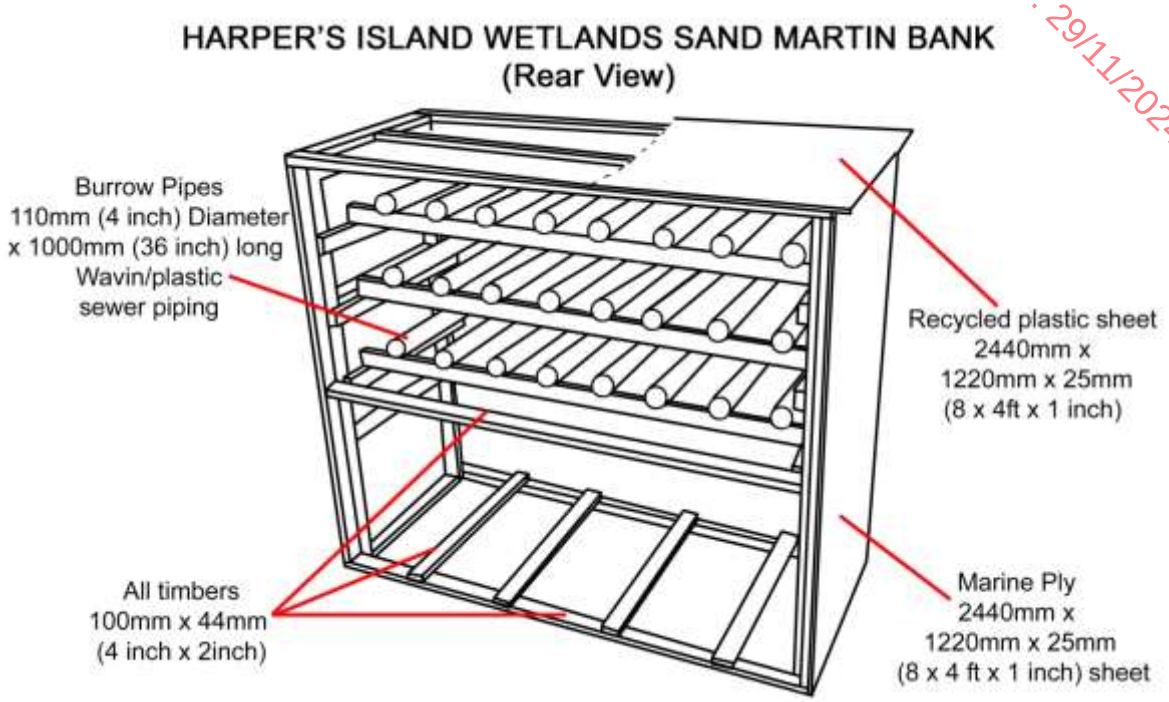
2. Recycled plastic one 2440mm x 1220mm x 25mm (8ft x 4ft x 1inch) sheet. Marine Ply can be used instead of the recycled plastic sheet.

3. 100mm x 44mm (4 inch x 2inch) deal timber
4. 110mm (4 inch) Wavin/plastic sewer piping.
5. 300mm – 380mm (12 – 15inch) plastic drainage pipe for support piles for the bank.
6. Builders mesh for front and sides to support plastering to give the bank a natural look finish.
7. Sand Martin looped call player (NOTE: License is required from NPWS to use this)
8. 12 Volt Car Battery to power the call player.

Locating the bank

Sand Martins like to nest over water with the lowest nest burrow approximately 1m above the water. The Harper's bank is facing south with the prevailing winds from the southwest but apparently there is no preferred direction but would suggest not straight into the prevailing winds to minimise rain getting into the burrows.

Construction



1. We did not have solid ground on which to build the bank so we cut and half buried 12 – 15inch/300mm – 380mm drainage piping in the four corners of the base footprint of the bank and filled them with concrete and inserted fastening bolts to make the support piles for the bank.

2. Once the concrete has set erect the frame for the Sand Martin bank using 100mm x 44mm (4 inch x 2inch) lengths of timber, starting by bolting the base to the concrete piles.

3. Attach vertically two sheets of marine ply to the front and one each vertically to the sides of the frame.

4. We used a 2440mm x 1220mm (8ft x 4ft) recycled plastic sheeting for the roof. Alternatively marine ply can be used for this.

5. Attach builders mesh to the front and sides of the bank to support plastering to give the bank a natural look finish.

6. Cut the 110mm (4 inch) Wavin/plastic sewer piping into 36 inch/1000mm lengths to make the burrow pipes.

7. The front of the bank is 2440mm x 2440mm (8 ft X 8 ft) .The nest holes need to be at least 300mm (12inches) apart both horizontally and vertically. The lowest burrows should be at least 1000mm (3ft) above the summer high water mark/ground. We put our nest holes in the upper half of the front of the bank.

8. Our design allows for three rows of eight burrows.

9. The back of the lengths of burrow piping needs to be angled up about 26mm (1 inch) higher than the front (about 5-10 degrees) to stop water that gets in the front from flooding the burrow. Drill a 12-14mm (1/2 inch) drainage hole in the bottom of the pipe just inside the front of the pipe.

10. The burrow pipes are mounted on 100mm x 44mm (4 inch x 2inch) horizontal timbers and secured to them using screws and galvanised banding.

11. Then plaster the front and sides to give the bank a natural look finish.

12. When plastering the front use some plaster to create a concrete lip at the burrow entrance so it half covers the entrance hole to keep the sand in.

13. Once all the burrow pipes are in place half fill them from the back with builder's sand and cap the back of the burrow pipes with plastic caps or wooden discs in our case. These need to be removable to allow cleaning out and refilling with sand between breeding seasons.

14. The sides and roof 1220mm (4ft) wide so that the pipes are enclosed in the box to keep them steady in the wind.

15. Finally secure two Marine Ply 2440mm x 1220mm x 25mm (8ft x 4ft x 1 inch) sheets horizontally on the back of the bank. Make sure these can be easily removed between breeding seasons to facilitate access to clean the burrow pipes and add sand where needed.

16. To keep rats and other mammals off the bank you can also attach lengths of 450mm (18 inch) aluminium sheeting or similar at a downward 45 degree angle around the base.

17. From the end of March we set up a looped recording broadcasting Sand Martin calls to attract arriving birds. We used Swift Call Boxes (swiftcallboxes@gmail.com) which we found great value for money and resulted in birds nesting in our artificial Sand Martin bank in its first year. It was powered by a 12 volt car battery. IMPORTANT: You will need a license from the National Parks and Wildlife Serve to broadcast.

For more information on looped recording broadcasting equipment:

https://twitter.com/MayoCorncrake77/status/1518196655564238849

https://www.pippahackett.ie/post/sand-martin-wall-design

swift-conservation.org

https://www.swiftconservation.ie/nest-box-advice/

Appendix 1.

Examination of Harper's Sand Martin Nests 19th November 2022.

After an incredibly successful first season, with all 24 nesting burrows occupied, we removed all nests from the nesting burrows in the Sand Martin nesting bank to have the burrows clean and topped up with fresh sand. We took the opportunity to record details of the nests.

- All 24 burrows had evidence of occupation.
- 20 nests were situated at the very back of the one metre nesting tunnels and four were situated 60 - 64cm from the front of the tunnels.
- The majority of nests were composed of dead grass/plant material with very few if any containing feathers.
- Only two nests had substantial amounts of feathers with one made almost exclusively of feathers. The feathers looked like gull feathers, probably feathers dropped by preening Black-headed Gulls.
- 21 nests were empty.
- One nest contained three unhatched eggs and two hatched egg shells.
- One nest contained a hatched egg shell.
- One nest contained a dead Sand Martin with full flight feathers. Possibly a juvenile based on pale edging to some of the visible flight feathers?
- 21 burrows had one nest cup and three had nests with two nest cups, one immediately in front of the other. The three doubles were made from dead grass/plant material.

Cleaning out the nesting burrows.

A nest at the very back of the nesting burrow.

A nest made from mostly feathers at the very back of the nesting burrow.

The nest made mostly of feathers.

Two nests one in front of the other.

22 of the 24 nests showing the variety of materials used.

There is thin buff edging to the visible primaries and secondaries suggesting a young bird?

Three unhatched and two empty shells in this nest.

For more information on Harper's Island Wetlands:

www.harpersislandwetlands.ie

info@harpersislandwetlands.ie

https://www.facebook.com/harpersislandwetland

APPENDIX 3

BTO WILDLIFE TOWER DRAWINGS

KESTREL access hole
250 wide (top) x 400 wide (bottom)
x 350 high.
with timber or stone landing platform
below size = 400 wide x 350
projecting x 50 thickness

Kestrel ledge

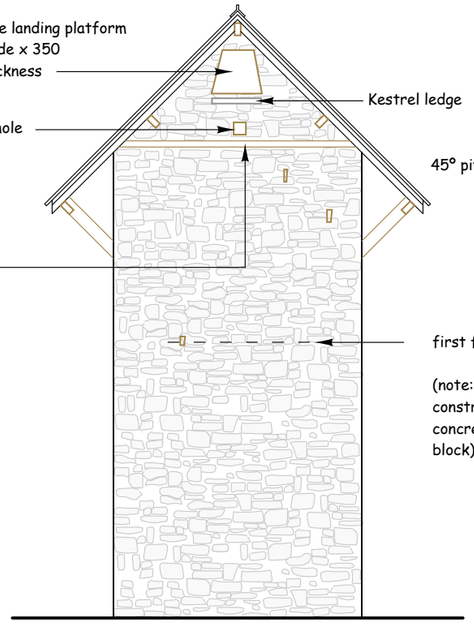
LITTLE OWL access hole
100 x 100

45° pitch roof

LITTLE OWL perch

first floor level

(note: first floor
construction =
concrete beam +
block)



WEST FACING ELEVATION

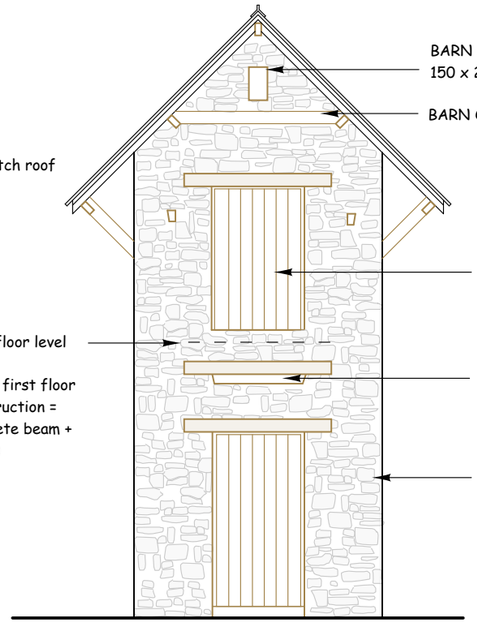
BARN OWL access hole
150 x 250

BARN OWL perch / ledge

timber doors, lintels,
roof rafters and purlins.

BAT slot through stone
facing and inner blockwork
into tower. 700 x 100

walls:
local natural stone facing
to inner blockwork



EAST FACING ELEVATION

roof:

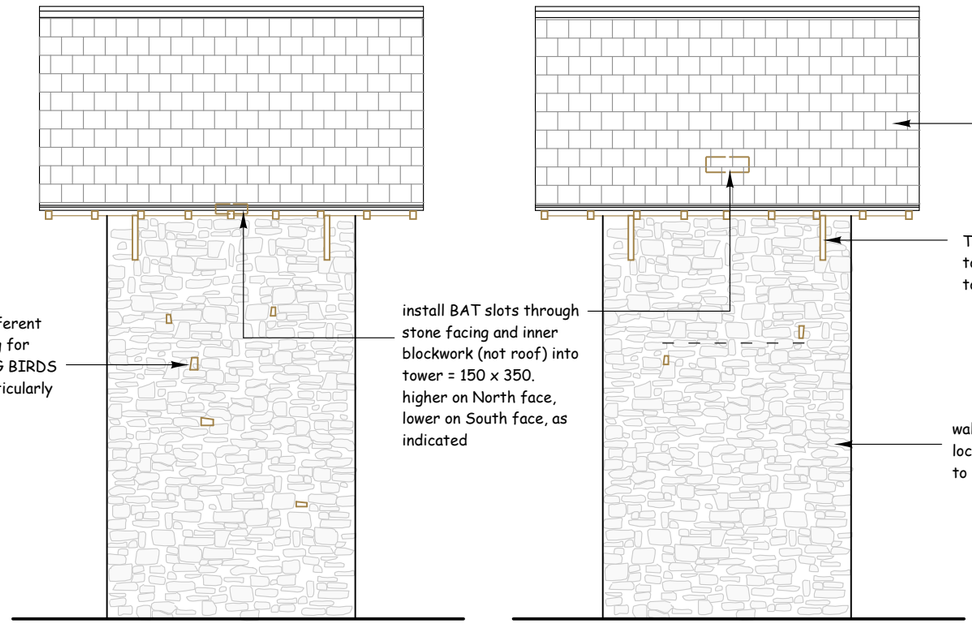
natural slate.

Timber brackets to be fixed
to the inner blockwork in order
to stabalise the roof overhang

Install lots of cavities of different
sizes in depth of stone facing for
INVERTEBRATES, NESTING BIRDS
etc. to all wall faces, but particularly
to the South face

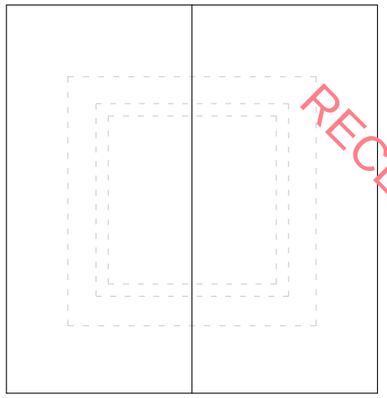
install BAT slots through
stone facing and inner
blockwork (not roof) into
tower = 150 x 350.
higher on North face,
lower on South face, as
indicated

walls:
local natural stone facing
to inner blockwork



SOUTH FACING ELEVATION

NORTH FACING ELEVATION



ROOF PLAN

NOTE

generous roof overhang at each
gable end provides required shelter
for safe fledging of young birds

North facing BAT box

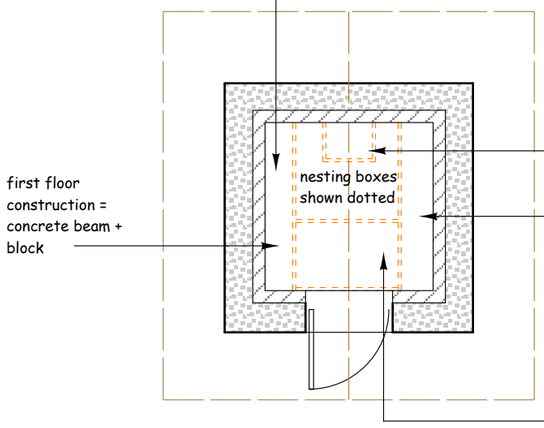
LITTLE OWL nestbox under
KESTREL nestbox

nesting boxes
shown dotted

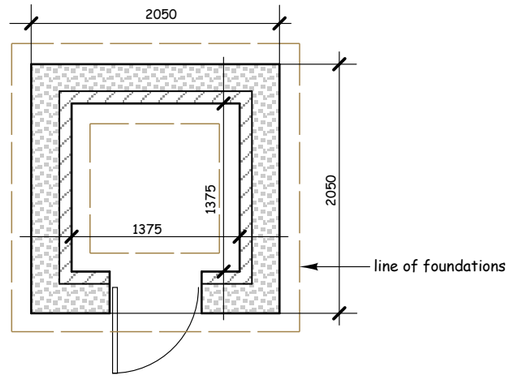
South facing BAT box

first floor
construction =
concrete beam +
block

BARN OWL nestbox. Note
floor of nestbox must be
minimum 500 below access hole



FIRST FLOOR LEVEL



line of foundations

GROUND FLOOR LEVEL

ALL DIMENSIONS IN MILLIMETRES

MICHAEL
DEFRIEZ
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CARPENTER'S COTTAGE
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project
BARN OWL TRUST
Proposed Wildlife Tower

drawing
scheme

project no.

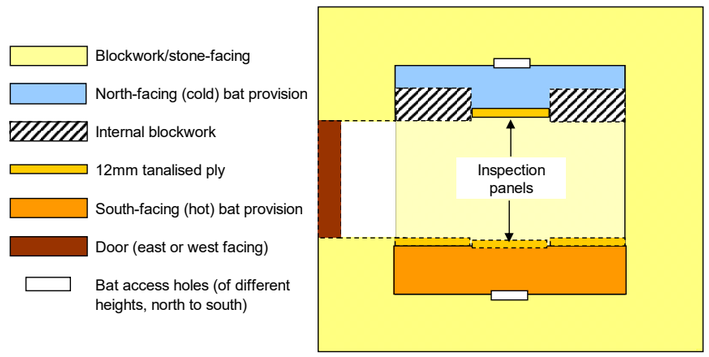
drawing no. **04B**

scale	date	drawn
1-50	27 Oct 2010	MDF.

BAT AND BIRD PROVISIONS (NOT TO SCALE)

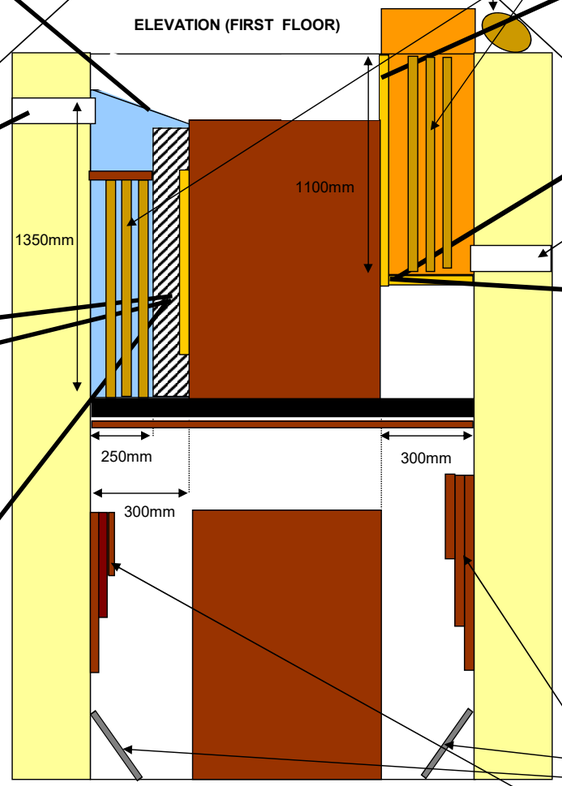
PLAN (FIRST FLOOR)

North



Slates

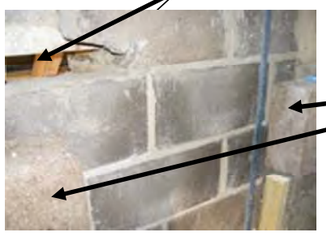
ELEVATION (FIRST FLOOR)



Kent bat box erected in other side from Hessian sacks

Hessian sacks stuffed over eaves to reduce drafts and draped in one side of the provision

Warm plywood space insulated with jablite inspection panel; bat hole at the bottom (warm air rises)



Cold blockwork space with ply inspection panel and roofing tiles over; bat hole at the top.

Showing both cold (left) and hot (right) bat spaces. Provisions made up flush to door frame.

Scored untreated rough sawn timber planks erected 25mm from ceiling to both provide space for crevice dwellers and roost locations for cavity dwellers.

Slates stood on end around base internally

Kent bat boxes erected on all walls

Cold bat space specifications;
250mm deep x 1350mm high, as wide as available space

Hot bat space specifications;
300mm wide x 1100mm high, as wide as available space and up to rafters

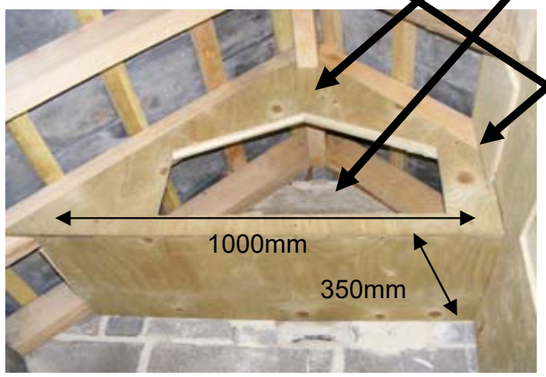
BARN OWL PROVISION

Barn Owl provision built the other side of the tower to the Kestrel provision,
as big as the available space allows but allowing for inspection panel.
Barn Owl provision floor must be a minimum of 500mm below access hole.

Tray outside Barn Owl provision fixed to the wall and a piece of 2" x 2" slung across the purlins.
External timber tanalised and treated with external wood preservative.

Barn Owl provision specifications;
1000mm wide x 400mm deep x 500mm high (from chamber floor to bottom of access hole)

KESTREL AND LITTLE OWL PROVISION



External landing stone leading to Kestrel provision.
Internal box to be built around the rafters after the bat spaces have been finished using 12mm ply fixed to timber baton fixed to blockwork
Space for inspection panel for maintenance/clearing out/ringing etc.

Kestrel box specifications;
1000mm wide x 350mm deep. Floor at or just below access hole, space up to apex (Kestrels like to see out of their nest sites)

Little Owl provision made underneath Kestrel provision.
Little Owl nestbox to wall mounted to wall on 2" x 1" baton, specification and design here;
https://www.barnowltrust.org.uk/barn-owl-nestbox/little-owl-nest-box/

CONFIDENTIAL APPENDIX

LOCATION OF THE BARN OWL NEST ONSITE

Map Legend

- Proposed Development boundary
- Proposed Extraction boundary
- Proposed Restoration boundary
- Barn Owl Nest

N

Drawing Title

Location of the Barn Owl Nest Onsite

Project Title

Proposed Quarry Extraction and Restoration Ballyquin, Co. Clare

Drawn By	Checked By
CT	RW
Project No.	Drawing No.
211137	Confidential Figure 1
Scale	Date
1:9,000	07.11.24

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