APPENDIX 7.1

BAT SURVEY RESULTS

PREPARED BY MKO

Planning and Environmental Consultants

Bat Survey Results

Proposed Killala Data Centre, Co. Mayo

DOCUMENT DETAILS

Client:	**AVAIO**
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Prepared By:	**MKO** **Tuam Road** **Galway** **Ireland** **H91 VW84**

Planning and Environmental Consultants

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01	Draft	24/06/2024	KG	SF/AJ
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1. INTRODUCTION

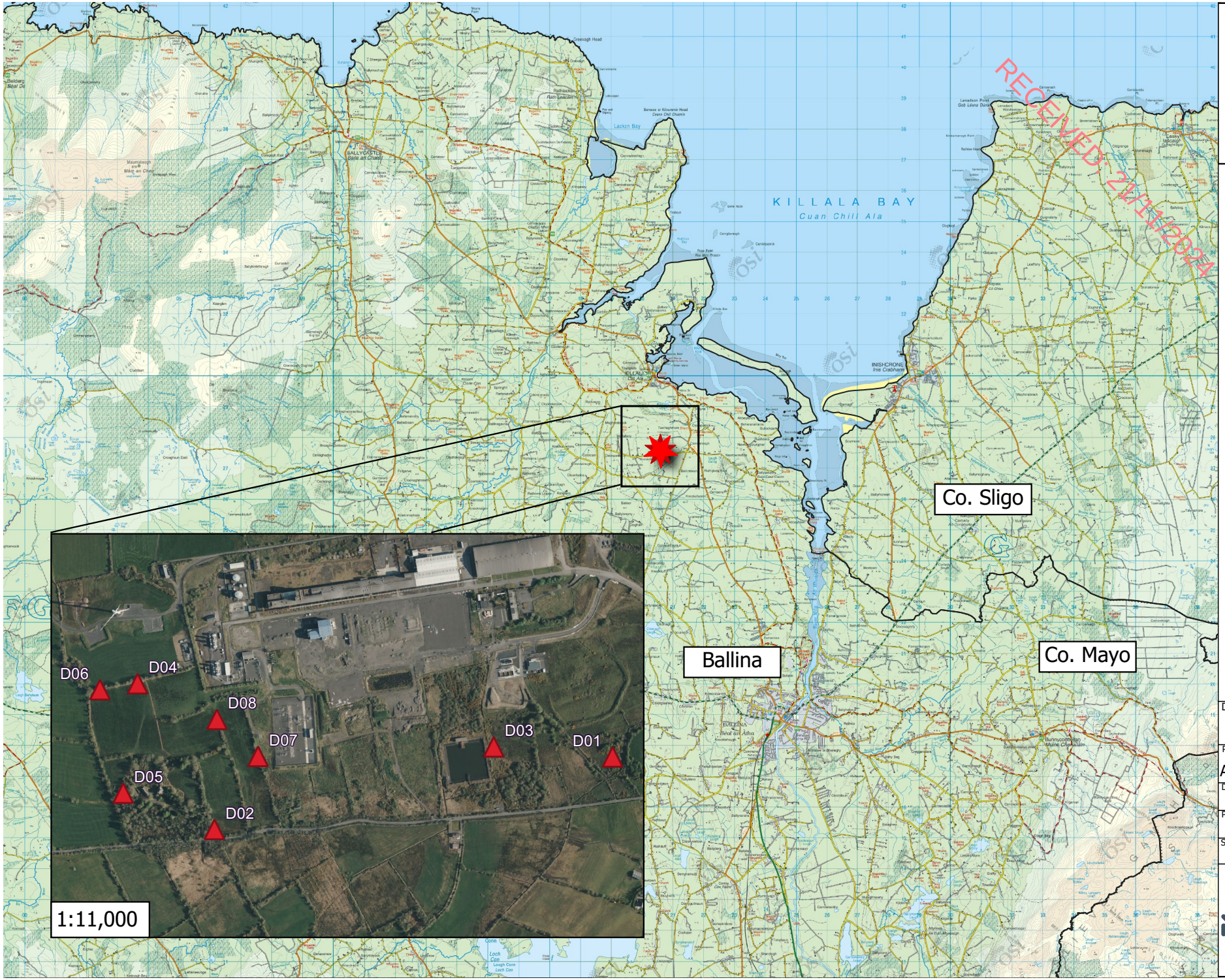
Background

MKO was commissioned to undertake bat surveys for a proposed development of a data centre at Killala, Co. Mayo (IG Ref.: G 20481 27598) (Figure 1-1). This document provides an overview of the bat survey results carried out in August and September 2023.

A walkover survey of the site was carried out during daylight hours on the 2nd and 23rd of August and the 11th of September 2023. The daytime walkover surveys were followed by Dusk Emergence Surveys on the 2nd of August and the 9th of September and a Nighttime Bat Walkover (NBW) transect survey on the 23rd of August. Four full spectrum static bat detectors were deployed for the duration of the bat survey period to record bat activity at fixed locations. Further information on the survey effort can be found below. The main objective of the surveys was to gather information on roosting, commuting, and foraging bats using the site and to identify any important features for bats.

The bat survey and assessment were informed by a desk study and with reference to the following guidelines:

- *Bat Surveys for Professional Ecologists – Good Practice Guidelines (3rd edn.) (Collins, 2016)*
- *Bat Roosts in Trees (Andrews, 2018)*
- *Best Practice Guidelines for the Conservation of Bats in the Planning of National Road Schemes (NRA, 2006a)*
- *Guidelines for the Treatment of Bats during the Construction of National Road Schemes (NRA, 2006b)*
- *British Bat Calls: A Guide to Species Identification (Russ, 2012)*
- *Bat Mitigation Guidelines for Ireland – V2. Irish Wildlife Manuals, No. 134. (Marnell, Kelleher & Mullen 2022)*
- *Guidance Note 08/23: Bats and Artificial Lighting at Night (ILP, 2023)*



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Map Legend

Site Location

Static Detector Locations

Drawing Title

Site Location

Project Title	Avaio – Killala Data Centre
Drawn By: RC	Checked By: AJ
Project No.: 230313	Drawing No.: Figure 1-1
Scale: 1:160,000	Date: 2024-06-27

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1.1 Policy and Legislation

All Irish bats are protected under European legislation, namely the Habitats Directive (92/43/EEC). All Irish species are listed under Annex IV of the Directive, requiring strict protection for individuals, their breeding sites and resting places. The Lesser horseshoe bat (*Rhinolophus hipposideros*) is further listed under Annex II of the Directive, requiring the designation of conservation areas for the species. Under this Directive, Ireland is obliged to maintain the favourable conservation status of Annex-listed species. This Directive has been transposed into Irish law through the European Communities (Birds and Natural Habitats) Regulations 2011 (S.I. No. 477/2011).

In addition, Irish species are further protected by national legislation (Wildlife Acts 1976, as amended). Under this legislation, it is an offence to intentionally disturb, injure or kill a bat or disturb its roost. Any work at a roost site must be carried out with the agreement of the National Parks and Wildlife Service (NPWS) and a derogation licence must be granted before works commence. Breeding birds are also protected under this legislation.

The NPWS monitors the conservation status of European protected habitats and species and reports their findings to the European Commission every 6 years in the form of an Article 17 Report. The most recent report for the Republic of Ireland was submitted in 2019. Table 1-1 summarises the current conservation status of Irish bat species and identified threats to Irish bat populations.

Table 1-1 Irish Bat Species Conservation Status and Threats (NPWS, 2019)

Bat Species	Conservation Status	Principal Threats
Common pipistrelle *Pipistrellus pipistrellus*	Favourable	**A05** Removal of small landscape features for agricultural land parcel consolidation (M) **A14** Livestock farming (without grazing) [impact of anti-helminthic dosing on dung fauna] (M) **B09** Clear--cutting, removal of all trees (M) **F01** Conversion from other land uses to housing, settlement or recreational areas (M) **F02** Construction or modification (e.g. of housing and settlements) in existing urban or recreational areas (M) **F24** Residential or recreational activities and structures generating noise, light, heat or other forms of pollution (M) **H08** Other human intrusions and disturbance not mentioned above (Dumping, accidental and deliberate disturbance of bat roosts (e.g. caving) (M) **L06** Interspecific relations (competition, predation, parasitism, pathogens) (M) **M08** Flooding (natural processes) **D01** Wind, wave and tidal power, including infrastructure (M)
Soprano pipistrelle *Pipistrellus pygmaeus*	Favourable	
Nathusius' pipistrelle *Pipistrellus nathusii*	Unknown	
Leisler's bat *Nyctalus leisleri*	Favourable	
Daubenton's bat *Myotis daubentoni*	Favourable	
Natterer's bat *Myotis nattereri*	Favourable	
Whiskered bat *Myotis mystacinus*	Favourable	
Brown long-eared bat *Plecotus auritus*	Favourable	
Lesser horseshoe bat *Rhinolophus hipposideros*	Inadequate	

1.2 Bat Roosting Behaviour

Bats use a variety of natural and manmade structures as roosting or resting places. The type of roost and its level of use is determined by its function in the bat life cycle. Table 1-2 provides a summary of different types of bat roosts.

Table 1-2 Bat Roost Types and Definitions

Roost Type	Definition
Day	Where individuals or small groups of male's rest/shelter in the day but are rarely found by night in summer.
Night	Where bats rest/shelter at night but are rarely found in the day.
Feeding	Where individuals rest/feed during the night but are rarely found during the day.

Transitional	Used by a few individuals for short periods of time prior to or following hibernation.
Swarming	Where large numbers gather in late summer to autumn. Important mating sites.
Mating	Where mating takes place in late summer to winter.
Maternity	Where females give birth and raise their young.
Hibernation	Where bats are found during winter (constant cool temperature and high humidity).
Satellite	An alternative roost found in close proximity to the main nursery colony.

There are currently no clear guidelines to determine the significance of a bat roost. All the largest roosts of LHB in Ireland are of international importance and it is anticipated that all large Leisler's bat roosts (>100) would also have international significance (NRA, 2006). Table 1-3 provides some criteria for determining the significance of different building roosts, as determined by the Bat Expert Panel of the Heritage Council in 2003 (NRA, 2006).

Table 1-3 Level of Importance of Various Roosts

Species	Indicator	Significance
Lesser horseshoe bat	Special Area of Conservation	Very significant
	If present	Significant
Whiskered bat	>10	Very significant
	If present	Significant
Natterer's bat	>10	Very significant
	If present	Significant
Daubenton's bat	Maternity roost	Significant
Leisler's bat	Maternity roost	Significant
Common pipistrelle	Maternity roost	Significant
Soprano pipistrelle	Maternity roost	Significant
Brown long-eared bat	Maternity roost	Significant

The likelihood of detecting active roosts is determined by the timing of the roost survey. In general;

- April surveys may detect transitional roosts used by bats following hibernation and prior to summer roosting.
- May-August surveys may detect maternity colonies and male/non-breeding female summer roosts.
- August surveys are best to determine maximum counts of adult and juvenile bats.
- August – October surveys may detect swarming and mating bats.
- September and October surveys may detect transitional roosts used by bats following the dispersal of maternity colonies and prior to hibernation.
- Day, night, feeding and satellite roosts may be found anytime between April and October.
- November – March surveys may detect hibernacula.

1.3 Statement of Authority

MKO employs a dedicated bat unit within its Ecology team, who are experienced in scoping, carrying out, and reporting on bat surveys, as well as producing impact assessments in relation to bats. MKO ecologists have relevant academic qualifications and are qualified in undertaking surveys to the levels required. MKO's Ecology team holds the necessary bat derogation licence from NPWS. The licence is intended for professionals carrying out surveys with the potential to disturb roosting bats (i.e. roost inspections).

Survey scoping was prepared by Sara Fissolo. The daytime walkover survey, inspections and night-time surveys were carried out by Kate Greaney (BSc., MSc.), Laura Gránicz (BSc., MSc.), David Culleton (BSc., MSc.), and Ryan Connors (BSc., MSc.). This report was prepared by Kate Greaney and Sara Fissolo and was reviewed by Aoife Joyce. Staff's roles and relevant training are presented in Table 1-4 below.

Table 1-4 Project team qualifications and training.

Staff	Role	Qualifications and Training
Aoife Joyce (B.Sc., M.Sc.)	Project Director	B.Sc. (Hons) Environmental Science, University of Galway, Ireland. M.Sc. (Hons) Agribioscience, University of Galway, Ireland. Advanced Bat Survey Techniques – Trapping, biometrics, handling (BCI), Bat Impacts and Mitigation (CIEEM), Bat Tree Roost Identification and Endoscope Training (BCI), Bats in Heritage Structures (BCI), Bats and Lighting (BCI),
Sara Fissolo (B.Sc.)	Project Ecologist	B.Sc. (Hons) Ecology and Environmental Biology, University College Cork, Ireland. Advanced Bat Survey Techniques (BCI), Bat Impacts and Mitigation (CIEEM), Bats in Heritage Structures (BCI), Bat Care (BCT), Bats and Lighting (BCI), Kaleidoscope Pro Analysis (Wildlife Acoustics).
Kate Greaney (B.Sc., M.Sc.)	Ecologist	B.Sc. (Hons) Botany and Plant Science National university of Ireland, Galway, M.Sc. (Hons) Climate Change, Agriculture, and Food Security (MScCCAFS) National university of Ireland, Galway Kaleidoscope Pro Analysis (Wildlife Acoustics). Endoscope Training (Internal), Emergence and Re-Entry Surveys (Internal) Structure & Tree Inspection (Internal), Manual Transect Survey (Internal), Bat Habitat Appraisal (Internal)
Laura Gránicz (B.Sc., M.Sc.)	Bat Ecologist	B.Sc. Biology, University of Szeged, Hungary. M.Sc. Biology, University of Pécs, Hungary. Structure & Tree Inspection (Internal), Manual Transect Survey (Internal), Bat Habitat Appraisal (Internal), Emergence and Re-Entry Surveys (Internal), Advanced Bat Survey Techniques (BCI), Kaleidoscope Pro Analysis (Wildlife Acoustics).
Ryan Connors (B.Sc., M.Sc.)	Bat Ecologist	B.Sc. (Hons) Zoology, University College Galway, Ireland. M.Sc. (Hons) Conservation Behaviour, Atlantic Technological University, Galway, Ireland. Surveying Trees for Bats (BRTS), Structure & Tree Inspection (Internal), Manual Transect Survey (Internal), Bat Habitat Appraisal (Internal), Emergence and Re-Entry Surveys (Internal), Kaleidoscope Pro Analysis (Internal), Winter Tree Identification (Internal), Wintering Bird Surveying (Internal).
David Culleton (B.Sc., M.Sc.)	Bat Ecologist	B.Sc. (Hons) Zoology, University College Cork, Ireland. M.Sc. (Hons) Conservation Behaviour, Atlantic Technological University, Galway, Ireland. Bat Detector and Survey Training (BCI), Kaleidoscope Pro Analysis (Wildlife Acoustics), Endoscope Training (Internal), Structure & Tree Inspection (Internal), Manual Transect Survey (Internal), Bat Habitat Appraisal (Internal), Emergence and Re-Entry Surveys (Internal).

2. METHODOLOGY

2.1 Bat Survey

2.1.1 Bat Habitat Appraisal

A walkover survey of the site was carried out during daylight hours on the 2nd August 2023. The site was revisited on the 23rd August and 11th September 2023. The site visited in 2023 consisted of two separate sections located to the east and west of the existing Mayo Power Plan (Plate 2-1). These work areas were considered provisional at the time, and their boundaries were likely to be subject to design changes. The eastern section of the site was considered less likely to be considered further, and as such the western section, surrounding an existing rectory, was the main focus of the bat surveys undertaken.

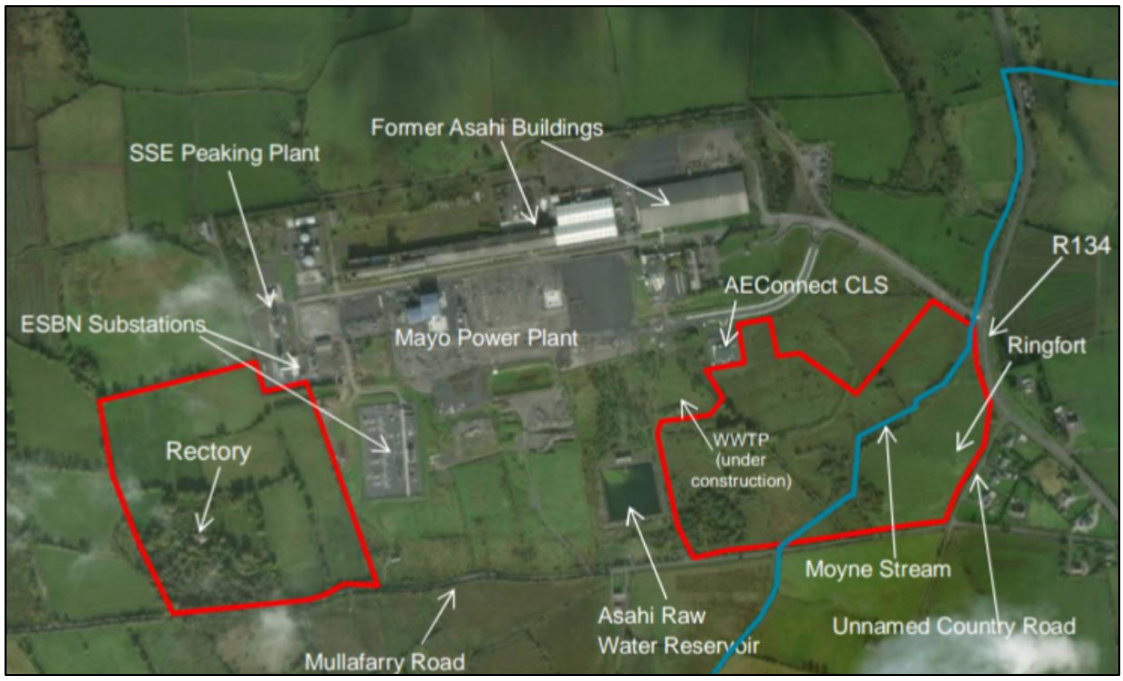

Plate 2-1 Provisional work areas visited during bat habitat appraisals carried out in 2023.

The landscape features on the site were visually assessed for potential use as bat roosting habitats and commuting/foraging habitats using a protocol set out in BCT Bat Surveys for Professional Ecologists: Good Practice Guidelines (3rd edn.) (Collins, 2016). The aim of the survey was to identify suitable habitats within the site to guide further survey efforts.

Table 4.1 of the 2016 BCT Guidelines identifies a grading protocol for assessing structures, trees and commuting/foraging habitat for bats, which is summarised in Table 2-2. The protocol is divided into four Suitability Categories: High, Moderate, Low and Negligible.

Table 2-1 BCT protocol for bat habitat appraisals (Collins, 2016)

Assessment	Rationale
High	Structure with one or more potential roost sites that are obviously suitable for use by larger numbers of bats on a more regular basis and potentially for longer periods of time due to their size, shelter, protection, conditions, and surrounding habitat. Continuous, high-quality, well-connected habitats, connected to known roosts.

Moderate	A structure used by bats due to their size, shelter, protection, conditions and surrounding habitat, but are unlikely to support a roost of high conservation status, and suitable, connected habitats.
Low	Structures with one or more potential roost sites that could be used by an individual bat opportunistically, and suitable but isolated habitats that could be used by a small number of bats.
Negligible	No obvious features present, but a level of uncertainty remains.

New Collins guidelines were published in September 2023 (Collins, 2023), after the bat habitat appraisal was undertaken. The new protocol includes the None category, where no uncertainty exists on the lack of PRFs on a tree or structure. Trees where further assessment is required are marked as FAR, and trees with obvious PRF are marked PRF, which can be assessed as either PRF-I, which corresponds to the previous Negligible and Low categories, or PRF-M, which marks a sizeable feature suitable to host a maternity roost. The preliminary assessment and scope of surveys carried out with reference to the previous edition are considered in line with the updated guidelines and appropriate for the site.

2.1.1.1 Preliminary Roost Assessment

A search for roosts was undertaken within the boundary of the proposed site by licenced ecologists to identify any potential roost features (PRFs). The licence, issued by NPWS, is intended for professionals carrying out surveys with the potential to disturb roosting bats. The aim of the survey was to determine the presence of roosting bats, potential access points, roosting locations and the need for further survey work or mitigation.

All structures identified within the site were assessed for their potential to support roosting bats. A systematic search of all accessible interiors, including all attic spaces, was undertaken. The exterior of each building was inspected first from ground level and included all accessible windowsills, walls, eaves, roof ridge and roof slates. Inspections were carried out with the aid of torches, a ladder, an endoscope, a thermal camera and binoculars, and searched for evidence of bat use, including live and dead specimens, droppings, feeding remains, urine splashes, fur oil staining and noises, as well as potential access points into the structure.

The proposed development site contains a large number of trees spread within woodland and treeline habitats. Roosting suitability was assessed in clusters and at feature level during the initial walkover surveys to inform need for further surveys and assessment.

Trees present within the site/within the proposed development footprint were examined from ground level for the presence of rot holes, hazard beams, cracks and splits, partially detached bark, knot holes, gaps between overlapping branches and any other PRFs identified by Andrews (2018).

2.1.2 Manual Activity Surveys

Manual activity were conducted in the form of presence/absence surveys of identified PRFs as well as a night bat walkover (NBW). Surveyors were equipped with active full spectrum bat detectors, Batlogger M (Elekon AG, Lucerne, Switzerland). The survey effort is summarised in Table 2-2 and presented in Figure 2-1.

Table 2-2 Bat Activity survey effort

Date	Surveyors	Type	Sunrise/ Sunset	Weather
02/08/2023	KG, LG, DC, RC	Roost Emergence & NBW	21:15	17-20°C, Dry, Calm-Gentle Breeze
23/08/2023	KG, RC	NBW	20:50	13-16°C, Dry, Light Breeze

Date	Surveyors	Type	Sunrise/ Sunset	Weather
11/09/2023	KG, DC	Roost Emergence	20:04	12-15 °C, Dry, Calm

2.1.2.1 Roost Surveys

Presence/absence surveys were undertaken on the evenings of the 2nd and 11th September 2023. The aim of this survey was to identify bat species using the site for roosting and to gather any information on bat behaviour and important features used by bats. The activity survey focused on the PRFs identified during the daytime inspections and activity in the wider area was also monitored. The surveys started half an hour before sunset and concluded one hour and a half afterwards.

Surveyors were located to ensure maximum coverage for access points within the structure. A thermal camera (IRay Technology Co. Ltd, Eye II V2.0) as a night vision aid for the survey. Thermal footage was analysed following the survey. All bat echolocation was recorded for subsequent analysis to confirm species identifications. August is within the optimal survey period for bat activity surveys (Collins, 2016). No limitations associated with access or weather conditions were recorded during the survey.

2.1.2.2 Night Bat Walkover

The night walkover was walked by two surveyors, recording bats in real time. On the 2nd August, it followed the manual roost survey and was completed within 3 hours after sunset. Four surveyor split up after the roost surveys and covered the north-western and southern section of the area surrounding the rectory. On the 23rd of august, a standalone walkover was conducted to observe activity across the site, it covered the entirety of the western section. The transect commenced five minutes before sunset and was concluded two and a half hours afterwards.

2.1.3 Static Detector Survey

Four full spectrum SM4 bat detectors (Wildlife Acoustics, Maynard, MA, USA), were deployed during static surveys to record bat activity for a period of 40 nights. The detectors were deployed on 2nd August 2023. They were moved on 23rd August to four new locations and were finally collected on 11th September 2023. The four locations of static detectors were selected to represent the range of habitats present within the site, including favourable bat habitats.

Settings used were those recommended by the manufacturer for bats, with minor adjustments in gain settings and band pass filters to reduce background noise when recording. Detectors were set to record from 30 minutes before sunset until 30 minutes after sunrise. The Song Meter automatically adjusts sunset and sunrise times using the Solar Calculation Method when provided with GPS coordinates. Static detector locations are shown in Figure 2-1 and presented in Table 2-3.

Table 2-3 Static Detector Location

Detector ID	IG Reference	Habitat	Deployment	Collection
D01	G 21272 27597	WD1	02/08/23	23/08/23
D02	G 20384 27435	WD1	02/108/23	23/08/23
D03	G 21007 27619	WL1, GA1	02/08/23	23/08/23
D04	G 20213 27760	WD1, GA1	02/08/23	23/08/23

D05	G 20181 27516	WD1	23/08/23	11/09/23
D06	G 20129 27747	GA1	23/08/23	11/09/23
D07	G 20481 27598	GA1	23/08/23	11/09/23
D08	G 20389 27681	GA1	23/08/23	11/09/23

*WD1 = (Mixed) broadleaved woodland, WL1 = Hedgerow, GA1 = Agricultural grassland

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Map Legend

Static Detector Locations

PRF Locations

Rectory

Shed

Stables

Dusk Transect Route 1
2nd August 2023

Dusk Transect Route 2
2nd August 2023

Dusk Transect Route 3
23d August 2023

Drawing Title
Survey Effort

Project Title
Avaio – Killala Data Centre

Drawn By	Checked By
RC	AJ
Project No.	Drawing No.
230313	Figure 2-1
Scale	Date
1:6,000	2024-06-27

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2.1.3.1 Bat Call Analysis

All recordings were later analysed using bat call analysis software Kaleidoscope Pro v.5.4.8 (Wildlife Acoustics, MA, USA). The aim of this was to identify, to a species or genus level, what bats were present at the proposed development site. Bat species were identified using established call parameters, to create site-specific custom classifiers. All identified calls were also manually verified.

Echolocation signal characteristics (including signal shape, peak frequency of maximum energy, signal slope, pulse duration, start frequency, end frequency, pulse bandwidth, inter-pulse interval and power spectra) were compared to published signal characteristics for local bat species (Russ, 1999). *Myotis* species (potentially Daubenton's bat *(M. daubentonii),* Whiskered bat *(M. mystacinus),* Natterer's bat *(M. nattereri)*) were considered as a single group, due to the difficulty in distinguishing them based on echolocation parameters alone (Russ, 1999). The echolocation of Soprano pipistrelle *(P. pygmaeus)* and Common pipistrelle *(P. pipistrellus)* are distinguished by having distinct (peak frequency of maximum energy in search flight) peak frequencies of ~55 kHz and ~46 kHz respectively (Jones & van Parijs, 1993). Some overlapping is possible between these species: where no certainty could be achieved, calls were identified to genus level.

Individual bats of the same species cannot be distinguished by their echolocation alone. Thus, 'bat passes' was used as a measure of activity (Collins, 2023). A bat pass was defined as a recording of an individual species/species group's echolocation containing at least two echolocation pulses and of maximum 15s duration. All bat passes recorded in the course of this study follow these criteria, allowing comparison. Due to the volume of bat activity data recorded, where multiple bat passes were recorded within the same registration, rarer or harder to record species were identified. Underreporting of common species is possible using this method and is accounted for within the assessment.

Echolocation calls by brown long-eared bats (*Plecotus auritus*) are intrinsically quiet and hard to record by static equipment. All data collected, including Noise files and Auto ID files are checked to ensure all calls for this species have been captured. However, a level of underrepresentation is expected for this species and is accounted for in the assessment of activity levels.

3. RESULTS

3.1 Bat Habitat Appraisal

The site consists of open grassland habitats surrounded by well-established treelines and patches of mixed woodland and scrub. The land use in the immediate surrounding consists primarily of low-intensity agriculture, with power station and business centre located in-between the site. Two separate sections of the site, to the east and west of Mayo Power Plant, were visited.

The eastern section of the site presented limited suitability to the north east, where few connecting corridors existed, with more established suitable habitats located to the south west, where patches of woodland and vegetated field boundaries were found. The section was assigned moderate suitability for commuting and foraging bats. Limited roosting potential was identified, with a small number of trees identified as having *Low* potential (PRF-I as per Collins 2023), and one sycamore (Plate 3-1) found to have potential to host larger roosts (PRF-M as per Collins 2023). These are presented in Table 3-1 below. A single building was found in this section, a pump house located next to the existing reservoir, which is described in section 3.1.2 below.

Plate 3-1 Sycamore tree with PRF-M potential.

Table 3-1 PRF trees identified in the eastern section of the site

Species & Number	Lat	Long	Potential	Notes
Sycamore (1)	54.1921588	-9.2094886	Moderate (PRF-M)	Broken limbs, knot holes
Sycamore (1)	54.1921095	-9.2096385	Low (PRF-I)	Mature tree
Sycamore (1)	54.1920956	-9.2097492	Low (PRF-I)	Mature tree, lifting bark
Sycamore (3)	54.1919793	-9.209744	Low (PRF-I)	Mature tree, 2 with ivy coverage
Sycamore (3)	54.1918955	-9.2097051	Low (PRF-I)	Mature trees
Sycamore (1)	54.1918774	-9.2095671	Low (PRF-I)	Mature tree, some vegetation coverage

The western section of the site was characterised by well-established linear features, well-connected to the wider habitat which provide *High* potential for bats. A large roost of multiple species was identified within the existing rectory, a protected structure, and is described in more detail below. No works were proposed on the existing woodland surrounding the rectory, as such the appraisal was limited to establishing the potential of the woodland for roosting bats. It was assessed as having High suitability, with multiple PRFs observed on the existing trees.

3.1.1 Preliminary Roost Assessment

The structures identified within the site have been described below. No works were proposed on any of the structures at the time of surveys; however, these were assessed to inform on any potential indirect impacts on roosting bats as a result of the proposed development.

Pump House – Reservoir

This was a cement block structure located in the eastern section of the site, in proximity of the existing reservoir. Access into the building was possible for bats through the broken access door and window slats. However little roosting potential was identified, limited to a few cracks between ceiling cement blocks, and the building was assessed as being unlikely to be used as a maternity roost or for hibernation. No evidence of bat use was found. It was assigned *Low* potential on the basis that it could be used opportunistically or as a night roost/feeding perch. The building was not subject to any further surveys as the eastern section of the site was subsequently removed from provisional designs.

Plate 3-2 Pump House

Plate 3-3 Pump house interior

Rectory

The rectory is a protected structure consisting of two main stories, half floors, a basement area and an attic space (Plates 3-4 and 3-5). The rectory was located in the western section of the site, together with the adjoining stables and shed described below. It has been partially renovated, with a new insulated roof and supports having been installed in recent years. The building was fully inspected, with some limitations where health and safety concerns prevented full access to the attic. Significant evidence of bat use was observed throughout, with droppings and feeding remains covering the floors on all levels (Plate 3-6). Droppings were found to likely belong to different species. No live specimen was found during the inspection to identify exact roosting locations. It was assigned a *High* roosting potential.

Plate 3-4 External elevation of Rectory, viewed from stables.

Plate 3-5 External elevation of Rectory.

Plate 3-6 Bat droppings and feeding remains.

Plate 3-7 Basement area of Rectory.

Stables

The stables were a stone and brick single-floor structure located in proximity to the rectory building. A new corrugated roof has been recently installed to prevent decay. The stonework also looked to have been recently repointed. The structure was completely accessible to bats however it offered less optimal conditions than the nearby rectory. It was assigned *High* roosting potential.

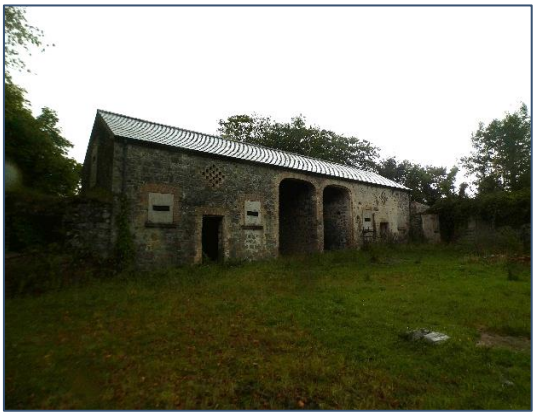

Plate 3-8 Stables front elevation

Plate 3-9 Stables side elevation

Plate 3-10 Stable interior

Shed

The shed was a brick and stone structure located in proximity of the stables. As for the stable, access was available, however roosting potential was likely limited to less significant roosting. It is likely to support transitional and secondary roosting for the species identified in the rectory. It was assigned *Moderate* potential.

Plate 3-11 Overgrown shed adjacent to stables

3.2 Manual Activity Surveys

Plate 3-12 presents the total species composition recorded at the site across all manual surveys. Soprano pipistrelle was the most commonly reported species on site (n=3,808), followed by *Myotis spp.* (n=142) and Leisler's bat (n=44). Brown long-eared bat (n=24) and common pipistrelle (n=16) were recorded less frequently during the manual surveys. Details of the surveys are provided below.

High foraging and commuting bat activity was observed during the dusk activity surveys. Activity was dominated by Soprano pipistrelle (*Pipistrellus pygmaeus*). It is likely that bats are emerging from the confirmed roosts, foraging to the west of the site and then commuting north/ northeast to continue foraging. Table 3-2 shows total bat passes per species per survey.

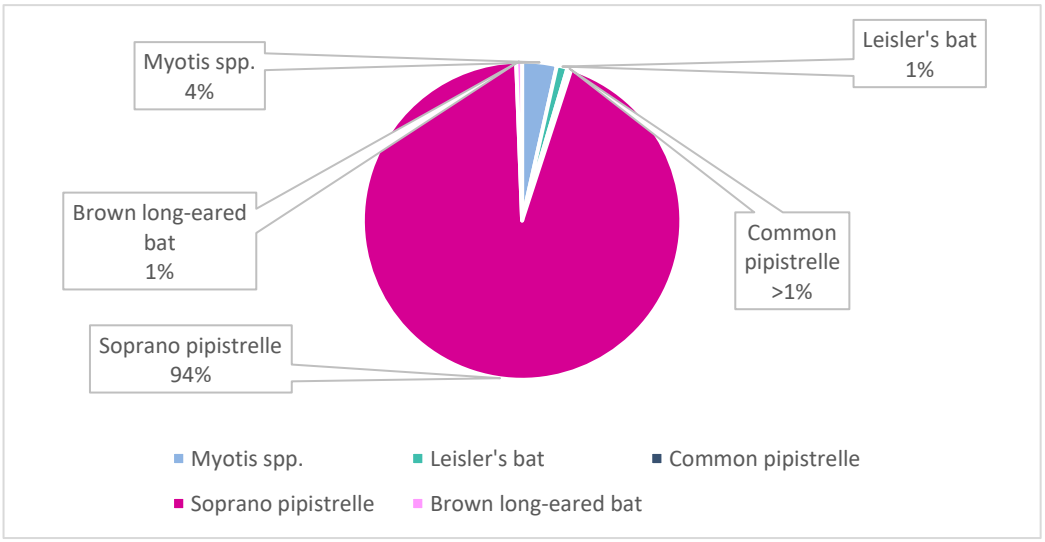

Plate 3-12 Bat Species Composition during the whole survey period

Table 3-2 Total Bat Passes Per Survey (incl. emergence surveys)

Species	Dusk 1 – Rectory & NBW	Dusk 2 – NBW	Dusk 3 – Rectory Outbuildings
Myotis spp.	121	8	13
Leisler's bat	32	6	6
Common pipistrelle	4	11	1
Soprano pipistrelle	728	881	2199
Brown long-eared bat	14	5	5

3.2.1 Roost Surveys

A presence/absence survey was undertaken in the form of a dusk emergence survey on the evenings of the 2nd August and 11th September 2023. The first survey focused on the rectory and was conducted by four surveyors. As the rectory was confirmed as a roost and species composition was identified, the following survey focused on the adjacent structures to establish their use. Table 3-3 summarises survey results.

Table 3-3 Manual activity surveys at PRFs.

PRF	Location (IG)	Date	Status	Result	Emergence location
Rectory	G 20266 27523	2nd August	Confirmed roost	Approx. 100 bats (Soprano pipistrelle, common pipistrelle, *Myotis spp.* and Leisler's bat) observed emerging.	Gaps in windows across building
Stables	G 20229 27518	11th September	Confirmed roost	8no. brown long-eared bat observed emerging	Open doorways & windows
Shed	G 20218 27534	11th September	Confirmed roost	16no. soprano pipistrelle observed emerging	Open doorway

3.2.2 Night-time bat walkovers (NBWs)

NBWs were carried out on the nights of the 2nd of August and 23rd of August. On the 2nd of August, following the emergence survey, two surveyors completed a walkover to the southeast of the site and an additional two surveyors completed a walkover to the northwest of the site to observe likely activity and commuting corridors. The night walkover completed on the 23rd of August followed on this initial survey and covered the entirety of the western area of the site. The results of the walkover carried out on the 23rd August are presented in Figure 3-1.


RECEIVED: 21/11/2024
Map Legend
Dusk Transect Route 3 23d August 2023
Manual Results Dusk 2
Myotis spp.
Leisler's bat
Common pipistrelle
Soprano pipistrelle
N
Microsoft product screen shots reprinted with permission from Microsoft Corporation
© Ordnance Survey Ireland. All rights reserved. Licence number CYAL50267517
Drawing Title
Night Bat Walkover Results – 23rd August 2023
Project Title
Avaio – Killala Data Centre
Drawn By
RC
Checked By
AJ
Project No.
230313
Drawing No.
Figure 3-1
Scale
1:2,000
Date
2024-06-27
MKO
Planning and Environmental Consultants
Tuam Road, Galway
Ireland, H91 VW84
+353 (0) 91 735611
email:info@mkoireland.ie
Website: ww.mkoireland.ie

3.3 Static Detector Survey

In total, 43,716 bat passes were recorded. Analysis of the detector recordings positively identified five bats to species level with *Myotis* genus also present. Bat species included: Soprano pipistrelle *(Pipistrellus pygmaeus)* (n=38,522), common pipistrelle *(Pipistrellus pipistrellus)* (n=2,108), Leisler's bat *(Nyctalus leisleri)* (n=1,454), *Myotis* spp. (n=1,309), and brown-long eared bat *(Plecotus auritus)* (n=323). The species composition recorded is shown in Plate 3-13.

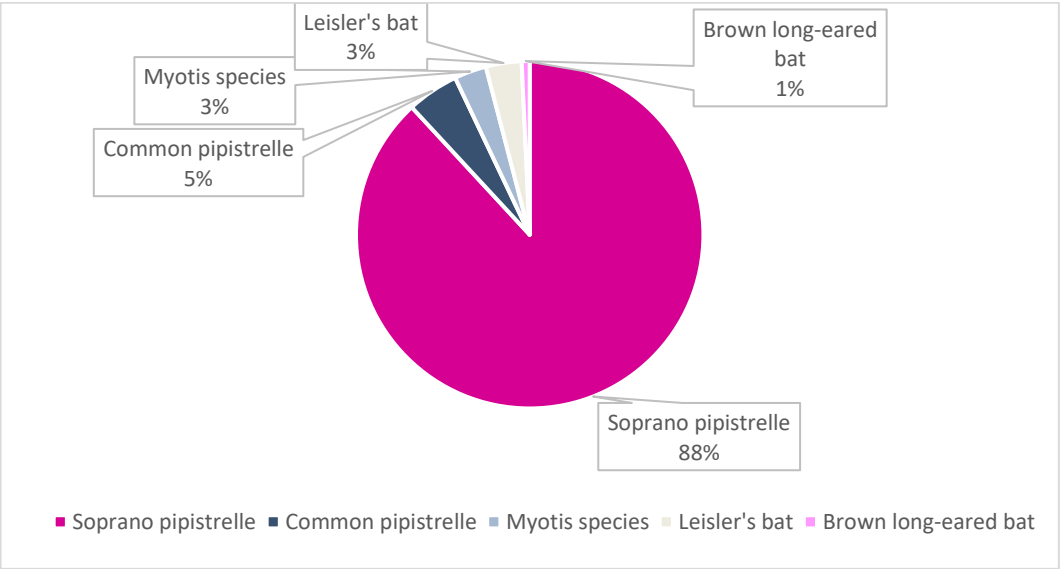

Plate 3-13 Bat Species Composition During Manual Surveys

Plate 3-14 shows total bat passes per detector. Detector D01 was located in an area of scrub to the far east of the site. Detector D02 was located in a hedgerow to the southwest of the site. D03 was placed close to the remains of the Asahi Raw Water Reservoir. D04 was located in a treeline to the northwest of the site.

When the detectors were moved on the 23rd of August, consideration was given to the previous locations and habitats surveys and the new locations ensured good coverage of the site. D05 was located in an area with mature trees, to the west of the rectory. D06 was placed along the same treeline as D04 but to the western corner. D07 was located in a hedgerow to the east of the western site and D08 in the northeast of the western site. Detector locations are shown in Figure 2-1.

Activity was highest at D05 and D06, and lowest at D07. *Myotis spp.* and brown long-eared bat activity was highest at D02, whereas common pipistrelle were most frequently recorded at D03.

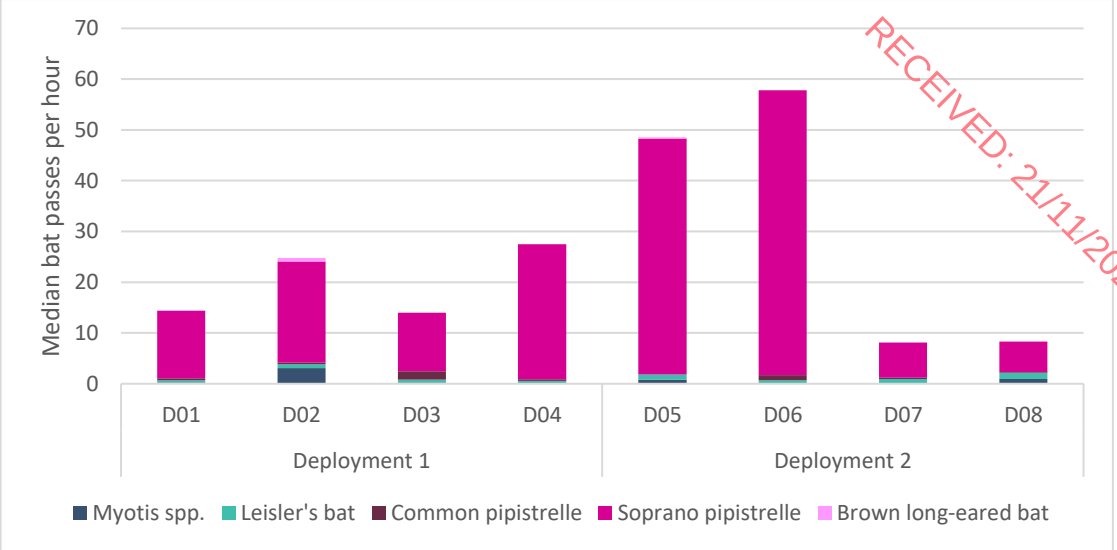

Plate 3-14 Total Bat Passes per Detector

Analysis of the detector recordings also highlighted the total bat passes per night. Species composition per night is shown in Plate 3-15. The species count was higher during the 2nd deployment than the first deployment. This is likely due to the location of the detectors and the proximity of the detectors to the roost.

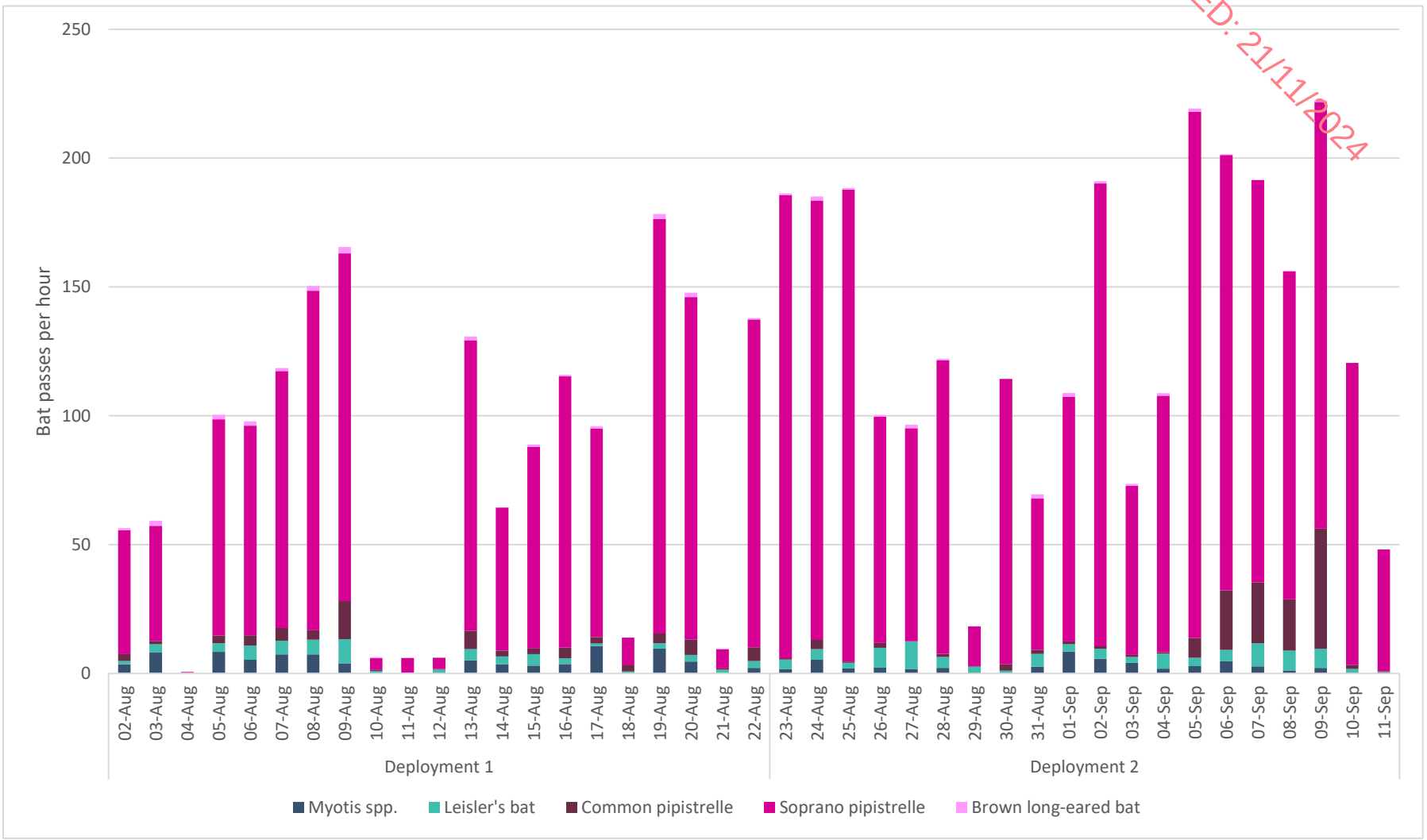

Plate 3-15 Total Bat Passes Per Hour, Per Night

4. CONCLUSION & RECOMMENDATIONS

Survey Summary

Bat activity within the site was relatively high overall. Activity was dominated by soprano pipistrelle. There were lower numbers of four other bat species/species group recorded, which included common pipistrelle, Leisler's bat, *Myotis spp.* and brown long-eared bat.

The site supports significant roosting: any proposed development within the site will need to be designed with consideration to the existing roosts and their commuting corridors and incorporate best practice mitigation measures to ensure there is no significant impact on the local environment, and designated sites. Two buildings were considered to be of *High* suitability for bats and an additional building was considered to have *Moderate* suitability for bats. Given the results of the manual activity surveys, is it likely these roosts are maternity roosts.

- The rectory was found to support a large soprano pipistrelle roost, as well as smaller numbers of Leisler's, common pipistrelle and *Myotis spp.* (approx. 100 bats total)
- The shed was found to support a small soprano pipistrelle roost. (16 bats total)
- The stables were found to support a small brown long-eared roost. (8 bats total)

Recommendations to safeguard bats

A more detailed assessment, informed by additional surveys, should be conducted prior to any proposed development to inform an impact assessment and provide mitigations. Below are preliminary recommendations to safeguard bats.

- As bat roosts were identified within the structures, a bat derogation licence must be obtained from NPWS prior to works commencing to account for the potential disturbance of roosting bats during works.
- It is highly recommended to avoid any works on the existing structures or removing any of the vegetation surrounding the identified roosts, and their commuting corridors identified.
- In the event that works are proposed within the structures identified, every effort should be made to retain any identified bat roosts and their access, and suitable alternative roosting locations must be provided (under NPWS licence) in the event these are removed/altered.
- It is recommended that the linear landscape features on the site, as well as woodland, be maintained/enhanced as part of any future development. In case of unavoidable tree removals, a pre-construction survey is recommended to be undertaken by a qualified ecologist, on trees to be felled with suitable potential roost features, to full assess each tree for roosting potential and to ensure there are no roosting bats present.
- Any proposed operational lighting plan (external and internal) should be designed with consideration of the following guidelines: Bat Conservation Ireland (Bats and Lighting: Guidance Notes for Planners, Engineers, Architects and Developers, BCI, 2010), the Bat Conservation Trust (Guidance Note 08/23 Bats and Artificial Lighting at Night (BCT, 2023) and Dark Sky Ireland to minimise light spillage, thus reducing any potential disturbance to bats.
- Where lighting is unavoidable during construction, low-intensity lighting and motion sensors should be used to limit illumination. Exterior during construction lighting should be designed to minimize light spillage thus reducing the effect on areas outside the proposed development, and consequently on bats. The luminaries should be of the type that prevent upward spillage of light and minimize horizontal spillage away from the intended lands. However, should any task lighting be required to facilitate works, these should be reasonably managed with all lighting turned off after working hours. Interior lighting must be directed away from any identified roosts.

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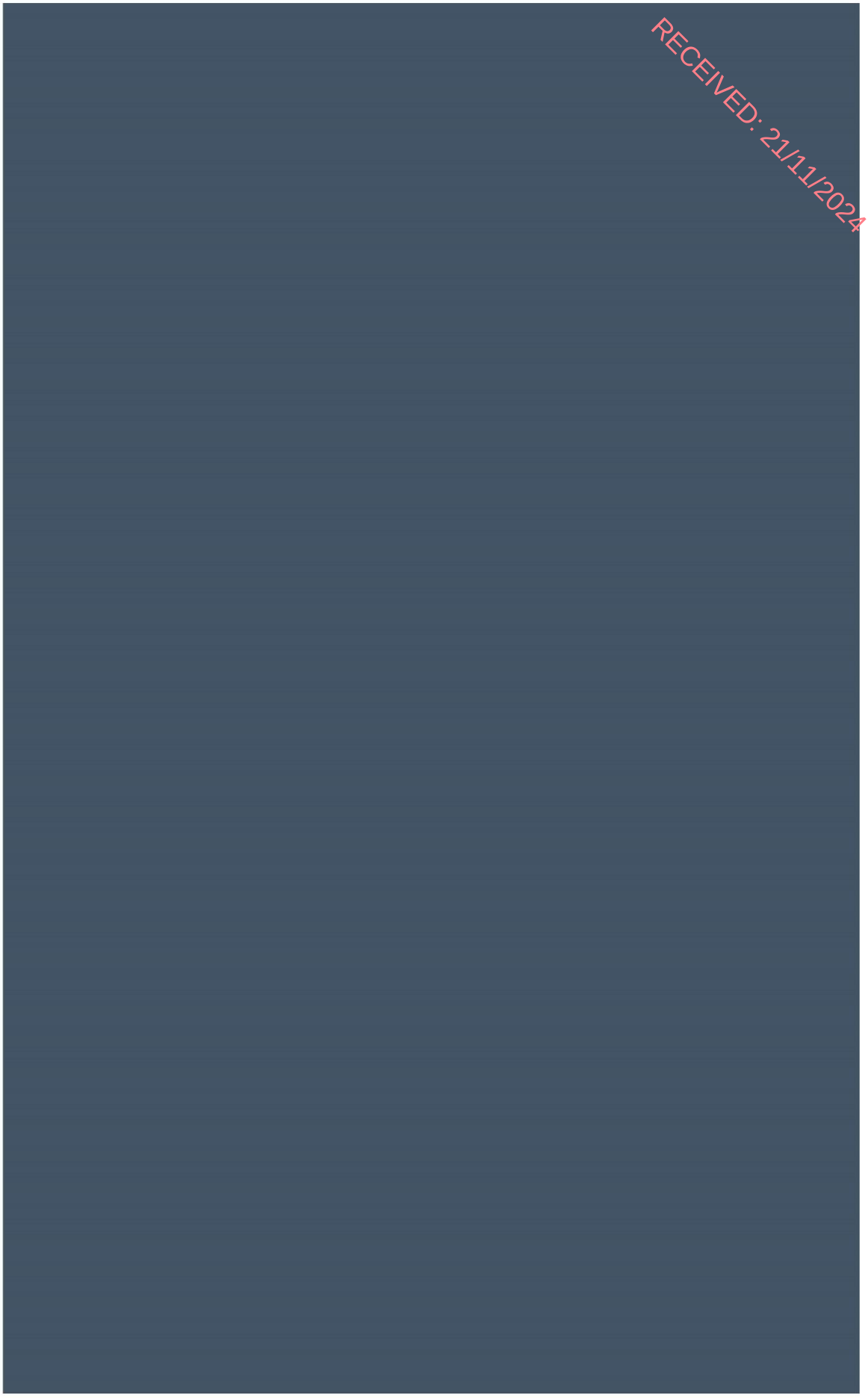

APPENDIX 7.2

NATURA IMPACT STATEMENT

PREPARED BY MOORE GROUP

Natura Impact Statement

Killala Data Centre

Prepared by: Moore Group – Environmental Services

14 November 2024

On behalf of Mayo Data Hub Limited

Project Proponent	Mayo Data Hub Limited
Project	Killala Data Centre
Title	Natura Impact Statement Appropriate Assessment Killala Data Centre

Project Number	24144	**Document Ref**	24144 Killala Data Centre NIS Rev0
Revision	**Description**	**Author**	**Date**
Rev0	Issued to Client	G. O'Donohoe	11 October 2024
Rev1	Final Issued	G. O'Donohoe	14 November 2024
Moore Archaeological and Environmental Services Limited			

Abbreviations

AA	Appropriate Assessment
ABP	An Bord Pleanála
CEMP	Construction Environmental Management Plan
EEC	European Economic Community
EPA	Environmental Protection Agency
EU	European Union
FWPM	Freshwater Pearl Mussel
GIS	Geographical Information System
LAP	Local Area Plan
NHA	Natural Heritage Area
NIS	Natura Impact Statement
NPWS	National Parks and Wildlife Service
OSI	Ordnance Survey Ireland
pNHA	proposed Natural Heritage Area
SAC	Special Area of Conservation
SPA	Special Protection Area
SuDS	Sustainable Drainage System
UÉ	Uisce Éireann
WFD	Water Framework Directive

Contents

1. Introduction

1.1. General Introduction

This Natura Impact Statement (NIS) has been prepared by Moore Group – Environmental Services on behalf of Mayo Data Hub Limited. This NIS report contains information to assist the competent authority in carrying out an Appropriate Assessment (AA) for the purposes of Article 6(3) of the Habitats Directive and section 177V of the Planning and Development Act 2000, as amended, (the "Planning Acts") in respect of the construction and operation of a data centre at Mullafarry, Killala, Co. Mayo (hereafter referred to as the Proposed Development).

This NIS informs the Appropriate Assessment process in the determination of any adverse effects on the integrity of European sites, having regard to their conservations objectives and in light of best scientific knowledge. It is necessary that the Proposed Development has complies with Article 6(3) of the Council Directive 92/43/EEC on the Conservation of Natural Habitats and of Wild Fauna and Flora (as amended) (referred to as the Habitats Directive). For the purposes of the Proposed Development, this is transposed into Irish Law by Part XAB of the Planning and Development Act 2000 as amended[1]. The focus of the assessment is on objectively assessing by reference to the evidence as to whether the Proposed Development will adversely affect the integrity of the European sites in light of their conservation objectives.

1.2. Legislative Background - The Habitats and Birds Directives

Articles 6(3) and 6(4) of the Habitats Directive are transposed into Irish Law inter alia by the Part XAB of the Planning Acts (section 177U and 177V) governing the requirement to carry out appropriate assessment screening and appropriate assessment, where required, per Section 1.1 above.

The Habitats Directive (Council Directive 92/43/EEC of 21 May 1992) on the conservation of natural habitats and of wild fauna and flora) is the main legislative instrument for the protection and conservation of biodiversity in the European Union (EU). Under Article 3 of the Habitats Directive, Member States are obliged to designate Special Areas of Conservation (SACs) which contain habitats or species considered important for protection and conservation in a EU context.

[1]The European Communities (Birds and Natural Habitats) Regulations, 2011 (S.I. 477) as amended (referred to as the Habitats Regulations) transposes the Habitats Directive for the purposes of proposed projects subject to legislation other than the Planning and Development Act 2000, as amended.

The Birds Directive (Council Directive 2009/147/EC) on the conservation of wild birds), transposed into Irish law by the Habitats Regulations 2011, as amended, is concerned with the long-term protection and management of all wild bird species and their habitats in the EU. Among other things, the Birds Directive requires that Special Protection Areas (SPAs) be established to protect migratory species and species which are rare, vulnerable, in danger of extinction, or otherwise require special attention.

SACs designated under the Habitats Directive and SPAs, designated under the Birds Directive, form a pan-European network of protected sites known as Natura 2000. The Habitats Directive sets out a unified system for the protection and management of SACs and SPAs. These sites are also referred to in Irish legislation as 'European sites'.

Articles 6(3) and 6(4) of the Habitats Directive set out the requirement for an assessment of proposed plans and projects likely to have a significant effect on Natura 2000 sites.

Article 6(3) establishes the requirement to screen all plans and projects and to carry out an appropriate assessment if required (Appropriate Assessment (AA)).

> ***Article 6(3):*** *"Any plan or project not directly connected with or necessary to the management of the site but likely to have a significant effect thereon, either individually or in combination with other plans or projects, shall be subjected to an appropriate assessment of its implications for the site in view of the site's conservation objectives. In light of the conclusions of the assessment of the implications for the site and subject to the provisions of paragraph 4, the competent national authorities shall agree to the plan or project only after having ascertained that it will not adversely affect the integrity of the site concerned and, if appropriate, after having obtained the opinion of the general public."*

Article 6(4) establishes requirements in cases of imperative reasons of overriding public interest.

These obligations in relation to Appropriate Assessment have been implemented in Ireland under Part XAB of the Planning and Development Act 2000, as amended, and in particular Section 177T thereof.

Section 177T(1)(b) and (2) state as follows with regard to a Natura Impact Statement:

> *"(b) A Natura impact statement means a statement, for the purposes of Article 6 of the Habitats Directive, of the implications of a proposed development, on its own or in combination with other plans or projects, for one or more than one European site, in view of the conservation objectives of the site or sites."*
>
> *"(2) Without prejudice to the generality of subsection (1), a Natura impact report or a Natura impact statement, as the case may be, shall include a report of a scientific examination of evidence and data, carried out by competent persons to identify and*

classify any implications for one or more than one European site in view of the conservation objectives of the site or sites."

The EU Water Framework Directive[2] (WFD) is an important piece of environmental legislation which aims to improve our water quality. It applies to rivers, lakes, groundwater, estuaries and coastal waters. The Water Framework Directive was agreed by all individual EU member states in 2000, and its first cycle ran from 2009 – 2015. The Directive runs in 6-year cycles, so the second cycle runs from 2016 – 2021 and the third cycle runs form 2022-2027. It focuses on protection of surface water and the consideration of the WFD has been incorporated into this NIS where the assessment of potential impacts on Killala Bay and the Moy Estuary were assessed and necessarily considered the impact on surface waters which were potentially linked to the European sites considered in this AA.

1.3. Methodology

The Commission's methodological guidance (EC, 2002, 2018, 2021 see Section 1.4 below) promotes a four-stage process to complete the AA and outlines the issues and tests at each stage. An important aspect of the process is that the outcome at each successive stage determines whether a further stage in the process is required.

Stages 1 and 2 deal with the main requirements for assessment under Article 6(3). Stage 3 may be part of Article 6(3) or may be a necessary precursor to Stage 4. Stage 4 is the main derogation step of Article 6(4).

Stage 1 Screening: This stage examines the likely effects of a project either alone or in combination with other projects upon a Natura 2000 site and considers whether it can be objectively concluded that these effects will not be significant. In order to screen out a project, it must be excluded, on the basis of objective information, that the Proposed Development, individually or in combination with other plans or projects, will have a significant effect on a European site.

Stage 2 Appropriate Assessment: In this stage, there is a consideration of the impact of the project with a view to ascertain whether there will be any adverse effect on the integrity of the Natura 2000 site either alone or in combination with other projects or plans, with respect to the site's structure and function and its conservation objectives. Additionally, where there are predicted impacts, an assessment of the potential mitigation of those impacts is considered.

[2] Directive 2000/60/EC of the European Parliament and of the Council of 23 October 2000 establishing a framework for Community action in the field of water policy.

Stage 3 Assessment of Alternative Solutions: This stage examines alternative ways of implementing the project that, where possible, avoid any adverse impacts on the integrity of the Natura 2000 site.

Stage 4 Assessment where no alternative solutions exist and where adverse impacts remain: Where imperative reasons of overriding public interest (IROPI) exist, an assessment to consider whether compensatory measures will or will not effectively offset the damage to the sites will be necessary.

1.4. Guidance

The NIS has been compiled in accordance with guidance contained in the following documents:

- Appropriate Assessment of Plans and Projects in Ireland - Guidance for Planning Authorities. (Department of Environment, Heritage and Local Government, 2010 rev.)(soon to be superseded by EC Guidance in prep.).
- Appropriate Assessment under Article 6 of the Habitats Directive: Guidance for Planning Authorities. Circular NPWS 1/10 & PSSP 2/10.
- Managing Natura 2000 Sites: The Provisions of Article 6 of the Habitat's Directive 92/43/EEC (EC, 2018).
- Guidance document on the strict protection of animal species of Community interest under the Habitats Directive (EC, 2021).
- Assessment of plans and projects in relation to Natura 2000 sites - Methodological guidance on Article 6(3) and (4) of the Habitats Directive 92/43/EEC (EC, 2021).
- Office of the Planning Regulator (OPR) Practice Note PN01 Appropriate Assessment Screening for Development Management (OPR, 2021).

1.5. Data Sources

Sources of information that were used to collect data on the Natura 2000 network of sites, and the environment within which they are located, are listed below:

- The following mapping and Geographical Information Systems (GIS) data sources, as required:
    - National Parks & Wildlife (NPWS) protected site boundary data;
    - Ordnance Survey of Ireland (OSI) mapping and aerial photography;
    - OSI/Environmental Protection Agency (EPA) rivers and streams, and catchments;
    - Open Street Maps;
    - Digital Elevation Model over Europe (EU-DEM);
    - Google Earth and Bing aerial photography 1995-2024;
- Online data available on Natura 2000 sites as held by the National Parks and Wildlife Service (NPWS) from www.npws.ie including:

- Natura 2000 - Standard Data Form;
- Conservation Objectives;
- Site Synopses;

- National Biodiversity Data Centre records;
  - Online database of rare, threatened and protected species;
  - Publicly accessible biodiversity datasets.
- Status of EU Protected Habitats in Ireland. (National Parks & Wildlife Service, 2019); and
- Relevant Development Plans in neighbouring areas;
  - Mayo County Development Plan 2022 - 2028

1.6. Statement of Authority

This report was compiled by Ger O'Donohoe (B.Sc. Applied Aquatic Sciences (ATU Galway , 1993) & M.Sc. Environmental Sciences (TCD, 1999)) who has 30 years' experience in environmental impact assessment and has completed numerous reports for Appropriate Assessment Screening and Natura Impact Statements in terrestrial and aquatic habitats.

Engineering and technical data was supplied by AWN Consulting for the Proposed Development.

1.7. Description of the Proposed Development

The proposed development comprises a data centre within the townlands of Mullafarry and Tawnaghmore Upper, Killala, Co. Mayo.

This will include a single data centre building located towards the north of the site. The building will accommodate data halls, associated electrical and mechanical plant rooms, maintenance and storage space, ancillary office administration areas, with plant at roof level.

To the north of and adjacent to the main data centre building it is proposed to provide for 25 no. backup generators and associated flues within a fenced compound.

To the east of the site is an area which is reserved for a 110kV substation which will connect the proposal to the electricity network. This substation will be subject to a separate pre-application request to An Bord Pleanála, to determine whether it constitutes Electricity Transmission Strategic Infrastructure Development under section 182A of the Planning and Development Act 2000, as amended. A sprinkler tank and pumphouse compound is located to the north east of the site.

Access to the site is proposed from the south with a gatehouse located on the easternmost of the two entrances along with a turning area to allow vehicles to return to the road safely. Access will be provided around the site for delivery and emergency vehicle access. Car parking is proposed to the east of the building. 56 spaces are proposed which is in line with the future users' requirements. Safe and secure cycle parking is also proposed to the east, close to the building entrance.

An attenuation pond is proposed to the south of the site to facilitate sustainable drainage and a range of planting will be incorporated to screen the site and to increase biodiversity across the site.

The Proposed Development as set out in the public notices consists of:

- The construction of a single data centre building located to the north of the site, with an overall gross floor area of c. 29,076 sq.m across two levels and an overall maximum height of c. 22.764m at parapet level.
- The data centre building includes data halls and associated electrical and mechanical plant rooms (c. 23,908 sq.m), an administrative and staff services block (c. 5,052 sq.m) and circulation and stairs (c. 116 sq.m).
- 2 no. external terraces are proposed to the east of the building (c. 309 sq.m) and an external generator yard to the south of the building (c. 5,205 sq.m) accommodating 25. no. backup / dispatchable generators and associated flues (to a height of c. 21.164m) within an enclosed compound.
- The construction of a sprinkler tank and pump house to the northeast of the site, the sprinkler tank is an overall height of c. 7.2 m and the pump house is a single storey building with an overall height of c. 4.15m and area GFA of c. 40.23 sq.m.
- The construction of an entrance hut at the main access to the south of the site, the hut is an overall height of c. 3.225m and area GFA of c. 11.6 sq.m.
- Construction of 2 no. site access points from the south and internal road network and circulation areas, footpaths, cyclist infrastructure, the provision of 56 no. car parking spaces (including 12 EV charging spaces and 7 disabled spaces, 3 of them EV), 20 no. cycle parking spaces, hard and soft landscaping and planting, site lighting, PV panels and plant at roof level, foul water connection connecting to existing WWTP in Killala Business Park, boundary treatments, green walls and all associated and ancillary works including underground foul and storm water drainage network and utility cables and all ancillary works and services.

1.8. Construction Management

A Construction Environmental Management Plan (CEMP) has been prepared to manage the impacts of construction activities associated with the Proposed Development.

The CEMP sets out the principles to be adhered to and outlines measures that will be implemented during the construction of the development to ensure that potential environmental impacts and disturbance will be minimised or eliminated.

It will be the responsibility of the project proponent and contractor employed to update and add (where required) specific control measures relevant to the environmental management plan and procedures, taking into account any conditions imposed on any planning permissions granted. The control measures will be amended by improvement with regards to environmental protection and will take cognisance of additional environmental commitments arising from planning conditions.

The Project Proponent will oversee the process through appointment of the contractor with input from the Project engineer and oversight from the planning and project team. The contractor will be contractually obliged to comply with the CEMP.

Figure 1 shows the Proposed Development location and Figure 2 shows a detailed view of the Proposed Development boundary on recent aerial photography. Figure 3 presents a plan of the Proposed Development.

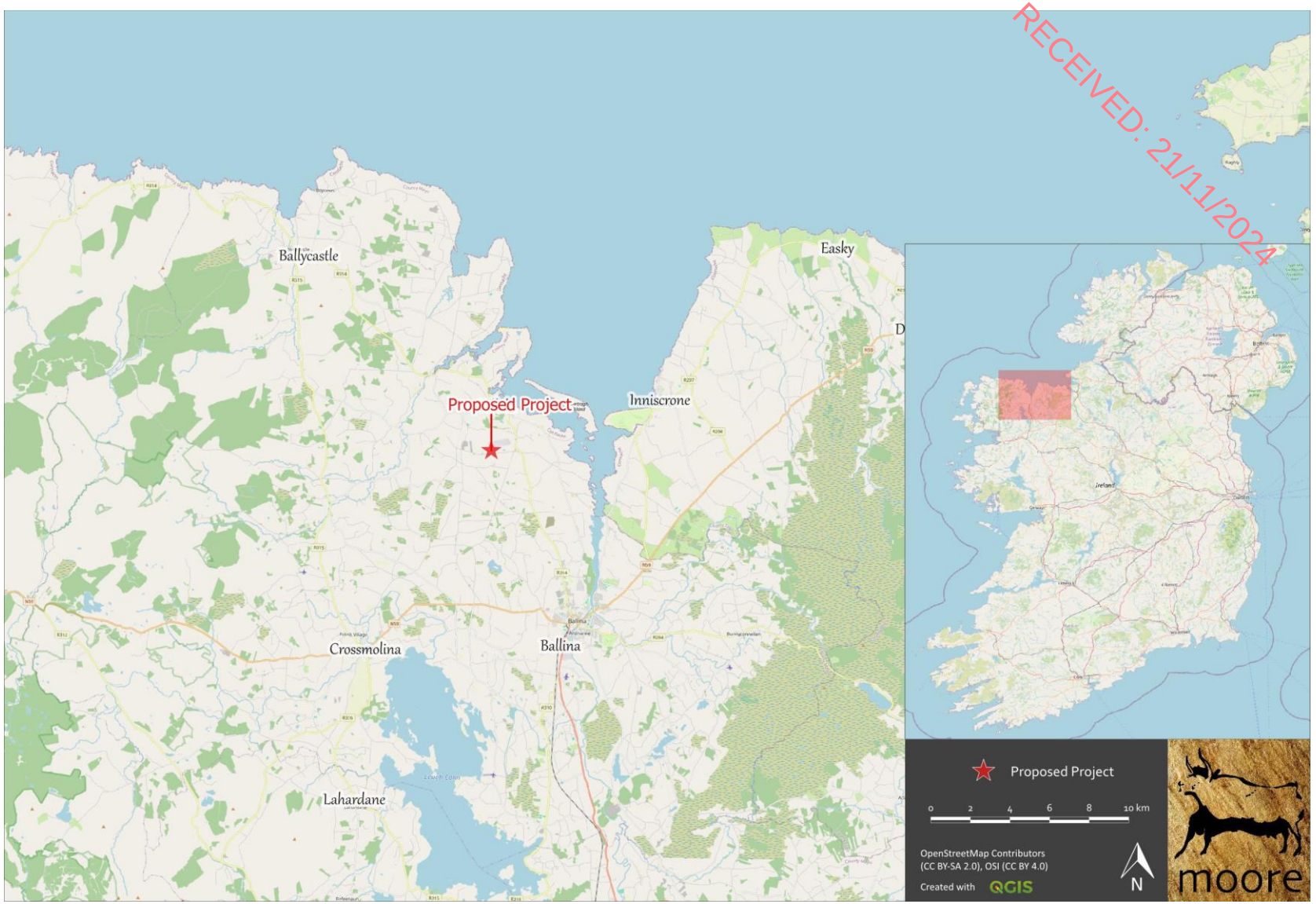

Figure 1. Showing the Proposed Development location at Killala, Co. Mayo.

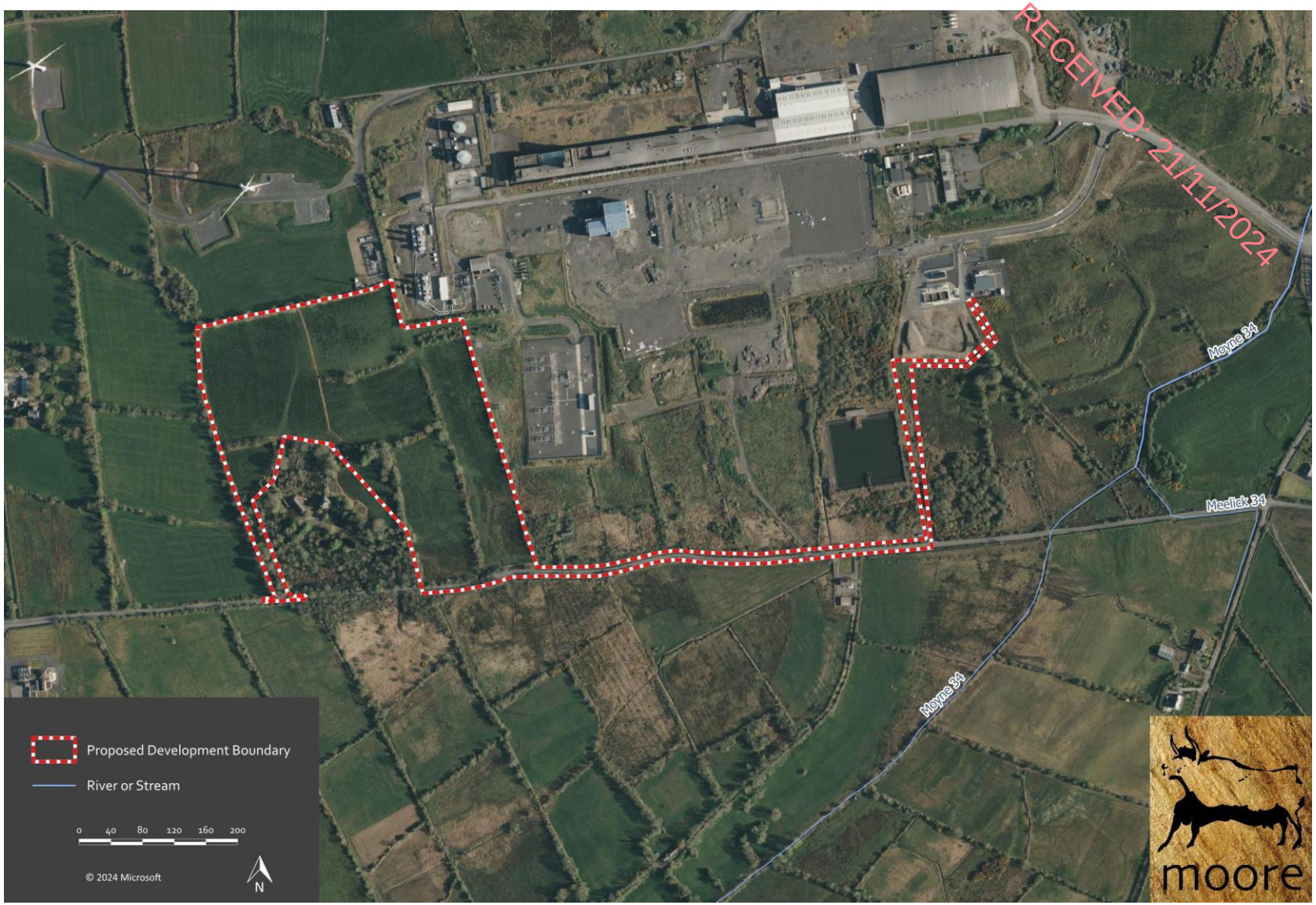

Figure 2. Showing the Proposed Development boundary on recent aerial photography with road link to WWTP to the east.

Figure 3. Plan of the Proposed Development.

2. Stage 1 – Screening for Appropriate Assessment

The potential for source pathway receptor connectivity was firstly identified through GIS interrogation and detailed information was then provided on sites with connectivity. European sites that are located within a potential Zone of Influence of the Overall Development are listed in Table 1 and presented in Figures 4 and 5, below. Spatial boundary data on the Natura 2000 network was extracted from the NPWS website (www.npws.ie) on 14 November 2024. This data was interrogated using GIS analysis to provide mapping, distances, locations and pathways to all sites of conservation concern including pNHAs, NHAs and European sites.

Table 1 European Sites located within the potential Zone of Influence[3] of the Proposed Development.

Site Code	Site name	Distance (km)[4]
000458	Killala Bay/Moy Estuary SAC	1.17
004036	Killala Bay/Moy Estuary SPA	1.77

The Proposed Development is located immediately adjacent to EirGrid/ESB's Tawnaghmore 110kV substation, immediately south of the Killala Business Park, approximately 2km south of Killala, Co. Mayo.

The nearest European sites to the Proposed Development, and the only sites considered to lie within its potential Zone of Influence, are the Killala Bay/Moy Estuary SAC, (Site code 000458), 1.17km to the north, and the Killala Bay/Moy Estuary SPA, (Site code 004036), 1.77km to the north.

There are a number of field boundaries with associated hedgerows with drainage predominantly flowing south toward the local road where it is conveyed in a drainage ditch toward the 'Moyne 34' Stream which ultimately discharges to Killala Bay approximately 3.25 river kilometres downstream where the receiving environment is designated as part of the Killala Bay/Moy Estuary SAC and the Killala Bay/Moy Estuary SPA.

Were the development to proceed, there would be no direct effects on the Killala Bay/Moy Estuary SAC or the Killala Bay/Moy Estuary SPA and so potential indirect impacts are then considered.

The potential for indirect significant adverse effects on the Killala Bay/Moy Estuary SAC and the Killala Bay/Moy Estuary SPA is uncertain in the absence of control of potential pollution on surface water during construction and operation.

[3] All European sites potentially connected irrespective of the nature or scale of the Proposed Development.
[4] Distances indicated are the closest geographical distance between the Proposed Development and the European site boundary, as made available by the NPWS.

Details of the qualifying interests of Killala Bay/Moy Estuary SAC (Site Code 000458) and Killala Bay/Moy Estuary SPA (Site Code 004036) are listed in Table 2 below, and Site Synopses are available from the NPWS website (www.npws.ie). The QIs of the European sites may be re-confirmed by the competent authority prior to completing the assessment under Article 6(3) of the Habitats Directive.

Table 2 Qualifying Interests and Conservation Objectives (QIs potentially affected are highlighted in green text).

Killala Bay/Moy Estuary SAC (000458)			
Qualifying Interests	Key environmental conditions supporting site integrity, and key threats	Conservation Objective	Potential Effects
1014 Narrow-mouthed Whorl Snail *Vertigo angustior*	Surface water dependent Highly sensitive to hydrological change Very highly sensitive to pollution.	To maintain favourable conservation condition.	Based on review of Conservation Objectives this species does not occur in the zone of influence of the Proposed Development and is located at a distance of removal that it will not be affected.
1095 Sea Lamprey *Petromyzon marinus*	Surface water dependent Highly sensitive to hydrological change.	To maintain favourable conservation condition.	There will be no direct effects on Sea Lamprey. In the absence of mitigation measures to control the potential contamination of surface water from contaminated surface water runoff such as chemical pollution from a hydrocarbon spill or from contaminated surface water, potential effects on Sea Lamprey cannot be excluded.
1130 Estuaries	Marine and groundwater dependent. Medium sensitivity to hydrological change. Changes in salinity and tidal regime. Overgrazing, erosion and accretion.	To maintain favourable conservation condition.	Based on review of Conservation Objectives records of this annexed habitat occurs in the SAC downstream of the Proposed Development. In the absence of mitigation measures to control the potential contamination of surface water from contaminated surface water runoff such as chemical pollution from a hydrocarbon spill or from contaminated surface water, potential effects on this habitat cannot be excluded.
1140 Mudflats and sandflats not covered by seawater at low tide	Marine and groundwater dependent. Medium sensitivity to hydrological change. Changes in salinity and tidal regime. Overgrazing, erosion and accretion.	To maintain favourable conservation condition.	Based on review of Conservation Objectives records of this annexed habitat occurs in the SAC downstream of the Proposed Development. In the absence of mitigation measures to control the potential contamination of surface water from contaminated surface water runoff such as chemical pollution from a hydrocarbon spill or from contaminated surface water, potential effects on this habitat cannot be excluded.
1210 Annual vegetation of drift lines	Marine and groundwater dependent. Medium sensitivity to hydrological change. Changes in salinity and tidal regime.	To maintain favourable conservation condition.	Based on review of Conservation Objectives records of this annexed habitat occurs in the SAC downstream of the Proposed Development.

	Overgrazing, erosion and accretion.		In the absence of mitigation measures to control the potential contamination of surface water from contaminated surface water runoff such as chemical pollution from a hydrocarbon spill or from contaminated surface water, potential effects on this habitat cannot be excluded
1310 Salicornia and other annuals colonizing mud and sand	Marine and groundwater dependent. Medium sensitivity to hydrological change. Changes in salinity and tidal regime. Overgrazing, erosion and accretion.	To maintain favourable conservation condition.	Based on review of Conservation Objectives records of this annexed habitat occurs in the SAC downstream of the Proposed Development. In the absence of mitigation measures to control the potential contamination of surface water from contaminated surface water runoff such as chemical pollution from a hydrocarbon spill or from contaminated surface water, potential effects on this habitat cannot be excluded.
1330 Atlantic salt meadows (*Glauco-Puccinellietalia maritimae*)	Marine and groundwater dependent. Medium sensitivity to hydrological change. Changes in salinity and tidal regime. Overgrazing, erosion and accretion.	To maintain favourable conservation condition.	Based on review of Conservation Objectives records of this annexed habitat occurs in the SAC downstream of the Proposed Development. In the absence of mitigation measures to control the potential contamination of surface water from contaminated surface water runoff such as chemical pollution from a hydrocarbon spill or from contaminated surface water, potential effects on this habitat cannot be excluded.
1365 Harbour Seal *Phoca vitulina*	Prey availability. Water Quality.	To maintain favourable conservation condition.	There were no otter holts or resting paces recorded adjacent to the site. There will be no direct effects on Otters. In the absence of mitigation measures to control the potential contamination of surface water from contaminated surface water runoff such as chemical pollution from a hydrocarbon spill or from riparian habitat disturbance resulting in elevated suspended solids, potential effects on Otters cannot be excluded.
2110 Embryonic shifting dunes	Marine and groundwater dependent. Medium sensitivity to hydrological change. Changes in salinity and tidal regime. Overgrazing, erosion and accretion.	To restore favourable conservation condition.	Based on review of Conservation Objectives records of this annexed habitat occurs in the SAC downstream of the Proposed Development. In the absence of mitigation measures to control the potential contamination of surface water from contaminated surface water runoff such as chemical pollution from a hydrocarbon spill or from contaminated surface water, potential effects on this habitat cannot be excluded.
2120 Shifting dunes along the shoreline with *Ammophila arenaria* ('white dunes')	Marine and groundwater dependent. Medium sensitivity to hydrological change. Changes in	To restore favourable conservation condition.	Based on review of Conservation Objectives records of this annexed habitat occurs in the SAC downstream of the Proposed Development.

	salinity and tidal regime. Overgrazing, erosion and accretion.		In the absence of mitigation measures to control the potential contamination of surface water from contaminated surface water runoff such as chemical pollution from a hydrocarbon spill or from contaminated surface water, potential effects on this habitat cannot be excluded.
2130 *Fixed coastal dunes with herbaceous vegetation ('grey dunes')	Marine and groundwater dependent. Medium sensitivity to hydrological change. Changes in salinity and tidal regime. Overgrazing, erosion and accretion.	To restore favourable conservation condition.	Based on review of Conservation Objectives records of this annexed habitat occurs in the SAC downstream of the Proposed Development. In the absence of mitigation measures to control the potential contamination of surface water from contaminated surface water runoff such as chemical pollution from a hydrocarbon spill or from contaminated surface water, potential effects on this habitat cannot be excluded.
2190 Humid dune slacks	Marine and groundwater dependent. Medium sensitivity to hydrological change. Changes in salinity and tidal regime. Overgrazing, erosion and accretion.	To maintain favourable conservation condition.	Based on review of Conservation Objectives records of this annexed habitat occurs in the SAC downstream of the Proposed Development. In the absence of mitigation measures to control the potential contamination of surface water from contaminated surface water runoff such as chemical pollution from a hydrocarbon spill or from contaminated surface water, potential effects on this habitat cannot be excluded.
Killala Bay/ Moy Estuary SPA (004036)			
Special Conservation Interests	Key environmental conditions supporting site integrity	Conservation Objective	Potential Effects
A137 Ringed Plover *Charadrius hiaticula*	Surface water dependent Sensitive to hydrological change. Sensitive to pollution.	To maintain favourable conservation condition.	There will be no direct effects on Ringed Plover. In the absence of mitigation measures to control the potential contamination of surface water from contaminated surface water runoff such as chemical pollution from a hydrocarbon spill or from contaminated surface water, potential effects on Ringed Plover cannot be excluded.
A140 Golden Plover *Pluvialis apricaria*	Surface water dependent Sensitive to hydrological change. Sensitive to pollution.	To maintain favourable conservation condition.	There will be no direct effects on Golden Plover. In the absence of mitigation measures to control the potential contamination of surface water from contaminated surface water runoff such as chemical pollution from a hydrocarbon spill or from contaminated surface water, potential effects on Golden Plover cannot be excluded.

A141 Grey Plover *Pluvialis squatarola*	Surface water dependent Sensitive to hydrological change. Sensitive to pollution.	To maintain favourable conservation condition.	There will be no direct effects on Grey Plover. In the absence of mitigation measures to control the potential contamination of surface water from contaminated surface water runoff such as chemical pollution from a hydrocarbon spill or from contaminated surface water, potential effects on Grey Plover cannot be excluded.
A144 Sanderling *Calidris alba*	Surface water dependent Sensitive to hydrological change. Sensitive to pollution.	To maintain favourable conservation condition.	There will be no direct effects on Sanderling. In the absence of mitigation measures to control the potential contamination of surface water from contaminated surface water runoff such as chemical pollution from a hydrocarbon spill or from contaminated surface water, potential effects on Sanderling cannot be excluded.
A149 Dunlin *Calidris alpina alpina*	Surface water dependent Sensitive to hydrological change. Sensitive to pollution.	To maintain favourable conservation condition.	There will be no direct effects on Dunlin. In the absence of mitigation measures to control the potential contamination of surface water from contaminated surface water runoff such as chemical pollution from a hydrocarbon spill or from contaminated surface water, potential effects on Dunlin cannot be excluded.
A157 Bar-tailed Godwit *Limosa lapponica*	Surface water dependent Sensitive to hydrological change. Sensitive to pollution.	To maintain favourable conservation condition.	There will be no direct effects on Bar-tailed Godwit. In the absence of mitigation measures to control the potential contamination of surface water from contaminated surface water runoff such as chemical pollution from a hydrocarbon spill or from contaminated surface water, potential effects on Bar-tailed Godwit cannot be excluded.
A160 Curlew *Numenius arquata*	Surface water dependent Sensitive to hydrological change. Sensitive to pollution.	To maintain favourable conservation condition.	There will be no direct effects on Curlew. In the absence of mitigation measures to control the potential contamination of surface water from contaminated surface water runoff such as chemical pollution from a hydrocarbon spill or from contaminated surface water, potential effects on Curlew cannot be excluded.
A162 Redshank *Tringa totanus*	Surface water dependent Sensitive to hydrological change. Sensitive to pollution.	To maintain favourable conservation condition.	There will be no direct effects on Redshank. In the absence of mitigation measures to control the potential contamination of surface water from contaminated surface water runoff such as chemical pollution from a hydrocarbon spill or from contaminated surface water, potential effects on Golden Redshank cannot be excluded.

A999 Wetlands	Surface water dependent Sensitive to hydrological change. Sensitive to pollution.	To maintain favourable conservation condition.	In the absence of mitigation measures to control the potential contamination of surface water from contaminated surface water runoff such as chemical pollution from a hydrocarbon spill or from contaminated surface water, potential effects on this habitat cannot be excluded.

The Proposed Development will require the implementation of measures set out in a Construction Environmental Management Plan to avoid potential impacts on Killala Bay and the Moy Estuary, and it is concluded that in line with Departmental Guidance and having regard to ECJ case law and the 'Precautionary Principle', a Natura Impact Statement must be prepared for the purpose of Article 6(3) of the Habitats Directive and Part XAB of the Planning and Development Act, 2000, as amended.

Stage 2 Appropriate Assessment of the Proposed Development has been prepared as follows.

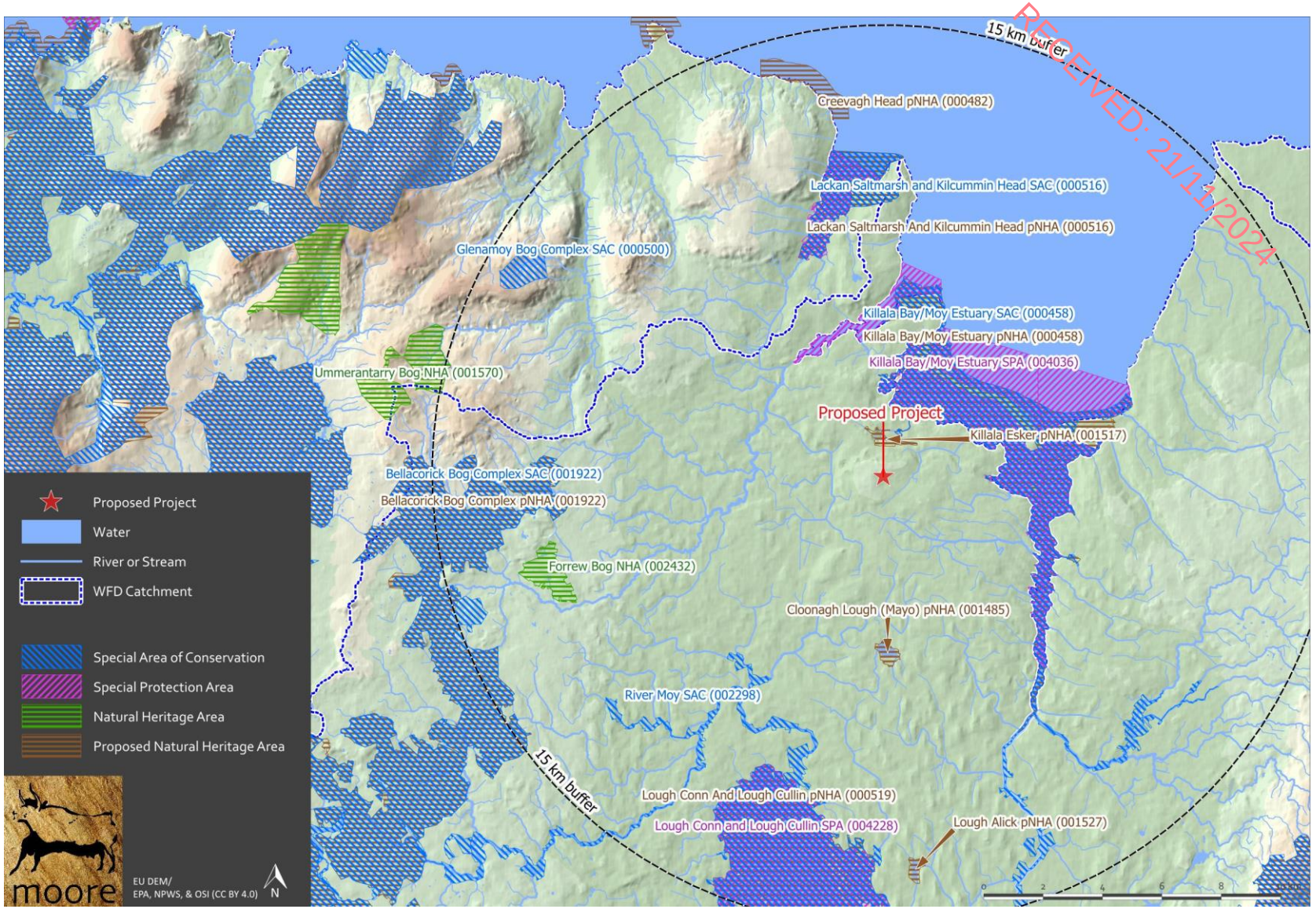

Figure 4. Showing European sites and NHAs/pNHAs in the wider vicinity of the Proposed Development.

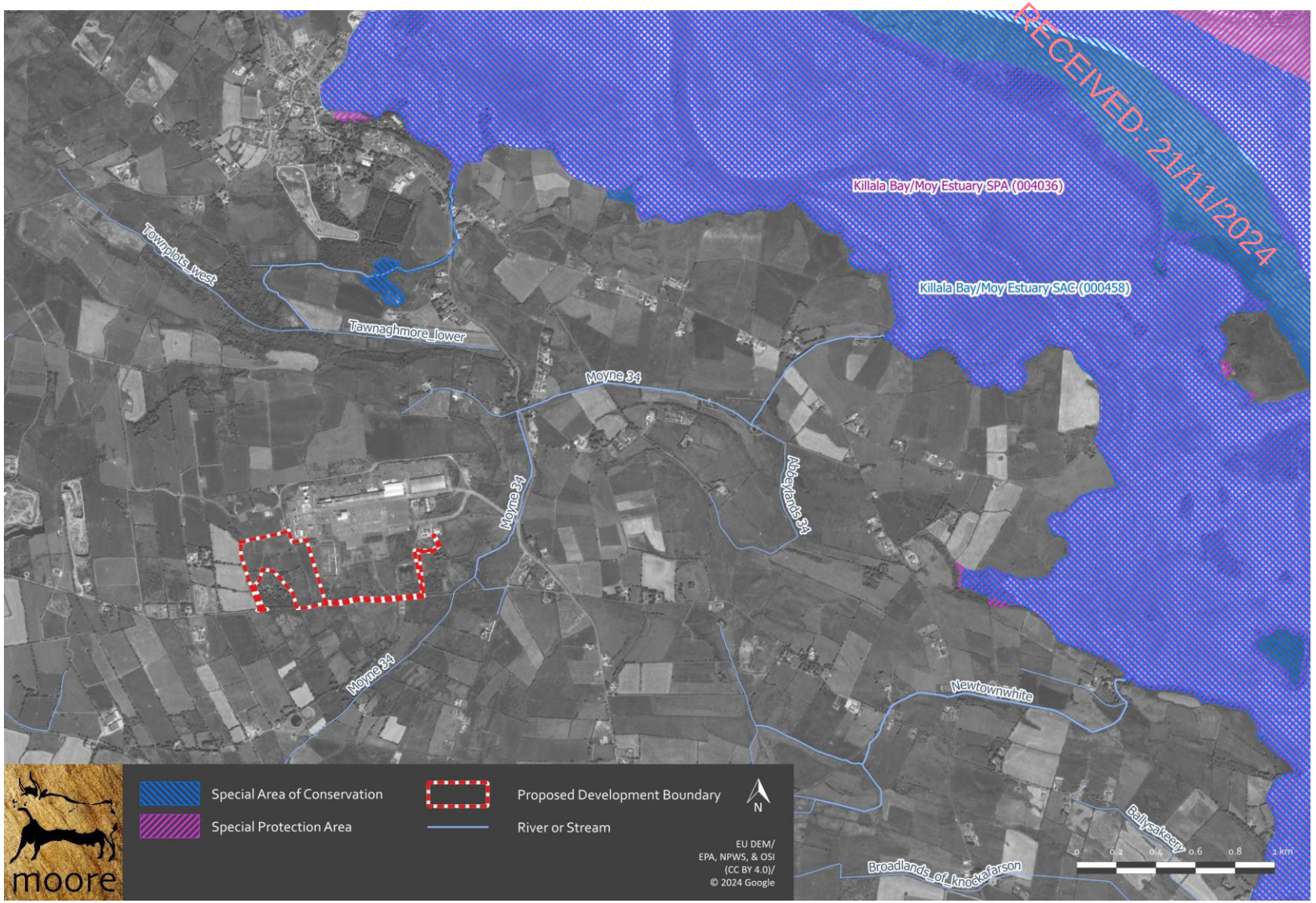

Figure 5. Detailed view of European sites in the nearer vicinity of the Proposed Development.

3. Stage 2 – Appropriate Assessment

This stage considers whether the Proposed Development, alone or in combination with other projects or plans, will have adverse effects on the integrity of a European site, and includes any mitigation measures necessary to avoid, reduce or offset negative effects. The Stage 2 Appropriate Assessment comprises a scientific examination of the plan / project and the relevant European site; to identify and characterise any possible implications for the site in view of the site's conservation objectives, structure and function; taking account of in combination effects.

3.1. Description of European Sites Potentially Affected

Potential impacts on the following European sites have been identified**:**

3.1.1. Killala Bay/Moy Estuary SAC [000458]

The NPWS provides the following Site Synopsis in relation to the Killala Bay/ Moy Estuary SAC (Version date 10th December 2015, 000458_Rev15.Docx):

"North of Ballina town, the River Moy flows to the sea via a long, narrow estuarine channel. After approximately 8 km, the estuary widens to form a north-facing triangular bay, with the towns of Inishcrone (Co. Sligo) and Killala (Co. Mayo) situated on the eastern and western shores, respectively. The estuary itself forms the County boundary along its northern part. A long sandy island (Bartragh Island) separates the south-western side of the bay from the open water. Much of the inner part of the bay is intertidal The northern part shelves to approximately 10 m.

The site is a Special Area of Conservation (SAC) selected for the following habitats and/or species listed on Annex I / II of the E.U. Habitats Directive (= priority; numbers in brackets are Natura 2000 codes):*

[1130] Estuaries
[1140] Tidal Mudflats and Sandflats
[1210] Annual Vegetation of Drift Lines
[1230] Vegetated sea cliffs of the Atlantic and Baltic coasts
[1310] Salicornia Mud
[1330] Atlantic Salt Meadows
[2110] Embryonic Shifting Dunes
[2120] Marram Dunes (Winte Dunes)
[2130] Fixed Dunes (Grey
[2190] Humid Dune Slacks
[1014] Narrow-mouthed Whorl Snail (Vertigo angustior)
[1095] Sea Lamprey (Petromyzon marinus)
[1365] Common (Harbour) Seal (Phoca vitulina)

Extensive sandflats and mudflats are exposed in the estuary and bay at low tide. For the most part, these flats are unvegetated, but mats of Eelgrass (Zostera spp.), Beaked Tasselweed (Ruppia maritima) and green algae (Enterornorpha spp.) occur which provide important feeding material for birds. The estuary

is generally in a natural state and is considered to be one of the best examples of a largely unpolluted system in Ireland.

The dune systems at Bartragh Island, Inishcrone and Ross, to the north-west, are well-developed and constitute good examples of dunes with a rich and diverse flora. Dunes dominated by Marram (Ammophila arenaria) are located at all three sub-sites.

At Enniscrone they stretch the length of the strand and are particularly well- developed towards the western end. They are found along the northern stretch of Ross and also run the length of Bartragh Island. Other species found growing in this habitat include Cat's-ear (Hypochoeris radicata), Smooth Sow-thistle (Sonchus oleraceus) and Groundsel (Senecio vulgaris). Associated with the Marram dunes are embryonic foredunes and these are particularly well-represented at Enniscrone. The most commonly encountered species in the foredunes include Sand Couch (Elymus farctus), Sea Sandwort (Honkenya peploides), Sea Rocket (Cakile maritima) and Lyme Grass (Leymus arenarius).

Although much of the fixed dune area has been developed as golf course or improved for agriculture, the site still contains a relatively large area of intact fixed dunes, a priority habitat listed on Annex I of the E U. Habitats Directive. Species recorded include Red Fescue (Festuca rubra), Lady's Bedstraw (Galium verum), Kidney Vetch (Anthyllis vulneraria), Common Centuary (Centaurium erythraea), Sand Sedge (Carex arenaria), Harebell (Campanula rotundifolia), Wild Thyme (Thymus praecox), Fairy Flax (Linum catharticum), Common Bird's-foot-trefoil (Lotus corniculatus) and Pyramidal Orchid (Anacarnptis pyramidalis). Bryophyte communities are well represented, With such species as Brachythecium rutabulum, Hornalothecium lutescens and Tortula ruraliformis. Lichens (Peltigera spp.) are also frequent. Humid dune slacks occur at Ross. Species present include Jointed Rush (Juncus articulatus), Common Spike Rush (Eleocharis palustris), Water Mint (Mentha aquatica), Meadowsweet (Filipendula ulmaria), Creeping Willow (Salix repens), Silverweed (Potentilla anserina), orchids (Dactylorhiza spp.), Common Twayblade (Listera ovata) and the moss Calliergon cuspidatum. A similar species complement is found in the wet hollows at Enniscrone and there also appears to be some large slack-like areas to the rear of Bartragh Island.

Saltmarshes are present in sheltered parts of the site, some of which occur in association With the dune systems. Species typical of Atlantic salt meadows commonly observed include Common Saltmarsh-grass (Puccinellia maritima), Thrift (Armeria maritima), Sea Aster (Aster tripolium) and Red Fescue. Occasionally Lax- flowered Sea-lavender (Limoniurn humile) and Saltmarsh Flat-sedge (Blysmus rufus) are present, along with some stands of Sea Rush (Juncus maritimus). On the lower marshes, and extending out onto the most sheltered parts of the open mudflats, typical pioneering species such as glassworts (Salicornia spp.) and Annual Sea-blite (Suaeda maritima) occur.

Elsewhere along the coastline are sandy beaches, shingle beaches and some bedrock shores which are occasionally backed by clay sea-cliffs, such as at Moyne. Species such as Sea Rocket, Colt's-foot (Tussilago farfara) and Sea Mayweed (Matricaria maritima) are indicative of the habitat 'annual vegetation of drift lines'. South-east of Killala town, Lough Meelick adds habitat diversity to the site. It

is significant for the presence of the Thin-lipped Mullet, a fish which is only occasionally found in the region.

A number of rare plants have been found in the site. Opposite-leaved Pondweed (Groenlandia densa), a species protected under the Flora (Protection) Order, 2015, has been recorded in the Moy Estuary, and Hoary Whitlowgrass (Draba incana), a Red Data Book species, has been recorded from sand dunes along the coast east of Killala town.

The site holds populations of three species listed on Annex II of the E U. Habitats Directive: Common Seal (maximum count of 108 in the all-Ireland survey of 2003); Sea Lamprey and Narrow-mouthed Whorl Snail (Vertigo angustior). The rare snail has been known at this site for over 100 years. It occurs in an area of wet marsh and this site represents one of the few remaining examples of Vertigo angustior in its marsh 'phase". This species has been declining throughout much of its range due to loss of habitat, and in particular, drainage of wetlands.

The site is very important for wintering waterfowl, with eight species having populations of national importance. These are as follows, With numbers referring to the average peaks over winters 1994/95 - 1997/98: Red-breasted Merganser (38), Ringed Plover (207), Grey Plover (200), Knot (429), Sanderling (135), Dunlin (1816), Bar-tailed Godwit (309) and Greenshank (19). Other notable populations include Golden Plover (1303) and Brent Goose (166). At times Brent Goose occur in numbers of international importance (>200). The presence of Golden Plover and Bar-tailed Godwit is of particular note as these species are listed on Annex I of the E.U. Birds Directive.

This composite site has an excellent range of good quality coastal habitats, including a number listed on Annex I of the E.U. Habitats Directive. In particular, the dune complex at Bartragh Island is relatively undisturbed and is considered to be one of the best in the country in terms of its naturalness and intact state. The presence of the Annex II snail, Vertigo angustior, and the importance of the area for wintering waterfowl, including two Annex I Birds Directive species, adds further significance to this area. The site is extremely scenic and is a significant regional amenity area for its beaches and for fishing."

3.1.2. Killala Bay/Moy Estuary SPA [004036]

The NPWS provides the following Site Synopsis in relation to the Killala Bay/Moy Estuary SPA (Version date 7/7/2014):

This large site comprises the estuary of the River Moy and the inner part of Killala Bay, including Lackan Bay and Rathfran Bay, in Counties Mayo and Sligo. It is a funnel-shaped estuary, c. 7 wide at its outer limit. It is very' well sheltered by a sandy island, Baltragh, and by a sandy peninsula that extends from Enniscrone on the eastern side. Extensive intertidal sand and mud flats are exposed at low tide. For the most part, these flats are unvegetated, but mats of Eelgrass (Zostera spp.), Beaked Tasselweed (Ruppia maritima) and green algae (Ulva spp.) occur, which provide important feeding material for waterfowl species.

The site is a Special Protection Area (SPA) under the E.U. Birds Directive, of special conservation interest for the following species: Ringed Plover, Golden Plover, Grey Plover, Sanderling, Dunlin, Bar-tailed Godwit, Curlew and Redshank. The E.U. Birds Directive pays particular attention to wetlands and, as these form part of this SPA, the site and its associated waterbirds are of special conservation interest for Wetland & Waterbirds.

The site is very' important for wintering waterfowl and provides excellent feeding grounds for the birds, as well as high-tide roosts. Eight species have populations of national importance, i.e. Ringed Plover (245), Golden Plover (2,361), Grey Plover (221), Sanderling (123), Dunlin (2,073), Bar-tailed Godwit (366), Curlew (731) and Redshank (372) - all figures are mean peaks for the five year period 1995/96 to 1999/2000). A range of other species occurs, including Light-bellied Brent Goose (170), Shelduck (64), Wigeon (339), Teal (236), Red-breasted Merganser (44), Red-throated Diver (15), Oystercatcher (531), Lapwing (1,854) and Greenshank (24). The site is also used by Mallard (92), Tumstone (50), Grey Heron (21) and Cormorant (40). Substantial numbers of gulls are present at the site during winter, including Black-headed Gull (338), Common Gull (368), Heming Gull (336) and Great Black- backed Gull (120).

Killala Bay/Moy Estuary SPA is of high ornithological importance as it supports eight species that have populations of national importance, including a very' substantial population of Grey Plover (3.4% of the all-Ireland total). The presence of Red-throated Diver, Golden Plover and Bar-tailed Godwit is of particular note as these species are listed on Annex I of the E.U. Birds Directive. Killala Bay/Moy Estuary is a Ramsar Convention site.

3.2. Description of the Existing Environment

The proposed development areas comprise agricultural grassland (GA1), artificial surfaces along the local road and adjacent areas at Killala Business Park and drainage ditches leading to the Moyne Stream.

A Drainage ditch (FW4) runs along the road side boundary of the site. This have marginal species with Fools Watercress (*Apium nodiflorum*) and Water Starwort (*Callitriche stagnalis*) in stagnant sections along with Duckweed (*Lemna minor*) and with higher ground having Meadowsweet (*Filipendula ulmaris*), Nettle (*Urtica diocia*), occasional Water mint (*Mentha aquatica*), Bulrush (*Typha latifolia*) and Yellow-flag Iris (*Iris pseudacorus*). At the southern end of two fields of semi-improved wet grassland the grassland merges with the drainage ditch to form a mosaic marsh type habitat.

The majority of the fields within the proposed development area are improved (GA1) with relatively high levels of grazing with the exception of the lower or southern portions of the two most southeasterly fields in the main data centre site which grade to wet grassland and wetter sections form a Marsh mosaic adjacent to the local access road. The improved grassland fields are essentially large, in most cases, open fields of grassland which are managed for either silage, hay or grazing dominated by common forage grasses such as Perennial Rye-Grass and Yorkshire Fog with little in the way of herbs

present along with Creeping Thistle, Meadow Buttercup, Nettle and Silverweed (*Potentilla anserina*). The edges of the fields contain some well grown Hawthorn (*Crataegus monogyna*) and Ash (*Fraxinus excelsior*).

Wet grassland (GS4), with characteristic species such as abundant Soft Rush (*Juncus effusus*), Meadowsweet (*Filipendula ulmaria*), Yorkshire Fog (*Holcus lanatus*), Star Sedge (*Carex echinata*), Marsh Thistle (*Cirsium palustre*) and Creeping Buttercup (*Ranunculus repens*) is present in the lower wetter sections of the two most southeastern fields closest to the local road and divided by outgrown hedgerows (WL1). The roadside ditch has Floating Sweet Grass (*Glyceria fluitans*) and Bulrush (*Typha latifolia*) was common along Meadowsweet and Yellow-flag Iris (*Iris pseudoacorus*) form a marshy mosaic.

The land surrounding the old Rectory and attendant buildings is classed as Mixed broadleaf woodland (WD1). Trees are generally outgrown garden or landscape features with a mix of native species such as Common Alder, Ash, Willow, Wych Elm, Hawthorn, Scot's Pine and with Silver Fir (*Abies alba*). The proposed western access route runs through an area of mature trees, with Scots Pine, Aspen, Alder and Beech. There is a small centrally located area of conjoining hedgerows which forms a spread of woodland, c. 75m NW of the Rectory House. The woodland understorey generally comprises abundant Nettle (*Urtica dioica*), Yorkshire Fog (*Holcus lanatus*), Rough Meadow Grass (*Poa trivialis*) and Creeping Thistle (*Cirsium arvense*), False Oat Grass (*Arrhenatherum elatior*), while wetter areas comprise tall Wet grassland (GS4), with Meadowsweet, Great Willowherb (*Epilobium hirsutum*), Iris, False Oat-Grass and Reed Canary Grass. The areas fringing the main roadside are scrubby in patches with frequent Gorse. Gorse scrub is abundant in the line of the proposed access to the WWTP.

The fields, including the roadside boundary are lined by hedgerows (WL1), which have largely been allowed to develop into taller treelines. Ash is the predominant species (much of it diseased) with Sycamore and Hawthorn, Willow, Elder (*Sambucus nigra*) and Blackthorn (*Prunus spinosa*).

Road crossings and hardstanding areas of tracks and existing pathways are classed as Buildings and artificial surfaces (BL3).

There are no rare or protected habitats recorded in the study area inside the site boundary. The site may be considered of Low to Moderate Ecological Value at a Local level.

Invasive Species

A large infestation of Japanese knotweed (*Reynoutria japonica*) was recorded growing in two patches on the property of the former Rectory House adjacent to the eastern facade. The stand is located at least 45m from the site boundary to the east and is noted for avoidance only.

3.3. Conservation Objectives of European Sites

3.3.1. Killala Bay/Moy Estuary SAC [000458]

Specific Conservation Objectives and Target Notes are set by the NPWS (Version 1. 19th July 2011) for those habitats and species which occur within the potential zone of influence of the Proposed Development in the Killala Bay/Moy Estuary SAC (000458) as follows.

Conservation objectives for: Killala Bay/Moy Estuary SAC [000458]

1014 Narrow-mouthed Whorl Snail *Vertigo angustior*

To maintain the favourable conservation condition of Narrow-mouthed Whorl Snail in Killala Bay/Moy Estuary SAC, which is defined by the following list of attributes and targets:

Attribute	Measure	Target	Notes
Distribution: occupied sites	Number	No decline. There is one known site for this species in this SAC. See map 8	From Moorkens and Killeen (2011)
Presence on transect	Occurrence	Adult or sub-adult snails are present in at least 3 places on the transect where optimal or sub-optimal habitat occurs (minimum 5 samples)	Transect established as part of condition assessment monitoring at this site (Moorkens and Killeen, 2011). See habitat area target below for definition of optimal and sub-optimal habitat
Abundance	Number per sample	At least 2 samples on the transect have more than 10 *V. angustior* individuals (minimum 5 samples)	From Moorkens and Killeen (2011)
Transect habitat quality	Metres	More than 50m of habitat along the transect is classed as optimal or sub-optimal	From Moorkens and Killeen (2011). See habitat area target below for definition of optimal and sub-optimal habitat
Transect optimal wetness	Metres	Soils, at time of sampling, are damp (optimal wetness) and covered with a layer of humid thatch for more than 50m along the transect	From Moorkens and Killeen (2011)
Habitat area	Hectares	1.465ha of potential habitat (optimal and sub-optimal); Optimal habitat is defined as marsh with transition of ecotone between red fescue (*Festuca rubra*) and silverweed (*Potentilla anserina*) wet grassland and waterlogged marsh dominated by yellow iris (*Iris pseudacorus*) and low growing herbs. Vegetation height 20-40cm. Habitat growing on wet to saturated soil covered with a deep layer of mosses and humid, open structured thatch. Sub-optimal habitat is defined as for optimal habitat, but either vegetation height is less than 20cm, or between 40 and 50cm; or the soil is dry, or covered with standing water	From Moorkens and Killeen (2011)

Conservation objectives for: Killala Bay/Moy Estuary SAC [000458]

1095 Sea Lamprey *Petromyzon marinus*

To maintain the favourable conservation condition of Sea Lamprey in Killala Bay/Moy Estuary SAC, which is defined by the following list of attributes and targets:

Attribute	Measure	Target	Notes
Distribution: extent of anadromy	% of estuary accessible	No barriers for migratory life stages of lamprey moving from freshwater to marine habitats and vice versa	This SAC only covers the estuarine portion of the River Moy. The adjacent River Moy SAC (site code: 2298) encompasses the freshwater elements of sea lamprey habitat. Artificial barriers can block or cause difficulties to lampreys' upstream migration, thereby limiting species to lower stretches and restricting access to spawning areas. See O'Connor (2004) for further information on artificial barriers in the Moy catchment
Population structure of juveniles	Number of age/size groups	At least three age/size groups present	Attribute and target based on data from Harvey and Cowx (2003) and O'Connor (2007). Important juvenile habitat identified immediately downstream of Ballina (see O'Connor, 2004)
Juvenile density in fine sediment	Juveniles/m²	Juvenile density at least 1/m²	Juveniles burrow in areas of fine sediment in still water. Attribute and target based on data from Harvey and Cowx (2003). Important juvenile habitat identified immediately downstream of Ballina (see O'Connor, 2004)

Conservation objectives for: Killala Bay/Moy Estuary SAC [000458]

1130 Estuaries

To maintain the favourable conservation condition of Estuaries in Killala Bay/Moy Estuary SAC, which is defined by the following list of attributes and targets:

Attribute	Measure	Target	Notes
Habitat area	Hectares	The permanent habitat area is stable or increasing, subject to natural processes. See map 3	Habitat area was estimated as 736ha using OSi data and the defined Transitional Water Body area under the Water Framework Directive
Community extent	Hectares	Maintain the extent of the *Zostera*-dominated community, subject to natural processes. See map 5	Estimated by EPA during 2011 intertidal survey. See marine supporting document for further details
Community structure: *Zostera* density	Shoots per m^2	Conserve the high quality of the *Zostera*-dominated community, subject to natural processes	Estimated by EPA during 2011 intertidal survey. See marine supporting document for further details
Community distribution	Hectares	Conserve the following community types in a natural condition: Muddy sand to fine sand dominated by *Hydrobia ulvae*, *Pygospio elegans* and *Tubificoides benedii* community complex; Estuarine muddy sand dominated by *Hediste diversicolor* and *Heterochaeta costata* community complex; and Fine sand dominated by *Nephtys cirrosa* community complex. See map 5	Habitat structure was elucidated from intertidal and subtidal surveys undertaken in 2010 (Aquafact, 2011; ASU, 2011). See marine supporting document for further details

Conservation objectives for: Killala Bay/Moy Estuary SAC [000458]

1210 Annual vegetation of drift lines

To maintain the favourable conservation condition of Annual vegetation of drift lines in Killala Bay/Moy Estuary SAC, which is defined by the following list of attributes and targets:

Attribute	Measure	Target	Notes
Habitat area	Hectares	Area stable or increasing, subject to natural processes, including erosion and succession. For sub-site mapped: Bartragh Island-0.58ha. See map 7	Based on data from the Coastal Monitoring Project (Ryle et al. 2009). Habitat is very difficult to measure in view of its dynamic nature which means that it can appear and disappear within a site from year to year. This habitat was only recorded from Bartragh Island. See coastal habitats supporting document for further details
Habitat distribution	Occurrence	No decline, or change in habitat distribution, subject to natural processes	Based on data from Ryle et al. (2009). Two separate narrow strips of strandline habitat were recorded on the northern side of Bartragh Island. See coastal habitats supporting document for further details
Physical structure: functionality and sediment supply	Presence/ absence of physical barriers	Maintain the natural circulation of sediment and organic matter, without any physical obstructions	Dunes are naturally dynamic systems that require continuous supply and circulation of sand. Accumulation of organic matter in tidal litter is essential for trapping sand and initiating dune formation. Sea defence/coastal protection works are present near the main access point to the beach at Inishcrone (Ryle et al. 2009). See coastal habitats supporting document for further details
Vegetation structure: zonation	Occurrence	Maintain the range of coastal habitats including transitional zones, subject to natural processes including erosion and succession	Based on data from Ryle et al. (2009). At Bartragh Island there are transitions from sand dunes into saltmarsh habitats. See coastal habitats supporting document for further details
Vegetation composition: typical species and sub-communities	Percentage cover at a representative sample of monitoring stops	Maintain the presence of species-poor communities with typical species: sea rocket (*Cakile maritima*), sea sandwort (*Honckenya peploides*), prickly saltwort (*Salsola kali*) and Orache (*Atriplex* spp.)	Based on data from Ryle et al. (2009). See coastal habitats supporting document for further details
Vegetation composition: negative indicator species	Percentage cover	Negative indicator species (including non-natives) to represent less than 5% cover	Negative indicators include non-native species, species indicative of changes in nutrient status and species not considered characteristic of the habitat. Based on data from Ryle et al. (2009). See coastal habitats supporting document for further details

Conservation objectives for: Killala Bay/Moy Estuary SAC [000458]

1140 Mudflats and sandflats not covered by seawater at low tide

To maintain the favourable conservation condition of Mudflats and sandflats not covered by seawater at low tide in Killala Bay/Moy Estuary SAC, which is defined by the following list of attributes and targets:

Attribute	Measure	Target	Notes
Habitat area	Hectares	The permanent habitat area is stable or increasing, subject to natural processes. See map 4	Habitat area was estimated as 1,332ha using OSi data
Community extent	Hectares	Maintain the extent of the *Zostera*-dominated community, subject to natural processes. See map 5	Estimated by EPA during 2011 intertidal survey. See marine supporting document for further details
Community structure: *Zostera* density	Shoots per m^2	Conserve the high quality of the *Zostera*-dominated community, subject to natural processes	Estimated by EPA during 2011 intertidal survey. See marine supporting document for further details
Community distribution	Hectares	Conserve the following community types in a natural condition: Muddy sand to fine sand dominated by *Hydrobia ulvae, Pygospio elegans* and *Tubificoides benedii* community complex; Estuarine muddy sand dominated by *Hediste diversicolor* and *Heterochaeta costata* community complex and Fine sand dominated by *Nephtys cirrosa* community complex. See map 5	Habitat structure was elucidated from intertidal survey undertaken in 2010 (ASU, 2011). See marine supporting document for further details

Conservation objectives for: Killala Bay/Moy Estuary SAC [000458]

1310 Salicornia and other annuals colonizing mud and sand

To maintain the favourable conservation condition of *Salicornia* and other annuals colonizing mud and sand in Killala Bay/Moy Estuary SAC, which is defined by the following list of attributes and targets:

Attribute	Measure	Target	Notes
Habitat area	Hectares	Area stable or increasing, subject to natural processes, including erosion and succession. For sub-sites mapped: Bartragh Island- 0.26ha, Ross- 0.29ha. See map 6	Based on data from Saltmarsh Monitoring Project (SMP) (McCorry, 2007). Habitat mapped at two of the four sub-sites surveyed, giving a total estimated area of 0.55ha. NB further unsurveyed areas maybe present within the site. See coastal habitats supporting document for further details
Habitat distribution	Occurrence	No decline, or change in habitat distribution, subject to natural processes. See map 6 for known distribution	Based on data from McCorry (2007). Salicornia is an annual species, so its distribution can vary significantly from year to year. See coastal habitats supporting document for further details
Physical structure: sediment supply	Presence/ absence of physical barriers	Maintain natural circulation of sediments and organic matter, without any physical obstructions	Based on data from McCorry (2007). Sediment supply is particularly important for this pioneer saltmarsh community, as the distribution of this habitat depends on accretion rates. Accretion was noted at Ross and Bartragh Island. Old seawalls were recorded at Bartragh Island and some protection works were noted around buildings close to the shoreline at Ross. See coastal habitats backing document for further details
Physical structure: creeks and pans	Occurrence	Maintain creek and pan structure, subject to natural processes, including erosion and succession	Based on data from McCorry and Ryle (2009). Creeks deliver sediment throughout saltmarsh system. Creeks and pan structures are well developed at Ross. See coastal habitats supporting document for further details
Physical structure: flooding regime	Hectares flooded; frequency	Maintain natural tidal regime	This pioneer saltmarsh community requires regular tidal inundation. See coastal habitats supporting document for further details
Vegetation structure: zonation	Occurrence	Maintain the range of coastal habitats including transitional zones, subject to natural processes including erosion and succession	Based on data from McCorry (2007). Transitions to dune habitats are found at Bartragh Island and Ross. See coastal habitats supporting document for further details
Vegetation structure: vegetation height	Centimeters	Maintain structural variation within sward	Based on data from McCorry (2007). At Castleconor, grazing is absent. There are moderate levels of grazing at Rusheens, while grazing at Ross is heavy in places. Grazing intensity is low on Bartragh Island See coastal habitats supporting document for further details

Conservation objectives for: Killala Bay/Moy Estuary SAC [000458]

1310 Salicornia and other annuals colonizing mud and sand

To maintain the favourable conservation condition of *Salicornia* and other annuals colonizing mud and sand in Killala Bay/Moy Estuary SAC, which is defined by the following list of attributes and targets:

Attribute	Measure	Target	Notes
Vegetation structure: vegetation cover	Percentage cover at a representative sample of monitoring stops	Maintain more than 90% of the area outside of the creeks vegetated	Based on data from McCorry (2007). Castleconor and Rusheens are heavily poached in places. There are moderate levels of poaching at Bartragh Island and Ross. See coastal habitats supporting document for further details
Vegetation composition: typical species & sub-communities	Percentage cover	Maintain the presence of species-poor communities with typical species listed in the Saltmarsh Monitoring Project (McCorry and Ryle, 2009)	See coastal habitats supporting document for further details
Vegetation structure: negative indicator species-*Spartina anglica*	Hectares	No significant expansion of common cordgrass (*Spartina anglica*), with an annual spread of less than 1%	Based on data from McCorry (2007). See coastal habitats supporting document for further details

Conservation objectives for: Killala Bay/Moy Estuary SAC [000458]

1330 Atlantic salt meadows (*Glauco-Puccinellietalia maritimae*)

To maintain the favourable conservation condition of Atlantic salt meadows (*Glauco-Puccinellietalia*) in Killala Bay/Moy Estuary SAC, which is defined by the following list of attributes and targets:

Attribute	Measure	Target	Notes
Habitat area	Hectares	Area stable or increasing, subject to natural processes, including erosion and succession. For sub-sites mapped: Bartragh Island- 29.22ha, Ross- 14.95ha, Rusheens- 1.24ha, Castleconor - 1.61ha. See map 6	Based on data from the Saltmarsh Monitoring Project (SMP) (McCorry, 2007; McCorry and Ryle 2009). Four sub-sites that supported Atlantic salt meadow were mapped (47.02ha) and additional areas of potential ASM (3.34ha) were identified from an examination of aerial photographs, giving a total estimated area of 50.37ha. NB further unsurveyed areas maybe present within the site. See coastal habitats supporting document for further details
Habitat distribution	Occurrence	No decline, or change in habitat distribution, subject to natural processes. See map 6 for known distribution	Based on data from McCorry (2007). ASM is the dominant saltmarsh type with a wide distribution throughout the SAC. See coastal habitats supporting document for further details
Physical structure: sediment supply	Presence/ absence of physical barriers	Maintain natural circulation of sediments and organic matter, without any physical obstructions	Based on data from McCorry and Ryle (2009). The SMP noted accretion at Ross and Bartragh Island. Old seawalls were recorded at Bartragh Island and there are some protection works around buildings close to the shoreline at Ross. See coastal habitats supporting document for further details
Physical structure: creeks and pans	Occurrence	Maintain creek and pan structure/ allow to develop, subject to natural processes, including erosion and succession	Based on data from McCorry and Ryle (2009). Creeks and pan structures are well developed at Ross. See coastal habitats supporting document for further details
Physical structure: flooding regime	Hectares flooded; frequency	Maintain natural tidal regime	See coastal habitats supporting document for further details
Vegetation structure: zonation	Occurrence	Maintain the range of coastal habitats including transitional zones, subject to natural processes including erosion and succession	Based on data from McCorry (2007). Transitions to dune habitats are found at Bartragh Island and Ross. See coastal habitats supporting document for further details
Vegetation structure: vegetation height	Centimeters	Maintain structural variation within sward	Based on data from McCorry (2007). At Castleconor, grazing is absent. At Rusheens there are moderate levels of grazing. At Ross grazing is heavy in places. At Bartragh Island grazing intensity is low. See coastal habitats supporting document for further details

Conservation objectives for: Killala Bay/Moy Estuary SAC [000458]

1330 Atlantic salt meadows (*Glauco-Puccinellietalia maritimae*)

To maintain the favourable conservation condition of Atlantic salt meadows (*Glauco-Puccinellietalia*) in Killala Bay/Moy Estuary SAC, which is defined by the following list of attributes and targets:

Attribute	Measure	Target	Notes
Vegetation structure: vegetation cover	Percentage cover at a representative sample of monitoring stops	Maintain more than 90% of the area outside of the creeks vegetated	Based on data from McCorry (2007). Castleconor and Rusheens are heavily poached in places. There are moderate levels of poaching at Bartragh Island and Ross. See coastal habitats supporting document for further details
Vegetation composition: typical species and sub-communities	Percentage cover at a representative sample of monitoring stops	Maintain range of sub-communities with typical species listed in Saltmarsh Monitoring Project (McCorry and Ryle, 2009)	Based on data from McCorry and Ryle (2009). See coastal habitats supporting document for further details
Vegetation structure: negative indicator species-*Spartina anglica*	Hectares	No significant expansion of common cordgrass (*Spartina anglica*), with an annual spread of less than 1%	Based on data from McCorry (2007). See coastal habitats supporting document for further details

Conservation objectives for: Killala Bay/Moy Estuary SAC [000458]

1365 Harbour Seal *Phoca vitulina*

To maintain the favourable conservation condition of Harbour Seal in Killala Bay/Moy Estuary SAC, which is defined by the following list of attributes and targets:

Attribute	Measure	Target	Notes
Access to suitable habitat	Number of artificial barriers	Species range within the site should not be restricted by artificial barriers to site use. See map 9 for suitable habitat	See marine supporting document for further details
Breeding behaviour	Breeding sites	Conserve the breeding sites in a natural condition. See map 9	Attribute and target based on background knowledge of Irish breeding populations, review of data summarised by Summers et al. (1980), Harrington (1990), Lyons (2004) and unpublished National Parks and Wildlife Service records. See marine supporting document for further details
Moulting behaviour	Moult haul-out sites	Conserve the moult haul-out sites in a natural condition. See map 9	Attribute and target based on background knowledge of Irish populations, review of data from Lyons (2004), Cronin et al. (2004), NPWS (2010), NPWS (2011), NPWS (2012) and unpublished National Parks and Wildlife Service records. See marine supporting document for further details
Resting behaviour	Resting haul-out sites	Conserve the resting haul-out sites in a natural condition. See map 9	Attribute and target based on background knowledge of Irish populations, review of data from Lyons (2004), unpublished National Parks and Wildlife Service records and unpublished data collected by University College Cork/Inland Fisheries Ireland. See marine supporting document for further details
Disturbance	Level of impact	Human activities should occur at levels that do not adversely affect the harbour seal population at the site	See marine supporting document for further details

Conservation objectives for: Killala Bay/Moy Estuary SAC [000458]

2110 Embryonic shifting dunes

To restore the favourable conservation condition of Embryonic shifting dunes in Killala Bay/Moy Estuary SAC, which is defined by the following list of attributes and targets:

Attribute	Measure	Target	Notes
Habitat area	Hectares	Area increasing, subject to natural processes, including erosion and succession. For sub-site mapped: Ross-0.81ha, Bartragh Island - 0.75ha. See map 7	Based on data from the Coastal Monitoring Project (Ryle et al., 2009). Habitat is very difficult to measure in view of its dynamic nature and was only recorded at Bartragh Island and Ross, giving a total estimated area of 1.56ha. Accretion was noted from the western end of Bartragh Island. Embryo dune habitat is restricted to a small area on the seaward edge at Ross. See coastal habitats supporting document for further details
Habitat distribution	Occurrence	No decline, or change in habitat distribution, subject to natural processes. See map 7 for known distribution	Based on data from Ryle et al. (2009). See coastal habitats supporting document for further details
Physical structure: functionality and sediment supply	Presence/ absence of physical barriers	Maintain the natural circulation of sediment and organic matter, without any physical obstructions	Dunes are naturally dynamic systems that require continuous supply and circulation of sand. Sea defence/coastal protection works are present near the main access point to the beach at Inishcrone (Ryle et al. 2009). See coastal habitats supporting document for further details
Vegetation structure: zonation	Occurrence	Maintain the range of coastal habitats including transitional zones, subject to natural processes including erosion and succession	Based on data from Gaynor (2008) and Ryle et al. (2009). At Bartragh Island and Ross there are transitions from sand dunes into saltmarsh habitats. See coastal habitats supporting document for further details
Vegetation composition: plant health of foredune grasses	Percentage cover	More than 95% of sand couch (*Elytrigia juncea*) and/or lyme-grass (*Leymus arenarius*) should be healthy (i.e. green plant parts above ground and flowering heads present)	Based on data from Ryle et al. (2009). See coastal habitats supporting document for further details
Vegetation composition: typical species and sub-communities	Percentage cover at a representative sample of monitoring stops	Maintain the presence of species-poor communities with typical species: sand couch (*Elytrigia juncea*) and/or lyme-grass (*Leymus arenarius*)	Based on data from Ryle et al. (2009). See coastal habitats supporting document for further details
Vegetation composition: negative indicator species	Percentage cover	Negative indicator species (including non-natives) to represent less than 5% cover	Based on data from Ryle et al. (2009). Negative indicators include non-native species, species indicative of changes in nutrient status and species not considered characteristic of the habitat. Sea-buckthorn (*Hippophae rhamnoides*) should be absent or effectively controlled. See coastal habitats supporting document for further details

Conservation objectives for: Killala Bay/Moy Estuary SAC [000458]

2120 Shifting dunes along the shoreline with *Ammophila arenaria* ('white dunes')

To restore the favourable conservation condition of Shifting dunes along the shoreline with *Ammophila arenaria* (white dunes) in Killala Bay/Moy Estuary SAC, which is defined by the following list of attributes and targets:

Attribute	Measure	Target	Notes
Habitat area	Hectares	Area increasing, subject to natural processes including erosion and succession. For sub-sites mapped: Ross- 1.58; Bartragh Island- 7.52ha ; Inishcrone- 3.65ha. See map 7	Habitat was mapped during the Coastal Monitoring Project (Ryle et al., 2009). Habitat was mapped at three sub-sites to give a total estimated area of 12.75ha. Habitat is very difficult to measure in view of its dynamic nature. See coastal habitats supporting document for further details
Habitat distribution	Occurrence	No decline, or change in habitat distribution, subject to natural processes. See map 7 for known distribution	Based on data from Ryle et al. (2009). Mobile dunes are well developed at Bartragh Island, while at Inishcrone they are patchy in distribution and eroded back to the fixed dune in places. See coastal habitats supporting document for further details
Physical structure: functionality and sediment supply	Presence/ absence of physical barriers	Maintain the natural circulation of sediment and organic matter, without any physical obstructions	Dunes are naturally dynamic systems that require continuous supply and circulation of sand. Marram (*Ammophila arenaria*) reproduces vegetatively and requires constant accretion of fresh sand to maintain active growth, thus encouraging further accretion. There are coastal protection works in place at Inishcrone. See coastal habitats supporting document for further details
Vegetation structure: zonation	Occurrence	Maintain the range of coastal habitats including transitional zones, subject to natural processes including erosion and succession	Based on data from Gaynor (2008) and Ryle et al. (2009). At both Bartragh Island and Ross there are transitions from sand dune to saltmarsh habitats. See coastal habitats supporting document for further details
Vegetation composition: plant health of dune grasses	Percentage cover	More than 95% of marram (*Ammophila arenaria*) and/or lyme-grass (*Leymus arenarius*) should be healthy (i.e. green plant parts above ground and flowering heads present)	Based on data from Ryle et al. (2009). See coastal habitats supporting document for further details
Vegetation composition: typical species and sub-communities	Percentage cover at a representative sample of monitoring stops	Maintain the presence of species-poor communities dominated by marram (*Ammophila areanaria*) and/or lyme-grass (*Leymus arenarius*)	Based on data from Ryle et al. (2009). Bartragh Island, Ross and Inishcrone all support a characteristic dune flora. See coastal habitats supporting document for further details

Conservation objects for: Killala Bay/Moy Estuary SAC [000458]

2120 Shifting dunes along the shoreline with *Ammophila arenaria* ('white dunes')

To restore the favourable conservation condition of Shifting dunes along the shoreline with *Ammophila arenaria* (white dunes) in Killala Bay/Moy Estuary SAC, which is defined by the following list of attributes and targets:

Attribute	Measure	Target	Notes
Vegetation composition: negative indicator species	Percentage cover	Negative indicator species (including non-natives) to represent less than 5% cover	Based on data from Ryle et al. (2009). Negative indicators include non-native species, species indicative of changes in nutrient status and species not considered characteristic of the habitat. Sea-buckthorn (*Hippophae rhamnoides*) should be absent or effectively controlled. The mobile dune habitat at Ross has a high cover of creeping thistle (*Cirsium arvense*) and common ragwort (*Senecio jacobaea*). At Inishcrone and Bartragh Island, ragwort (*Senecio jacobaea*) is also common. See coastal habitats supporting document for further details

Conservation objectives for: Killala Bay/Moy Estuary SAC [000458]

2130 *Fixed coastal dunes with herbaceous vegetation ('grey dunes')

To restore the favourable conservation condition of Fixed coastal dunes with herbaceous vegetation (grey dunes) in Killala Bay/Moy Estuary SAC, which is defined by the following list of attributes and targets:

Attribute	Measure	Target	Notes
Habitat area	Hectares	Area increasing, subject to natural processes including erosion and succession. For sub-site mapped: Ross - 100.79ha; Bartragh Island - 120.13ha; Inishcrone - 38.53ha. See map 7	Based on data from the Coastal Monitoring Project (Ryle et al., 2009). Habitat mapped at three sub-sites to give a total estimated area of 259.46ha. See coastal habitats supporting document for further details
Habitat distribution	Occurrence	No decline, or change in habitat distribution, subject to natural processes. See map 7 for known distribution	Based on data from the Coastal Monitoring Project (Ryle et al., 2009). Fixed dune habitat is extensive at Bartragh Island. The extent of the fixed dune habitat is reduced at Inishcrone owing to presence of Enniscrone golf course. See coastal habitats supporting document for further details
Physical structure: functionality and sediment supply	Presence/ absence of physical barriers	Maintain the natural circulation of sediment and organic matter, without any physical obstructions.	Based on data from the Coastal Monitoring Project (Ryle et al., 2009). Physical barriers can lead to fossilisation or over-stabilisation of dunes, as well as beach starvation resulting in increased rates of erosion. There are coastal protection works at the main access to the beach at Inishcrone. See coastal habitats supporting document for further details
Vegetation structure: zonation	Occurrence	Maintain the range of coastal habitats including transitional zones, subject to natural processes including erosion and succession	Based on data from Ryle et al. (2009). At both Bartragh Island and Ross there are transitions from sand dune to saltmarsh habitats. See coastal habitats supporting document for further details
Vegetation structure: bare ground	Percentage cover	Bare ground should not exceed 10% of fixed dune habitat, subject to natural processes.	Based on data from Gaynor (2008) and Ryle et al. (2009). See coastal habitats supporting document for further details
Vegetation composition: sward height	Centimeters	Maintain structural variation within sward.	Based on data from Gaynor (2008) and Ryle et al. (2009). Vegetation is quite rank in places at Ross, Inishcrone and Bartragh Island due to undergrazing. See coastal habitats supporting document for further details
Vegetation composition: typical species and sub-communities	Percentage cover at a representative sample of monitoring stops	Maintain range of sub-communities with typical species listed in Ryle et al. (2009)	Based on data from Gaynor (2008) and Ryle et al. (2009). See coastal habitats supporting document for further details

Conservation objectives for: Killala Bay/Moy Estuary SAC [000458]

2130 *Fixed coastal dunes with herbaceous vegetation ('grey dunes')

To restore the favourable conservation condition of Fixed coastal dunes with herbaceous vegetation (grey dunes) in Killala Bay/Moy Estuary SAC, which is defined by the following list of attributes and targets:

Attribute	Measure	Target	Notes
Vegetation composition: negative indicator species (including *Hippophae rhamnoides*)	Percentage cover	Negative indicator species (including non-natives) to represent less than 5% cover	Based on data from Ryle et al. (2009). Negative indicators include non-native species, species indicative of changes in nutrient status and species not considered characteristic of the habitat. Sea-buckthorn (*Hippophae rhamnoides*) should be absent or effectively controlled. Bracken (*Pteridium aquilinum*) was recorded at Bartragh Island. At Inishcrone, common ragwort (*Senecio jacobaea*), creeping thistle (*Cirsium vulgare*) and bramble (*Rubus fruticosus*) occur. At Ross, creeping thistle (*Cirsium arvense*), common ragwort (*Senecio jacobaea*) and hogweed (*Heracleum sphondylium*) occur. See coastal habitats supporting document for further details
Vegetation composition: scrub/trees	Percentage cover	No more than 5% cover or under control	Based on data from Ryle et al. (2009). Scattered shrubs and stunted trees occur at Ross, while occasional scrub occurs at Bartragh Island. See coastal habitats supporting document for further details

Conservation objectives for: Killala Bay/Moy Estuary SAC [000458]

2190 Humid dune slacks

To maintain the favourable conservation condition of Humid dune slacks in Killala Bay/Moy Estuary SAC, which is defined by the following list of attributes and targets:

Attribute	Measure	Target	Notes
Habitat area	Hectares	Area stable or increasing, subject to natural processes including erosion and succession. For sub-sites mapped: Ross: 3.87ha; Bartragh Island: 1.22ha. See map 6	Based on data from the Coastal Monitoring Project (Ryle et al., 2009). Habitat was mapped at two sub-sites, giving a total estimated area of 5.09ha. See coastal habitats supporting document for further details
Habitat distribution	Occurrence	No decline or change in habitat distribution, subject to natural processes. See map 6 for known distribution	Based on data from Ryle et al. (2009). Dune slacks at Bartragh Island are narrow linear features. See coastal habitats supporting document for further details.
Physical structure: functionality and sediment supply	Presence/ absence of physical barriers	Maintain natural circulation of sediment and organic matter, without any physical obstructions	Physical barriers can lead to fossilisation or over-stabilisation of dunes, as well as beach starvation resulting in increased rates of erosion. See coastal habitats supporting document for further details
Physical structure: hydrological and flooding regime	Presence/ absence of water abstraction or drainage works	Maintain natural hydrological regime	Based on data from Gaynor (2008) and Ryle et al. (2009). See coastal habitats supporting document for further details
Vegetation structure: zonation	Occurrence	Maintain the range of coastal habitats including transitional zones, subject to natural processes including erosion and succession	Based on data from Ryle et al., (2009). At both Bartragh Island and Ross sub-sites there are transitions from sand dune to saltmarsh habitats. See coastal habitats supporting document for further details
Vegetation structure: bare ground	Percentage cover	Bare ground should not exceed 5% of dune slack habitat, with the exception of pioneer slacks which can have up to 20% bare ground.	Based on data from Gaynor (2008) and Ryle et al. (2009). At Ross, the dune slacks are poached by cattke in places. See coastal habitats supporting document for further details
Vegetation structure: vegetation height	Centimeters	Maintain structural variation within sward.	Based on data from Ryle et al. (2009). See coastal habitats supporting document for further details
Vegetation composition: typical species and sub-communities	Percentage cover at a representative sample of monitoring stops	Maintain range of sub-communities with typical species listed in Ryle et al. (2009)	Based on data from Gaynor (2008) and Ryle et al. (2009). See coastal habitats supporting document for further details
Vegetation composition: cover of S. repens	% cover; centimeters	Maintain more than 40% cover of creeping willow (*Salix repens*)	Based on data from Ryle et al. (2009). Cover of creeping willow (*Salix repens*) needs to be controlled (e.g. through an appropriate grazing regime) to prevent the development of a coarse, rank vegetation cover. *Salix repens* ssp. *argentea* was noted at Bartragh Island, but its cover was only 10% and it was not widespread. See coastal habitats supporting document for further details

Conservation objectives for: Killala Bay/Moy Estuary SAC [000458]

2190 Humid dune slacks

To maintain the favourable conservation condition of Humid dune slacks in Killala Bay/Moy Estuary SAC, which is defined by the following list of attributes and targets:

Attribute	Measure	Target	Notes
Vegetation composition: negative indicator species	Percentage cover	Negative indicator species (including non-natives) to represent less than 5% cover	Based on data from Ryle et al. (2009). Negative indicators include non-native species, species indicative of changes in nutrient status and species not considered characteristic of the habitat. Sea-buckthorn (*Hippophae rhamnoides*) should be absent or effectively controlled. See coastal habitats supporting document for further details
Vegetation composition: scrub/trees	Percentage cover	No more than 5% cover or under control	Based on data from Ryle et al. (2009). See coastal habitats supporting document for further details

3.3.2. Killala Bay/Moy Estuary SPA [004036]

First Order Site-specific Conservation Objectives are set by the NPWS (Version 28/5/2013) for the Killala Bay/Moy Estuary SPA (00036) as follows.

The overall aim of the Habitats Directive is to maintain or restore the favourable conservation status of habitats and species of community interest. These habitats and species are listed in the Habitats and Birds Directives and Special Areas of Conservation and Special Protection Areas are designated to afford protection to the most vulnerable of them. These two designations are collectively known as the Natura 2000 network.

European and national legislation places a collective obligation on Ireland and its citizens to maintain habitats and species in the Natura 2000 network at favourable conservation condition. The Government and its agencies are responsible for the implementation and enforcement of regulations that will ensure the ecological integrity of these sites.

The maintenance of habitats and species within Natura 2000 sites at favourable conservation condition will contribute to the overall maintenance of favourable conservation status of those habitats and species at a national level.

Favourable conservation status of a habitat is achieved when:

• its natural range, and area it covers within that range, are stable or increasing, and
• the specific structure and functions which are necessary for its long-term maintenance exist and are likely to continue to exist for the foreseeable future, and
• the conservation status of its typical species is favourable.

The favourable conservation status of a species is achieved when:

• population dynamics data on the species concerned indicate that it is maintaining itself on a long-term basis as a viable component of its natural habitats, and

• the natural range of the species is neither being reduced nor is likely to be reduced for the foreseeable future, and

• there is, and will probably continue to be, a sufficiently large habitat to maintain its populations on a long-term basis.

Objective: To maintain or restore the favourable conservation condition of the bird species listed as Special Conservation Interests for this SPA:

A229 Kingfisher *Alcedo atthis*

A140 Golden Plover Pluvialis apricaria

A141 Grey Plover *Pluvialis squatarola*

A144 Sanderling Calidris alba

A149 Dunlin *Calidris alpina alpina*

A157 Bar-tailed Godwit *Limosa lapponica*

A160 Curlew *Numenius Arquata*

A162 Redshank *Tringa tetanus*

An additional conservation objective for Wetlands is also provided:

Conservation Objectives for : Killala Bay/Moy Estuary SPA [004036]

A999 Wetlands

To maintain the favourable conservation condition of wetland habitat in Killala Bay/Moy Estuary SPA as a resource for the regularly occurring migratory waterbirds that utilise it. This is defined by the following attribute and target:

Attribute	Measure	Target	Notes
Habitat area	Hectares	The permanent area occupied by the wetland habitat should be stable and not significantly less than the area of 3204 hectares, other than that occurring from natural patterns of variation	The wetland habitat area was estimated as 3204ha using OSi data and relevant orthophotographs. For further information see part three of the conservation objectives supporting document

3.4. Consideration of Effects on European Sites

3.4.1. Annex I Habitats Directive Habitats

The Proposed Development site is located 3.25 river kilometres upstream of the Killala Bay/Moy Estuary SAC (Site Code 000458).

There are no Annex I habitats located in the vicinity of the Proposed Development.

There will be no direct impacts on Killala Bay/Moy Estuary SAC and there will be no habitat loss or fragmentation as a result of the proposed development. Having considered direct impacts and ruling them out, indirect impacts are then considered in terms of source pathway vectors.

Potential impacts on the Killala Bay/Moy Estuary SAC are considered in terms of hydrological connectivity between the Proposed Development and the drainage ditches which have connectivity with Killala Bay/Moy Estuary.

A worst-case scenario may arise were the Proposed Development to result in a significant detrimental change in water quality in the relevant drainage ditch and watercourses, either alone or in combination with other projects or plans as a result of indirect pollution, the effect would have to be considered in terms of changes in water quality which would significantly affect the habitats or food sources for which Killala Bay/Moy Estuary SAC species are designated.

3.4.2. Annex I Birds Directive Birds

The Proposed Development and adjacent environment does not provide suitable nesting, foraging or commuting habitat for any of the species listed as conservation objectives of the Killala Bay/Moy Estuary SPA.

There will be no direct impacts on any of the species listed as conservation objectives of the Killala Bay/Moy Estuary SPA and so the main concern is with regard to water quality and indirect impacts on water quality and prey species.

3.4.3. Habitats Directive Annex II Species

Narrow-mouthed Whorl Snail Vertigo angustior

Records for Narrow-mouthed Whorl Snail occur upstream on the River Moy Estuary, approximately 6km to the southeast of the point of discharge of connected watercourses into Killala Bay. It is considered that this species lies outside the Zone of Influence of the Proposed Development, and there will be no direct or indirect impacts on Narrow-mouthed Whorl Snail.

Harbour Seal Phoca vitulina

Harbour Seal are common in Killala Bay and the Moy Estuary, including around Bartragh Island. There will be no direct impact on seals and so the main concern is with regard to water quality and indirect impacts on water quality, particularly in regard to prey abundance.

Sea Lamprey Petromyzon marinus

Sea Lamprey (*Petromyzon marinus*), have potential to occur in the Killala Bay and the Moy Estuary downstream of the Proposed Development site. There will be no direct impacts on Sea Lamprey and so the main concern is with regard to water quality and indirect impacts on water quality and prey species.

Each of these species is listed as one of the qualifying interests of the Killala Bay/Moy Estuary SAC designation. However, there will be no direct impacts on these Annex II species as a result of the Proposed Development.

A worst-case scenario may be considered whereby the Proposed Development may result in a significant detrimental change in water quality in Killala Bay/Moy Estuary either alone or in combination with other projects or plans as a result of indirect pollution. The effect would have to be considered in terms of changes in water quality which would affect the habitats or food sources for which the Killala Bay/Moy Estuary SAC and the Killala Bay/Moy Estuary SPA species are designated.

It is unlikely that there would be a pollution event from fuel or chemical spillage. However, such an event could significantly affect the trophic status of the adjacent drains and watercourses, which would be contrary to the conservation objectives of the Killala Bay/Moy Estuary SAC and the Killala Bay/Moy Estuary SPA. However, as a precaution a Construction Environmental Management Plan has been prepared to outline best practice construction management measures to avoid potential impacts on the water quality of the River Moy Estuary and Killala Bay.

3.4.4. Ecological Network Supporting Natura 2000 Sites

An analysis of the proposed Natural Heritage Areas and designated Natural Heritage Areas in terms of their role in supporting the species using Natura 2000 sites was undertaken. These supporting roles mainly relate to mobile fauna such as mammals and birds which may use pNHAs and NHAs as “stepping stones” between Natura 2000 sites.

Article 10 of the Habitats Directive and the Habitats Regulations 2011 place a high degree of importance on such non-Natura 2000 areas as features that connect the Natura 2000 network. Features such as ponds, woodlands and important hedgerows were taken into account during the AA process.

There are no Natural Heritage Areas or proposed Natural Heritage Areas that will be affected by the Proposed Development.

The proposed development was considered in terms of County Mayo’s Green Infrastructure, which includes river corridors. Such corridors are considered to be landscape features that are of major importance for wild fauna and flora under Article 10 of the Habitats Directive (92/EEC/43). These are

features which, by virtue of their function and structure, are essential for the migration, dispersal and genetic exchange of wild species and form part of the network of Green Infrastructure.

To this end the Proposed Development includes a comprehensive Landscape Management Plan has been prepared which has regard to the rehabilitation of the existing site.

3.5. Effects on the Qualifying Interests of European Sites

3.5.1. Direct Effects

There will be no direct impacts on the Killala Bay/Moy Estuary SAC or the and the Killala Bay/Moy Estuary SPA as a result of the implementation of the Proposed Development. Direct impact refers to physical impacts defined in the Departmental Guidance as 'Loss of habitat area' and/or 'Habitat Fragmentation'. There are no direct impacts identified which may affect the Annexed habitats or species of the SAC. The proposed development will have **no impacts** upon the integrity or the site structure of the Killala Bay/Moy Estuary SAC or the Killala Bay/Moy Estuary SPA.

Having established this, the assessment emphasis is placed on potential indirect and cumulative impacts.

The primary consideration in terms of source-vector-pathways for indirect impacts relates to surface water and potential indirect impacts on hydrologically linked habitats and aquatic species.

3.5.2. Indirect Effects

The potential for impact is considered whereby the Proposed Development would result in a significant detrimental change in water quality either alone or in combination with other projects or plans as a result of indirect pollution of surface water. The effect would have to be considered in terms of changes in water quality which would affect the aquatic species for which the Killala Bay/Moy Estuary SAC and the Killala Bay/Moy Estuary SPA are designated.

Consideration of Effects on Groundwater

The proposed development will have no liquids or fuels stored at the site that could have the potential to cause groundwater contamination. The trafficked areas on site and the structures will be sealed with concrete and the remaining sealed areas will be underlain with an impermeable membrane to ensure that run-off is filtered and collected for treatment prior to discharge to ground.

Consideration of Effects on Surface Water

The likelihood of impacts on hydrologically connected environmental sites is low and will be avoided by best practice construction management.

Accidental spillages and contaminated runoff and will be avoided by construction management measures which are set out in a Construction Environmental Management Plan (CEMP). Management measures will include appropriate site-specific measures from the CIRIA Report C532 Control of Water Pollution from Construction Sites.

The CEMP will include a reference to this NIS for the Proposed Development which establishes the connectivity of the Killala Bay/Moy Estuary and the requirement for avoidance in terms of potential indirect construction activity.

Consideration of Effects on Air Quality

A comprehensive evaluation of the potential impact of emissions from the proposed development on ambient air quality has been completed and included in the project EIAR.

The impact of emissions of NOX, and nitrogen and acid deposition (as N) on ambient ground level concentrations within designated habitat sites within 20 km of the facility was assessed using AERMOD. The 20 km distance was selected based on maximum extent of the impact zone from the air emissions onsite. After 20 km, the ambient air concentration of NOX, and nutrient and acid deposition due to emissions from the facility are imperceptible.

The nitrogen deposition flux for the worst-case year is 4.837 kg/ha/yr and is below the range in worst-case critical loads of 5-10 kg/ha/yr (APIS, 2023) for the various habitat types (Calcareous grassland, *Vertigo angustior*, Estuaries, Atlantic salt meadows (Glauco-Puccinellietalia Maritimae), Embryonic shifting dunes, Shifting dunes along the shoreline with *Ammophila arenaria* (white dunes), Fixed coastal dunes with herbaceous vegetation (grey dunes), Humid dune slacks) in the Killala Esker pNHA, indicating that the effects of nitrogen deposition on designated sites due to the proposed operations of the facility are direct, long-term, negative and not significant, which is overall not significant in EIA terms.

The acid deposition (as N) flux for the worst-case year is 0.331 keq/ha/yr and is below the worst case maximum critical load range of 0.714 – 5.589 keq/ha/yr for the various habitat types (*Vertigo angustior*, Estuaries, Atlantic salt meadows (Glauco-Puccinellietalia Maritimae), Embryonic shifting dunes, Shifting dunes along the shoreline with *Ammophila arenaria* (white dunes), Fixed coastal dunes with herbaceous vegetation (grey dunes), Humid dune slacks) in the Killala Esker pNHA) in the Killala Esker pNHA (APIS, 2023), indicating that the effects of acid deposition (as N) on designated sites due to the proposed operations of the facility are direct, long-term, negative and not significant, which is overall not significant in EIA terms.

Ambient Ground Level Concentrations (GLCs) of PM10 results indicate that the ambient ground level concentrations are below the relevant air quality standards for all modelled years for PM10. For the worst-case year, emissions from the site lead to an ambient PM10 concentration (including background) which is 41% of the maximum ambient 24-hour limit value (measured as a 90.4th%ile) at the worst-case receptor and 29% of the annual limit value at the worst-case receptor.

In summary, emissions to atmosphere of PM10 from the site will be in compliance with the ambient air quality standards which are based on the protection of the environment and human health. Therefore, the effect of the Do Nothing scenario on air quality is predicted to be direct, long-term, negative and not significant, which is overall not significant in EIA terms.

The $PM_{2.5}$ modelling results derived from a worst-case assumption that all PM_{10} emissions from the facility are of a particle size of 2.5 microns or less ($PM_{2.5}$). This assumption is necessitated due to the lack of availability of $PM_{2.5}$ emission concentration data for emission sources and therefore $PM_{2.5}$ emissions could not be directly modelled. In reality, particles greater than 2.5 microns will also be present and thus the mass of $PM_{2.5}$ released has been overestimated.

For the worst-case year, ambient concentrations (including background) will be 34% of the annual mean $PM_{2.5}$ limit value of 25 µg/m^3 or 42% of the Stage 2 annual mean limit value of 20 µg/m^3 at the worst-case receptor. As the annual mean $PM_{2.5}$ concentrations have been conservatively assumed equal to the annual mean PM_{10} concentrations.

In summary, emissions to atmosphere of $PM_{2.5}$ from the site will be in compliance with the ambient air quality standards which are based on the protection of the environment and human health. Therefore, the effect of the Proposed Development on air quality is predicted to be ***direct, long-term, negative*** and ***not significant***, which is overall ***not significant*** in EIA terms.

The CO modelling results at the worst-case receptor results indicate that the ambient ground level concentrations are in compliance with the relevant air quality standards for CO.

3.6. Mitigation Measures

3.6.1. Construction Phase

Ground disturbance is unlikely to have indirect impacts the Killala Bay/Moy Estuary SAC or the Killala Bay/Moy Estuary SPA. However, as a precaution, best practice construction methods are proposed to include standard site management to prevent local impacts. The standard best practices also outline methods for the prevention of chemical pollution.

The measures outlined in the following sections will be put in place during the construction phase to ensure protection of surface waterbodies and groundwater. Construction works will be informed by best practice guidance from Inland Fisheries Ireland on the prevention of pollution during development projects. These measures comply with the following relevant CIRIA and Inland fisheries guidance documents:

- Control of Water Pollution from construction Sites, Guidance for consultants and contractors (C532)
- Environmental Good Practice on Site (3rd edition) (C692)
- Guidelines on Protection of Fisheries During Construction Works in and Adjacent to Waters (2016).

The Outline CEMP includes a reference to the EcIA Report and to this NIS for the Proposed Development which establishes the connectivity of the site drainage to the Killala Bay/Moy Estuary SAC and the Killala Bay/Moy Estuary SPA.

Detailed mitigation included in the Outline CEMP is referred to as follows:

Surface Water

Prior to any works, all personnel involved will receive an on-site induction relating to operations adjacent to watercourses and the environmentally sensitive nature of the drainage ditches and the Killala Bay/Moy Estuary, and re-emphasise the precautions that are required as well as the construction management measures to be implemented.

The project proponent will ensure that the engineer setting out the works is fully aware of the ecological constraints and construction management requirements.

Pollution of watercourses

- Site boundary markings to safeguard features of interest/value, e.g. drainage connectivity with the Killala Bay/Moy Estuary will be established.

- The protection of the Killala Bay/Moy Estuary downstream will be ensured by a stepwise approach to site preparation with the installation of a silt fence to be placed prior to construction activity, checked weekly during operation and only removed when the construction activity pathway to the Killala Bay/Moy Estuary has been removed.
- The purpose of the silt fencing is to prevent silt laden water leaving the site and entering adjoining lands and the adjacent watercourses. A typical silt fence detail is shown below in the Figure below. It will consist of a double layer of geotextile membrane fixed to

wooden stakes approximately 600mm high. The membrane will be anchored into the ground to form a continuous barrier to silt laden water from the works site.

- Silt fences will be monitored via a silt inspection log (to be maintained by the Environmental Manager) and periodically maintained during the construction period. Typical maintenance will consist of repairs to damaged sections of membrane and removal of a build-up of silt on the upslope side of the fence. Daily silt fence inspections are recommended as part of their operation ensuring that any necessary repairs can be expedited.

Typical silt fence to be employed.

- A Waste Management Plan will identify any material such as dust, sand, rubble, concrete that may be generated during demolition works and address its storage and appropriate removal from the site to avoid pathways identified as having connectivity with Killala Bay/Moy Estuary.

Fuel/Lubricant spillage from equipment

- Chemicals used will be stored in sealed containers.
- Chemicals shall be applied in such a way as to avoid any spillage or leakage.
- All refuelling, oiling and greasing will take place above drip trays or on an impermeable surface which provides protection to underground strata and watercourses and away from drains and watercourses as far as reasonably practicable. Vehicles will not be left unattended during refuelling.
- Storage areas, machinery depots and site offices will be located within the site boundary.

- Spill kits will be made available and all staff will be properly trained on correct use.
- All fuels, lubricants and hydraulic fluids required to be stored on site will be kept in secure bunded areas at a minimum of 10m from the drainage any watercourses. The bunded area will accommodate 110% of the total capacity of the containers within it.
- Containers will be properly secured to prevent unauthorised access and misuse. An effective spillage procedure will be put in place with all staff properly briefed. Any waste oils or hydraulic fluids will be collected, stored in appropriate containers and disposed of offsite in an appropriate manner.
- All plant shall be well maintained with any fuel or oil drips attended to on an ongoing basis.
- Any minor spillage during this process will be cleaned up immediately.
- Should any incident occur, the situation will be dealt with and coordinated by the nearest supervisor who will be responsible for instructions by the Local Authority.

Concrete

- Wet concrete and cement are very alkaline and corrosive and can cause serious pollution to watercourses.
- Disposal of raw or uncured waste concrete will be controlled to ensure that Killala Bay/Moy Estuary will not be impacted.
- Best practice in bulk-liquid concrete management addressing pouring and handling, secure shuttering / form-work, adequate curing times will be implemented.
- Wash water from cleaning ready mix concrete lorries and mixers may be contaminated with cement and is therefore highly alkaline, therefore, washing will not be permitted on site.

Landscaping

A comprehensive Landscape Plan has been prepared which has regard to the rehabilitation of the existing site to provide supporting native hedge, Whip planting and additional native trees merging to support the surrounding woodland where existing trees and vegetation will be retained.

3.7. Assessment of In-Combination Effects

The Commission services' interpretation document 'Managing Natura 2000 sites', makes clear that the phrase 'in combination with other plans or projects' in Article 3(3) refers to cumulative effects caused by the projects or plans that are currently under consideration together with the effects of any existing or Proposed Developments or plans. When impacts are assessed in combination in this way, it can be established whether or not there may be, overall, an impact which may have significant effects on a Natura 2000 site or which may adversely affect the integrity of a site.

As part of the Appropriate Assessment, in addition to the proposed works, other relevant projects and plans in the region must also be considered at this stage. This step aims to identify at this early stage any possible significant in-combination or cumulative effects / impacts of the proposed development with other such plans and projects on the Natura 2000 site.

A review of the National Planning Application Database was undertaken. The database was queried for developments granted planning permission within the zone of impact of the Proposed Development presented in Table 3.

Table 3. Relevant Planning History within the vicinity of the subject site.

Planning Reference, Application and Location	Development Description	Decision Date	Grant Date
2360182 BP Mitchell Haulage and Plant Hire Ltd. Mullafarry Townland, Killala, Co. Mayo, F26 XY45	The development will consist of an Inert Waste Recovery Facility within an application area of c. 1.8 Ha.	01/02/2024	-
2360376 Brendan & Lorraine Cattigan Farragh, Killala, Co. Mayo	The application will consist of planning permission to (1) Demolish part of existing house and existing porch, (2) Demolish existing shed, (3) Construct extension and carry out alterations to existing dwelling house (4) Construct new Effluent Treatment System with all associated works, (5) Connect to all services, and (6) Carry out all required ancillary works on site.	09/11/2023	10/12/2023
2360218 Olivia & Tony Browne Crosspatrick, Killala, Co. Mayo, F26WC81	1. Demolish existing dwelling house 2. Construct new Dwelling House 3. All ancillary services associated with the development	01/08/2023	01/09/2023
22757 Lorcan Brennan Coonealcauran, Ballina, Co. Mayo	Filling of approximately 15,000 square metres of existing land by the importation of construction and demolition waste material to an average depth of 2m, level and	17/05/2023	17/06/2023

Planning Reference, Application and Location	Development Description	Decision Date	Grant Date
	reseed the site on completion of the fill, together with all associated site works		
2360266 Constant Energy Old Ashai Plant, Killala Business Park, Killala	The Proposed Development will consist of a Hydrogen Plant and an Energy Centre. The Hydrogen Plant, to the south of the site ,will consist of a Double Storey Electrolyser Building of up to 24m height; Fin Fan Coolers of up to 10.5m height; Hydrogen Storage Area of 7m height; Hydrogen Gas Tube Filling Station of up to 9m height, Gas Injection Compound and Gas Above Ground Installation Building of 4m height; Electrical Substation up to 15m height and Ancillary Equipment Building of up to 3m height; Fire Water Tank of up to 14m height; Pump House of up to 5m height; Administration/welfare building and control block building of up to 4m height. The Energy Centre, to the north of the site, will consist of 9no. Gas Engines generating up to 106MW of power, housed in a Gas Engine Building of up to 13.6m height with two stacks of up to 25m height, Distillate fuel tank of up to 11.2m height, Firewater tank of up to 10m height, associated pumps, sludge tank of 2.1m height and Pump house of 5m Height, Electrical Building of 4m Height, Gate House of up to 4m Height, Administration/Welfare building of up to 4m Height. The Proposed Development includes the demolition and removal of the existing Asahi Plant buildings, foundations, as well as decommissioning and removal of the existing overhead, above ground drainage system and underground services. The Proposed Development will also include Resurfacing, Repair and Improvement of Existing Site Entrance and new Internal Access Roads which in turn opens onto the existing entrance road to the Ballina/Killala regional road (R314). The provision for 23 no. car parking spaces, footpaths, street lighting, external lighting, CCTV cameras, signage, security fencing, construction compound, and all other associated site development plant and equipment and other works including, utilities connections, potable water, stormwater, sewage, and foul wastewater drainage	Decision due 29/10/2024	-

Planning Reference, Application and Location	Development Description	Decision Date	Grant Date
	infrastructure, within a total overall application boundary of 6.88ha.		
2360134 Mayo Renewable Limited Tawnaghmore Upper and Tawnaghmore Lower, Killala, Co. Mayo, F26 X7NP	A nominal 50 megawatt electricity generating station, combusting woody biomass chips (domestic and imported) as well as a small proportion of fuel oil for boiler start-up. The total site area is 19.0 ha of which approximately 7 ha will be developed. The elements of the station are: weighbridges (2 no.), scale house, roundwood storage area, log deck, enclosed wood chipper, wood chip truck dump, wood chip receiving hopper, wood chip screen, wood chip hog, wood chip bins (2 no.), wood chip storage building, wood chip reclaimer, wood chip conveyors with associated magnetic separators, fuel oil storage tank and associated pumps, fuel oil generator, boiler house, baghouse, ash silo, induced draft fan room, boiler stack, combustion air and flue gas fans, boiler additive material receiving hoppers (3 no.), boiler additive conveyors with associated magnetic separators, boiler additive silos (3 no.), boiler water treatment tanks and associated pumps, ammonia tank and associated pumps, turbine hall (existing), control room (existing), cooling tower and associated pumps, water treatment building, waste water storage tank, fire water storage tank and associated pumps, compressed air system, high voltage transfer lines (3 no.), low voltage transfer lines (3 no.), GSU transformer, switchyard, switchyard MCC room (existing), storage and maintenance building (existing), garage, car park, HGV parking, flagpoles (3 no.), external lighting, CCTV cameras, internal road system, signage, construction compound, landscaping, foul and storm water disposal systems, storm water attenuation, wheel washes, gatehouses (2 no.), entrance gates, security fencing, and all associated site works and services. (See attached Description of Proposed Development document for more details.)	20/02/2024	22/03/2024

Planning Reference, Application and Location	Development Description	Decision Date	Grant Date
22927 Vincent & Gillian McGuire Carrowreagh, Killala, co. Mayo	Demolish existing detached dormer bungalow dwelling house and construct a replacement two storey dwelling house with all associated ancillary site works	03/02/2023	10/03/2023
22288 Tom & Grace Zajac Meelick, Killala, Co. Mayo	Construction of a dwelling house and domestic garage with effluent treatment system and for all associated site works on this site	13/10/2022	12/11/2022
211284 Mullafarry Quarry LTD. Mullafarry & Cloonawillin, Killala, Co. Mayo	1.0 Hectare extension to an existing authorised quarry and will comprise of the following: Extraction of material by blasting means down to a level of -2.0mod; transportation of extracted material to the existing quarry for processing; landscaping and restoration of the site upon completion of work and all associated ancillary facilities. The applicant is seeking a 10-year permission.	23/09/2022	-
22562 Aqua Comms (Ireland) Ltd. Killala Business Park, Killala, Co. Mayo	Erection of a one-storey extension to existing cable landing station, proposed esb substation and all associated site works	29/08/2022	29/09/2022
211313 Alec McGregor Leadymore, Killala, Co. Mayo	Construction of a walled silage slab and slatted cubicle shed and underground slurry storage tank along with all associated site works	03/08/2022	03/09/2022
22464 Eamon Killeen On Behalf of Killala Gaa Club Rathowen East, Killala, Co. Mayo	construct new clubhouse, proprietary effluent treatment unit and percolation area including all ancillary site works	22/07/2022	22/08/2022
2193 Lisglennon Ad Limited Lisglennon, Ballybroony, Coonealmore, Coonealcauraun, Rathrooen, Culleens,, Laghtadawannagh & Farrannoo, Ballina, Co. Mayo	An anaerobic digestion (ad) biogas facility and associated gas pipeline. Comprising of: renewable energy project consisting of an ad biogas facility using locally sourced silage & slurry as feedstock to generate biogas for export to the national grid with residual digestate being available for use locally as bio-fertiliser; 2 no grass silage storage clamps; access & circulation tract from the l1110 of c.832m with average width of 6m; new site entrance on the Mullafarry Road and c.236 of new 4m wide site access track and upgrade of c.92m; pipeline of c.8.6km located in the public road and verges to connect the ad facility to the national grid north of Ballina; all ancillary development including a site office building, weighbridge, perimeter	07/06/2022	-

Planning Reference, Application and Location	Development Description	Decision Date	Grant Date
	landscaping berm, fencing, lighting, attenuation tank and on-site drainage; nis accompanies the application		
211228 Marcus Hannick Crosspatrick, Killala, Co. Mayo	Construction of a new dwelling house and domestic garage new entrance on-site wastewater treatment system together with ancillary site development works	26/01/2022	01/03/2022
211290 Joesph & Annie McDonnell Meelick, Killala, Co Mayo	Construction of new dwelling house and on-site wastewater treatment system together with ancillary site development works	23/03/2022	26/04/2022
21708 BP Mitchell Haulage and Plant Hire Ltd. Mullafarry Townland, Killala, Co. Mayo	Continued use and operation of the existing limestone quarry (c. 3.97 ha) including wheelwash, settlement lagoons, portable office, workshop and all associated ancillary activities, permitted under plan reg. Ref. No. 02/1931 and 08/1563; installation of a packaged wastewater treatment system and polishing filter	11/01/2022	14/02/2022
21795 Helen Stephens Farragh, Killala, Co. Mayo	Extend and reconstruct dwelling house, construct domestic garage, retain minor alterations to include gable window, retain extension to rear of dwelling house	13/12/2021	25/01/2022
21640 Brian & Marie Campbell Moyne, Killala, Co. Mayo	Demolition of an existing 2 storey dwelling and construction of a replacement 2 storey dwelling and associated ancillary works	04/08/2021	07/09/2021
21241 Wesley & Stephanie Langdon Moyne, Killala, Co. Mayo	Construct a dwelling house and septic tank/proprietary effluent treatment system together with all ancillary site works and services	01/07/2021	04/08/2021
21487 Declan & Mary Nolan Moyne, Killala, Co. Mayo	Demolish existing detached house, construct replacement detached dwelling house together with all associated site works	01/07/2021	04/08/2021
21257 Michael Lynn and Susan Cummins Moyne, Killala, Co. Mayo	Demolish an existing house and construct a new dwelling house, garage and septic tank/proprietary effluent treatment system together with all ancillary site works (including removal of sheds/existing septic tank) and services	01/07/2021	04/08/2021
21342 Mullafarry Quarry LTD. Mullafarry, Killala, Co. Mayo	Filling of lands with inert waste for the purpose of quarry restoration, and all associated ancillary works.	22/11/2021	27/12/2021
2122 Gerard & Valarie Adams Carrowreagh, Killala, Co. Mayo	Demolish existing detached dwelling house, construct replacement detached dwelling house, together with all associated site works	08/03/2021	11/04/2026

Planning Reference, Application and Location	Development Description	Decision Date	Grant Date
20644 Ray Carroll Mullafarry, Killala, Co. Mayo	Construct new dwelling house, proprietary effluent treatment system, percolation area including all ancillary site works.	04/03/2021	08/04/2021
20266 Nicholas Bourke Rathoma, Killala, Co. Mayo	Construct a 4-bay double slatted shed with a creep area and underground slurry storage tank along with all associated site works	07/12/2020	
19967 B.O.M. Newtownwhite Educate Together N.S. Newtownwhite, Ballina, Co. Mayo	Retention for the erection of a prefabricated structure (84sqm) for use as a temporary classroom, full planning permission for the construction of a new single storey extension (278sqm) consisting of 2 no. Classrooms and 1 no. Multi purpose resource room, alterations of internal layout of existing school building and the installation of a new effluent treatment system and percolation area together with new boundary treatments and all associated site works	13/10/2020	18/11/2020
20460 Kevin & Antoinette Maheady Ballinteean, Killala, Co. Mayo	Extend and reconstruct dwelling house including all ancillary site works.	02/09/2020	06/10/2020
20123 Jonathan & Oonagh Petrie RAthowen East, Killala, CO. Mayo	Construct new dwelling house, domestic garage, on-site wastewater treatment system together with ancillary site development works	29/06/2020	13/08/2020
19295 Kevin & Mary Mcdonnell Townplots West, Killala, Co. Mayo	construction of 3 no. 2 storey terraced houses, connect to all public utilities and carry out all ancillary site works	20/03/2020	19/06/2020
19724 Bob Sweeny Rosserrk, Ballina, Co. Mayo	Construct an indoor horse arena complete with stable block, horse handling area, domestic kitchen/canteen and toilet facilities (2,635.2 sqm), construction of a 4 bay machinery shed (252 sqm), construction of a 2 bay manure shed (99.2 sqm), complete with domestic septic system, boundary treatment, parking and all ancillary site development works	21/02/2020	27/03/2020
19312 Alcam Retail Ltd Market Street, Killala, Co. Mayo	Extension of existing supermarket at ground floor level into the adjoining shop premises to the north side with an 80 sq.m. increase in floor area. Associated revisions to shop front to facilitate extension into adjoining shop and refurbishment of existing shop, including new street front entrance and associated signage. Extension into existing adjoining premises to the north side at lower ground floor/basement level for storage with an increase in floor	06/02/2020	12/03/2020

Planning Reference, Application and Location	Development Description	Decision Date	Grant Date
	area of 26 sq.m. Filling in of a portion of unusable lower ground floor/basement area of adjoining premises to the north side. Breaking out of a fire escape door on the south side to the lower ground floor of the existing premises onto the car park. Revisions to first floor of adjoining premises to north to provide a 1-bedroom apartment accessed from stairs serving first floor of existing building. Conversion of existing 5-bedroom apartment to first floor of existing building to 2 apartments, comprising 1 no. 2 bedroom apartment and 1 no. 1 bedroom apartment. All associated revisions to elevations, all associated demolitions and breaking out and all ancillary site works and services		
19205 Mullafarry Quarry Ltd. Mullafarry, Killala, Co. Mayo	Construct an ESB electricity substation with switch room building and the erection and operation of an asphalt mixing plant (height 20m), aggregate loading bins, hot storage bins and all associated ancillary works on 0.2-hectare area within the existing quarry complex	24/10/2019	28/11/2019
19260 Killala Community Windfarm Designated Activity Company Mullafarry and Tawnaghmore Lower, Killala, Co. Mayo	25-year permission for a single electricity generating wind turbine with an overall maximum height of up to 125m. The development will also consist of a turbine hardstand, access track of c.394m, internal cable trench of c.1,775m and ancillary site works. The planning application is accompanied by a Natura Impact Statement	10/09/2019	15/10/2019
19136 Carr & Sons Seafood Ltd. Townplots West, Killala, Co. Mayo	1. Demolition of existing storage extensions to the north and south of the existing administration building; 2. Construct three new extensions to existing administration building comprising of cold storage extension to the north, workshop and compressor room extension to the west and extension to facilitate dispatch cold room, salting room and washing room to the south; 3. Construct new extension to the north of existing factory building to comprise of washing room and covered canopy; 4). Retention of existing extension building to the west of the existing administration building used for purposes of blast freezer, retention of compressor room to the north along with all ancillary site works; 5). Retention of the existing	29/08/2019	30/09/2019

Planning Reference, Application and Location	Development Description	Decision Date	Grant Date
	stand-alone building for the purposes of waste recycling, along with all ancillary and site works		
19351 Westland Networks LTD Tawnaghmore Upper, Killala Business Park	A 20m free-standing structure carrying telecommunications equipment together with associated infrastructure including underground cabling and all ancillary development.	08/07/2019	12/08/2019
18764 Killala Sports & Social Club Ltd., T/A Killala Fc Courthouse Street, Townplots East, Killala, Co. Mayo	First floor extension to the existing club house to include a meeting room, office, gym, general purpose room, plant/storage area and toilet facilities. A wheelchair accessible toilet and two additional changing rooms shall be provided on the existing ground floor of the club house with minor modifications to the existing layout together with all ancillary site works	26/11/2018	02/01/2019
17619 Killala Community Windfarm Designated Activity Company Magherabrack/Mullafarry, Tawnaghmore Lower/Upper, Meelick/Killala	10-year planning permission for 5 turbine wind farm. Proposed development will be located in the townlands of Magherabrack, Mullafarry, Tawnaghmore lower, Mellick and Tawnaghmore upper, Killala approx. 1.3km south of Killala. Development is an updated application to the consented 6 turbine wind farm p09/780. Proposal is for a wind energy development comprising 5 electricity generating wind turbines, each with a rotor diameter not exceeding 103.2m a hub height not exceeding 73.5m and a blade tip height of not exceeding 126m. The development will include a meteorological mast not exceed 82m in height, internal underground electrical cabling, a substation building, an external underground grid connection cable and ducting to the existing 110kv Tawnaghmore substation, associated grid substation works, associated site access roads and ancillary site works including upgrades to existing site access, a temporary construction compound and haulage route works. The max output capacity of the wind farm will be up to 18mw and has an intended operation life of 25 years	11/01/2018	15/02/2018

3.7.1. Conclusion of In-combination Effects

Given the inclusion of strict Best Practice Construction Measures to be included and enforced through a Construction Environmental Management Plan, the proposed development will have no predicted

impacts on local ecology and biodiversity or on hydrologically linked European sites, therefore in-combination impacts can be ruled out.

The Mayo County Development Plan in complying with the requirements of the Habitats Directive requires that all Projects and Plans that could affect the Natura 2000 sites in the same zone of impact of the Proposed Development site would be initially screened for Appropriate Assessment and if requiring Stage 2 AA, that appropriate employable mitigation measures would be put in place to avoid, reduce or ameliorate negative impacts. In this way, any in-combination impacts with Plans or Projects for the development area and surrounding townlands in which the development site is located, would be avoided.

Any new applications for the Proposed Development area will be assessed on a case by case basis *initially* by Mayo County Council which will determine the requirement for AA Screening as per the requirements of Article 6(3) of the Habitats Directive.

4. Natura Impact Statement & Conclusion

This NIS has reviewed the predicted impacts arising from the Proposed Development and found that with the implementation of appropriate mitigation measures specifically with regard to surface water, significant effects on the integrity of the Killala Bay/Moy Estuary SAC and Killala Bay/Moy Estuary SPA can be ruled out.

It is the conclusion of this NIS, on the basis of the best scientific knowledge available, and with the implementation of the mitigation and restriction measures set out under Section 3.6., that the possibility of any adverse effects on the integrity of the European Sites considered in this NIS (having regard to their conservation objectives), or on the integrity of any other European Sites (having regard to their conservation objectives,) arising from the proposed development, either alone or in combination with other plans or projects, can be excluded beyond reasonable scientific doubt.

A final determination will be made by the competent authority in this regard.

5. References

Department of the Environment, Heritage and Local Government (2009) Guidance on Appropriate Assessment of plans and projects in Ireland (as amended February 2010).

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NPWS (2012) Conservation Objectives: Killala Bay/Moy Estuary SAC 000458. Version 1.0. National Parks and Wildlife Service, Department of Culture, Heritage and the Gaeltacht.

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APPENDIX 8.1

DESCRIPTION OF THE AERMOD MODEL

PREPARED BY AWN CONSULTING

The AERMOD dispersion model has been developed in part by the U.S. Environmental Protection Agency (USEPA) (USEPA, 1995; 1998; 1999; 2000; 2005; 2022). The model is a steady-state Gaussian model used to assess pollutant concentrations associated with industrial sources. The model is an enhancement on the Industrial Source Complex-Short Term 3 (ISCST3) model which has been widely used for emissions from industrial sources.

Improvements over the ISCST3 model include the treatment of the vertical distribution of concentration within the plume. ISCST3 assumes a Gaussian distribution in both the horizontal and vertical direction under all weather conditions. AERMOD with PRIME, however, treats the vertical distribution as non-Gaussian under convective (unstable) conditions while maintaining a Gaussian distribution in both the horizontal and vertical direction during stable conditions. This treatment reflects the fact that the plume is skewed upwards under convective conditions due to the greater intensity of turbulence above the plume than below. The result is a more accurate portrayal of actual conditions using the AERMOD model. AERMOD also enhances the turbulence of night-time urban boundary layers thus simulating the influence of the urban heat island.

In contrast to ISCST3, AERMOD is widely applicable in all types of terrain. Differentiation of the simple versus complex terrain is unnecessary with AERMOD. In complex terrain, AERMOD employs the dividing-streamline concept in a simplified simulation of the effects of plume-terrain interactions. In the dividing-streamline concept, flow below this height remains horizontal, and flow above this height tends to rise up and over terrain. Extensive validation studies have found that AERMOD (precursor to AERMOD with PRIME) performs better than ISCST3 for many applications and as well or better than CTDMPLUS for several complex terrain data sets (Paine, 1997b).

Due to the proximity to surrounding buildings, the PRIME (Plume Rise Model Enhancements) building downwash algorithm has been incorporated into the model to determine the influence (wake effects) of these buildings on dispersion in each direction considered. The PRIME algorithm takes into account the position of the stack relative to the building in calculating building downwash. In the absence of the building, the plume from the stack will rise due to momentum and/or buoyancy forces. Wind streamlines act on the plume leads to the bending over of the plume as it disperses. However, due to the presence of the building, wind streamlines are disrupted leading to a lowering of the plume centreline.

When there are multiple buildings, the building tier leading to the largest cavity height is used to determine building downwash. The cavity height calculation is an empirical formula based on building height, the length scale (which is a factor of building height & width) and the cavity length (which is based on building width, length and height). As the direction of the wind will lead to the identification of differing dominant tiers, calculations are carried out in intervals of 10 degrees.

In PRIME, the nature of the wind streamline disruption as it passes over the dominant building tier is a function of the exact dimensions of the building and the angle at which the wind approaches the building. Once the streamline encounters the zone of influence of the building, two forces act on the plume. Firstly, the disruption caused by the building leads to increased turbulence and enhances horizontal and vertical dispersion. Secondly, the streamline descends in the lee of the building due to the reduced pressure and drags the plume (or part of) nearer to the ground, leading to higher ground level concentrations. The model calculates the descent of the plume as

a function of the building shape and, using a numerical plume rise model, calculates the change in the plume centreline location with distance downwind.

The immediate zone in the lee of the building is termed the cavity or near wake and is characterised by high intensity turbulence and an area of uniform low pressure. Plume mass captured by the cavity region is re-emitted to the far wake as a ground-level volume source. The volume source is located at the base of the lee wall of the building, but is only evaluated near the end of the near wake and beyond. In this region, the disruption caused by the building downwash gradually fades with distance to ambient values downwind of the building.

AERMOD has made substantial improvements in the area of plume growth rates in comparison to ISCST3 (Paine, 1997a; Paine, 1997b; USEPA, 1999). ISCST3 approximates turbulence using six Pasquill-Gifford-Turner Stability Classes and bases the resulting dispersion curves upon surface release experiments. This treatment, however, cannot explicitly account for turbulence in the formulation. AERMOD is based on the more realistic modern planetary boundary layer (PBL) theory which allows turbulence to vary with height. This use of turbulence-based plume growth with height leads to a substantial advancement over the ISCST3 treatment.

Improvements have also been made in relation to mixing height (Paine, 1997a; Paine, 1997b; USEPA, 1999; USEPA, 2022). The treatment of mixing height by ISCST3 is based on a single morning upper air sounding each day. AERMOD, however, calculates mixing height on an hourly basis based on the morning upper air sounding and the surface energy balance, accounting for the solar radiation, cloud cover, reflectivity of the ground and the latent heat due to evaporation from the ground cover. This more advanced formulation provides a more realistic sequence of the diurnal mixing height changes.

AERMOD also has the capability of modelling both unstable (convective) conditions and stable (inversion) conditions. The stability of the atmosphere is defined by the sign of the sensible heat flux. Where the sensible heat flux is positive, the atmosphere is unstable whereas when the sensible heat flux is negative the atmosphere is defined as stable. The sensible heat flux is dependent on the net radiation and the available surface moisture (Bowen Ratio). Under stable (inversion) conditions, AERMOD has specific algorithms to account for plume rise under stable conditions, mechanical mixing heights under stable conditions and vertical and lateral dispersion in the stable boundary layer.

AERMOD also contains improved algorithms for dealing with low wind speed (near calm) conditions. As a result, AERMOD can produce model estimates for conditions when the wind speed may be less than 1 m/s, but still greater than the instrument threshold.

APPENDIX 8.1

METEOROLOGICAL DATA – AERMET

PREPARED BY AWN CONSULTING

AERMOD incorporates a meteorological pre-processor AERMET (version 16216) (USEPA, 2018). AERMET allows AERMOD to account for changes in the plume behaviour with height. AERMET calculates hourly boundary layer parameters for use by AERMOD, including friction velocity, Monin-Obukhov length, convective velocity scale, convective (CBL) and stable boundary layer (SBL) height and surface heat flux. AERMOD uses this information to calculate concentrations in a manner that accounts for changes in dispersion rate with height, allows for a non-Gaussian plume in convective conditions, and accounts for a dispersion rate that is a continuous function of meteorology.

The AERMET meteorological preprocessor requires the input of surface characteristics, including surface roughness (z_0), Bowen Ratio and albedo by sector and season, as well as hourly observations of wind speed, wind direction, cloud cover, and temperature. A morning sounding from a representative upper air station, latitude, longitude, time zone, and wind speed threshold are also required.

Two files are produced by AERMET for input to the AERMOD dispersion model. The surface file contains observed and calculated surface variables, one record per hour. The profile file contains the observations made at each level of a meteorological tower, if available, or the one-level observations taken from other representative data, one record level per hour.

From the surface characteristics (i.e. surface roughness, albedo and amount of moisture available (Bowen Ratio)) AERMET calculates several boundary layer parameters that are important in the evolution of the boundary layer, which, in turn, influences the dispersion of pollutants. These parameters include the surface friction velocity, which is a measure of the vertical transport of horizontal momentum; the sensible heat flux, which is the vertical transport of heat to/from the surface; the Monin-Obukhov length which is a stability parameter relating the surface friction velocity to the sensible heat flux; the daytime mixed layer height; the nocturnal surface layer height and the convective velocity scale which combines the daytime mixed layer height and the sensible heat flux. These parameters all depend on the underlying surface.

The values of albedo, Bowen Ratio and surface roughness depend on land-use type (e.g., urban, cultivated land etc) and vary with seasons and wind direction. The assessment of appropriate land-use types was carried out in line with USEPA recommendations (USEPA, 2005) and using the detailed methodology outlined by the Alaska Department of Environmental Conservation (ADEC, 2008). AERMET has also been updated to allow for an adjustment of the surface friction velocity (u*) for low wind speed stable conditions based on the work of Qian and Venkatram. Previously, the model had a tendency to over-predict concentrations produced by near-ground sources in stable conditions.

Surface roughness

Surface roughness length is the height above the ground at which the wind speed goes to zero. Surface roughness length is defined by the individual elements on the landscape such as trees and buildings. In order to determine surface roughness length, the USEPA recommends that a representative length be defined for each sector, based on geometric mean of the inverse distance area-weighted land use within the sector, by using the eight land use categories outlined by the USEPA. The area-weighted surface roughness length derived from the land use classification within a radius of 1 km from Belmullet is shown in Table.9.2.0.1.

Table.9.2.0.1 Surface Roughness based on an inverse distance area-weighted average of the land use within a 1 km radius of Belmullet

Sector	Area Weighted Land Use Classification	Spring	Summer	Autumn	Winter Note 1
180-140	100% Grassland	0.05	0.1	0.01	0.001
140-180	100% Water (fresh and sea)	0.001	0.001	0.001	0.001

Note 1 Winter defined as periods when surfaces covered permanently by snow whereas autumn is defined as periods when freezing conditions are common, deciduous trees are leafless and no snow is present. Thus for the current location autumn more accurately defines "winter" conditions at the facility.

Albedo

Noon-time Albedo is the fraction of the incoming solar radiation that is reflected from the ground when the sun is directly overhead. Albedo is used in calculating the hourly net heat balance at the surface for calculating hourly values of Monin-Obuklov length. The area-weighted arithmetic mean albedo derived from the land use classification over a 10 km x 10 km area centred on Belmullet is shown in Table 0.2.

Table 0.2 Albedo based on an area-weighted arithmetic mean of the land use over a 10 km x 10 km area centred on Belmullet

Area Weighted Land Use Classification	Spring	Summer	Autumn	Winter Note 1
85% Grassland, 15% Water (fresh & sea)	0.17	0.19	0.20	0.60

Note 1 For the current location autumn more accurately defines "winter" conditions at the facility.

Bowen Ratio

The Bowen ratio is a measure of the amount of moisture at the surface of the earth. The presence of moisture affects the heat balance resulting from evaporative cooling which, in turn, affects the Monin-Obukhov length which is used in the formulation of the boundary layer. The area-weighted geometric mean Bowen ratio derived from the land use classification over a 10 km x 10 km area centred on Belmullet is shown in Table 9.2.0.3.

Table 9.2.0.3 Bowen Ratio based on an area-weighted geometric mean of the land use over a 10 km x 10 km area centred on Belmullet

Area Weighted Land Use Classification	Spring	Summer	Autumn	Winter Note 1
85% Grassland, 15% Water (fresh & sea)	0.38	0.73	0.93	1.50

Note 1 For the current location autumn more accurately defines "winter" conditions at the facility.

APPENDIX 10.1

GLOSSARY OF ACOUSTIC TERMINOLOGY

PREPARED BY AWN CONSULTING

ambient noise	The totally encompassing sound in a given situation at a given time, usually composed of sound from many sources, near and far.
background noise	The steady existing noise level present without contribution from any intermittent sources. The A-weighted sound pressure level of the residual noise at the assessment position that is exceeded for 90 per cent of a given time interval, T ($L_{AF90,T}$).
broadband	Sounds that contain energy distributed across a wide range of frequencies.
dB	Decibel - The scale in which sound pressure level is expressed. It is defined as 20 times the logarithm of the ratio between the RMS pressure of the sound field and the reference pressure of 20 micro-pascals (20 µPa).
dB L_{pA}	An 'A-weighted decibel' - a measure of the overall noise level of sound across the audible frequency range (20 Hz – 20 kHz) with A-frequency weighting (i.e. 'A'–weighting) to compensate for the varying sensitivity of the human ear to sound at different frequencies.
Hertz (Hz)	The unit of sound frequency in cycles per second.
impulsive noise	A noise that is of short duration (typically less than one second), the sound pressure level of which is significantly higher than the background.
$L_{Aeq,T}$	This is the equivalent continuous sound level. It is a type of average and is used to describe a fluctuating noise in terms of a single noise level over the sample period (T). The closer the L_{Aeq} value is to either the L_{AF10} or L_{AF90} value indicates the relative impact of the intermittent sources and their contribution. The relative spread between the values determines the impact of intermittent sources such as traffic on the background.
L_{AFN}	The A-weighted noise level exceeded for N% of the sampling interval. Measured using the "Fast" time weighting.
L_{AFmax}	is the instantaneous slow time weighted maximum sound level measured during the sample period (usually referred to in relation to construction noise levels).
$L_{Ar,T}$	The Rated Noise Level, equal to the L_{Aeq} during a specified time interval (T), plus specified adjustments for tonal character and impulsiveness of the sound.
L_{AF90}	Refers to those A-weighted noise levels in the lower 90 percentile of the sampling interval; it is the level which is exceeded for 90% of the measurement period. It will therefore exclude the intermittent features of traffic and is used to estimate a background level. Measured using the "Fast" time weighting.
L_{AT}(DW)	equivalent continuous downwind sound pressure level.

L_{fT}(DW)	equivalent continuous downwind octave-band sound pressure level.
L_{day}	L_{day} is the average noise level during the day time period of 07:00hrs to 19:00hrs
L_{night}	L_{night} is the average noise level during the night-time period of 23:00hrs to 07:00hrs.
low frequency noise	LFN - noise which is dominated by frequency components towards the lower end of the frequency spectrum.
noise	Any sound, that has the potential to cause disturbance, discomfort or psychological stress to a person exposed to it, or any sound that could cause actual physiological harm to a person exposed to it, or physical damage to any structure exposed to it, is known as noise.
noise sensitive location	NSL – Any dwelling house, hotel or hostel, health building, educational establishment, place of worship or entertainment, or any other facility or other area of high amenity which for its proper enjoyment requires the absence of noise at nuisance levels.
octave band	A frequency interval, the upper limit of which is twice that of the lower limit. For example, the 1,000Hz octave band contains acoustical energy between 707Hz and 1,414Hz. The centre frequencies used for the designation of octave bands are defined in ISO and ANSI standards.
rating level	See $L_{Ar,T}$.
sound power level	The logarithmic measure of sound power in comparison to a referenced sound intensity level of one picowatt (1pW) per m^2 where: $$Lw = 10Log\frac{P}{P_0}\ \text{dB}$$ Where: p is the rms value of sound power in pascals; and P_0 is 1 pW.
sound pressure level	The sound pressure level at a point is defined as: $$Lp = 20Log\frac{P}{P_0}\ \text{dB}$$
specific noise level	A component of the ambient noise which can be specifically identified by acoustical means and may be associated with a specific source. In BS 4142, there is a more precise definition as follows: 'the equivalent continuous A-weighted sound pressure level at the assessment position produced by the specific noise source over a given reference time interval ($L_{Aeq,T}$)'.
tonal	Sounds which cover a range of only a few Hz which contains a clearly audible tone i.e. distinguishable, discrete or continuous

	noise (whine, hiss, screech, or hum etc.) are referred to as being 'tonal'.
$^1/_3$ octave analysis	Frequency analysis of sound such that the frequency spectrum is subdivided into bands of one–third of an octave each.

APPENDIX 10.2

NOISE MODEL PARAMETERS

PREPARED BY AWN CONSULTING

Prediction calculations for noise emissions have been conducted in accordance with *ISO 9613: Acoustics – Attenuation of sound during propagation outdoors, Part 2: General method of calculation, 1996*. The following are the main aspects that have been considered in terms of the noise predictions presented in this instance.

Directivity Factor: The directivity factor (D) allows for an adjustment to be made where the sound radiated in the direction of interest is higher than that for which the sound power level is specified. In this case the sound power level is measures in a down wind direction, corresponding to the worst case propagation conditions and needs no further adjustment.

Ground Effect: Ground effect is the result of sound reflected by the ground interfering with the sound propagating directly from source to receiver. The prediction of ground effects is inherently complex and depend on source height receiver height propagation height between the source and receiver and the ground conditions. The ground conditions are described according to a variable defined as G, which varies between 0.0 for hard ground (including paving, ice concrete) and 1.0 for soft ground (includes ground covered by grass trees or other vegetation) Our predictions have been carried out using various source height specific to each plant item, a receiver heights of 1.6m for single storey properties and 4m for double. An assumed ground factor of G = 0.5 has been applied off site. Noise contours presented in the assessment have been predicted to a height of 4m in all instances. For construction noise predictions have been made at a level of 1.6m as these activities will not occur at night.

Geometrical Divergence This term relates to the spherical spreading in the free-field from a point sound source resulting in attenuation depending on distance according to the following equation:

$$A_{geo} = 20 \times \log(\text{distance from source in meters}) + 11$$

Atmospheric Absorption Sound propagation through the atmosphere is attenuated by the conversion of the sound energy into heat. This attenuation is dependent on the temperature and relative humidity of the air through which the sound is travelling and is frequency dependent with increasing attenuation towards higher frequencies. In these predictions a temperature of 10°C and a relative humidity of 70% have been used, which give relativity low levels of atmosphere attenuation and corresponding worst case noise predictions.

Table 10.2.1 *Atmospheric Attenuation Assumed for Noise Calculations (dB per km)*

Temp (ºC)	% Humidity	Octave Band Centre Frequencies (Hz)							
		63	125	250	500	1k	2k	4k	8k
10	70	0.12	0.41	1.04	1.92	3.66	9.70	33.06	118.4

Barrier Attenuation

The effect of any barrier between the noise source and the receiver position is that noise will be reduced according to the relative heights of the source, receiver and barrier and the frequency spectrum of the noise.

APPENDIX 10.3

NOISE MODELLING DETAILS AND ASSUMPTIONS

PREPARED BY AWN CONSULTING

Noise Model

A 3D computer-based prediction model has been prepared in order to quantify the noise level associated with the proposed building. This section discusses the methodology behind the noise modelling process.

DGMR iNoise

Proprietary noise calculation software has been used for the purposes of this modelling exercise. The selected software, DGMR iNoise 2024.1, calculates noise levels in accordance with *ISO 9613: Acoustics – Attenuation of sound during propagation outdoors, Part 2: General method of calculation, 1996*.

DGMR iNoise is a proprietary noise calculation package for computing noise levels in the vicinity of noise sources. iNoise calculates noise levels in different ways depending on the selected prediction standard. In general, however, the resultant noise level is calculated taking into account a range of factors affecting the propagation of sound, including:

the magnitude of the noise source in terms of A weighted sound power levels (L_{WA});
the distance between the source and receiver;
the presence of obstacles such as screens or barriers in the propagation path;
the presence of reflecting surfaces;
the hardness of the ground between the source and receiver;
Attenuation due to atmospheric absorption; and
Meteorological effects such as wind gradient, temperature gradient and humidity (these have significant impact at distances greater than approximately 400m).

Brief Description of ISO9613-2: 1996

ISO9613-2:1996 calculates the noise level based on each of the factors discussed previously. However, the effect of meteorological conditions is significantly simplified by calculating the average downwind sound pressure level, $L_{AT}(DW)$, for the following conditions:

- wind direction at an angle of ±45° to the direction connecting the centre of the dominant sound source and the centre of the specified receiver region with the wind blowing from source to receiver, and;

- wind speed between approximately 1ms-1 and 5ms-1, measured at a height of 3m to 11m above the ground.

The equations and calculations also hold for average propagation under a well-developed moderate ground based temperature inversion, such as commonly occurs on clear calm nights.

The basic formula for calculating $L_{AT}(DW)$ from any point source at any receiver location is given by:

$$L_{fT}(DW) = LW + Dc - A \qquad \textbf{Eqn. A}$$

Where:
$L_{fT}(DW)$ is an octave band centre frequency component of $L_{AT}(DW)$ in dB relative to $2x10^{-5}$Pa;
L_W is the octave band sound power of the point source;
D_c is the directivity correction for the point source;
A is the octave band attenuation that occurs during propagation, namely attenuation due to geometric divergence, atmospheric absorption, ground effect, barriers and miscellaneous other effects.

The estimated accuracy associated with this methodology is shown in Table 1 below:

Table 1 *Estimated Accuracy for Broadband Noise of $L_{AT}(DW)$*

Height, h*	Distance, d†	
	0 < d < 100m	100m < d < 1,000m
0<h<5m	±3dB	±3dB
5m<h<30m	±1dB	±3dB

* h is the mean height of the source and receiver. † d is the mean distance between the source and receiver.
N.B. These estimates have been made from situations where there are no effects due to reflections or attenuation due to screening.

Input Data and Assumptions

The noise model has been constructed using data from various source as follows:

Site Layout The general site layout has been obtained from the drawings forwarded by the project architects.

Local Area The location of noise sensitive locations has been obtained from a combination of site drawings provided by the project architects and others obtained from Ordinance Survey Ireland (OSI).

Heights The heights of buildings on site have been obtained from site drawings forwarded by HJL Architects. Off-site buildings have been assumed to be 8m high with the exception of industrial buildings where a default height of 15m has been assumed.

Contours Site ground contours/heights have been obtained from site drawings forwarded by HJL Architects where available.

The final critical aspect of the noise model development is the inclusion of the various plant noise sources. Details are presented in the following section.

Source Sound Power Data

The noise modelling competed indicates the following limits in relation to various items of plant associated with the overall site development. Plant items will be selected in order to achieve the stated noise levels and or appropriate attenuation will be incorporated into the design of the plant/building in order that the plant noise emission levels are achieved on site (including any system regenerated noise).

Table 2 *L_{wA} levels Utilised in Noise Model*

Source	L_{wA} - Octave Band Centre Frequency								dB (A)
	63	125	250	500	1k	2k	4k	8k	
Chillers	--	75	76	79	82	77	67	61	84
Generator Front	59	68	65	72	72	74	67	65	79
Generator Rear	64	74	68	58	52	53	59	75	79
Generator Side	68	77	73	77	77	78	73	76	85
Generator Top	74	81	81	79	80	80	76	76	88
Generator Vent Discharge	73	85	69	56	55	56	55	65	86
Generator Stack Outlet	80	90	77	77	76	70	60	47	90
Transformer	--	--	--	67	--	--	--	--	67

Note A Generator values based on rating of 65 dB at 10m from unit.

The louvre screen around the chillers is assumed to have the following performance:

Table 3 *Louvre acoustic performance*

Element	Sound Insertion Loss dB – Octave Band Centre Frequency (Hz)							
	63	125	250	500	1k	2k	4k	8k
Louvre	6	7	10	12	18	18	14	13

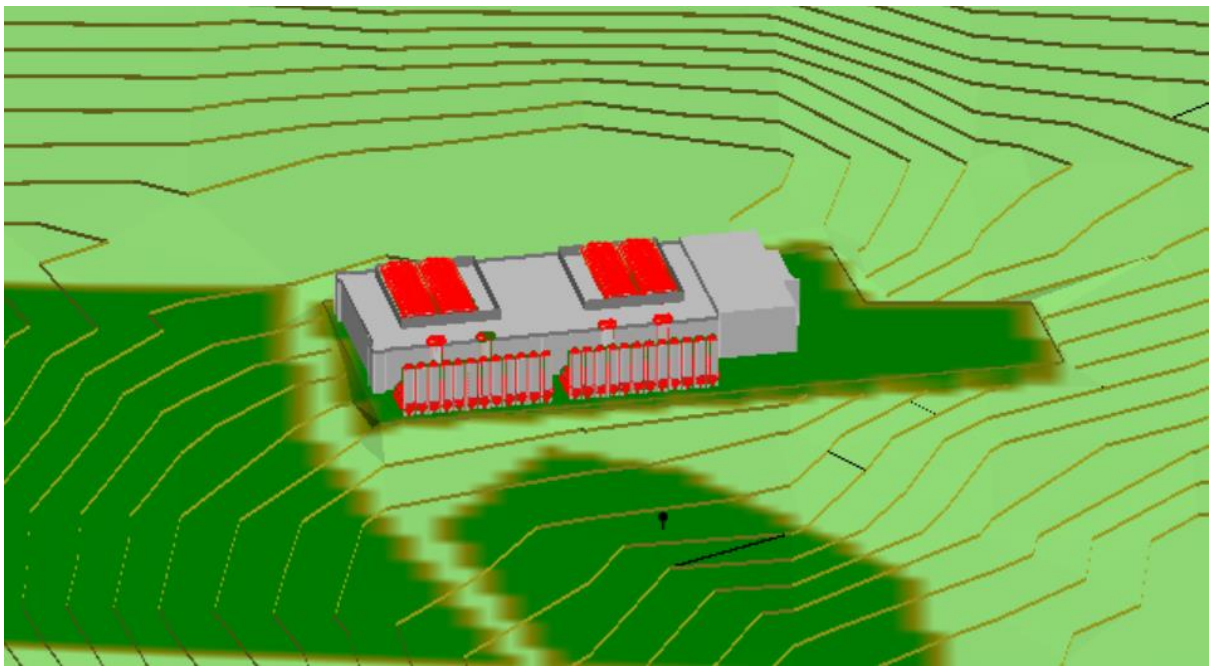

Figure 10.3.1 Image of Developed Noise Model.