Environmental Impact Assessment Report

Volume 3
Appendices

Large-Scale Residential Development (LRD)

Lands at Station Road (L2228) and Old Navan Road (R147), Townlands: Dunboyne, Clonee, Castle Farm and Loughsallagh, Co. Meath

On behalf of
John Connaughton Ltd.

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Brock McClure
PLANNING & DEVELOPMENT CONSULTANTS

63 York Road,
Dún Laoghaire,
Co. Dublin

www.brockmcclure.ie

APPENDICES TO CHAPTER 8

CHAPTER 8 – BIODIVERSITY APPENDICES

APPENDIX I – LEGISLATION AND POLICY

International Legislation

EU Birds Directive

The Birds Directive constitutes a level of general protection for all wild birds throughout the European Union. Annex I of the Birds Directive includes a total of 194 bird species that are considered rare, vulnerable to habitat changes or in danger of extinction within the European Union. Article 4 establishes that there should be a sustainable management of hunting of listed species, and that any large scale non-selective killing of birds must be outlawed. The Directive requires the designation of Special Protection Areas (SPAs) for: listed and rare species, regularly occurring migratory species and for wetlands which attract large numbers of birds. There are 25 Annex I species that regularly occur in Ireland.

EU Habitats Directive

The Habitats Directive aims to protect some 220 habitats and approx. 1000 species through-out Europe. The habitats and species are listed in the Directives annexes where Annex I covers habitats and Annex II, IV and V cover species. There are 59 Annex I habitats in Ireland and 33 Annex IV species which require strict protection wherever they occur. The Directive requires the designation of Special Areas of Conservation (SACs) for areas of habitat deemed to be of European interest. The SACs together with the SPAs from the Birds Directive from a network of protected sites called Natura 2000.

Bern and Bonn Convention

The Convention on the Conservation of European Wildlife and Natural Habitats (Bern Convention 1982) was enacted to conserve all species and their habitats. The Convention on the Conservation of Migratory Species of Wild Animals (Bonn Convention 1979, enacted 1983) was introduced in order to give protection to migratory species across borders in Europe.

Ramsar Convention

The Ramsar Convention on Wetlands is an intergovernmental treaty signed in Ramsar, Iran, in 1971. The treaty is a commitment for national action and international cooperation for the conservation of wetlands and their resources. In Ireland there are currently 45 Ramsar sites which cover a total area of 66,994ha.

Water Framework Directive

The EU Water Framework Directive (WFD) 2000/60/EC is an important piece of environmental legislation which aims to protect and improve 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; the second cycle ran from 2016 – 2021, and the current (third) cycle runs from 2022-

2027. The aim of the WFD is to prevent any deterioration in the existing status of water quality, including the protection of good and high-water quality status where it exists. The WFD requires member states to manage their water resources on an integrated basis to achieve at least 'good' ecological status, through River Basin Management Plans (RBMP), by 2027.

National Legislation

Wildlife Act 1976 and amendments

The Wildlife Act 1976 was enacted to provide protection to birds, animals, and plants in Ireland and to control activities which may have an adverse impact on the conservation of wildlife. With regard to the listed species, it is an offence to disturb, injure or damage their breeding or resting place wherever these occur without an appropriate licence from the National Parks and Wildlife Service (NPWS). This list includes all wild birds along with their nests and eggs. Intentional destruction of an active nest from the building stage up until the chicks have fledged is an offence. This includes the cutting of hedgerows from the 1st of March to the 31st of August. The act also provides a mechanism to give statutory protection to Natural Heritage Areas (NHAs). The Wildlife Amendment Act 2000 widened the scope of the Act to include most species, including the majority of fish and aquatic invertebrate species which were excluded from the 1976 Act.

The current list of plant species protected by Section 21 of the Wildlife Act, 1976 (and amendments) is set out in the Flora (Protection) Order, 2015 (S.I. No. 356/2015). The Flora (Protection) Order affords protection to several species of plant in Ireland, including 68 vascular plants, 40 mosses, 25 liverworts, 1 stonewort and 1 lichen. This Act makes it illegal for anyone to uproot, cut or damage any of the listed plant species and it also forbids anyone from altering, interfering, or damaging their habitats. This protection is not confined to within designated conservation sites and applies wherever the plants are found.

EU Habitats Directive 1992 and EC (Birds and Natural Habitats) Regulations 2011

The EU Directive on the Conservation of Natural Habitats and of Wild Fauna and Flora (Habitats Directive 1992) provides protection to particular species and habitats throughout Europe. The Habitats Directive has been transposed into Irish law through the EC (Birds and Natural Habitats) Regulations 2011.

Annex IV of the EU Habitats Directive provides protection to a number of listed species, wherever they occur. Under Regulation 23 of the Habitats Directive, any person who, in regard to the listed species, "Deliberately captures or kills any specimen of these species in the wild, deliberately disturbs these species particularly during the period of breeding, rearing, hibernation and migration, deliberately takes or destroys eggs from the wild or damages or destroys a breeding site or resting place of such an animal shall be guilty of an offence."

Invasive Species Legislation

Certain plant species and their hybrids are listed as Invasive Alien Plant Species in Part 1 of the Third Schedule of the *European Communities (Birds and Natural Habitats) Regulations* 2011 (SI 477 of 2011, as amended). In addition, soils and other material containing such invasive plant material, are classified in Part 3 of the Third Schedule as vector materials and are subject to the same strict legal controls.

Failure to comply with the legal requirements set down in this legislation can result in either civil or criminal prosecution, or both, with very severe penalties accruing. Convicted parties under the Act can be fined up to €500,000.00, jailed for up to 3 years, or both.

Extracts from the relevant sections of the regulations are reproduced below.

"*49(2) Save in accordance with a licence granted* [by the Department of Arts, Heritage and the Gaeltacht]*, any person who plants, disperses, allows or causes to disperse, spreads or otherwise causes to grow in anyplace* [a restricted non-native plant]*, shall be guilty of an offence.*

49(3) … it shall be a defence to a charge of committing an offence under paragraph (1) or (2) to prove that the accused took all reasonable steps and exercised all due diligence to avoid committing the offence.

50(1) Save in accordance with a licence, a person shall be guilty of an offence if he or she […] offers or exposes for sale, transportation, distribution, introduction, or release—
(a) an animal or plant listed in Part 1 or Part 2 of the Third Schedule,
(b) anything from which an animal or plant referred to in subparagraph (a) can be reproduced or propagated, or
(c) a vector material listed in the Third Schedule, in any place in the State specified in the third column of the Third Schedule in relation to such an animal, plant or vector material."

National Biodiversity Action Plan 2023-2030

The National Biodiversity Plan (NBAP) 2023-2030, the fourth such plan for Ireland, captures the objectives, targets and actions for biodiversity that will be undertaken by a wide range of government, civil society and private sectors. Actions required to achieve the strategic objectives as well as the lead and key partners responsible for their implementation are set out for each of the objectives and their outcomes (Table A1).

TABLE A1: OBJECTIVES AND TARGETS OF THE NATIONAL BIODIVERSITY ACTION PLAN 2023-2030.

Objective	Outcome
1: Adopt a Whole-of-Government, Whole-of-Society Approach to Biodiversity	1A. Governance structures and reporting outputs have improved.
	1B. Organisational capacity and resources for biodiversity have increased at all levels of Government.
	1C: Responsibility for biodiversity is shared across the whole of government.
	1D: Biodiversity initiatives are supported across the whole of society.
	1E. The legislative framework for biodiversity conservation is robust, clear and enforceable.
2: Meet Urgent Conservation and Restoration Needs	2A: The protection of existing designated areas and protected species is strengthened and conservation and restoration within the existing protected area network are enhanced.

	2B: Biodiversity and ecosystem services in the wider countryside are conserved and restored – agriculture & forestry.
	2C: Biodiversity and ecosystem services in the wider countryside are conserved and restored – peatlands & climate action.
	2D: Biodiversity and ecosystem services in the marine and freshwater environment are conserved and restored.
	2E: Genetic diversity of wild and domesticated species is safeguarded.
	2F: A National Restoration Plan is in place to contribute to the ambition of the EU Biodiversity Strategy 2030 and global restoration targets.
	2H: Invasive alien species (IAS) are controlled and managed on an all-island basis to reduce the harmful impact they have on biodiversity and measures are undertaken to tackle the introduction and spread of new IAS to the environment.
3. Secure Nature's Contribution to People	3A: Ireland's natural heritage and biocultural diversity is recognised, valued, enhanced and promoted in policy and practice.
	3B: The role of biodiversity in supporting wellbeing, livelihoods, enterprise and employment is recognised and enhanced.
	3C: Planning and development will facilitate and secure biodiversity's contributions to people.
4. Enhance the Evidence Base for Action on Biodiversity	4A: Research funding bodies will have an improved understanding of the research and skills required to address biodiversity research gaps.
	4B: Data relevant to biodiversity and ecosystems, including conservation needs, is widely accessible and standardised.
	4C: Long-term monitoring programmes are in place to guide conservation and restoration goals.
	4D: Ireland has prepared national assessments of ecosystem services.
5. Strengthen Ireland's Contribution to International Biodiversity Initiatives	5A: Science, policy and action on biodiversity conservation and restoration is effectively coordinated in an all-island approach.
	5B: Ireland takes action internationally to cooperate with other countries, sectors, disciplines and communities to address the biodiversity crisis.
	5C: Ireland enhances its contributions to the international biodiversity data drive.

Policies and objectives of the Meath County Development Plan (MCDP) 2021 – 2027 that are of relevance to this EIAR Biodiversity Chapter are outlined below:

Overall policies and objectives on Biodiversity:

- HER POL 27: "To protect, conserve and enhance the County's biodiversity where appropriate."
- HER POL 28: "To integrate in the development management process the protection and enhancement of biodiversity and landscape features wherever possible, by minimising adverse impacts on existing habitats (whether designated or not) and by including mitigation and/or compensation measures, as appropriate."
- HER POL 31: "To ensure that the ecological impact of all development proposals on habitats and species are appropriately assessed by suitably qualified professional(s) in accordance with best practice guidelines – e.g. the preparation of an Ecological Impact Assessment (EcIA), Screening Statement for Appropriate Assessment, Environmental Impact Assessment, Natura Impact Statement (NIS), species surveys etc. (as appropriate)."
- HER OBJ 30: "To implement, in partnership with the Department of Culture, Heritage and the Gaeltacht, relevant stakeholders and the community, the objectives and actions of Ireland's National Biodiversity Action Plan 2017 - 2021 which relate to the remit and functions of Meath County Council."
- HER OBJ 31: "To implement, in partnership with the Department of Culture, Heritage and the Gaeltacht, relevant stakeholders and the community, the objectives and actions of the County Meath Biodiversity Plan 2015-2020 and any revisions thereof."

Protecting Biodiversity in Meath – Sites Designated for Nature Conservation

- HER OBJ 32: "To actively support the implementation of the All Ireland Pollinator Plan 2021-2025 and any revisions thereof."
- HER POL 32: "To permit development on or adjacent to designated Special Areas of Conservation, Special Protection Areas, Natural Heritage Areas, Statutory Nature Reserves or those proposed to be designated over the period of the Plan, only where the development has been subject to the outcome of the Appropriate Assessment process and has been carried out to the satisfaction of the Planning Authority, in consultation with National Parks and Wildlife."
- HER POL 33: "To have regard to the views and guidance of the National Parks and Wildlife Service in respect of proposed development where there is a possibility that such development may have an impact on a designated European or National site or a site proposed for such designation."
- HER POL 34: "To undertake appropriate surveys and collect data to provide an evidence-base to assist the Council in meeting its obligations under Article 6 of the Habitats Directives (92/43/EEC) as transposed into Irish Law, subject to available resources."

- HER OBJ 33: "To ensure an Appropriate Assessment in accordance with Article 6(3) and Article 6(4) of the Habitats Directives (92/43/EEC) and in accordance with the Department of Environment, Heritage and Local Government Appropriate Assessment of Plans and Projects in Ireland – Guidance for Planning Authorities, 2009 and relevant EPA and European Commission guidance documents, is carried out in respect of any plan or project not directly connected with or necessary for the management of the site but likely to have a significant effect on a Natura 2000 site(s), either individually or in-combination with other plans or projects, in view of the site's conservation objectives."

- HER OBJ 34: "To protect and conserve the conservation value of candidate Special Areas of Conservation, Special Protection Areas, Natural Heritage Areas and proposed Natural Heritage Areas as identified by the Minister for the Department of Culture, Heritage and the Gaeltacht and any other sites that may be proposed for designation during the lifetime of this Plan in accordance with the provisions of the Habitats and Birds Directives and to permit development in or affecting same only in accordance with the provisions of those Directives as transposed into Irish Law."

Protecting Biodiversity – Non-designated sites:

- HER POL 35: "To ensure, where appropriate, the protection and conservation of areas, sites, species and ecological/networks of biodiversity value outside designated sites and to require an appropriate level of ecological assessment by suitably qualified professional(s) to accompany development proposals likely to impact on such areas or species."

Protected Species:

- HER POL 36: "To consult with the National Parks and Wildlife Service and take account of their views and any licensing requirements, when undertaking, approving or authorising development which is likely to affect plant, animal or bird species protected by law."

- HER OBJ 35: "To ensure that development does not have a significant adverse impact, incapable of satisfactory avoidance or mitigation, on plant, animal or bird species protected by law."

Woodlands, Hedgerows and Trees:

- HER POL 37: "To encourage the retention of hedgerows and other distinctive boundary treatments in rural areas and prevent loss and fragmentation, where practically possible. Where removal of a hedgerow, stone wall or other distinctive boundary treatment is unavoidable, mitigation by provision of the same type of boundary will be required."

- HER POL 38: "To promote and encourage planting of native hedgerow species in new developments and as part of the Council's own landscaping works."

- HER POL 39: "To recognise the archaeological importance of townland boundaries including hedgerows and promote their protection and retention."

- HER POL 40: "To protect and encourage the effective management of native and semi-natural woodlands, groups of trees and individual trees and to encourage the retention of mature trees and the use of tree surgery rather than felling, where possible, when undertaking, approving or authorising development."
- HER POL 41: "To protect trees the subject of Tree Preservation Orders (see Map 9.3), Champion and Heritage Trees identified on the Tree Register of Ireland and Heritage Tree Database when undertaking, approving, or authorising development."

Invasive Species:

- HER POL 43: "To promote best practice in the control of invasive species in the carrying out its functions in association with relevant authorities including TII and the Department of Transport, Tourism and Sport."
- HER POL 44: "To require all development proposals to address the presence or absence of invasive alien species on proposed development sites and (if necessary) require applicants to prepare and submit an Invasive Species Management Plan where such a species exists to comply with the provisions of the European Communities (Birds and Natural Habitats) Regulations 2011-2015."

Green Infrastructure:

- HER POL 55: "To require that all Land Use Plans protect, manage and provide where possible green infrastructure in an integrated and coherent manner."
- HER OBJ 60: "To encourage, pursuant to Article 10 of the Habitats Directive (92/43/EEC), the management of features of the landscape, such as traditional field boundaries, important for the ecological coherence of the Natura 2000 network and essential for the migration, dispersal and genetic exchange of wild species."

County Meath Biodiversity Action Plan 2015-2020

The main function of the County Meath Biodiversity Action Plan (BAP) 2015-2020 is to provide a framework and series of actions to conserve, enhance and raise awareness of Meath's rich biodiversity and to maximise the contribution that it makes to the social, economic and environmental wellbeing of the county, taking into account local, national and international, including European priorities.

The County Meath BAP contains four main objectives:

- Objective 1: To raise awareness of biodiversity in Meath, its value and the issues facing it.
- Objective 2: To better understand the biodiversity of Meath.
- Objective 3: To conserve and enhance habitats and species in Meath, taking account of national and local priorities.
- Objective 4: To foster active participation to help biodiversity in Meath, encouraging a partnership approach to help our species and habitats.

- The BAP includes a total of 28 action items to meet these objectives, ranging from monitoring projects to preparing guidance documents and increasing public awareness.

APPENDIX II – VALUE OF ECOLOGICAL RESOURCES

The criteria outlined in the table below, taken from the Guidelines for Assessment of Ecological Impacts of National Road Schemes published by the NRA, were used for assigning value to designated sites, habitats and species within the Site of the Proposed Development and surrounding area.

Table A2.1. Description of values for ecological resources based on geographic hierarchy of importance (NRA, 2009b).

IMPORTANCE	CRITERIA

International Importance	- 'European Site' including Special Area of Conservation (SAC), Site of Community Importance (SCI), Special Protection Area (SPA) or proposed Special Area of Conservation.
	- Proposed Special Protection Area (pSPA). - Site that fulfils the criteria for designation as a 'European Site' (see Annex III of the Habitats Directive, as amended).
	- Features essential to maintaining the coherence of the Natura 2000 Network
	- Site containing 'best examples' of the habitat types listed in Annex I of the Habitats Directive.
	- Resident or regularly occurring populations (assessed to be important at the national level) of the following:
	  o Species of bird, listed in Annex I and/or referred to in Article 4(2) of the Birds Directive; and/or
	  o Species of animal and plants listed in Annex II and/or IV of the Habitats Directive
	- Ramsar Site (Convention on Wetlands of International Importance Especially Waterfowl Habitat 1971).
	- World Heritage Site (Convention for the Protection of World Cultural & Natural Heritage, 1972).
	- Biosphere Reserve (UNESCO Man & The Biosphere Programme)
	- Site hosting significant species populations under the Bonn Convention (Convention on the Conservation of Migratory Species of Wild Animals, 1979).
	- Site hosting significant populations under the Berne Convention (Convention on the Conservation of European Wildlife and Natural Habitats, 1979).
	- Biogenetic Reserve under the Council of Europe.
	- European Diploma Site under the Council of Europe.
	- Salmonid water designated pursuant to the European Communities (Quality of Salmonid Waters) Regulations, 1988, (S.I. No. 293 of 1988).

National Importance	- Site designated or proposed as a Natural Heritage Area (NHA).
	- Statutory Nature Reserve.
	- Refuge for Fauna and Flora protected under the Wildlife Acts.
	- National Park.
	- Undesignated site fulfilling the criteria for designation as a Natural Heritage Area (NHA); Statutory Nature Reserve; Refuge for Fauna and Flora protected under the Wildlife Act; and/or a National Park.
	- Resident or regularly occurring populations (assessed to be important at the national level) of the following:
	  o Species protected under the Wildlife Acts; and/or
	  o Species listed on the relevant Red Data list.
	  o Site containing 'viable areas' of the habitat types listed in Annex I of the Habitats Directive

County Importance	- Area of Special Amenity. - Area subject to a Tree Preservation Order. - Area of High Amenity, or equivalent, designated under the County Development Plan. - Resident or regularly occurring populations (assessed to be important at the County level) of the following:

	○ Species of bird, listed in Annex I and/or referred to in Article 4(2) of the Birds Directive; ○ Species of animal and plants listed in Annex II and/or IV of the Habitats Directive; ○ Species protected under the Wildlife Acts; and/or ○ Species listed on the relevant Red Data list. ○ Site containing area or areas of the habitat types listed in Annex I of the Habitats Directive that do not fulfil the criteria for valuation as of International or National importance. - County important populations of species; or viable areas of semi-natural habitats; or natural heritage features identified in the National or Local BAP; if this has been prepared. - Sites containing semi-natural habitat types with high biodiversity in a county context and a high degree of naturalness, or populations of species that are uncommon within the county. - Sites containing habitats and species that are rare or are undergoing a decline in quality or extent at a national level.
Local Importance (higher value)	- Locally important populations of priority species or habitats or natural heritage features identified in the Local BAP, if this has been prepared; - Resident or regularly occurring populations (assessed to be important at the Local level) of the following: ○ Species of bird, listed in Annex I and/or referred to in Article 4(2) of the Birds Directive; ○ Species of animal and plants listed in Annex II and/or IV of the Habitats Directive; ○ Species protected under the Wildlife Acts; and/or o ○ Species listed on the relevant Red Data list. ○ Sites containing semi-natural habitat types with high biodiversity in a local context and a high degree of naturalness, or populations of species that are uncommon in the locality; - Sites or features containing common or lower value habitats, including naturalised species that are nevertheless essential in maintaining links and ecological corridors between features of higher ecological value.
Local Importance (lower value)	- Sites containing small areas of semi-natural habitat that are of some local importance for wildlife; - Sites or features containing non-native species that is of some importance in maintaining habitat links.

APPENDIX III – EPA IMPACT ASSESSMENT CRITERIA

In line with the draft EPA Guidelines (EPA 2022), the following terms are defined when evaluating and quantifying the quality, significance, extent/context, probability and duration/frequency of effects.

Table A3.1. Definition of quality, significance, extent/context, probability and duration/frequency of effects.

TERM	DEFINITION
Quality of Effects	
Positive	A change which improves the quality of the environment (for example, by increasing species diversity, or improving the reproductive capacity of an ecosystem, or by removing nuisances or improving amenities).
Neutral	No effects or effects that are imperceptible, within normal bounds of variation or within the margin of forecasting error.
Negative/Adverse	A change which reduces the quality of the environment (for example, lessening species diversity or diminishing the reproductive capacity of an ecosystem, or damaging health or property or by causing nuisance).
Significance of Effects	
Imperceptible	An effect capable of measurement but without significant consequences.
Not Significant	An effect which causes noticeable changes in the character of the environment but without significant consequences.
Slight	An effect which causes noticeable changes in the character of the environment without affecting its sensitivities.
Moderate	An effect that alters the character of the environment in a manner that is consistent with existing and emerging baseline trends.
Significant	An effect which, by its character, magnitude, duration or intensity, alters a sensitive aspect of the environment.
Very Significant	An effect which, by its character, magnitude, duration or intensity, significantly alters most of a sensitive aspect of the environment.
Profound	An effect which obliterates sensitive characteristics. No effects or effects that are imperceptible, within normal bounds of variation or within the margin of forecasting error
Extent and Context of Effects	
Extent	Describe the size of the area, the number of sites and the proportion of a population affected by an effect.
Context	Describe whether the extent, duration or frequency will conform or contrast with established (baseline) conditions (is it the biggest, longest effect ever?)
Probability of Effects	

Likely	The effects that can reasonably be expected to occur because of the planned project if all mitigation measures are properly implemented.
Unlikely	The effects that can reasonably be expected not to occur because of the planned project if all mitigation measures are properly implemented.
Duration and Frequency of Effects	
Momentary	Effects lasting from seconds to minutes.
Brief	Effects lasting less than a day
Temporary	Effects lasting less than a year.
Short-term	Effects lasting one to seven years.
Medium-term Effects	Effects lasting seven to fifteen years.
Long-term	Effects lasting fifteen to sixty years.
Permanent	Effects lasting over sixty years.
Reversible	Effects that can be undone, for example through remediation or restoration.
Frequency	Describe how often the effect will occur (once, rarely, occasionally, frequently, constantly – or hourly, daily, weekly, monthly, annually).

APPENDIX IV – SITE PHOTOGRAPHS

Photograph 1. View of arable crops (BC1) habitat at the JCL lands of the Proposed Development Site, identified as winter wheat (*Triticum aestivum*).

Photograph 2. Mature hedgerows (WL1) splitting the crop fields on JCL lands.

Photograph 3. Scrub (WS1) habitat recorded at the north of the Site.

Photograph 4. The western boundary hedgerow facing south (Dunboyne Railway Station carpark visible in the right background) at the Site.

Photograph 5. Example of dry drainage ditch (FW4) habitat that runs along the hedgerows at the Site.

APPENDIX V – BAT DETECTOR METADATA

Table A: Full bat survey metadata for the dusk survey of the JCL lands - 15th September 2022 (Analysis carried out using Elekon BatExplorer 2.1.11.2 Software)

RECORD	TIME STAMP	SPECIES	CALLS [#]	MEAN PEAK FREQUENCY [KHZ]	MEAN MAX FREQUENCY [KHZ]	MEAN MIN FREQUENCY [KHZ]	MEAN CALL LENGTH [MS]	MEAN CALL DISTANCE [MS]	LATITUDE [WGS84]	LONGITUDE [WGS84]
7370013	15/09/2022 20:00	Nyctalus leisleri	7	21.7	22.1	21.1	7.8	610	53.41774	-6.46113
7370020	15/09/2022 20:10	Nyctalus leisleri	11	22.6	23.2	21.4	14	346	53.42195	-6.4639
7370021	15/09/2022 20:10	Nyctalus leisleri	9	22.9	24.5	21.9	13.5	314	53.42198	-6.46394
7370024	15/09/2022 20:14	Pipistrellus pipistrellus	12	47.8	54	47	4	90	53.42281	-6.46567
7370036	15/09/2022 20:49	Pipistrellus pipistrellus	26	52	72.8	48.8	3	74	53.42028	-6.46153
7370037	15/09/2022 20:49	Pipistrellus pipistrellus	44	48.7	80.8	47	4	100	53.42027	-6.46149
7370038	15/09/2022 20:49	Pipistrellus pipistrellus	56	47.7	72.7	46.6	3	94	53.42026	-6.46149
7370039	15/09/2022 20:49	Pipistrellus pipistrellus	38	49.4	72.7	47.4	3	90	53.42026	-6.46148
7370040	15/09/2022 20:49	Pipistrellus pipistrellus	62	47.9	77.5	46.8	4	90	53.42025	-6.46148

RECORD	TIME STAMP	SPECIES	CALLS [#]	MEAN PEAK FREQUENCY [KHZ]	MEAN MAX FREQUENCY [KHZ]	MEAN MIN FREQUENCY [KHZ]	MEAN CALL LENGTH [MS]	MEAN CALL DISTANCE [MS]	LATITUDE [WGS84]	LONGITUDE [WGS84]
7370041	15/09/2022 20:50	Pipistrellus pipistrellus	19	47.5	60.1	46.7	3	80	53.42016	-6.46147
7370042	15/09/2022 20:50	Pipistrellus pipistrellus	67	48	80.9	46.7	4	85	53.42016	-6.46147
7370043	15/09/2022 20:50	Pipistrellus pipistrellus	75	48.5	78.8	46.6	5	85	53.42014	-6.46148
7370044	15/09/2022 20:50	Pipistrellus pipistrellus	74	47.2	70.1	46.3	5	100	53.42012	-6.46148
7370045	15/09/2022 20:50	Pipistrellus pipistrellus	12	47	56.3	46.4	3	96	53.42007	-6.46139
7370046	15/09/2022 20:51	Pipistrellus pipistrellus	14	47.7	55.4	46.8	3	90	53.42001	-6.46134
7370047	15/09/2022 20:51	Pipistrellus pipistrellus	2	46.7	51.4	45.8	4	172	53.41998	-6.46138
7370048	15/09/2022 20:51	Pipistrellus pipistrellus	3	48.6	56.6	47.6	3.2	271	53.41997	-6.4614

Table B: Full bat survey metadata for the dusk survey of the JCL lands - 12th of June 2023 (Analysis carried out using Elekon BatExplorer 2.1.11.2 Software)

RECORD	TIME STAMP	SPECIES	CALLS [#]	MEAN PEAK FREQUENCY [KHZ]	MEAN MAX FREQUENCY [KHZ]	MEAN MIN FREQUENCY [KHZ]	MEAN CALL LENGTH [MS]	MEAN CALL DISTANCE [MS]	LATITUDE [WGS84]	LONGITUDE [WGS84]
2180000	12 Jun 2023 21:49:15	Common Pipistrelle	0	0	0	0	0	0	53.41795	-6.46346

RECORD	TIME STAMP	SPECIES	CALLS [#]	MEAN PEAK FREQUENCY [KHZ]	MEAN MAX FREQUENCY [KHZ]	MEAN MIN FREQUENCY [KHZ]	MEAN CALL LENGTH [MS]	MEAN CALL DISTANCE [MS]	LATITUDE [WGS84]	LONGITUDE [WGS84]
2180001	12 Jun 2023 21:49:20	Noise	2	23.3	23.6	20.6	12	44	53.41795	-6.46346
2180002	12 Jun 2023 21:49:37	Noise	0	0	0	0	0	0	53.41795	-6.46346
2180003	12 Jun 2023 21:50:41	Noise	1	21.8	22.1	19.9	4.8	0	53.4161	-6.46305
2180004	12 Jun 2023 21:53:05	Noise	0	0	0	0	0	0	53.41631	-6.4629
2180005	12 Jun 2023 21:58:51	Noise	0	0	0	0	0	0	53.41626	-6.46286
2180006	12 Jun 2023 21:59:11	Noise	0	0	0	0	0	0	53.41626	-6.46287
2180007	12 Jun 2023 22:11:42	Leisler's Bat	2	21.8	22.5	20.6	19.2	0	53.41795	-6.46346
2180008	12 Jun 2023 22:11:54	Leisler's Bat	1	21	21.8	19.9	21.3	0	53.41794	-6.46346
2180009	12 Jun 2023 22:12:14	Leisler's Bat	3	22	22.5	20.8	15.8	548	53.41794	-6.46346
2180010	12 Jun 2023 22:12:25	Leisler's Bat	0	0	0	0	0	0	53.41795	-6.46346
2180011	12 Jun 2023 22:12:42	Leisler's Bat	5	22.6	23.9	21.9	14.8	312	53.41794	-6.46346
2180012	12 Jun 2023 22:13:52	Leisler's Bat	12	23.3	25.4	21.8	16	215	53.41795	-6.46347
2180013	12 Jun 2023 22:13:55	Leisler's Bat	5	21.9	23	20.8	20	293	53.41795	-6.46347
2180014	12 Jun 2023 22:14:13	Noise	0	0	0	0	0	0	53.41796	-6.46346
2180015	12 Jun 2023 22:14:29	Leisler's Bat	6	23.1	24.6	21.9	16.7	261	53.41795	-6.46347

RECORD	TIME STAMP	SPECIES	CALLS [#]	MEAN PEAK FREQUENCY [KHZ]	MEAN MAX FREQUENCY [KHZ]	MEAN MIN FREQUENCY [KHZ]	MEAN CALL LENGTH [MS]	MEAN CALL DISTANCE [MS]	LATITUDE [WGS84]	LONGITUDE [WGS84]
2180016	12 Jun 2023 22:14:43	Noise	1	22.1	22.5	21.8	12.3	0	53.41795	-6.46347
2180017	12 Jun 2023 22:14:55	Leisler's Bat	3	21.8	22.4	20.6	18.3	327	53.41795	-6.46347
2180018	12 Jun 2023 22:35:24	Leisler's Bat	17	24.4	24.9	23	16	280	53.4223	-6.46578
2180019	12 Jun 2023 22:35:32	Leisler's Bat	7	24.2	25.1	23.1	15.8	306	53.4223	-6.46577
2180020	12 Jun 2023 22:35:43	Noise	0	0	0	0	0	0	53.4223	-6.46578
2180021	12 Jun 2023 22:38:20	Noise	1	25.5	29.3	25.1	17.6	0	53.42229	-6.46578
2180022	12 Jun 2023 22:38:29	Noise	0	0	0	0	0	0	53.42229	-6.46578
2180023	12 Jun 2023 22:41:29	Noise	0	0	0	0	0	0	53.4223	-6.46578
2180024	12 Jun 2023 22:44:14	Soprano Pipistrelle	6	60.9	71.3	60.1	3	224	53.4227	-6.46582
2180025	12 Jun 2023 22:46:56	Soprano Pipistrelle	21	51.1	93.2	50.5	4	76	53.42399	-6.46614
2180026	12 Jun 2023 22:47:13	Soprano Pipistrelle	19	51.3	98.9	50.7	4	80	53.424	-6.46614
2180027	12 Jun 2023 22:47:24	Noise	0	0	0	0	0	0	53.42401	-6.46616
2180028	12 Jun 2023 22:47:25	Soprano Pipistrelle	6	51.3	67.4	50.7	3	113	53.42401	-6.46616
2180029	12 Jun 2023 22:47:48	Soprano Pipistrelle	25	51	67.3	50.4	3	74	53.424	-6.46615
2180030	12 Jun 2023 22:48:02	Soprano Pipistrelle	13	51.4	63.3	50.9	3	80	53.424	-6.46615

RECORD	TIME STAMP	SPECIES	CALLS [#]	MEAN PEAK FREQUENCY [KHZ]	MEAN MAX FREQUENCY [KHZ]	MEAN MIN FREQUENCY [KHZ]	MEAN CALL LENGTH [MS]	MEAN CALL DISTANCE [MS]	LATITUDE [WGS84]	LONGITUDE [WGS84]
2180031	12 Jun 2023 22:48:11	Soprano Pipistrelle	26	51.2	73.5	50.7	3	74	53.424	-6.46615
2180032	12 Jun 2023 22:48:22	Soprano Pipistrelle	15	51.1	79.4	50.5	3	80	53.424	-6.46615
2180033	12 Jun 2023 22:48:26	Soprano Pipistrelle	8	50.2	55.9	49.6	3	80	53.424	-6.46615
2180034	12 Jun 2023 22:48:40	Noise	0	0	0	0	0	0	53.424	-6.46614
2180035	12 Jun 2023 22:48:42	Soprano Pipistrelle	11	50.7	60.5	50.1	3	70	53.424	-6.46614
2180036	12 Jun 2023 22:48:49	Common Pipistrelle	24	50.4	57.8	49.7	3	80	53.42401	-6.46613
2180037	12 Jun 2023 22:50:26	Common Pipistrelle	0	0	0	0	0	0	53.424	-6.46613
2180038	12 Jun 2023 22:52:04	Soprano Pipistrelle	22	50.8	61.3	49.9	3	80	53.42401	-6.46614
2180039	12 Jun 2023 22:53:05	Soprano Pipistrelle	11	51.1	94.6	49.8	3	80	53.424	-6.46614
2180040	12 Jun 2023 22:53:30	Soprano Pipistrelle	46	50.2	83.9	49.5	4	80	53.42399	-6.46614
2180041	12 Jun 2023 22:53:55	Common Pipistrelle	21	50.7	62.8	49.9	3	80	53.424	-6.46615
2180042	12 Jun 2023 22:54:13	Common Pipistrelle	17	49.3	72.4	48.6	4	80	53.424	-6.46614
2180043	12 Jun 2023 22:54:30	Common Pipistrelle	16	50.1	99	49.5	4	80	53.424	-6.46614
2180044	12 Jun 2023 22:56:06	Soprano Pipistrelle	21	59.6	70.3	58.5	5	70	53.42406	-6.4661
2180045	12 Jun 2023 22:56:19	Noise	1	25.1	26.6	21	8	0	53.42412	-6.466

RECORD	TIME STAMP	SPECIES	CALLS [#]	MEAN PEAK FREQUENCY [KHZ]	MEAN MAX FREQUENCY [KHZ]	MEAN MIN FREQUENCY [KHZ]	MEAN CALL LENGTH [MS]	MEAN CALL DISTANCE [MS]	LATITUDE [WGS84]	LONGITUDE [WGS84]
2180046	12 Jun 2023 22:56:37	Leisler's Bat	1	28.5	33	26.3	16	0	53.42419	-6.46584
2180047	12 Jun 2023 22:56:41	Leisler's Bat	0	0	0	0	0	0	53.42419	-6.46585
2180048	12 Jun 2023 22:56:43	Leisler's Bat	3	24.9	28.1	21.8	16.4	340	53.42419	-6.46585
2180049	12 Jun 2023 22:56:46	Leisler's Bat	2	23.8	24.4	22.5	16	433	53.4242	-6.46584
2180050	12 Jun 2023 22:57:24	Noise	0	0	0	0	0	0	53.4242	-6.46581
2180051	12 Jun 2023 23:03:05	Common Pipistrelle	36	49.2	86.6	48.3	4	80	53.42387	-6.46443
2180052	12 Jun 2023 23:03:45	Leisler's Bat	0	0	0	0	0	0	53.42386	-6.46442
2180053	12 Jun 2023 23:04:39	Noise	0	0	0	0	0	0	53.42386	-6.46442
2180054	12 Jun 2023 23:06:29	Noise	0	0	0	0	0	0	53.42385	-6.46441
2180055	12 Jun 2023 23:08:41	Noise	0	0	0	0	0	0	53.42386	-6.46442
2180056	12 Jun 2023 23:09:16	Common Pipistrelle	31	47.2	75.3	46.3	4	83	53.42386	-6.46441
2180057	12 Jun 2023 23:10:11	Noise	0	0	0	0	0	0	53.42384	-6.46441
2180058	12 Jun 2023 23:14:18	Common Pipistrelle	28	47.5	67.3	46.9	4	80	53.42273	-6.46542
2180059	12 Jun 2023 23:14:25	Soprano Pipistrelle	24	59.6	70.3	58.8	4	80	53.42269	-6.46536
2180060	12 Jun 2023 23:14:33	Common Pipistrelle	19	49	59.5	48.3	5	100	53.42263	-6.46525

RECORD	TIME STAMP	SPECIES	CALLS [#]	MEAN PEAK FREQUENCY [KHZ]	MEAN MAX FREQUENCY [KHZ]	MEAN MIN FREQUENCY [KHZ]	MEAN CALL LENGTH [MS]	MEAN CALL DISTANCE [MS]	LATITUDE [WGS84]	LONGITUDE [WGS84]
2180061	12 Jun 2023 23:14:37	Soprano Pipistrelle	31	59.7	73.9	58.9	4	75	53.42261	-6.46518
2180062	12 Jun 2023 23:15:43	Common Pipistrelle	7	45	45.6	44.6	8	271	53.42242	-6.4646
2180063	12 Jun 2023 23:20:05	Noise	0	0	0	0	0	0	53.4217	-6.46347
2180064	12 Jun 2023 23:31:28	Noise	0	0	0	0	0	0	53.42088	-6.46203
2180065	12 Jun 2023 23:32:53	Noise	0	0	0	0	0	0	53.42084	-6.462
2180066	12 Jun 2023 23:58:08	Common Pipistrelle	27	45.3	68.6	44.3	5	83	53.41861	-6.46132
2180067	12 Jun 2023 23:58:16	Common Pipistrelle	22	43.8	48.8	43	5	110	53.41861	-6.46132
2180068	12 Jun 2023 23:58:23	Common Pipistrelle	10	44.4	57.8	43.7	4	80	53.41861	-6.46132
2180069	12 Jun 2023 23:58:26	Common Pipistrelle	3	46.1	53.3	45	3.2	244	53.41861	-6.46132
2180070	13 Jun 2023 00:08:49	Leisler's Bat	7	24.4	25.6	23.1	10	350	53.41713	-6.46107
2180071	13 Jun 2023 00:08:51	Leisler's Bat	12	25.7	28.6	24.4	9	377	53.41713	-6.46107
2180072	13 Jun 2023 00:08:57	Leisler's Bat	4	23.7	25.7	22.8	10	324	53.41713	-6.46108
2180073	13 Jun 2023 00:13:09	Common Pipistrelle	21	49	80.8	48	4	65	53.41715	-6.46107
2180074	13 Jun 2023 00:13:35	Common Pipistrelle	32	48.6	73.8	47.7	4	90	53.41715	-6.46106
2180075	13 Jun 2023 00:22:08	Leisler's Bat	0	0	0	0	0	0	53.41606	-6.46106

Table C: Full bat survey metadata for the dusk survey of the JCL lands - 10th July 2023 (Analysis carried out using Elekon BatExplorer 2.1.11.2 Software)

RECORD	TIME STAMP	SPECIES	CALLS [#]	MEAN PEAK FREQUENCY [KHZ]	MEAN MAX FREQUENCY [KHZ]	MEAN MIN FREQUENCY [KHZ]	MEAN CALL LENGTH [MS]	MEAN CALL DISTANCE [MS]	LATITUDE [WGS84]	LONGITUDE [WGS84]
2180000	10 Jul 2023 22:33:07	Common Pipistrelle	35	46.1	55.5	45.2	3	83	53.42219	-6.4643
2180001	10 Jul 2023 22:33:15	Common Pipistrelle	79	46.5	55.9	45.5	3	74	53.42219	-6.46431
2180002	10 Jul 2023 22:33:26	Common Pipistrelle	52	45.9	57	45	3	80	53.42219	-6.4643
2180003	10 Jul 2023 22:33:40	Common Pipistrelle	53	45.8	56.5	45	3	80	53.42219	-6.4643
2180004	10 Jul 2023 22:33:51	Common Pipistrelle	22	46.1	57.7	45.4	3	63	53.42218	-6.46429
2180005	10 Jul 2023 22:33:56	Common Pipistrelle	24	46.2	61.8	45.4	3	70	53.42216	-6.46426
2180006	10 Jul 2023 22:33:58	Common Pipistrelle	31	46.2	67.6	45.5	3	64	53.42214	-6.46424
2180007	10 Jul 2023 22:34:02	Common Pipistrelle	26	46.7	72.6	45.7	3	73	53.42212	-6.4642
2180008	10 Jul 2023 22:34:04	Common Pipistrelle	87	47	83.4	46	4	80	53.42212	-6.46418
2180009	10 Jul 2023 22:34:19	Common Pipistrelle	56	46.2	77.7	45.3	3	84	53.42209	-6.46417
2180010	10 Jul 2023 22:34:49	Common Pipistrelle	39	46.5	58.9	45.7	3	80	53.42204	-6.46404
2180011	10 Jul 2023 22:35:06	Common Pipistrelle	26	46.1	60.8	45.2	3	84	53.42201	-6.46402

RECORD	TIME STAMP	SPECIES	CALLS [#]	MEAN PEAK FREQUENCY [KHZ]	MEAN MAX FREQUENCY [KHZ]	MEAN MIN FREQUENCY [KHZ]	MEAN CALL LENGTH [MS]	MEAN CALL DISTANCE [MS]	LATITUDE [WGS84]	LONGITUDE [WGS84]
2180012	10 Jul 2023 22:37:30	Common Pipistrelle	13	46.5	53.8	45.6	3	90	53.42167	-6.46349
2180013	10 Jul 2023 22:37:33	Common Pipistrelle	19	45.8	56	45	3	90	53.42167	-6.46349
2180014	10 Jul 2023 22:38:37	Common Pipistrelle	36	48.8	93.6	47.5	4	80	53.42168	-6.46348
2180015	10 Jul 2023 22:40:33	Common Pipistrelle	76	48.4	89.1	47.4	4	80	53.42167	-6.46346
2180016	10 Jul 2023 22:40:48	Common Pipistrelle	10	49.6	89.4	48.4	4	116	53.42167	-6.46345
2180017	10 Jul 2023 22:40:51	Common Pipistrelle	3	49.5	59	48.5	3	271	53.42166	-6.46345
2180018	10 Jul 2023 22:41:14	Common Pipistrelle	6	49.1	57.1	47.4	4	269	53.42168	-6.46346
2180019	10 Jul 2023 22:41:22	Common Pipistrelle	40	48.7	79.3	47.3	4	76	53.42169	-6.46347
2180020	10 Jul 2023 22:41:35	Common Pipistrelle	93	48.7	85.4	47.1	4	70	53.42169	-6.46346
2180021	10 Jul 2023 22:41:49	Common Pipistrelle	6	48.3	97.6	47.5	4	67	53.42168	-6.46348
2180022	10 Jul 2023 22:41:57	Common Pipistrelle	59	49.2	88.6	47.3	4	60	53.42168	-6.46349
2180023	10 Jul 2023 22:42:28	Common Pipistrelle	144	48.4	90.2	47	4	60	53.42168	-6.46349
2180024	10 Jul 2023 22:42:43	Common Pipistrelle	126	48.2	89.8	46.9	4	70	53.42169	-6.46348
2180025	10 Jul 2023 22:42:58	Common Pipistrelle	37	49.6	74.6	47.4	3	73	53.42169	-6.46347
2180026	10 Jul 2023 22:43:11	Common Pipistrelle	28	48.2	89.8	46.9	4	55	53.42169	-6.46347

RECORD	TIME STAMP	SPECIES	CALLS [#]	MEAN PEAK FREQUENCY [KHZ]	MEAN MAX FREQUENCY [KHZ]	MEAN MIN FREQUENCY [KHZ]	MEAN CALL LENGTH [MS]	MEAN CALL DISTANCE [MS]	LATITUDE [WGS84]	LONGITUDE [WGS84]
2180027	10 Jul 2023 22:43:34	Common Pipistrelle	47	49.4	66.3	47.6	4	65	53.42169	-6.46349
2180028	10 Jul 2023 23:08:07	Common Pipistrelle	46	47.2	69.5	46.4	4	74	53.41935	-6.46153
2180029	10 Jul 2023 23:08:12	Common Pipistrelle	100	47.6	68.4	46.6	3	74	53.41934	-6.46154
2180030	10 Jul 2023 23:08:27	Common Pipistrelle	121	47.7	67.3	46.6	3	74	53.41933	-6.46153
2180031	10 Jul 2023 23:08:42	Common Pipistrelle	44	47.4	66.9	46.6	3	75	53.41934	-6.46153
2180032	10 Jul 2023 23:08:54	Common Pipistrelle	28	47.5	77.3	46.7	3	65	53.41935	-6.46154
2180033	10 Jul 2023 23:09:04	Common Pipistrelle	4	47.4	56.5	46.7	3	144	53.41934	-6.46153
2180034	10 Jul 2023 23:09:12	Common Pipistrelle	5	47.8	56.2	46.8	3.1	174	53.41934	-6.46151
2180035	10 Jul 2023 23:09:14	Common Pipistrelle	82	47.7	66.8	46.9	3	70	53.41934	-6.46152
2180036	10 Jul 2023 23:09:29	Common Pipistrelle	62	47.7	80.7	46.9	4	80	53.41934	-6.46152
2180037	10 Jul 2023 23:18:09	Noise	0	0	0	0	0	0	53.41861	-6.46131
2180038	10 Jul 2023 23:18:29	Noise	0	0	0	0	0	0	53.4186	-6.46131
2180039	10 Jul 2023 23:22:11	Noise	0	0	0	0	0	0	53.41859	-6.4613
2180040	10 Jul 2023 23:24:08	Common Pipistrelle	16	46.1	53.9	45.1	4	95	53.41859	-6.46133
2180041	10 Jul 2023 23:34:47	Noise	0	0	0	0	0	0	53.4161	-6.46104

RECORD	TIME STAMP	SPECIES	CALLS [#]	MEAN PEAK FREQUENCY [KHZ]	MEAN MAX FREQUENCY [KHZ]	MEAN MIN FREQUENCY [KHZ]	MEAN CALL LENGTH [MS]	MEAN CALL DISTANCE [MS]	LATITUDE [WGS84]	LONGITUDE [WGS84]
2180042	10 Jul 2023 23:42:52	Common Pipistrelle	7	27.1	31.7	26	4.9	298	53.41635	-6.46294
2180043	10 Jul 2023 23:46:04	Common Pipistrelle	2	43.5	46.9	42.9	4.3	137	53.41635	-6.46296
2180044	10 Jul 2023 23:46:29	Common Pipistrelle	15	46.3	55.7	45	6	95	53.41635	-6.46295
2180045	10 Jul 2023 23:49:55	Leisler's Bat	2	21.6	22.1	20.6	21.3	336	53.41636	-6.46294
2180046	10 Jul 2023 23:51:43	Common Pipistrelle	12	45.5	51.5	44.7	7	90	53.41624	-6.46294
2180047	10 Jul 2023 23:51:48	Common Pipistrelle	4	45.7	50.3	44.9	5.6	356	53.4162	-6.46294
2180048	10 Jul 2023 23:51:53	Common Pipistrelle	42	45.1	52.2	44.3	5	94	53.41616	-6.46294
2180049	10 Jul 2023 23:52:00	Common Pipistrelle	9	45	49.6	44.3	4	129	53.41614	-6.46293
2180050	10 Jul 2023 23:53:13	Common Pipistrelle	2	42.8	47.1	42.4	5.9	791	53.41606	-6.46177
2180051	10 Jul 2023 23:53:23	Common Pipistrelle	1	45.8	52.9	43.9	3.2	0	53.41607	-6.46158
2180052	10 Jul 2023 23:53:29	Common Pipistrelle	8	43.6	53.5	43	8.5	202	53.41606	-6.46148
2180053	10 Jul 2023 23:53:52	Common Pipistrelle	13	45.3	63.5	44.6	4	80	53.41605	-6.46108
2180054	10 Jul 2023 23:54:56	Common Pipistrelle	10	44.5	51.2	43.9	4	110	53.41619	-6.46138
2180055	10 Jul 2023 23:55:01	Common Pipistrelle	13	43.7	51.7	42.7	5	80	53.4162	-6.46147
2180056	10 Jul 2023 23:55:05	Common Pipistrelle	28	43.2	68.9	42.4	6	90	53.4162	-6.46151

RECORD	TIME STAMP	SPECIES	CALLS [#]	MEAN PEAK FREQUENCY [KHZ]	MEAN MAX FREQUENCY [KHZ]	MEAN MIN FREQUENCY [KHZ]	MEAN CALL LENGTH [MS]	MEAN CALL DISTANCE [MS]	LATITUDE [WGS84]	LONGITUDE [WGS84]
2180057	10 Jul 2023 23:55:18	Common Pipistrelle	7	43.1	47.5	42.6	5	183	53.4162	-6.46151
2180058	10 Jul 2023 23:55:22	Common Pipistrelle	34	43.3	59.7	42.6	5	90	53.4162	-6.46151
2180059	10 Jul 2023 23:55:38	Common Pipistrelle	53	43.6	61.3	42.5	5	90	53.4162	-6.46154
2180060	10 Jul 2023 23:56:22	Common Pipistrelle	22	43.4	58	42.4	5	93	53.4162	-6.46155
2180061	10 Jul 2023 23:56:31	Common Pipistrelle	53	44.6	57.7	43.1	6	100	53.4162	-6.46155
2180062	10 Jul 2023 23:57:07	Common Pipistrelle	10	44.3	52.7	43.3	7	110	53.41627	-6.46175
2180063	10 Jul 2023 23:57:16	Common Pipistrelle	1	45.4	49.9	44.3	4.8	0	53.41632	-6.4618
2180064	10 Jul 2023 23:57:24	Common Pipistrelle	12	45.5	55.8	44.7	5	94	53.4164	-6.46185
2180065	10 Jul 2023 23:57:34	Common Pipistrelle	55	44.8	57.6	44	6	95	53.41646	-6.46193
2180066	10 Jul 2023 23:57:49	Common Pipistrelle	43	45.1	62.4	44.3	6	100	53.41654	-6.46204
2180067	10 Jul 2023 23:58:04	Common Pipistrelle	65	45.3	65.8	44.4	6	94	53.41655	-6.46208
2180068	10 Jul 2023 23:58:19	Common Pipistrelle	7	43.8	49.7	43.1	6	290	53.41655	-6.46209
2180069	10 Jul 2023 23:58:27	Common Pipistrelle	50	44.6	56.4	43.8	6	104	53.41655	-6.46208
2180070	10 Jul 2023 23:58:42	Common Pipistrelle	27	44.6	57	43.7	7	96	53.41655	-6.46208
2180071	10 Jul 2023 23:59:05	Common Pipistrelle	4	44.6	52.4	43.9	6.4	582	53.4166	-6.46229

RECORD	TIME STAMP	SPECIES	CALLS [#]	MEAN PEAK FREQUENCY [KHZ]	MEAN MAX FREQUENCY [KHZ]	MEAN MIN FREQUENCY [KHZ]	MEAN CALL LENGTH [MS]	MEAN CALL DISTANCE [MS]	LATITUDE [WGS84]	LONGITUDE [WGS84]
2180072	11 Jul 2023 00:01:59	Common Pipistrelle	6	45.4	49.9	44.5	6	181	53.41782	-6.46342
2180073	11 Jul 2023 00:02:10	Common Pipistrelle	34	46	68.4	44.7	4	80	53.41785	-6.46343
2180074	11 Jul 2023 00:02:30	Common Pipistrelle	36	46	77.1	44.7	5	86	53.41792	-6.46345
2180075	11 Jul 2023 00:02:45	Common Pipistrelle	10	46.4	54.7	45	5	95	53.41792	-6.46345
2180076	11 Jul 2023 00:02:54	Common Pipistrelle	24	44.5	55.8	43.7	7	100	53.41792	-6.46345
2180077	11 Jul 2023 00:03:05	Common Pipistrelle	21	45.8	59	44.8	5	90	53.41792	-6.46345
2180078	11 Jul 2023 00:03:22	Common Pipistrelle	41	45.5	67.5	44.6	6	90	53.41791	-6.46346
2180079	11 Jul 2023 00:03:37	Common Pipistrelle	13	45.8	69.3	44.8	6	86	53.41792	-6.46346
2180080	11 Jul 2023 00:03:44	Common Pipistrelle	21	45.3	65.5	44.4	6	93	53.41792	-6.46346
2180081	11 Jul 2023 00:03:57	Common Pipistrelle	28	45	60.2	43.9	7	90	53.41792	-6.46345
2180082	11 Jul 2023 00:04:06	Common Pipistrelle	65	44.9	55.1	44	7	100	53.41792	-6.46345
2180083	11 Jul 2023 00:04:21	Common Pipistrelle	28	45.6	64.9	44.8	7	90	53.41792	-6.46344
2180084	11 Jul 2023 00:04:28	Common Pipistrelle	17	44.2	46.8	43.2	9	200	53.4179	-6.46344
2180085	11 Jul 2023 00:04:40	Common Pipistrelle	8	44.3	46.5	43.5	9	204	53.41789	-6.46344
2180086	11 Jul 2023 00:04:44	Common Pipistrelle	24	45.2	53.1	44.5	6	95	53.4179	-6.46344

RECORD	TIME STAMP	SPECIES	CALLS [#]	MEAN PEAK FREQUENCY [KHZ]	MEAN MAX FREQUENCY [KHZ]	MEAN MIN FREQUENCY [KHZ]	MEAN CALL LENGTH [MS]	MEAN CALL DISTANCE [MS]	LATITUDE [WGS84]	LONGITUDE [WGS84]
2180087	11 Jul 2023 00:04:52	Common Pipistrelle	30	45.3	55	44.5	6	96	53.41792	-6.46346
2180088	11 Jul 2023 00:04:59	Common Pipistrelle	19	45.5	56.6	44.2	7	95	53.41792	-6.46345
2180089	11 Jul 2023 00:05:56	Common Pipistrelle	10	45.2	56	44.3	6	86	53.41792	-6.46346
2180090	11 Jul 2023 00:06:01	Common Pipistrelle	23	45.4	58.7	44.4	6	83	53.41792	-6.46346
2180091	11 Jul 2023 00:06:25	Common Pipistrelle	27	44.9	59.6	43.8	7	94	53.41792	-6.46345
2180092	11 Jul 2023 00:06:37	Common Pipistrelle	23	46	68.8	45.2	5	80	53.41792	-6.46346
2180093	11 Jul 2023 00:07:02	Common Pipistrelle	50	44.9	54.6	43.7	7	100	53.41793	-6.46345
2180094	11 Jul 2023 00:07:20	Common Pipistrelle	70	45.1	59.5	44.2	6	90	53.41792	-6.46344
2180095	11 Jul 2023 00:07:35	Common Pipistrelle	41	44.9	58.8	43.9	6	90	53.41793	-6.46345
2180096	11 Jul 2023 00:07:54	Common Pipistrelle	45	46.2	77.2	45.2	4	80	53.41792	-6.46344
2180097	11 Jul 2023 00:08:05	Common Pipistrelle	28	45.1	52.3	44	7	94	53.41792	-6.46345
2180098	11 Jul 2023 00:08:21	Common Pipistrelle	24	44.1	48.6	43.3	5	100	53.41793	-6.46345
2180099	11 Jul 2023 00:08:31	Common Pipistrelle	37	45.1	51.2	43.7	7	95	53.41793	-6.46344
2180100	11 Jul 2023 00:08:42	Common Pipistrelle	22	45	64.4	44	7	95	53.41793	-6.46344
2180101	11 Jul 2023 00:08:48	Common Pipistrelle	20	45.2	67.7	44.5	6	90	53.41793	-6.46345

RECORD	TIME STAMP	SPECIES	CALLS [#]	MEAN PEAK FREQUENCY [KHZ]	MEAN MAX FREQUENCY [KHZ]	MEAN MIN FREQUENCY [KHZ]	MEAN CALL LENGTH [MS]	MEAN CALL DISTANCE [MS]	LATITUDE [WGS84]	LONGITUDE [WGS84]
2180102	11 Jul 2023 00:08:55	Common Pipistrelle	56	45.2	60.8	43.6	7	90	53.41793	-6.46344
2180103	11 Jul 2023 00:09:10	Common Pipistrelle	31	44.6	52.2	43.6	7	100	53.41793	-6.46345
2180104	11 Jul 2023 00:09:19	Common Pipistrelle	9	44.3	47.5	43.5	6.8	290	53.41792	-6.46345
2180105	11 Jul 2023 00:09:22	Common Pipistrelle	20	45.2	51.6	44.3	7	95	53.41792	-6.46345
2180106	11 Jul 2023 00:09:31	Common Pipistrelle	8	45.3	58.2	44.3	6	137	53.41792	-6.46345
2180107	11 Jul 2023 00:09:38	Common Pipistrelle	9	44.9	46.5	44	6	285	53.41792	-6.46345
2180108	11 Jul 2023 00:09:41	Common Pipistrelle	28	44.7	52.7	43.4	7	95	53.41792	-6.46345
2180109	11 Jul 2023 00:09:58	Common Pipistrelle	51	44.9	56.1	43.9	6	90	53.41793	-6.46344
2180110	11 Jul 2023 00:10:19	Common Pipistrelle	2	45	46.7	44.4	6.7	601	53.41794	-6.46344
2180111	11 Jul 2023 00:10:29	Common Pipistrelle	36	44.9	58.5	43.5	6	85	53.41793	-6.46344
2180112	11 Jul 2023 00:10:43	Common Pipistrelle	14	44.6	49.7	43.6	7	100	53.41793	-6.46342
2180113	11 Jul 2023 00:10:53	Common Pipistrelle	14	44.9	52.4	43.8	7	100	53.41793	-6.46343
2180114	11 Jul 2023 00:11:02	Common Pipistrelle	25	44.4	51.2	42.7	9	104	53.41793	-6.46343
2180115	11 Jul 2023 00:11:11	Common Pipistrelle	30	45.1	56.1	44.3	6	85	53.41793	-6.46344
2180116	11 Jul 2023 00:11:31	Common Pipistrelle	15	45.3	50.8	44.4	6	90	53.41803	-6.46347

Table D: Full bat survey metadata for the dusk survey of the JCL lands - 15th of August 2023 (Analysis carried out using Elekon BatExplorer 2.1.11.2 Software)

RECORD	TIME STAMP	SPECIES	CALLS [#]	MEAN PEAK FREQUENCY [KHZ]	MEAN MAX FREQUENCY [KHZ]	MEAN MIN FREQUENCY [KHZ]	MEAN CALL LENGTH [MS]	MEAN CALL DISTANCE [MS]	LATITUDE [WGS84]	LONGITUDE [WGS84]
02180000	15 Aug 2023 20:58:18	Noise	1	21	26.6	19.1	3.2	0	53.41605	-6.46141
02180001	15 Aug 2023 21:04:20	Noise	0	0	0	0	0	0	53.41791	-6.46342
02180002	15 Aug 2023 21:09:38	Noise	1	24	26.6	19.1	4.3	0	53.41793	-6.46344
02180003	15 Aug 2023 21:19:04	Noise	0	0	0	0	0	0	53.41976	-6.46376
02180004	15 Aug 2023 21:19:21	Noise	0	0	0	0	0	0	53.41977	-6.46375
02180005	15 Aug 2023 21:27:41	Soprano Pipistrelle	11	52.4	58.8	51.6	3	132	53.42222	-6.46572
02180006	15 Aug 2023 21:27:56	Noise	6	53.6	61.8	53	3	80	53.42222	-6.46572
02180007	15 Aug 2023 21:28:27	Soprano Pipistrelle	16	52.5	72.5	51.9	3	74	53.42222	-6.46572
02180008	15 Aug 2023 21:28:33	Soprano Pipistrelle	15	52.2	86.8	51.4	4	65	53.42222	-6.46572
02180009	15 Aug 2023 21:28:39	Soprano Pipistrelle	2	54.4	61.9	53.6	2.4	78	53.42222	-6.46572
02180010	15 Aug 2023 21:28:58	Soprano Pipistrelle	22	52.3	69.6	51.4	3	65	53.42222	-6.46572
02180011	15 Aug 2023 21:29:29	Noise	0	0	0	0	0	0	53.42223	-6.46571
02180012	15 Aug 2023 21:29:36	Soprano Pipistrelle	5	52.8	59.7	52.1	3	90	53.42223	-6.46571

RECORD	TIME STAMP	SPECIES	CALLS [#]	MEAN PEAK FREQUENCY [KHZ]	MEAN MAX FREQUENCY [KHZ]	MEAN MIN FREQUENCY [KHZ]	MEAN CALL LENGTH [MS]	MEAN CALL DISTANCE [MS]	LATITUDE [WGS84]	LONGITUDE [WGS84]
02180013	15 Aug 2023 21:30:46	Soprano Pipistrelle	13	53.5	73.3	52.7	3	60	53.42224	-6.4657
02180014	15 Aug 2023 21:31:36	Common Pipistrelle	7	50.2	82.1	47.3	3	103	53.42234	-6.4658
02180015	15 Aug 2023 21:36:44	Soprano Pipistrelle	8	55.8	60.1	55.1	2	234	53.42397	-6.46612
02180016	15 Aug 2023 21:37:48	Soprano Pipistrelle	10	50.7	89.9	49.5	5	70	53.42396	-6.46612
02180017	15 Aug 2023 21:43:24	Soprano Pipistrelle	23	54.6	86.5	53.9	4	75	53.4243	-6.46558
02180018	15 Aug 2023 21:46:22	Soprano Pipistrelle	12	53.3	78.4	52.5	5	80	53.42396	-6.46424
02180019	15 Aug 2023 21:46:39	Common Pipistrelle	18	44.7	71.5	44	4	85	53.42384	-6.46436
02180020	15 Aug 2023 21:46:44	Common Pipistrelle	6	44.7	50.9	44.1	3	186	53.42384	-6.46437
02180021	15 Aug 2023 21:49:25	Soprano Pipistrelle	6	52.2	54.4	51.8	7.6	164	53.42383	-6.4644
02180022	15 Aug 2023 21:49:44	Common Pipistrelle	19	45.8	83.7	45.2	4	50	53.42382	-6.46441
02180023	15 Aug 2023 21:50:18	Noise	0	0	0	0	0	0	53.42382	-6.46441
02180024	15 Aug 2023 21:50:34	Common Pipistrelle	31	45.5	47.8	44.9	6	110	53.42382	-6.46442
02180025	15 Aug 2023 21:51:34	Common Pipistrelle	28	47.7	91.3	46.8	4	85	53.42382	-6.46441
02180026	15 Aug 2023 21:52:10	Common Pipistrelle	15	48.8	84	47.4	5	70	53.42382	-6.46439
02180027	15 Aug 2023 21:53:17	Soprano Pipistrelle	17	52.9	74	51.7	6	74	53.42382	-6.4644

RECORD	TIME STAMP	SPECIES	CALLS [#]	MEAN PEAK FREQUENCY [KHZ]	MEAN MAX FREQUENCY [KHZ]	MEAN MIN FREQUENCY [KHZ]	MEAN CALL LENGTH [MS]	MEAN CALL DISTANCE [MS]	LATITUDE [WGS84]	LONGITUDE [WGS84]
02180028	15 Aug 2023 22:00:31	Leisler's Bat	5	23	24.2	21.2	14	375	53.42223	-6.46431
02180029	15 Aug 2023 22:00:35	Leisler's Bat	5	23.3	24.7	22.2	14	354	53.42221	-6.46428
02180030	15 Aug 2023 22:00:39	Leisler's Bat	4	22.1	22.9	21.5	15.3	519	53.42221	-6.46427
02180031	15 Aug 2023 22:04:42	Noise	0	0	0	0	0	0	53.42172	-6.46353
02180032	15 Aug 2023 22:11:51	Noise	0	0	0	0	0	0	53.42126	-6.46209
02180033	15 Aug 2023 22:21:07	Soprano Pipistrelle	5	50	56.6	49.4	5	176	53.42027	-6.46146
02180034	15 Aug 2023 22:22:01	Noise	0	0	0	0	0	0	53.42023	-6.46142
02180035	15 Aug 2023 22:31:37	Common Pipistrelle	11	43.1	44.3	42.4	10	405	53.41869	-6.46122
02180036	15 Aug 2023 22:34:57	Noise	0	0	0	0	0	0	53.41868	-6.46122
02180037	15 Aug 2023 22:35:17	Noise	0	0	0	0	0	0	53.41868	-6.46123
02180038	15 Aug 2023 22:43:45	Noise	0	0	0	0	0	0	53.4177	-6.46116
02180039	15 Aug 2023 22:47:51	Common Pipistrelle	2	22.5	25.9	19.5	2.1	0	53.41736	-6.46115
02180040	15 Aug 2023 22:50:03	Soprano Pipistrelle	16	52.6	55.6	51.9	6	100	53.41619	-6.46108
02180041	15 Aug 2023 22:50:17	Leisler's Bat	2	24	25.9	23.1	11.2	884	53.41614	-6.46107
02180042	15 Aug 2023 22:53:28	Leisler's Bat	9	23.5	24.4	22.8	10	431	53.41612	-6.46106

RECORD	TIME STAMP	SPECIES	CALLS [#]	MEAN PEAK FREQUENCY [KHZ]	MEAN MAX FREQUENCY [KHZ]	MEAN MIN FREQUENCY [KHZ]	MEAN CALL LENGTH [MS]	MEAN CALL DISTANCE [MS]	LATITUDE [WGS84]	LONGITUDE [WGS84]
02180043	15 Aug 2023 22:53:33	Leisler's Bat	5	21	21.5	20.3	15.8	505	53.41612	-6.46106

Appendix VI – Dunboyne Eastern Distributor Road Hedgerow Appraisal Report

Enviroguide CONSULTING

enviroguide.ie

Hedgerow Appraisal Report

PRESENTED TO

Conncarr Developments Limited
Eastern Distributor Road, Dunboyne, Co. Meath

DATE

December 2023

Environmental Consultancy Services

DOCUMENT CONTROL SHEET

Client	Conncarr Developments Limited
Project Title	Proposed Development of Eastern Distributor Road at Station Road, Pace Line Bracetown, Dunboyne, Co. Meath
Document Title	Hedgerow Appraisal Report

Revision	Status	Author(s)	Reviewed	Approved	Issue Date
00	Draft for internal Review	YM *Ecologist*	BL *Principal Ecologist*	-	-
01	Draft for Client	YM *Ecologist*	SH *Project Ecologist*	-	-
02	Final	YM *Ecologist*	SH *Project Ecologist*	BL *Principal Ecologist*	15/08/2023
03	Final	YM *Ecologist*	LG *Senior Ecologist*	BL *Principal Ecologist*	06/10/2023
04	Final	YM *Ecologist*	LG *Senior Ecologist*	BL *Principal Ecologist*	10/10/2023
05	Final	YM *Ecologist*	LG *Senior Ecologist*	BL *Principal Ecologist*	15/12/2023

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The methodology adopted and the sources of information used by Enviroguide in providing its services are outlined in this Report.

The work described in this Report is based on the conditions encountered and the information available during the said period of time. The scope of this Report and the services are accordingly factually limited by these circumstances.

All work carried out in preparing this report has used, and is based upon, Enviroguide's professional knowledge and understanding of the current relevant national legislation. Future changes in applicable legislation may cause the opinion, advice, recommendations or conclusions set out in this report to become inappropriate or incorrect. However, in giving its opinions, advice, recommendations and conclusions, Enviroguide has considered pending changes to environmental legislation and regulations of which it is currently aware. Following delivery of this report, Enviroguide will have no obligation to advise the client of any such changes, or of their repercussions.

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Unless otherwise stated in this Report, the assessments made assume that the site and facilities will continue to be used for their current or stated proposed purpose without significant changes.

The content of this report represents the professional opinion of experienced environmental consultants. Enviroguide does not provide legal advice or an accounting interpretation of liabilities, contingent liabilities or provisions.

If the scope of work includes subsurface investigation such as boreholes, trial pits and laboratory testing of samples collected from the subsurface or other areas of the site, and environmental or engineering interpretation of such information, attention is drawn to the fact that special risks occur whenever engineering, environmental and related disciplines are applied to identify subsurface conditions. Even a comprehensive sampling and testing programme implemented in accordance with best practice and a professional standard of care may fail to detect certain conditions. Laboratory testing results are not independently verified by Enviroguide and have been assumed to be accurate. The environmental, ecological, geological, geotechnical, geochemical and hydrogeological conditions that Enviroguide interprets to exist between sampling points may differ from those that actually exist. Passage of time, natural occurrences and activities on and/or near the site may substantially alter encountered conditions.

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1 INTRODUCTION

1.1 Background

Enviroguide Consulting was commissioned by Conncarr Developments Limited to undertake a Hedgerow Appraisal of lands associated with the Proposed Eastern Distributor Road Development at lands at Station Road, Pace Line Bracetown, Dunboyne, Co. Meath, hereafter referred to as 'Proposed Development' or 'Site', when referring to the application Site area.

The route of the Proposed Development extends over two relatively large areas of land separated by a trainline and intersects with a number of hedgerows. These lands are under different ownership and referred to as 'CE lands' (under Carroll Estates ownership) and 'JCL lands' (under John Connaughton Limited ownership); where it is necessary to distinguish between the two areas of the overall Site (e.g., when describing survey effort).

This Hedgerow Appraisal assesses the hedgerows within the route of the proposed distributor road, and also those associated with future plans for development on CE and JCL lands; which will be the subject of future planning applications.

The purpose of this Report is to summarise the results of a Hedgerow Assessment Survey carried out by Enviroguide Consulting in 2023. The results of this survey will inform the impact assessment and recommendations in relation to hedgerows to be affected.

1.2 Relevant Legislation

1.2.1 Wildlife (Amended) Act 2000

The Wildlife Act 1976 was enacted to provide protection to birds, animals, and plants in Ireland and to control activities which may have an adverse impact on the conservation of wildlife. With regard to the listed species, it is an offence to disturb, injure or damage their breeding or resting place wherever these occur without an appropriate licence from the National Parks and Wildlife Service (NPWS). This list includes all wild birds along with their nests and eggs. Intentional destruction of an active nest from the building stage up until the chicks have fledged is an offence.

This includes the cutting of hedgerows from the 1st of March to the 31st of August. The act also provides a mechanism to give statutory protection to Natural Heritage Areas (NHAs). The Wildlife Amendment Act 2000 widened the scope of the Act to include most species, including the majority of fish and aquatic invertebrate species which were excluded from the 1976 Act.

1.2.2 Invasive Species

Certain plant species and their hybrids are listed as Invasive Alien Plant Species in Part 1 of the Third Schedule of the European Communities (Birds and Natural Habitats) Regulations 2011 (SI 477 of 2011, as amended). In addition, soils and other material containing such invasive plant material, are classified in Part 3 of the Third Schedule as vector materials and are subject to the same strict legal controls.

Failure to comply with the legal requirements set down in this legislation can result in either civil or criminal prosecution, or both, with very severe penalties accruing. Convicted parties under the Act can be fined up to €500,000.00, jailed for up to three years, or both.

Extracts from the relevant sections of the regulations are reproduced below:

"49(2) Save in accordance with a licence granted [by the Department of Arts, Heritage and the Gaeltacht], any person who plants, disperses, allows or causes to disperse, spreads or otherwise causes to grow in anyplace [a restricted non-native plant], shall be guilty of an offence.

49(3) … it shall be a defence to a charge of committing an offence under paragraph (1) or (2) to prove that the accused took all reasonable steps and exercised all due diligence to avoid committing the offence.

50(1) Save in accordance with a licence, a person shall be guilty of an offence if he or she […] offers or exposes for sale, transportation, distribution, introduction, or release—

(a) an animal or plant listed in Part 1 or Part 2 of the Third Schedule,

(b) anything from which an animal or plant referred to in subparagraph (a) can be reproduced or propagated, or

(c) a vector material listed in the Third Schedule, in any place in the State specified in the third column of the Third Schedule in relation to such an animal, plant or vector material."

1.3 Relevant Policies and Objectives

Policies and objectives of the Meath County Development Plan 2021-2027 that are of relevance to local hedgerows are described in Chapter 08. Cultural and Natural Heritage Strategy are as below:

- **HER POL 37**: To encourage the retention of hedgerows and other distinctive boundary treatments in rural areas and prevent loss and fragmentation, where practically possible. Where removal of a hedgerow, stone wall or other distinctive boundary treatment is unavoidable, mitigation by provision of the same type of boundary will be required.
- **HER POL 38**: To promote and encourage planting of native hedgerow species in new developments and as part of the Council's own landscaping works.
- **HER OBJ 36**: To promote awareness, understanding and best practice in the management of the County's woodland, tree and hedgerow resource.

Additionally, the Chapter states "*Roadside boundaries, whether hedgerows, sod and stone bank, stone wall or other boundaries, provide important features that are elements of both the landscape and ecology of rural areas. The retention of such boundary treatments assists in absorbing new rural housing into its surroundings and should generally be encouraged. Occasionally, the removal of substantial lengths of roadside boundaries is proposed as part of an element of improving visibility at the junction of a new entrance onto a road. Where an alternative site is available and otherwise suitable, applicants and Planning Authorities should consider a location that avoids the necessity for widespread boundary removal*."

1.4 Hedgerow Definition

According to Foulkes et al. (2013), hedgerows are defined as linear strips of woody plants with a shrubby growth form that cover more than 25% of the length of a field or property boundary

that have been deliberately established or managed. They often have associated banks, walls, ditches (drains), or trees. Hedges that have developed into lines of trees which no longer display a shrubby growth form (remnant hedgerows) are also included. A remnant hedgerow is generally indicated by a (broken) line of mature or senescent plants in tree, rather than shrub form. These almost invariably have a high percentage of gaps, although may have bits of shrubby growth (including brambles) along their length.

Foulkes' definition of a hedgerow correlates with Fossitt (2000), which defines hedgerows as "*linear strips of shrubs, often with occasional trees, that typically form field or property boundaries. Dimensions of hedgerows are taken here as being mainly less than 5m high and 4m wide. When wider or taller than this, or dominated by trees, the habitat should be considered as a narrow strip of scrub or woodland, or as a treeline - WL2. Some hedgerows may be overgrown or fragmented if management has been neglected, but they should still be considered in this category unless they have changed beyond recognition. Linear strips of low scrub are included in this category if they occur as field boundaries.*"

It should be noted that gaps that are filled with brambles (*Rubus* spp.) and/or non woody vegetation were still recorded as gaps in this report following Foulkes *et. al* (2013). All hedgerows and treelines that were surveyed at the Site were assessed as being 'hedgerows' according to the above definitions.

1.4.1 Irish Hedgerows

Networks of dense hedgerows are a distinct characteristic of the Irish landscape, and reflect many centuries of planting, border establishment, and cultural practice. Hedgerows are most widespread semi-natural habitats in the country and are multi-functional and represent a potentially vital source of biodiversity that has yet to be comprehensively quantified and fully understood.

Hedgerows are used as/for:

- Agricultural barriers and boundaries,
- Historic townland boundary markers,
- Livestock control,
- Shade and shelter provision,
- Archives of cultural and archaeological history,
- Aesthetic, sense of place,
- Habitat provision for wildlife species,
- Biodiversity refugia and corridors.

In addition, the network of hedgerows provides several recognised Ecosystem Services in Ireland:

- Provisioning Services (i.e., food and fuel).
- Regulation Services (i.e., air quality, climate moderation, water quality, soil erosion control, disease management, pest control and pollination).

- Cultural Services (i.e., aesthetic value, educational and recreational).
- and Support Services (i.e., soil formation, photosynthesis, and nutrient cycling).

2 METHODOLOGY

2.1 Desk Study

A desktop study was carried out to collate and review available information, datasets, and documentation sources relevant for the completion of the Hedgerow Assessment Survey. The desktop study, completed in July 2023 relied on the following sources:

- National Parks and Wildlife Service (NPWS) datasets.
- Geological Survey Ireland (GSI) online datasets and mapping.
- Environmental Protection Agency (EPA) mapping and datasets.
- OSI aerial imagery and Discovery Series mapping.
- Satellite imagery from various sources and dates (Google, Digital Globe, Bing).
- The Status of EU Protected Habitats in Ireland (NPWS).
- Office of Public Works (OPW) Flood Plans (*https://www.floodinfo.ie/map/floodplans/*).
- Department of Agriculture, Food, and the Marine Forestry Licence Viewer (*https://forestry-maps.apps.rhos.agriculture.gov.ie/*).

2.2 Field Survey

The Hedgerow Assessment Survey conducted was an adaptation of the Hedgerow Appraisal System (HAS) by Foulkes et al., 2013. In addition, the assessment adapted the Hedgerow Evaluation and Grading System (HEGS) by Clements and Toft (1992) was supplementally implemented at the same time. The survey was conducted on 28th June 2023.

The hedgerows on the Site were divided into four distinct hedgerows (H1 to H4 (Figure 1)), with nodes or connections to adjacent hedgerows demarcating the extent of any single hedgerow.

The route of each length of hedgerow was then walked and surveyed. Hedgerows can be said to be of three floristic layers, each of which was visually inspected, and species/condition recorded:

i. The tree layer, in which trees within the hedge are distinct from the shrub layer.

ii. The shrub layer, which includes thorns, woody climbers/lianas, shrubby trees (a result of cutting or laying).

iii. The ground flora are herbaceous, broadleaved plants, rushes, grasses, and ferns found at the base of the hedge. Some of these species are indicators of hedgerow antiquity.

2.2.1 Hedgerow Appraisal System (Foulkes et al. 2013)

It was necessary to modify the approach as the objective of Foulkes et al. (2013) was to devise a national database of hedgerows whereby samples from 1 km² areas are surveyed, rather than hedgerows associated with a particular site. Hence, the following criteria (as per Foulkes) were included:

- Adjacent land use.
- History.

- Links to semi-natural habitat and/or designated sites.
- Construction of the hedgerow (ditches, banks, walls).
- Structure/condition.
- Species present.

The field data collected was also used to assess the condition of each hedgerow based on the following categories (after Foulkes et al. 2013):

- Structural variables.
- Continuity.
- Negative indicators/degradation/issues affecting long term viability etc.

The condition of the hedgerow is ranked on a scale of 0 to 3, where 0 is unfavourable, 1 is adequate, 2 is favourable and 3 is highly favourable. The higher the score, the more favourable the condition of the hedgerow in question. A score of 0 in any category is indicative of a hedgerow that is in an unfavourable condition overall at present (Foulkes et al. 2013).

The aforementioned three categories representing the Structural variables, Continuity and other Negative Indicators are divided into several criteria for each, which are assessed with the rank 0 to 3 individually. Overall score for each category is calculated as the average of the values of the rank for each criteria. If the average value is a fraction, it will be rounded up.

2.2.2 Hedgerow Evaluation and Grading System (HEGS) (Clements and Toft 1992)

The Hedgerow Evaluation and Grading System (Clements and Toft 1992), which broadly follows the methodology of the Hedgerows Regulations 1997 of England and Wales and provides a greater level of detail when assessing a hedgerows ecological features, was undertaken. It has been applied mainly in the UK but has not been validated for Irish conditions, however, has been applied here to give insight to the ecological value of any given hedgerow on Site.

The methodology provides a score between 0 (bad) and 4 (good) for hedgerow features with a final grade assigned based on the results, as indicated below. Grades above 2 are classed as being of nature conservation priority.

- Grade 1 – High to very high value;
- Grade 2 – Moderately high to high value;
- Grade 3 – Moderate value; and
- Grade 4 – Low value.

Survey sheets are presented in Appendix II. This is based on the hedgerow recording and evaluation criteria and scoring matrix as prepared by the Hedgerow evaluation and Grading System (Clements and Toft 1992).

For the assessment, the following filed data were collected on the following in accordance with the criteria outlined in Schedule 1, Part II of the above Hedgerow Regulations:

- Number of woody species, on average, in each 30m strip;
- Presence of rare tree species;
- Number of standard trees, on average, within each 50 m section;
- Number of gaps in the hedgerow;
- Presence of woodland ground flora species listed in Schedule 2 of the Regulations;
- Presence of ditches, banks or walls;

- Number of connections with other hedgerows, ponds or woodland;
- Presence of parallel hedges within 15 m of the hedgerow; and
- Presence of bridleways, footpaths, byways or public paths.

2.2.3 Floristic Recording

For the assessment in both methodologies, floristic data was recorded from the entire length of each hedgerow and from two non-concurrent 30m strips randomly selected along the length of each hedgerow following HAS System.

Data was collected on:

- Records of all species in tree, shrub and ground flora layers, following Stace (2010);
- Relative abundance for each species;
    - Abundance was measured by eye using percentage cover scales (dominant to rare or absent, with a percentage estimate to reduce subjectivity)-a modified version of the method used for detecting charcoal in archaeobotanical light fraction samples.
    - The DAFOR scale was employed to measure abundance when developing species lists for each site, along with the growth form (e.g., shrub or field layer, single, clumps, tussock). In this method, the surveyor assigns one of the following categories to the abundance of the species; Dominant, Abundant, Frequent, Occasional or Rare.
- Number of woody species as present and the dominant species within each 30m strip and along the entire length of each hedgerow.

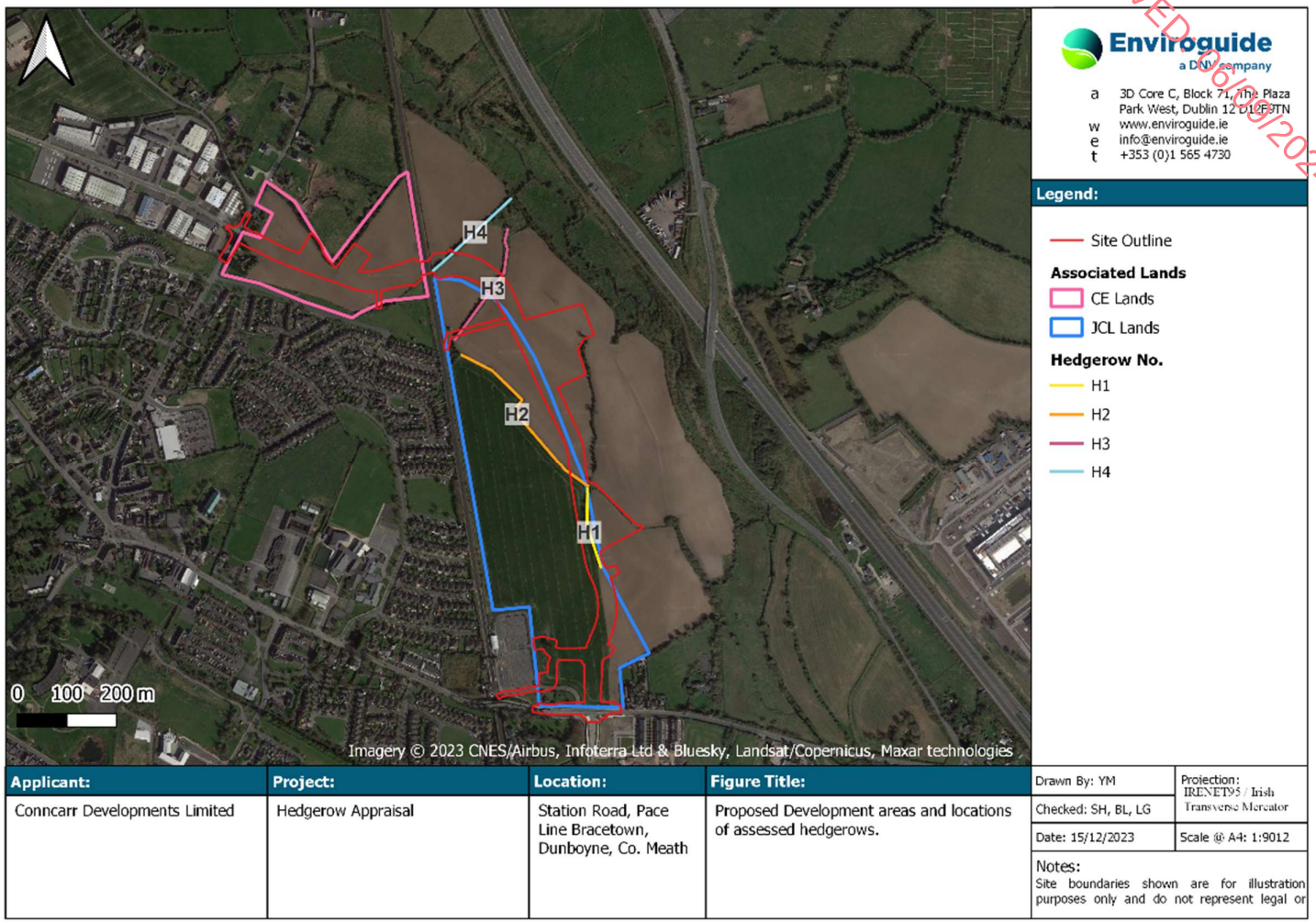


FIGURE 1: HEDGEROW H1 TO H4 AND PROPOSED DEVELOPMENT AREAS. NOTE THAT THE BOUNDARIES ARE SHOWN FOR ILLUSTRATIONS PURPOSES ONLY, AND DO NOT REPRESENT LEGAL OR EXACT BOUNDARIES.

2.3 Limitations

Although efforts were made to identify all flowering species along the survey routes, there is always the possibility that, due to limitations of time and resources, some species may have been missed. As such, as a precaution, the results of the hedgerow appraisals should be considered as indicative rather than comprehensive. However, it is noted that this limitation in no way prevents robust conclusions from being drawn as to the condition and quality of the hedgerows present on Site, and therefore, in no way impedes the fulfilment of its brief as the hedgerow appraisals.

3 RESULTS

All raw data are presented in Appendix I.

3.1 H1

H1 (Figure 2 to Figure 6) is an internal farm boundary between the two arable fields (Oats and Barley) in the Site. H1 is 163m in length with aspect side one being East. The hedgerow consists of two incomplete rows of trees on full hedge-banks[1] (1m height), putting dry vegetated drain (0.5-1m depth) between, with native Irish hedgerow species such as Hawthorn *Crataegus monogyna* and Ash *Fraxinus excelsior*. In summary, standards are overgrown shrubs/trees without management, bases are also outgrown and dense, and there is one gap (2m length). As negative indicators, both sides have no grassy margin over 2m and adjoin arable fields.

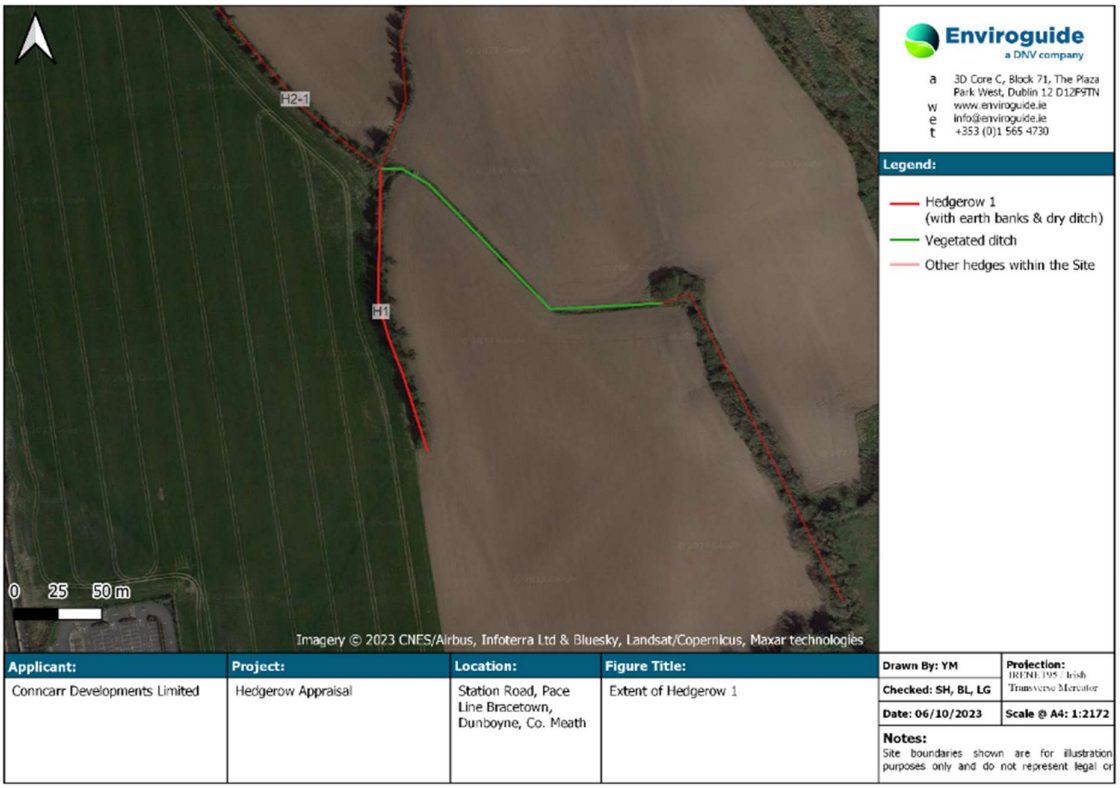
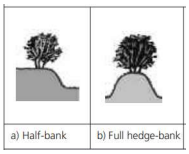


FIGURE 2: H1 EXTENT.

[1] Bank of hedgerows can be divided into 2 types: Half-bank and Full hedge-bank as below (Defra 2007).



The following are the overall results of Hedgerow Assessment for H1:

TABLE 1: H1 OVERALL ASSESSMENT SCORE USING THE MEAN OF CONDITION SCORES (HAS AND HEGS).

Assessment Criteria to Determine Hedgerow Condition	H1
Structural	3- Highly favourable
Continuity	2- Favourable
Negative indicators/Degradation	2- Favourable
HAS Score Overall (the mean of the above scores)	2- Favourable

HEGS Score	Grade 1- High to very high value

Further detail is provided in Table 2:

TABLE 2: H1 ASSESSMENT FURTHER DETAIL (HAS).

Assessment Criteria to Determine Hedgerow Condition	H1	Assessment Score
Structural		
Height	3-5m	3- Highly favourable
Width	>3m	3- Highly favourable
Profile	Overgrown, Outgrowths at base	3- Highly favourable
Basal density	Dense	3- Highly favourable
Continuity		
% Gaps	<5%	2- Favourable
Specific Gaps	1.5m	1- Adequate
Negative Indicators		
Degradation of bank/wall	Minor, earthen banks are densely vegetated by blackberries	2- Favourable
% Canopy dominated by ivy	10%	2- Favourable
Unfavourable species composition	0% of woody growth	3- Highly favourable
>20% evidence herbicide use	<5%	2- Favourable
>20% nutrient rich species	c. 15% of ground flora layer (Common Nettle, Creeping Thistle, Spear Thistle, Curled Dock)	1- Adequate

Alien invasives?	N	3- Highly favourable
Degraded margin	No grassy margin >2m	0- Unfavourable

The following plant species were recorded at H1:

TABLE 3: H1 PLANT SPECIES LIST.

Layer	Common name	Scientific name	DAFOR
Tree	Ash[2]	*Fraxinus excelsior*	D
	Hawthorn	*Crataegus monogyna*	D
	Common Ivy	*Hedera helix*	A
Shrub	Elmleaf Blackberry	*Rubus ulmifolius*	D
	Hawthorn	*Crataegus monogyna*	D
	Common Ivy	*Hedera helix*	A
	Elder	*Sambucus nigra*	F
	Dog Rose	*Rosa canina*	O
	Rusty Willow	*Salix cinerea* subsp. *oleifolia*	R
Herbaceous	Common Ivy	*Hedera helix*	D
	Elmleaf Blackberry	*Rubus ulmifolius*	D
	Hogweed	*Heracleum sphondylium*	F
	Cleavers	*Galium aparine*	O
	Common Nettle[3]	*Urtica dioica*	O
	Hawthorn	*Crataegus monogyna*	O
	Red Fescues	*Festuca rubra* agg.	O
	Creeping Thistle	*Cirsium arvense*	R
	Spear Thistle	*Cirsium vulgare*	R
	Bush Vetch	*Vicia sepium*	R
	Curled Dock	*Rumex crispus*	R
	False Oat-grass	*Arrhenatherum elatius*	R
	Lady's Bedstraw	*Galium verum*	R
	Lesser & Wood Burdock	*Arctium minus*	R
	Perennial Rye-grass	*Lolium perenne*	R
	Prickly Sow-thistle	*Sonchus asper*	R

[2] : species listed in the current hedgerow survey list of native trees, shrubs and climbers (Foulkes et al. 2013).

[3] **A**: Nutrient rich species defined in the guideline of the HAS (Foulkes et al. 2013).

FIGURE 3: H1, THE SOUTHERN END POINT.

FIGURE 4: H1, THE WEST SIDE (TAKEN FROM NORTH TO SOUTH)

FIGURE 5: H1, THE EAST SIDE (TAKEN FROM SOUTH TO NORTH).

FIGURE 6: H1, CONDITION OF THE BASE DOMINATED BY ELMLEAF BLACKBERRIES.

3.2 H2

H2 (Figure 7 to Figure 14) is an internal farm boundary between the two arable fields (Oats and Barley) in the Site. H2 is 395m in length with aspect side one being SW (H2-1) – NW (H2-2) – SW (H2-3). The majority area of the hedgerow is composed of two incomplete rows of trees on full hedge-banks (0.5-1m height), putting dry vegetated drain (0.5-1m depth) between, with native Irish woody species such as Hawthorn and Ash. In summary, standards are overgrown shrubs/trees without management, bases are also outgrowth and dense, and there are five gaps (<5m length). As negative indicators, both sides have no grassy margin over 2m and adjoin arable fields, and a single fruiting mature tree of Sycamore *Acer pseudoplatanus*, which is classed as Invasive Species – risk of Medium Impact by NBDC, was found in H2-3 with some saplings (Figure 7) .

FIGURE 7: H2 EXTENT.

The following are the overall results of the Hedgerow Assessment for H2:

TABLE 4: H2 OVERALL ASSESSMENT SCORE USING THE MEAN OF CONDITION SCORES (HAS AND HEGS).

Assessment Criteria to Determine Hedgerow Condition	H2
Structural	3- Highly favourable
Continuity	2- Favourable
Negative indicators/Degradation	2- Favourable
HAS Score Overall	2- Favourable
HEGS Score	Grade 1 High to very high value

Further detail is provided in Table 5:

TABLE 5: H2 ASSESSMENT FURTHER DETAIL (HAS).

Assessment Criteria to Determine Hedgerow Condition	H2	Assessment Score
Structural		
Height	4-8.5m	3- Highly favourable
Width	>3m	3- Highly favourable
Profile	Overgrown, Outgrowths at base	3- Highly favourable
Basal density	Dense	3- Highly favourable
Continuity		
% Gaps	<5%	2- Favourable
Specific Gaps	3m, 3m, 4m, 2m, 4m and 3m	1- Adequate
Negative Indicators		
Degradation of bank/wall	Minor, earthen banks are densely vegetated by blackberries	2- Favourable
% Canopy dominated by ivy	30%	0- Unfavourable
Unfavourable species composition	<5% of woody growth (Sycamore)	3- Highly favourable
>20% evidence herbicide use	<5%	2- Favourable
>20% nutrient rich species	c. 10% of ground flora layer (Common Nettle, Creeping Thistle, Common Ragwort, Curled Dock)	1- Adequate

Alien invasives?	N[4]	3- Highly favourable
Degraded margin	No grassy margin >2m	0- Unfavourable

The following plant species were recorded at H2:

TABLE 6: H2 PLANT SPECIES LIST.

Layer	Common name	Scientific name	DAFOR
Tree	Ash	*Fraxinus excelsior*	D
	Hawthorn	*Crataegus monogyna*	D
	Common Ivy	*Hedera helix*	A
	Elder	*Sambucus nigra*	O
	Dog Rose	*Rosa canina*	R
	Spindle-tree	*Euonymus europaeus*	R
	Sycamore	*Acer pseudoplatanus*	R
	Wych Elm	*Ulmus glabra*	R
Shrub	Hawthorn	*Crataegus monogyna*	D
	Common Ivy	*Hedera helix*	A
	Elder	*Sambucus nigra*	A
	Elmleaf Blackberry	*Rubus ulmifolius*	A
	Dog Rose	*Rosa canina*	F
	Spindle-tree	*Euonymus europaeus*	R
Herbaceous	Common Ivy	*Hedera helix*	D
	Elmleaf Blackberry	*Rubus ulmifolius*	D
	Cleavers	*Galium aparine*	F
	Common Nettle	*Urtica dioica*	O
	Hogweed	*Heracleum sphondylium*	O
	Red Fescues	*Festuca rubra* agg.	O
	Bush Vetch	*Vicia sepium*	R
	Common Bird's-foot-trefoil	*Lotus corniculatus*	R
	Common Ragwort	*Senecio jacobae*	R
	Creeping Buttercup	*Ranunculus repens*	R
	Creeping Cinquefoil	*Potentilla reptans*	R

[4] Although Sycamore is classed as Invasive Species-risk of Medium Impact by NBDC, it is defined as Naturalised species in the guideline of the HAS and not listed as a legislative invasive species. Therefore, it is ruled out from Alien invasives in the HAS assessment and treated as an unfavourable species.

	Creeping Thistle	*Cirsium arvense*	R
	Curled Dock	*Rumex crispus*	R
	Dog Rose	*Rosa canina*	R
	Elder	*Sambucus nigra*	R
	False Oat-grass	*Arrhenatherum elatius*	R
	Lady's Bedstraw	*Galium verum*	R
	Meadow Foxtail	*Alopecurus pratensis*	R
	Meadow Sweet	*Filipendula ulmaria*	R
	Meadow Vetchling	*Lathyrus pratensis*	R
	Prickly Sow-thistle	*Sonchus asper*	R
	Rosebay Willowherb	*Chamaenerion angustifolium*	R
	^Sycamore[5]	*Acer pseudoplatanus*	R
	Wood Avens[6]	*Geum urbanum*	R
	Wood Dock	*Rumex sanguineus*	R
	Yarrow	*Achillea millefolium*	R
	Willowherb sp.	*Epilobium* sp.	R

[5] ^: Naturalised species defined in the guideline of the HAS (Foulkes et al. 2013).
A: Unfavourable species, not listed as legislative invasive species but classed as Invasive Species by NBDC.

[6] : Species listed in "The current hedgerow survey list of ground flora species" (Foulkes et al. 2013).

FIGURE 8: H2-1, THE NORTH-EAST SIDE (TAKEN FROM SOUTH TO NORTH).

FIGURE 9: H2-1, THE NORTH-EAST SIDE.

FIGURE 10: H2-1, THE CROSS SECTION OF THE MIDDLE POINT.

FIGURE 11: H2-2, THE NORTH-WEST SIDE ON THE MIDDLE OF H2.

FIGURE 12: H2-3, THE SOUTH-WEST SIDE (TAKEN FROM NORTH TO SOUTH).

FIGURE 13: H2, CONDITION BETWEEN THE HEDGE LINES.

FIGURE 14: H2-3, A SINGLE MATURE STAND OF SYCAMORE AS UNFAVOURABLE SPECIES (MARKED IN RED)

3.3 H3

H3 (Figure 15 to Figure 19) is an internal farm boundary between the two arable fields (Barley) in the Site. H3 is 257m in length with aspect side one being NW. The hedgerow is composed of two incomplete lines of trees with native Irish hedgerow species such as Hawthorn and Elder *Sambucus nigra* on almost half-bank (0-0.5m height), putting a dry vegetated drain (1.5m depth) between. In summary, standards are overgrown shrubs without management, bases are also outgrown and dense, and there are two gaps (<5m length). As negative indicators, both sides have no grassy margin over 2m and adjoin arable fields.

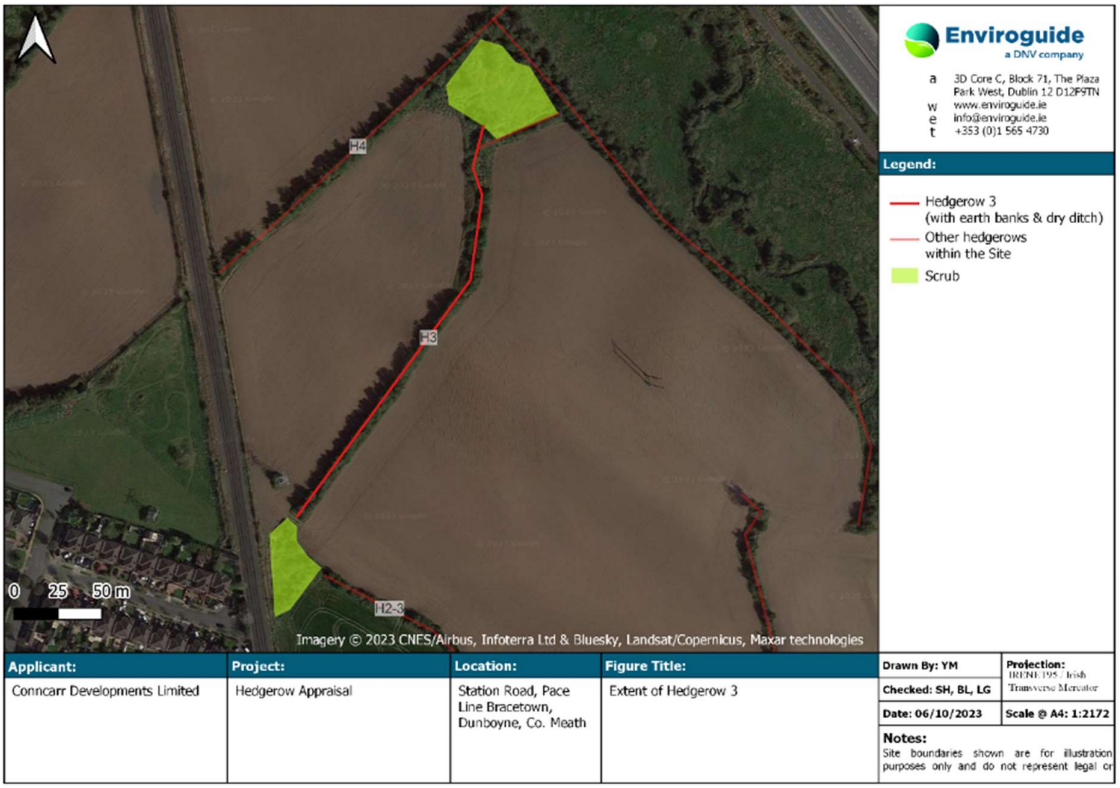


FIGURE 15: H3 EXTENT.

The following are the overall results of the Hedgerow Assessment for H3:

TABLE 7: H3 OVERALL ASSESSMENT SCORE USING THE MEAN OF CONDITION SCORES (HAS AND HEGS)

Assessment Criteria to Determine Hedgerow Condition	H3
Structural	3- Highly favourable
Continuity	2- Favourable
Negative indicators/Degradation	2- Favourable
HAS Score Overall	2- Favourable

HEGS Score	Grade 2- Moderately high to high value

Further detail is provided in Table 8:

TABLE 8: H3 ASSESSMENT FURTHER DETAIL (HAS).

Assessment Criteria to Determine Hedgerow Condition	H3	Assessment Score
Structural		
Height	3-5m	3- Highly favourable
Width	>3m	3- Highly favourable
Profile	Overgrown, Outgrowths at base	3- Highly favourable
Basal density	Dense	3- Highly favourable
Continuity		
% Gaps	<5%	2- Favourable
Specific Gaps	2m and 3m	1- Adequate
Negative Indicators		
Degradation of bank/wall	Minor, earthen banks are densely vegetated by blackberries	2- Favourable
% Canopy dominated by ivy	<5%	2- Favourable
Unfavourable species composition	0% of woody growth	3- Highly favourable
>20% evidence herbicide use	<5%	2- Favourable
>20% nutrient rich species	c. 5% of ground flora layer (Common Nettle, Common Ragwort)	2- Favourable
Alien invasives?	N	3- Highly favourable
Degraded margin	No grassy margin >2m	0- Unfavourable

The H3 plant species lists is presented in Table 9 as follows:

TABLE 9: H3 PLANT SPECIES LIST.

Layer	Common name	Scientific name	DAFOR
Tree	Hawthorn	*Crataegus monogyna*	R
	Common Ivy	*Hedera helix*	R
Shrub	Hawthorn	*Crataegus monogyna*	D
	Elder	*Sambucus nigra*	A
	Common Ivy	*Hedera helix*	A
	Dog Rose	*Rosa canina*	O
	Elmleaf Blackberry	*Rubus ulmifolius*	O
	Wych Elm	*Ulmus glabra*	R
Herbaceous	Common Ivy	*Hedera helix*	D
	Elmleaf Blackberry	*Rubus ulmifolius*	A
	Cleavers	*Galium aparine*	O
	Common Nettle	*Urtica dioica*	O
	Rosebay Willowherb	*Chamaenerion angustifolium*	O
	Cock's-foot	*Dactylis glomerata*	R
	Common Ragwort	*Senecio jacobae*	R
	Creeping Buttercup	*Ranunculus repens*	R
	Dandelion	*Taraxacum* agg.	R
	Dog Rose	*Rosa canina*	R
	False Oat-grass	*Arrhenatherum elatius*	R
	Groundsel	*Senecio vulgaris*	R
	Hogweed	*Heracleum sphondylium*	R
	Lady's Bedstraw	*Galium verum*	R
	Nipplewort	*Lapsana communis*	R
	Willowherb sp.	*Epilobium* sp.	R

FIGURE 16: H3, THE SOUTH END POINT.

FIGURE 17: H3, THE NORTH-WEST SIDE (TAKEN FROM SOUTH TO NORTH).

FIGURE 18: H3, THE NORTH-WEST SIDE (TAKEN FROM NORTH TO SOUTH).

FIGURE 19: H3, GAP WITHIN THE HEDGEROW WITH ELMLEAF BLACKBERRY AND ROSEBAY WILLOWHERB.

3.4 H4

H4 (Figure 20 to Figure 24) is an internal farm boundary between the two arable fields (Barley) in the Site. H4 is 212m in length with aspect side one being NW. The hedgerow consists of two incomplete lines of trees on half-banks (0-0.5m height) with common hedgerow tree species such as Hawthorn and Elder, putting dry vegetated drain (0.5-1m depth) between. In summary, standards are overgrown without management, bases are also outgrown and dense, and there is one gap (5m length). As negative indicators, there is no grassy margin over 2m and some dumping was observed, and herbicide use was identified along the SE verge (c. 50m) (Figure 24).

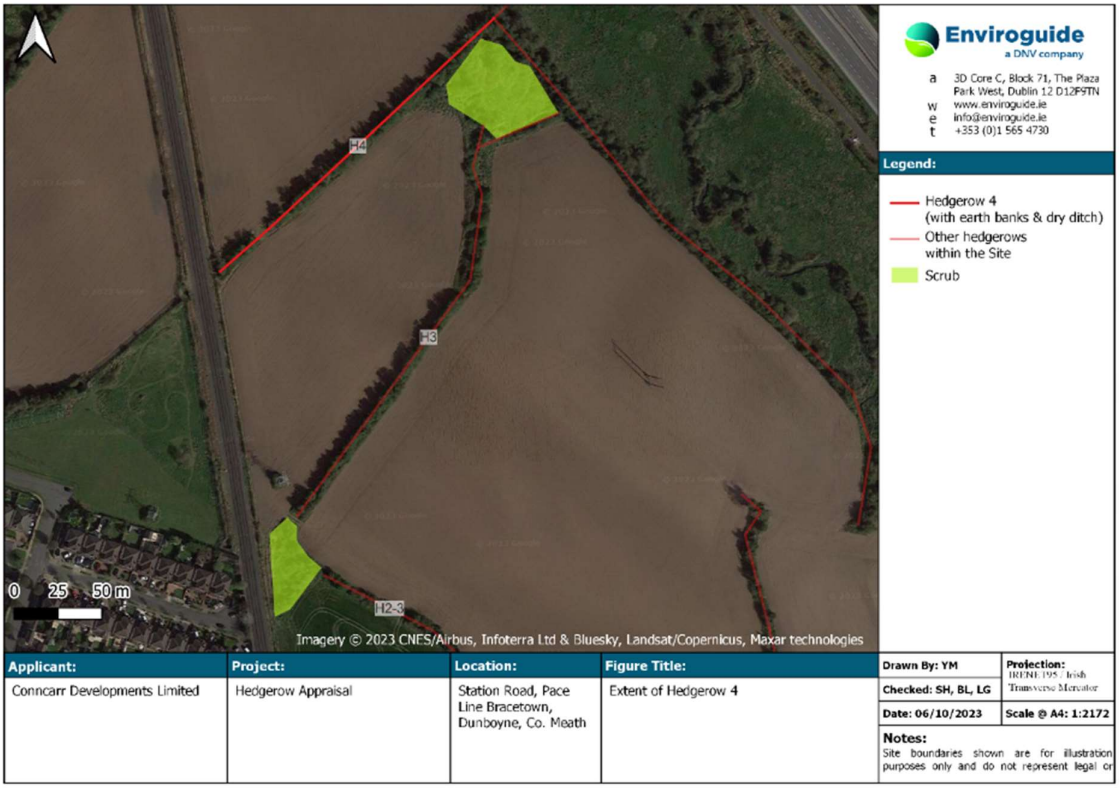


FIGURE 20: H4 EXTENT.

The following are the overall results of the Hedgerow Assessment for H4:

TABLE 10: H4 OVERALL ASSESSMENT SCORE USING THE MEAN OF CONDITION SCORES (HAS AND HEGS).

Assessment Criteria to Determine Hedgerow Condition	H4
Structural	3- Highly favourable
Continuity	2- Favourable
Negative indicators/Degradation	2- Favourable
HAS Score Overall	2- Favourable

HEGS Score	Grade 2- Moderately high to high value

Further details are provided in Table 11:

TABLE 11: H4 ASSESSMENT FURTHER DETAIL (HAS).

Assessment Criteria to Determine Hedgerow Condition	H4	Assessment Score
Structural		
Height	3-5m	3- Highly favourable
Width	3m	2- Favourable
Profile	Overgrown, Outgrowths at base	3- Highly favourable
Basal density	Dense	3- Highly favourable
Continuity		
% Gaps	<5%	2- Favourable
Specific Gaps	5m	1- Adequate
Negative Indicators		
Degradation of bank/wall	Minor, earthen banks are densely vegetated by blackberries	2- Favourable
% Canopy dominated by ivy	<5%	2- Favourable
Unfavourable species composition	0% of woody growth	3- Highly favourable
>20% evidence herbicide use	c. 10% (Might be pesticide)	1- Adequate
>20% nutrient rich species	c. 20% of ground flora layer (Common Nettle, Creeping Thistle, Spear Thistle)	0- Unfavourable
Alien invasives?	N	3- Highly favourable

Degraded margin	No grassy margin >2m	0- Unfavourable

Plant species encounter in H4 include (but are not limited to):

TABLE 12: H4 PLANT SPECIES LIST.

Layer	Common name	Scientific name	DAFOR
Tree	Hawthorn	*Crataegus monogyna*	A
	Common Ivy	*Hedera helix*	R
Shrub	Hawthorn	*Crataegus monogyna*	D
	Elder	*Sambucus nigra*	F
	Elmleaf Blackberry	*Rubus ulmifolius*	O
	Common Ivy	*Hedera helix*	O
	Dog Rose	*Rosa canina*	R
Herbaceous	Common Ivy	*Hedera helix*	D
	Elmleaf Blackberry	*Rubus ulmifolius*	A
	Cleavers	*Galium aparine*	F
	Common Nettle	*Urtica dioica*	F
	Hogweed	*Heracleum sphondylium*	F
	Rosebay Willowherb	*Chamaenerion angustifolium*	O
	Creeping Thistle	*Cirsium arvense*	R
	Nipplewort	*Lapsana communis*	R
	Perennial Rye-grass	*Lolium perenne*	R
	Spear Thistle	*Cirsium vulgare*	R
	Wood Dock	*Rumex sanguineus*	R
	Willowherb sp.	*Epilobium* sp.	R
	Common Poppy	*Papaver rhoeas*	R
	Pineappleweed	*Matricaria discoidea*	R
	White Clover	*Trifolium repens*	R

FIGURE 21: H4, THE SOUTH-EAST SIDE (TAKEN FROM SOUTH TO NORTH).

FIGURE 22: H4, THE SOUTH-EAST SIDE (TAKEN FROM NORTH TO SOUTH).

FIGURE 23: H4, THE SHALLOW DITCH BORDERING AGRICULTURE FIELD ON THE SOUTH EAST.

FIGURE 24: H4, AGRICULTUAL-SPRAY DRIFT (CHLOROSIS OF CLEAVERS AND DOCKS) ON THE SOUTH EAST.

4 HEDGEROW CONDITION SCORING

4.1 Scoring Hedgerow Condition

The condition of the hedgerows at the Site are ranked on a scale of 0 to 3, where 0 is unfavourable, 1 is adequate, 2 is favourable and 3 is highly favourable. The higher the score, the more favourable the condition of the hedgerow in question. A score of 0 in any category is indicative of a hedgerow that is in an unfavourable condition overall at present (Foulkes et al. 2013).

Table 13 outlines the collated condition scores of hedgerows at the Site.

TABLE 13: COLLATED HEDGEROW SCORES

Hedgerow	Condition Score (HAS)	Condition Score (HEGS)
H1	2- Favourable	Grade 1- High to very high value
H2	2- Favourable	Grade 1- High to very high value
H3	2- Favourable	Grade 2- Moderately high to high value
H4	2- Favourable	Grade 2- Moderately high to high value
Median Score	2- Favourable	Grade 2- Moderately high to high value

As can be seen, all hedgerows have been allocated “Favourable” condition assessment in the HAS, and H1 and H2 have been assessed as High to very high ecological value in the HEGS. Hedgerows scored well as regards to structural variables, such as width, height, and having an over-grown profile, as well as biodiversity.

5 IMPACT OF THE PROPOSED DEVELOPMENT

5.1 Removal Hedgerows

Given the combined impact of the proposed road and potential future residential developments, the entire length of hedgerows or majority sections of all hedgerows assessed will be lost (Figure 25).

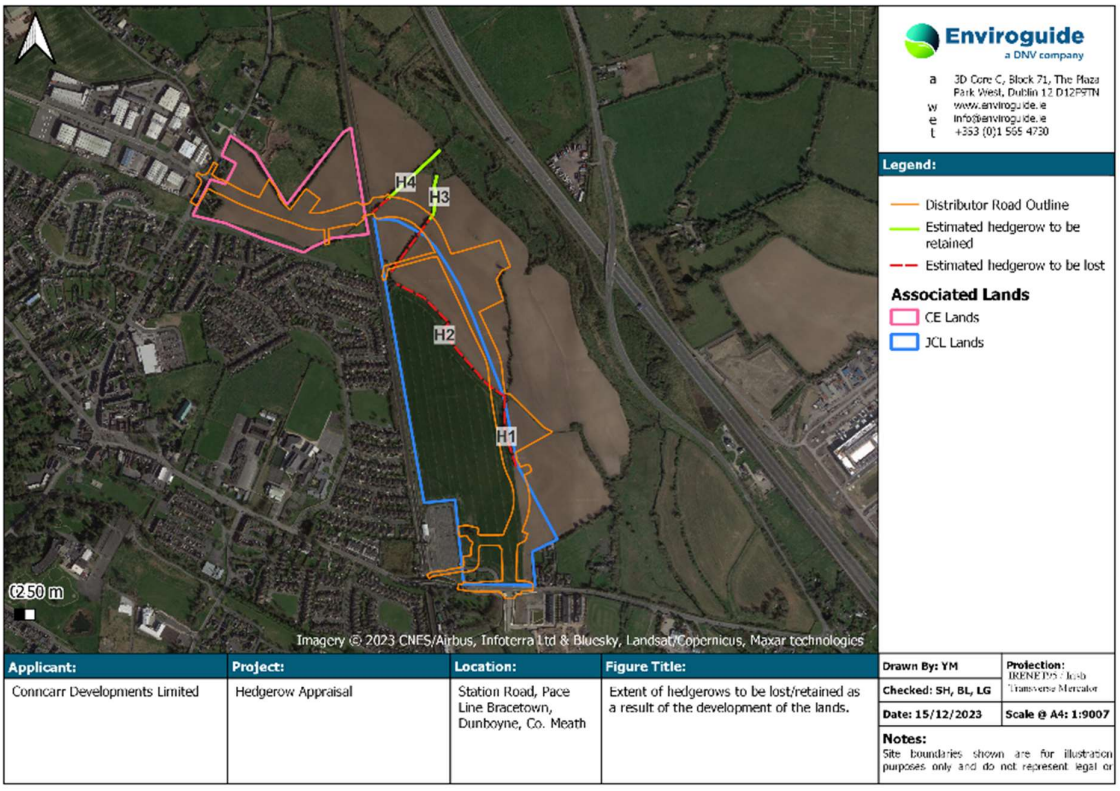


FIGURE 25: ESTIMATED EXTENT OF HEDGEROW LOSS WITH THE PROPOSED (AND FUTURE) DEVELOPMENTS. NOTE THAT THE BOUNDARIES ARE SHOWN FOR ILLUSTRATIONS PURPOSES ONLY, AND DO NOT REPRESENT LEGAL OR EXACT BOUNDARIES.

H1 and H2, which were assessed as “Favourable” and “High to very high value” are likley to be entirely removed (*c.* 163m and 395m, respectively) to allow for the Proposed Development and future development of the JCL lands. H3 and H4, which were assessed “Favourable” and “Moderate to high value”, will have partial removals with the same proposals. The majority of the hedge structures are mature, overgrowing, consisting of native Irish hedgerow species such as Hawthorn, Ash and Elder, with outgrowths and dense basal sections dominated by Elmleaf Blackberry and lack of grassy margins. The approximate lengths of removed hedgerow will be *c.* 74% of the baseline lengths (Table 14), and the loss of these features will result in a significantly reduced habitat for commuting and foraging bats, mammal species and also local breeding bird populations within the Site. In addition, it will have a negative effect on connectivity with other local hedgerows.

TABLE 14: THE BASELINE LENGTH AND POTENTIALLY REMOVED LENGTHS AS A RESULT OF THE PROPOSED AND FUTURE DEVELOPMENT OF EACH HEDGEROW IN THE SITE

Hedgerow no.	H1	H2	H3	H4	Total
Baseline Length	*c.* 163m	*c.* 395m	*c.* 257m	*c.* 212m	*c.* 1027m
Potentially removed length	*c.* 163m	*c.* 395m	*c.* 154m	*c.* 48m	*c.* 760m (c. 74% for the baseline length)

5.2 Damage to the retained trees

National Roads Authority (NRA) (2006) states examples for expected disturbances on trees during a construction as below, in Guidelines for the Protection and Preservation of Trees, Hedgerows and Scrub Prior to, During and Post Construction of National Road Schemes,

- Mechanical damage to bark, limbs or roots;
- Compaction of the Root Protection Area (RPA)[7] as the result of vehicular and pedestrian activity and/or the storage of materials within this area; and,
- Altered ground levels affecting the hydrological regime.

These disturbances are deemed to lead to the potential of additional impacts on any retained hedges in the Site and the local area.

5.3 Spread of invasive species

A single stand of Sycamore was identified within the hedgerow (H2-3) (Figure 7) in the Site.

Although Sycamore is not a regulated invasive plant species listed in the Third Schedule of the European Communities (Birds and Natural Habitats) Regulations 2011, as amended, it is classed as 'Invasive species – risk of Medium impact' in the NBDC database.

5.4 Impact assessment

In the context of the aforementioned impacts, in the worst-case scenario without any mitigation or compensation measures, the impact on hedgerows is considered to be **permanent, negative and significant** at the Local scale.

Hence, to minimise the impact, it is recommended to create new hedgerows within the Site as the ecological mitigation and compensation approach. Following this approach, while the removals as a result of the Proposed and future Developments will represent a **short to medium-term, negative, slight** impact at the Local scale; until the replacement hedgerows have been planted and become established, the ultimately recreated mature hedgerows will result in **a long-term neutral or positive** effect, depending on the species composition and success of establishment.

[7] RPA is a calculated area of ground that lies immediately under a tree and just beyond the extent of its crown. It is intended to help avoid damage to the tree's rooting system (Woodland Trust 2021).

6 MITIGATION AND COMPENSATION RECOMMENDATIONS

6.1 Construction Phase

6.1.1 Protection of retained trees

For any retained trees and hedgerows, in accordance with British Standards BS 5837:2012 'Trees in relation to design, demolition and construction – Recommendations' (The British Standards Institution 2012), protective tree fencing will be erected prior to any Construction works being undertaken to prevent damage to the canopy and root protection areas of existing trees within the Site. The fencing should be signed off by a qualified arborist prior to Construction to ensure it has been properly erected. No ground clearance, earthworks, stock-piling or machinery movement will be undertaken within these areas.

All trees that are being retained within the Site must be protected by barriers and ground protection prior to the construction phase as below. The measures should be carried out following NRA (2006) and BS 5837:2012:

- Barriers and protection should be put in place prior to any development work or soil excavations being carried out.
- Prior to installation of barriers, calculate the RPA for the retained trees, then protect the area with fencing barriers and/or ground protection measures from pedestrian and vehicle activities. The formulas are stated in NRA (2006).
- Where all works can be excluded from the RPA, it is desirable that fences will be erected outside of the RPA to create the exclusion zone around a retained existing hedges.
- Where construction activities are needed within the RPA, ground protection will be installed there.
- As per NRA (2012), the barrier will consist of a vertical and horizontal scaffold frames and should be at least 2.3m in height. Scaffold frames and welded mesh panels are recommended as materials in BS 5837:2012.
- Examples of ground protection include a layer of bark mulching, single thickness scaffolding boards and so on. The selection should be decided following the guidelines of NRA (2006) and BS 5837:2012, and depend on a type of the activities within the RPA, namely: merely pedestrians or including vehicles.
- Ground alteration in the vicinity of the retained hedges could lead the change of soil hydrology. Therefore, where it is needed, a ECoW should assess the impact and advise a measurement.

6.1.2 Timing of Hedgerow Removal

As the hedgerows have been deemed suitable for supporting various types of wildlife, including birds and small mammals (see Biodiversity Chapter of EIAR that accompanies the Distributor Road Application under separate cover), vegetation clearance should be ideally carried out within the months of September and October. This will avoid the main breeding seasons for birds and other small fauna (e.g. mammals and reptiles), as well as hibernation season for small mammals.

Where this seasonal restriction cannot be observed, a check for active nests will be carried out by a suitably qualified Ecological Clerk of Works a maximum of 24h prior to removal. Where a breeding bird and an active nest is found, the nest will be protected, and no further works will take place in the vicinity of the nest until the young have fledged. Where continuance of works is critical, the biodiversity/heritage department of Meath CoCo will be consulted on how best to proceed.

In addition, all vegetation clearance must take place in a phased manner to prevent entrapment of fauna potentially present. Full details of the phased approach are given in the Biodiversity Chapter of the EIAR.

Furthermore, it is recommended that where feasible, berry-bearing trees such as Hawthorn and Blackthorn are left in place until January/February to retain some level of an all-important food source for birds and any remaining other fauna for the duration of the first winter of works at the Site.

6.1.3 Management of Sycamore

To minimize the risk of spreading Sycamore via any works to the on Site, it is recommended the following mitigation measures are adhered to:

1. If removal of the hedgerow including the stand of Sycamore is needed:
   - Prior to any works including the removal of the entire hedgerow, Sycamore should be removed by selective felling, following consultation with a qualified Ecologist, thus ensuring all stands are identified.
   - If nearby native trees are to be left in situ, care must be taken to avoid damaging them during Sycamore removal.
   - Any plant materials of Sycamore must be retrieved from the Site and be disposed of at licensed waste facilities or composting sites, appropriately buried, or incinerated having regard to relevant legislation. All disposals must be carried out in accordance with the relevant Waste Management legislation.

2. If not needed:
   - The Sycamore tree can be left, given the sensitivity of the habitat offered by itself and the hedgerow accommodating it. With the aforementioned protection for retained trees, the spread via the relevant works is deemed to be prevented.

6.2 Construction/Post-construction Phase Hedgerow Recreation

Given the local policies on hedgerow retention and protection (see section 1.3), it is recommended to replant hedgerows within the wider Site area to mitigate and compensate the impact on local hedgerows resulting as the hedgerow removals for the Proposed Development. The proposed plan for the hedgerow recreation is outlined below.

6.2.1 Targets

To mitigate and compensate the impact of the Proposed Development towards hedgerows in the Site, it is recommended to restore hedgerows to the same/higher condition scores as those lost, namely: **overall score should be 2- Favourable or 3- Highly favourable** in the HAS.

To get the high overall score, the new hedgerows should pass criteria with 2- Favourable or 3- Highly favourable in each condition, which is showed in Table 15. In summary, the new hedgerows should be ultimately 2.5m height and 2m width at the least, have a dense base whether they would be topped or escaped (un-topped) hedgerows, and have >2m margin on one side at the least, <5% gaps, <20% noxious species and no invasive species.

Generally, hedgerows with high ecological values can be divided mainly into two types of profiles, namely: escaped hedges which remain un-topped but can be side-trimmed, and topped hedges which trim to A-shaped cross-section with a wide base excluding occasional trees. Either should have a flowering canopy. Although the original hedgerows have the profile of escaped hedges, the choice should depend on the feasibility with the Proposed Development.

TABLE 15: TARGET SCORE AND CRITERIA FOR THE NEW HEDGEROWS

Structural Variables	**2**	**3**
Dimensions	**Favourable**	**Highly favourable**
Height	2.5 – 4m	>4m
Width	2- 3m	>3m
Profile	Boxed/A-shaped; Straight sided	Overgrown; Top heavy/undercut; Outgrowths at base
Basal density	Semi-opaque	Opaque/Dense

Continuity	**2**	**3**
	Favourable	**Highly favourable**
% gaps	<5%	Continuous
Specific gaps	No gaps	No gaps

Negative Indicators	**2**	**3**
	Favourable	**Highly favourable**
% gaps	<5%	Continuous
Ground Flora/Hedge Base		no evidence of Herbicide Use
Ground Flora/Hedge Base		0% Contain Noxious weeds
Ground Flora/Hedge Base		0% Presence of alien invasive species
Degraded Margin	(grassy) margin (2 m or greater on one side of the hedge)	(grassy) margins (2 m or greater on both sides of the hedge)

6.2.1.1 Length

To compensate the loss of the development fully, the minimum linear length will be **the same/longer length as those hedgerows which will be lost as a result of the Proposed Development,** and should be in a single continuous length. Where it is deemed to be difficult to create a single linear feature, several hedgerows can be created; as long as possible, provided they connect with other hedgerows (either within the Site on adjacent lands).

6.2.1.2 Location

The new hedgerows should be planted along a small bank, or with an associated ditch within the Site to consider drainages at the outset and support wildlife movement throughout the Site.

In addition, it is recommended to restore/recreate the connectivity with other hedgerows or isolated patches within the Site after the development of the lands; to provide the wildlife corridors connecting to the surrounding area. Examples include that the new hedges will be located along the proposed road (Eastern Distributor Road), and where the design allows the new hedges to link up with other hedgerows or woody patches. However, the final placement will depend on the design of the Proposed Development.

6.2.1.3 Species

Barr *et. al* (2005) states the recommendation for planting mixed species within hedgerows as *"The idea that mixed species hedges are of more benefit to wildlife than single species lines is long established."* in Hedgerow Management and Costs.

Therefore, to maximise the ecological value of the new hedgerows, they should comprise multiple (at least five) species to enhance overall species richness of the hedgerow resource but with composition based on hedgerows present in the local area. Therefore, the hedgerow should include, Hawthorn, Wych Elm, Spindle-tree, Hazel *Corylus avellana* and Blackthorn *Prunus spinosa*. These are more likely to thrive in the local climate and soils and to be in keeping with the character of the landscape. **At the very least trees should be purchased from a company growing their stock within Ireland**. Imported tree stock has been responsible for the introduction of invasive species such as New Zealand flatworm and likely expedited the spread of ash dieback in the country.

6.2.1.4 Period, Frequency and Intensity of the Management

The period, frequency and intensity of management should depend on the choice of the management methods for escaped hedges with coppicing and laying or topped hedges detailed in the method section. In any case, it is desirable that cutting/laying will be carried out every year partially, e.g. a third of the entire length of the hedges annually and done in multi-year (three years at the minimum) rotation, and the management and maintenance will be continued until the new hedges achieve the targeted overall scores with monitoring. Details are shown in each section.

6.2.2 Methods

To achieve the conditions shown in Table 15, methods for how to create the new hedges and margins and manage them are recommended below.

6.2.2.1 Creating Hedgerows

General recommendations for methods to plant new hedgerows are as follows.

- Clear any grass and vegetation where the new hedges will be planted. Where they will be planted on the existing ditches or hedges with gaps, any works including clearing litter should be implemented September and October (see section 6.1.2)
- If there are no available existing ditches, dig out ditches/drains where possible.
- Bare-root stock can be planted between the end of October and the end of March. Generally, it's best to plant early in the season, before January, to allow the plants more time to establish a network of feeder roots before the onset of spring.

- Never plant during freezing weather or if the ground is waterlogged. Ideally plant on a still, moist day, to minimise root drying and stress to the plants.
- Do not bury the stem or expose the roots when planting.
- Plant in species of local provenance. It is desirable that the hedgerows include Hawthorn, Wych Elm, Spindle-tree, Hazel and Blackthorn. Trees should be purchased from a company growing their stock within Ireland.
- Young plants should be closely spaced (50 cm maximum). As a guide, it is suggested that at least 40cm is left between each row and that four to six plants are planted per metre, mixing several species.
- Hedgerows should be planted in a double staggered row which tends to be better for wildlife than single rows as they are wider and provide more shelter and habitat. Or they should be planted on a herringbone/zigzag line, not a straight line (Heritage Council 2016).

6.2.2.2 Creating herbaceous margins

All original hedgerows assessed did not have adequate margins (>2m with ground flora), which is one of criteria to be assessed **2- Favourable or 3- Highly favourable for Negative Indicator** (Table 15). Therefore, at the same time with hedgerows recreation, it is recommended to create >2m margins dominated by native herbaceous species along new hedgerows aiming to compensate or gain the value of local hedgerows in the future.

- A strip of grassland at least 2m wide on either side of any newly planted hedgerow will greatly increase its value for wildlife.
- It is preferable if herbaceous margins contains a good range of broad leaved herbs and grasses. However, All-Ireland Pollinator Plan does not recommend the use commercial wildflower seed mixes as they have a risk containing non-native species (NBDC 2023).
- Instead, natural regeneration is desirable; to collect seeds from native species in the local areas and sow them into the margins in autumn, or to depend on native species colonizing naturally without sowing. However, the choice should also depend on the weed spectrum, which is more likely to be a problem on heavy soils.
- Mow the margins infrequently (no more than once per year, after mid-July) to encourage a natural succession of native species.

6.2.2.3 Managing hedgerows

As options to maximize the ecological value of hedgerows, the following methods are recommended:

1) Escaped hedge

Escaped hedge is described by Teagasc as bellow:

"Escaped hedge where the individual plants have grown up, become single stem mature trees with gaps in between and thin at the base, but has sufficient stems, one every metre or so. It can be very successfully rejuvenated into a hedge with a dense base by either coppicing or laying."

The best practice for the escaped hedge is as below:

- Trim the sides, never cut the top of trees.
- Side trim should be carried out on a two to three year cycle in rotation, e.g. a third annually, resulting in some areas producing blossom each year. That is because frequent trimming could reduce the biodiversity benefits of hedges, for example, due to cutting the previous year's stems of Hawthorn whose flowers are produced on them (Hedgerows Ireland 2023), or due to tight trimming leading to patchy and frail hedgerows.
- Enhance the rejuvenation to create dense bases by laying or coppicing.

The above methods will promote the creation of similar condition hedgerows to the original hedgerows in the Site, namely, outgrowth of trees and dense bases, which correspond with **3- Highly favourable for Structure Variables** (Table 15).

Methods for laying and coppicing are mentioned below.

a) Hedge-laying

Hedge-laying is a method that allows the creation of high value hedges with tall over trees and thick base, encouraging rejuvenation. The structure of the laid hedge is ideal for local nesting birds.

The general principles are as below:

- Cut stems at the base, as low to the ground as possible, 1/2 to 2/3 of the way through to avoid snapping of the trunk. Stems are left attached to the cut stump by a long living hinge.
- After cutting, stems are laid at an angle of 35-45 degrees running up the slope, producing a hedge approximately 1.2m in height.
- Always lay a hedge uphill if the ground slopes to get better transpiration of moisture so the sap rises and the hedge remains living.
- The timing for laying is when the hedge becomes open at the base or stems are 5-10cm in diameter and 2.5-5.0m height (Lake et. al 2015).
- It is good practice to leave some mature trees or straight stems uncut within the hedge.
- Lay approx. 50m to 100m of the entire length every year and after 10-15 years the length is completed, and you start again at the beginning.

Further information is present on the websites of Teagasc – "How to lay a hedge" (Teagasc 2020) and Hedgerows Ireland – "Hedgerow Planting & Management" (Hedgerows Ireland 2023).

b) Coppicing

Similarly to hedge laying, coppicing involves cutting a tree to stimulate rejuvenation of hedgerows. In coppicing, the entire stem is cut to just above ground level and the cut stump is encouraged to re-shoot. Coppicing will enhance the light condition for ground flora and promote rejuvenation.

However, most coppiced hedges will not return to a flowering mode for a number of years. Therefore, it is recommended not to cut the entire hedgerows at the same time (ideally no more than 5% of a hedge should be coppiced annually) to avoid creating gaps within the hedges and to retain habitats for the wildlife.

Hedgerows Ireland (2023) and Teagasc (2020) mentions the following general principles for coppicing:

- Identify a few occasional trees that will be left uncut and let grow into mature single-stem trees above with a full canopy above the body of the hedge.
- Cut down stems to 2-3 inches above ground level (not right into the soil, just above the soil to produce new shoots).
- All vegetative debris must be cleared from underneath the hedge to get as clean a base as possible. If possible, ivy, bramble and briars should be removed from the ground.
- Fill in gaps with new plants - four per metre with native shrubs such as Hawthorn or Blackthorn.
- No more than 5% of the entire length should be coppiced every year to avoid making gaps within the hedges and losing the resources, structure and function.

Further information are present in the websites of Teagasc – “How to coppice a hedge” (Teagasc 2020) and Hedgerows Ireland – “Hedgerow Planting & Management” (Hedgerows Ireland 2023).

2) Topped hedge

Topped hedge is routinely cut by hedge cutters annually or every few years. It doesn’t need rejuvenation.

The best practice for a topped hedge is as below:

- Side trim from a wide base to a A-shaped profile, which creates a bushy top for maximum protection from wind. This will encourage the development of a dense hedge (Heritage Council 2016).
- Trim the top a little above the previous year’s cut and aim to grow up to at least 2.5m, to gradually reduce cutting intensity each year; cut taller and wider.
- Leave Hawthorn/Blackthorn trees out of rotational cutting on occasion, so that mature trees with a full canopy intermix in every hedge to provide food resources throughout the hedgerow.
- Cut your hedge on a three year cycle in rotation, e.g. a third annually, resulting in some areas producing blossom each year.

The above method allows to create hedges with A-shaped profile and dense bases, which correspond with the condition to get **2- Favourable or 3- Highly Favourable in Structure Variables** (Table 15).

Further information can be found on the website of Hedgerows Ireland – "Hedgerow Planting & Management" (Hedgerows Ireland 2023).

3) Common notes

The following should be noted during the management of new hedgerows:

- Cutting Hedges and ditches should be implemented between September and October to avoid harm and/or injury to fauna.
- Where possible, it is desirable to install fences along the new hedgerows or clear hard tubes around the base of the saplings while the trees are young to prevent deer, hares and rabbits from grazing and browsing on them.
- Do not apply herbicides, pesticides or fertilisers within 1.5m of a hedgerow, as this can lead to nutrient enrichment that can enhance populations for noxious species and invasive species, which affects **scores for Negative Indicator** (Table 15). On the other hand, good weed control is required to protect young growth trees from being excluded by aggressive colonisation and shading by unfavourable species. Management to achieve good weed control should be a priority in the first year. Cut regularly in the first spring/summer to top annual grass weeds and encourage perennial grasses to tiller.
- If any invasive species were found, consult how to deal with them in an ecologically sensitive way by consulting a suitably qualified ecologist.
- During maintenance, if >5m gaps were found within the new hedgerows, close the gap up with native shrubs such as Hawthorn or Blackthorn to retain connectivity and aim to have no gaps, which is a condition of **2- Favourable or 3- Highly favourable for Continuity.**

4) Machine Cutting

General recommendations for the machines to manage hedges are as follows.

- A circular saw should only be considered for coppicing and must not be used for general hedgerow maintenance.
- Finger bar cutters with a pair of reciprocating blades are suitable for trimming young growth.
- A flail cutter should only be used on soft growth of thorny species, and never on heavy woody growth: the resulting ragged ends are unsightly and invite disease.

6.2.3 Monitoring

In the post-construction phase, two years of annual monitoring for the ecological values of the new hedgerows should be carried out by a suitably qualified Ecologist/Botanist, who will provide an updated monitoring and management plan for the hedgerows going forward. Management of the new hedgerows should be carried out as part of the Proposed Development landscape maintenance program, and should be based on the same methods as used in this report, namely, the HAS and if at all possible, supplemented by the HEGS,

depending on the outcomes and recommendations made by the surveying Ecologist/Botanist over the first two years.

7 CONCLUSION

In total four hedgerows were recorded and assessed within the Site, of which all four hedgerows were found to be in '2- Favourable' condition in accordance with the HAS.

As a result of the impact assessment, where the impact of the Proposed and future Developments will be combined, the entire length of hedgerows or majority sections of all hedgerows assessed within the JCL lands will be lost. Without any mitigation and/or compensation measures, this impact might be **permanent, negative and significant at the Local scale**.

Therefore, it is recommended to create new high quality hedgerows within the Site to minimise and compensate the impact. The mitigation and compensation measures consider the disturbance and other impacts from removal of the existing hedgerows, and provide a number of recommendations for planting and management to recreate the hedgerows with the same or higher quality outcomes after a period of establishment with slight negative impacts.

Provided all mitigation measures are implemented and recommendations are adhered to, it is anticipated that the loss and eventual replanting on the assessed hedgerows in new locations will result in an overall **long-term** and **neutral** impact. **Slightly positive, long-term** impacts can be expected if the resulting hedgerows are managed and maintained in a way that promotes higher quality hedgerows than what is currently present.

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APPENDIX I – HEDGEROW DATA SHEETS FOR THE HEDGEROW APPRAISAL SYSTEM

H1

Assessment Criteria to Determine Hedgerow Condition	H1
Structural	3- Highly favourable
Continuity	1.5- Adequate to Favourable
Negative indicators/Degradation	1.9- Favourable
HAS Score Overall (the mean of the above scores)	2.1- Favourable

* This table is scored from 0 to 3: 3 is highly variable, 2 is favourable, 1 is adequate, 0 is unfavourable condition.

HEGS Score	Grade 1- High to very high value

Assessment Criteria to Determine Hedgerow Condition	H1	Assessment Score
Structural		
Height	3-5m	3- Highly favourable
Width	>3m	3- Highly favourable
Profile	Overgrown, Outgrowths at base	3- Highly favourable
Basal density	Dense	3- Highly favourable
Continuity		
% Gaps	<5%	2- Favourable
Specific Gaps	1.5m	1- Adequate
Negative Indicators		
Degradation of bank/wall	Minor, earthen banks are densely vegetated by blackberries	2- Favourable
% Canopy dominated by ivy	10%	2- Favourable
Unfavourable species composition	0% of woody growth	3- Highly favourable
>20% evidence herbicide use	<5%	2- Favourable
>20% nutrient rich species	c. 15% of ground flora layer (Common Nettle, Creeping Thistle, Spear Thistle, Curled Dock)	1- Adequate

Alien invasives?	N	3- Highly favourable
Degraded margin	No grassy margin >2m	0- Unfavourable

This table goes into the criteria in more detail and provides the scores for the first table.

Hedgerow code	**H1**
Surveyor	YM
Date	28/06/2023
Distance between node and strip/strip and next strip	45m Start node to 1st 30m strip
	82m 1st strip to end node
Context	
Land Cover Classification	211 - Non-irrigated arable land
Soil Type (Deep? Well drained? Brown soil?)	Well drained, Brown soil
GPS start point	
GPS end point	
Elevation max (m)	67.7
Elevation min (m)	67.2
Aspect side 1 (N/S/E/W etc.)	E
Aspect side 2	W
1. Adjacent Land Use (Tick where relevant)	
Tillage	X
Dairy	
Cattle	
Sheep	
Mixed stock	
Equine	
Other	
Fodder	
Curtilage	
Amenity/golf course/pitch	
Parkland	
2. History (Tick where relevant)	
Internal farm boundary	X
Townland/parish boundary	
Canal side boundary	
Railway line boundary	
Farm boundary	

Road	
Stream	
Recently established	
First OS edition on which boundary is present (Insert Year)	N
Connects to site or monument? (Y/N and provide details)	N
Connects to historical woodland? OS map (Y/N and provide details)	N
3. Road class (Tick where relevant)	
NP National Primary	
NS National Secondary	
R Regional	
L Local	
U Unclassified	
F Farm Road/Track	(X)
C Coillte Road	
4. Habitat Link Classification (Tick where relevant)	
Arable	X (oats and barley)
Improved grassland	
Neglected pasture	
Semi-natural grassland	
Non-native woodland	
Semi-natural woodland/scrub	
Transitional woodland	
Curtilage/ built land	
Peatlands	
Lake/pond	
Watercourse	
Hedgerow	X
Earth bank	X
Re-colonising bare ground	
Other	X Vegetated wet ditch
5. Designated site (Tick where relevant)	
Annex I habitat	
Designated site	
Designated woodland	

6. Hedgerow/Boundary Function	
Hedgerow redundant	
Active and functional boundary	X (Internal farm boundary)
Construction	**Hedge 1**
7. Outline (Tick where relevant)	
Linear	X
Non-linear	
2. Linearity of shrub	
Single line hedge	
Double line hedge	X
Random line	
3. Bank, wall, shelf (include rough size: <0.5m, 0.5 – 1m, >1m)	
Bank	X (1m)
Wall	
Shelf	
Other	
4. Drain (include rough size: 0.5m, 0.5 – 1m, >1m & whether wet or dry)	
External drain	X (0.5-1m, wet but no flow)
Internal drain	X (0.5-1m, dry)
Internal path/track	
Other	
5. Boundary classification	
WL1 Hedgerow	
WL2 Treeline	X
Structure/Condition	**Hedge 1**
1. Profile	
Remnant	
Derelict/relict	X
Boxed/A-shaped	
Overgrown/irregular	X
Top heavy/undercut	
Straight sided	
Wind-shaped	
2. Base	

Losing basal structure	
Outgrowths at base	X
3. Base structure	
Open	
Semi-open	
Semi-opaque with vegetation	
Opaque/dense	X
4. Height	
<1.5m	
1.5-2.5m	
2.5-4m	
4-5m	X
5m+	
5. Width	
<1m	
1-2m	
2-3m	X
3m+	
6. % Gaps	
Complete	
< 5% gaps	X
5-10%	
10-25%	
25-50%	
>50%	
Specific or general?	General
7. Bank degradation degree and extent	
None	
Minor	X No collapse but covered by blackberries
Severe	
Drain blocked/waterlogged	
Degradation >10%?	N
Degradation isolated?	
Trees	**Hedge 1**
8. Tree Quantity	
None	
Up to 15%	
15-30%	
31-75%	

>75%	X
9. Tree Age	
All mature	
Predominantly mature	X
Predominantly immature	
Mixed age range	
10. Tree height (max)	
<3m	
3-5	
5-10	X
10-20	
>20m	
Hedge Margin	**Hedge 1**
11. Margin/verge width (both sides)	
<1m	X
1-2	
2-4	
4m+	
none	
12. Margin/verge degradation (both sides)	
None	
Poached within 2m	
Ploughed within 2m	X
Herbicide use >2m	
13. Condition	
Poor	X
Average	
Good	
Evidence of disease	
Management	**Hedge 1**
14. Management	
Cut box profile	
Cut A shape	
Cut on one side	
Cut on both sides	
Topped	
Laid	
Coppiced	
Short term unmanaged	

Long term unmanaged	X
Infill planting	
Pruned	
Cropped	
Other	
Out of season? (cut between 1st March and 31st August)	
15. Management Stage	
Over trimmed, gaps, stems sparse	
Over trimmed, infrequent stems far apart	
Recently laid, coppiced, or planted hedgerow	
Dense, healthy, frequent stems >2m	
>3m height, trimmed on rotation	
Non-intervention hedge (intentionally untrimmed)	X
Mature, tall hedgerow with spreading tops	X
Over mature with tops dying back	X
Hedge developed into line of trees	X
16. Management method	
Flail	
Circular saw	
Bar cutter	
Hand tools	
Excavator	
other	
17. Evidence of rejuvenation?	
Sapling	X (Elder, Ash Hawthorn)
18. Fencing	
none	X
Electric	
Post and wire	
Sheep wire	
Timber fence	
Concrete post and rail	
wall	

H2

Assessment Criteria to Determine Hedgerow Condition	H2
Structural	3- Highly favourable
Continuity	1.5- Adequate to Favourable
Negative indicators/Degradation	1.6- Adequate to Favourable
HAS Score Overall	2- Favourable

* This table is scored from 0 to 3: 3 is highly variable, 2 is favourable, 1 is adequate, 0 is unfavourable condition

HEGS Score	Grade 1 High to very high value

Assessment Criteria to Determine Hedgerow Condition	H2	Assessment Score
Structural		
Height	4-8.5m	3- Highly favourable
Width	>3m	3- Highly favourable
Profile	Overgrown, Outgrowths at base	3- Highly favourable
Basal density	Dense	3- Highly favourable
Continuity		
% Gaps	<5%	2- Favourable
Specific Gaps	3m, 3m, 4m, 2m, 4m and 3m	1- Adequate
Negative Indicators		
Degradation of bank/wall	Minor, earthen banks are densely vegetated by blackberries	2- Favourable
% Canopy dominated by ivy	30%	0- Unfavourable
Unfavourable species composition	<5% of woody growth (Sycamore)	3- Highly favourable
>20% evidence herbicide use	<5%	2- Favourable
>20% nutrient rich species	c. 10% of ground flora layer (Common Nettle, Creeping Thistle, Common Ragwort, Curled Dock)	1- Adequate
Alien invasives?	N	3- Highly favourable
Degraded margin	No grassy margin >2m	0- Unfavourable

This table goes into the criteria in more detail and provides the scores for the first table.

Hedgerow code	H2
Surveyor	YM
Date	28/06/2023
Distance between node and strip/strip and next strip	25m Start node to 1st 30m strip
	70m 1st strip to 2nd 30m strip
	58m 2nd strip to 3rd 30m strip
	55m 3rd strip to 4th 30m strip
	66m 4th strip to end node
Context	
Land Cover Classification	212 - Non-irrigated arable land
Soil Type (Deep? Well drained? Brown soil?)	Well drained, Brown soil
GPS start point	
GPS end point	
Elevation max (m)	68.5
Elevation min (m)	66.8
Aspect side 1 (N/S/E/W etc.)	NW, SW, NW
Aspect side 2	SE, NE, SE
1. Adjacent Land Use (Tick where relevant)	
Tillage	X
Dairy	
Cattle	
Sheep	
Mixed stock	
Equine	
Other	
Fodder	
Curtilage	
Amenity/golf course/pitch	
Parkland	
2. History (Tick where relevant)	
Internal farm boundary	X
Townland/parish boundary	
Canal side boundary	
Railway line boundary	
Farm boundary	
Road	

Stream	
Recently established	
First OS edition on which boundary is present (Insert Year)	N
Connects to site or monument? (Y/N and provide details)	N
Connects to historical woodland? OS map (Y/N and provide details)	N
3. Road class (Tick where relevant)	
NP National Primary	
NS National Secondary	
R Regional	
L Local	
U Unclassified	
F Farm Road/Track	(X)
C Coillte Road	
4. Habitat Link Classification (Tick where relevant)	
Arable	X (oats and barley)
Improved grassland	
Neglected pasture	
Semi-natural grassland	
Non-native woodland	
Semi-natural woodland/scrub	(X)
Transitional woodland	
Curtilage/ built land	
Peatlands	
Lake/pond	
Watercourse	
Hedgerow	X
Earth bank	X
Re-colonising bare ground	
Other	
5. Designated site (Tick where relevant)	
Annex I habitat	
Designated site	
Designated woodland	
6. Hedgerow/Boundary Function	

Hedgerow redundant	
Active and functional boundary	X (Internal farm boundary)
Construction	**Hedge 2**
7. Outline (Tick where relevant)	
Linear	X
Non-linear	
2. Linearity of shrub	
Single line hedge	
Double line hedge	X
Random line	
3. Bank, wall, shelf (include rough size: <0.5m, 0.5 – 1m, >1m)	
Bank	X (0.5-1m)
Wall	
Shelf	
Other	
4. Drain (include rough size: 0.5m, 0.5 – 1m, >1m & whether wet or dry)	
External drain	X (0.5-1m, wet but no flow)
Internal drain	X (0.5-1m, dry)
Internal path/track	
Other	
5. Boundary classification	
WL1 Hedgerow	X
WL2 Treeline	
Structure/Condition	**Hedge 2**
1. Profile	
Remnant	
Derelict/relict	X
Boxed/A-shaped	
Overgrown/irregular	X
Top heavy/undercut	
Straight sided	
Wind-shaped	
2. Base	
Losing basal structure	

Outgrowths at base	X
3. Base structure	
Open	
Semi-open	
Semi-opaque with vegetation	
Opaque/dense	X
4. Height	
<1.5m	
1.5-2.5m	
2.5-4m	
4-5m	
5m+	X
5. Width	
<1m	
1-2m	
2-3m	
3m+	X
6. % Gaps	
Complete	
< 5% gaps	X
5-10%	
10-25%	
25-50%	
>50%	
Specific or general?	
7. Bank degradation degree and extent	
None	
Minor	X No collapse but covered by blackberries
Severe	
Drain blocked/waterlogged	
Degradation >10%?	N
Degradation isolated?	
Trees	**Hedge 2**
8. Tree Quantity	
None	
Up to 15%	
15-30%	
31-75%	X
>75%	

9. Tree Age	
All mature	
Predominantly mature	X
Predominantly immature	
Mixed age range	
10. Tree height (max)	
<3m	
3-5	
5-10	X
10-20	
>20m	
Hedge Margin	**Hedge 2**
11. Margin/verge width (both sides)	
<1m	
1-2	X
2-4	
4m+	
none	
12. Margin/verge degradation (both sides)	
None	
Poached within 2m	
Ploughed within 2m	X
Herbicide use >2m	
13. Condition	
Poor	X
Average	
Good	
Evidence of disease	
Management	**Hedge 2**
14. Management	
Cut box profile	
Cut A shape	
Cut on one side	
Cut on both sides	
Topped	
Laid	
Coppiced	
Short term unmanaged	
Long term unmanaged	X

Infill planting	
Pruned	
Cropped	
Other	
Out of season? (cut between 1st March and 31st August)	
15. Management Stage	
Over trimmed, gaps, stems sparse	
Over trimmed, infrequent stems far apart	
Recently laid, coppiced, or planted hedgerow	
Dense, healthy, frequent stems >2m	
>3m height, trimmed on rotation	
Non-intervention hedge (intentionally untrimmed)	X
Mature, tall hedgerow with spreading tops	X
Over mature with tops dying back	X
Hedge developed into line of trees	X
16. Management method	
Flail	
Circular saw	
Bar cutter	
Hand tools	
Excavator	
other	
17. Evidence of rejuvenation?	
Sapling	X (Elder, Sycamore)
18. Fencing	
none	X
Electric	
Post and wire	
Sheep wire	
Timber fence	
Concrete post and rail	
wall	

H3

Assessment Criteria to Determine Hedgerow Condition	H3
Structural	3- Highly favourable
Continuity	1.5- Adequate to Favourable
Negative indicators/Degradation	2- Favourable
HAS Score Overall	2.2- Favourable

* This table is scored from 0 to 3: 3 is highly variable, 2 is favourable, 1 is adequate, 0 is unfavourable condition

HEGS Score	Grade 2- Moderately high to high value

Assessment Criteria to Determine Hedgerow Condition	H3	Assessment Score
Structural		
Height	3-5m	3- Highly favourable
Width	>3m	3- Highly favourable
Profile	Overgrown, Outgrowths at base	3- Highly favourable
Basal density	Dense	3- Highly favourable
Continuity		
% Gaps	<5%	2- Favourable
Specific Gaps	2m and 3m	1- Adequate
Negative Indicators		
Degradation of bank/wall	Minor, earthen banks are densely vegetated by blackberries	2- Favourable
% Canopy dominated by ivy	<5%	2- Favourable
Unfavourable species composition	0% of woody growth	3- Highly favourable
>20% evidence herbicide use	<5%	2- Favourable
>20% nutrient rich species	c. 5% of ground flora layer (Common Nettle, Common Ragwort)	2- Favourable
Alien invasives?	N	3- Highly favourable
Degraded margin	No grassy margin >2m	0- Unfavourable

This table goes into the criteria in more detail and provides the scores for the first table.

Hedgerow code	H3
Surveyor	YM
Date	28/06/2023
Distance between node and strip/strip and next strip	23m Start node to 1st 30m strip
	38m 1st strip to 2nd 30m strip
	75m 2nd strip to 3rd 30m strip
	24m 3rd strip to end node
Context	
Land Cover Classification	215 - Non-irrigated arable land
Soil Type (Deep? Well drained? Brown soil?)	Well drained, Brown soil
GPS start point	
GPS end point	
Elevation max (m)	69.3
Elevation min (m)	70.9
Aspect side 1 (N/S/E/W etc.)	SE
Aspect side 2	NW
1. Adjacent Land Use (Tick where relevant)	
Tillage	X
Dairy	
Cattle	
Sheep	
Mixed stock	
Equine	
Other	
Fodder	
Curtilage	
Amenity/golf course/pitch	
Parkland	
2. History (Tick where relevant)	
Internal farm boundary	X
Townland/parish boundary	
Canal side boundary	
Railway line boundary	
Farm boundary	
Road	
Stream	

Recently established	
First OS edition on which boundary is present (Insert Year)	N
Connects to site or monument? (Y/N and provide details)	N
Connects to historical woodland? OS map (Y/N and provide details)	N
3. Road class (Tick where relevant)	
NP National Primary	
NS National Secondary	
R Regional	
L Local	
U Unclassified	
F Farm Road/Track	(X)
C Coillte Road	
4. Habitat Link Classification (Tick where relevant)	
Arable	X (berley and barley)
Improved grassland	
Neglected pasture	
Semi-natural grassland	
Non-native woodland	
Semi-natural woodland/scrub	
Transitional woodland	
Curtilage/ built land	
Peatlands	
Lake/pond	
Watercourse	
Hedgerow	X
Earth bank	
Re-colonising bare ground	
Other	X Scrub
5. Designated site (Tick where relevant)	
Annex I habitat	
Designated site	
Designated woodland	
6. Hedgerow/Boundary Function	
Hedgerow redundant	

Active and functional boundary	X (Internal farm boundary)
Construction	
7. Outline (Tick where relevant)	
Linear	X
Non-linear	
2. Linearity of shrub	
Single line hedge	
Double line hedge	X
Random line	
3. Bank, wall, shelf (include rough size: <0.5m, 0.5-1m, >1m)	
Bank	X (0-0.5m)
Wall	
Shelf	
Other	
4. Drain (include rough size: 0.5m, 0.5 – 1m, >1m & whether wet or dry)	
External drain	
Internal drain	X (1.5m, dry)
Internal path/track	
Other	
5. Boundary classification	
WL1 Hedgerow	X
WL2 Treeline	
Structure/Condition	
1. Profile	
Remnant	
Derelict/relict	X
Boxed/A-shaped	
Overgrown/irregular	X
Top heavy/undercut	
Straight sided	
Wind-shaped	
2. Base	
Losing basal structure	
Outgrowths at base	X

3. Base structure	
Open	
Semi-open	
Semi-opaque with vegetation	
Opaque/dense	X
4. Height	
<1.5m	
1.5-2.5m	
2.5-4m	X
4-5m	
5m+	
5. Width	
<1m	
1-2m	
2-3m	
3m+	X
6. % Gaps	
Complete	
< 5% gaps	X
5-10%	
10-25%	
25-50%	
>50%	
Specific or general?	
7. Bank degradation degree and extent	
None	
Minor	X No collapse but covered by blackberries
Severe	
Drain blocked/waterlogged	
Degradation >10%?	N
Degradation isolated?	
Trees	
8. Tree Quantity	
None	
Up to 15%	
15-30%	
31-75%	X
>75%	
9. Tree Age	

All mature	
Predominantly mature	
Predominantly immature	
Mixed age range	X
10. Tree height (max)	
<3m	
3-5	X
5-10	
10-20	
>20m	
Hedge Margin	
11. Margin/verge width (both sides)	
<1m	
1-2	X
2-4	
4m+	
none	
12. Margin/verge degradation (both sides)	
None	
Poached within 2m	
Ploughed within 2m	X
Herbicide use >2m	
13. Condition	
Poor	X
Average	
Good	
Evidence of disease	
Management	
14. Management	
Cut box profile	
Cut A shape	
Cut on one side	
Cut on both sides	
Topped	
Laid	
Coppiced	
Short term unmanaged	
Long term unmanaged	X
Infill planting	

Pruned	
Cropped	
Other	
Out of season? (cut between 1st March and 31st August)	
15. Management Stage	
Over trimmed, gaps, stems sparse	
Over trimmed, infrequent stems far apart	
Recently laid, coppiced, or planted hedgerow	
Dense, healthy, frequent stems >2m	
>3m height, trimmed on rotation	
Non-intervention hedge (intentionally untrimmed)	X
Mature, tall hedgerow with spreading tops	X
Over mature with tops dying back	X
Hedge developed into line of trees	
16. Management method	
Flail	
Circular saw	
Bar cutter	
Hand tools	
Excavator	
other	
17. Evidence of rejuvenation?	
Sapling	
18. Fencing	
none	X
Electric	
Post and wire	
Sheep wire	
Timber fence	
Concrete post and rail	
wall	

H4

Assessment Criteria to Determine Hedgerow Condition	H4
Structural	3- Highly favourable
Continuity	1.5- Adequate to Favourable
Negative indicators/Degradation	1.6- Adequate to Favourable
HAS Score Overall	2- Favourable

* This table is scored from 0 to 3: 3 is highly variable, 2 is favourable, 1 is adequate, 0 is unfavourable condition

HEGS Score	Grade 2- Moderately high to high value

Assessment Criteria to Determine Hedgerow Condition	H4	Assessment Score
Structural		
Height	3-5m	3- Highly favourable
Width	3m	2- Favourable
Profile	Overgrown, Outgrowths at base	3- Highly favourable
Basal density	Dense	3- Highly favourable
Continuity		
% Gaps	<5%	2- Favourable
Specific Gaps	5m	1- Adequate
Negative Indicators		
Degradation of bank/wall	Minor, earthen banks are densely vegetated by blackberries	2- Favourable
% Canopy dominated by ivy	<5%	2- Favourable
Unfavourable species composition	0% of woody growth	3- Highly favourable
>20% evidence herbicide use	c. 10% (Might be pesticide)	1- Adequate
>20% nutrient rich species	c. 20% of ground flora layer (Common Nettle, Creeping Thistle, Spear Thistle)	0- Unfavourable
Alien invasives?	N	3- Highly favourable
Degraded margin	No grassy margin >2m	0- Unfavourable

This table goes into the criteria in more detail and provides the scores for the first table.

Hedgerow code	H4
Surveyor	YM
Date	28/06/2023
Distance between node and strip/strip and next strip	32m Start node to 1st 30m strip
	34m 1st strip to 2nd 30m strip
	96m 2nd trip to end node
Context	
Land Cover Classification	216 - Non-irrigated arable land
Soil Type (Deep? Well drained? Brown soil?)	Well drained, Brown soil
GPS start point	
GPS end point	
Elevation max (m)	71.1
Elevation min (m)	71.8
Aspect side 1 (N/S/E/W etc.)	NW
Aspect side 2	SE
1. Adjacent Land Use (Tick where relevant)	
Tillage	X
Dairy	
Cattle	
Sheep	
Mixed stock	
Equine	
Other	
Fodder	
Curtilage	
Amenity/golf course/pitch	
Parkland	
2. History (Tick where relevant)	
Internal farm boundary	X
Townland/parish boundary	
Canal side boundary	
Railway line boundary	
Farm boundary	
Road	
Stream	

Recently established	
First OS edition on which boundary is present (Insert Year)	N
Connects to site or monument? (Y/N and provide details)	N
Connects to historical woodland? OS map (Y/N and provide details)	N
3. Road class (Tick where relevant)	
NP National Primary	
NS National Secondary	
R Regional	
L Local	
U Unclassified	
F Farm Road/Track	(X)
C Coillte Road	
4. Habitat Link Classification (Tick where relevant)	
Arable	X (berley and barley)
Improved grassland	
Neglected pasture	
Semi-natural grassland	
Non-native woodland	
Semi-natural woodland/scrub	
Transitional woodland	
Curtilage/ built land	
Peatlands	
Lake/pond	
Watercourse	
Hedgerow	X
Earth bank	
Re-colonising bare ground	
Other	X (Shrub)
5. Designated site (Tick where relevant)	
Annex I habitat	
Designated site	
Designated woodland	
6. Hedgerow/Boundary Function	
Hedgerow redundant	

Active and functional boundary	X (Internal farm boundary)
Construction	
7. Outline (Tick where relevant)	
Linear	X
Non-linear	
2. Linearity of shrub	
Single line hedge	
Double line hedge	X
Random line	
3. Bank, wall, shelf (include rough size: <0.5m, 0.5 – 1m, >1m)	
Bank	X (0-0.5m)
Wall	
Shelf	
Other	
4. Drain (include rough size: 0.5m, 0.5 – 1m, >1m & whether wet or dry)	
External drain	
Internal drain	X (0.5-1m, dry)
Internal path/track	
Other	
5. Boundary classification	
WL1 Hedgerow	X
WL2 Treeline	
Structure/Condition	
1. Profile	
Remnant	
Derelict/relict	X
Boxed/A-shaped	
Overgrown/irregular	X
Top heavy/undercut	
Straight sided	
Wind-shaped	
2. Base	
Losing basal structure	
Outgrowths at base	X

3. Base structure	
Open	
Semi-open	
Semi-opaque with vegetation	
Opaque/dense	X
4. Height	
<1.5m	
1.5-2.5m	
2.5-4m	X
4-5m	
5m+	
5. Width	
<1m	
1-2m	
2-3m	X
3m+	
6. % Gaps	
Complete	
< 5% gaps	X
5-10%	
10-25%	
25-50%	
>50%	
Specific or general?	
7. Bank degradation degree and extent	
None	
Minor	X No collapse
Severe	
Drain blocked/waterlogged	
Degradation >10%?	N
Degradation isolated?	
Trees	
8. Tree Quantity	
None	
Up to 15%	
15-30%	X
31-75%	
>75%	
9. Tree Age	

All mature	
Predominantly mature	
Predominantly immature	
Mixed age range	X
10. Tree height (max)	
<3m	
3-5	X
5-10	
10-20	
>20m	
Hedge Margin	
11. Margin/verge width (both sides)	
<1m	
1-2	X
2-4	
4m+	
none	
12. Margin/verge degradation (both sides)	
None	
Poached within 2m	X
Ploughed within 2m	X
Herbicide use >2m	X
13. Condition	
Poor	X
Average	
Good	
Evidence of disease	X Chlorosis
Management	
14. Management	
Cut box profile	
Cut A shape	
Cut on one side	
Cut on both sides	
Topped	
Laid	
Coppiced	
Short term unmanaged	
Long term unmanaged	X
Infill planting	

Pruned	
Cropped	
Other	
Out of season? (cut between 1st March and 31st August)	
15. Management Stage	
Over trimmed, gaps, stems sparse	
Over trimmed, infrequent stems far apart	
Recently laid, coppiced, or planted hedgerow	
Dense, healthy, frequent stems >2m	
>3m height, trimmed on rotation	
Non-intervention hedge (intentionally untrimmed)	X
Mature, tall hedgerow with spreading tops	X
Over mature with tops dying back	
Hedge developed into line of trees	
16. Management method	
Flail	
Circular saw	
Bar cutter	
Hand tools	
Excavator	
other	
17. Evidence of rejuvenation?	
Sapling	
18. Fencing	
none	X
Electric	
Post and wire	
Sheep wire	
Timber fence	
Concrete post and rail	
wall	

APPENDIX II – HEDGEROW DATA SHEETS FOR THE HEGS

The assessment scores of H1-H4 for the HEGS are present in Table 16.

TABLE 16: ASSESSMENT SCORES OF H1-H4 FOR THE HEGS

		STRUCTURE								CONNECTIVITY		
Q	6	1	2	3	4	5a	5b	7	8	9	10	11
Hedge Number	Length (m)	Recent	Height	Width	Cross-section	No. Mature	No Young	Mature per 100m	Young Per 100m	No. Gaps	No. Connections	No. Woody species
H1	163	0	4	4	4	3	4	2	2	3	2	6
H2	395	0	4	4	4	8	8	2	2	3	3	6
H3	153	0	4	3	4	2	3	2	2	3	2	6
H4	212	0	3	3	4	2	2	1	1	3	2	5

	DIVERSITY		FEATURES			Total No. Woody species	HEGS Score	Average Number of Species per 30m Section
Q	12	13	14	15	16			
Hedge Number	Native dominance	Woody Species	Bank	Ditch	Verge			
H1	4	2	4	4	0	7	**-1**	6
H2	4	2	3	4	0	9	**-1**	6
H3	4	2	3	3	0	6	**2+**	5
H4	4	2	2	4	0	6	**-2**	5