

7.2 Terrestrial Ecology (Flora and Fauna)

7.2.1 Introduction

Background

This section provides an assessment of the likely impacts of the proposed N9 Kilcullen to Powerstown Scheme on the terrestrial flora and fauna between Kilcullen and Powerstown. It is carried out in compliance with the European Communities (Environmental Impact Assessment) Regulations, 1989 – 2000 and follows the Environmental Protection Agency's *Guidelines on the information to be contained in Environmental Impact Statements* (EPA, 2002).

Approach

While roads have impacts on flora and fauna along their entire length, this report focuses on the areas or features that are of particular ecological significance. Important areas for habitats or species that occur along the route are treated as separate ecological sites. None of these currently has a formal conservation designation. Hedgerows and treelines, because of their structural and species diversity and their role as ecological corridors, are also important for wildlife, particularly in areas of intensive farmland. These linear habitats are widespread and abundant along the proposed route and are described in general terms in this report. Individual hedgerows and treelines are identified where they have significant ecological value. While watercourses are an integral part of some of the terrestrial sites, they are described separately under the aquatic ecology section, in Section 7.3 of this report.

7.2.2 Methodology

Field Survey

Field surveys were carried out in August / September 2002 to identify, describe, map and evaluate habitats, and to verify the information gathered at the desk study stage. Habitats were classified using "A Guide to Habitats in Ireland" (Fossitt, 2000) and the dominant plant species were recorded. The field survey included an assessment of linear habitats along field boundaries, and of the aquatic and riparian habitats at the crossing points of watercourses (see Section 7.3 Aquatic Ecology and Water Quality). In February and April 2003, a walkover survey was carried out on any areas of the alignment that had not been surveyed during the earlier field survey.

Mammals and birds were assessed in the course of the main habitat surveys using a combination of direct sightings and observations of signs, tracks and droppings. Such an assessment of mammals and birds is not exhaustive, but does provide a general evaluation of the main species present.

Consultations

Dúchas, The Heritage Service were consulted to seek their views on various aspects of the scheme including, in particular, the impacts on flora, fauna and fisheries and the proposed mitigation measures.

Evaluation and Impact Assessment Criteria

Terrestrial sites were evaluated and given an overall significance rating on the basis of the criteria outlined in 7.2 Appendix I. The scale of the likely impacts was

assessed on the basis of the area / length of the particular site or habitat that would be lost, and the ecological value of that site or habitat. The impact levels for terrestrial sites were rated as outlined in 7.2 Appendix II.

7.2.3 The Receiving Environment

General

Between Kilcullen and Powerstown, the proposed route passes through flat to undulating land in central and south County Kildare and north County Carlow. Most of the land has been heavily modified by human activity and the predominant land use is agriculture. The land is mostly under good quality farmland and is mainly used for grazing, silage making and tillage, as well as some areas of marginal farmland on poorly drained land. Occasional mixed broadleaf and mixed conifer woodlands occur along the route.

Figure 7.1 – 7.9 (Volume 2), illustrates the significant terrestrial habitats intersected by the route. The proposed route also intersects 3 tributaries of the Barrow, namely the River Lerr, the Burren River and the River Greese. The northern section of the route intersects the Kilcullen River, a tributary of the Liffey. The impacts of the scheme on these rivers is discussed in Section 7.3.

Designated Conservation Areas

Designated conservation areas are areas containing habitats or species of national or international conservation importance. Five designated areas occur within 3 kilometres of the proposed route, having either or both of the following designations: proposed Natural Heritage Area (pNHA) and proposed candidate Special Area of Conservation (pcSAC). These sites, identified and designated by Dúchas, are considered to be of national and international importance respectively for nature conservation. Table 7.2.1 below lists the designated conservation areas that fall within 3 kilometres of the scheme.

Table 7.2.1 Designated Conservation Areas Within 3 kilometres of the Proposed Route

Site Name	Site Code	Status	Distance From Route
Curragh (Kildare)	392	pNHA	2 km north-west
Dunlavin Marshes	1772	pNHA	0.4 km and 2.4 km east
Grand Canal	2104	pNHA	1.6 km west of Athy link
River Lerr pcSAC	2162	pcSAC	Crossed by the route at Ch. 51,200 – Ch. 51,520
River Barrow pcSAC (includes Cloghrick Wood pNHA 806)	2162	pcSAC	0.5km west (Cloghrick Wood 0.3 km north)

The River Lerr and an associated area of land on each side of the river, (which has been designated a proposed candidate Special Area of Conservation pcSAC in 2003) is crossed by the scheme. Dunlavin marshes pNHA and Cloghrick Wood pNHA / pcSAC and the River Barrow (pcSAC) are the closest pNHA's to the proposed route and are located approximately 0.4 and 0.3 kilometres away from the scheme. There will be no direct impact on Dunlavin marshes. While Cloghrick Wood and the River Barrow are outside the study area of the N9 Kilcullen to Powerstown Scheme, the proximity of Junction 5 to the River Barrow pcSAC and Cloghrick Wood pNHA warrants that these areas are included in the

assessment. Cloghrystick Wood is comprised of oak (*Quercus* sp.), beech (*Fagus sylvatica*) hazel (*Corylus avellana*) and willow (*Salix* spp.). Approximately 1200 square metres at the southern tip of the wood will be impacted by any extension of the scheme south of Powerstown, resulting in the loss of 13 semi-mature / mature beech and oak trees. While the River Barrow is outside the study area for this section of the scheme, it will be crossed by any extension of the proposed road. All these sites are of international importance.

Rare Plant Sites

There is 1 recorded rare plant site in an active quarry along the route. Blue fleabane (*Erigeron acer*), listed as vulnerable in the Irish Red Data Book for plants (Curtis and McGough, 1988), was recently recorded from Clonmelsh Pit (Grid ref. S72 70). The route does not impact this site. The Dúchas database contains other records of rare plant sites that may occur in the vicinity of the route. As these records are old (pre-1900) and the locations of the sites are given as 10 kilometres squares only, it not known whether the proposed route impacts upon these sites or not. More detailed grid-reference locations were obtained from Duchas (where available), but the proposed route is not impacting on any of these plants. No rare plants were encountered during the walk-over survey.

Terrestrial Habitats

Most other areas of ecological value that contain some semi-natural habitats, but which are not designated sites, are named and located here by chainage and townland. They are widespread throughout the study area, but are generally of limited extent. They are comprised of a range of habitats including broadleaf woodland, treelines, hedgerows, bogs, fens and wet grassland, and occur mainly along rivers and field boundaries. Small stands and narrow strips of broadleaved woodland have a scattered and localised distribution and are mainly associated with former tree planting on estates, as are most of the treelines with mature broadleaved trees. In places there are well-developed networks of interconnected hedgerows and treelines.

Many of these sites are contiguous and the boundaries are somewhat arbitrary. Table's 7.2.2, 7.2.3, 7.2.4 and 7.2.5 present a summary description of all identified sites for each of the four sections of this route. Figure 7.1 to 7.9 (Volume 2) illustrates the habitats intersected by this route. Field boundaries comprised of hedgerows and treelines are the habitats most frequently occurring along the route and are thus described in more detail below. Abbreviations of habitats in parentheses follow Fossitt (2000).

Field Boundaries

Hedgerows (WL1)

Hedgerows are the predominant type of field boundary and are common along the route, despite the enlargement of fields in many areas. Hedgerows vary considerably in terms of their structural and species diversity. The majority are unmanaged and overgrown, and occur in association with other features such as wet and dry drainage ditches, streams and banks. Some support occasional standard trees, most commonly ash (*Fraxinus excelsior*), willow (*Salix* spp.), beech (*Fagus sylvatica*) and sycamore (*Acer pseudoplatanus*). In places, hedgerows have become overgrown and resemble treelines (greater than 5 metres in height), usually with abundant semi-mature ash.

The most species-poor hedgerows are dominated by willow and / or gorse (*Ulex europaeus*), and also contain brambles (*Rubus fruticosus* agg.) and dog-rose (*Rosa canina*). Many of these occur in poorly drained land, usually in association with drainage ditches or streams. Hawthorn (*Crataegus monogyna*) and/or blackthorn (*Prunus spinosa*) are present in most other hedgerows, and typically occur together with willow, gorse and ash in hedgerows of moderately low species diversity. The other most common woody species are holly (*Ilex aquifolium*), elder (*Sambucus nigra*), ash, beech, sycamore and oak (*Quercus* sp.); some hedgerows also contain elm (*Ulmus glabra*), alder (*Alnus glutinosa*) and birch (*Betula* sp.). The more species-rich hedgerows contain 7 – 10 woody species. When not too shaded, the associated ditches and banks often support vegetation that is typical of a woodland ground flora, with species such as herb Robert (*Geranium robertianum*), primrose (*Primula vulgaris*), hart's-tongue fern (*Phyllitis scolopendrium*) and ivy (*Hedera helix*). Species-poor hedges, comprising mainly non-native species, have been planted around a small number of houses.

In addition to their species and structural diversity, hedgerows are also evaluated on the basis of their connectivity, or potential as ecological corridors for wildlife, and on the presence of mature trees. Mature trees are important for the habitat diversity they provide for invertebrates, birds and bats. The majority of hedgerows surveyed are of low to moderate ecological value.

Treelines (WL2)

There are numerous treelines and networks of treelines along the proposed route. They occur along field boundaries and roads and are most likely to have originated from tree planting on estates in the past. The majority of treelines are dominated by broadleaved species, most commonly oak, beech and ash. Other trees include sycamore, Scots pine (*Pinus sylvestris*) and alder. Most treelines have hedgerow or scrub development at the base and some occur in association with watercourses. The majority of treelines surveyed are of moderate ecological value.

Riparian and Aquatic Habitats

Many of the rivers and streams have a poor diversity of riparian habitat, due to intensive tillage farming in the area. Some of the watercourse channels have been modified to facilitate drainage, and this has generally had a damaging effect on the riverbank and substrate habitats. For further discussion refer to Section 7.3.

Terrestrial Fauna

The otter is a legally protected species under the EU Habitats Directive (listed in Annex II) and is found throughout Ireland (Hayden and Harrington, 2000). Otters tend to occupy linear territories along watercourses and are rarely found far away from water. Although no signs of otter were recorded, all of the main watercourses surveyed have suitable habitat for otters. Many of the minor watercourses will also provide suitable habitat for otters.

Badgers are legally protected under the Wildlife (Amendment) Act 2000. They are common and widespread in Ireland, and are found in all lowland habitats where the soil is dry and not subject to flooding (Hayden and Harrington, 2000). Badgers are social animals that live in complex underground tunnel systems called setts. Badger territories may vary in size from about 60 – 200 hectares (Smal, 1995). Setts tend to be well concealed in hedgerows or areas of scrub or woodland and are often difficult to find. Badger setts were encountered during the walk-over survey (see Section 7.2.4 – Badgers for details).

Deer are protected under the Wildlife (Amendment) Act 2000. Fallow and sika deer are likely to use areas of woodland, including conifer plantations, in the vicinity of the proposed route. Signs of deer were noted in Narraghmore Bog. Other areas of woodland such as at Burton Hall (Mainline Ch. 46,500), and conifer plantations at Turnerstown (Athy to R747 Link Ch. 5,850 – Ch. 5,350) contain suitable habitat for deer populations.

All species of bat occurring in Ireland are protected under the EU Habitats Directive, listed under Annex II and IV. Bats are widespread in Ireland and can generally be found in areas where suitable roost sites (trees, disused buildings, old stone walls and bridges, or caves) occur in close proximity to areas of suitable foraging habitat (woodland, scrub, hedgerows, wetland areas and open water). Bats commonly feed and commute along linear habitats such as hedgerows, treelines and watercourses because of the high densities of insects that are usually present and the cover such features afford.

A bat survey to assess the suitability of trees as bat roosts and to assess the suitability of buildings and old stone culverts (that require demolition) as bat roosts was not carried out during the Preliminary Design stage due to seasonal constraints. A bat survey will be carried out during the appropriate season at the detailed design stage on buildings and stone culverts that are to be demolished and on mature trees to assess the suitability of the trees as bat roosts.

Site / Habitat Evaluation

Ecological sites and habitats that occur along the proposed route are evaluated for each of sections A to D of the route in Table's 7.2.2, 7.2.3, 7.2.4 and 7.2.5. With the exception of the majority of hedgerows and treelines, habitats that occur outside the ecological sites (mainly improved agricultural grassland and arable land) are of low ecological value. The majority of hedgerows and treelines are of moderate ecological value; a small number of hedgerows are of low ecological value. Hedgerows of high ecological value intersected by the route are listed in the tables as sites. Treelines of moderate to high ecological value intersected by the route are also listed as sites. Of the 19 ecological sites impacted by the route, two are of high local ecological value, three are of moderate/ high value and the other 14 sites are of moderate local ecological value.

Section A Kilcullen to Mullmast Ch. 78,500 – Ch. 62,000

In Section A, 8 sites would be impacted by the alignment. These are comprised of treelines / hedgerows that are dominated by ash, sycamore, white willow (*Salix alba*) and beech. Two of these sites are along the banks of the 2 streams that intersect the proposed route (Ch. 76,500 – Ch. 75,700) and 1 is adjacent to wet grassland (Ch. 65,600 – Ch. 65,280). Two of the sites are of high to moderate local ecological value and 6 of these sites are of moderate local ecological value. See Table 7.2.2 for a summary evaluation of the main terrestrial sites in Section A.

The proposed structure A10 (over 100 metres long), which carries the proposed mainline under the existing N9 at Usk Little is to be constructed along the line of the existing N9. Approximately 7 trees comprised of ash and beech along the existing N9 will be removed to facilitate this overbridge.

Also, the proposed route runs adjacent to a raised bog in Narraghmore (Site 4a). Although the proposed route does not impact the bog directly, it is described below on the basis that it is of regionally important ecological value. It is therefore important that there are no indirect impacts.

Narraghmore Bog (Ch. 70,500 – Ch. 69,000)

Narraghmore Bog was once a raised bog that has been drained by a large perimeter drain (W = 1m; D = 40cm) and some internal drains. There is evidence of peat cutting in the past. The centre of the bog has remnants of active raised bog vegetation with good hummock / hollow formation and the presence of bog moss (*Sphagnum* spp.) in the hollow areas, but it has been extensively drained.

Most of the bog vegetation is on peat that is drying out and is mainly comprised of ling heather (*Calluna vulgaris*) and moss (*Hypnum cupressiforme*). In wetter areas, common cotton grass (*Eriophorum angustifolium*), hare's-tail cotton grass (*Eriophorum vaginatum*) and localised areas of *Sphagnum* dominate the old depressions and drainage ditches along with areas of quaking fen type vegetation. There are also blocks of mature coppiced birch / willow woodland dispersed throughout the bog, but mainly along the edges of the bog. There is a patchy distribution of conifer plantation. There is also evidence of deer, frogs and fox presence on the site.

Although Narraghmore Bog has been degraded in the past due to drainage, peat cutting and conifer plantation, it is one of the most easterly raised bogs in Ireland and is of high regional ecological value.

Table 7.2.2 Section A – Terrestrial Site Description and Evaluation

Chainage & Townland	Site No.	Brief Habitat Description	Site Evaluation *
Ch. 78,000 Old Kilcullen	A1	Treeline / hedgerow with semi-mature ash on either side of track	D Moderate value
Ch. 76,500 – Ch. 75,700 Cartersbog	A2	Treeline of young to semi-mature alder with mature hedgerow (H = 3m) on riverbank of Kilcullen stream.	D Moderate value
L6089 Realigned Local Road Ch. 600 – Ch. 750 Yellowbogcommon	A2a	Treeline of white willow	D Moderate value
Ch. 75,600 – Ch. 75,100 Halverstown	A3	Three mature treelines containing ash, beech and some oak along a raised bank with hawthorn understorey	D/C Moderate/High value
Ch. 74,000 – Ch. 73,600 Baronsland	A4	Treeline of ash and sycamore with hawthorn understorey on west side of third order tributary of Finnelly stream.	D Moderate value
Ch. 70,000 Blackrath	A5	Treeline containing mature beech, semi-mature sycamore along with sitka spruce (<i>Picea sitchensis</i>) and Scot's pine.	D Moderate value
Ch. 69,440 Blackrath	A6	Treeline of mature and semi-mature ash with one mature beech	D Moderate value

Table 7.2.2 Section A – Terrestrial Site Description and Evaluation (contd.)

Chainage & Townland	Site No.	Brief Habitat Description	Site Evaluation *
Ch. 65,600 – Ch. 65,280 Crookstown Lower Boleybeg	A9	Treeline of mature oak, semi-mature ash, crab apple (<i>Malus sylvestris</i>), beech, sycamore with holly, hazel (<i>Corylus avellana</i>) and willow. Wet grassland comprised of Yorkshire fog (<i>Holcus lanatus</i>) and rush (<i>Juncus</i> spp.) with occasional gorse, silverweed (<i>Potentilla anserina</i>), thistle, self-heal (<i>Prunella vulgaris</i>), red clover (<i>Trifolium pratense</i>) and knapweed (<i>Centaurea nigra</i>). A stream source is also located at this location.	D/C Moderate/High value

* See 7.2 Appendix I for evaluation criteria. C = High local ecological value; D = Moderate local ecological value.

Section B Mullamast to Prumplestown Ch. Ch. 62,000 – Ch. 50,000

In Section B, 1 site is comprised of treelines / hedgerows, which also has a stream associated with it. See Table 7.2.3 for a summary evaluation of this terrestrial site in Section B.

Table 7.2.3 Section B – Terrestrial Site Description and Site Evaluation

Chainage & Townland	Site No.	Brief Habitat Description	Site Evaluation *
Ch. 58,100 – Ch. 57,500 Ballynamony	B4	Treeline of mature beech with occasional oak, ash and pine with a hawthorn, alder and willow understorey. Dense hedgerow, running adjacent to a stream, comprised of hawthorn, semi-mature and mature ash, and occasional Scot's pine with young alder.	C High value

* See 7.2 Appendix I for evaluation criteria. C = High local ecological value.

Section C Prumplestown to Powerstown Ch. Ch. 50,000 – Ch. 32,300

In Section C, 1 site is comprised of a block of (mixed) broadleaf woodland of high local ecological value. A suite of treelines comprised of poplar, ash, beech and alder (Ch. 43,240) is of high / moderate local ecological value. Four sites are comprised of treelines / hedgerows, which are dominated by ash, beech, willow and hawthorn. One of these sites is along the banks of a stream that intersects the proposed route (Ch. 38,370). These sites are of moderate local ecological value. See Table 7.2.4 for a summary evaluation of the main terrestrial sites in Section C.

Table 7.2.4 Section C – Terrestrial Site Description and Evaluation

Chainage & Townland	Site No.	Brief Habitat Description	Site Evaluation *
Ch. 46,500 Burton Hall	C1	Area of (mixed) broadleaf woodland comprised of mature lime (<i>Tilia</i> sp.) trees, with semi-mature/mature ash, oak, occasional beech and horse chestnut (<i>Aesculus hippocastanum</i>). A sitka spruce plantation with occasional yew (<i>Taxus baccata</i>) trees occurs in the middle of the woodland. The understorey is mainly comprised of laurel (<i>Prunus laurocerasus</i>), elder, box (<i>Boxus sempervirens</i>), bramble and occasional holly.	C High value
Ch. 45,740 Russelstown	C2	Mature hedgerow of willow, hawthorn and holly connected to a treeline of semi-mature beech.	D Moderate value
Ch. 44,260 – Ch. 43,800 Johnstown	C3	Mature treelines of semi-mature and mature ash, beech and the occasional oak with an understorey of hawthorn, elder and young elm.	D Moderate value
Ch. 43,240 Johnstown	C4	Suite of treelines comprised of poplar, ash, beech, alder and mature hedgerows of willow, elm, hawthorn and elder.	D/C Moderate / High
Ch. 38,370 Tinryland	C5	Suite of mature and semi-mature treelines/hedgerows comprised of semi-mature and mature ash, sycamore, beech and occasional oak with an understorey of hawthorn and crab apple.	D Moderate
Ch. 36,800 – Ch. 36,400 Tinryland	C6	Mature hedgerow of hawthorn, ash saplings, hazel, alder, guelder-rose (<i>Viburnum opulus</i>) and bramble with some semi mature ash and crab apple adjacent to stream.	D Moderate value

* See 7.2 Appendix I for evaluation criteria. C = High local ecological value; D = Moderate local ecological value.

Section D Athy to R747 Link Road

In Section D, 3 sites are comprised of treelines / hedgerows, dominated by ash, beech and hawthorn. The fourth site is a block of (mixed) conifer woodland with an associated treeline comprised of beech (Ch. 5,350 – Ch.5,850). These sites are all of moderate local ecological value. See Table 7.2.5 for a summary evaluation of the main terrestrial sites in Section D.

Table 7.2.5 Section D – Terrestrial Site Description and Evaluation

Chainage & Townland	Site No.	Brief Habitat Description	Site Evaluation *
Ch. 5,350 – Ch. 5,850 Turnerstown	D1	(Mixed) conifer woodland of sitka spruce and sycamore with treelines along each side of road comprised of young and semi-mature ash, willow, beech, cypress (<i>Cupressus</i> sp.) and occasional oak. A treeline of beech also occurs on the south side of the roadway at the eastern end on leaving the woodland.	D Moderate

Table 7.2.5 Section D – Terrestrial Site Description and Evaluation (contd.)

Chainage & Townland	Site No.	Brief Habitat Description	Site Evaluation *
Ch. 7,550 – Ch. 7,910 Burtown Little	D2	Suite of semi-mature and mature treelines comprised of ash, sycamore and beech.	D Moderate
Ch. 9,330 – Ch. 9,500 Moone	D3	Treeline of mature beech, ash, sycamore and alder with dense understorey of hawthorn, holly, bramble and beech saplings.	D Moderate
Ch. 9,560 Mullamast	D4	Hedgerow/treeline on raised bank. It is comprised of semi-mature and mature ash, beech, Scot's pine and crab apple with hawthorn and bramble understorey. Possible badger activity.	D Moderate

* See 7.2 Appendix I for evaluation criteria. D = Moderate local ecological value.

7.2.4 Predicted Impacts

General Impacts

The scale of the likely impacts has been assessed on the basis of the area / length of the particular site or habitat that would be lost, and the ecological value of that site or habitat. The impact levels were rated on a five-point scale as outlined in 7.2 Appendix II.

Designated Conservation Areas

The River Lerr was designated a pcSAC in 2003, and included land adjacent to the river, which is currently under improved grassland and tillage with some hedgerow and a treeline of poplar. This watercourse and the adjacent lands will be impacted by the road scheme. The habitats in the adjacent lands are of low ecological value, and while they are designated pcSAC, this designation relates to the watercourse, hence the evaluation of impacts relates to the watercourse (see Section 7.3 Table 7.3.3 for details). Mitigation should focus on minimising the impacts on the watercourse. The alignment of any extension of the route through the southern tip of Cloghrick wood will result in a severe negative impact.

Terrestrial Impacts

The impacts of each of the areas of ecological value along the proposed route are outlined in Table's 7.2.6, 7.2.7, 7.2.8 and 7.2.9. Of the 19 sites, 1 is subject to major negative impact, 16 sites are subject to moderate negative impact and 2 sites are subject to minor negative impact.

Other Habitats and their Impacts

The total length of hedgerow on the proposed N9 Kilcullen to Powerstown Scheme Section to be removed is estimated to be 48.8 kilometres. The total loss of treeline on the N9 is 6.65 kilometres. The loss of other terrestrial habitats of low ecological value, such as improved grassland, is of minor / insignificant impact.

The loss of other terrestrial habitats of low ecological value, such as improved grassland or tillage, is of minor / insignificant impact.

Terrestrial Fauna

There will be negative impacts for fauna as a result of the proposed N9 Kilcullen to Waterford Scheme because of: disturbance (mainly during construction but also during operation); loss and fragmentation of areas of suitable habitat for feeding, breeding, roosting and cover; severance of territories and creation of barriers to animal movement; isolation of populations.

Otters are sensitive to disturbance and deterioration of water quality. Any negative impacts on watercourses and fisheries as a result of the proposed development would have knock-on effects for otters.

Badger territories are likely to be severed by road construction. Badgers are animals of habit and, as the same setts and traditional pathways are typically used over generations (Hayden and Harrington, 2000), this can result in badger deaths, particularly on new roads. The area of foraging habitat will be reduced.

Deer that utilise the conifer plantations and other areas of woodland in the general locality are likely to be impacted by the road. Road construction will result in the loss and fragmentation of some semi-natural woodland habitat.

Bats are likely to be negatively impacted by road construction through the loss of feeding habitat, roost sites and flight paths or commuting routes. Areas of potential feeding habitat such as wet grassland, woodland, hedgerow and treeline will be lost. Removal of mature trees along the route may also destroy small existing and potential bat roost sites. Bats are often faithful to a particular roost site from year to year. Buildings occupied by bats during summer are usually maternity roosts, where female bats congregate to give birth. Loss of such sites can therefore have serious implications for a colony, as there may be no other suitable breeding sites in the area. Loss of roost sites is believed to be one of the factors contributing to declines in bat populations throughout Europe. Flight paths between foraging and roosting sites will be lost or interrupted through the removal of hedgerows, treelines and woodland. Bats tend not to fly over areas of open ground so the construction of roads can act as a barrier to their movement. Lighting associated with roads and interchanges can also constitute a negative impact for some bat species. The main impacts will be in or close to areas of suitable habitat that were previously unlit.

Birds will be impacted by the loss of feeding and nesting habitat, and by increased disturbance, particularly during construction of the proposed road.

Section A Kilcullen to Mullamast Ch. 78,500 – Ch. 62,000

Terrestrial Impacts

The impacts of each of the terrestrial sites of ecological value along the proposed route within Section A are outlined in Table 7.2.6. Of the 8 sites, 7 are subject to moderate negative impact and 1 site to a minor negative impact. The possible indirect impact on Narraghmore is a major / moderate negative impact.

The proposed structure A10 (over 100 metres long), which carries the proposed mainline under the existing N9 at Calverstown Little may impact on approximately four additional trees comprised of ash and beech (non-native), than would otherwise be impacted by the proposed mainline and realigned Local road. This is a minor / not significant impact and hence does not warrant being listed as a site of ecological value within Table 7.2.6.

Bats

A shed on the L6095 (Ch. 70,500), a modern barn and old building on the L8015, Narraghmore Road (Ch. 68,700) and 3 culverts are scheduled to be demolished as part of the scheme. Some of these structures could contain possible bat roosts. If a survey reveals that bats use these buildings, development of the scheme would result in a negative impact.

Table 7.2.6 Section A – Terrestrial Sites’ Evaluation and Impacts

Chainage & Townland	Site No.	Site Evaluation	Impact*
Ch. 78,000 Old Kilcullen	A1	D Moderate value	Minor negative
Ch. 76,500 – Ch. 75,700 Cartersbog	A2	D Moderate value	Moderate negative
L6089 Realigned Local Road Ch. 600 – Ch. 750 Yellowbogcommon	A2a	D Moderate value	Moderate negative
Ch. 75,600 – Ch. 75,100 Halverstown	A3	D/C Moderate/High value	Moderate negative
Ch. 74,000 – Ch. 73,600 Baronsland	A4	D Moderate value	Moderate negative
Ch. 70,000 Blackrath	A5	D Moderate value	Moderate negative
Ch. 69,440 Blackrath	A6	D Moderate value	Moderate negative
Ch. 65,600 – Ch. 65,280 Crookstown Lower Boleybeg	A9	D/C Moderate/High value	Moderate negative

* See 7.2 Appendix II for impact criteria.

Section B Mullamast to Prumplestown Ch. 62,000 – Ch. 50,000

Terrestrial Impacts

The impact on the single terrestrial site of ecological value along the proposed route within Section B is outlined in Table 7.2.7; the site is subject to a major negative impact.

Badgers:

A small active badger sett (containing approximately four entrances) was noted in hedgerows between Ch. 59,900 and Ch. 59,100 located 50 metres west of the proposed N9 Kilcullen to Waterford Scheme. It will not be directly impacted but will have its territory fragmented by the route. Other setts located in the vicinity of the route may have their territories fragmented by the route. This will have a negative impact.

Bats:

Two stone outhouses and a modern container type building along the existing N9 at Prumplestown Cross south-west of Junction 3, along with 2 culverts are due to be demolished as part of the scheme. Some of these structures could contain possible bat roosts. If a survey reveals that bats use these buildings, development of the scheme would result in a negative impact.

Table 7.2.7 Section B – Terrestrial Site Evaluation and Impacts

Chainage & Townland	Site No.	Site Evaluation	Impact*
Ch. 58,100 – Ch. 57,500 Ballynamony	B4	C High value	Major negative

* See 7.2 Appendix II for impact criteria.

Section C Prumplestown to Powerstown Ch. 50,000 – Ch. 32,300

Terrestrial Impacts

The impacts of each of the terrestrial sites of ecological value along the proposed route within Section C are outlined in Table 7.2.8. Of the 6 sites impacted, 5 sites are subject to moderate negative impact and 1 site is subject to a minor negative impact.

Bats

Several culverts are due to be demolished, some of which could contain possible bat roosts. If a survey reveals that bats use these structures, development of the scheme would result in a negative impact.

Table 7.2.8 Section C – Terrestrial Sites' Evaluation and Impacts

Chainage & Townland	Site No.	Site Evaluation	Impact*
Ch. 46,500 Burton Hall	C1	C High value	Moderate negative
Ch. 45,740 Russelstown	C2	D Moderate value	Minor negative
Ch. 44,260 – Ch. 43,800 Johnstown	C3	D Moderate value	Moderate negative
Ch. 43,240 Johnstown	C4	D/C Moderate/High	Moderate negative
Ch. 38,370 Tinryland	C5	D Moderate	Moderate negative
Ch. 36,800 – Ch. 36,400 Tinryland	C6	D Moderate value	Moderate negative

* See 7.2 Appendix II for impact criteria.

Section D Athy to R747 Link Road

Terrestrial Impacts

The impacts of each of the terrestrial sites of ecological value along the proposed route within Section D are outlined in Table 7.2.9. The 4 sites are subject to moderate negative impact.

Bats

Four culverts are due to be demolished, some of which could contain possible bat roosts. If a survey reveals that bats use these culverts, development of the scheme would result in a negative impact.

Table 7.2.9 Section D – Terrestrial Sites' Evaluation and Impacts

Chainage & Townland	Site No.	Site Evaluation	Impact*
Ch. 5,350 – Ch. 5,850 Turnerstown	D1	D Moderate	Moderate negative impact on woodland and treeline
Ch. 7,550 – Ch. 7,910 Burtown Little	D2	D Moderate	Moderate negative
Ch. 9,330 – Ch. 9,500 Moone	D3	D Moderate	Moderate negative
Ch. 9,650 Mullamast	D4	D Moderate	Moderate negative

* See 7.2 Appendix II for impact criteria.

7.2.5 Remedial or Reductive Measures

General Remedial or Reductive Measures

Outlined below are remedial or reductive measures that are recommended to avoid or reduce the predicted impacts of the proposed N9 Kilcullen to Waterford Scheme on the flora and fauna. The specific remedial or reductive measures of each of the terrestrial sites of ecological value in each section of the route are outlined in Table's 7.2.10, 7.2.11, 7.2.12 and 7.2.13.

Designated Areas

Alternative alignments were developed in order to avoid Cloghrystick Wood though it was not possible to produce an alignment that completely avoided the wood. Compensatory planting (of species similar to those removed) will be proposed for the proposed extension of the alignment south of Junction 5 when the Kilcullen to Waterford scheme is developed to the south.

Terrestrial – Remedial or Reductive Measures

No special mitigation measures are required for improved grassland, arable land or areas of semi-natural grassland that are of low ecological value.

To avoid impacts on breeding birds there should be no removal of hedgerows, trees, tree-lines, or areas of semi-natural habitat where nests are present from the 1st March to the 31st of August inclusive. In particular the months of March to June are important for breeding birds and best practice would be to avoid any clearance of vegetation during this period. Although the Wildlife (Amendment) Act, 2000 affords protection to breeding birds by prohibiting the clearance of vegetation during this period, there is an exemption for works associated with road construction. An assessment of habitat suitability and the presence of breeding birds along the route of the proposed scheme will be undertaken to identify whether any nests are present prior to construction.

The working area around ecological sites, hedgerows and treelines should be kept to a minimum to reduce the area or length of these sites or habitats that will be lost. The working area will be defined at the outset by the erection of fencing to define the limits of site works. Any trees, treelines or hedgerows that are to be retained within the site works would be fenced off at the outset, at the outer canopy line of trees. Ground levels should not be altered in any way within the canopy line of trees that are to be retained.

Where other ecological sites, hedgerows, treelines and mature trees cannot be avoided, direct mitigation is not feasible. To compensate for the loss of this habitat resource, new areas of semi-natural habitat should be created using native seed sources. New hedgerows, treelines and small stands of woodland should also be planted in appropriate locations. Hedgerows and treelines should be planted along new road margins, where appropriate, to reconnect severed hedgerows and treelines, to create new networks of ecological corridors, and to interlink with other areas of semi-natural habitat. The trees and shrubs should be predominantly native species, and the species composition should reflect that of the habitat or habitats being lost.

The details of tree planting, species mixes and habitat creation will be established at the detailed design stage. The number of trees that will be planted as part of the general landscaping, should exceed the number of mature trees that will be lost.

A number of hedgerows, treelines and small streams may be impacted by the land-take for (i) screening (ii) drainage outfalls (iii) access tracks etc. Where possible, it is preferable to retain existing hedgerows and trees that border screening areas. Access tracks should be positioned to minimise the impacts on trees wherever possible, and tracks adjacent to small streams should be constructed to leave a strip of riparian habitat to minimise impacts.

Fauna – Remedial or Reductive Measures

For otters, there will be further investigation by appropriate specialists to identify holt locations at crossing points during the Detailed Design stage.

Where practical mammal passes / otter ledges with appropriate fencing should be provided to guide animals, and planting implemented to provide the necessary vegetation cover in the vicinity of the mammal passes. River crossings will include at least 2 metres of riverbank at either side of the main channel to allow for the passage of mammals.

While some locations supporting badger activity were identified within the footprint, further more detailed investigation to identify the full extent of sett locations, territories and path networks will be carried out at the detailed design stage. The location of underpasses and badger proof fencing where required, will be determined at this stage.

Deer fencing along the margins of the plantation at Turnerstown and Narraghmore and the mixed broadleaf woodland at Burton Hall will be established if deemed necessary following further investigation of deer activity at detailed design stage.

Bats and their roosting sites (both summer, maternity and winter hibernation sites) are afforded protection under Annex IV of the EU Habitats Directive. Buildings that are known to contain bat roosts should not be demolished or otherwise disturbed during the breeding season, between the months of June to August inclusive, or during hibernation in the months of November to March inclusive. Structures and trees that are to be demolished or cut down should be surveyed in a detailed survey between mid-June and mid-August prior to demolition, to establish the presence of bats. Trees found to either contain or likely to contain a roost should be felled during the months September to October.

Where bats are confirmed to be using a building, and its demolition is unavoidable, bats must be excluded prior to demolition. Where the removal of mature trees

cannot be avoided, and there is evidence of bat usage, bat boxes should be erected in appropriate locations in the area at least one month in advance of any felling or disturbance.

For most other species of fauna that are not legally protected in Ireland at present, no special mitigation measures are proposed other than to retain as much semi-natural habitat as possible.

Section A Kilcullen to Mullamast – Remedial or Reductive Measures

Terrestrial Ecology

In Section A, there are eight sites impacted by the proposed N9 Kilcullen to Waterford Scheme. While the general remedial or reductive measures discussed above apply to all the sites impacted in Section A, the more pertinent remedial or reductive measures are outlined in Table 7.2.10.

A preliminary hydro-geological survey of Narraghmore Bog has been undertaken to assess the possible impacts of the scheme on the bog and to address mitigation measures. Refer to Section 7.6 of this report for a discussion of the issues. It is recommended that the design will not further drain Narraghmore Bog. Other remedial measures recommended for Narraghmore Bog are:

- Reed bed attenuation would be the most appropriate method of ensuring surface water run-off is pollution free; reed bed attenuation has a dual-purpose role of purification and habitat enhancement.
- A hydrological / geological survey should be carried out, post-detailed design stage.
- Sensitive preparation of the drainage channel is needed.
- A suitably qualified ecologist should be present during the construction phase of this section of roadway.
- A hydrocarbon trap should be installed to collect surface pollutants. Silt traps are necessary during construction, to reduce run-off into the field drain at the perimeter of the bog.
- A mammal pass may be required, depending on the extent of mammal presence in the area.
- A deer pass or deer fencing may be required depending on the population density and frequency of crossings on the existing N9, with warning signs along the road.

Remedial measures for structure A10 involves compensatory planting of an equivalent number of trees similar to those species removed.

Table 7.2.10 Section A – Impacts and Remedial or Reductive Measures for Terrestrial Sites

Chainage & Townland	Site No.	Site Evaluation	Impact	Remedial Or Reductive Measures
Ch. 78,000 Old Kilcullen	A1	D	Minor negative	No ground disturbance within the crown spread of the treeline. The working area to be outlined by the erection of fencing to define the limits of site works.
Ch. 76,500 – Ch. 75,700 Cartersbog	A2	D	Moderate negative	Compensatory planting of similar species along the banks of the realigned Kilcullen Stream.
L6089 Realigned Local Road Ch. 600 – Ch. 750 Yellowbogcommon	A2a	D	Moderate negative	Removal of trees should be kept to an absolute minimum. Replanting of an equivalent length of treeline of native species, which should be strategically located to add to connectivity.
Ch. 75,600 – Ch. 75,100 Halverstown	A3	D/C	Moderate negative	Removal of trees should be kept to an absolute minimum. Replanting of an equivalent length of treeline of native species, which should be strategically located to add to connectivity. Possible mammal pass required, depending on the extent of mammal presence in the area.
Ch. 74,000 – Ch. 73,600 Baronsland	A4	D	Moderate negative	Removal of trees / hedgerow should be kept to an absolute minimum. Replanting of an equivalent length of treeline / hedgerow of native species, which should be strategically located to add to connectivity. Apply standard mitigation measures for stream diversion. See aquatics section.
Ch. 70,000 Blackrath	A5	D	Moderate negative	No ground disturbance within the crown spread of the treeline. The working area to be outlined by the erection of fencing to define the limits of site works.
Ch. 69,440 Blackrath	A6	D	Moderate negative	Replanting of an equivalent length of treeline / hedgerow of native species.
Ch. 65,600 – Ch. 65,280 Crookstown Lower Boleybeg	A9	D/C	Moderate / High negative	Replanting of an equivalent length of hedgerow / treeline of native species. Culvert the spring, incorporating a mammal pass.

Section B Mullamast to Prumplestown – Remedial or Reductive Measures
Terrestrial Ecology

In Section B, there is only one site affected by the alignment. While the general remedial or reductive measures discussed above apply to this site, the more pertinent remedial or reductive measures are outlined in Table 7.2.11 for site B4.

Table 7.2.11 Section B – Impacts and Remedial or Reductive Measures for Terrestrial Sites

Chainage & Townland	Site No.	Site Evaluation	Impact	Remedial Or Reductive Measures
Ch. 58,100 – Ch. 57,500 Ballynamony	B4	C	Major negative	Replanting of an equivalent length of hedgerow / treeline of native species. The channel design will be incorporating the SRFB and should incorporate natural features

Section C Prumplestown To Powerstown – Remedial Or Reductive Measures

Terrestrial Ecology

In Section C, 5 sites are affected by the alignment. While the general remedial or reductive measures (see above) apply to all the sites impacted in Section C, the more pertinent remedial or reductive measures are outlined in Table 7.2.12.

Table 7.2.12 Section C – Impacts and Remedial or Reductive Measures for Terrestrial Sites

Chainage & Townland	Site No.	Site Evaluation	Impact	Remedial Or Reductive Measures
Ch. 46,500 Burton Hall	C1	C	Moderate negative	If an area of this woodland is removed, then an equivalent area of native woodland will need to be planted in an area adjoining the existing woodland.
Ch. 45,740 Russelstown	C2	D	Minor negative	Move the attenuation area and sensitive fencing of land-take. Use of gabion wall to allow for retention of beech trees. Replanting of an equivalent length of hedgerow / treeline of native species.
Ch. 44,260 – Ch. 43,800 Johnstown	C3	D	Moderate negative	Replanting of an equivalent length of hedgerow / treeline of native species. Replanting should be strategically located to add to connectivity.
Ch. 43,240 Johnstown	C4	D/C	Moderate negative	Replanting of an equivalent length of hedgerow / treeline of native species. Replanting should be strategically located to add to connectivity. Recommend mammal underpass in this area at detailed design stage.
Ch. 38,370 Tinryland	C5	D	Moderate negative	Replanting of an equivalent length of hedgerow / treeline of native species. Recommend mammal underpass in this area at detailed design stage.
Ch. 36,800 – Ch. 36,400 Tinryland	C6	D	Moderate negative	Replanting of an equivalent length of hedgerow / treeline of native species.

Section D Athy to R747 Link Road – Remedial or Reductive Measures

Terrestrial Ecology

Four sites are impacted by the proposed alignment in Section D. While the general remedial or reductive measures apply to all the sites impacted in Section D, the more pertinent remedial or reductive measures for the four sites are outlined in Table 7.2.13 below.

Table 7.2.13 Section D – Impacts and Remedial or Reductive Measures for Terrestrial Sites

Chainage & Townland	Site No.	Site evaluation	Impact	Remedial or Reductive Measures
Ch. 5,350 – Ch. 5,850 Turnerstown	D1	D	Moderate negative impact on woodland and major negative impact on treeline.	Replanting of an equivalent length of native species to compensate for loss of hedgerow / treeline.
Ch. 7,550 – Ch. 7,910 Burtown Little	D2	D	Moderate negative	No ground disturbance within the crown spread of the treelines, where possible. The working area will be outlined by the erection of fencing to define the limits of site works. Replanting of an equivalent length of native species to compensate for loss of hedgerow / treeline.
Ch. 9,330 – Ch. 9,500 Moone	D3	D	Moderate negative	No ground disturbance within the crown spread of treeline / hedgerow being retained. To compensate for any loss of treeline / hedgerow, replant an equivalent length of hedgerow / treeline of native species.
Ch. 9,560 Mullamast	D4	D	Moderate negative	Replanting of an equivalent length of native species to compensate for loss of hedgerow / treeline.

7.2.6 Residual Impacts

General Residual Impacts

The impacts of each of the terrestrial sites of ecological value post remedial or reductive measures are outlined in Tables 7.2.14 to 7.2.17. Of the 19 sites, 1 is subject to major negative residual impact, 14 sites are subject to moderate negative residual impact, 1 site is subject to minor negative residual impact and 1 has no significant residual impact.

Section A Kilcullen to Mullamast Ch. 78,500 – Ch. 62,000

Terrestrial Ecology

The residual impacts of each of the terrestrial sites of ecological value along the proposed route within Section A are outlined in Table 7.2.14. Of the 8 sites, 5 sites are subject to moderate negative residual impact, 2 sites are subject to a minor negative residual impact and the residual impact site of 1 site is insignificant.

Remedial measures for Narraghmore Bog, as outlined in Section 7.2.5, would result in no negative impact on the drainage of the bog.

Table 7.2.14 Section A – Terrestrial Sites’ Residual Impacts

Chainage & Townland	Site No.	Site Evaluation	Impact	Residual Impacts
Ch. 78,000 Old Kilcullen	A1	D Moderate value	Minor negative	Not significant
Ch. 76,500 – Ch. 75,700 Cartersbog	A2	D Moderate value	Moderate negative	Moderate negative
L6089 Realigned Local road Ch. 600 – Ch. 750 Yellowbogcommon	A2a	D Moderate value	Moderate negative	Moderate negative
Ch. 75,600 – Ch. 75,100 Halverstown	A3	D/C Moderate/High value	Moderate negative	Moderate negative
Ch. 74,000 – Ch. 73,600 Baronsland	A4	D Moderate value	Moderate negative	Minor negative
Ch. 70,000 Blackrath	A5	D Moderate value	Moderate negative	Not significant
Ch. 69,440 Blackrath	A6	D Moderate value	Moderate negative	Moderate negative
Ch. 65,600 – Ch. 65,280 Crookstown Lower Boleybeg	A9	D/C Moderate/High value	Moderate negative	Moderate negative

Section B Mullamast to Prumplestown Ch. 62,000 – Ch. 50,000

Terrestrial Ecology

The residual impact on site B4 within Section B is subject to a major negative residual impact and is listed in Table 7.2.15.

Table 7.2.15 Section B - Terrestrial Site’s Residual Impacts

Chainage & Townland	Site No.	Site Evaluation	Impact	Residual Impacts
Ch. 58,100 – Ch. 57,500 Ballynamony	B4	C High value	Major negative	Major negative

Section C Prumplestown to Powerstown Ch. 50,000 – Ch. 32,300

Terrestrial Ecology

The residual impacts of each of the terrestrial sites of ecological value along the proposed route within Section C are outlined in Table 7.2.16. Of the 6 sites, 5 sites are subject to moderate negative residual impact and 1 site’s residual impact is not significant.

Table 7.2.16 Section C – Terrestrial Sites' Residual Impacts

Chainage & Townland	Site No.	Site Evaluation	Impact	Residual Impacts
Ch. 46,500 Burton Hall	C1	C High value	Moderate negative	Moderate negative
Ch. 45,740 Russelstown	C2	D Moderate value	Minor negative	Not significant
Ch. 44,260 – Ch. 43,800 Johnstown	C3	D Moderate value	Moderate negative	Moderate negative
Ch. 43,240 Johnstown	C4	D/C Moderate/High	Moderate negative	Moderate negative
Ch. 38,370 Tinryland	C5	D Moderate	Moderate negative	Moderate negative
Ch. 36,800 – Ch. 36,400 Tinryland	C6	D Moderate value	Moderate negative	Moderate negative

Section D Athy to R747 Link Road

Terrestrial Ecology

The residual impacts of each of the terrestrial sites of ecological value along the proposed route within Section D are outlined in Table 7.2.17. The 4 sites are subject to a moderate residual negative impact.

Table 7.2.17 Section D – Terrestrial Sites' Residual Impacts

Townland & Chainage	Site No.	Site Evaluation	Impact	Residual Impacts
Turnerstown Ch. 5,350 – Ch. 5,850	D1	D Moderate	Moderate negative impact on woodland and treeline	Moderate negative impact on woodland and treeline
Burtown Little Ch. 7,550 – Ch. 7,910	D2	D Moderate	Moderate negative	Moderate negative
Moone Ch. 9,330 – Ch. 9,500	D3	D Moderate	Moderate negative	Moderate negative
Mullamast Ch. 9,560	D4	D Moderate	Moderate negative	Moderate negative

7.2 Appendix I: Site Evaluation Scheme

Rating	Criteria for assessing ecological importance of sites
A	<p>Internationally important</p> <p>Sites designated (or qualifying for designation) as SAC or SPA under the EU Habitats or Birds Directives.</p> <p>Undesignated sites containing good examples of Annex I <i>priority</i> habitats under the EU Habitats Directive.</p> <p>Major salmon river fisheries.</p> <p>Major salmonid lake fisheries.</p>
B	<p>Nationally important</p> <p>Sites or waters designated or proposed as NHAs or statutory Nature Reserves.</p> <p>Undesignated sites containing good examples of Annex I habitats (under EU Habitats Directive).</p> <p>Undesignated sites containing <i>significant populations</i> of Annex II species under the EU Habitats Directive or Annex I species under the EU Birds Directive or species protected under the Wildlife (Amendment) Act 2000.</p> <p>Major trout river fisheries.</p> <p>Waters with major amenity fishery value.</p> <p>Commercially important coarse fisheries.</p>
C	<p>High value, locally important</p> <p>Sites containing semi-natural habitat types with high biodiversity in a local context and a high degree of naturalness, or significant populations of locally rare species.</p> <p>Small water bodies with known salmonid populations or with good potential salmonid habitat.</p> <p>Sites containing any listed Annex II species under the EU Habitats Directive or Annex I species under the EU Birds Directive.</p> <p>Large water bodies with some coarse fisheries value.</p>
D	<p>Moderate value, locally important</p> <p>Sites containing some semi-natural habitat or locally important for wildlife.</p> <p>Small water bodies with some coarse fisheries value or some potential salmonid habitat.</p> <p>Any stream with an unpolluted Q-value rating.</p>
E	<p>Low value, locally important</p> <p>Artificial or highly modified habitats with low species diversity and low wildlife value.</p> <p>Water bodies with no current fisheries value and no significant potential fisheries value.</p>

SAC = Special Area of Conservation; SPA = Special Protection Area; NHA = Natural Heritage Area

7.2 Appendix II: Criteria for Assessing Impact Significance

Terrestrial Sites

Site category* ► Impact level ▼	A Sites Internationally important	B Sites Nationally important	C Sites High value, locally important	D Sites Moderate value, locally important	E Sites Low value, locally important
Severe negative	Any permanent impacts	Permanent impacts on a large part of a site			
Major negative	Temporary impacts on a large part of a site	Permanent impacts on a small part of a site	Permanent impacts on a large part of a site		
Moderate negative	Temporary impacts on a small part of a site	Temporary impacts on a large part of a site	Permanent impacts on a small part of a site	Permanent impacts on a large part of a site	
Minor negative		Temporary impacts on a small part of a site	Temporary impacts on a large part of a site	Permanent impacts on a small part of a site	Permanent impacts on a large part of a site
Neutral	No impacts	No impacts	No impacts	No impacts	Permanent impacts on a small part of a site
Minor positive				Permanent beneficial impacts on a small part of a site	Permanent beneficial impacts on a large part of a site
Moderate positive			Permanent beneficial impacts on a small part of a site	Permanent beneficial impacts on a large part of a site	
Major positive		Permanent beneficial impacts on a small part of a site	Permanent beneficial impacts on a large part of a site		

* Site categories A to E are defined in 7.2 Appendix I.

7.2 Appendix III: References

Curtis, T.G.F. & McGough, H.N. (1988). *Irish Red Data Book 1: Vascular Plants*, Stationery Office, Dublin.

EPA (2002) *Guidelines on the Information to be contained in Environmental Impact Statements*. Environmental Protection Agency.

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