

# Proposed Development at Knockharley Landfill (ABP Planning Ref. PL17.303211)

## Response to Request for Further Information – Issue No. 4 Part 1

## Response to FERS Ltd. Observation on the EIAR Biodiversity Chapter

CREATED FOR:

Knockharley Landfill Ltd.



CREATED:

October 2019

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## 1 INTRODUCTION

Knockharley Landfill Ltd. submitted an application for permission for a proposed strategic infrastructure development at Knockharley Landfill in December 2018. This application for permission was accompanied by an EIAR, of which Chapter 10 identifies, describes and assesses in an appropriate manner, the direct and indirect significant effects of the project in terms of Biodiversity. In a request for further information dated 16<sup>th</sup> May 2019, at paragraph 3, An Bord Pleanála requested the applicant to submit the following supplementary information in respect of Biodiversity:

*The applicant is requested to review and consider in full the issues raised in the Peer Review Report commissioned by Meath County Council on the biodiversity chapter of the EIAR, the Appropriate Assessment Screening Report and the Natura Impact Statement. The report identifies perceived deficiencies and issues which the applicant is requested to address. The applicant should consider the requirement for additional surveys for species of conservation interest and the availability of suitable habitats for such species. The response should ensure that adequate and up to date information is available to enable the Board to fully assess the ecological impacts of the proposed development and to carry out an Appropriate Assessment for the purposes of Article 6(3) of the Habitats Directive.*

This document has been prepared in response to RFI No. 4 Part 1, where Part 1 is the Applicant's response to observations made in the FERS Report in respect of the EIAR Biodiversity chapter and Part 2 is the Applicant's response to issues made in respect of the Appropriate Assessment Screening Report and the Natura Impact Statement.

The purpose of this report is to clarify and reaffirm the appropriateness, findings and conclusions of Chapter 10 of the EIAR - Biodiversity and to identify the inaccuracies in the FERS report.

This report addresses each assertion raised in the FERS report. Section numbers from the FERS report are dealt with in sequence, with specific text from the FERS report in italics.

This response includes the results of continued ecological/biodiversity surveys carried out at Knockharley Landfill during 2018/19 winter period and 2019. These ecological surveys were undertaken to continue the ongoing environmental monitoring at the existing landfill development and provide updated information in relation to, and thereby informs, the baseline assessment of the receiving environment of the proposed development. The details of these updated ecological surveys are included as separate reports appended to this document. This response should be read in conjunction with Chapter 10 Biodiversity of the EIAR and these individual survey reports. The reports attached are as follows:

- Appendix 1: Knockharley Landfill bird surveys 2018/19
- Appendix 2: Knockharley Landfill bat surveys 2019
- Appendix 3: Knockharley Landfill mammal survey 2019
- Appendix 4: Knockharley Landfill botanical and habitat surveys 2019
- Appendix 5: Knockharley Landfill aquatic survey report 2019
- Appendix 6: Knockharley Landfill Viviparous Lizard, *Zootoca vivipara* survey 2019

### 1.1 Field Surveys

Table 1.1 below outlines the details of the ecological surveys undertaken at Knockharley Landfill over the winter of 2018/19 and during 2019.

**Table 1-1: The details of the ecological surveys undertaken at Knockharley Landfill in 2019**

Survey Type		Surveyor	Survey Dates
Bat		Caroline Shiels (BSc, PhD) & Rory Dalton (BSc)	28/06/19, 29/06/19 16/07/19, 17/17/19, 31/08/19, 01/09/19, 24/09/19, 25/09/19
Bird		Jonathon Dunn (BSc, MSc, PhD) & Joseph Adamson (BSc, MSc)	16/11/2018, 12/12/2018, 25/01/2019, 15/05/2019, 14/06/2019, 21/06/2019, 08/07/2019, 07/08/2019
Mammal		Jonathon Dunn (BSc, MSc, PhD) & Orla Coffey (BSc, MSc)	31/08/19, 02/10/19
Botanical and Habitat		Ben O'Dwyer (BSc) & Joseph Adamson (BSc, MSc)	31/07/19, 01/08/19, 26/08/19
Otter and Aquatic		Ross Macklin (BSc, HDip, PDip) & Bill Brazier (BSc)	02/08/19, 22/08/19
Lizard		Rory Dalton (BSc)	19/09/19, 20/09/19, 21/09/19, 25/09/19, 26/09/19, 29/09/19, 07/10/19, 08/10/19

## 1.2 Details of Personnel

The following provides details of the competency of the team of ecological consultants that completed ecological surveys and prepared reports for the proposed application.

### Jon Kearney (BSc, MSc)

Jon Kearney is a principal ecologist with Fehily Timoney and Company with more than 14 years' experience in both the UK and Ireland. Jon holds a BSc in Applied Ecology from University College Cork and MSc in Ecological Management and Biological Conservation from Queens University Belfast. He is a full member of the Chartered Institute of Ecology and Environmental Management (MCIEEM).

Jon has prepared Appropriate Assessments (AAs), Ecological Impact Assessment (EcIA), ecological report in the UK and Ireland, on a broad diversity of projects including EIARs for several wind farms, solar farms, road schemes and commercial developments. His skills include an extensive knowledge of field survey techniques and methodology for ornithology, reptile, mammal and amphibian surveying; habitat surveying, botanical surveying and invertebrate sampling techniques and identification. He has considerable experience of EIS and ecological constraints work, which often includes extensive reference to, and interpretation of, Article 6 of 'The Habitats Directive', and to other EU, UK and Irish conservation legislation.

Jon as the lead ecologist has provided expert witness testimony at several An Bord Pleanála Oral Hearings including Páirc Uí Chaoimh (Cork) and Doolin Pier (Clare).

**Caroline Shiel (BSc, PhD)**

Caroline Shiel is a Principal Bat Ecologist. Caroline has a BSc. First Class Honours (Zoology) and is a Doctor of Philosophy (Ph.D). She is a member of the Heritage Council's panel of bat experts and have conducted numerous bat surveys of buildings with architectural/historical merit and is an author of several published papers on bat ecology. She holds a current bat specialist's licence (Sections 22 & 23) from National Parks and Wildlife Service.

Caroline has 30 years' experience in the field of bat research and in conducting bat surveys. Her B.Sc. thesis was an investigation of the diet of four species of Irish bat. This research was published in the Journal of Zoology, London. Her Ph.D. research was on the ecology of the internationally important Leisler's bat, *Nyctalus leisleri* in Ireland, conducted using radio-telemetry. This research was published in 5 papers, also in the Journal of Zoology (see below).

She has extensive experience in carrying out bat surveys for buildings, road construction (M11 Gorey bypass, M11 Arklow bypass, M11 Enniscorthy bypass, M18 Gort bypass, N6 Galway City Transport Project and Tobercurry bypass) and wind farm construction work on behalf of many private companies.

She has conducted bat, otter and bird surveys in relation to masonry bridges for Donegal, Sligo, Wexford, Galway, Kilkenny, Roscommon, Leitrim and Mayo County Councils as part of their bridge rehabilitation programmes. She has conducted bat surveys of numerous heritage buildings for the Office of Public Works.

She regularly conducts bird surveys, on a voluntary basis, as part of Birdwatch Ireland's monitoring programmes including Countryside Bird Survey and IWeBS. She participates in all Bat Conservation Ireland's monitoring programmes, also on a voluntary basis. She conducts surveys for otter, badger, freshwater crayfish and invasive species.

**Joseph Adamson (BSc, MSc)**

Joseph is a principal ornithologist / ecologist. He holds a BSc (Thames Valley University) and MSc (UCD) and is a member of the Chartered Institute of Ecology and Environmental Management. Joseph has over 30 years' experience as an ornithologist and has worked in the USA and Ireland. He is an experienced field ornithologist contributed to ecological impact assessments, habitat restoration and creation projects, hydrological assessments and peat stability assessments. Species specific surveys include Hen Harrier, Barn Owl, Nightjar, Red Grouse, Merlin, Golden Plover, Greenland White-fronted Geese, Red Kite, Buzzard and upland and general bird surveys. Joseph has also acted as Environmental Officer for a large number of wind farm projects during construction

**Ross Macklin (BSc, HDip, PDip)**

Ross Macklin is a principal aquatic ecologist specialising in freshwater and fisheries ecology with 14 years professional experience. He studied a Bachelors Degree in Applied Ecology at UCC and later completed diplomas in Geographical Information Systems and Integrated Pest Management. He is currently completing his PhD in UCC in the area of fisheries ecology. Ross has an in-depth knowledge of all freshwater ecosystems and riparian corridors. He has undertaken river habitat, lake habitat, wetland habitat and fisheries assessments in professional work for 14 years. His specialist freshwater experience lies in biological and physiochemical water quality analysis, fisheries ecology, riparian habitat assessments, habitat mapping, protected species, geographical information systems, ecological design and invasive species. Ross has expert experience in identifying and assessing macrophyte plants, terrestrial plants, fish and macro-invertebrates from a variety of aquatic habitats. He routinely undertakes Natura Impact Screening, Natura Impact Statements, Pollution Audits, Fisheries Assessments, Protected Species Surveys, Invasive Species Surveys, Habitat & Surface Water Management Plans, CEMP, EcIA and EIAR reporting.

**Bill Brazier (BSc)**

A senior ecologist with Triturus Environmental Ltd., Bill Brazier is an aquatic ecologist specialising in freshwater fisheries and aquatic ecology. Having completed a B.Sc. (Hons.) in Applied Freshwater & Marine Biology at GMIT, he is currently completing a Ph.D. in fish genetics and ecology at UCC. With 8 years professional experience, Bill has considerable experience in a range of key areas of aquatic ecology including impact assessment (screening, AA, EIA, EIAR, NIS), invasive alien species assessment, habitat mapping, protected species surveys, biodiversity assessments and fisheries assessments.

**Rory Dalton (BSc)**

Rory is an independent ecological consultant with experience across a range of disciplines including aquatic ecology, reptiles, habitats, mammals, and birds. He also carries out a range of species-specific studies. He has over 8 years of experience as a professional ecologist. He graduated from University College Cork with a BSc. Hons in Environmental and Earth Science, after which he spent three years working with a leading ecological consultancy in Limerick. He then set up his own company and has been running it since. Sectors he works in include solar farms, wind farms, roads and bridges, gas pipelines, grid connections, housing developments, greenways, instream civil works, drinking water etc. The projects he is involved with range in size from small bridge surveys to the largest wind energy project in the country and the largest water quality project in Europe. He carries out work for a number of County Councils, State Bodies, Semi-State Bodies, Engineering Consultants, Ecology Consultants, Environmental Consultants and Laboratories.

**Jonathon Dunn (BSc, MSc, PhD)**

Jonathon is a Project Ecologist with Fehily Timoney & Company. He has over 5 years' experience in the environmental sector and holds a PhD in Avian Ecology from Newcastle University, an MSc in Ecology, Evolution and Conservation from Imperial College London and a BA in Natural Sciences from the University of Cambridge. Jonathon has a broad skill set, having gained much experience while working for Newcastle University teaching various ornithological, botanical and entomological survey techniques. He also possesses experience of ecological habitat assessments, Appropriate Assessments and invasive species monitoring.

**Orla Coffey (BSc, MSc)**

Orla Coffey is a Project Ecologist with Fehily Timoney & Company. She has gained extensive experience of ecological assessments and field surveying techniques during her time in the environmental sector. She holds an MSc in Biological Sciences from the University of Bristol and a BSc in Botany from University College Dublin. While the basis of her education was botanically orientated, Orla has developed a broad skill set having gained much experience in her professional career conducting various floral and faunal surveys. She also possesses extensive experience of Ecological Impact Assessments and Appropriate Assessments. Orla has also created a number of habitat restoration plans and invasive management plans throughout her professional career.

**Ben O'Dwyer (BSc)**

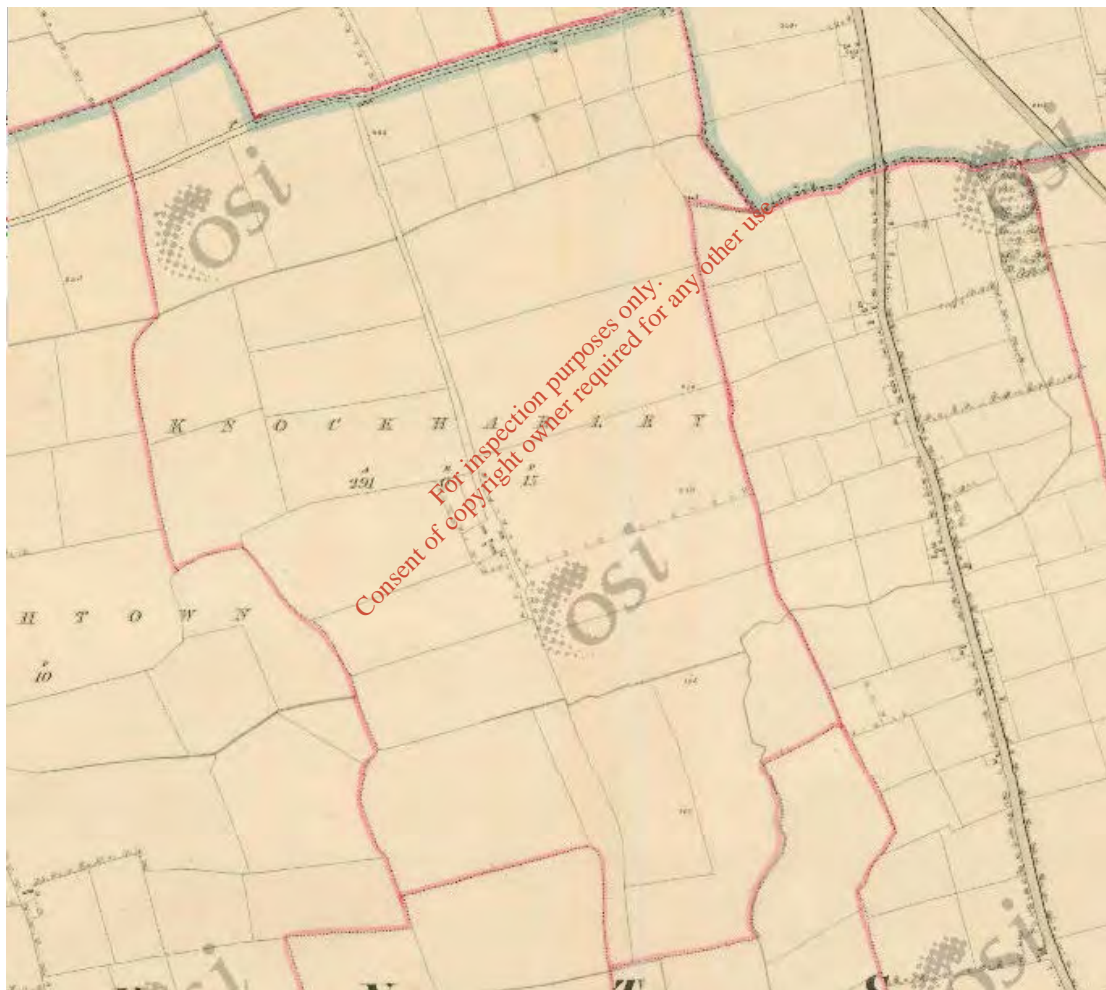
Ben O'Dwyer is a project ecologist with Fehily Timoney and Company with over 4 years professional experience. He holds a BSc in Wildlife Biology and has prepared Appropriate Assessments (AAs), Ecological Impact Assessment (EcIA), ecological survey reports for a wide range of projects including EIARs for several solar farms, road schemes commercial developments and wind farms. Ben's has experience in a range of key areas for ecological studies including mammal survey, bat survey and avian surveys.

### 1.3 Soils, Historical Habitats and Management

This section has been included to give an overview of the history of land use and habitats present at Knockharley Landfill site. This information is relevant when considering the habitats present on site in terms of their origin, age and development.

The predominant soil type covering the site according to Teagasc’s Irish Soil Information System is “fine loamy drift with limestones” (soil series Straffan 0700ST), which is a clay loam with neutral pH in the upper horizons, becoming more basic as the bedrock is approached. River alluvium is present in some areas of the site (soil series Boyne 0500SBO), which is a silty river alluvium falling within the sub-group “typical alluvial gleys”.

Historical 6-inch mapping (1837-1842) (plate 1 below) does not show any wooded areas within the site at that time. A number of fields forming the eastern flank of the site are shown as containing a mix of broadleaved and coniferous trees in mapping from 1888-1913 (see plate 2 below).



**Plate 1: Historical Mapping of Landfill Site (1837-1842)**

(Source: <http://map.geohive.ie/mapviewer.html>; accessed 03/10/2019)

Historical 25-inch mapping (1888-1913) shows that parts of the site were wooded during this period (see plate 2 below). These blocks of woodland were confined to within pre-existing field boundaries, where no woodland was depicted on previous (1837-1842) mapping, indicating their artificial origin i.e. a plantation.



The composition of the majority of these woodlands as indicated on these maps was mixed broadleaved/conifer (see inset to left in plate 2). Only one parcel of broadleaved woodland is depicted in the area during this time (right inset in plate 2).



**Plate 2: Historical Mapping of Landfill Site (1888-1913)**

(Source: <http://map.geohive.ie/mapviewer.html>; accessed 03/10/2019)

Examination of historical aerial imagery indicates the land within the site was used for a mix of intensive arable and pastoral farming up until at least the year 2000. The imagery from 2000 shows recently planted arable crops, uniform pastures and fields with exposed soil which indicates re-seeding of pastureland or tilled land in preparation for planting of arable crops. There are no areas of woodland present within the site in aerial imagery from the year 2000 (see plate 3 below).

Aerial imagery from 2005 shows landfilling activity onsite, with extensive areas of stripped soil, excavations and trackways. Outside of constructions area, the surrounding habitats remained similar to that in 2000, with arable and pasture land dominating, and no evidence of woodlands (see plate 4 below).



**Plate 3: Satellite Imagery (2000)**

(Source: <http://map.geohive.ie/mapviewer.html>; accessed 03/10/2019)



**Plate 4: Satellite Imagery (2005)**

(Source: <http://map.geohive.ie/mapviewer.html>; accessed 03/10/2019)

Within the landfill site boundary, no land parcels contained woodland in the era leading up to construction of the landfill. Planting with commercial forestry has taken place since landfill operations commenced. The next available set of aerial imagery (2005-2012) (plate 5 below) has a broad temporal range but shows that forestry plantations surrounding the landfill were established during this timeframe. The recolonisation by grassy vegetation of areas stripped during construction and cessation of intensive agricultural management of two fields to the north of the existing landfill (within footprint of permitted extension) can also be seen in this imagery.



**Plate 5: Satellite Imagery (2005-2012) including site boundary**

(Source: <http://map.geohive.ie/mapviewer.html>; accessed 03/10/2019)

The mapping and aerial imagery referenced was accessed through Ordnance Survey Ireland's online GIS platform *Geohive* at <http://map.geohive.ie/mapviewer.html> (accessed 03/10/2019).

Taken collectively, these images and mapping shows a history of the development on the site since 2000 and shows that no semi-natural habitats occupied the open spaces within the proposed development site in the era prior to construction of the landfill. They also show that the grassland communities currently occupying the site developed recently following disturbance and cessation or intensification of management, and that the woodlands within the site were recently planted.

The satellite image post-2012 shown in plate 6 below shows continuing site clearance works associated with the consented landfill development. The aerial photograph below (plate 7) shows the artificial character of the grasslands near the site offices soon after the facility was constructed.



**Plate 6: Satellite Imagery (post-2012) including site boundary**  
(Source: ESRI/ArcMap accessed 09/10/2019)



**Plate 7: Aerial photograph showing artificial character of grasslands around landfill offices after construction**

(From EIAR)

Areas fringing the east and northwest of the consented landfill cells are subject to ongoing disturbance vegetation clearance works within the existing facility. These areas are classified as a Spoil and Bare Ground/Recolonising Bare Ground ED2/ED3 Mosaic under the Fossitt (2000) habitat classification system and show the ongoing (permitted) works within the facility (see plate 8).

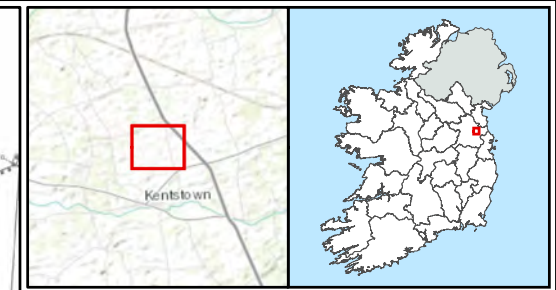
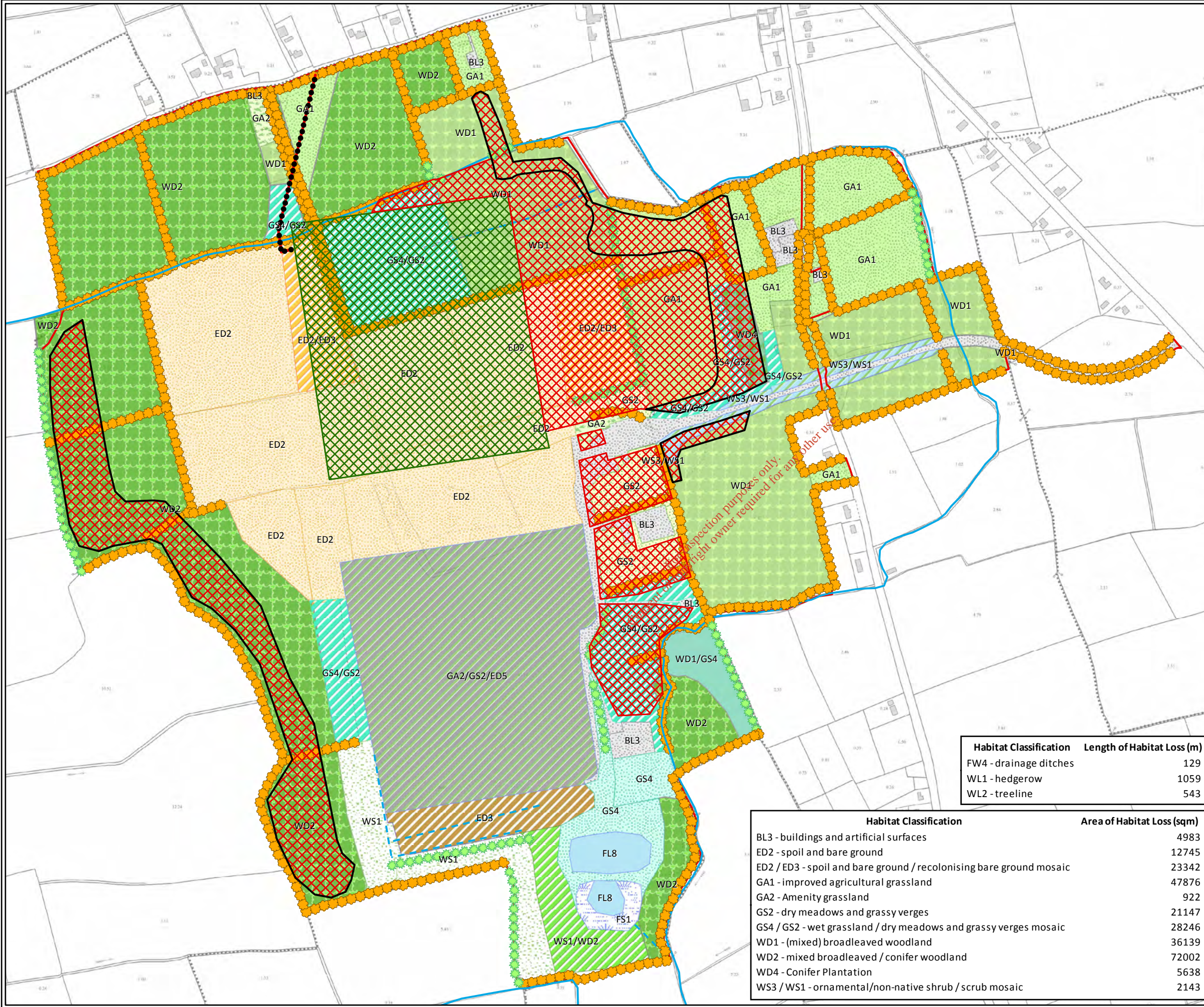
This habitat type is within the proposed IBA facility footprint. It is a transitory and severely disturbed habitat of limited ecological value and it is classified as *Locally important (lower value)*.



**Plate 8: Spoil and Bare Ground/Recolonising Bare Ground ED2/ED3 Mosaic (within proposed IBA facility footprint)**

## 1.4 Knockharley Landfill

Chapter 2 of Volume 2 of the EIAR describes both the existing development and the proposed development. The sections make reference to specific drawings showing existing infrastructure and proposed infrastructure. Those drawings were included in Volume 4 of the EIAR, and there is a drawing list for ease of reference. 2 no. new drawings have been prepared to simplify existing versus proposed development areas (LW14-821-01-P0000-0014 Rev A Overview of Permitted, Existing and Proposed Development) and to clarify the proposed changes to the overhead electricity lines on site (LW14-821-01-P-0050-014 Rev A Overview of Overhead Lines). These additional drawings, and an updated drawing list, are included in Appendix 7 of this document. For further clarity Figure 1-1 shows the footprint of the proposed development (red hatch) and permitted development (green hatch) within the existing fully operational Knockharley Facility. Further explanation is provided below.

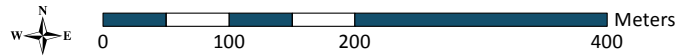


- Proposed Overhead Electricity
- ▭ Berm
- ▭ Planning Boundary
- ▭ Permitted elements not yet
- ▭ Proposed elements
- Habitat**
- FW1 - eroding river
- - - FW4 - drainage ditches
- WL1 - hedgerow
- WL2 - treeline
- ▭ BL3 - buildings and artificial surfaces
- ▭ ED2 - spoil and bare ground
- ▭ ED2 / ED3 - spoil and bare ground /
- ▭ ED3 - recolonising bare ground
- ▭ FL8 - artificial lakes and ponds
- ▭ FS1 - reed and large sedge swamps
- ▭ GA1 - improved agricultural grassland
- ▭ GA1 / GS4 - improved agricultural grassland /
- ▭ GA2 - Amenity grassland
- ▭ GA2/GS2/ED5 - amenity grassland / dry meadows and grassy verges / refuse and other
- ▭ GS2 - dry meadows and grassy verges
- ▭ GS4 - wet grassland
- ▭ GS4 / GS2 - wet grassland / dry meadows and
- ▭ WD1 - (mixed) broadleaved woodland
- ▭ WD1 / GS4 - (mixed) broadleaved woodland /
- ▭ WD2 - mixed broadleaved / conifer woodland
- ▭ WD4 - Conifer Plantation
- ▭ WS1 - scrub
- ▭ WS1 / WD2 - scrub / mixed broadleaved-
- ▭ WS3 / WS1 - ornamental/non-native shrub /

Habitat Classification	Length of Habitat Loss (m)
FW4 - drainage ditches	129
WL1 - hedgerow	1059
WL2 - treeline	543

Habitat Classification	Area of Habitat Loss (sqm)
BL3 - buildings and artificial surfaces	4983
ED2 - spoil and bare ground	12745
ED2 / ED3 - spoil and bare ground / recolonising bare ground mosaic	23342
GA1 - improved agricultural grassland	47876
GA2 - Amenity grassland	922
GS2 - dry meadows and grassy verges	21147
GS4 / GS2 - wet grassland / dry meadows and grassy verges mosaic	28246
WD1 - (mixed) broadleaved woodland	36139
WD2 - mixed broadleaved / conifer woodland	72002
WD4 - Conifer Plantation	5638
WS3 / WS1 - ornamental/non-native shrub / scrub mosaic	2143

<b>TITLE:</b>	Habitat Loss
<b>PROJECT:</b>	Knockharley Landfill, Co. Meath
<b>FIGURE NO:</b>	1.1
<b>CLIENT:</b>	Knockharley Landfill Ltd.
<b>SCALE:</b>	1:6000
<b>REVISION:</b>	0
<b>DATE:</b>	21/10/2019
<b>PAGE SIZE:</b>	A3



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## 2 BIODIVERSITY CHAPTER OF THE EIAR

### 2.1 Desktop study

#### FERS Assertion

*Section 5.1.1: It must be noted however that the authors fail to identify the date or version of the GIS shapefiles downloaded from NPWS. These shapefiles undergo sporadic updates during new data, including newly designated Natura 2000 sites, are added).*

#### Response

Contrary to the FERS report, the most up to date version of the GIS shapefiles from NPWS were utilised at the time for the EIAR. The shapefiles of the cSACs, SPAs and pNHAs used in the EIAR figure were compared to the latest national datasets from the NPWS. While the shapefiles do not contain any dates, the NPWS assign a version number to each polygon. Following recent analysis to inform this response, it was found that only one polygon was updated, from version 1.11 to 1.12, where an additional area was incorporated into the River Boyne and River Blackwater SAC (002299). This change occurred 31km away from the facility boundary, which is well outside the 15km study area. Therefore, the shapefiles utilised are still accurate at the time of this response.

#### FERS Assertion

*Section 5.1.2: The authors have presented results obtained from the NPWS database regarding records of protected species presented within the 10 km square N96. The majority of these records are out of date, with numerous records now 50 years old. The National Biodiversity Data Centre is the current repository for such records.*

#### Response

##### **Birds**

As expressly stated in Chapter 10 – Biodiversity section 10.4.2 'The NPWS website and National Biodiversity Data Centre (NBDC) website were searched for records of protected species from the 10km grid (NPWS data) and for the 2km grid squares in which the proposed development is located (NBDC data). Records of rare/threatened and/or protected bird species since 2007 within grid square N96 obtained from the NBDC are included in Table 10-8 of Chapter 10 – Biodiversity in the EIAR.

It should be noted that the NBDC report for N96 included a number of bird species which are not of conservation concern, including Common Grasshopper Warbler (incorrectly identified as being amber-listed), Common Pheasant, Common Wood Pigeon, Mallard, and Rock Pigeon. Records for Rock Pigeon *Columba livia* do not differentiate between wild and feral populations, with wild populations being restricted to remote areas of Counties Mayo, Galway, Kerry and Cork.

Corn Crane, Grey Partridge, Eurasian Curlew, Great Cormorant, Little Grebe and Stock Pigeon were omitted from Table 10-8 in the Biodiversity Chapter as records were restricted to those from 2007 onwards.

Corn Crane and Grey Partridge in particular are highly unlikely to occur due to the destruction of their habitats by intensive agricultural practices. Great Cormorant are unlikely to use the habitats at the landfill facility due to lack of large waterbodies or mature trees beside large waterbodies.

##### **Mammals and Amphibians**

Table 10-4 of the Biodiversity Chapter contains only data for grid square N96 obtained from the NPWS, NBDC records for the 2km grid square (N96T) overlapping the landfill facility were also examined as stated in the paragraph preceding Table 10-4.

##### *Common Frog*

Records of Common Frog are present in the NPWS dataset for N96.



*Bats*

Records of Leisler's bat, Common Pipistrelle and Soprano Pipistrelle within grid square N96Y are available from the NBDC. The closest records of brown long-eared bat from the NBDC are 7 km east in grid square O043661.

*Badger*

The NBDC holds records of Badger setts within the 2km grid square to the north of the facility (N9668). A number of recent roadkill records, between 2008 -2012, in the vicinity of the site are available from the NBDC.

*Red Squirrel*

There are no recent records of Red Squirrel in the vicinity of the facility. The closest recent records are from and suburban Navan c. 8.9 km west.

*Otter*

Records for Otter dating from 1982 in the vicinity of the landfill facility are available from the NBDC. The closest is c. 1.6 km northwest of the landfill site, within grid square N947688. A more recent record noted in 2010 is located > 5km south east of the site.

*Pine Marten*

The closest recent records for this species are from Rathdrinagh 2km north (2012) and Flemingstown 2.2 km southeast (2012).

*Red Deer*

The record of this species is low resolution (10 km scale), originating from a study on the range expansion of Irish Deer carried out in 2008. The lack of other records for this species within N96 available through the NBDC indicates they are unlikely to be present at high density; the data presented in Carden *et al* (2010) (the study from which the NBDC data originates) shows that Red Deer have recently expanded their range into the area. No information on density is available, and Red Deer are likely to be widely dispersed throughout the landscape.

In addition, Red Deer in this part of the country are of lower conservation concern, having originated from more recently introduced stock.

*Hedgehog*

A number of recent roadkill records, between 2008 -2012, in the vicinity of the site are available from the NBDC.

## 2.2 Flora and Habitats

### FERS Assertion

Section 5.2.1: *There is a marked paucity of information regarding the methodology utilised to undertake the habitat and botanical surveys.*

### Response

As expressly stated in section 10.3.4 of the EIAR, all flora present were identified, habitats were classified according to Fossitt (2000) <sup>(1)</sup> and following best practice recommended in Smith *et al.* 2011 <sup>(2)</sup>. Dominant habitats of the facility were previously classified according to Fossitt (2000) in 2010. The habitats on site were re-visited in March 2015 and February 2016. These assessments identified ongoing disturbance onsite associated with the expansion of the operational landfill and ongoing agricultural management. As part of ongoing monitoring surveys to support for this planning application dedicated habitat and botanical surveys were continued in 2019 to reconfirm the findings of the EIAR. The ongoing monitoring surveys included a habitat survey (Fossitt 2000), quadrat and relevés of grassland and the planted woodland within the facility. For the full methodology for these surveys see Knockharley Landfill botanical and habitat surveys 2019 report in Appendix 4 of this document.

Ortho-photographs of the subject site were annotated in the field to delineate each habitat type identified. Target notes were recorded for each habitat polygon and for features of interest recorded during the survey. The minimum size of habitats mapped was 400m<sup>2</sup> for polygons, or 20m for linear habitats, in line with recommended guidance (Smith *et al.*, 2011). The position of notable small habitats and features of interest was marked using a GPS and recorded as points of interest. The main plant species in each habitat type were recorded, thereby enabling a full species list for the site to be compiled.

As part of the ongoing monitoring surveys, quadrats and relevés were used to record vegetation in areas within the footprint of the proposed extensions to the east of the existing (capped) landfill and consented landfill cells. For grassland areas, the methodology detailed in "The Irish semi-natural grasslands survey 2007-2012" (O'Neill *et al.*, 2013) was used, while survey of plots in plantation woodland areas was undertaken following the methodology detailed in the "National Survey of Native Woodlands 2003-2008" (Perrin *et al.* 2008).

Habitat boundaries and associated attribute data were mapped using desk-based GIS software, namely ArcGIS 10.4.1, which was also used to calculate habitat areas and lengths. In addition to habitat identification, each habitat was assessed for its ecological significance, based on the National Roads Authority (NRA) Site Evaluation Scheme (NRA, 2009) <sup>(3)</sup>.

Accordingly, there is no basis for the FERS assertion that there is a paucity of information in relation to the habitat and botanical survey methodology.

### FERS Assertion

Section 5.2.1: *No records of moss, liverwort or lichen species, which do not appear to have been included in the survey despite the suitability of habitat (please note that there are numerous rare and protected such species).*

### Response

Contrary to the FERS report, the habitats within the facility do not offer suitable habitat for liverwort or lichen species. Following ongoing ecological monitoring, it is confirmed that only common moss species have been recorded. For the full account of the results of these updated surveys see *Knockharley Landfill Botanical and Habitat Surveys 2019 Report* in Appendix 4 of this document. There are no rare and protected moss, liverwort or lichen species within the facility due to the unsuitability of the habitats present and the ongoing disturbance associated with the continued development and this operation facility.

<sup>1</sup> Fossitt J.A. (2000). A Guide to Habitats in Ireland. Heritage Council, Kilkenny

<sup>2</sup> Smith, G., O'Donoghue, P., O'Hora, K., and Delaney, E. (2011). Best Practice Guidance for Habitat Survey and Mapping. Kilkenny, Ireland.: The Heritage Council.

<sup>3</sup> NRA (2009). Guideline for the Assessment of Ecological Impacts of National Road Schemes, National Roads Authority

A search for records of rare and/or protected flora and lichens in the 10 km grid square (N96) overlapping the Knockharley Landfill site was carried out using the National Biodiversity Data Centre (NBDC) website on 8<sup>th</sup> October 2019. This returned no records of rare or protected vascular plants, and no records of any species of lichen. The NPWS map viewer was also searched for records of rare/protected species within grid square N96 and no records were returned. A data request for rare and protected species within 10km of the existing facility was submitted to the NPWS on 8<sup>th</sup> October 2019. This data was received from the NPWS on the 11<sup>th</sup> October 2019. There were records of rare or protected flora within the 10km grid square (N96) encompassing the proposed development.

Of the 81 species of bryophyte (mosses and liverworts) recorded within grid square N96, one record was of a rare/threatened species which is Slender Pocket-moss *Fissidens exilis*. The record is from 1978 with no further records over the intervening 40 years. While geographical resolution is low at 10km, the place name Somerville is given, which corresponds to an area c. 500m south-east of the landfill site. *F.exilis* is assessed as Vulnerable in Lockhart et al (2012) red list 'Rare and threatened bryophytes of Ireland'.

As per the British Bryological Societies 'Mosses and Liverworts of Britain and Ireland – a field guide' *F.exilis* inhabits neutral or acidic loam and clay soils in low-lying woodland habitats, on sheltered (often shady) banks, molehills, stream sides, and in damp fields and grassland. As the grassland and woodland habitats present on site are of recent origin, there is little potential for *F.exilis* to occur.

The online mapping tool 'FPO (Flora Protection Order) Bryophytes Map Viewer <http://dahg.maps.arcgis.com/apps/webappviewer/index.html?id=71f8df33693f48edbb70369d7fb26b7e> details the locations of rare and threatened bryophyte species listed on the Flora Protection Order (2015). None of these locations are within or surrounding the proposed development site. The closest sites located in Baltray, Co. Louth c. 19 km to the east of the proposed development, where Pointed Beard-moss *Didymodon acutus* is present. The records for this species in the east of Ireland are limited to the Baltray and Clogherhead areas.

Six lichen species are listed in Kingston's (2012) 'Checklist of protected & rare species in Ireland'. Of these, Scrambled-egg Lichen *Fulgensia fulgens* is the only lichen species listed on the Flora Protection Order. This species typically inhabits well-lit calcareous dune systems of the south east of Ireland. It is found only at Ballyteigue Burrow in Co. Wexford.

The remaining five lichen species identified by Kingston (2012) are of the genus *Cladonia* and are listed in Annex V of the EU Habitats Directive (the harvesting of Annex V species is restricted).

- *Cladonia arbuscular* is a common lichen species on acid heathlands, peat, moors and areas of dune – none of these habitats occur at Knockharley.
- *Cladonia ciliata* is common on dunes, moors, heathland and scree – none of these habitats occur at Knockharley.
- *Cladonia portentosa* is common on heaths and peat moors – none of these habitats occur at Knockharley.
- *Cladonia rangiferina* is common in highland areas and on lowland heaths along the coasts – there are no heath habitats at Knockharley.
- *Cladonia azorica* is rare and under recorded in Ireland and is only known from the Dingle peninsula in Co. Kerry.

All bryophyte species encountered were identified in the field using the BBS Field Guide "Mosses and Liverworts of Britain and Ireland a field guide" (Atherton et al., 2010).

No lichens are present on site. The recent establishment and history of disturbance of habitats on site limits their suitability to host lichens.

### FERS Assertion

Section 5.2.2: *It is important to note that there is a complete absence of any species of moss, liverwort or lichen present in the survey area. It is almost certain that this absence of records would indicate a lack of expertise or industry on the part of the surveyor(s) rather than the absence of these organisms from the site. This alone would pose questions as to the reliability of the findings of the botanical and habitat survey.*

### Response

Contrary to the wholly speculative and factually incorrect assertion made in the FERS report, the surveyors engaged in relation to the preparation of the application have the requisite expertise and experience and utilised the correct methodology. All flora present were identified, and habitats were classified according to Fossitt (2000) "A Guide to Habitats in Ireland" (Fossitt, 2000) with habitat mapping undertaken in accordance with "Best Practice Guidance for Habitat Survey and Mapping" (Smith et. al, 2011).

All habitats within the facility were classified to Fossitt (2000) level three, the recognised guidance document for habitat classification in Ireland. Detailed species lists have been compiled of the flora within each of the habitat types to provide a full comparison with the key indicator species for each habitat types. It is important to note that mosses, liverworts or lichen are not required to classify these habitat types recorded within the facility for Fossitt, 2000 and do not form a key indicator species for any of the habitat types recorded within the facility. The assertion in the FERS report that the omission of these species casts doubt on the habitat survey and exhibits a lack of expertise or industry on the part of the surveyor(s) is wholly mistaken. Indeed, the significance ascribed by the authors of the FERS report to the omission of these taxa shows a clear lack of understanding on the part of FERS as to the procedure for habitat classification in circumstances where, in particular, there are no sand dunes, moors, heathland, bog, rocky outcrops within the facility or indeed stonewalls where mosses, liverworts or lichen would be considered a potential indicator species.

Intensive surveying of the broadleaved plantations and grasslands within the proposed development footprint was undertaken using quadrats and relevés, as detailed in Section 2.1 of the Botanical and Habitat Survey report (Appendix 4).

All bryophyte species encountered were identified in the field using the BBS Field Guide "Mosses and Liverworts of Britain and Ireland a field guide" (Atherton et al., 2010). For the full account of the results of these surveys and species lists see *Knockharley Landfill botanical and habitat surveys 2019 report* in Appendix 4 of this document.

No lichens are present on site. The recent establishment and history of disturbance of habitats at the facility limits their suitability to host lichens.

The findings of the 2019 survey confirm the findings set out in the EIAR, namely, that there are no rare or protected species of species of moss, liverwort or lichen due to the recent establishment and history of disturbance of habitats at the facility. This is detailed in Section 1.1 of the Botanical and Habitat Survey report (Appendix 4).

### FERS Assertion

Section 5.2.1: *There does not appear in the Biodiversity Chapter of the EIAR any reference to any detailed qualitative or quantitative botanical survey of the areas of WD1 or WD2.*

### Response

Contrary to the FERS report, it is not the case that botanical surveys of the areas of WD1 or WD2 were not carried out. All flora present in these habitats were identified, and structural characteristics and environmental characteristics were also recorded. No protected species of flora were identified on-site during botanical surveys undertaken for the EIAR or during ongoing monitoring survey in 2019 and therefore there will be no impact to protected flora as a result of the proposed development.

As part of ongoing monitoring, surveys of the broadleaved plantations (WD1) within the development footprint were undertaken in accordance with the methodology detailed in the “*National Survey of Native Woodlands 2003-2008*” (Perrin et al. 2008), one 10 x 10 m Relevé was recorded in each habitat type present in woodland blocks. All species were identified and recorded. Canopy and understory cover, stem density and diameter at breast height for mature trees, natural regeneration, dead wood (cover and characteristics) and characteristics such as grazing and invasive species were also recorded. The results of these surveys confirm findings of the assessment undertaken within the EIAR.

The recent establishment of plantation woodlands on site is detailed in Section 1.3 of above.

The site surrounding the active landfill facility is dominated by mixed broadleaved/coniferous woodland (WD2), with small sections of mixed broadleaved woodland (WD1) and conifer plantation (WD4) which has been planted as part of the development of the facility. This woodland is subject to the same management regime as conifer plantation, with periodic thinning and shall ultimately be felled once it reaches maturity. The stands are intersected by a network of rill drains and trees have been planted at evenly spaced distances in lines between these drains. These plantations are not ‘**ancient woodland**’ or indeed ‘**naturally occurring woodland**’ a point which has clearly been overlooked in the FERS report. A more informed assessment of the chapter would have differentiated the value of planted commercial forestry over that of naturally occurring woodland.

Recently established (2005-2012) (Mixed) Broadleaved Woodland WD1 plantation totalling 3.6 ha will be lost within the footprint of the proposed (eastern) screening berm, IBA Facility, surface water holding pond, surface water attenuation lagoon, and constructed wetland. While these plantations are of recent origin, artificial structure, and of low species diversity with few woodland specialists present and ground flora still dominated by the grasses which covered these areas during agricultural use, the use of native species (ash and alder) imparts some degree of naturalness.

Considering that these areas were established solely for commercial purposes and would ultimately be harvested, and are subject to forestry management, they are of lower value than long-established woodlands. While potentially of limited value to local wildlife, these plantations do not currently correspond to any ecologically valuable habitat. As detailed in the EIAR, considering these factors and that they will be replaced with similar planting following completion of proposed construction, a *Short-Term Moderate* Impact is envisaged.

Recently established Mixed Broadleaved/Conifer Woodland WD2 totalling 7.2 ha will be lost within the footprint of the proposed screening berm running along the western boundary. It is of similar or value to the woodlands described above, and as detailed in the EIAR, when taking re-planting into account, the same *Short-Term Moderate* Impact is envisaged.

Recently established Conifer Plantation WD4 totalling 0.5ha will be lost within the footprint of the proposed screening berm east of the IBA Facility. This woodland type is of lower value in its own right to those described above due to the dominance of non-native conifers, but is of value to local wildlife as a source of food and cover. Again taking re-planting into account, a *Short-Term Slight* Impact is envisaged.



**Plate 9: Plantation of Mixed Broadleaved Woodland WD1 Plantation (north-east of existing facility).**



**Plate 10: Plantation of Mixed Broadleaved/Conifer Woodland WD2 (along north and western boundaries of the facility)**

FERS Assertion

*Section 5.2.2: There is no attempt within the Biodiversity Chapter of the EIAR to identify, characterise or assess the importance of "Ecological Stepping Stones" or "Ecological Corridors" in accordance with Article 10 of the Habitats Directive.*

## Response

Cognisance was taken of the importance of “Ecological Stepping Stones” or “Ecological Corridors” for the evaluation of habitats within the site outlined in Chapter 10 – Biodiversity section 10.4.3 in accordance with Article 10 of the Habitats Directive.

Knockharley Landfill is located approximately c. 9km east of Navan within a predominately rural landscape. The existing facility is surrounded by agricultural land bounded by hedgerows and treelines. There are a small number of residential properties within the wider environs of the landfill.

To the north the existing facility is directly bordered by an unnamed local road. The N2 is located east of the landfill. Just beyond the agricultural fields that border the south and west of the landfill, lies the R150 and an unnamed local road respectively. The road network surrounding the landfill greatly limits the connectivity of the site.

The hedgerows/treeline and woodlands offer the potential for connectivity with the wider environs however given the surrounding road network these are unlikely to be of high value. The main continuous corridor is Knockharley stream which traverses the north and south of the existing facility.

The Knockharley Stream was identified of to be of Local Importance (higher value) as it acts as a corridor for local wildlife in section 10.5.2.2 Chapter 10 – Biodiversity of the EIAR. This watercourse was considered as part of the ecological surveying to determine its value / importance as an ecological corridor in accordance with Article 10 of the Habitats Directive.

Biological water quality in Knockharley Stream is assessed on an annual basis in compliance with the EPA licence. Biological monitoring was conducted from 2013–2018 at four locations by means of calculating Small Stream Risk Scores (SSRS) which is a more appropriate methodology for the type of stream on site. These monitoring locations are detailed in Table 2-1.

**Table 2-1: Biological Monitoring Locations**

Sample	Location
Site 1	Less than 1 km downstream receptor site on the Knockharley stream.
Site 2	Upstream control site on the Knockharley stream.
Site 3	Downstream receptor site (corresponds with the EPA site 08/N/01/ 200) on the River Nanny.
Site 4	Upstream control site (Corresponds with EPA site 08/N/01/0110) on the River Nanny.

Two additional monitoring sites were added in 2019 (sites 5 and 6) on the Kentstown and Veldonstown Streams respectively to obtain additional data on watercourses situated south and south west of the landfill and within the larger catchment area. These sampling sites would also act as further upstream control sites to compare with water quality data downstream of the confluence with the Flemingstown (Knockharley) Stream that receives a licensed discharge from the existing landfill.

The following aquatic surveys/assessments were undertaken at the 6 monitoring sites during 2019:

- Walkover surveys
- Fish Stock Assessment (Electro-fishing)
- Fisheries appraisal
- Q-Sampling
- Water Quality (Physio Chemical)
- River Hydromorphological Assessment Technique (RHAT)
- Kingfisher (at 4 vantage points)
- Otter

In summary, the watercourses within the vicinity of Knockharley landfill are generally of poor quality. This is expected for historically modified, straightened and or deepened channels with bordering intensive agricultural pressures. Siltation levels, for example, were evidently excessive on the River Nanny (sites 3 and 4) and this greatly reduced the fisheries potential, especially for salmonids. Biological water quality ranged from bad (Q2) to poor (Q2-3 or Q3) status and thus is not meeting target good status (Q4).

No Kingfisher nesting sites were recorded during walkover surveys. No Kingfishers were recorded during dedicated vantage point surveys; however, a single bird was recorded during walkover surveys flying upstream along the Flemingstown stream near the landfill boundary. Also, a single Kingfisher was observed in August 2019 during the ornithological surveys at the inflow pipe culvert of the existing surface water attenuation pond within the site boundary.

Examination of the culvert into the existing surface water attenuation pond did not detect evidence of breeding activity during the summer. Due to the late date of the sighting and the fact that no Kingfishers were observed during previous surveys at this location during the summer, it is thought that this sighting concerned a transient bird passing through, but not breeding at the existing facility.

Overall, surveys showed that habitat within the existing facility is sub-optimal for Kingfishers with no nesting sites identified and limited suitable perch sites available, with limited potential feeding habitat.

While the smaller tributary streams offer lower potential habitat for Kingfisher, including the Flemingstown stream adjacent to the facility, the River Nanny downstream may offer potential habitat for the species. However, it is concluded that the Knockharley study area is of lower overall value for kingfisher apart from transient foraging opportunities.

Otter utilisation of watercourses in the vicinity of the landfill appeared to be low as only a small number spraint sites were recorded. This aligns with the results gathered during the 2010 and 2015 otter surveys. Two otter spraints were found along Knockharley Stream in the northwest of the site in 2010. Spraints were found along Knockharley Stream and channels in three locations during the 2015 surveys. Most recently in 2019 otter signs were recorded at 3 locations recorded along the watercourses in the vicinity of Knockharley Landfill. All signs consisted of spraint with two sites recorded at bridges along the River Nanny. One very regular spraint site was also recorded on the inflow pipe culvert to the existing landfill surface water attenuation pond. No otter holts were recorded during any of the surveys. As with kingfisher these watercourses are likely only used for transient foraging.

## 2.3 Birds

### FERS Assertion

*Section 5.4.1: The methodology is poorly described. There is no indication as to whom carried out the bird surveys nor their ability to undertake such a survey. There are no details provided as to the time of commencement/end of survey, weather conditions during the survey or equipment utilised.*

### Response

The surveys referred to were undertaken by Daphne Roycroft, Jon Kearney, Chris Cullen and Jonathon Dunn. All surveys were undertaken by highly qualified and experienced Ecologists with a minimum of five years' experience. The qualifications and experience of Jon Kearney and Jonathon Dunn are set out in section 1.2 of this response. Chris Cullen is a Senior Ecologist with 11 years' professional experience and Associate Member of the Chartered Institute of Ecology and Environmental Management. He holds a Higher National Diploma in Engineering and a further Diploma in Field Ecology. He has a broad range of experience within the environmental sector. He is a specialist in Ornithological surveys and assessments however he also has experience in Project Management, Appropriate Assessment, Cumulative Impact Assessment, Habitat Mapping, Mitigation Development, EIA, Collision Risk Modelling, Biomonitoring, Education, Public Speaking and a broad range of survey methodologies. Chris has had a number of papers published in peer reviewed publications such as Irish Birds, The Irish Naturalists Journal, The Proceedings of the Royal Irish Academy, Ringing and Migration and In Practice. Chris has also been a named author additional papers published in journals such as Ibis.



Dr. Daphne Roycroft was at the time of the survey (2010), a Senior Ecologist with FT. She is a graduate of Zoology from the National University of Ireland, Cork, obtaining a B.Sc. (1H) in 2000 and a Ph.D in 2005. She is experienced in a wide range of ecological sampling techniques, with particular expertise in distance sampling of birds and marine mammals. As part of her Ph.D she studied the impacts of mussel suspension aquaculture on seabirds and has published her results in several peer-reviewed international journals.

Details of the bird survey methodology is presented in Chapter 10 - Biodiversity section 10.3.6 of the EIAR . Breeding birds at the site were previously surveyed using a series of survey transects on the 5<sup>th</sup> and 6<sup>th</sup> of May 2010 (Bibby *et al.*, 2000<sup>4</sup>). A total of five transects of approximately 800 m in length were walked during the survey visits (See Figure 10-1). A minimum distance of 250 m was allowed between transects to minimise double-counting of individual birds across the site.

All species encountered (seen or heard) within 100 m of the observer were recorded and their abundance was noted. All species occurring more than 100 m from the observer or flying were not included in the abundance analysis, but were recorded as 'additional' species for separate analysis. The total number of birds per species was derived by adding abundance data from all transects. This allowed a measure of relative abundance to be examined for all breeding bird species recorded.

The above transects were repeated for the evaluation on 26<sup>th</sup> March 2015 and 8<sup>th</sup> July 2016; winter transects were also carried out on the 16<sup>th</sup> December 2015, 29<sup>th</sup> January 2016 and the results are included in this document. One further winter bird surveys were carried out on 16<sup>th</sup> November 2018. To complete the winter season surveys for 2018/19 a second and third visit was undertaken on the 12<sup>th</sup> December 2018 and the 25<sup>th</sup> January 2019, respectively.

Details are provided below of the survey times, surveyors, weather conditions etc. The equipment utilised included binoculars, telescopes, field maps, field sheets, recorders / or phone and cameras. Recorders (phone) were available for utilisation if required however all of the surveyors used for these surveys were qualified, highly experienced individuals that were able to identify bird calls in the field.

**Table 2-2: Details of the survey times, surveyors, weather conditions for ecology surveys at Knockharley Landfill, Co. Meath**

Date	Survey type	Surveyor	Cloud	Rain	Visibility	Wind	Start Time	End Time
05/05/2010	Breeding bird survey	Daphne Roycroft	8/8	Drizzle at first but dry after	Good	F-2-3	10:00	14:45
06/05/2010	Breeding bird survey	Daphne Roycroft	8/8	None	Good	F0	08:30	12:30
16/12/2015	Winter bird survey	Jon Kearney	7/8	None	Very Good	F3 SW	08:30	12:37
26/03/2015	Breeding bird survey	Chris Cullen	3/8	None	Very Good	F4 W	10:16	12:58
29/01/2016	Winter bird survey	Jon Kearney	7/8	None	Excellent	F4 WSW	08:25	12:10
08/07/2016	Breeding bird survey	Jon Kearney	3/8	None	Excellent	F3 W	08:45	12:47
16/11/2018	Winter bird survey	Jonathon Dunn	3/8	None	Excellent	FW2 S	09:07	12:40
12/12/2018	Winter bird survey	Jonathon Dunn	8/8	None	OK	F1 S	08:45	11:45
25/01/2019	Winter bird survey	Jonathon Dunn	0/8	None	Excellent	F0	08:50	11:35

<sup>4</sup> Bibby *et al.*, 2000. Bird Census Techniques. Bibby, C.J.; Burgess, N.D., Hill, D.A. & Mustoe, S.H. Second Edition. Academic Press.

2018/19 Surveys

In addition, the following ornithological surveys were carried out on the within the existing facility (See Appendix 1 Knockharley Landfill bird surveys 2018/19):

- Breeding Wader Survey
- Breeding Raptor Survey
- Kingfisher Survey
- Summer Bird Survey
- Barn Owl Survey

## FERS Assertion

*Section 5.4.1 The transects utilised concentrate on hedgerow and field habitats, but little cognisance is given to the importance of woodland interior habitat or the pond and FS1 habitats.*

## Response

This statement is factually incorrect as all five transects utilised either bounded or traversed woodland habitat onsite. The location of these transects are present in Figure 10.1 of the EIAR.

The five transects run adjacent to the following woodland habitats:

- Transect 1 includes and is adjacent to (mixed) broadleaved woodland (WD1).
- Transect 2 runs immediately adjacent to (mixed) broadleaved woodland (WD1) and mixed broadleaved / conifer woodland (WD2).
- Transect 3 is immediately adjacent to mixed broadleaved / conifer woodland (WD2).
- Transect 4 is immediately adjacent to the edges of mixed broadleaved / conifer woodland (WD2)
- Transect 5 ends in a (mixed) broadleaved woodland (WD1) plantation.

Thus, woodland habitats are included in the buffer / study area for every single transect route deployed.

The species within the pond and FS1 habitats were noted as recorded during each site survey the results are present separately below. This table was generated using information already presented in the EIAR.

**Table 2-3: Species recorded during counts at the tailings pond within Knockharley Landfill site.**

Date	Survey	Species	0-25m	25-100m	Fly over
16/12/2015	Winter survey	bird Herring Gull			40
16/12/2015	Winter survey	bird Hooded Crow		10	
16/12/2015	Winter survey	bird Lesser Black-Backed Gull			20
16/12/2015	Winter survey	bird Linnet		3	
16/12/2015	Winter survey	bird Magpie		1	
16/12/2015	Winter survey	bird Moorhen		3	
16/12/2015	Winter survey	bird Mute Swan	2		
16/12/2015	Winter survey	bird Pied Wagtail	2		

Date	Survey	Species	0-25m	25-100m	Fly over
16/12/2015	Winter survey	bird Song Thrush		1	
16/12/2015	Winter survey	bird Stonechat	1		
29/01/2016	Winter survey	bird Blackbird	1		
29/01/2016	Winter survey	bird Black-Headed Gull			15
29/01/2016	Winter survey	bird Herring Gull			120
29/01/2016	Winter survey	bird Hooded Crow			20
29/01/2016	Winter survey	bird Lesser Black-Backed Gull	5		100
29/01/2016	Winter survey	bird Magpie		2	
29/01/2016	Winter survey	bird Mute Swan	2		
29/01/2016	Winter survey	bird Pied Wagtail	2		
29/01/2016	Winter survey	bird Rook			50
29/01/2016	Winter survey	bird Stonechat	2		
16/11/2018	Winter survey	bird Goldfinch			20
16/11/2018	Winter survey	bird Common Gull			4
16/11/2018	Winter survey	bird Fieldfare			5
16/11/2018	Winter survey	bird Rook			5
16/11/2018	Winter survey	bird Woodpigeon			2
16/11/2018	Winter survey	bird Hooded Crow			2
16/11/2018	Winter survey	bird Herring Gull			2
16/11/2018	Winter survey	bird Song Thrush	1		
12/12/2018	Winter survey	bird Hooded Crow		2	
12/12/2018	Winter survey	bird Herring Gull			10
12/12/2018	Winter survey	bird Woodpigeon			5

Date	Survey	Species	0-25m	25-100m	Fly over
12/12/2018	Winter survey	bird Rook		2	

FERS Assertion

*Section 5.4.1 Given the abundance of GS4 habitat on site and the relatively protected nature of the site (fences, pest control, etc.) we would question as to why a breeding wader survey was not undertaken... Breeding waders are very susceptible to disturbance and the absence of walkers, dogs, etc. (presumably) would indicate that the grassland habitats as indicated in the habitat by the habitat survey may be suitable habitat for breeding waders.*

Response

Contrary to the FERS report, it is not the case that the habitats within the footprint of the proposed development, or indeed the surrounding habitats, are undisturbed and offer potentially high value habitat for breeding waders. The grassland habitats within the site are subject to regular disturbance due to ongoing agricultural practices including grazing and cutting for silage in the northern section of the site. Areas fringing the east and northwest of the consented landfill cells are subject to ongoing disturbance vegetation clearance works within the existing facility. These areas are classified as a Spoil and Bare Ground/Recolonising Bare Ground ED2/ED3 Mosaic under the Fossitt (2000) habitat classification system and show the ongoing (permitted) works within the facility (see plate 8). This habitat type is within the proposed IBA facility footprint.

These grassland fields are located immediately adjacent to an existing and fully operational large landfill facility with daily disturbance (Monday to Saturday) from waste delivery vehicles, on-site machinery and personnel. The transects utilised for these survey traversed the grassland habitats within the site during the breeding bird season. However, there were no observations of breeding waders during any of the breeding season surveys completed within the study area of the proposed Knockharley study area (5<sup>th</sup> and 6<sup>th</sup> of May 2010, or the 8<sup>th</sup> July 2016). There were also no records of the species during winter surveys.

For the avoidance of any doubt, breeding waders surveys were conducted currently over the summer 2019 period to confirm the findings of the EIAR: no breeding waders were detected during the breeding wader surveys in 2019 (see Appendix 5 for the bird survey report). While there is some suitable breeding wader habitat present in the form of wet grassland, at the southeast of the existing facility, no breeding waders were detected at this location. In addition, this area is too close to the Methane Plant, where disturbance is a limiting factor in relation to habitat suitability.

The grassed-over landfill (amenity grassland / dry meadows and grassy verges / refuse and other waste; GA2/GS2/ED5) at the centre of the existing facility was deemed too overgrown, rank and too dry to support breeding waders such as Curlew and Lapwing. In addition, there are a lot of methane stand pipes at this location and there is evidence that corvids roost at this location, as all the stand pipes were whitewashed with bird droppings at the times of the surveys, so disturbance and predation from Hooded Crows to breeding waders is a major issue, coupled with the fact that the area is driven regularly by existing facility personnel.

The improved agricultural grasslands at the north and northeast of the existing facility were deemed unsuitable, as the fields are too small and enclosed by tall hedgerows and treelines. The fields at the northeast of the existing facility are deemed too close to human habitation, so disturbance is an issue. Also, the agricultural grasslands at the north of the existing facility were unmanaged at the times of the survey and the grass sward was too high for breeding Curlew and Lapwing. They are also very close to access roads that lead to ongoing landfill operations.

No breeding Snipe were detected in the area of the southern surface water attenuation pond or the wet grassland at the southeast of the existing facility (although a single bird was flushed from wet grassland near transect 2 during winter transect surveys in January 2019). The area of the surface water attenuation pond is contained by a fence line, with little grassland vegetation. There is very little habitat within the existing facility, in the form of undisturbed wet grassland, to support breeding Snipe.

With regard to breeding waders such as Curlew and Lapwing, both of these species are highly territorial and extremely vocal during the breeding season and are easily agitated, particularly by the presence of corvids, such as Hooded Crows which will prey upon eggs and young, and by human presence. Thus, both species are easily detected, if present.

In summary, the site (existing and proposed) is not suitable for breeding waders due to the ongoing landfill activities taking place, including continuous alteration and disturbance of the facility, lack of suitable breeding habitat and potential predation by corvids.

#### FERS Assertion

*Section 5.4.1 Given the presence of a watercourse (Knockharley stream), in which there is planned to be in-stream works, within a 10km square in which Kingfisher are recorded, less than 5km from a Natura 2000 site for which Kingfisher is the Qualifying interest (River Boyne and River Blackwater SPA), a dedicated Kingfisher survey of suitable habitat should have been undertaken ...*

#### Response

Cognisance was taken of the potential value of the Knockharley Stream during the surveys undertaken to inform the EIAR. The species was highlighted during the desktop study presented in the Table 10-8 of the EIAR as being located within the 10km grid square (N96). However, there is no hydrological connection between the stream draining Knockharley landfill and the River Boyne and River Blackwater SPA 4.6km north of the site and the assertion that there is a link within the FERS report is factually incorrect.

The record referred to by FERS was recorded in Kentstown, south of the site. While it is recognised that there is connectivity downstream from the proposed development via the Knockharley stream, what is clearly misunderstood within the FERS report is the size of Knockharley stream and the fisheries value of the stream. This 1<sup>st</sup> order stream has a typical wet width of < 1m. Knockharley Stream has limited habitat for fish. Three-spined Stickleback was the only species recorded during electro-fishing at the two sites (sites 1 and 2) on the Knockharley Stream during the 2019 aquatic survey 1 and 2 (See Appendix 5). No optimal larval Lamprey habitat was recorded on the Knockharley stream, with any soft sediment present invariably compacted. No Salmonids or Eel were captured on the stream during the survey.

A review of Kingfisher habitats from six river systems, including the River Boyne (Cummins *et al*, 2010<sup>5</sup>) found a preference by Kingfishers for banks of at least 1-2 metres high, vertical banks and for 'some fringing vegetation'. Vertical banks suitable for Kingfisher nesting are not present along the stream within the site. This factor along with the lack of suitable perching features and limited fish stock make this stream a low value watercourse for Kingfisher. However, a Kingfisher survey has been carried out as part of the ongoing monitoring within the site to further confirm the findings of the EIAR (See Appendix 5). Despite the presence of Three-spined Stickleback within sections of the Flemingstown (Knockharley) Stream, Kentstown Stream and Veldonstown Stream, along with more diverse fish stocks in the River Nanny, kingfisher habitat is considered sub-optimal. The smaller watercourses (all watercourses bar the River Nanny) were invariably heavily overgrown (scrub vegetation) with steep but compacted banks not suitable for kingfisher nesting. Suitable perch sites were also noted as being scarce along large sections of the River Nanny and smaller watercourses. No Kingfisher nesting sites were recorded during walkover surveys.

No Kingfishers were recorded during dedicated vantage point surveys; however, a single bird was recorded during walkover surveys flying upstream along the Flemingstown stream near the landfill boundary. Also, a single Kingfisher was observed in August 2019 during the summer transect survey at transect 2 at the inflow pipe culvert of the existing surface water attenuation pond within the site boundary. It remained on the pipe briefly and took off in a south easterly direction over deciduous forestry. A pond net sample at this location undertaken as part of the aquatic surveys in 2019 (See Appendix 5) confirmed that Three-spined Stickleback *Gasterosteus aculeatus* occur within the existing surface water attenuation pond. The presence of a Grey Heron observed at the pond on most survey dates also confirms that low numbers of fish were present.

<sup>5</sup> Cummins, S., Fisher, J., McKeever, R.G., McNaghten, L., & Crowe, O., (2010). Assessment of the distribution and abundance of Kingfisher *Alcedo atthis* and other riparian birds on six SAC river systems in Ireland, A report commissioned by the National Parks and Wildlife Service and prepared by BirdWatch Ireland. June 2010

Examination of the culvert into the existing surface water attenuation pond did not detect evidence of breeding activity during the summer. Due to the late date of the sighting and the fact that no Kingfishers were observed during previous surveys at this location during the summer, it is thought that this sighting concerned a transient bird passing through, but not breeding at the existing facility.

Overall, surveys showed that habitat within the existing facility is sub-optimal for Kingfishers with no nesting sites identified and limited suitable perch sites available, with limited potential feeding habitat.

While the smaller tributary streams offer lower potential habitat for Kingfisher, including the Flemingstown stream adjacent to the facility, the River Nanny downstream may offer potential habitat for the species. With regards to the potential for pollution and degradation of this larger watercourse the potential impact is discussed in Chapter 10 - Biodiversity section 10.5 with mitigation measures provided in Section 10.6. Taking into consideration the updated surveys and mitigation measures proposed, it is confirmed that there will be an imperceptible impact to Kingfisher.

Kingfishers are listed as a qualifying interest of the River Boyne and River Blackwater SPA (site code 004232). This site is approximately 4.6 km to the north east of the existing facility. It is highly unlikely that any construction activities within the existing facility will affect this SPA owing to distance and the fact that it is within a different catchment area. The SPA is within the Boyne catchment and the existing facility is within the Nanny-Delvin catchment. Thus, no hydrological link exists between the two locations and so there is no mechanism by which the proposed development can affect water quality at the SPA. Furthermore, the Kingfisher observed at the existing facility during site surveys was judged to be a transient, passing through but not breeding or regularly feeding at the existing facility. There is no suitable breeding habitat at the existing landfill. Even if there were, Kingfishers are highly territorial. During the breeding season, they typically maintain territories 1 km in length (Fry *et al.* 1999)<sup>6</sup>. As the River Boyne and River Blackwater SPA is 5 km from the existing facility, it is highly unlikely any Kingfishers within the SPA would use the existing facility for breeding. Therefore, it is not envisaged that there will be any significant negative effects on Kingfishers within the River Boyne and River Blackwater SPA (site code 004232).

#### FERS Assertion

*Section 5.4.1 Given the proposed relocation of ESB powerlines ... a dedicated Whooper Swan Survey should have been undertaken in order to identify flight paths of this Annex I species (Birds Directive) species such as to ensure that new location are not in conflict with Whooper Swan flight paths.*

#### Response

Grassland areas along the Boyne and Blackwater are used by a nationally important winter flock of Whooper Swan (*Cygnus Cygnus*). The cSAC is located 4.6km north of the Knockharley landfill facility. Scottish Natural Heritage Guidance<sup>7</sup> gives a foraging range of less than 5km for Whooper Swan from night roosts during the winter season. Therefore, Knockharley landfill would, using the most conservative estimate, be located on the very edge of the core foraging range for this species. There have been no observations of Whooper Swan during bird surveys conducted from 2010 to present day. The habitats within the site are of limited value, with no flooded fields/callows for roosting/feeding. Improved agricultural grassland fields and wet grassland fields within the footprint and adjacent to the permitted extension of the cells to the north (phases 5, 6 and 7) along with the existing surface water attenuation pond to the south offer some limited potential. However, the species have not been recorded utilising these features. The ongoing activity associated with the operational landfill along with the use of bird deterrents reduces the suitability of habitats within the site for the species.

There is no suitable habitat in the surrounding hinterland either. The arable fields surrounding the facility are deemed too small and enclosed by tall treelines and hedgerows. This species favours a broad, uninterrupted view of the surrounding hinterland, while feeding or roosting.

The details of the existing and amended sections of powerlines are provided in Figure LW14-821-01-P-0000-003, Volume 4 of the main Proposed Site Layout Plan.

<sup>6</sup> Fry, C.H., Fry, K. and Harris, A. 1999. Kingfishers, Bee-eaters and Rollers. London: Christopher Helm. pp. 219–221.

<sup>7</sup> Scottish Natural Heritage (2016) Assessing Connectivity with Special Protection Areas (SPAs) Guidance, Version 3 – June 2016

Detailed descriptions are also provided in Chapter 2 (Sections 2.1.1 and 2.2), Volume 2 of the EIAR. It is proposed to bring a new overhead supply to the proposed substation on the north west corner of the permitted development (Phase 7). This new supply will be an overhead 10kV/20kv line (subject to ESB recommendations) mounted on wooden poles 6 m to 8 m above existing ground levels parallel to and offset by approximately 7.5 m (subject to ESB recommendations) from the existing 220 KVA overhead pylons. The powerline shall be along the same corridor as the existing powerline at that location.

An existing section of overhead lines within the footprint of the proposed IBA shall require a minor diversion around the southern edge of the area. The existing overhead line located to the north of the administration building will be relocated to the south of the proposed IBA development. The power lines will, subject to ESB recommendations, be laid over ground mounted on wooden poles 6 m to 8 m above existing ground levels or in underground ducts. The alignment of both options will be parallel to and offset from the existing site access road by approximately 7.5 m to the north. Whooper swans are well-known for attaining great heights on migration, with satellite tags recording a mean altitude of 74 m over land<sup>8</sup>. Larsen and Clausen (2002)<sup>9</sup> showed that the risk of collision for Whooper Swans in winter is mainly during morning and evening flights to and from roosts, where the majority of individuals and flocks flew at heights between 11-20m. There are no suitable roost and feeding sites within the existing facility, thereby negating the need to make low flights. Consequently, the potential risk of collision for Whooper Swans with overhead cables is considered to be negligible.

In the context of negligible risk, there is no necessity for a Whooper Swan survey. However, surveys will be undertaken late in 2019 during the optimal winter survey period as a precautionary measure.

These proposed overhead lines provide only marginal diversions adjacent to existing overhead lines within the site. It must also be noted that there is a network of powerlines running through and around the perimeter of the landfill site currently and therefore these marginal diversions adjacent to existing lines will not be traversing new areas of habitat where powerlines were not previously present. Overall the proposed development shall result only in a marginal realignment of a small section of overhead powerlines within the site and therefore the potential risk shall be negligible compared to the existing conditions for bird species including Whooper Swan.

#### FERS Assertion

*Section 5.4.1 Given the nature of the existing and proposed development (landfill with associated vermin, in particular rodents) and pest control methodology in place (including rodenticide), a dedicated raptor survey should have been undertaken at the site.*

#### Response

Knockharley Landfill employ the services of a specialist pest control contractor to provide a pest prevention service for the landfill, which includes rats, mice and seasonal treatment for flies, where necessary. The Applicant is also required, as a condition of its EPA licence, to provide pest control measures to reduce the potential infestation of pest species on neighbouring properties. A specialist contractor visits the site approximately 8 times per year, to carry out inspections and service poison bait boxes which are installed strategically around the site. Bait is placed in housed units as a biosecurity measure to avoid poison being eaten by other species. While there is the potential for raptor species to prey upon poisoned rodents on occasion if foraging immediately adjacent to the landfill this is an ongoing practice with all operational landfills and is not a new measure to be implemented for the development subject to the current planning application.

Pest control keeps the rodent numbers down within the immediate area of the facility and thereby reduces the availability of prey species for raptors throughout the year. It must also be noted that bird numbers and activity around the permitted operational landfill are also controlled/deterred using distress calls, balloons and decoys. Two species of raptor have been recorded within the site during winter and summer transect surveys namely Buzzard and Kestrel. Buzzard are a green listed species in Ireland and are considered a species of low conservation concern as their range is expanding across Ireland in recent years.

<sup>8</sup> Griffin, L., Rees, E. & Hughes, B. 2010. The Migration of Whooper Swans in Relation to Offshore Wind Farms. WWT Final Report to COWRIE Ltd, WWT, Slimbridge. 69 pp.

<sup>9</sup> Larsen & Clausen. 2002. Potential Wind Park Impacts on Whooper Swan in Winter: The Risk of Collision. Waterbirds: the International Journal of Waterbird Biology. Volume 25. pp 327 – 330.

Kestrel are an amber listed species of medium conservation concern <sup>(10)</sup>. A pair of Buzzard were noted as breeding within the woodland north of the proposed development (outside the permitted and proposed footprint). The species was recorded again during the winter 2016 survey and are likely to foraging within the habitats surrounding the development particularly.

As part of ongoing monitoring surveys for this planning application a dedicated raptor VP survey and breeding bird transects have been undertaken to confirm the findings of the EIAR. The details of these surveys are provided in the Knockharley Landfill bird surveys 2018/19 report (Appendix 1).

Annex I-listed Peregrine Falcon was observed flying through the existing facility in January 2019. However, there was no evidence of Peregrine breeding within the facility, during the summer bird surveys.

While there was evidence that Buzzard is present during the breeding season and possibly breed within the general area surrounding the facility, none were detected breeding within the confines of the facility. The mature trees at the north of the existing facility offered suitable breeding habitat for raptors such as Buzzard and Sparrowhawk but none were observed breeding within this area, during the breeding surveys. There was only one observation of Sparrowhawk during the breeding season and this occurred at the surface water attenuation pond at the south of the facility, during a transect survey on 7<sup>th</sup> August 2019. The bird was flushed from the dirt track at the west of the existing surface water attenuation pond.

There were no sightings of Kestrel during any of the bird surveys in 2019. It is thought that the paucity of rodents, due to vermin control measures carried out at the facility, may explain their absence. Suitable habitat such as the grassed-over landfill, at the centre of the facility was deemed a likely area for their occurrence, but none were observed. It must be pointed out that Kestrels are not scavengers. They eat live prey. With regard to nesting Kestrels, they do not build nests, but will scrape a depression in the nest substrate, for example in hole nests or in the collapsed nest cup of an old crow nest (Hardey *et al.* 2006). No old Hooded Crow nests or hollow trees were observed within the existing facility during the surveys.

Buzzards were observed infrequently during all bird surveys in 2019. An old nest observed on one of the electricity pylons at the northwest of the existing facility was thought to be that of a Buzzard but was not active during surveys. During raptor vantage point surveys, particular attention was given to the overhead pylons located at the west and north of the existing facility, due to their potential for collision by birds of prey. No collisions were noted during surveys and, indeed, no birds of prey were observed perching on the pylons.

During vantage point watches, the permanent presence of corvids and a sizeable gull flock near the activities of the vehicles delivering refuse, were good indicators of the presence of a Buzzard within the confines of the facility. If one was present and flew within their range, the flocks would take-off and the corvids would mob the raptor.

In addition to live prey, Buzzards will scavenge carrion. Observations at this landfill site during surveys showed that when refuse is delivered and deposited, it is covered up almost immediately by excavated, inert soil from elsewhere on the existing facility. Also, it was observed that pine mulch was often mixed in with the other substrates, which would aid in decomposition and reduce odour. These activities reduce the population of rodents within the area of refuse deposition and thereby reduce the presence of birds of prey within the existing facility.

## FERS Assertion

*Section 5.4.1 Given the nature of the existing and proposed development (landfill, with associated vermin, in particular rodents) and the pest control methodology in place (including rodenticide), in combination with a relatively recent record of this species within the vicinity of the proposed development a targeted Barn Owl survey should have been undertaken.*

## Response

Please see previous response in relation to the use of rodenticides. As part of the ongoing ornithological and ecological surveys within the site the footprint and the larger study area were surveys for potential nesting/roosting habitat for Barn Owl.

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<sup>10</sup> Colhoun K. & Cummins S. 2013., 'Birds of Conservation Concern in Ireland 2014 – 2019'. Irish Birds. Volume 9 Number 4.



A Barn Owl survey within the site was also undertaken during June 2019. The methodology followed that of Gilbert *et al.* (2011) <sup>(11)</sup> and the NRA guidelines (NRA, 2008) <sup>(12)</sup>. Briefly, this included systematic searches for field signs (pellets, droppings and feathers) and all possible roost/nest sites within the study area during the daytime for evidence of occupation. The details of these surveys are provided in the Knockharley Landfill bird surveys 2018/19 report (Appendix 1). Briefly, it was found that the majority of woodland at the facility was deemed too immature. No hollow trees or nest boxes were located during the Barn Owl surveys. The only suitable buildings that could potentially hold breeding Barn Owls were at a farm to the northeast of the facility. There was no evidence that Barn Owls were present at this location during the survey period. There were no roosts/nests found within buildings or trees within the site. Therefore, the proposed development shall not result in the loss of a Barn Owl roost.

The habitats within the site offers potential foraging habitat for Barn Owl and the species was recorded historically foraging in the site. The ongoing expansion under the permitted development shall result in the loss of several agricultural field to the north of the existing land fill area. The grassland habitats within the footprint of the proposed development consists of two Dry Meadows and Grassy Verges (one with a mosaic of wet grassland). These fields are immediately adjacent to the existing landfill site and are currently subject to pest control to keep rodent abundant in these areas at low levels. Given the scale of the habitat loss envisaged this is not considered to be a significant impact to the species.

The Applicant is required, as a condition of the EPA licence, to provide pest control to reduce the potential infestation of pest species on neighbouring properties. While there is the potential for Barn Owl to prey upon poisoned rodents on occasion if foraging immediately adjacent to the landfill this is an ongoing practice within this operational landfill and is not a new measure to be implemented for the development subject to the current planning application. Pest control is also likely to keep rodent numbers down within the immediate area and therefore would reduce the availability of prey species for Barn Owl periodically throughout the year. It must be noted also that bird numbers and activity around the permitted operational landfill are also controlled/deterred using distress calls, balloons and decoys.

#### FERS Assertion

*Section 5.4.1 The diurnal and nocturnal usage of habitats within the proposed development site, and the environs by Golden Plover and other species of wader comprising the Qualifying interests of proximate Special Protection Areas should have been a key element of the bird surveys undertaken to inform both the EIAR and any Appropriate Assessment.*

#### Response

See previous response in relation to breeding waders with regards to the unsuitability of habitats within the site for breeding Golden Plover. The potential for breeding Golden Plover to be present onsite is further dispelled as it is recognised that during the breeding season the species are found in heather moors, blanket bogs and acidic grasslands in the uplands of north and west Ireland with a low overall breeding density in the country (Balmer *et al.* 2013) <sup>(2)</sup>.

Golden Plover (*Pluvialis apricaria*) was recorded in an arable land adjacent to the site during previous surveys (Greenstar EIS, 2008). However, Golden Plover have not been recorded during any of the ecological surveys undertaken to inform the EIAR and there is no evidence of the species utilising habitats within the footprint of the proposed development.

Similarly, there were no records of Golden Plover *Pluvialis apricaria* during the 2018/19 winter bird transect survey, or indeed, any other surveys carried out within the existing facility in 2019. There is no suitable habitat present within the existing facility for feeding or roosting Golden Plover.

The species are a conservation interest species of the Boyne Estuary SPA (004080) located 14.7km from the site. I-WeBS counts by birdwatch Ireland from 2006/07 to 2015/16 show a mean number of 606 Golden Plover recorded at this site with a peak number of 1,800 recorded during the winter of 2012/13. The mean count during the same period for the River Nanny SPA located c. 17km from the site was 145 Golden Plover with a peak number of 450 in the winter of 2009/10.

<sup>11</sup> Gilbert, G., Gibbons, D.W. & Evans, J. (1998) Bird Monitoring Methods. The RSPB. The Lodge, Sandy, Bedfordshire SG19 2DL.

<sup>12</sup> NRA. (2008). Ecological Surveying Techniques for Protected Flora and Fauna during National Road Schemes

While these are considered to have the largest populations of the species it is noted that SNH guidance states that the core range of the species 3km, with maximum range of 11km<sup>(3)</sup> and therefore the species is not considered to be utilising habitat surrounding the site in large numbers. No Golden Plovers were observed or heard during 2018/19 winter survey work carried out at the facility.

## 2.4 Mammals - General

### FERS Assertion

*Section 5.5.1 There is no indication of the route taken during the survey, the weather conditions during the survey, the qualifications of the surveyor(s) or the start and finish time of the survey.*

### Response

The entire site was previously surveyed for mammals on the 5<sup>th</sup> and 6<sup>th</sup> of May 2010 by Daphne Roycroft (BSc, PhD). On 5<sup>th</sup> May the survey was undertaken from 10.00 to 17:00. On the 6<sup>th</sup> May the survey was undertaken from 08:30-12:30. Weather conditions are described in Table 2.4.

The survey was updated on the 26<sup>th</sup> of March 2015, by Chris Cullen (Dip Ecol.) from 12:58 to 17:00, with particular attention paid to areas proposed for new development. For both survey all habitats within the red line boundary (See Plate 6 of this document) were searched for signs of mammals. All field boundaries (hedgerows, treelines) and woodlands were searched extensively for evidence of mammals.

**Table 2-4: Weather conditions for 2010 mammal survey**

Survey Date	Visibility	Cloud Cover	Rain	Wind
05/05/10	Good visibility	100% (8/8 oktas)	Dry	Light breeze (F2/3)
06/05/10	Good visibility	100% (8/8 oktas)	Dry	Calm (F0)
26/03/2015	Very good visibility	37.5% (3/8 oktas)	Dry	Moderate breeze (F4)

An updated walkover mammal survey was conducted within the **entire footprint** of the Knockharley Landfill on 2<sup>nd</sup> October 2019. Surveys were undertaken by Dr Jonathon Dunn (PhD, MSc & BSc) and Orla Coffey (MSc & BSc). Weather conditions were favourable; 10°C, no rain, no wind, 5/8 cloud cover.

### FERS Assertion

*Section 5.5.1 There is no use of modern technology such as trail camera to supplement the survey.*

### Response

Contrary to the assertion made in the FERS report, the recognised guidance document for mammal surveys NRA (2009) "Ecological Surveying Techniques for Protected Flora and Fauna during the Planning of National Road Schemes" states that the presence of mammals "should be confirmed as part of the multi-disciplinary walkover survey". The use of trail cameras is not referenced in the NRA guidance.

A full site walkover survey for mammals was completed on the 5<sup>th</sup> and 6<sup>th</sup> of May 2010 and again on the 26<sup>th</sup> of March 2015. The mammal survey consisted of a site walkover, with features such as field boundaries, stream banks and access tracks being closely searched for signs of mammals. Any tracks or signs (including droppings, prints, resting places, burrows and setts) of mammals occurring within or in the vicinity of the site were recorded using field notes and/or handheld GPS units (Garmin). In addition, any direct sightings of mammals made during the walkover were recorded.

Signs such as dwellings, feeding traces, tracks or droppings indicate the presence of mammals on site, and occasional direct observations were made. The methods used to identify the presence of mammals in the survey area followed international best practice (Lawrence & Brown, 1973; Clark, 1988; Smal, 1995; Sargent & Morris, 2003; Bang & Dahlstrom, 2004; JNCC, 2004; NRA, 2009; NRA, 2004). The results of these surveys and the study area are clearly defined in Chapter 10 – Biodiversity Figure 10.4.

A desktop study of mammal records within the 2km grid square (N96T) overlapping the landfill facility were also examined. A conservative approach was taken for the potential for other mammal species to utilise the site which were not recorded during surveys. As noted in section 10.4.7 in Chapter 10 (Biodiversity), elusive species whose field signs are often overlooked due to their size namely Pygmy Shrew (*Sorex minutus*), Irish Stoat (*Mustela erminea hibernica*) and Hedgehog (*Erinaceus europaeus*) were considered within the impact assessment of Chapter 10 – Biodiversity based on a precautionary approach. It is noted that trails cameras would not confirm the presence of these species.

As part of the 2019 survey, trail cameras were placed within the site to complement the third walkover mammal survey. These surveys were carried out to obtain a sample of mammal activity within Knockharley Landfill. Two trail cameras were deployed at the existing facility and left for a minimum of 62 days. The results of these survey confirmed the findings of the EIAR. For further details of 2019 mammal surveys undertaken see appendix 3 Knockharley Landfill mammal surveys 2019.

#### FERS Assertion

*Section 5.5.1 Given the suitability of the habitat for numerous species of conservation concern – the failure of the mammal survey to comprehensively assess the use of WD1 and WD2 habitat by mammals is a critical flaw of the EIAR.*

#### Response

Once again, the assertion made in the FERS report is premised on a factually incorrect understanding of the receiving environment and the nature and scope of the surveys conducted on behalf of the Applicant. For the avoidance of doubt, both the 2010 and 2015 surveys comprehensively assessed the entire site, including WD1 and WD2 habitat, for use by mammals. Mammal surveying in 2010 and 2015 was conducted by highly experienced and proficient ecologists, namely, Daphne Roycroft (BSc, PhD) and Chris Cullen (Dip Ecol). The results of these surveys and the study area are clearly defined in Chapter 10 – Biodiversity Figure 10.4.

## 2.5 Otter

#### FERS Assertion

*Section 5.6.1 A dedicated Otter survey should have been undertaken as per the methodology described in "Irish Wildlife Manual No.76".*

#### Response

Again, as is evident from the EIAR and supporting documentation, and contrary to the assertion made in the FERS report, a dedicated Otter survey was undertaken to inform the EIAR. These surveys followed the methodologies outlined in the recognised guidance documents Lenton et al. (1980), Chanin (2003) and Bailey & Rochford (2006) appropriate for the scope and scale of this development rather than a survey at a national level within 'Irish Wildlife Manual No.76'.

Two Otter spraints were found at conspicuous locations along Knockharley Stream in the northwest of the site during the 2010 mammal survey. The spraints appeared to be fresh and marked a regularly used pathway along the stream bank. It is unlikely that this species occurs in high numbers on the site due to the small size of the stream and the limited suitability of the habitat further downstream on the site. No evidence of breeding (i.e. an Otter holt) was found.

Evidence of Otter was found at 3 locations across the site during the 2015 mammal survey. An Otter spraint was found to the west of the existing landfill at a drain crossing point; in addition, an Otter spraint and territorial markings were found along the Knockharley River, and an Otter spraint and the remains of foraged frogspawn were located along a drain in the northeast of the site. No evidence of breeding (i.e. an Otter holt) was found.

Field surveys for Otter (*Lutra lutra*) signs along the watercourses in the study area were conducted in August 2019 (see appendix 5). The survey was deliberately conducted during a prolonged dry period to ensure that all habitat used by Otter could be accessed and to ensure that Otter signs (spraint, smears etc.) were not washed away due to recent rainfall events.

The walkover surveys broadly followed the best practice survey methodology for Otter as recommended by Lenton et al. (1980), Chanin (2003) and Bailey & Rochford (2006). However, the methodology differed in that the entire waterline was surveyed rather than the standard 500-600m sections from accessible points (e.g. bridges). In this respect, this novel survey technique is known as a total corridor Otter survey (TCOS) (Macklin et al., 2019), representing riparian zone and in-channel surveys along both banks of an entire river or river section (the former representing disjointed sections of river channel within a catchment).

The overall value of the habitats within and adjoining the proposed development for breeding and foraging Otter was also considered. A desktop review of known distributions of Otter within the Knockharley Landfill and wider Nanny-Delvin catchment was undertaken.

Otter signs, in the form of spraints, (n=3) were recorded along the watercourses in the vicinity of Knockharley Landfill during walkover surveys in August 2019. Two of these spraints were recorded at bridges along the River Nanny, outside the boundary of the facility. An additional and very regular spraint site was recorded on the inflow pipe culvert to the existing landfill surface water attenuation pond. No Otter holts were recorded during the site walkover which included the surface water attenuation pond area.

The existing surface water attenuation pond was evidently regularly used by Otters (i.e. given the recorded regular sprainting site). This is likely due to the prey resource range present (i.e. stickleback, snails and small water birds) in addition to typically lower levels of human disturbance (site fenced-off).

The limited distribution of Otter signs is a consequence of the poor fisheries habitat and low prey resources present on the smaller watercourses in the vicinity of the landfill. Although unlikely to be used regularly as foraging habitats, these watercourses are being utilised by commuting Otter (i.e. evidence of movement along Knockharley Stream given known records) or for transient foraging.

The 2019 surveys were consistent in terms of the findings of the EIAR, which noted Otter spraint and territorial markings were found along the Knockharley River, and an Otter spraint and the remains of foraged frogspawn were located along a drain in the northeast of the site but no evidence of breeding (i.e. an Otter holt) was found but no records of holts.

## 2.6 Bats

### FERS Assertion

*Section 5.7.1 The methodology is poorly and unscientifically described. The bat survey was undertaken at the end of the bat maternity season on one night. The timing and lack of replication (one dusk survey) of the survey is a critical flaw in the bat assessment.*

### Response

Contrary to the FERS report, habitats on site proposed for development were considered for their suitability for bats following habitat surveys. A bat activity survey was carried out on the 29<sup>th</sup> of August 2016. Transects through favourable habitats for bats were walked within the planned development areas during which bat activity was recorded using heterodyne/frequency division (*BatBox Duet - BatBox Electronics*) and real time, full spectrum recording, super heterodyne (*Elekon Batlogger M with inbuilt GPS*) detectors. Refer to Figure 2-1 for the bat transect route. Contrary to the FERS report, the results of these surveys are presented in Chapter 10 – Biodiversity Figures 10.4 and 10.5 in the EIAR. The existence of these figures, within the body of the Biodiversity Chapter of the EIAR, appear to have been overlooked in the FERS Report.

Surveys targeted a range of foraging and commuting habitats present within the study area, those associated with linear features such as roadside margins, woodland plantation edges, hedgerows, treelines and waterbodies. A sample of stream corridors within study areas was sampled for Daubenton's bats.

Bat surveying was conducted using a Frequency Division Detector System. Frequency Division detectors record bat ultrasonic calls on a continuous basis and stores the information onto an internal CF card. Frequency Division is a technique used to convert the inaudible bat echolocation calls to audible sounds.

The bat detectors used a Full Spectrum Analysis to make the real-time recorded calls visible for display purposes. It is these sonograms (2-d sound pictures) that are digitally stored on a CF card and downloaded for analysis. Each time a bat is detected, an individual time and GPS stamped (date and time to the second) file is recorded.

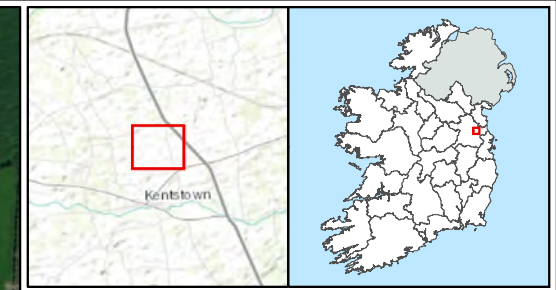
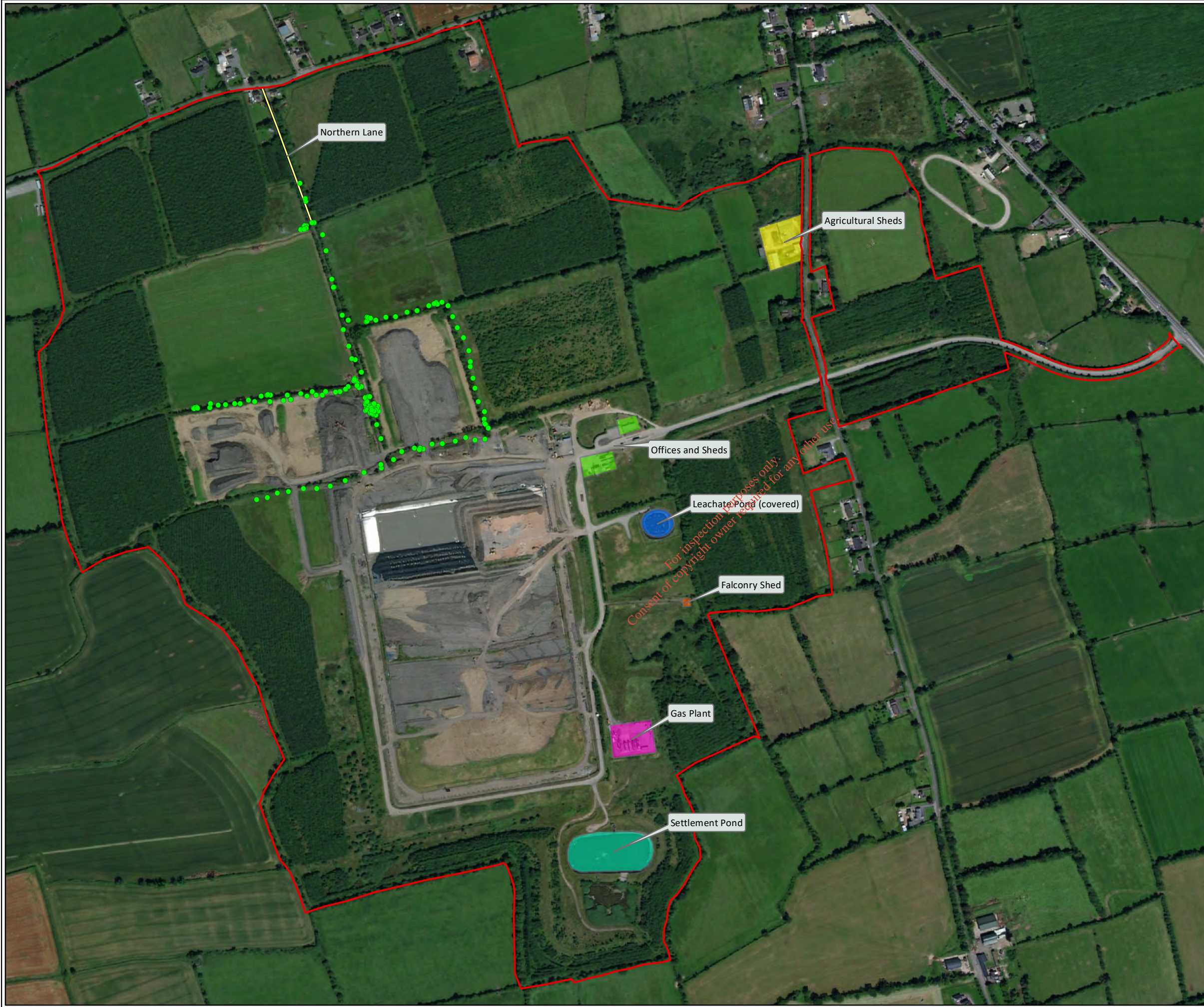
Bat activity is governed by the activity of their insect prey and insect abundance is in turn governed by weather conditions and climate. Insects, and therefore bats, are unlikely to be present at temperatures below 6° Celsius or during periods of strong winds or heavy rainfall so survey in such conditions is not possible. All field surveys were undertaken within the active bat season and during good weather conditions (dry conditions and temperature at 8° and greater).

Nocturnal bat activity is mainly bi-modal taking advantage of increased insect numbers on the wing in the periods after dusk and before dawn, with a lull in activity in the middle of the night. This is particularly true of 'hawking' species – i.e. bats which capture prey in the open air. However, 'gleaning' species remain active throughout the night as prey is available on foliage for longer periods. Gleaning is the term for taking prey from foliage or the ground.

The bat survey was carried out in accordance with the recognised best practice guidance 'Bat Surveys: Good Practice Guidelines' (Hundt 2012).

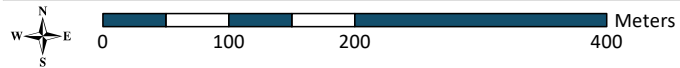
The proposed site was walked and habitats of potential value to bats were noted and marked on a map. The value of each feature was noted according to its potential for use by bats for roosting. The value of habitat features for bats was defined in accordance with Bat Surveys: Good Practice Guidelines publication (Hundt, 2012).

A total of 4 no. bat activity/emergence surveys in addition to static detector surveys were carried out during 2019 (refer to Appendix 2 for details). These surveys followed the specific guidelines set out by the Bat Conservation Trust in Bat Surveys: Good Practice Guidelines (Hundt, 2012 and Collins, 2016). For further details of bat surveys undertaken see appendix 2 Knockharley Landfill bat surveys 2019.



- Bat Transect Route
- Planning Boundary
- Northern Lane
- Agricultural Sheds
- Offices and Sheds
- Leachate Pond (covered)
- Falconry Shed
- Gas Plant
- Settlement Pond

<b>TITLE:</b>	Bat Survey Transect 2016		
<b>PROJECT:</b>	Knockharley Landfill, Co. Meath		
<b>FIGURE NO:</b>	2.1		
<b>CLIENT:</b>	Knockharley Landfill Ltd.		
<b>SCALE:</b>	1:6000	<b>REVISION:</b>	0
<b>DATE:</b>	24/10/2019	<b>PAGE SIZE:</b>	A3



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## FERS Assertion

*Section 5.7.1 There is no indication as to the start/finish time of the survey, nor any indication of approximate sunrise, sunset (06:31 first light 05:7/20:23 last light 21:47). There is no indication of attempt to assess the relationship between when the bats were observed and time elapsed post sunset, which would be indicative of distance from a roost.*

## Response

Sunset on the night of the bat activity survey in 2016 was 20:22. The survey took place from 19:52 -22:50. Contrary to the FERS report, the timings of the bat calls for Common Pipistrelle (PipPIP), Soprano Pipistrelle (PipPYG), Leisler's Bat (LEI Bat) and Brown Long-eared Bat (BLE Bat) are outlined in Chapter 10 – Biodiversity Table 10-14.

The timings of the first calls in relation to sunset for each species was used to ascertain whether there was a potential roost nearby, or if they had travelled from further afield for foraging. Common and Soprano Pipistrelles typically emerge about 20 minutes after sunset, earlier on warmer nights (Irish Wildlife Trust). The 1<sup>st</sup> call recorded for Common Pipistrelle is 58 minutes post sunset and the 1<sup>st</sup> call recorded for Soprano Pipistrelle is 1 hour 27 mins post sunset. Therefore, it is likely that these species travelled from further away and that neither of these species are roosting in close proximity to the existing facility.

Similarly, for Leisler's bats which usually emerge early, around sunset. The median emergence time for Leisler's Bats is 18 minutes after sunset (Jones & Rydell, 1994). The 1<sup>st</sup> call recorded for Leisler's bat is 35 minutes post sunset which implies that this species has travelled some distance from its roost.

Brown long-eared bats emerge relatively late at night (approximately 55 minutes after sunset) and remaining active throughout the night (Entwistle et al., 1996). Median emergence time is 54 minutes after sunset (Jones & Rydell, 1994).

## FERS Assertion

*Section 5.7.1 There is no indication of prevailing weather conditions.*

## Response

During the 2016 bat activity survey weather conditions were as follows; 18 °C, good visibility, dry.

## FERS Assertion

*Section 5.7.1: It is stated that bats were identified by several methods, including "...behavioural and flight observations....". It is not stated how many observers were involved in the survey. It is not stated that the surveyor(s) were equipped with night vision or thermal imagers to observe such behavioural and flight activities..... It is not possible to note behavioural and flight observations beyond the calls of the bat (unless torches are utilised, which can themselves impact on bat behaviour and flight).*

## Response

Bat surveying in 2016 and 2019 was conducted by a highly experienced and proficient bat specialist. As outlined in section 10.3.6. of the EIAR surveys were conducted using a Frequency Division Detector System. Frequency Division detectors record bat ultrasonic calls on a continuous basis and stores the information onto an internal CF card. Frequency Division is a technique used to convert the inaudible bat echolocation calls to audible sounds.

The bat detectors used a Full Spectrum Analysis to make the real-time recorded calls visible for display purposes. It is these sonograms (2-d sound pictures) that are digitally stored on a CF card and downloaded for analysis. Each time a bat is detected, an individual time and GPS stamped (date and time to the second) file is recorded.

As outlined in section 10.3.6 of the EIAR, bats were identified by their ultrasonic calls coupled with behavioural and flight observations and on computer by sound analysis of recorded echolocation and social calls with dedicated software (Kaleidoscope Viewer - Wildlife Acoustics). Behaviour and flight observations were possible given the existing lighting at the landfill and natural light i.e. from the moon.



No bat roosts were recorded within Knockharley Landfill which includes the proposed development footprint during the 2019 surveys. One Common pipistrelle flew into the large agricultural shed in the east of the existing facility, outside of the development footprint in 2019. It is concluded may be of use as a transitory roosting site for this one individual but there was no evidence of more prolonged roosting during previous dawn and dusk surveys at the site. Bat activity levels at the existing facility are very low which indicates that Knockharley Landfill is currently not a favourable site for bats.

Nonetheless given the removal of hedgerow and treelines, the proposed works have the potential to have a medium term Moderate Impact during the construction phase in the absence of mitigation measures. However, given the implementation of mitigation measures described in section 10.6 of the EIAR, it is concluded that there will be no negative impacts on bats during the construction phase.

Taking into consideration the results of the continued bat surveys and the mitigation measures to be implemented, it is reconfirmed that the proposed development will not result in a significant negative residual impact on bat species.

For further details of bat surveys undertaken see appendix 2 Knockharley Landfill bat surveys 2019.

#### FERS Assertion

*Section 5.7.1 The failure of any bat survey to undertake a comprehensive assessment of the bat activity occurring within the woodland areas to be removed is a critical flaw in the bat assessment. It is proposed to remove approximately 12.5 Ha of woodland habitat, but there was no attempt to monitor usage of this habitat by bats.*

#### Response

Contrary to the FERS assertion, there is no critical flaw in the assessment. In section 10.4.3. of the EIAR, the habitats within the existing facility are evaluated for the ecological significance. It is stated that "While the mixed broadleaved/coniferous woodland (WD2) and deciduous woodland (WD1) located within the site have been planted and have undergone some improvement, these habitats provide both shelter and foraging habitats for local wildlife and are therefore evaluated as Local Importance (Higher Value)." The 2016 bat activity survey comprised walked transects through favourable habitats – which, as higher value habitats, included the woodlands on-site. Refer to Figure 2.1 above for the 2016 bat transect route.

As part of ongoing ecological monitoring, a full season of bat surveys were undertaken in 2019. For further details of bat surveys undertaken see appendix 2 Knockharley Landfill bat surveys 2019. The woodland habitats within Knockharley Landfill were reassessed for bat activity during the bat activity/emergence and the used of static detector surveys.

A transect was driven around the perimeter of the existing facility during Survey 1 while recording bat activity with a Batlogger bat detector. The total length of the transect was 8.8km and allowed for a comprehensive assessment of bat activity within the woodland areas in the existing facility.

During Survey 2 at dusk, survey effort was concentrated on the tree lines / woodland edges surrounding the main proposed extension area to the north of the office blocks to investigate the presence of tree roosts. No bats emerged from any of the trees on site. This was followed by a driven transect of the perimeter of the site, stopping at selected points to monitor activity. During the dawn survey, a transect was walked along the northern boundary of the existing facility, which is dominated by woodland.

During Survey 3 Common pipistrelle and a Soprano pipistrelle were recorded foraging in the mixed broadleaved woodland in the north east of the existing facility.

During Survey 4, at dusk, survey effort was concentrated at the northern boundary and northern lane which is dominated by mixed broadleaved/conifer woodland.

Two static detectors were deployed at Knockharley Landfill. Songmeter A was deployed at the corner of the mixed broadleaved woodland in the north of the existing facility (Grid Reference 53.65019, -6.52912). Songmeter B was deployed at edge of woodland/scrub in the east of the existing facility (Grid reference 53.64396, -6.52424) for a minimum period of 57 nights during the bat activity season.

The 2019 bat surveys reconfirm the appraisal in the EIAR that the proposed development will not result in a significant negative impact on bat species.

#### FERS Assertion

*Section 5.7.1 There is a constructed wetland on site, likely with a good diversity of invertebrate prey associated with the habit, which may attract bats from surrounding areas. The failure of the bat survey to assess use of this habitat, considering the ecological linkages present (hedgerows and several waterways) by bats which could commute to forage here is a critical flaw in the bat assessment.*

#### Response

Contrary to the FERS assertion, there is no critical flaw in the assessment. As stated in section 10.3.6 of the EIAR "Habitats on site proposed for development were also considered for their suitability for bats following habitat surveys". This included an assessment of the use of the constructed wetland for bats.

The constructed wetland on site, termed the settlement pond, was surveyed at dusk on 31<sup>st</sup> August 2019 and 24<sup>th</sup> September 2019 during Survey 3 and Survey 4 respectively. A single Daubenton's Bat was recorded foraging over the settlement pond during Survey 3. One Leisler's bat flew briefly over the settlement pond but did not remain to forage during Survey 3. No bat activity was recorded at the settlement pond during Survey 4. The driven transect during Survey 1 also incorporated the settlement pond. No activity was recorded at the settlement pond during Survey 1.

Daubenton's Bats were not recorded foraging there at any other time. In fact, foraging activity over the settlement pond was very low for a waterbody. On inspection, the settlement pond appeared silty with very low levels of insect density in the vicinity.

#### FERS Assertion

*Section 5.7.1 The corridor presented by the Knockharley stream, with associated woodland habitat is ideal for numerous bat species, yet there does not appear to have been a survey concentrated on use of this habitat, which could represent an important commuting and foraging corridor.*

#### Response

In section 10.4.3. of the EIAR, the habitats within the existing facility are evaluated for the ecological significance. The 2016 bat activity survey comprised walked transects through favourable habitats including woodland habitats. An assessment of Knockharley stream was incorporated as part of the bat activity survey. Refer to Figure 2-1 for the bat transect route.

The surveys conducted as part of ongoing environmental monitoring in 2019 confirmed the findings of the surveys identified in the EIAR. The driven transect during Survey 1 incorporated Knockharley stream. Survey 2 (dusk and dawn) and Survey 4 (dusk) incorporated Knockharley stream at selected points to monitor activity. No bat activity was recorded at Knockharley stream during the 2019 surveys.

#### FERS Assertion

*Section 5.7.1 There was no pre-dawn survey, and no survey to monitor activity throughout the night.*

#### Response

At the start of the bat survey in 2016, a single Leisler's bat was observed emerging from a mature Ivy covered tree considered a temporary transitional roost within a treeline within the site. This tree along with the treeline has subsequently been removed under the permitted Knockharley landfill.

The survey also highlighted that Leisler's bat, brown long-eared bat, common pipistrelle and soprano pipistrelle bats are using some of the site's hedgerows and treelines to forage and/or commute. As no bats were recorded emerging from other any trees or any buildings within the site, it was not necessary to complete a pre-dawn survey.

The surveys conducted as part of ongoing environmental monitoring in 2019 confirmed the findings of the bat surveys referenced in the EIAR. A dusk and associated dawn survey was undertaken on three occasions within the bat activity season.

1. Survey 2 comprised a dusk survey on 16<sup>th</sup> July 2019 with a dawn survey undertaken the following morning 17<sup>th</sup> August 2019.
2. Survey 3 comprised a dusk survey on 31<sup>st</sup> August 2019 with a dawn survey undertaken the following morning 1<sup>st</sup> September 2019.
3. Survey 4 comprised a dusk survey on 24<sup>th</sup> September 2019 with a dawn survey undertaken the following morning 25<sup>th</sup> September 2019.

Two static bat detectors (Song Meter SM4BAT Full spectrum bat recorder) were deployed on site on the 31<sup>st</sup> July 2019 and left to record overnight bat activity for a minimum period of 57 nights during the bat activity season. No roosts were recorded within the landfill site during the 2019 surveys.

#### FERS Assertion

*Section 5.7.1 It is proposed to construct several waterbodies (northern Stormwater attenuation pond and new flood area). There was no attempt to assess the bat activity around the current pond and wetland in order to assess bats currently using similar habitat.*

#### Response

As part of ongoing ecological monitoring, a full season of bat surveys were undertaken in 2019. For further details of bat surveys undertaken see appendix 2 Knockharley Landfill bat surveys 2019. The leachate lagoon within the existing facility was surveyed during Survey 2 (dusk) on 16<sup>th</sup> August 2019 and Survey 4 (dawn) on 25<sup>th</sup> September 2019. No bat activity was recorded at leachate pond during either survey.

The constructed wetland on site, termed the settlement pond, was surveyed at dusk on 31<sup>st</sup> August 2019 and 24<sup>th</sup> September 2019 during Survey 3 and Survey 4 respectively. A single Daubenton's Bat was recorded foraging over the settlement pond during Survey 3. One Leisler's bat flew briefly over the settlement pond but did not remain to forage during Survey 3. No bat activity was recorded at the settlement pond during Survey 4. The driven transect during Survey 1 also incorporated the settlement pond. No activity was recorded at the settlement pond during Survey 1.

Daubenton's Bats were not recorded foraging there at any other time. In fact, foraging activity over the settlement pond was very low for a waterbody. On inspection, the settlement pond appeared silty with very low levels of insect density in the vicinity.

#### FERS Assertion

*Section 5.7.1 Query regarding Brown Long-eared bat activity and roosts within 500m of Knockharley Landfill.*

#### Response

According to the Bat Conservation Ireland [BCI] database there are no known bat roosts listed within 1km of Knockharley landfill. During the 2016, a bat activity survey was completed and the finding of that survey do not give rise to the assertion that "there is likely a maternity roost(s) of Brown Long-eared Bat within [500m] and that the bats from this roost(s) utilise the woodland and associated with the Knockharley habitat for foraging". Since the finalisation of the EIAR in 2018, the BCI database still shows that there are no known roosts within 1km of the site.

For the sake of completeness, additional bat activity surveys were undertaken at Knockharley landfill in 2019. No Brown Long-eared bats were recorded during the 4 bat activity surveys that were undertaken from June-September 2019. The static detectors deployed at the landfill, to complement the activity surveys, recorded very low levels of Brown Long-eared bat activity. The average number of calls of Brown Long-eared bats was 0.42 and 0.41 calls per night for Songmeter A and Songmeter B respectively.

Given the absence of roost records within 1km of the existing facility and the low levels of Brown Long-eared bat activity at Knockharley Landfill, it is considered that construction of the proposed development will result in a short-term slight impact on this species in the absence of mitigation measures. Section 10.6 of the EIAR outlines mitigation measures relevant to bat species.

## 2.7 Other Fauna

### FERS Assertion

*Section 5.7.1 Chapter 10 of the EIAR indicates that there were no dedicated reptile, amphibian or invertebrate surveys undertaken within the study area*

### Response

Lizard was not considered in the EIAR as there was no evidence that that species was, or could potentially, occur on-site. However, as part of ongoing monitoring within the site, a Common Lizard survey has been undertaken which reconfirmed the findings of the EIAR (see Appendix 6: Knockharley Landfill Viviparous Lizard, *Zootoca vivipara* survey 2019).

Viviparous lizard surveys were out carried out in areas to the north and east of Knockharley Landfill during summer / autumn 2019. These surveys were completed as a result of the protections that the viviparous lizard is offered by legislation (Wildlife Act 1976) and to examine the potential impact of the proposed development on this protected species.

A mixture of placed refuges and direct observations was utilised in line with best practice guidelines (Reading 1997, Gent 1998, Sewell 2013, NRA 2009). Five zones of potential habitat within the facility were identified following an initial site walkover.

Within each zone the refuges were placed along a transect which was walked during each visit. These walked transects were laid out to incorporate as many existing basking spots as could be found within each zone. The suitability of habitats was determined using the 'Habitat Structure' section of JNCC (2004).

During the survey period in 2019, a total of 11 survey visits to the transects within the viviparous lizard survey zones were completed (NRA, 2009 and Sewell et al. 2013). During the initial site visit, a transect within each zone was identified which incorporated as many potential basking spots as possible, all spots were noted, and refuges were placed along the transect.

During each subsequent visit, each transect was walked, each suitable basking spot was checked, each placed refuge was checked, each placed refuge was turned over to check underneath, a vigilant eye was maintained when moving between placed refuges/basking spots.

The Key Reptile Sites Assessment (KRSA) as discussed by Gent (1998) is a method designed to identify important reptile sites within an area. It allows for the classification of the relative size of reptile populations based on survey counts and allows the user to identify the quality of the reptile population. This Key Reptile Sites Assessment (KRSA) as discussed by Gent (1998) was used to assess the score of the reptile population within the development site. The desktop study showed that the nearest documented sighting was 20km from Knockharley Landfill.

Following a total of 11 survey visits to the site to carry out transects, no lizards were observed. Habitat suitability assessments of the five zones are described in the report.

No viviparous lizard observations or evidence was recorded during the surveys in 2019. Given that the species were not observed during specific surveys, and historical records of the species indicate that it has not been recorded within 20km of the Knockharley Landfill since 1970, the construction, operation or decommissioning of the proposed development will have no impact on viviparous lizard as they are not present within the existing facility.

In any event, in order to apply a precautionary approach, all areas of habitat surveyed as part of this survey within the construction zone, with the potential to support reptiles that will be affected by ground works, will be managed as follows:

- Precautionary strimming should be carried out to reduce the height of ruderal vegetation, rough grassland and scrub.
- Strimming will be directional from west to east to flush animals towards existing habitat to the east.
- Vegetation will be cut no shorter than 10cm above the ground.
- Arisings should then be left for 24 hours to enable any animals to disperse before ground clearance commences. This action will reduce the quality of the habitat and the risk of killing / injury of any animals during works

Construction work will be undertaken shortly after the completion of the precautionary clearance. Vegetation within the construction zone will be kept unsuitable for reptiles during the intervening period by either maintaining the above strimming regime, or by removing topsoil that may support habitat suitable for reptiles.

Taking into consideration the updated surveys, it is confirmed that there will be no residual impact to common lizard as they are not present within the existing facility.

To conclude no lizards were observed during the 11 survey visits, results which confirm that the Knockharley landfill site (both existing and proposed) is not of importance for lizards. The site does not qualify for the Key Reptile Site Register.

#### FERS Assertion

Section 5.7.1 Chapter 10 of the EIAR indicates that there were no dedicated reptile, amphibian or invertebrate surveys undertaken within the study area

#### Response

The details of amphibian records are provided in section 10.4.8 Chapter 10 – Biodiversity of the EIAR. As noted in section 10.4.8 Common Frog was found to be present on the site with tadpoles found in standing water within wet grassland (GS4) (located within the southern section of the site) and in artificial lakes (FL8) (located to the south of the proposed development site) on the 26<sup>th</sup> of March 2015.

Evidence of feeding remains, presumed to be by Otter, was found in the form of foraged tadpoles on the 26<sup>th</sup> of March 2015 during Otter specific surveys within a drain in the northeast of the facility, within the site footprint. No Smooth Newt were identified during ecological surveys in 2010 and 2015.

A desktop study of National Biodiversity Data Centre (NBDC) data sets was accessed on the 23<sup>rd</sup> of October 2019. This detailed the historical recording of one amphibian species within the 10km grid square N96 in which the site occurs. Common Frog (*Rana temporaria*), Annex V of the habitats directive and Wildlife Act, was recorded within N96 in 2018.

A National Parks and Wildlife Service (NPWS) data request (received October 2019) detailed Common Frogs were recorded within N96, with the latest record being in March 2010. Amphibians were historically recorded within the 10km grid square N96, in which the Knockharley site occurs.

During Common Lizard surveys on the 21<sup>st</sup> of September 2019, undertaken to continue the ongoing environmental monitoring at the existing landfill development, a pair of juvenile Smooth Newts were found within broadleaved plantation to the north east of the facility within the development footprint. Four adult Common Frogs were also found during Common Lizard surveys in September 2019 within wet grassland habitat to the north of the existing facility within the proposed development footprint.

During habitat surveys in 2019 Common Frogs were also found to be present to the north of the facility within the proposed footprint. Observations of a single adult, within mixed broadleaved/ conifer woodland (WD2) and froglets, within a ditch surrounded by wet grassland, on the 1st of August 2019 were recorded.

Suitable habitat of Common Frog and Smooth Newt was identified throughout the proposed site including within wet grassland mosaic habitats (GS4), within the proposed elements of the development, drainage ditches (FW4), within the proposed elements of the development, artificial lakes and ponds (FL8) and reed and large sedge swamps (FS1), outside of the proposed elements of the development. The leachate pond to the east of the existing facility, within an area classified as buildings and artificial surfaces (BL3) is covered and so poses no ecological benefit to amphibians on site.

### Construction Phase Impacts

Within section 10.5.2 Chapter 10 – Biodiversity of the EIAR it was stated that;

*"No other species of high conservation concern were recorded on the site. The Common Frog is expected to be widespread on the site given the available wet habitats and any displaced Frogs will be able to move to alternative habitats elsewhere on the site. .... Impacts to these species will be temporary and imperceptible."*

The 2019 surveys re-confirmed that the Common Frog is present within the Knockharley site, particularly towards the northern section of the facility. The construction of the proposed facility and associated berm will result in the loss of 4.8 ha of Improved Agricultural Grassland GA1, 2.8 ha of Wet Grassland/Dry Meadows and Grassy Verges GS4/GS2 Mosaic, 2.1 ha of Dry Meadows and Grassy Verges GS2, 3.6 ha of (Mixed) Broadleaved woodland WD1, 0.6 ha of Conifer Plantation WD4, 7.2 ha of Mixed Broadleaved/Conifer Woodland WD2, 0.5 ha of Buildings and Artificial Surfaces BL3, while 2.3 ha of Spoil and Bare Ground/Recolonising Bare Ground ED2/ED3 Mosaic, 1.3 ha of Spoil and Bare Ground ED2 and 0.09 ha of Amenity Grassland GA2 and 0.2 ha of Ornamental/Non-native Shrub/Scrub WS3/WS1 Mosaic will be lost.

The drainage channel to the north of the facility, identified as supporting frogspawn and adult Common Frog, is within the footprint of the proposed surface water holding pond, proposed northern attenuation lagoon, proposed screening berm and consented landfill cells. Wet Grassland/ Dry meadows and Grassy Verges Mosaic habitat (GS4/ GS2) is present adjacent to this drainage ditch (outside of the development footprint) and has the potential to be suitable for amphibians.

The construction of the proposed facility will result in the loss of 2.8 ha of Wet Grassland/Dry Meadows and Grassy Verges GS4/GS2 Mosaic habitat. This habitat type is largely present towards the north, north-east, and east of the existing facility. Artificial Lakes and Ponds (FL8) and Reed and Large Sedge Swamps (FS1), along with Wet Grassland (GS4) habitats to the south of the existing facility, with suitable habitat for Common Frog and Smooth Newt and will not be lost as a result of the proposed development. These habitats have the potential to support displaced individuals from surrounding habitat types within the boundary of the existing facility.

Smooth Newt were not discussed within the EIAR as no evidence of the species was found during surveys in 2010 or 2015. The species was found onsite, however in 2019. The impacts upon Smooth Newt are likely to be similar to those envisaged to effect Common Frog due to their requirements for similar habitat.

Figure 2.2 details the habitats of higher value for amphibians within the site along with the proposed development footprint.

### Operational Phase Impacts

Within section 10.5.3.4 Chapter 10 – Biodiversity of the EIAR it was stated that;

*"During the operational phase, [amphibians] are likely to continue to use the site and the new woodland created will provide habitat for cover and foraging. The increased activity to the north west of the site where the IBA facility is located may deter mammals from this area, however, resulting in a slight localised disturbance impact. However, as the woodland and landscaping matures this impact shall be reduced."*

*Mixed deciduous and coniferous trees felled will be replaced with native broadleaved trees which will be of higher ecological value to local wildlife. This woodland planting will provide cover and foraging habitat for local fauna. As these trees mature, they will also provide nesting habitat for birds. This woodland will be commercial forestry and will therefore be felled in the future. Planting of deciduous woodland will have a Positive Short-Term Moderate impact on local fauna."*

[addendum: The new wetlands area to be created to the north of the site shall also in time offer additional habitat for amphibians. Amphibians are highly adaptable, given the scale and nature of the development and the high adaptability of amphibians it is envisaged that the operational phase of the proposed development will be temporary and imperceptible.]

#### Decommissioning Phase Impacts

Within the section 10.5.3.4 Chapter 10 – Biodiversity it was stated that;

*“On cessation of waste acceptance at the landfill, a restoration and aftercare plan will be put in place (please see Chapter 2 Description of the Proposed Development in Volume 2 of this EIAR) and any structures not required as part of the restoration and aftercare plan will be removed. During the removal of structures and restoration works there may be local short-term disturbance to flora and fauna.”*

#### Mitigation Measures

##### *Preconstruction Amphibian Surveys*

Preconstruction amphibian surveys will be carried out prior to construction works commencing to reconfirm the findings of the EIAR. These surveys will be completed within areas offering suitable for amphibians including wet grassland mosaic habitats, settlement ponds and artificial lagoons and will be undertaken between February and May, during the optimal survey period.

In the event that newt eggs or frogspawn are observed in areas within the footprint of works, habitat alteration will be required to be postponed until after the breeding cycle has been completed or an appropriate derogation licence shall be sought to translocation spawn out of the area of works to suitable habitat (drains ponds) within the site.

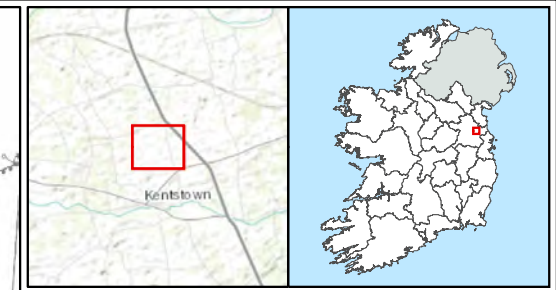
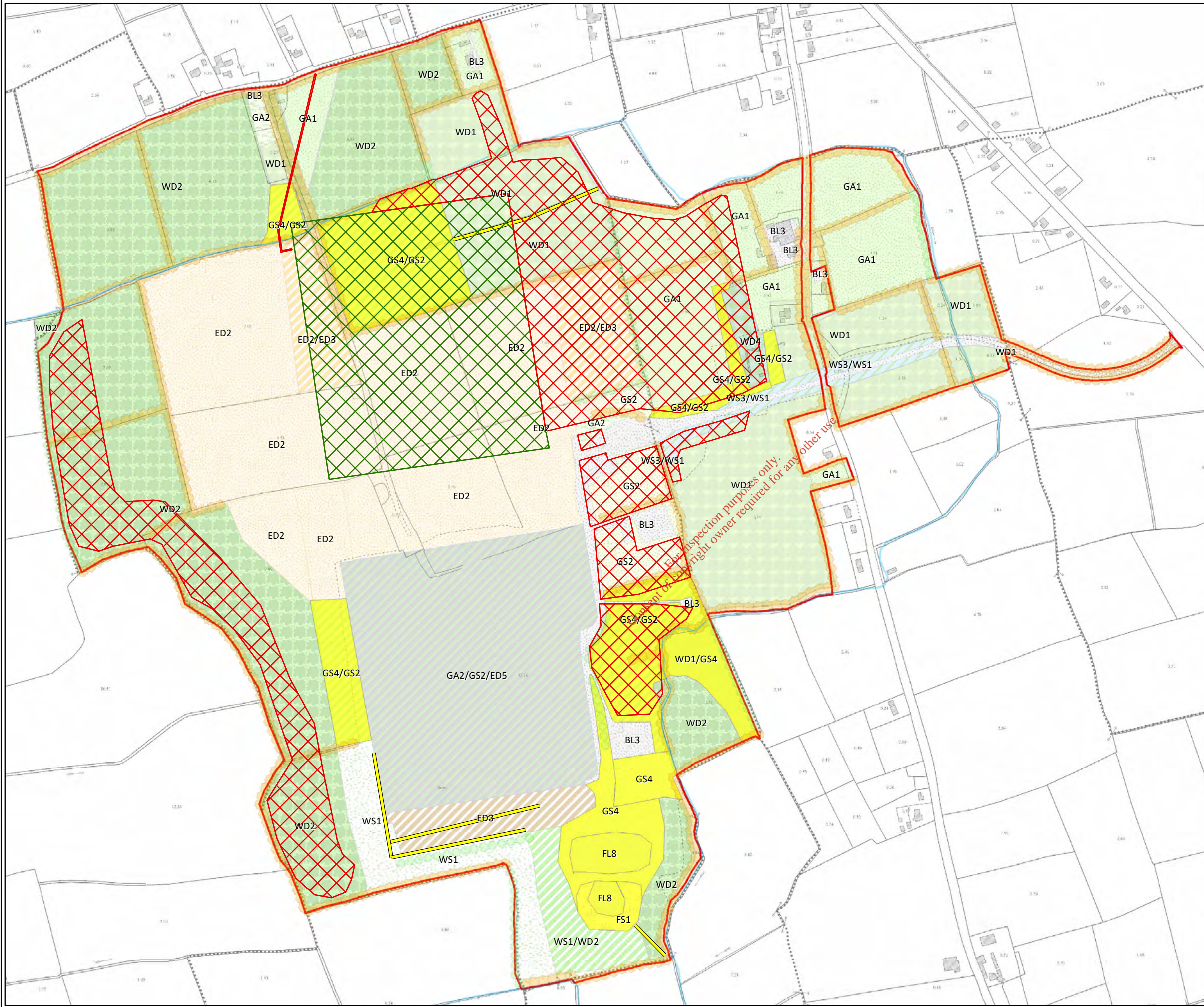
##### *Site Preparation*

Precautionary strimming should be carried out to reduce the height of ruderal vegetation, rough grassland and scrub. Strimming will be directional from west to east to flush individuals towards existing habitat to the east. Vegetation will be cut no shorter than 10cm above the ground. Arisings should then be left for 24 hours to enable any individuals to disperse before ground clearance commences. This action will reduce the quality of the habitat and the risk of killing / injury of any reptiles during works.

Construction work should be undertaken shortly after the completion of the precautionary clearance. Vegetation within the construction zone should be kept unsuitable for invertebrates during the intervening period by either maintaining the above strimming regime.

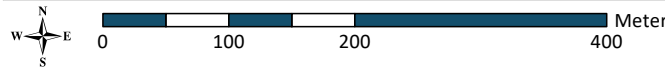
#### Residual Impact

As per the findings of Chapter 10 – Biodiversity section 10.7 with the application of the above mitigation measures, no significant residual impacts from this development are envisaged.



- Permitted elements not yet constructed
- Proposed elements
- Planning Boundary
- Amphibian Habitat Potential (drainage ditches)
- Amphibian Habitat Potential
- Habitat Classification**
- FW1 - eroding river
- FW4 - drainage ditches
- WL1 - hedgerow
- WL2 - treeline
- BL3 - buildings and artificial surfaces
- ED2 - spoil and bare ground
- ED2 / ED3 - spoil and bare ground / recolonising bare ground mosaic
- ED3 - recolonising bare ground
- FL8 - artificial lakes and ponds
- FS1 - reed and large sedge swamps
- GA1 - improved agricultural grassland
- GA1 / GS4 - improved agricultural grassland / wet grassland mosaic
- GA2 - Amenity grassland
- GA2/GS2/ED5 - amenity grassland / dry meadows and grassy verges / refuse and other waste
- GS2 - dry meadows and grassy verges
- GS4 - wet grassland
- GS4 / GS2 - wet grassland / dry meadows and grassy verges mosaic
- WD1 - (mixed) broadleaved woodland
- WD1 / GS4 - (mixed) broadleaved woodland / wet grassland mosaic
- WD2 - mixed broadleaved / conifer woodland
- WD4 - Conifer Plantation
- WS1 - scrub
- WS1 / WD2 - scrub / mixed broadleaved-conifer woodland mosaic
- WS3 / WS1 - ornamental/non-native shrub / scrub mosaic

<b>TITLE:</b>	Amphibian Habitat Potential		
<b>PROJECT:</b>	Knockharley Landfill, Co. Meath		
<b>FIGURE NO:</b>	2.2		
<b>CLIENT:</b>	Knockharley Landfill Ltd.		
<b>SCALE:</b>	1:6000	<b>REVISION:</b>	0
<b>DATE:</b>	24/10/2019	<b>PAGE SIZE:</b>	A3





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## FERS Assertion

Section 5.8.1 Chapter 10 of the EIAR indicates that there were no dedicated reptile, amphibian or invertebrate surveys undertaken within the study area

## Response

The details of invertebrate records are provided in section 10.4.8 Chapter 10 – Biodiversity of the EIAR. The presence of any other species (e.g. butterflies, reptiles or amphibians) encountered during all ecological surveys was recorded.

A total of five insect species were recorded on the site during survey visits in 2010 and 2015. Three Butterfly species were recorded as well as a Ladybird species and a species of Bumblebee. All of these species are common and widespread in the Irish landscape (Fitzpatrick, et al., 2006; Regan, et al., 2010) This can be found in Table 2.5, below.

**Table 2-5: Invertebrate species recorded on site during surveys in 2010 and 2015**

Common name	Scientific name	Habitat
Seven-spot ladybird	<i>Coccinella 7-punctata</i>	WS2 (Immature woodland)
Bumblebee	<i>Bombus terrestris</i>	GA1/GS4 (Improved agricultural grassland/ Wet grassland)
Speckled Wood Butterfly	<i>Pararge aegeria</i>	GA1/GS4 (Improved agricultural grassland/ Wet grassland)
Orange-tip Butterfly	<i>Anthocharis cardamines</i>	GS4 (Wet grassland)
Small White Butterfly	<i>Pieris rapae</i>	GS4 (Wet grassland)

Seven-spot ladybirds were found within Immature Woodland habitat (WS2) towards the north-east of the existing site, within the proposed development footprint. Bumblebee (*Bombus terrestris*) and Speckled Wood Butterfly were found within Improved agricultural grassland/ Wet grassland (GA1/GS4) habitat to the north-east of the existing site, within the proposed development footprint. Orang-tip Butterfly and Small White Butterfly were identified within Wet Grassland (GS4) also to the to the north-east of the existing site, within the proposed development footprint.

Section 10.4.8 Chapter 10 – Biodiversity of the EIAR details that the wet habitats across the site, particularly areas of wet grassland and ponds are likely to support damsel and dragonfly species. These habitat types are situated across the site with those being of highest value being located towards the south of the existing facility, outside of the proposed development footprint.

A desktop study of National Biodiversity Data Centre (NBDC) data sets was accessed on the 22<sup>nd</sup> of October 2019 (Table 2-6). This detailed the historical recording of two invasive (New Zealand Flatworm and Budapest Slug) and six threatened invertebrate species *Andrena (Melandrena) nigroaenea*, *Halictus (Seladonia) tumulorum*, Large Red-Tailed Bumble Bee, Common Whorl Snail, English Chrysalis Snail and Marsh Whorl Snail) within the 10km grid square N96 in which the site occurs. Of the six threatened species none are located in the site and four date from 1982. Of the more recent records the record for Large Red Tailed Bumble Bee dating from 2018 and is located in Sandymount 3km north of the site. The record of *A. nigroaenea* is from Dalgan park > 6km south west of the site recorded in 2018.

None of these species, either invasive or threatened, were found during ecological surveys at the site across survey periods in 2010, 2015 or 2019.

**Table 2-6: Invertebrate species records from the National Biodiversity Data Centre 10km grid square N96**

Common name	Scientific name	Date	Dataset	Designation
New Zealand Flatworm	<i>Arthurdendyus triangulatus</i>	05/04/2017	New Zealand Flatworm (Arthurdendyus triangulatus) Database	High Impact Invasive Species
-	<i>Andrena (Melandrena) nigroaenea</i>	28/04/2018	Bees of Ireland	Threatened Species: Vulnerable
-	<i>Halictus (Seladonia) tumulorum</i>	13/05/1977	Bees of Ireland	Threatened Species: Near threatened
Large Red Tailed Bumble Bee	<i>Bombus (Melanobombus) lapidarius</i>	28/04/2018	Bees of Ireland	Threatened Species: Near threatened
Budapest Slug	<i>Tandonia budapestensis</i>	06/04/1982	All Ireland Non-Marine Molluscan Database	Medium Impact Invasive Species
Common Whorl Snail	<i>Vertigo (Vertigo) pygmaea</i>	06/04/1982	All Ireland Non-Marine Molluscan Database	Threatened Species: Near threatened
English Chrysalis Snail	<i>Leiostryla (Leiostryla) anglica</i>	06/04/1982	All Ireland Non-Marine Molluscan Database	Threatened Species: Vulnerable
Marsh Whorl Snail	<i>Vertigo (Vertigo) antvertigo</i>	06/04/1982	All Ireland Non-Marine Molluscan Database	Threatened Species: Vulnerable

A 2019 National Parks and Wildlife Service (NPWS) data request (received October 2019) detailed that no invertebrate species were historically recorded within the 10km grid square N96, in which the Knockharley site occurs.

No European sites within 15km of the Knockharley site are designated for threatened invertebrate species.

#### Records of invertebrates during 2019 surveys

During the ecological surveys in September 2019, the GS4/GS2 habitat mosaic in the eastern section of the site was identified as an area with a good mix of common invertebrate species. Across the period also Common Field Grasshopper (*Chorthippus brunneus*) and Common Darter Dragonfly (*Sympetrum striolatum*) were identified basking on the false refugia placed for the lizard survey.

Low level of moths and other insects was noted throughout bat surveys in 2019 in from June to September. Q-samples were collected and analysed from n=6 sites watercourses in the vicinity of the landfill (See Appendix 5). A total of n=28 species across n=25 families were recorded. However, no rare macroinvertebrate species were recorded from the n=6 sampling locations which included the River Nanny downstream of the site. On the Flemingstown (Knockharley Stream) downstream of the landfill site, it had a similar composition to site 2 upstream. There was an absence of clean-water indicator species (i.e. EPA class A and B mayflies and stoneflies). Only a single EPA class B species cased caddis was recorded.

An invertebrate sample was taken from the surface water attenuation pond at Knockharley including a sample from the macrophytes present at the margins in August 2019. Species typical of a pond environment were recorded (i.e. gastropods, damselfly larvae and pond olives). A low to moderate diversity (n=9) species was recorded with no rare species present.

During habitat surveys in July and August 2019, a variety of common invertebrate species were found within differing habitat types, these include; White-lipped snail (*Cepaea hortensis*) and *Grypocoris stysi* being found within mixed broadleaved/ conifer woodland plantation (WD2) to the north of the existing facility, within the proposed development footprint, Devil's Coach Horse Beetle (*Ocypus olens*) being identified within buildings and artificial habitat type (BL3) near the car park to the north-east of the existing facility, inside the proposed development footprint and Soldier Beetle (*Rhagonycha fulva*), Common Blue (*Polyommatus Icarus*) along with Large White (*Pieris brassicae*) being identified in wet grassland/ dry meadows and grassy verges (GS4/ GS2) habitat mosaic.

#### Construction Phase Impacts

In section 10.5.2.4 Chapter 10 – Biodiversity of the EIAR it was stated that;

*"No other species of high conservation concern were recorded on the site... the terrestrial invertebrates recorded are highly mobile and displaced individuals will be able to relocate to other suitable habitats on the site. Impacts to these species will be temporary and imperceptible."*

The 2019 surveys re-confirmed that no invertebrate species of high conservation concern were recorded on site. Habitats with potential high invertebrate richness have been identified within the site, areas of local importance to invertebrates include artificial lakes and ponds (FL8) habitat mixed with wet grassland (GS4) and reed and large sedge swamps (FS1) to the south east of the existing landfill facility, outside of the proposed development footprint.

#### Operational Phase Impacts

Within section 10.5.3.4 Chapter 10 – Biodiversity of the EIAR it was stated that;

*"During the operational phase, [invertebrates] are likely to continue to use the site and the new woodland created will provide habitat for cover and foraging. The increased activity to the north west of the site where the IBA facility is located may deter mammals from this area, however, resulting in a slight localised disturbance impact. However, as the woodland and landscaping matures this impact shall be reduced."*

*Mixed deciduous and coniferous trees felled will be replaced with native broadleaved trees which will be of higher ecological value to local wildlife. This woodland planting will provide cover and foraging habitat for local fauna. As these trees mature, they will also provide nesting habitat for birds. This woodland will be commercial forestry and will therefore be felled in the future. Planting of deciduous woodland will have a Positive Short-Term Moderate impact on local fauna."*

During the operational phase invertebrates are likely to continue to utilise the site along with areas of new woodland created, providing potential feeding habitat and refuge and the existing areas of artificial lakes and ponds, wet grassland and reed and large sedge swamp, outside of the proposed development footprint. The planting of deciduous woodland and creation of wetland habitat to the north of the facility will have a *Positive Short-Term Moderate impact* on local invertebrates.

#### Decommissioning Phase Impacts

Within section 10.5.4 Chapter 10 – Biodiversity of the EIAR it was stated that;

*"On cessation of waste acceptance at the landfill, a restoration and aftercare plan will be put in place (please see Chapter 2 Description of the Proposed Development in Volume 2 of this EIAR) and any structures not required as part of the restoration and aftercare plan will be removed. During the removal of structures and restoration works there may be local short-term disturbance to [invertebrates]."*

The removal of structures and restoration works is likely to result in *local short-term disturbance* to invertebrates.

Mitigation Measures

No additional mitigation measures required

Residual Impact

As per the findings of Chapter 10 – Biodiversity section 10.7 with the application of the above mitigation measures, no significant residual impacts from this development are envisaged.

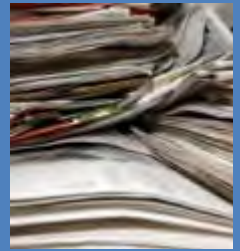
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# Appendix 1

## Knockharley Landfill Bird Surveys 2018/2019

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# KNOCKHARLEY LANDFILL BIRD SURVEY 2018/19

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**CREATED FOR:**

Knockharley Landfill Ltd.



**CREATED:**

October 2019

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## 1 INTRODUCTION

This report details the results of bird surveys carried out at Knockharley Landfill during 2018/19 and 2019. This survey was undertaken to continue the ongoing environmental works at the existing landfill in accordance with 2014 EIA Directive 2014/52/EU. This report should be read in conjunction with Chapter 10 of the EIAR.

Knockharley Landfill Ltd proposes to further develop the existing facility. In addition to desktop study, an extensive field-based assessment was carried out within the boundary of the entire facility. The surveys were carried out to examine the potential impact of the proposed development on avian species.

The following surveys were undertaken in the winter of 2018/19 and summer of 2019:

- Winter Bird Transect Survey
- Summer Bird Transect Survey
- Breeding Raptor Survey
- Raptor Vantage Point Survey
- Breeding Wader Survey
- Kingfisher Survey
- Barn Owl Survey

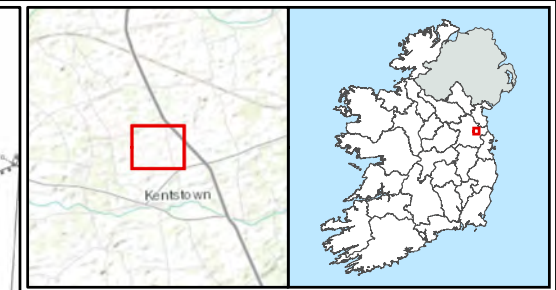
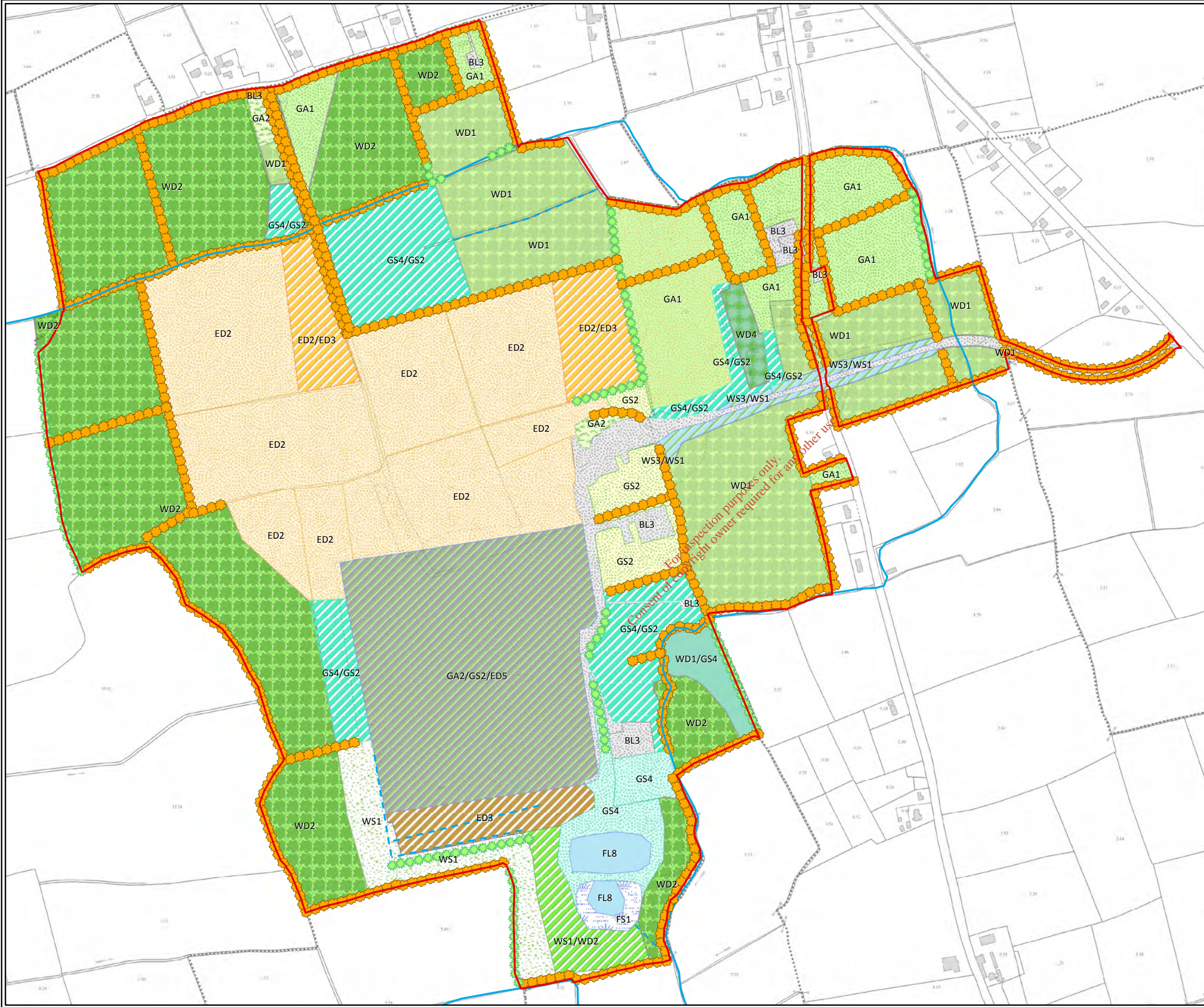
### 1.1 Habitats within the facility

The following habitats, classified according to Fossitt (2000), are located within the proposed development:

- Improved Agricultural Grassland (GA1)
- Wet Grassland/Dry Meadows and Grassy Verges (GS4/GS2) Mosaic
- Dry Meadows and Grassy Verges (GS2)
- Wet Grassland (GS4)
- Hedgerows (WL1)
- Treelines (WL2)
- (Mixed) Broadleaved woodland (WD1)
- (Mixed) Broadleaved Woodland/Wet Grassland (WD1/GS4) Mosaic
- Conifer Plantation (WD4)
- Mixed Broadleaved/Conifer Woodland (WD2)
- Buildings and Artificial Surfaces (BL1)
- Spoil and Bare Ground (ED2)
- Recolonising Bare Ground (ED3)
- Spoil and Bare Ground/Recolonising Bare Ground (ED2/ED3) Mosaic
- Scrub (WS1)
- Ornamental/Non-native Shrub/Scrub (WS3/WS1) Mosaic
- Drainage Ditches (FW 4)
- Eroding Rivers (FW 1)
- Artificial Lakes and Ponds (FL8)
- Reed and Large Sedge Swamps (FS1)

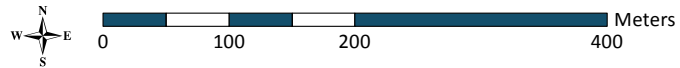
Figure 1 below illustrates the habitats and their coverage at the facility.

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- Planning Boundary
- Habitat**
- FW1 - eroding river
- FW4 - drainage ditches
- WL1 - hedgerow
- WL2 - treeline
- BL3 - buildings and artificial surfaces
- ED2 - spoil and bare ground
- ED2 / ED3 - spoil and bare ground / recolonising bare ground mosaic
- ED3 - recolonising bare ground
- FL8 - artificial lakes and ponds
- FS1 - reed and large sedge swamps
- GA1 - improved agricultural grassland
- GA1 / GS4 - improved agricultural grassland / wet grassland mosaic
- GA2 - Amenity
- GA2/GS2/ED5 - amenity grassland / dry meadows and grassy verges / refuse and other waste
- GS2 - dry meadows and grassy verges
- GS4 - wet grassland
- GS4 / GS2 - wet grassland / dry meadows and grassy verges mosaic
- WD1 - (mixed) broadleaved woodland
- WD1 / GS4 - (mixed) broadleaved woodland / wet grassland mosaic
- WD2 - mixed broadleaved / conifer woodland
- WD4 - Conifer Plantation
- WS1 - scrub
- WS1 / WD2 - scrub / mixed broadleaved-conifer woodland mosaic
- WS3 / WS1 - ornamental/non-native shrub / scrub mosaic

<b>TITLE:</b>	Habitats
<b>PROJECT:</b>	Knockharley Landfill, Co. Meath
<b>FIGURE NO:</b>	1
<b>CLIENT:</b>	Knockharley Landfill Ltd.
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## 2 METHODOLOGY

### 2.1 Desktop Study

A desktop study was carried out to collate and review available information, datasets and documentation sources pertaining to the facility's natural environment. It involved an examination of birds recorded within the 10 km grid square in which the existing facility is located using the National Biodiversity Data Centre (NDBC) mapping system (<http://maps.biodiversityireland.ie/#/Map>) and information on the National Parks and Wildlife Service (NPWS) webpage, metadata available online from the NPWS mapping system (<http://webgis.npws.ie/npwsviewer/>). These databases were accessed on the 8<sup>th</sup> October 2019.

A data request for rare and protected species within 10 km of the existing facility was submitted to the NPWS on 8<sup>th</sup> October 2019. A response was received on the 11<sup>th</sup> October 2019 and the information received used within this report.

### 2.2 EIAR Surveys

Breeding bird surveys following Bibby *et al.* (2000) were previously undertaken on 5<sup>th</sup> and 6<sup>th</sup> May 2010 and 26<sup>th</sup> March 2015 and 8<sup>th</sup> July 2016. Winter transects following the same methodology were undertaken on 16<sup>th</sup> December 2015 and 29<sup>th</sup> January 2016. Both sets of transect surveys were to inform EIAR preparation.

As per section 10.3.6 of the EIAR:

*"Breeding birds at the site were previously surveyed using a series of survey transects on the 5th and 6th of May 2010 (Bibby et al., 2000) (FT, 2010). A total of five transects of approximately 800 m in length were walked during the survey visits (See Figure 10-1). A minimum distance of 250 m was allowed between transects to minimise double-counting of individual birds across the site.*

*Any additional bird species encountered at the site but outside of the dedicated surveys were also noted. All species encountered (seen or heard) within 100 m of the observer were recorded and their abundance was noted. All species occurring more than 100 m from the observer or flying were not included in the abundance analysis, but were recorded as 'additional' species for separate analysis. The total number of birds per species was derived by adding abundance data from all transects. This allowed a measure of relative abundance to be examined for all breeding bird species recorded.*

*The above transects were repeated for the current evaluation on 26th March 2015 and 8th July 2016; primarily to determine whether any changes to the existing environment in the interim since the commencement of operation had led to changes in the suite of avifauna present, and/or likely to be affected by the proposed development. Transects were repeated as in the 2010 survey, apart from slight amendments to T1 and T5 due to the presence of security fencing which prevented the original route from being followed. In this manner, a taxa list of the birds present in the area and their relative abundance could be generated.*

*Winter transects were also carried out on the 16th December 2015, 29th January 2016 and 16th November 2018 and the results are included in this document. Two further winter bird surveys will be carried out in December 2018 and January 2019.*

*The conservation status of each bird species recorded by this study was assessed. 'Birds of Conservation Concern in Ireland' (BoCCI) are classified into three separate lists; Red-listed species are of high conservation concern, Amber-listed species are of medium conservation concern and Green-listed species are considered to be of no conservation concern (see Colhouns & Cummins 2013). The conservation status of the bird species found by this study was also assessed by reviewing if species recorded at the site are listed on Annex I on the EU Birds Directive (2009/147/EC). These species are afforded additional protection through the designation of Special Protection Areas (SPAs) throughout EU countries. Again, it should be noted that, an appraisal of the potential impacts of the proposed development on the constitutive characteristics of European sites within 15km of the proposed development at the Knockharley landfill is set out in the AA Screening Statement and Natura Impact Statement which accompany this application for permission."*

### 2.3 2018/19 Surveys

Bird surveys were carried out on the following dates within the existing facility (Figure 2):

**Table 2-1: Winter 2018 and Summer 2019 Bird Survey Details**

Date; Start - End time	Surveys	Weather Conditions	Surveyor
12 <sup>th</sup> December 2018; 08:45 - 11:45	Winter Bird Transect Survey	Dull, overcast, Wind West F-1. Visibility excellent	Dr. Jonathon Dunn, MA (Cantab.), MSc and PhD (Avian Ecology)
25 <sup>th</sup> January 2019; 08:50 - 11:35	Winter Bird Transect Survey	Overcast, but clear. Cloud 7/8. Visibility excellent	Dr. Jonathon Dunn, MA (Cantab.), MSc and PhD (Avian Ecology)
15 <sup>th</sup> May 2019; 08:40 - 12:00	Summer Bird Transect Survey.	Mild, Wind southeast F-2. Cloud 6/8. Visibility excellent	Dr. Jonathon Dunn, MA (Cantab.), MSc and PhD (Avian Ecology)
14 <sup>th</sup> June 2019; 07:00 - 13:00	Breeding Wader Survey, Kingfisher Survey, Barn Owl Survey	Dull, humid. Wind west F-2. Cloud 8/8	Dr. Jonathon Dunn, MA (Cantab.), MSc and PhD (Avian Ecology)
21 <sup>st</sup> June 2019; 07:00 - 16:00	Breeding Wader Survey, Raptor Vantage Point Survey, Kingfisher Survey	Bright, calm, sunny. 16 degrees. Wind Southwest, F2-3. Cloud 2/8. Visibility excellent	Joseph Adamson M.Sc, MCIEEM
8 <sup>th</sup> July 2019; 07:00 - 16:00	Breeding Wader Survey, Raptor Vantage Point Survey, Kingfisher Survey, Barn Owl Survey	Dull, overcast, mild. 19 degrees. Humid. Wind East-southeast <F -1. Cloud 8/8. Visibility excellent	Joseph Adamson M.Sc, MCIEEM
7 <sup>th</sup> August 2019; 07:00 - 16:00	Raptor Vantage Point Survey, Kingfisher Survey	Bright, but overcast at times. 21 degrees. Occasional shower. Wind southwest F-2-3. Cloud 8/8. Visibility excellent	Joseph Adamson M.Sc, MCIEEM

### 2.4 Breeding Wader Survey

A breeding wader survey was carried out at the facility, to evaluate the existing facility for the potential for breeding waders such as Curlew *Numenius arquata*, Lapwing *Vanellus vanellus* and Snipe *Gallinago gallinago*.

Three site visits were carried out on 14<sup>th</sup> and 21<sup>st</sup> June 2019 and 8<sup>th</sup> July 2019. The survey methodology followed O'Brien and Smith (1992) from Gilbert *et al* (1998).

The surveys were carried out within three hours after dawn and all potential breeding habitat areas were surveyed, including the agricultural grasslands at the north and northeast of the facility, the wet grassland area at the southeast of the facility, the surface water attenuation pond at the south of the facility and the grassed over landfill area at the centre of the facility. Nikon Monarch M511 8x42 binoculars were used.

### 2.5 Breeding Raptor Vantage Point Survey

A breeding raptor survey was carried out at the facility during the summer of 2019 and the methodology followed Hardey *et al.* (2006). A raptor vantage point survey was carried out on 21<sup>st</sup> June 2019, 7<sup>th</sup> July 2019 and the 8<sup>th</sup> August 2019. Target breeding raptors within the facility included Buzzard *Buteo*, Sparrowhawk *Accipiter nisus* and Kestrel *Falco tinnunculus*, species that may breed within the facility.



The raptor vantage point survey entailed watching from a fixed vantage point, for a duration of six hours, during each visit. The grassed over landfill at the centre of the facility was deemed a suitable vantage point as it was elevated and offered the observer a 180-degree panoramic view of the entire facility and beyond. This afforded a constant view that could be monitored. The vantage point was located at E97351 N67073 on the landfill. In addition to Zeiss 7x42 binoculars, a Swarovski 20-60x60 HD Telescope was used for the vantage point survey. If raptors were observed, their flight height, duration of the sighting and behaviour was noted.

## 2.6 Kingfisher Survey

A survey of watercourses and standing water at the facility was conducted, in order to detect the presence of breeding Kingfisher *Alcedo atthis* within the facility. Kingfisher surveys were carried out on 14<sup>th</sup> and 21<sup>st</sup> June 2019; and 8<sup>th</sup> July 2019 and 7<sup>th</sup> August 2019. The methodology followed NRA Guidelines (NRA 2009) and an assessment was carried out of water features and associated habitats for foraging, nesting and roosting Kingfishers. Watercourses and standing water at the facility included the following (Figure 2):

- A = Small stream (Fossitt code FW1; eroding river) with some partly near bird transect survey TR-2
- P1 = Surface water attenuation pond (Fossitt code FL8; artificial lakes and ponds) near start of TR-2
- P2 = Surface water attenuation pond and overflow pond (Fossitt code FL8; artificial lakes and ponds) at the south of the facility
- B = Drainage ditch (Fossitt code FW4; drainage ditches) near TR-3
- C = Small stream (Fossitt code FW1; eroding river) near TR-4
- E = Drainage ditch (Fossitt code FW4; drainage ditches) near TR-5

Nikon Monarch M511 8x42 binoculars were used.

Note that a separate Kingfisher survey was undertaken as part of the aquatic surveys (Triturus, 2019). A full description of this methodology is provided in the companion report. Briefly, vantage point surveys were undertaken at four locations both within the existing facility and the surrounding environs on 02/08/2019 and 22/08/2019.

## 2.7 Transect Surveys

### 2.7.1 Winter Bird Survey

A winter bird survey was carried out on two dates during the winter of 2018/19 (a previous survey was carried out on 16/11/2018 already included in the EIAR). Five transects were chosen, which afforded coverage of all the habitats present throughout the facility. As for previous surveys, the transect route was divided into band widths and recorded species within these band widths following Bibby *et al.* (2000). This is the methodology used by BirdWatch Ireland when carrying out annual Countryside Bird Surveys to monitor long-term breeding bird population fluctuations within the Republic of Ireland. The survey entails walking the centre line of the transect and recording species observed or heard at 0-25 m, 25-50 m and 50-100 m band widths.

For each date, the total number of a particular species recorded from all five transects were collated so, for example, four Blackbirds recorded on 12/12/18 was the sum total observed or heard from all five transects in the facility, on that date. Nikon Monarch M511 8x42 binoculars were used. No recording equipment was used.

Winter bird surveys were carried out on the following dates: 12/12/18 and 25/01/19.

Descriptions of the transect routes and their location are as follows:

#### Transect 1 (TR-1)

This transect is located at the northeast of the facility and starts at the offices and car park at the entrance. It includes the roadside entering the facility, improved agricultural grassland (GA1) adjacent to (mixed) broadleaved woodland (WD1), ornamental/non-native shrub / scrub mosaic (WS3/WS1) and farm buildings. Thus, woodland was included in the buffer zones for each transect and was surveyed. See Figure 2.

#### Transect 2 (TR-2)

This transect is located at the east of the facility and starts at the northern surface water attenuation pond (artificial lakes and ponds; FL8). This pond is lined with a LDPE polymer cover and is quite shallow. The transect runs through a vegetated track and then enters an open area of wet grassland / dry meadows and grassy verges (GS4 / GS2) mosaic, where a derelict shed is located. This shed was used in the past to keep birds of prey, which were used in the facility to deter corvids and gulls on the landfill area. The transect affords a view of the grassed-over landfill (amenity grassland/dry meadows and grassy verges/refuse and other waste mosaic; GA2/GS2/ED5) to the west. The transect runs immediately adjacent to (mixed) broadleaved woodland (WD1) and mixed broadleaved / conifer woodland (WD2). Thus, woodland was included in the buffer zones for each transect and was surveyed.

This transect then passes the Landfill Gas Compound and runs in a south-westerly direction over wet grassland (GS4) and includes the southern surface water attenuation pond (artificial lakes and ponds; FL8) and the wetland (reed and large sedge swamps; FS1) that has developed from overflow of this attenuation pond. This attenuation pond is lined with a similar substrate to the northern pond. The pond is essentially an Integrated Constructed Wetland. The wetland is dominated by Common Reed *Phragmites australis* with some Bullrush *Typha latifolia* with standing water. The transect then runs in a northerly and then a westerly direction along a track between a high berm to the south and the grassed-over landfill (amenity grassland/dry meadows and grassy verges/refuse and other waste mosaic; GA2/GS2/ED5) to the north. It ends at the southwest corner of the grassed-over landfill (Figure 2).

#### Transect 3 (TR-3)

This transect runs in a northerly direction to the west of the grassed-over landfill (amenity grassland/dry meadows and grassy verges/refuse and other waste mosaic; GA2/GS2/ED5) and is immediately adjacent to mixed broadleaved / conifer woodland (WD2), further west. Thus, woodland was included in the buffer zones for each transect and was surveyed. The transect then travels close to the area of active landfill operations, over excavated soil (spoil and bare ground; ED2), where the majority of gulls and corvids congregate within the facility. The transect affords views of agricultural land to the west, outside of the facility, and the active landfill area and the proposed leachate cells (Figure 2).

#### Transect 4 (TR-4)

This transect is located at the northeast of the facility and runs in a northerly and then an easterly direction over spoil and bare ground (ED2) and spoil and bare ground / recolonising bare ground mosaic (ED2 / ED3). The transect is immediately adjacent to the edges of mixed broadleaved / conifer woodland (WD2) and a wet grassland / dry meadows and grassy verges mosaic (GS4/GS2). Thus, woodland was included in the buffer zones for each transect and was surveyed (Figure 2).

#### Transect 5 (TR-5)

This transect is located to the north of TR-1 and covers improved agricultural grassland (GA1), hedgerows (WL1) and treelines (WL2). It ends in a (mixed) broadleaved woodland (WD1) plantation (Figure 2). Thus, woodland was included in the buffer zones for each transect and was surveyed.

### 2.7.2 Summer Bird Survey

The summer bird survey was carried out over four dates during the summer of 2019. Dates surveyed are as follows: 15/5/2019 and 21/6/2019. The transects selected and the methodology used was identical to the winter bird survey.

The breeding status categories of species was defined i.e. non-breeding, possibly breeding, probably breeding, confirmed breeding as outlined in Balmer et al. (2013) and the BTO breeding bird classification as shown below in Plate 1.

Non-breeding	
<b>F</b>	Flying over
<b>M</b>	Species observed but suspected to be still on <b>M</b> igration
<b>U</b>	Species observed but suspected to be <b>s</b> Ummering non-breeder
<b>Possible breeder</b>	
<b>H</b>	Species observed in breeding season in suitable nesting <b>H</b> abitat
<b>S</b>	Singing male present (or breeding calls heard) in breeding season in suitable breeding habitat
<b>Probable breeding</b>	
<b>P</b>	Pair observed in suitable nesting habitat in breeding season
<b>T</b>	Permanent <b>T</b> erritory presumed through registration of territorial behaviour (song etc) on at least two different days a week or more part at the same place or many individuals on one day
<b>D</b>	Courtship and <b>D</b> isplay (judged to be in or near potential breeding habitat; be cautious with wildfowl)
<b>N</b>	Visiting probable <b>N</b> est site
<b>A</b>	<b>A</b> gitated behaviour or anxiety calls from adults suggesting probable presence of nest or young nearby
<b>I</b>	Brood patch on adult examined in the hand suggesting <b>I</b> ncubation
<b>B</b>	Nest <b>B</b> uilding or excavating nest-hole
<b>Confirmed breeding</b>	
<b>DD</b>	<b>D</b> istracted- <b>D</b> isplay or injury feigning
<b>UN</b>	<b>U</b> sed <b>N</b> est or eggshells found (occupied or laid within period of survey)
<b>FL</b>	Recently <b>F</b> ledged young (nidicolous species) or downy young (nidifugous species). Careful consideration should be given to the likely provenance of any fledged juvenile capable of significant geographical movement. Evidence of dependency on adults (e.g. feeding) is helpful. Be cautious, even if the record comes from suitable habitat.
<b>ON</b>	Adults entering or leaving nest-site in circumstances indicating <b>O</b> ccupied <b>N</b> est (including high nests or nest holes, the contents of which can not be seen) or adults seen incubating
<b>FF</b>	Adult carrying <b>F</b> aecal sac or <b>F</b> ood for young
<b>NE</b>	<b>N</b> est containing <b>E</b> ggs
<b>NY</b>	<b>N</b> est with <b>Y</b> oung seen or heard

**Plate 1: BTO Classifications**

## 2.8 Barn Owl Survey

A Barn Owl survey was carried out at the facility on the 14<sup>th</sup> June and 8<sup>th</sup> July 2019. The methodology followed Gilbert *et al.* (1998) and NRA Guidelines (2009). The existing facility was searched for field signs, including pellets, droppings and feathers. The facility was searched for old hollow trees, nest boxes that may have been erected and old buildings. Nikon Monarch M511 8x42 binoculars were used. The June visit was conducted to locate active nests with eggs, if any, and the July visit, to check for fledged young and late nests.

The entire study area was checked for the presence of Barn Owls with special attention given to selected areas such as the farm buildings at the northeast of the existing facility.

## 2.9 Impact Assessment

EPA Guidelines (2017) were used to assess the potential impact and resulting effect of the proposed development on avian resources.

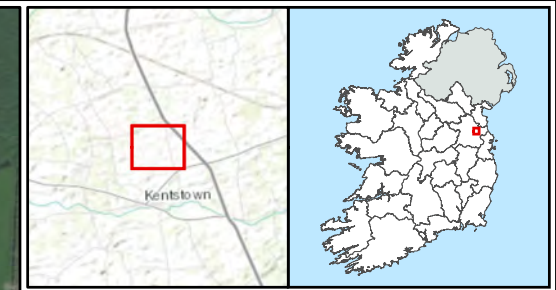
In line with the EPA Guidelines (EPA, 2017), the following terms are defined when quantifying duration:

- Momentary: from seconds to minutes
- Brief: up to 1 day
- Temporary: up to 1 year
- Short-term: from 1-7 years;
- Medium-term: 7-15 years;
- Long-term: 15-60 years; and
- Permanent: over 60 years.

The impacts were assessed under a number of parameters such as magnitude, extent, timing, frequency, duration and reversibility. The impact significance criteria (EPA, 2017) as set out in Table 2 are used where applicable. A glossary of impacts is further outlined in Appendix 10.3 Volume 3 of the EIAR.

**Table 2-2: Significance of Effects Criteria**

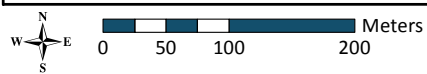
Impact Significance	Criteria
Imperceptible	An effect capable of measurement but without significant consequences
Not significant	An effect which causes noticeable changes in the character of the environment but without significant consequences
Slight	An effect which causes noticeable changes in the character 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



- Planning Boundary
  - Linear Waterbodies
  - Ponds
  - Bird Survey Transects
- Note: P1 is a covered attenuation pond

<b>TITLE:</b>	Bird Survey 2018/19		
<b>PROJECT:</b>	Knockharley Landfill, Co. Meath		
<b>FIGURE NO:</b>	2		
<b>CLIENT:</b>	Knockharley Landfill Ltd.		
<b>SCALE:</b>	1:6000	<b>REVISION:</b>	0
<b>DATE:</b>	24/10/2019	<b>PAGE SIZE:</b>	A3

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### 3 RESULTS

#### 3.1 Desktop Survey

A desktop review of information available from the National Biodiversity Data Centre (NBDC) and NPWS showed that 34 rare/threatened and/or protected bird species have been recorded historically within the 10 km grid square (N96) in which the existing facility is located (see Table 3)<sup>1</sup>. Only up-to-date records (made since 2009) have been included.

**Table 3-1: Desktop results of rare/threatened and/or protected bird species recorded since 2009 within the 10 km of the existing facility**

Common Name ( <i>Scientific name</i> )	Birds Directive	Conservation Status	Wildlife Acts
Barn Owl ( <i>Tyto alba</i> )	No	Red	Yes
Barn Swallow ( <i>Hirundo rustica</i> )	No	Amber	Yes
Black-headed Gull ( <i>Larus ridibundus</i> )	No	Red	Yes
Common Coot ( <i>Fulica atra</i> )	Annex II & III	Amber	Yes
Common Kestrel ( <i>Falco tinnunculus</i> )	No	Amber	Yes
Common Kingfisher ( <i>Alcedo atthis</i> )	Annex I	Amber	Yes
Common Linnet ( <i>Carduelis cannabina</i> )	No	Amber	Yes
Common Pheasant ( <i>Phasianus colchicus</i> )	Annex II & III	Green	Yes
Common Sandpiper* ( <i>Actitis hypoleucos</i> )	No	Amber	Yes
Common Snipe ( <i>Gallinago gallinago</i> )	Annex II & III	Amber	Yes
Common Starling ( <i>Sturnus vulgaris</i> )	No	Amber	Yes
Common Swift ( <i>Apus apus</i> )	No	Amber	Yes
Common Wood Pigeon ( <i>Columba palumbus</i> )	Annex II & III	Green	Yes
Cormorant ( <i>Phalacrocorax carbo</i> )	No	Amber	Yes
Eurasian Tree Sparrow ( <i>Passer montanus</i> )	No	Amber	Yes
Eurasian Woodcock ( <i>Scolopax rusticola</i> )	Annex II & III	Red	Yes
European Golden Plover ( <i>Pluvialis apricaria</i> )	Annex I, II & III	Red	Yes
Grey Heron* ( <i>Ardea cinerea</i> )	No	Green	Yes
Herring Gull ( <i>Larus argentatus</i> )	No	Red	Yes
House Martin ( <i>Delichon urbicum</i> )	No	Amber	Yes
House Sparrow ( <i>Passer domesticus</i> )	No	Amber	Yes
Mallard ( <i>Anas platyrhynchos</i> )	Annex II & III	Green	Yes
Mew Gull ( <i>Larus canus</i> )	No	Amber	Yes
Moorhen* ( <i>Gallinula chloropus</i> )	No	Green	Yes
Mute Swan ( <i>Cygnus olor</i> )	No	Amber	Yes

<sup>1</sup> Data were accessed from NBDC on 08/10/2019 and the data request received from NPWS on 11/10/2019

Common Name ( <i>Scientific name</i> )	Birds Directive	Conservation Status	Wildlife Acts
Northern Lapwing ( <i>Vanellus vanellus</i> )	Annex II	Red	Yes
Peregrine Falcon ( <i>Falco peregrinus</i> )	Annex I	Green	Yes
Ringed Plover ( <i>Charadrius hiaticula</i> )	No	Green	Yes
Rock Pigeon ( <i>Columba livia</i> )	Annex II	Green	Yes
Sand Martin* ( <i>Riparia riparia</i> )	No	Amber	Yes
Skylark ( <i>Alauda arvensis</i> )	No	Amber	Yes
Spotted Flycatcher ( <i>Muscicapa striata</i> )	No	Amber	Yes
Whooper Swan ( <i>Cygnus cygnus</i> )	Annex I	Amber	Yes
Yellowhammer ( <i>Emberiza citrinella</i> )	No	Red	Yes

### 3.2 EIAR Surveys

In the following section, the results from bird surveys shown in the EIAR in section 10.4.6 are included verbatim (with grey background and original numbering).

#### 10.4.6 Birds in the existing environment

A total of 24 bird species were recorded during avian surveys at the existing facility in 2010 (FT, 2010). A further two species were recorded in March 2015 and a further nine species in 2016. Table 10-9 shows the total number of birds recorded on all five avian transects in 2010, 2015 and 2016, and their conservation status following the most recent Birds of Conservation Concern in Ireland (BoCCI) list (Colhoun & Cummins 2013). Additional species observed during the surveys is detailed in Table 10-10.

#### Results of 2010 Survey

The most abundant species recorded during avian surveys were Woodpigeon, Wren, Goldfinch and Willow Warbler (9-10 records each). Skylark and Blackbird were also abundant on the site and these species were recorded on all five of the avian transects. All avian species were recorded on a minimum of two transects. Many of the species were associated with field boundaries, however the immature forestry also provides cover for many species.

Two Buzzards were recorded on the site on both of the surveys days and a third Buzzard was also recorded on the second survey day. Buzzards were recorded on transects 4 and 5 only. This species was observed flying over the northern area of the site and a roost site was located in a mature tree in the north of the site.

It is possible that this species nests in the vicinity of the roost site and the birds became very vocal when the roost tree was approached.

No evidence of a nest could be seen however and the presence of a third bird may indicate that these could be non-breeding birds. This species is regularly observed by site staff to the north of the site. Buzzards were not recorded on the site during previous surveys (Celtic waste, 2000, Greenstar, 2008), although it was observed in the wider landscape.

Figure 10-1 shows the location of the avian transects (2010, 2015 and 2016) and Appendix 10.2 Volume 3 of this EIAR gives the locations and habitats occurring on each transect. The habitats surveyed by all transects were similar, being dominated by a mosaic of wet grassland and improved agricultural grassland as well as immature woodland. Transects 2, 4 and 5 were located adjacent to field boundaries, including either hedgerows or treelines.



Avian species richness was highest on transect 5 (16 species) followed by transects 1 and 4 (15 species). Avian species richness was lowest (7 species) on transect 2, which was located to the east of the existing landfill site. It should be noted that a number of additional species were recorded flying over this area towards the landfill site (i.e. Rook and Jackdaw).

Disturbance was higher in this area than on the other transects due to human and vehicular activity and this may have contributed to the low number of species recorded here. Furthermore, the areas of improved agricultural grassland here provide little cover and/or food for birds.

A pair of Coots appear to be breeding on the constructed wetland in the south of the site and a Mallard was also seen flying over this area. Two Grey Heron were seen flying over the site in the northern area of the site and Hooded Crow were only recorded on the active landfill site itself. It should be noted that numbers of birds on the active landfill site were low, indicating that the bird control measures in place at the active landfill site were effective at the time of the survey.

#### Results of 2015 Survey

A total of 17 species were recorded, with distribution, as in previous surveys, mainly along field boundaries and in forestry. Species not recorded previously at the site included Kestrel, recorded twice (assumed to be the same bird) and Mistle Thrush.

As in previous surveys two Buzzards were recorded from transects, however an additional bird was also noted between transect T2 and T3 bringing the total recorded to 3. It is assumed that up to 2 pairs of Buzzard may still be present in the area. Mallard were recorded in a drainage ditch adjacent to T3. Numbers of birds active on the constructed landfill continue to be low with only corvids such as Hooded Crow noted.

The migrant species Grasshopper Warbler, Barn Swallow, Willow Warbler and Chiffchaff were not recorded. However this is due to the timing of the survey and all are likely to occur given that suitable habitat still exists.

#### Results of 2016 Survey

The number of species recorded in 2016 at transects 1 – 5 was 7 (T1); 9(T2); 6(T3); 10(T4) and 9(T5). Species diversity was highest in Transect 4 (10 species) and lowest in Transect 3 (6 species). Additional species compared with previous years included Blackcap, Black-headed Gull, Coal Tit, Spotted Flycatcher, Herring Gull, Hooded Crow, Lesser Black-backed Gull, Long-tailed Tit and Magpie. At Transect 4, there was a lot of disturbance in the environs due to new and ongoing expansion works and cattle were also grazing in the adjacent field. There were no observations of Common Buzzard or Kestrel during the summer surveys in 2016.

Overall, species diversity in T1 was reduced from 15 in 2010, to 3 in 2015 and 7 in 2016. Species diversity increased in T2 from 7 in 2010 to 8 in 2015 and 9 in 2016. Species diversity in T3 was reduced in 2016 (6) compared with 2010 and 2015 (12 each year). At T4, species diversity was reduced from 15 in 2010 to 5 in 2015 and rose to 10 in 2016. At T5, species diversity was also highest in 2010 and reduced to 7 in 2015 and 9 in 2016.

### Wintering Survey

A winter survey was conducted in December 2015 and January 2016 along each of the five transects. The results are presented in Table 10-11. Additional species recorded during the winter 2015/2016 surveys include Common Gull, Stonechat, Fieldfare, Redwing, Starling and Yellowhammer. Buzzards were also observed during the winter 2016 survey.

### Review of Species Recorded

Overall the general assemblage of birds present is evaluated as not differing significantly from that recorded in previous surveys. Habitats on site have not significantly changed in terms of species likely to occur, with the increased area of immature woodland likely to hold the same species as previously recorded.

Due to the change in the Birds of Conservation Concern in Ireland (BoCCI) list since 2010, the status of a number of species recorded on site has changed since the previous appraisal. This includes Robin, Goldcrest and Mistle Thrush, which are now amber listed on the basis of short term declines in abundance of at least 25% (Colhoun & Cummins 2013); Meadow Pipit has moved from green to red due to declines in breeding populations (a greater than 50% decline in the short term). Conversely, the Grasshopper Warbler has moved from amber to green on the basis of a short-term increase in breeding population and an increase in the range of the species. It has been suggested that the short-term declines in species such as Meadow Pipit and other resident passerines, which formed the basis for their revised status in 2013, coincided with the prolonged cold weather experienced during the winters of 2009/10 and 2010/11 (Crowe *et al.* 2011 cited in Colhoun & Cummins 2013). These species are still widespread with very little change in range or distribution.

Barn Owl (*Tyto alba*) was recorded on the site during previous surveys (Greenstar EIS, 2008), however no nocturnal surveys were carried out as part of the work carried out in 2010, 2015 or 2016. It is likely that this species forages on the site. Golden Plover (*Pluvialis apricaria*) was recorded in arable adjacent to the site in previous surveys (Greenstar EIS, 2008), however the habitats on the landfill site provide limited suitability for this species.

### 3.3 Breeding Waders Survey 2019

No breeding waders were detected during the breeding wader surveys. While there is some suitable wader breeding habitat present in the form of wet grassland, at the southeast of the existing facility, no breeding waders were detected at this location. In addition, this area is too close to the Methane Plant, where disturbance is a limiting factor in relation to habitat suitability.

As the facility is an active landfill for the most part, disturbance to potential breeding waders reduces the suitability of the habitats for these species. Vehicles are continuously active within all areas of the existing facility. The general buffer applied to waders (particularly Curlew) for construction projects is 500 m (Percival, 2003).

The grassed-over landfill (amenity grassland / dry meadows and grassy verges / refuse and other waste; GA2/GS2/ED5) at the centre of the existing facility was deemed too overgrown, rank and too dry to support breeding waders such as Curlew and Lapwing. In addition, there are a lot of methane stand pipes at this location and there is evidence that corvids roost at this location, as all the stand pipes were whitewashed with bird droppings at the times of the surveys, so disturbance and predation from Hooded Crows to breeding waders is a major issue, coupled with the fact that the area is driven regularly by existing facility personnel.

The improved agricultural grasslands at the north and northeast of the existing facility were deemed unsuitable, as the fields are too small and enclosed by tall hedgerows and treelines. The fields at the northeast of the existing facility are deemed too close to human habitation, so disturbance is an issue. Also, the agricultural grasslands at the north of the existing facility were unmanaged at the times of the survey and the grass sward was too high for breeding Curlew and Lapwing. They are also very close to access roads that lead to ongoing landfill operations.

No breeding snipe were detected in the area of the southern surface water attenuation pond or the wet grassland at the southeast of the existing facility (although a single bird was flushed from wet grassland near transect 2 during winter transect surveys in January 2019). The area of the surface water attenuation pond is contained by a fence line, with little grassland vegetation. There is very little habitat within the existing facility, in the form of undisturbed wet grassland, to support breeding snipe.

With regard to breeding waders such as Curlew and Lapwing, both of these species are highly territorial and extremely vocal during the breeding season and are easily agitated, particularly by the presence of corvids, such as Hooded Crows which will prey upon eggs and young, and by human presence. Thus, both species are easily detected, if present.

In summary, the existing facility is not suitable for breeding waders due to the various landfill activities taking place, including continuous alteration and disturbance of the facility, lack of suitable breeding habitat and potential predation by corvids.

### 3.4 Breeding Raptors Survey 2019

While there was evidence that Buzzard is present during the breeding season and possibly breed within the general area surrounding the facility, none were detected breeding within the confines of the facility. The mature trees at the north of the existing facility offered suitable breeding habitat for raptors such as Buzzard and Sparrowhawk but none were observed breeding within this area, during the breeding surveys. There was only one observation of Sparrowhawk during the breeding season and this occurred at the surface water attenuation pond at the south of the facility, during a survey on 7<sup>th</sup> August. The bird was flushed from the dirt track at the west of the pond.

There were no sightings of Kestrel during any of the bird surveys. It is thought that the paucity of rodents, due to vermin control measures carried out at the facility, may explain their absence. Suitable habitat such as the grassed-over landfill, at the centre of the facility was deemed a likely area for their occurrence, but none were observed. It must be pointed out that Kestrels are not scavengers. They eat live prey. With regard to nesting Kestrels, they do not build nests, but will scrape a depression in the nest substrate, for example in hole nests or in the collapsed nest cup of an old crow nest (Hardey *et al.* 2006). No old Hooded Crow nests or hollow trees were observed within the existing facility during the surveys.

Buzzards were observed infrequently during all bird surveys. An old nest observed on one of the electricity pylons at the northwest of the existing facility was thought to be that of a Buzzard but was not active during surveys. During raptor vantage point surveys, particular attention was given to the overhead pylons located at the west and north of the existing facility, due to their potential for collision by birds of prey. No collisions were noted during surveys and, indeed, no birds of prey were observed perching on the pylons. These pylons and their route are likely to have been in place long before the existing facility became a landfill facility.

During vantage point watches, the permanent presence of corvids and a sizeable gull flock near the activities of the vehicles delivering refuse, were good indicators of the presence of a Buzzard within the confines of the facility. If one was present and flew within their range the flocks would take-off and the corvids would mob the raptor.

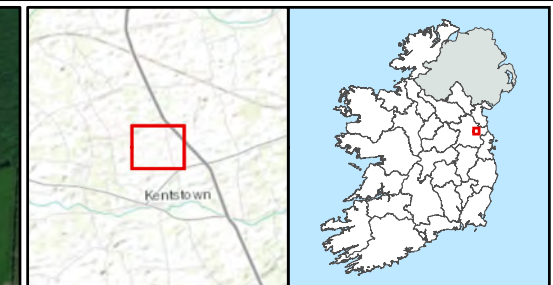
In addition to live prey, Buzzards will scavenge carrion. Observations at this landfill site during surveys showed that when refuse is delivered and deposited, it is covered up almost immediately by excavated, inert soil from elsewhere on the existing facility. Also, it was observed that pine mulch was often mixed in with the other substrates, which would aid in decomposition and reduce odour. These activities would aid in reducing the population of rodents within the area of refuse deposition and thus, reduce the presence of birds of prey within the existing facility.

Flightlines recorded during surveys are shown in Figure 3.

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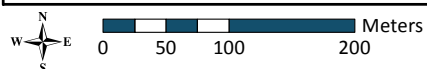


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- Planning Boundary
- Vantage Point
- Flightlines**
- 1. 21/06/2019. Buzzard
- 2. 07/08/2019. Sparrowhawk

<b>TITLE:</b>	Flightlines 2018/19		
<b>PROJECT:</b>	Knockharley Landfill, Co. Meath		
<b>FIGURE NO.:</b>	3		
<b>CLIENT:</b>	Knockharley Landfill Ltd.		
<b>SCALE:</b>	1:6000	<b>REVISION:</b>	0
<b>DATE:</b>	24/10/2019	<b>PAGE SIZE:</b>	A3
		Cork   Dublin   Carlow <a href="http://www.fehilytimoney.ie">www.fehilytimoney.ie</a>	



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### 3.5 Kingfisher Survey 2019

The Kingfisher Survey concentrated on hydrological features present within the existing facility, such as streams and water bodies. The following locations within the existing facility were surveyed for the presence of Kingfishers:

- A = Water quality slightly silty, stagnant. Steeply sloped, vegetated banks. Lots of overhanging branches. No fish observed. No Kingfisher sightings.
- B and D = Similar to A. No presence of Kingfishers.
- C = Similar to above but some flow. No Kingfishers present.
- P1 = Northern surface water attenuation pond. Little or no standing water. Not suitable for Kingfisher.
- P2 = Southern surface water attenuation pond and overflow pond. Standing water and good foraging Kingfisher habitat.

On 7<sup>th</sup> August 2019 at the surface water attenuation pond, a Kingfisher was initially heard, but not immediately observed. The call of Kingfisher was played back using a tape lure. There was no response at first. After the second playback, a Kingfisher appeared, and landed on a pipe jutting out into the pond. It remained on the pipe briefly and took off in a south easterly direction over deciduous forestry. A pond net sample at this location undertaken as part of the aquatic surveys in 2019 confirmed that Three-spined Stickleback *Gasterosteus aculeatus* occur within the pond. The presence of a Grey Heron observed at the pond on most survey dates also confirms that low numbers of fish were present.

Examination of the culvert into the pond did not detect evidence of breeding activity during the summer. Due to the late date of the sighting and the fact that no Kingfishers were observed during previous surveys at this location during the summer, it is thought that this sighting concerned a transient bird passing through, but not breeding at the existing facility.

Full results from the Kingfisher vantage point surveys are shown in the companion aquatic ecology report (Triturus, 2019). Briefly, no Kingfishers were recorded during surveys; however, a single bird was recorded during walkover surveys flying upstream along the Flemingstown stream near the landfill boundary on 22/08/2019. Overall, habitat was typically considered sub-optimal for Kingfishers with no nesting sites recorded and limited suitable perch sites available.

### 3.6 Transect Surveys 2018/19

#### 3.6.1 Winter Birds

The results of the winter bird surveys are provided in Table 4 over:

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Table 3-2: Bird species recorded from all transects within the study area during winter birds transect surveys<sup>2</sup>

Common name	Scientific name	Transect 1				Transect 2				Transect 3				Transect 4				Transect 5										
		11/12/2018		12/12/2018		11/12/2018		12/12/2018		11/12/2018		12/12/2018		11/12/2018		12/12/2018		11/12/2018		12/12/2018								
		0-25 m and 25-100 m / FO	>100m / FO	0-25 m and 25-100 m / FO	>100m / FO	0-25 m and 25-100 m / FO	>100m / FO	0-25 m and 25-100 m / FO	>100m / FO	0-25 m and 25-100 m / FO	>100m / FO	0-25 m and 25-100 m / FO	>100m / FO	0-25 m and 25-100 m / FO	>100m / FO	0-25 m and 25-100 m / FO	>100m / FO	0-25 m and 25-100 m / FO	>100m / FO	0-25 m and 25-100 m / FO	>100m / FO	0-25 m and 25-100 m / FO						
Black-headed gull	<i>Chroicocephalus ridibundus</i>	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	10				
Blackbird	<i>Turdus merula</i>	4	0	1	0	0	0	0	1	0	3	0	6	0	0	0	0	0	0	0	0	0	4	1	2	0	22	
Blue tit	<i>Parus caeruleus</i>	4	0	0	0	7	0	0	0	0	0	0	4	0	0	2	0	1	0	3	0	2	0	2	0	23		
Bullfinch	<i>Pyrrhula pyrrhula</i>	0	0	0	0	0	0	0	0	0	0	0	2	0	2	0	0	0	0	0	0	0	0	0	0	0	4	
Buzzard	<i>Buteo buteo</i>	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1	0	0	1	0	1	0	0	2	
Chaffinch	<i>Fringilla coelebs</i>	0	0	3	0	5	0	0	0	0	0	0	0	0	2	0	0	1	1	1	0	1	1	0	0	6	10	
Coal tit	<i>Periparus ater</i>	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	
Common Gull	<i>Larus canus</i>	0	0	0	0	0	0	0	0	0	0	28	0	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0
Dunnock	<i>Prunella modularis</i>	1	0	0	0	1	0	0	0	0	0	0	0	0	1	0	0	0	0	2	0	0	0	0	0	0	5	
Fieldfare	<i>Turdus pilaris</i>	0	0	0	0	0	0	0	0	0	0	5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Goldfinch	<i>Carduelis carduelis</i>	0	0	6	0	30	0	0	0	0	0	0	0	0	0	0	15	0	0	17	0	0	0	0	0	0	0	53
Great black-backed gull	<i>Larus marinus</i>	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Great tit	<i>Parus major</i>	0	0	1	0	1	0	0	0	0	1	0	0	0	0	1	0	0	1	1	0	0	1	1	0	0	5	
Herring gull	<i>Larus argentatus</i>	0	0	4	4	0	2	0	1	0	74	0	5	100	22	0	0	0	0	0	0	0	0	0	0	0	1	10
Hooded crow	<i>Corvus corone</i>	1	7	2	9	0	5	3	3	0	60	15	27	1	57	15	18	0	9	0	0	0	0	0	0	0	19	37
Jackdaw	<i>Corvus monedula</i>	0	0	0	2	0	4	0	0	0	0	0	0	0	4	0	6	0	0	0	0	0	0	0	0	0	0	0
Jay	<i>Garrulus glandarius</i>	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
Lesser black-backed gull	<i>Larus fuscus</i>	0	3	1	1	0	7	0	0	0	19	0	0	20	19	0	0	0	0	0	0	0	0	0	0	0	1	21

<sup>2</sup> Colours correspond to BoCCI conservation status. Annex I species highlighted in bold.

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Common name	Scientific name	Transect 1				Transect 2				Transect 3				Transect 4				Transect 5							
		11/12/2018		12/12/2018		11/12/2018		12/12/2018		11/12/2018		12/12/2018		11/12/2018		12/12/2018		11/12/2018		12/12/2018					
		0-25 m and 25-100 m / FO	>100m / FO	0-25 m and 25-100 m / FO	>100m / FO	0-25 m and 25-100 m / FO	>100m / FO	0-25 m and 25-100 m / FO	>100m / FO	0-25 m and 25-100 m / FO	>100m / FO	0-25 m and 25-100 m / FO	0-25 m and 25-100 m / FO	>100m / FO	0-25 m and 25-100 m / FO	0-25 m and 25-100 m / FO	>100m / FO	0-25 m and 25-100 m / FO	0-25 m and 25-100 m / FO	>100m / FO	0-25 m and 25-100 m / FO				
Linnet	<i>Carduelis cannabina</i>	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2		
Long-tailed tit	<i>Aegithalos caudatus</i>	0	0	0	0	6	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	8	
Magpie	<i>Pica pica</i>	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	
Meadow pipit	<i>Anthus pratensis</i>	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	4	
Mistle thrush	<i>Turdus viscivorus</i>	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	
Peregrine falcon	<i>Falco peregrinus</i>	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	
Pheasant	<i>Phasianus colchicus</i>	0	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	5
Pied wagtail	<i>Motacilla alba yarelli</i>	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	4
Redwing	<i>Turdus iliacus</i>	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Reed bunting	<i>Emberiza schoeniclus</i>	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	5
Robin	<i>Erithacus rubicola</i>	1	0	4	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	15
Rook	<i>Corvus frugilegus</i>	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	17
Snipe	<i>Gallinago gallinago</i>	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
Song thrush	<i>Turdus philomelos</i>	0	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	8
Sparrowhawk	<i>Accipiter nisus</i>	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Starling	<i>Sturnus vulgaris</i>	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Woodpigeon	<i>Columba palumbus</i>	0	8	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	47
Wren	<i>Troglodytes troglodytes</i>	1	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	8

A total of 36 species were observed at the existing facility during the winter transect surveys. Bird species observed in winter are typical of the habitats present at the existing facility.

There was only one observation of Buzzard during the winter transect surveys. This occurred at the northeast of the existing facility, when a bird was flushed from a tree and flew east, off the existing facility.

There was one observation of Peregrine Falcon during the winter transect surveys. This observation concerned a bird flying north over the grassed-over landfill, from TR-2 and was thought to be merely passing through the facility. This species is more frequent at coastal sites in winter.

There were no observations of Kestrel during the winter transect surveys. This may be due to the paucity of prey items such as rodents.

There was a continuous presence of gulls and corvids within the area of active landfill operations, which is to be expected and would deter birds of prey.

Meadow Pipit was scarce at the facility in winter. In addition, there were no records of Skylark during the winter transect survey. These two species tend to leave inland breeding sites during the winter months and are more frequent at coastal sites in winter. They tend to return to breeding sites from early February onwards. Meadow Pipit is a Red-Listed Species in Ireland, a species whose populations have declined by at least 50% over 25 years, in addition to other criteria, such as a decline in breeding range and non-breeding population decline (Colhoun and Cummins 2013).

There were no records of Golden Plover *Pluvialis apricaria* during the winter bird transect survey, or indeed, any other surveys carried out within the existing facility. There is no suitable habitat present within the existing facility for feeding or roosting Golden Plover. While some suitable habitat exists in the farmlands surrounding the facility, no Golden Plovers were observed or heard during winter survey work carried out at the facility.

There were no observations of Whooper Swan *Cygnus cygnus* during the winter bird transect surveys, or any other surveys carried out in winter. There is no suitable habitat present at the facility for wintering Whooper Swan in the form of flooded fields/callows for roosting/feeding or grassland for feeding. There is no suitable habitat in the surrounding hinterland either. The arable fields surrounding the facility are deemed too small and enclosed by tall treelines and hedgerows. These two species like to have a broad, uninterrupted view of the surrounding hinterland, while feeding or roosting.

While it must be pointed out that dedicated Whooper Swan and Golden Plover vantage point surveys to record overflying birds at dusk or night were not carried out during this survey period, winter survey work to determine the presence/absence of these two species is ongoing at the facility, and surveys will be carried out in the winter of 2019 and 2020.

Table 5 shows the SPA sites within 100 km of the existing facility that list Golden Plover and/or Whooper Swan as special conservation interests. There are 10 SPA sites within 100 km, with the Boyne Estuary SPA (code 004080) closest at 14.7 km north east of the existing facility. Golden Plover are listed as special interests at seven of the SPA sites and Whooper Swan at five.

I-WeBS counts by birdwatch Ireland from 2006/07 to 2015/16 show a mean number of 606 Golden Plover recorded at this site with a peak number of 1,800 recorded during the winter of 2012/13. The mean count during the same period for the River Nanny SPA located c. 17 km from the site was 145 Golden Plover with a peak number of 450 in the winter of 2009/10.

**Table 3-3: SPAs within 100 km of Knockharley existing facility with Golden Plover and/or Whooper Swan as special conservation interests**

Species	SPA (site code)	Distance from existing facility
Golden Plover	Boyne Estuary SPA (004080)	Ca. 14.7 km northeast
Golden Plover	River Nanny Estuary and Shore SPA (004158)	Ca. 17.4 km east
Golden Plover	Dundalk Bay SPA (004026)	Ca. 29 km northeast
Golden Plover	Malahide Estuary SPA (004025)	Ca. 29 km southeast
Golden Plover	Baldoyle Bay SPA (004016)	Ca. 36 km southeast
Golden Plover	North Bull Island SPA (004006)	Ca. 38.3 km southeast
Whooper Swan	Lough Iron SPA (004046)	Ca. 61 km west
Whooper Swan	Glen Lough SPA (004045)	Ca 61 km west
Whooper Swan	Lough Oughter Complex SPA (004049)	Ca. 70 km northwest
Golden Plover	Lough Ree SPA (004064)	Ca. 87 km west
Whooper Swan	Lough Ree SPA (004064)	Ca. 87 km west
Golden Plover	Middle Shannon Callows SPA (004096)	Ca. 97 km southwest
Whooper Swan	Middle Shannon Callows SPA (004096)	Ca. 97 km southwest

Table 6 shows the winter distribution and numbers of wintering Golden Plover and Whooper Swan, obtained from annual Irish Wetland Bird Surveys (IWeBS) carried out at dedicated survey sites, within 50 km of Knockharley Landfill.

Within 50 km of the Knockharley facility there are two I-WeBS sites:

- Killiner Quarry, Drogheda (site code: 02201) – 13 km northeast of existing facility;
- River Boyne, Rossnaree (site code: 0V301) – ca. 6 km northeast of existing facility.

Records of Golden Plover and/or Whooper Swan were only recorded at River Boyne, Rossnaree (site code: 0V301). See Table 6 below for records.

**Table 3-4: Records of Golden Plover and Whooper Swan from River Boyne, Rossnaree (code 0V301) I-WeBS site**

SPA_Name	National	International	2006/07	2007/08	2008/09	2009/10	2010/11	2011/12	2012/13	2013/14	2014/15	2015/16	Mean
Golden Plover	1200	9300	31	300	50	90	553	600	1800	300	300	30	606
Whooper Swan	150	270	11	46	247	152	82	9	10	27	32	27	21

### 3.6.2 Breeding Birds

The results of the breeding bird transects is shown in Table 7 below.

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Table 3-5: Bird species recorded from all transects within the study area, during summer birds transect surveys.<sup>3</sup>

Common name	Scientific name	Transect 1		Transect 2		Transect 3		Transect 4		Transect 5		Breeding status <sup>4</sup>														
		Visit 1		Visit 2		Visit 1		Visit 2		Visit 1			Visit 2													
		0-25 m and 25-100 m	>100m / FO	0-25 m and 25-100 m	>100m / FO	0-25 m and 25-100 m	>100m / FO	0-25 m and 25-100 m	>100m / FO	0-25 m and 25-100 m	>100m / FO		0-25 m and 25-100 m	>100m / FO												
Blackbird	<i>Turdus merula</i>	3	3	1	0	0	0	4	1	0	0	5	0	1	0	0	0	3	0	0	0	0	17	Pr		
Blackcap	<i>Sylvia atricapilla</i>	0	0	0	0	0	0	4	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	10	Pr	
Blue tit	<i>Parus caeruleus</i>	0	0	0	0	0	0	1	0	0	0	1	0	2	0	0	0	0	0	0	0	0	0	6	Pr	
Bullfinch	<i>Pyrrhula pyrrhula</i>	0	0	0	0	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	3	Pr	
Buzzard	<i>Buteo buteo</i>	0	1	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	NB	
Chaffinch	<i>Fringilla coelebs</i>	2	0	1	0	0	6	0	2	0	3	1	0	0	0	4	2	0	2	0	0	0	0	24	Pr	
Chiffchaff	<i>Phylloscopus collybita</i>	1	0	0	0	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	3	Po	
Coal tit	<i>Periparus atter</i>	1	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	4	Pr	
Cuckoo	<i>Cuculus canorus</i>	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	F	
Duncock	<i>Prunella modularis</i>	1	0	0	0	0	1	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	3	Pr	
Goldcrest	<i>Regulus regulus</i>	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	0	0	0	0	0	3	Pr	
Goldfinch	<i>Carduelis carduelis</i>	3	0	0	0	0	0	0	0	1	2	3	0	0	0	0	0	0	0	0	0	0	0	0	7	Pr
Great tit	<i>Parus major</i>	1	0	0	0	2	2	0	0	1	0	2	0	1	0	0	0	0	0	0	2	0	0	0	9	Pr
Greenfinch	<i>Carduelis chloris</i>	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	Pr
Heron	<i>Ardea cinerea</i>	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	F
Herring gull	<i>Larus argentatus</i>	0	4	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	F
Hooded crow	<i>Corvus corone</i>	0	5	3	0	0	7	1	0	18	18	15	0	1	17	2	0	0	0	0	0	2	0	0	42	Po
House martin	<i>Delichon urbica</i>	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	NB

<sup>3</sup> Colour corresponds to BoCCI conservation status. Annex 1 species highlighted in Bold.

<sup>4</sup> Pr = probable breeder, NB = non-breeding, Po = possible breeder, F = flyover and C = confirmed breeding

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Common name	Scientific name	Transect 1				Transect 2				Transect 3				Transect 4				Transect 5				Breeding status <sup>4</sup>						
		Visit 1		Visit 2		Visit 1		Visit 2		Visit 1		Visit 2		Visit 1		Visit 2		Visit 1		Visit 2								
		0-25 m and 25-100 m	>100m / FO	0-25 m and 25-100 m	>100m / FO	0-25 m and 25-100 m	>100m / FO	0-25 m and 25-100 m	>100m / FO	0-25 m and 25-100 m	>100m / FO	0-25 m and 25-100 m	>100m / FO	0-25 m and 25-100 m	>100m / FO	0-25 m and 25-100 m	>100m / FO	0-25 m and 25-100 m	>100m / FO	0-25 m and 25-100 m	>100m / FO		0-25 m and 25-100 m	>100m / FO				
House sparrow	<i>Passer domesticus</i>	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	C
Jackdaw	<i>Crocyus monedula</i>	0	1	0	0	1	5	0	0	4	1	8	0	0	0	0	0	0	0	0	0	0	0	0	0	0	13	C
Jay	<i>Garrulus glandarius</i>	0	0	0	0	1	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	Po	
Lesser black-backed gull	<i>Larus fuscus</i>	0	1	0	0	0	1	0	0	0	6	0	64	0	0	0	0	0	0	0	0	0	0	0	0	0	0	F
Lesser redpoll	<i>Carduelis cabaret</i>	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	1	Po	
Linnet	<i>Carduelis cannabina</i>	0	0	0	0	0	0	0	0	0	0	14	0	0	0	0	0	0	0	0	0	0	0	0	0	14	Po	
Magpie	<i>Pica pica</i>	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	1	2	0	0	0	0	0	0	0	2	Po	
Meadow pipit	<i>Anthus pratensis</i>	0	0	0	0	1	0	0	0	0	0	6	0	0	0	0	0	0	0	0	0	0	0	0	0	7	Po	
Mute swan	<i>Cygnus alor</i>	0	0	0	0	0	0	0	0	0	0	7	0	0	0	0	0	0	0	0	0	0	0	0	0	7	C	
Pheasant	<i>Phasianus colchicus</i>	1	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	2	0	0	3	0	7	Po	
Pied wagtail	<i>Motacilla alba</i>	0	2	0	0	1	0	0	0	1	0	0	0	0	0	3	4	0	0	0	1	0	0	0	0	6	C	
Raven	<i>Corvus corax</i>	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	1	Pr	
Reed bunting	<i>Emberiza schoeniclus</i>	2	0	0	0	0	0	4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	6	C	
Robin	<i>Erithacus rubicola</i>	1	2	2	0	2	0	0	0	1	0	1	0	0	1	0	0	0	0	2	0	2	0	0	0	12	C	
Rook	<i>Corvus frugilegus</i>	0	7	0	7	0	31	0	5	26	9	0	20	0	10	0	10	0	0	7	0	5	0	0	0	26	NB	
Skylark	<i>Alauda arvensis</i>	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	1	Pr	
Song thrush	<i>Turdus philomelos</i>	1	1	0	0	3	1	0	0	1	0	0	0	0	1	0	2	0	0	2	0	0	0	0	0	10	Pr	
Starling	<i>Sturnus vulgaris</i>	1	2	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	5	0	0	0	0	0	1	NB	

Section 3

Knockharley Landfill Ltd.  
Bird Survey Report 2018/19

Common name	Scientific name	Transect 1				Transect 2				Transect 3				Transect 4				Transect 5				Breeding status <sup>1</sup>	
		Visit 1		Visit 2		Visit 1		Visit 2		Visit 1		Visit 2		Visit 1		Visit 2		Visit 1		Visit 2			
		0-25 m and 25-100 m	>100m / FO	0-25 m and 25-100 m	>100m / FO	0-25 m and 25-100 m	>100m / FO	0-25 m and 25-100 m	>100m / FO	0-25 m and 25-100 m	>100m / FO	0-25 m and 25-100 m	>100m / FO	0-25 m and 25-100 m	>100m / FO	0-25 m and 25-100 m	>100m / FO	0-25 m and 25-100 m	>100m / FO	0-25 m and 25-100 m	>100m / FO		
Stonechat	<i>Saxicola torquata</i>	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	1	Pr
Swallow	<i>Hirundo rustica</i>	0	4	0	20	0	11	0	11	0	4	0	0	0	0	2	0	0	0	0	8	0	NB
Tree sparrow	<i>Passer montanus</i>	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	1	Pr
Willow warbler	<i>Phylloscopus trochilus</i>	2	0	0	0	2	2	3	0	2	0	4	0	4	0	1	0	0	0	0	0	14	Pr
Wood pigeon	<i>Columba palumbus</i>	1	18	2	0	5	12	3	0	1	2	3	0	3	0	2	42	5	0	7	25	32	Pr
Wren	<i>Troglodytes troglodytes</i>	2	0	0	0	2	0	5	0	1	0	3	0	3	0	1	0	0	0	0	0	14	Pr

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Additional species recorded during the breeding raptor survey can be seen in Table 8 below.

**Table 3-6: Additional bird species recorded within the study area during summer breeding raptor surveys<sup>5</sup>**

Common Name	Scientific Name	08/07/2019	07/08/2019	Notes	Breeding status <sup>6</sup>
Barn Swallow	<i>Hirundo rustica</i>	37	25	Breed in sheds at the entrance and one pair in the falcon shed. Very common at the facility in summer	C
Blackbird	<i>Turdus merula</i>	4	1	Common at the facility	Pr
Blackcap	<i>Sylvia atricapilla</i>	4	-	Frequent summer breeder	Pr
Blue Tit	<i>Parus caeruleus</i>	-	3	Scarce on facility	Pr
Bullfinch	<i>Pyrrhula pyrrhula</i>	2	1	Scarce on facility	Pr
Chaffinch	<i>Fringilla coelebs</i>	6	6	Frequent at the facility	Pr
Chiffchaff	<i>Phylloscopus collybita</i>	1	-	Scarce on facility	Po
Coal Tit	<i>Parus ater</i>	1	1	Scarce on facility	Po
Dunnock	<i>Prunella modularis</i>	1	1	Occasional at the facility	Pr
Goldcrest	<i>Regulus Regulus</i>	1	2	Scarce on facility	Pr
Goldfinch	<i>Carduelis carduelis</i>	2	19	Flock of 15 along TR-3 on 7/8	Pr
Great Tit	<i>Parus major</i>	5	5	Frequent at the facility	Pr
Great Black-backed Gull	<i>Larus marinus</i>	3	-	A scarce bird at the active landfill	NB
Greenfinch	<i>Carduelis chloris</i>	1	1	A scarce bird on facility	Pr
Grey Heron	<i>Ardea cinerea</i>	1	1	Southern surface water attenuation pond at TR-3	F

<sup>5</sup> Colour corresponds to BoCCI conservation status. Annex I species highlighted in Bold.

<sup>6</sup> Pr = probable breeding, NB = non-breeding, Po = possible breeder, F = flyover and C = confirmed breeding



Common Name	Scientific Name	08/07/2019	07/08/2019	Notes	Breeding status <sup>6</sup>
Grey Wagtail	<i>Motacilla cinerea</i>	1	-	Immature bird at the southern surface water attenuation pond on TR-2	C
Herring Gull	<i>Larus argentatus</i>	72	4	All observed with Lesser Black-backed Gulls	F
Hooded Crow	<i>Corvus corone</i>	8	12	Common over the facility	Po
House Martin	<i>Delichon urbica</i>	19	2	19 feeding over southern surface water attenuation pond.	NB
Jackdaw	<i>Corvus monedula</i>	25	-	Common at the facility	C
<b>Kingfisher</b>	<i>Alcedo atthis</i>	-	1	Flushed at the southern surface water attenuation pond. No evidence of breeding	NB
Lesser Black-backed Gull	<i>Larus Fuscus</i>	240	108	Large build up in July on excavated soil, east of TR-3	F
Linnet	<i>Carduelis cannabina</i>	14	5	South of grassed over landfill along TR-3	Po
Meadow Pipit	<i>Anthus pratensis</i>	8	-	Frequent in summer. Mainly over the grassed over land fill and grasslands at the north of the facility	Po
Moorhen	<i>Gallinula chloropus</i>	1	-	Southern surface water attenuation pond at TR-2	Po

Common Name	Scientific Name	08/07/2019	07/08/2019	Notes	Breeding status <sup>6</sup>
Mute Swan	<i>Cygnus olor</i>	5	5	Two adults and five cygnets at southern surface water attenuation pond along TR-3. Three cygnets in the July and August count	C
Pheasant	<i>Phasianus colchicus</i>	1	1	Frequently heard at the facility	Po
Pied Wagtail	<i>Motacilla alba yarelli</i>	5	4	Common at the facility	C
Reed Bunting	<i>Emberiza schoeniclus</i>	5	-	Common at the at the southern surface water attenuation pond	C
Robin	<i>Erithacus rubicola</i>	6	3	Common on-facility	C
Rook	<i>Corvus frugilegus</i>	29	-	Very common at the facility	NB
Sedge Warbler	<i>Emberiza schoeniclus</i>	-	1	An immature west of falcon shed along TR-2. Did not breed at the facility	Po
Song Thrush	<i>Turdus philomelos</i>	1	-		Pr
Sparrowhawk	<i>Accipiter nisus</i>	-	1	Flushed from hedgerow at southern surface water attenuation pond	Po
Stock Dove	<i>Columba oenas</i>	4	1	Grassed-over landfill	Po
Tree Sparrow	<i>Passer montanus</i>	2	-	Flushed from grassed-over landfill	Pr
Willow Warbler	<i>Phylloscopus trochilus</i>	6	6	Common summer visitor	C
Woodpigeon	<i>Columba palumbus</i>	11	5	Common at the facility	Pr
Wren	<i>Troglodytes troglodytes</i>	2	2	Common at the facility	Pr

A total of 42 species were recorded during the summer breeding bird transect surveys, and species observed are typical of the habitats present at the facility. An additional eight species were also recorded during breeding raptor surveys.

There was a greater number of species recorded during the summer transect surveys than the winter, due to the number of migrant birds returning to the facility to breed. Typical migrant species include Blackcap, Chiffchaff, Willow Warbler, Swallow and House Martin.

Meadow Pipit numbers increased at the facility during the summer period, due to returning birds from coastal or lowland areas. Skylark remained very scarce, with only one record from the grassed-over landfill outside the footprint of the proposed development. Skylark is an Amber-listed species in Ireland, a species that has undergone a moderate decline in abundance of between 25% and 49% over the past 13 years. (Colhoun and Cummins 2013).

There was only one observation of Cuckoo in the early summer, a Green-Listed species.

There were a number of notable bird observations from the area of the grassed-over landfill. While this part of the existing facility was not included in the transect surveys it could be viewed looking north and west from TR-2 and east, from TR-3. In addition, the raptor vantage point survey was carried out from the top of this landfill and was frequently visited.

Three species were recorded from this area of the existing facility and nowhere else, and the birds recorded appeared to remain faithful to this part of the existing facility. These included Stock Dove, Tree Sparrow and Stonechat. Stock Dove has undergone a significant range contraction in Ireland over the past forty years (Balmer *et al.* 2013). Tree Sparrow numbers appear to be stable, and the Irish population is mainly concentrated in the east and southeast of the island (Balmer *et al.* 2013). However, it still remains a scarce bird throughout much of its range. Stonechat numbers suffered a serious population crash during the harsh winters of 2009/10 and 2010/11 but their numbers have increased in subsequent years (Balmer *et al.* 2013). The grassed-over landfill area outside the footprint of the proposed development remains an important bird habitat for these three species, which are Amber-Listed.

The surface water attenuation pond and associated wetland at the south of the facility is also an important bird habitat. A number of species were recorded from this habitat and nowhere else within the existing facility. These included Kingfisher (discussed in 3.5), Grey Heron, Grey Wagtail, Reed Bunting, Mute Swan and Moorhen. The pond was also an important feeding area for hirundines such as Barn Swallow and House Martin. Grey Wagtail is a Red-Listed Species.

Kingfisher, Barn Swallow and House Martin are Amber-Listed species. Grey Heron and Moorhen are Green-Listed, species that are currently of favourable conservation status.

There was only one observation of Sparrowhawk at the existing facility during the summer bird survey where an individual was flushed from the area of the southern attenuation pond. While this species may breed in the surrounding woodland, there were no other sightings.

There were only three observations of Common Buzzard during the summer transect survey and no observations of Kestrel. In general, birds of prey are scarce at the existing facility in summer, which may be a reflection of lack of prey items and disturbance due to corvids and gulls.

Contrary to the initial findings of the EIAR on avifauna at the facility, there is little or no suitable habitat for breeding Yellowhammer, a Red-Listed species. There is no arable land within the existing facility a favoured habitat for foraging Yellowhammer. While the hedgerows at the north and northeast of the facility may afford some habitat, none were observed or heard at this part of the existing facility, during the summer bird surveys. The surrounding farmland may hold some birds, but none were heard or observed during the surveys.

### 3.7 Barn Owl Survey

There was no evidence of Barn Owl present or nesting at the facility. It was found that the majority of woodland at the facility was deemed too immature. No hollow trees or nest boxes were located during the Barn Owl surveys. The only suitable buildings that could potentially hold breeding Barn Owls were at a farm to the northeast of the facility. There was no evidence that Barn Owls were present at this location during the survey period.

There were no direct observations of Barn Owls during any of the existing facility surveys. It is thought that the lack of prey items due to vermin control may be a factor.

### 3.8 Summary of Bird Survey Results

Table 9 provides a summary of the bird assessment for rare/threatened and/or protected bird species only. It contains information from the EIAR and is updated to include the 2018/19 desktop and field studies. It outlines whether a bird species recorded during the desktop study was subsequently recorded within the existing facility during the bird surveys that took place from 2010 – 2019 and the potential for the species to utilise the existing facility. Note, results are combined from both winter and summer surveys.

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Table 3-7: Bird Survey Summary Results for Threatened/Rare and/or Protected Species

Common Name (Scientific Name)	Desktop Study (NBDC & NPWS)	2010 Survey	2015 Survey	2016 Survey	2018/19 Survey	Notes	Potential for species to utilise the existing facility
Barn Owl ( <i>Tyto alba</i> )	✓	✗	✗	✗	✗	None observed during surveys	Only suitable buildings on farm to northeast of facility. However the was no evidence of these building being used by Barn Owl
Barn Swallow ( <i>Hirundo rustica</i> )	✓	✓	✗	✗	✓	Recorded during surveys	Ponds provide feeding habitat. Confirmed breeding at sheds at facility entrance and in falcon shed
Black-headed Gull ( <i>Larus ridibundus</i> )	✓	✗	✓	✓	✓	Recorded during surveys	Landfill provides feeding habitat
Buzzard ( <i>Buteo buteo</i> )	✗	✗	✗	✓	✓	Recorded during surveys	Feeding habitat and some suitable breeding habitat to north of existing facility
Common Coot ( <i>Fulica atra</i> )	✓	✗	✗	✗	✗	Recorded as additional species 2010-2016 (outside of surveys)	Southern attenuation pond and reed bed suitable feeding/breeding habitat
Common Kestrel ( <i>Falco tinnunculus</i> )	✓	✗	✓	✗	✗	Recorded only once in 2015 survey	Paucity of prey species likely makes facility unsuitable feeding habitat
Common Kingfisher ( <i>Alcedo atthis</i> )	✓	✗	✗	✗	✓	Recorded once in 2019 survey.	Southern attenuation pond and reed bed suitable for transient but not breeding birds
Common Linnet ( <i>Carduelis cannabina</i> )	✓	✓	✗	✓	✓	Recorded in majority of transect surveys.	Small amounts of suitable habitat on existing facility margins and over-grassed area.
Common Pheasant ( <i>Phasianus colchicus</i> )	✓	✓	✓	✓	✓	Recorded in all transect surveys.	Suitable feeding habitat near farm
Common Sandpiper ( <i>Actitis hypoleucos</i> )	✓	✗	✗	✗	✗	Not recorded in surveys.	Attenuation ponds and reed beds could provide suitable feeding habitat.

Common Name (Scientific Name)	Desktop Study (NBDC & NPWS)	2010 Survey	2015 Survey	2016 Survey	2018/19 Survey	Notes	Potential for species to utilise the existing facility
Common Snipe ( <i>Gallinago gallinago</i> )	✓	✗	✗	✗	✓	Recorded once in transect survey in 2018/19	Very little breeding habitat. Only one observation during the winter season.
Common Starling ( <i>Sturnus vulgaris</i> )	✓	✗	✓	✓	✓	Recorded in most surveys.	Limited feeding habitat, mainly to north of facility
Common Swift ( <i>Apus apus</i> )	✓	✗	✗	✗	✗	Not recorded in any surveys.	Pond habitats suitable for foraging.
Common Wood Pigeon ( <i>Columba palumbus</i> )	✓	✓	✓	✓	✓	Recorded in all surveys.	Suitable habitats surrounding facility
Cormorant ( <i>Phalacrocorax carbo</i> )	✓	✗	✗	✗	✗	Not recorded in any surveys.	Habitats largely unsuitable for foraging.
Eurasian Tree Sparrow ( <i>Passer montanus</i> )	✓	✗	✗	✗	✓	Recorded in one transect survey in 2019.	Grassed-over landfill area (outside footprint) provides important habitat
Eurasian Woodcock ( <i>Scolopax rusticola</i> )	✓	✗	✗	✗	✗	Not recorded in any surveys.	Limited wader habitat available.
Goldcrest ( <i>Regulus regulus</i> )	✗	✓	✓	✓	✓	Recorded in all surveys.	Suitable feeding / breeding habitat on facility margins
Golden Plover ( <i>Pluvialis apricaria</i> )	✓	✗	✗	✗	✗	Not recorded in any surveys.	Limited feeding/roosting habitat available within facility. Some suitable habitat exists in the farmlands surrounding the existing facility, but no golden plovers were observed or heard during winter survey work carried out at the existing facility.
Greenfinch ( <i>Carduelis chloris</i> )	✗	✗	✗	✗	✓	Recorded in 2018/19 surveys only.	Some limited feeding habitat near facility entrance

Common Name (Scientific Name)	Desktop Study (NBDC & NPWS)	2010 Survey	2015 Survey	2016 Survey	2018/19 Survey	Notes	Potential for species to utilise the existing facility
Great Black-backed Gull ( <i>Larus</i> )	x	x	x	x	✓	Recorded in 2018/19 surveys only.	Feeding habitat on landfill
Grey Heron ( <i>Ardea cinerea</i> )	✓	x	x	✓	✓	Recorded in 2016 and 2018/19 surveys.	Ponds provide feeding habitat.
Grey Wagtail ( <i>Motacilla cinerea</i> )	x	x	x	x	✓	Recorded in 2018/19 surveys only.	Ponds provide feeding habitat. Confirmed breeding so suitable breeding habitat present near ponds.
Herring Gull ( <i>Larus argentatus</i> )	✓	✓	✓	✓	✓	Recorded in all surveys.	Feeding habitat on landfill
House Martin ( <i>Delichon urbicum</i> )	✓	x	x	x	✓	Recorded once in 2019 surveys.	Ponds provide feeding habitat.
House Sparrow ( <i>Passer domesticus</i> )	✓	x	x	x	✓	Recorded once in 2019 surveys.	Some suitable habitat on facility margins. Confirmed breeding.
Lesser black-backed gull ( <i>Larus fuscus</i> )	x	✓	✓	✓	✓	Recorded in all surveys.	Feeding habitat on landfill
Mallard ( <i>Anas platyrhynchos</i> )	✓	✓	x	x	x	Recorded once in 2010.	Attenuation pond / reed bed suitable habitat for feeding and breeding.
Meadow Pipit ( <i>Anthus pratensis</i> )	x	✓	✓	✓	✓	Recorded in all surveys.	Some habitat on grassed-over areas suitable.
Mew Gull ( <i>Larus canus</i> )	✓	✓	x	x	✓	Recorded in 2010 and 2018/19 surveys.	Feeding habitat on landfill
Mistle Thrush ( <i>Turdus viscivorus</i> )	x	x	x	✓	✓	Recorded in 2016 and 2018/19 surveys.	Suitable habitat within forestry.

Common Name (Scientific Name)	Desktop Study (NBDC & NPWS)	2010 Survey	2015 Survey	2016 Survey	2018/19 Survey	Notes	Potential for species to utilise the existing facility
Moorhen ( <i>Gallinula chloropus</i> )	✓	✗	✗	✗	✓	Recorded in 2018/19 surveys only.	Ponds provide feeding habitat.
Mute Swan ( <i>Cygnus olor</i> )	✓	✗	✗	✗	✓	Recorded in 2018/19 surveys only.	Ponds provide feeding/breeding habitat. Confirmed breeding.
Northern Lapwing ( <i>Vanellus vanellus</i> )	✓	✗	✗	✗	✗	Not recorded in any surveys.	Limited suitable habitat present
Peregrine Falcon ( <i>Falco peregrinus</i> )	✓	✗	✗	✗	✓	Recorded in 2018/19 surveys.	Limited feeding and breeding habitat
Robin ( <i>Erithacus rubecula</i> )	✗	✓	✓	✗	✓	Recorded in all surveys.	Abundant suitable feeding/breeding habitat on facility margins. Confirmed breeding.
Ringed Plover ( <i>Charadrius hiaticula</i> )	✓	✗	✗	✗	✗	Not recorded in any surveys.	Limited wader breeding habitat.
Rock Pigeon ( <i>Columba livia</i> )	✓	✗	✗	✗	✗	Not recorded in any surveys.	Limited breeding habitat.
Sand Martin ( <i>Riparia riparia</i> )	✓	✗	✗	✗	✗	Not recorded in any surveys (recorded as additional species outside surveys only).	No breeding habitat; feeding habitat present at ponds.
Sky Lark ( <i>Alauda arvensis</i> )	✓	✓	✗	✗	✓	Recorded in 2010 and 2018/19 surveys.	Small amount breeding habitat present; some over-grassed areas suitable.
Sparrowhawk ( <i>Accipiter nisus</i> )	✗	✗	✗	✗	✓	Recorded in 2018/19 surveys only.	Suitable breeding habitat to north of existing facility



Common Name (Scientific Name)	Desktop Study (NBDC & NPWS)	2010 Survey	2015 Survey	2016 Survey	2018/19 Survey	Notes	Potential for species to utilise the existing facility
Spotted Flycatcher ( <i>Muscicapa striata</i> )	✓	x	x	✓	x	Recorded in 2016 surveys only.	Some limited feeding habitat.
Stock Dove ( <i>Columba oenas</i> )	x	x	x	x	✓	Recorded in 2018/19 surveys only.	Grassed-over landfill area provides important feeding habitat
Stonechat ( <i>Saxicola rubicola</i> )	x	x	x	✓	✓	Recorded in 2016 and 2018/19.	Grassed-over landfill area provides important feeding habitat; potential breeding habitat in scrubby margins
Whooper Swan ( <i>Cygnus cygnus</i> )	✓	x	x	x	x	Not recorded in any surveys.	No suitable habitats present within facility in the form of flooded fields/callows for roosting/feeding or grassland for feeding. There is no suitable habitat in the surrounding hinterland either. The arable fields surrounding the existing facility are deemed too small and enclosed by tall treelines and hedgerows. This species like to have a broad, uninterrupted view of the surrounding hinterland, while feeding or roosting.
Yellowhammer ( <i>Emberiza citrinella</i> )	✓	x	✓	x	x	Recorded in 2015 surveys only.	Limited suitable breeding habitat present.

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## 4 IMPACT ASSESSMENT

In the following section the impacts on birds as determined in the EIAR are included verbatim (with grey background and original numbering). Any changes, additions or notes arising from the current assessment based on additional data included in bold below the relevant paragraph.

**Thirty-four bird species have been recorded within 10 km of the existing facility (NBDC and NPWS). Evidence of 24 (in 2010), 26 (in 2015), 33 (in 2016) and 58 (in 2019) birds were recorded within the existing facility boundary during field surveys.**

**Knockharley Landfill Ltd. is applying for permission for the continuation of landfilling activities beyond 2021. Construction of the proposed development will be phased.**

**Given the potential of some bird species to utilise the existing facility, it is possible that they may be negatively impacted by the proposed development.**

### 4.1 Construction Phase

The following section details the potential impacts to birds during the construction phase of the development in absence of mitigation. The potential impact to birds is considered in section 10.5.2.4 of the EIAR.

#### 4.1.1 General Avifauna

##### 10.5.2.4 Fauna

##### Potential Impacts on Birds

No Annex I birds of the EU Birds Directive were recorded on the site. Three red-listed species of conservation concern (Meadow Pipit, Herring Gull and Black-headed Gull) were recorded from the subject site. A flock of 200 Herring Gulls was recorded at T3 in January 2016. A total number of 80 were recorded along the same transect during the previous month surveys in December. Herring Gull were recorded along T2 and T3 during the same period in lower numbers. Meadow Pipit were recorded along four of the transects and are a local resident species likely to forage within site on occasion. Eight Amber-listed species of medium conservation were recorded on the site, however the majority of these occurred in low numbers or are nationally abundant in Ireland. A flock of 500 Lesser Black-backed gulls was recorded at T3. The number and abundance of species recorded on the site was entirely typical of the range of habitats present and all are likely to be widespread in the wider environment.

The construction phase of the project will have the highest potential impacts on bird species in terms of disturbance and loss of nesting habitat. As discussed in Section 10.5.2.2 Habitats and Fauna, the construction phase will be short-term and will take place in a phased manner, which will allow disturbed birds to relocate to alternative suitable habitats on and adjacent to the site. During the construction phase a limited amount of hedgerow and treelines will be removed; as will 12.5ha of (in a phased manner); commercial woodland that will be felled whether the proposed development goes ahead or not. Following the construction phase, woodland will be replanted plus additional compensation planting. Whilst felling and replanting will be phased, regrowth of trees will take some time to provide the same level of foraging and nesting habitat for birds. The impact is therefore deemed to be a **Medium-Term Moderate Impact** for birds.

**[Addendum: Two Annex I bird species were recorded on existing facility during the 2019 surveys: Peregrine Falcon and Kingfisher. However, in both cases, the birds were not found to be using the facility for breeding and are thought to be passing through only. In addition to the three Red-listed species previously recorded for the EIAR, a further Red-Listed bird was recorded at the existing facility: Grey Wagtail. A further 12 Amber-Listed bird species were also recorded since the EIAR surveys.**

There may be some disturbance to bird species within the existing facility during the construction phase of the proposed development. However, this disturbance would be deemed to be short-lived and sporadic, as the proposed development will occur in stages. In addition, there is currently existing ongoing disturbance within the area in terms of daily landfill operations taking place at the facility. There will be no disturbance to bird species listed as qualifying interests for SPA sites. Herring gulls are listed as a qualifying interest for the River Nanny Estuary and Shore SPA (004158). This SPA is 17.4 km east of the existing facility, which is outside of the industry-standard zone of influence of 15 km. Herring Gulls were observed in numbers feeding at the existing facility during November and December winter transects in 2018 and January 2019. There is a hydrological link to the SPA via the River Nanny. However, the SPA is at considerable remove from Knockharley Landfill (instream distance of c. 23 km) and so it is unlikely the proposed development will significantly impact aquatic habitats at the SPA site. Similarly, the Herring Gulls observed during transect surveys were feeding in the face of considerable disturbance by vehicles. Therefore, it is highly unlikely the proposed development will significantly impact Herring Gull feeding in a negative way. Construction impacts on Herring Gull will therefore be *Temporary* and *Not significant*.

Further details for other birds listed as qualifying interests for nearby SPAs are provided in the appropriate sections below.

While there will be some alteration to habitats at the facility, with some land-take in the area of the proposed IBA Facility, the proposed Screening Berms with new replanting around this facility will reduce, somewhat, the habitat loss in this area.

Habitats predicted to be lost are discussed in further detail in the companion Botanical and Habitat report. Habitats selected as key ecological receptors include: Wet Grassland/Dry Meadows and Grassy Verges Mosaic (GS4/GS2), Dry Meadows and Grassy Verges (GS2), (Mixed) Broadleaved Woodland (WD1), Conifer Plantation (WD4), Mixed Broadleaved/Conifer Woodland (WD2) and Ornamental/Non-native Shrub/Scrub Mosaic (WS3/WS1).

The Permitted Landfill Cells to be constructed are already being excavated and lined, so further construction in this area will be minimal. The habitat has already been altered so there will be no further loss to bird habitat.

Spoil and Bare Ground (ED2) is the only habitat type where any bird species listed as a qualifying interest of a SPA have been recorded foraging. Herring Gulls, which are a qualifying interest of the River Nanny Estuary and Shore SPA (004158) have been recorded foraging (104 no. in winter and 110 no. flying over during the summer) in this habitat at the centre of Knockharley Landfill. It is unlikely that the existing facility provides important *ex-situ* foraging habitat for this species, as gulls are renowned generalists, foraging in a wide range of habitats. This habitat type is also very common in the wider landscape (e.g. ploughed fields not yet tilled) and so an excess of alternative foraging locations exist. Therefore, it is not envisaged that the loss of Spoil and Bare Ground (ED2) will have a significant negative effect on Herring Gulls from the River Nanny Estuary and Shore SPA.

There are no proposed habitat changes to the existing grassed-over landfill cells that have been shown to be important for certain bird species such as Stock Dove, Tree Sparrow and Stonechat, so no habitat loss will be envisaged in this area. As these landfill cells lie adjacent to existing landfill cells that are currently being filled, the level of disturbance in this area will remain similar to current levels.]

#### 4.1.2 Breeding Raptors

The Buzzard roosting site recorded in 2010 on the site is located outside of the footprint of the proposed development and will not be impacted by this project. Buzzards appear to be common on the site and do not appear to be impacted by the current levels of activity on the existing landfill site as evidenced by the observations of Buzzard in March 2015.

[Addendum: Annex I-listed Peregrine Falcon was observed flying through the existing facility on a single occasion during January 2019 winter transect surveys. However, there was no evidence of Peregrine and other raptors (including Buzzard) breeding within the facility, during the summer bird surveys. The construction phase of the development will take place in stages, over an extend

period of time. The construction phase will be carried out in conjunction with ongoing regular landfill operations that occur on a daily basis which currently result in localised disturbance due to noise and vehicular movement.

Annex I Peregrine Falcon is not listed a qualifying interest for either of the SPA sites within 15 km of the existing facility. They also favour cliffs and quarries for breeding sites; neither of which are present at Knockharley Landfill. It therefore extremely unlikely that they will be impacted by the proposed development and there are no European sites where they are listed as qualifying interests within the industry-standard 15 km zone of influence. Construction impacts for Peregrine Falcon are envisaged to be *Temporary* and *Imperceptible*.]

#### 4.1.3 Breeding Waders

The constructed wetland provides nesting habitat for Coot and probably a range of other aquatic birds and this habitat will not be impacted by the proposed development.

[Addendum: No breeding waders were observed within the existing facility during the 2019 summer breeding wader survey and other bird surveys. As a result, there will be no impact on breeding wader species during the construction phase of the development.]

#### 4.1.4 Kingfisher

The constructed wetland provides nesting habitat for Coot and probably a range of other aquatic birds and this habitat will not be impacted by the proposed development.

[Addendum: There was one sighting of Annex I-listed Kingfisher during the summer bird surveys. This occurred at the existing southern water attenuation pond and associated wetland. This Integrated Constructed Wetland system was constructed to a very high professional standard and represents the best example of habitat creation within the existing facility, in terms of habitat for birds and other taxa, such as Dragonflies and Damselflies (Odonata).

A single kingfisher was observed in flight on the Flemingstown (Knockharley) Stream during a walkover survey as part of aquatic surveys (see Tritirus, 2019 for further details). Given the poor water quality and overgrown nature of the stream, the bird likely utilised the nearby existing surface water attenuation pond where broader prey resource existed (e.g. three-spined stickleback, macro-invertebrates, amphibians etc).

Like the Kentstown and Veldonstown Stream, the Flemingstown supported three-spined stickleback locally but nevertheless offered poor water quality and poor overall fisheries potential, thus being less attractive to kingfisher. Although not recorded along the River Nanny, the river provided better foraging habitat in addition to a greater number of perches (for feeding) between sites 3 and 4. Overall the study area offered poor nesting potential for kingfisher given heavily scrubbed over banks with no nesting sites recorded during the walkover survey.

There are no changes proposed for this system in the proposed development plan, and any proposed activities that will take place during construction are at the north of the existing facility, at remove from the southern attenuation pond. If Kingfishers were found to be breeding at this location during the construction phase of the development, it is predicted there will be a *Temporary, Imperceptible* impact on this species at this location.

Kingfishers are listed as a qualifying interest of the River Boyne and River Blackwater SPA (site code 004232). This site is approximately 5 km to the north east of the existing facility. It is highly unlikely that any construction activities within the existing facility will impact this SPA owing to distance and the fact that it is within a different catchment area. The SPA is within the Boyne catchment and the existing facility is within the Nanny-Delvin catchment. Thus, no hydrological link exists between the two locations and so there is no mechanism by which the proposed development can impact water quality at the SPA. Furthermore, the Kingfisher observed at the existing facility during site surveys was judged to be a transient, passing through but not breeding or regularly feeding at the existing facility. There is no suitable breeding habitat at the existing landfill. Even if there were, Kingfishers are highly territorial. During the breeding season, they typically maintain territories 1 km in length (Fry *et al.* 1999).

As the River Boyne and River Blackwater SPA is 5 km from the existing facility, it is highly unlikely any Kingfishers within the SPA would use the existing facility for breeding. Therefore, it is not envisaged that there will be any significant negative effects on Kingfishers within the River Boyne and River Blackwater SPA (site code 004232).

The proposed development plan entails creation of a second Integrated Constructed Wetland to the north of the proposed IBA Facility. There may be some disturbance to some woodland bird species during this operation, but the long-term benefits, in terms of a second wetland system located within the existing facility, outweigh any short-term disturbance to birds currently utilising this area.]

#### 4.1.5 [Barn Owl](#)

[Addendum: No Barn Owls were observed within the existing facility during the summer Barn Owl Survey and other bird surveys. As a result, there will be no impact on Barn Owls during the construction phase of the development.]

## 4.2 Operational Phase

The following section details the potential impacts to birds during the operational phase of the development in absence of mitigation. The potential impact to birds is considered in section 10.5.3.4 of the EIAR.

### 4.2.1 [General Avifauna](#)

#### 10.5.3.4 Fauna

Mixed deciduous and coniferous trees felled will be replaced with native broadleaved trees which will be of higher ecological value to local wildlife. This woodland planting will provide cover and foraging habitat for local fauna. As these trees mature, they will also provide nesting habitat for birds.

This woodland will be commercial forestry and will therefore be felled in the future. Planting of deciduous woodland will have a **Positive Short-Term Moderate impact** on local fauna.

[Addendum: There will be disturbance within the area of the Permitted Landfill Cells during the operational phase. Over time, when the permitted landfill cells reach capacity, these cells will be grassed-over and will become a similar habitat to the constructed landfill area that currently support Stock Dove, Stonechat and Tree Sparrow, so it is possible that numbers of these species will increase within the existing facility, as this additional habitat matures. Thus, for these species there will be a **Positive Short-Term Moderate impact**.]

### 4.2.2 [Breeding Raptors](#)

[Addendum: It is thought that the proposed developments will be of a similar nature to the current landfill operations in terms of noise, vehicular activity and disturbance that currently take place at the existing facility and so will not have a significant impact on birds of prey flying over the existing facility.

The details of the existing and amended sections of powerlines are provided in Figure LW14-821-01-P-0000-003, Volume 4 of the main Proposed Site Layout Plan.

Detailed descriptions are also provided in Chapter 2 (Sections 2.1.1 and 2.2), Volume 2 of the EIAR. It is proposed to bring a new overhead supply to the proposed substation on the north west corner of the permitted development (Phase 7). This new supply will be an overhead 10kV/20kv line (subject to ESB recommendations) mounted on wooden poles 6 m to 8 m above existing ground levels parallel to and offset by approximately 7.5 m (subject to ESB recommendations) from the existing 220 KVA overhead pylons. The powerline shall be along the same corridor as the existing powerline at that location.

An existing section of overhead lines within the footprint of the proposed IBA shall require a minor diversion around the southern edge of the area. The existing overhead line located to the north of the administration building will be relocated to the south of the proposed IBA development. The power lines will, subject to ESB recommendations, be laid over ground mounted on wooden poles 6 m to 8 m above existing ground levels or in underground ducts. The alignment of both options will be parallel to and offset from the existing site access road by approximately 7.5 m to the north.

These proposed overhead lines provide only marginal diversions adjacent to existing overhead lines within the site. It must also be noted that there is a network of powerlines running through and around the perimeter of the landfill site currently and therefore these marginal diversions adjacent to existing lines will not be traversing new areas of habitat where powerlines were not previously present. Overall the proposed development shall result only in a marginal realignment of a small section of overhead powerlines within the site.

The presence of additional power lines may have a *Long-Term, Imperceptible impact* on birds of prey frequenting the existing facility. Further observations, including vantage point surveys may have to be carried out in order to determine if there are any adverse effects of the additional power lines on birds of prey flying over the area.

None of the raptors observed during surveys to date were recorded breeding within the existing facility. The only Annex I raptor observed in 2019 was Peregrine Falcon, but this bird was passing through the site and was not using it for feeding or breeding. As explained previously, no SPA sites where Peregrine Falcon is listed as a qualifying interest are present within 15 km of the existing facility. Coupled with the lack of suitable feeding/breeding habitats, it is extremely unlikely Peregrine Falcon will be impacted by the proposed development. Operational impacts for Peregrine Falcon are envisaged to be *Temporary and Imperceptible.*]

#### 4.2.3 [Breeding Waders](#)

[Addendum: There will be no impact on breeding waders during the operational phase, as no breeding waders were observed during any of the bird surveys.]

#### 4.2.4 [Kingfisher](#)

[Addendum: A single Kingfisher was observed during active landfill operations that are currently taking place, including frequent vehicular activity close to the wetland. As there are no proposed developments planned at this location, future developments will have an *Imperceptible Impact* on this species.

Kingfishers are listed as a qualifying interest of the River Boyne and River Blackwater SPA (site code 004232). This site is approximately 5 km to the north east of the existing facility. It is highly unlikely that any construction activities within the existing facility will impact this SPA owing to distance and the fact that it is within a different catchment area. The SPA is within the Boyne catchment and the existing facility is within the Nanny-Delvin catchment. Thus, no hydrological link exists between the two locations and so there is no mechanism by which the proposed development can impact water quality at the SPA. Furthermore, the Kingfisher observed at the existing facility during site surveys was judged to be a transient, passing through but not breeding or regularly feeding at the existing facility. There is no suitable breeding habitat at the existing landfill. Even if there were, Kingfishers are highly territorial. During the breeding season, they typically maintain territories 1 km in length (Fry *et al.* 1999). As the River Boyne and River Blackwater SPA is 5 km from the existing facility, it is highly unlikely any Kingfishers within the SPA would use the existing facility for breeding. Therefore, it is not envisaged that there will be any significant negative effects on Kingfishers within the River Boyne and River Blackwater SPA (site code 004232).

When the second Integrated Constructed Wetland to the north of the existing facility is created, it will complement the existing wetland system at the south of the existing facility and will further enhance the existing facility, in terms of habitat creation and additional wetland bird assemblage within the existing facility, including Kingfisher.]

#### 4.2.5 Barn Owl

**[Addendum: There will be no impact on Barn Owls during the operational phase, as no Barn Owls were observed during any of the bird surveys.]**

### 4.3 Decommissioning Phase

On cessation of waste acceptance at the facility, a restoration and aftercare plan will be put in place (please see Chapter 2 Description of the Proposed Development in Volume 2 of the EIAR) and any structures not required as part of the restoration and aftercare plan will be removed.

**[Addendum: During the removal of structures and restoration works there will be local *Short-Term Slight impacts* due to disturbance of birds in the absence of mitigation. There is not predicted to be any effects on bird species listed as qualifying interests in nearby SPAs.]**

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## 5 MITIGATION MEASURES

### 5.1 General Avifauna

#### Construction Phase

##### 10.6.1.1 Fauna and Flora

- In terms of habitats, treelines and hedgerows will be retained where possible. Where retention is not possible vegetation clearance and tree felling will be carried out outside of the bird breeding season (the bird breeding season is between 1st March – 31st August).
- Construction operations will take place during the hours of daylight to minimise disturbances to nocturnal mammal species, roosting birds or active nocturnal bird species.

##### 10.6.2 Operational Phase

- Excessive additional lighting around the site will be avoided. Lighting will be kept to minimum safe levels to reduce disturbance to nocturnal mammals and birds. Directional lighting will be used to prevent light disturbance in the surrounding area.

**[Addendum: With regard to the general avifauna that has been recorded at the facility, no additional mitigation beyond that in the EIAR is proposed. However, consideration should be given to the important bird species recorded in the area of the grassed-over landfill at the centre of the existing facility.]**

The numbers of Tree Sparrow, Stock Dove and Stonechat recorded in this area were low, and this habitat may only support these numbers. In addition, these species were present before any surveys took place and colonised this area because the right conditions were created/present, such as food and cover. Therefore, it is difficult to suggest mitigation for some of the species such as Stock Dove and Stonechat.

However, with regard to Tree Sparrow, it is known that they nest colonially. The provision of a cluster of nest boxes as an enhancement measure within the facility to further attract this species is recommended. The location to be decided, by an qualified ecologist.]

### 5.2 Breeding Raptors

**[Addendum: There is no mitigation proposed for breeding raptors, as there was no evidence of raptors breeding at the existing facility.]**

### 5.3 Breeding Waders

**[Addendum: There is no mitigation proposed for breeding waders as there was no evidence of waders frequenting or breeding at the existing facility.]**

### 5.4 Kingfisher

**[Addendum: The proposed creation of an additional Integrated Constructed Wetland within the existing facility, while in itself part of the development plan and important for the facility, represents the best mitigation that could be adopted for the existing facility, and more than offsets any habitat loss or alteration to existing habitats that may occur during the implementation of this project.]**

**The results of the summer bird surveys and observations at the wetland at the south of the existing facility show the additional diversity that occurs when the right ecological conditions are created and, more importantly, maintained, as this wetland is.**

**The implementation of the mitigation measures to protect water quality shall also benefit Kingfisher prey items downstream.]**

## **5.5 Barn Owl**

**[Addendum: While no Barn Owls were recorded within the existing facility during any of the summer bird surveys, consideration should be given to the erection of a Barn Owl nest box in the area of the farm, located at the northeast of the facility.]**

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## 6 RESIDUAL IMPACTS

**[Addendum: Taking into consideration the updated surveys and mitigation measures proposed, it is reconfirmed that there will be no significant residual impact to birds as per the EIAR.]**

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## 7 CONCLUSION

Avian surveys were continued during 2019 as required by the 2014 EIA Directive 2014/52/EU. Thirty-four bird species have been recorded within 10 km of the existing facility (NBDC and NPWS). Evidence of 24 (in 2010), 26 (in 2015), 33 in 2016 and 55 (in 2019) bird species were recorded within the existing facility boundary during the surveys.

No bird species have the potential to be significantly impacted by the proposed developments.

No bird species listed as qualifying interests for nearby SPA sites have the potential to be negatively affected by the proposed development owing to a combination of distance, location within different catchment areas, existence of alternative foraging habitats within wider landscape and lack of suitable habitats for breeding and feeding at the existing facility.

During the operational phase, birds are likely to continue using the facility and the new woodland created will provide habitat for cover and foraging. It is considered that the operational phase of the development will not result in a significant negative impact on any bird species.

Taking into consideration the results of the continued bird surveys, the habitat preferences of the birds recorded and the habitats within the existing facility and in the surrounding landscape, it can be concluded that the proposed development will not result in a significant negative residual impact on bird species.

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# Appendix 1

## Site Investigation Results

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**Table A: Vantage Point Survey Details**

Survey Type	VP no.	Date	Observer	Start Time	End Time	Cloud	Visibility	Rain	Wind
Vantage Point	1	21/06/2019	Joseph Adamson	10:00	16:00	2/8	Excellent	Dry	F2 SW
Vantage Point	1	08/07/2019	Joseph Adamson	10:00	16:00	8/8	Excellent	Dry	F<1 ESE
Vantage Point	1	07/08/2019	Joseph Adamson	10:00	16:00	8/8	Excellent	Occasional shower	F2-3 SW

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**Table B: VP Survey Results (flight lines)**

Survey type	Species	Flightpath number	Date	VP	Start time	End time	Observer	Cloud	Visibility	Rain	Wind	Bird notes
NO FLIGHT LINES WERE RECORDED DURING VP SURVEYS - RESULTS SHOWN BELOW ARE FOR BIRDS RECORDED DURING ADDITIONAL SURVEYS												
Breeding bird transect	Buzzard	No flightpath recorded	21/06/2019	N/A	N/A	N/A	Joseph Adamson	2/8	Excellent	Dry	F<1 ESE	Perched on telegraph pole
Breeding bird transect	Buzzard	N/A	21/06/2019	N/A	N/A	N/A	Joseph Adamson	2/8	Excellent	Dry	F<1 ESE	Mobbed by crows
Breeding waders	Sparrowhawk	N/A	07/08/2019	N/A	N/A	N/A	Joseph Adamson	8/8	Excellent	Occasional shower	F2-3 SW	Near southern attenuation pond

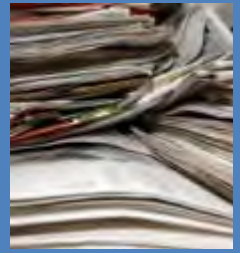
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# Appendix 2

## Knockharley Landfill bat surveys 2019

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# KNOCKHARLEY LANDFILL BAT SURVEYS 2019

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**CREATED FOR:**

Knockharley Landfill Ltd.



**CREATED:**

October 2019

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## 1 INTRODUCTION

This report details the results of the bat surveys carried out at Knockharley Landfill during 2019. This survey was undertaken to continue the ongoing environmental works at Knockharley Landfill in accordance with the EIA Directive 2014/52/EU. This report should be read in conjunction with Chapter 10 of Volume 2 of the Environmental Impact Assessment Report for Proposed Development at Knockharley Landfill (Fehily Timoney and Company, 2018) (EIAR).

Knockharley Landfill Ltd. proposes to further develop the existing facility as per the 2018 application for permission made directly to An Bord Pleanála. In addition to the desktop study, bat activity, emergence and static detector surveys were carried out within the boundary of the entire facility. The surveys were undertaken to confirm the information contained in the EIAR.

### 1.1 Bat Species

Bats belong to the Order Chiroptera and to date nine species are recorded as resident in Ireland. These nine species are divided into two families – Family Vespertilionidae which contain nine of our Irish species (Daubenton's bat *Myotis daubentonii*, Natterer's bat *Myotis nattereri*, Whiskered bat *Myotis mystacinus*, Leisler's bat *Nyctalus leisleri*, Brown Long-eared bat *Plecotus auritus*, Soprano Pipistrelle *Pipistrellus pygmaeus*, Common Pipistrelle *Pipistrellus pipistrellus* and Nathusius's Pipistrelle *Pipistrellus nathusii*) and one species in the family Rhinolophidae –the Lesser Horseshoe bat *Rhinolophus hipposideros*.

Brandt's bat *Myotis brandii* has only been recorded once in Ireland from a site in Co. Wicklow and is classified as a vagrant. In 2013 a single male Greater Horseshoe bat *Rhinolophus ferrumequinum* was recorded in Co. Wexford. This bat was also considered to be a vagrant. Knockharley is outside the distribution range for Lesser Horseshoe bat.

#### 1.1.1 Legislation

The serious decline in bat populations both in Ireland and across Europe has led to conservation measures and appropriate legislation being drawn up and implemented in an attempt to stabilise population numbers. It is estimated that bat populations across Europe have decreased by up to 60% in the last 30 years. As they are highly specialised animals, bats serve as biological indicators and are often amongst the first animal species to show signs of population change due to the activities of man. Destruction of roosts and foraging areas, coupled with the widespread use of pesticides, are the key reasons for the decline in numbers of bats in Ireland. Efforts should be made to retain known bat colonies and methods to lessen disturbance to these animals should be incorporated into any development.

Bats' dependency on insects has left them vulnerable to habitat destruction, land drainage, agricultural intensification and increased use of pesticides. Their reliance on buildings has also made them vulnerable to building repairs and the use of chemicals for timber treatment.

Roosting or hibernation sites in trees and disused buildings are also often lost to development.

#### Irish Legislation

In the Republic of Ireland, under Schedule 5 of the Wildlife Acts 1976 to 2018 all bats and their roosts are protected by law. It is an offence to disturb either without the appropriate licence. This Act was further strengthened by the Wildlife Amendment Act 2000.

#### E.U. Legislation

Under the Habitats Directive 1992 (EEC 92/43), each member state of the E.U. was requested to identify habitats of national importance and priority species of flora and fauna. These habitats are now designated as Special Areas of Conservation (SAC).

In Ireland, all bat species, except one are classified as Annex IV species under the Habitats Directive. Annex IV species are species in need of strict protection. The exception is the Lesser Horseshoe bat which is an Annex II species (Priority Species). Annex II species require the designation of Special Areas of Conservation specifically for their protection.

All species of bat in Ireland are strictly protected under the Habitats Directive to include deliberate disturbance of these species, particularly during the periods of breeding, rearing and hibernation. It also specifies deterioration or destruction of breeding or resting places.

### International Legislation

Ireland has ratified two international wildlife laws pertaining to bats:

- a) The Convention on the Conservation of European Wildlife and Natural Habitats (Bern Convention, 1982) – part of this convention stipulates that all bat species and their habitats are to be conserved.
- b) The Convention on the Conservation of Migratory Species of Wild Animals (Bonn Convention 1979, Enacted 1983). This was instigated to protect migrant species across all European boundaries.

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## 2 METHODOLOGY

### 2.1 Desktop Study

A desktop study was carried out to collate and review available information, datasets and documentation sources pertaining to the site's natural environment. It involved an examination of bat species recorded within the 10km grid square in which the existing facility is located using the National Biodiversity Data Centre (NDBC) mapping system (<http://maps.biodiversityireland.ie/#/Map>) and information on the National Parks and Wildlife Service (NPWS) webpage, metadata available online from the NPWS mapping system (<http://webgis.npws.ie/npwsviewer/>). These databases were accessed on the 8<sup>th</sup> October 2019.

A data request for rare and protected species within 10km of the existing facility was submitted to the NPWS on 8<sup>th</sup> October 2019. This data was received from the NPWS on the 11<sup>th</sup> October 2019.

A search of Bat Conservation Ireland's database was conducted to establish what bat roosts are known in the vicinity of Knockharley Landfill. The mid-point of the existing facility was taken as Grid reference N972 672.

#### 2.1.1 Bat Landscapes

Bat Conservation Ireland produced a landscape conservation guide for Irish bat species using their database of species records collated during the 2000-2009 survey seasons. An analysis of the habitat and landscape associations of all bat species deemed resident in Ireland was undertaken and reported in Lundy et al., 2011.

The degree of favourability ranges from 0 – 100, with 0 being least favourable and 100 most favourable for bats. The values of the grid squares represent the range of habitat suitability values the bat species can tolerate within each individual square

A caveat is attached to the model and it is that the model is based on records held on the BC Ireland database, while core areas have been identified, areas outside the core area should not be discounted as unimportant as bats are a landscape species and can travel many kilometres between roosts and foraging areas nightly and seasonally.

### 2.2 EIAR Surveys

A bat habitat suitability assessment was previously undertaken on 5<sup>th</sup> and 6<sup>th</sup> May 2010 and updated on 26<sup>th</sup> March 2015. A bat activity survey was previously undertaken on 29<sup>th</sup> August 2016.

As per section 10.3.6 of the EIAR:

*"Potential bat roosts sites such as mature trees were also identified on the site.....Habitats on site proposed for development were also considered for their suitability for bats following habitat surveys. A bat activity survey was carried out on the 29<sup>th</sup> August [2016]. Transects through favourable habitats for bats were walked within the planned development areas during which bat activity was recorded using heterodyne /frequency division (BatBox Duet – BatBox Electronics) and real time, fill spectrum recording, super heterodyne (Elektron Batlogger M with inbuilt GPS) detectors). Bats were identified by their ultrasonic calls coupled with behavioural and flight observations and on computer by sound analysis of recorded echolocation and social calls with dedicated software (Kaleidoscope Viewer – Wildlife Acoustics)."*

### 2.3 2019 Surveys

A total of 4 no. bat activity/emergence surveys in addition to static detector surveys were carried out during 2019 (refer to Table 2.1 for details). These surveys followed the specific guidelines set out by the Bat Conservation Trust in Bat Surveys: Good Practice Guidelines (Hundt, 2012 and Collins, 2016).

**Table 2-1: Bat Surveys 2019**

Survey Type	Survey Date	Surveyor
Bat Activity Survey 1 - Dusk	28/06/19 – 29/06/19	Rory Dalton (BSc)
Bat Activity Survey 2 - Dusk	16/07/19	Caroline Shiel (BSc, PhD)
Bat Activity Survey 2 - Dawn	17/07/19	Caroline Shiel (BSc, PhD)
Bat Activity Survey 3 - Dusk	31/08/19	Caroline Shiel (BSc, PhD)
Bat Activity Survey 3 - Dawn	01/09/19	Caroline Shiel (BSc, PhD)
Bat Activity Survey 4 - Dusk	24/09/19	Caroline Shiel (BSc, PhD)
Bat Activity Survey 4 - Dawn	25/09/19	Caroline Shiel (BSc, PhD)
Static Detectors	31/07/19 – 27/09/19	Caroline Shiel (BSc, PhD)

### 2.3.1 Bat activity surveys

Transects through bat favourable habitats within Knockharley Landfill including the footprint of the proposed development were walked during which bat activity was recorded using heterodyne/frequency division (BatBox Duet) and heterodyne/frequency division/time expansion (Batlogger) detectors while the wider area of the proposed development was surveyed from a vehicle driven at 15kph with a detector mounted on the hedge-side of the vehicle.

Surveys targeted a range of foraging and commuting habitats present within the study area, those associated with linear features such as roadside margins, woodland plantation edges, hedgerows, treelines and waterbodies. A sample of stream corridors within study areas was sampled for Daubenton's bats.

Bat surveying was conducted using a Frequency Division Detector System. Frequency Division detectors record bat ultrasonic calls on a continuous basis and stores the information onto an internal CF card. Frequency Division is a technique used to convert the inaudible bat echolocation calls to audible sounds.

The bat detectors used a Full Spectrum Analysis to make the real-time recorded calls visible for display purposes. It is these sonograms (2-d sound pictures) that are digitally stored on a CF card and downloaded for analysis. Each time a bat is detected, an individual time and GPS stamped (date and time to the second) file is recorded.

Bat activity is governed by the activity of their insect prey and insect abundance is in turn governed by weather conditions and climate. Insects, and therefore bats, are unlikely to be present at temperatures below 6° Celsius or during periods of strong winds or heavy rainfall so survey in such conditions is not possible. All field surveys were undertaken within the active bat season and during good weather conditions (dry conditions and temperature at 8° and greater).

Nocturnal bat activity is mainly bi-modal taking advantage of increased insect numbers on the wing in the periods after dusk and before dawn, with a lull in activity in the middle of the night. This is particularly true of 'hawking' species – i.e. bats which capture prey in the open air. However, 'gleaning' species remain active throughout the night as prey is available on foliage for longer periods. Gleaning is the term for taking prey from foliage or the ground.

Bats were identified by their ultrasonic calls coupled with behavioural and flight observations and on computer by sound analysis of recorded echolocation and social calls with dedicated software (Kaleidoscope Viewer - Wildlife Acoustics).

### 2.3.2 Survey Visit 1

Survey Visit 1 was undertaken on 28<sup>th</sup> June 2019. A transect was driven around the perimeter of Knockharley Landfill and the footprint of the proposed development between 22.10 and 00.45 while recording bat activity with a Batlogger bat detector. The total length of the transect was 8.8km and is presented in Figure 2.1 below.

### 2.3.3 Survey Visit 2

Prior to the second bat activity survey on 16<sup>th</sup> August 2019, each of the buildings within the existing facility were searched for signs of bats including bat droppings, dead bats, urine stains. The office buildings and structures at the landfill gas utilisation plant were confined to external searches only. The falconry shed and agricultural sheds were surveyed both externally and internally.

The existing facility was assessed to select suitable areas for dusk and dawn surveys on 16<sup>th</sup> August 2019.

Survey 2 was conducted at dusk on 16<sup>th</sup> August 2019 and at dawn on 17<sup>th</sup> August 2019. At dusk, survey effort was concentrated on the tree lines surrounding the main proposed development area to the north of the existing administration area to investigate the presence of tree roosts. This was followed by a driven transect of the perimeter of the site, stopping at selected points to monitor activity.

During the dawn survey, a transect was walked along the northern boundary of the site, followed by surveys of the falconry shed and office buildings. The transect route is presented in Figure 2.2 below.

### 2.3.4 Survey Visit 3

Survey 3 was conducted at dusk on 31<sup>st</sup> August 2019 and dawn on 1<sup>st</sup> September 2019.

The dusk survey was conducted by two surveyors at the agricultural sheds in the north eastern corner of the site, each assigned to a number of sheds (GPS 97851 67698). There is a range of agricultural sheds, some are metal sheds, some cement block and one old shed with stone walls still intact. These sheds were surveyed again externally and internally for signs of bat usage but none were recorded. After the emergence survey at the agricultural sheds, the office buildings, gas utilisation plant and settlement pond were surveyed for bat activity.

The dawn survey was conducted also at the agricultural sheds to investigate if any bats returned to any of the sheds at dawn.

The buildings surveyed and the route followed are presented in Figure 2.3 below.

### 2.3.5 Survey Visit 4

Survey 4 was conducted at dusk on 24<sup>th</sup> September 2019 and at dawn on 25<sup>th</sup> September 2019. At dusk a walking transect from the administration buildings to the northern boundary and northern lane was conducted and back to the administration/office area.

For the duration of the dawn survey one surveyor was stationed at the administration area and sheds to investigate if any bats returned at dawn. The second surveyor walked a transect to the covered leachate lagoon, falconry shed, landfill gas utilisation plant and surface water attenuation pond.

The transect and structures surveyed are shown in Figure 2.4 below.

### 2.3.6 Static Detector Surveys

Two static bat detectors (Song Meter SM4BAT Full spectrum bat recorder) were deployed on site on the 31<sup>st</sup> July 2019 and left to record overnight bat activity for a minimum period of 57 nights during the bat activity season.

- Songmeter A (G17) was sited at the corner of the conifer plantation to the north of the office buildings (53.65019, -6.52912) and was collected on 26<sup>th</sup> September 2019 (57 nights).
- Songmeter B (G16) was sited at the edge of woodland/scrub to the north of the gas plant (53.643.96, -6.52424) and was collected on 27<sup>th</sup> September 2019 (58 nights).

The data was analysed with Kaleidoscope 5.1.9g software (Bats of Europe 5.1.0 S/A: 0).

The location of the static detectors is presented in Figure 2.5 below.

### 2.3.7 Bat Roost Surveys

Habitats within the facility were assessed for their favourability for bats. All structures were surveyed for bat presence either externally via bat detector, internally by visual inspection or by a combination of both. All structures / suitable trees were inspected for bats and/or their signs using powerful torches.

The presence of bats is often shown by grease staining, droppings, urine marks, corpses, feeding signs such as invertebrate prey remains and/or the presence of bat fly Nycteribiidae pupae, although direct observations are also occasionally made. Bat droppings are often identifiable to species-level based on their size, shape and content and those of certain species, for example Brown Long-eared *Plecotus auritus* and Lesser Horseshoe *Rhinolophus hipposideros* bats, are very distinctive and unmistakable.

An appraisal of the suitability of any structures and trees at Knockharley Landfill that could be suitable for bats to roost in was undertaken on 16<sup>th</sup> and 31<sup>st</sup> August 2019 as well as the 1<sup>st</sup>, 24<sup>th</sup> and 25<sup>th</sup> of September 2019. The proposed site was walked and habitats of potential value to bats were noted and marked on a map. The value of each feature was noted according to its potential for use by bats for roosting. The value of habitat features for bats was defined in accordance with Bat Surveys: Good Practice Guidelines publication (Collins, 2016), as shown in Table 2-2.

**Table 2-2: Potential suitability of habitats for bats (Collins, 2016)**

Suitability	Description of Roosting Habitats	Commuting and Foraging Habitats
Negligible	Negligible habitat features on site likely to be used by roosting bats.	Negligible habitat features on site likely to be used by commuting or foraging bats.
Low	A structure with one or more potential roost sites that could be used by individual bats opportunistically. However, these potential roost sites do not provide enough space, shelter, protection, appropriate conditions and/or suitable surrounding habitat to be used on a regular basis or by larger numbers of bats (i.e. unlikely to be suitable for maternity or hibernation). A tree of sufficient size and age to contain PRFs but with none seen from the ground or features seen with only very limited roosting potential.	Habitat that could be used by small numbers of commuting bats such as gappy hedgerow or un-vegetated stream, but isolated, i.e. not very well connected to the surrounding landscape by other habitat. Suitable, but isolated habitat that could be used by small numbers of foraging bats such as a lone tree (not in a parkland situation) or a patch of scrub.
Moderate	A structure or tree with one or more potential roost sites that could be used by bats due to their size, shelter, protection, conditions and surrounding habitat but unlikely to support a roost of high conservation status (with respect to roost type only- the assessments in this table are made irrespective of species conservation status, which is established after presence is confirmed).	Continuous habitat connected to the wider landscape that could be used by bats for commuting such as lines of trees and scrub or linked back gardens. Habitat that is connected to the wider landscape that could be used by bats for foraging such as trees, scrub, grassland or water.
High	A structure or tree with one or more potential roost sites that are obviously suitable for use by larger numbers of bats on a more regular basis and potentially for longer periods of time	Continuous, high quality habitat that is well connected to the wider landscape that is likely to be used regularly by commuting bats such as river valleys,

Suitability	Description of Roosting Habitats	Commuting and Foraging Habitats
	due to their size, shelter, protection, conditions and surrounding habitat.	streams, hedgerows, lines of trees and woodland edge. High quality habitat that is well connected to the wider landscape that is likely to be used regularly by foraging bats such as broadleaved woodland, tree-lined watercourses and grazed parkland. Site is close to and connected to known roosts.

## 2.4 Impact Assessment

EPA Guidelines (2017) were used to assess the potential impact and resulting effect of the proposed development on bats.

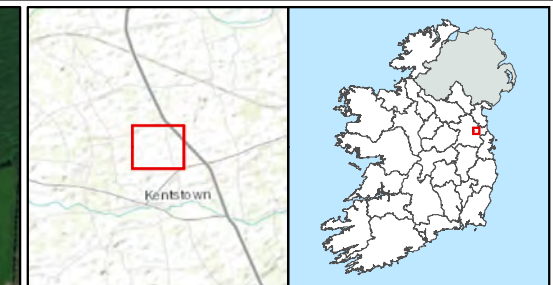
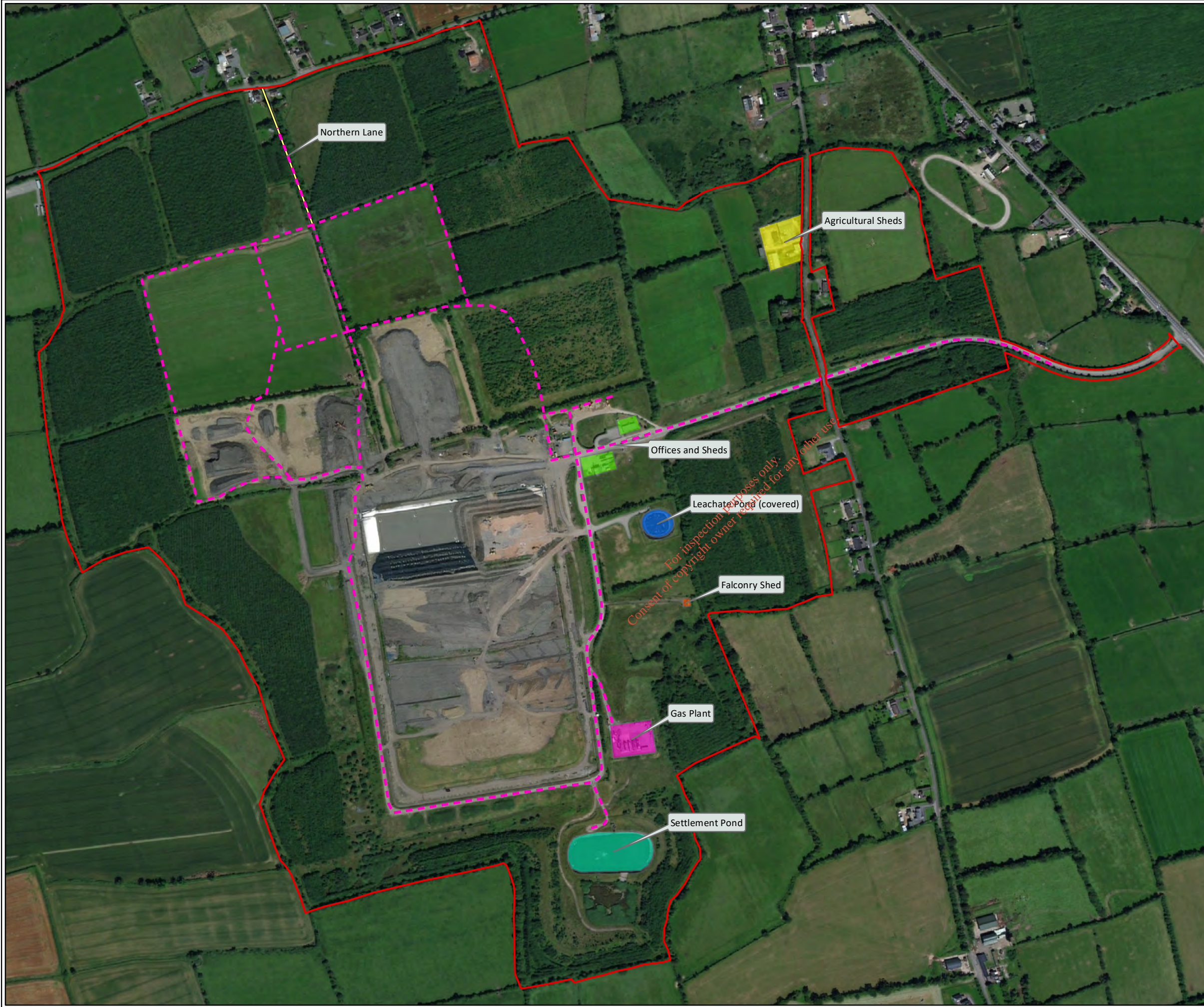
In line with the EPA Guidelines (EPA, 2017), the following terms are defined when quantifying duration:

- Momentary: from seconds to minutes
- Brief: up to 1 day
- Temporary: up to 1 year
- Short-term: from 1-7 years;
- Medium-term: 7-15 years;
- Long-term: 15-60 years; and
- Permanent: over 60 years.

The impacts were assessed under a number of parameters such as magnitude, extent, timing, frequency, duration and reversibility. The impact significance criteria (EPA, 2017) as set out in Table 2.3 are used where applicable. A glossary of impacts is further outlined in Appendix 10.3 Volume 3 of the EIAR.

**Table 2-3: Significance of Effects Criteria**

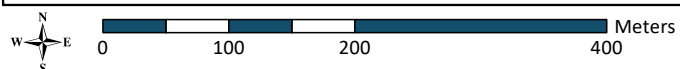
Impact Significance	Criteria
Imperceptible	An effect capable of measurement but without significant consequences
Not significant	An effect which causes noticeable changes in the character of the environment but without significant consequences
Slight	An effect which causes noticeable changes in the character 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



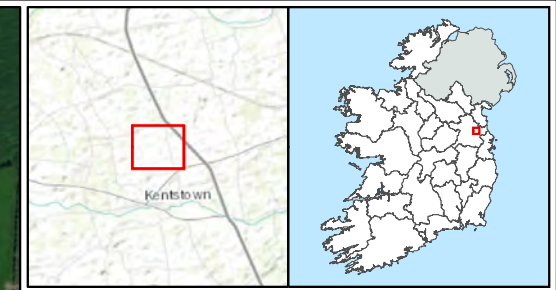
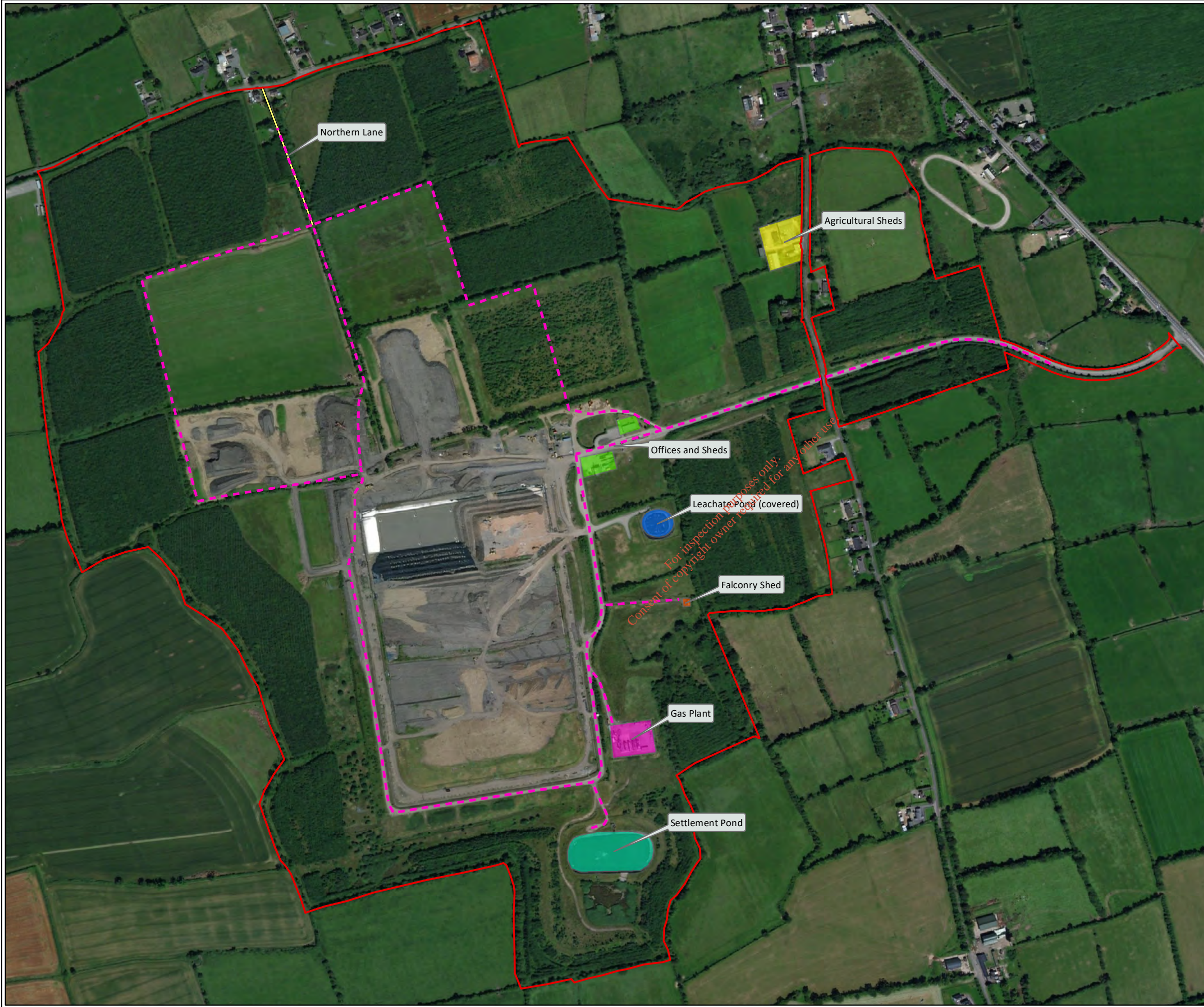
- - - Bat Survey 1 Transect Route
- Planning Boundary
- Northern Lane
- Agricultural Sheds
- Offices and Sheds
- Leachate Pond (covered)
- Falconry Shed
- Gas Plant
- Settlement Pond

<b>TITLE:</b>	Bat Survey 1 Transect Route		
<b>PROJECT:</b>	Knockharley Landfill, Co. Meath		
<b>FIGURE NO:</b>	2.1		
<b>CLIENT:</b>	Knockharley Landfill Ltd.		
<b>SCALE:</b>	1:6000	<b>REVISION:</b>	0
<b>DATE:</b>	24/10/2019	<b>PAGE SIZE:</b>	A3

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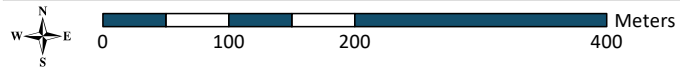




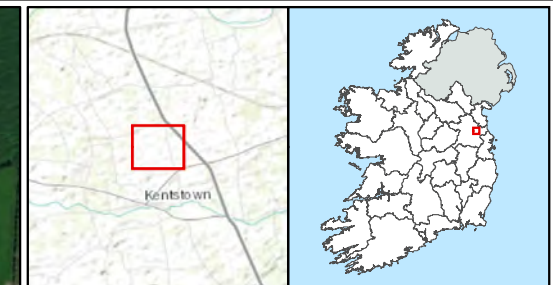
- - - Bat Survey 2 Transect Route
- Planning Boundary
- Northern Lane
- Agricultural Sheds
- Offices and Sheds
- Leachate Pond (covered)
- Falconry Shed
- Gas Plant
- Settlement Pond

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<b>TITLE:</b>	Bat Survey 2 Transect Route		
<b>PROJECT:</b>	Knockharley Landfill, Co. Meath		
<b>FIGURE NO:</b>	2.2		
<b>CLIENT:</b>	Knockharley Landfill Ltd.		
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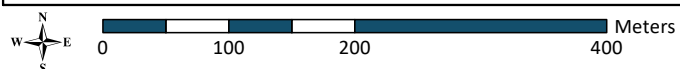


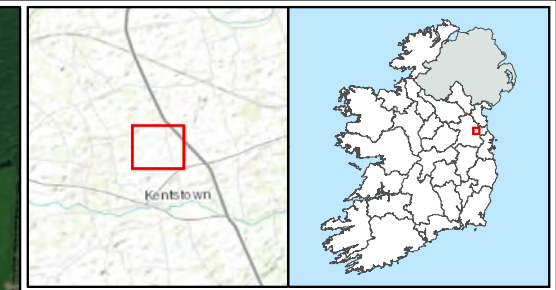
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- - - Bat Survey 3 Transect Route
- Planning Boundary
- Northern Lane
- Agricultural Sheds
- Offices and Sheds
- Leachate Pond (covered)
- Falconry Shed
- Gas Plant
- Settlement Pond

<b>TITLE:</b>	Bat Survey 3 Transect Route		
<b>PROJECT:</b>	Knockharley Landfill, Co. Meath		
<b>FIGURE NO:</b>	2.3		
<b>CLIENT:</b>	Knockharley Landfill Ltd.		
<b>SCALE:</b>	1:6000	<b>REVISION:</b>	0
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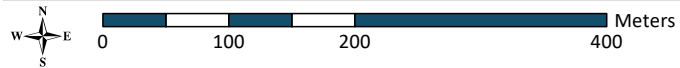


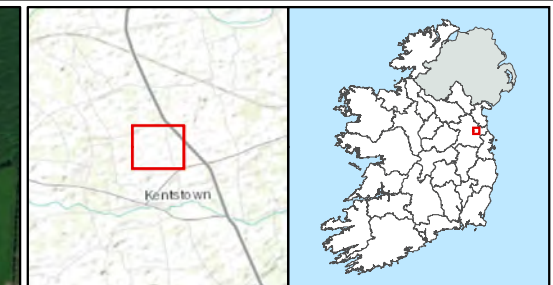


- - - Bat Survey 4 Transect Route
- Planning Boundary
- Northern Lane
- Agricultural Sheds
- Offices and Sheds
- Leachate Pond (covered)
- Falconry Shed
- Gas Plant
- Settlement Pond

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<b>TITLE:</b>	Bat Survey 4 Transect Route		
<b>PROJECT:</b>	Knockharley Landfill, Co. Meath		
<b>FIGURE NO:</b>	2.4		
<b>CLIENT:</b>	Knockharley Landfill Ltd.		
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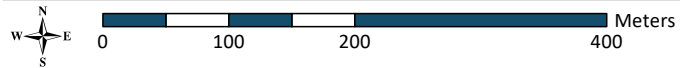




- Static Detector Locations 2019
- Planning Boundary
- Northern Lane
- Agricultural Sheds
- Offices and Sheds
- Leachate Pond (covered)
- Falconry Shed
- Gas Plant
- Settlement Pond

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<b>TITLE:</b>	
Static Detector Locations 2019	
<b>PROJECT:</b>	
Knockharley Landfill, Co. Meath	
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## 3 RESULTS

### 3.1 Desktop survey

A desktop review of information available from the National Biodiversity Data Centre (NBDC) indicates that the bat species as shown in Table 3.1 have been observed within the 10km grid square (N96) in which the existing facility is located.

The rare and protected species records from NPWS did not include any bat species.

**Table 3-1: Desktop results of bats within the 10km of the existing facility**

Bat Species	Legal Protection	Conservation Status (Marnell et al. 2009)
Brown Long-eared Bat ( <i>Plecotus auritus</i> )	EU Habitats Directive Annex IV, Wildlife Acts	Least Concern
Leisler's Bat ( <i>Nyctalus leisleri</i> )	EU Habitats Directive Annex IV, Wildlife Acts	Near Threatened
Common Pipistrelle ( <i>Pipistrellus Pipistrellus sensu lato</i> )	EU Habitats Directive Annex IV, Wildlife Acts	Least Concern
Soprano Pipistrelle ( <i>Pipistrellus pygmaeus</i> )	EU Habitats Directive Annex IV, Wildlife Acts	Least Concern

There are no known bat roosts listed within 1km of Knockharley Landfill.

When the search is extended to 10km from Knockharley Landfill there is a total of 44 no. roosts listed. However, the vast majority of these records are for very small numbers of bats recorded from bat boxes or tree roosts.

#### Roosts within 10km Of Knockharley Landfill

- 14 no. of the 44 no. roost records are from a bat box scheme at Oldbridge Demense, Co. Meath (Grid Reference O60460 075619) – boxes were surveyed in 2015 – all boxes contained bat droppings only except for two boxes which each contained a single male Soprano pipistrelle.
- Oldbridge Demense, Co Meath – 8 no. roost records from trees on site – again all very small numbers of bats – 4 no. trees with a single Soprano pipistrelle, one tree with a single Leisler's and a second tree with 2 no. Leisler's, 1 no. tree with a single Common pipistrelle and a single Brown long-eared and a tree with a single Leisler's and single Soprano pipistrelle.
- Indavver Energy Facility, Duleek, Co. Meath (Grid Reference O06174 70807) – Bat Box scheme – 6 no. roosts records but all of bat droppings only – no bat species identified.
- Annesbrook House, Duleek, Co Meath (O043 661) 2 no. common pipistrelles and 10 no. Leisler's bats in 1999
- Beaupark House, Navan, Co. Meath (N970 695) Common pipistrelles – no numbers given. 2006
- Dowdstown Cottage, Kilcarr, Navan, Co. Meath (N90017 63884) – 5 no. Brown long-eared droppings in 2014
- Fennor Derelict House, Slane, Co. Meath (N972 728) 9 no. Soprano pipistrelles in 2005
- Janeville House, Slane, Co. Meath (N974735) 2 no. Natterer's bats and 15 no. Soprano pipistrelles in 2005
- Johnstown Bridge, Navan, Co. Meath (N8966) 1 no. Daubenton's bat in 1991
- Slane Castle Demense - Oak tree (N95007 74348) – 10 no. Leisler's bats in 2012
- Prioryland, Duleek, Co. Meath (O054 749) – 90 no. bats in 1999 but not identified to species

- Railway underbridge (N9670) – 1 no. bat no identification in 2011
- Railway underbridge, Drumman, Co. Meath (O01194 68841) 1 no. Natterer’s bat in 2011
- Rathbeggan Stud farm, Dunshaughlin, Co. Meath (O004 690) – droppings only recorded in 2000
- Mill at Slane Bridge – (N967737) 294 no. Soprano pipistrelles in 2004
- St Martha’s College, Athlumney, Navan, Co. Meath (N892 668) – 2 no. skeletal remains – no identification in 2007
- St Patrick’s Church of Ireland, Slane, Co. Meath ((N960 742) 1 no. Leislars and 200 no. Soprano pipistrelles in 2004
- The Rectory, Boyne Road, Navan, Co. Meath (N888 687) Roost of Soprano pipistrelles – no count in 1999
- Townley Hall, Co. Meath (O026 765) Roost of Common pipistrelles – no number given in 2004.

### 3.1.1 Bat Landscapes

The bat favourability for the existing facility was assessed using the data from the National Biodiversity Data Centre and is presented in Table 3.2 below.

**Table 3-2: Bat Favourability**

Species	Degree of Favourability
<i>Pipistrellus pygmaeus</i>	39
<i>Plecotus auritus</i>	37
<i>Pipistrellus pipistrellus</i>	44
<i>Nyctalus leisleri</i>	44
<i>Myotis mystacinus</i>	28
<i>Myotis daubentonii</i>	33
<i>Pipistrellus nathusii</i>	12

The existing facility has a high degree of favourability for 4 of the 7 species recorded within the proposed development sites. These are *Pipistrellus pygmaeus*, *Pipistrellus pipistrellus*, *Plecotus auratus*, and *Nyctalus leisleri*. It also had moderate favourability for *Myotis mystacinus* and *Myotis daubentonii*. There was very low favourability for *Rhinolophus hipposideros* and *Pipistrellus nathusii*.

## 3.2 EIAR surveys

The following section details the results of bat survey undertaken in 2010, 2015 and 2016 for the proposed development in section 10.4.7 of the EIAR.

### 10.4.7 Mammals in the existing environment

#### Results of the 2010 survey

No bat roosts were found on the site; however, several mature trees were identified which may have potential for roosting bats. The hedgerows and treelines on the site certainly provide suitable foraging habitat for bats and both Common and Soprano Pipistrelle (*Pipistrellus* and *P. pygmaeus*) are likely to occur on the site. It is possible that other bat species also occur on the site from time to time.

#### Results of the 2015 survey

No bat roosts were found on the site; and no further trees were identified on site which may have potential for roosting bats. The hedgerows and treelines on the site still provide suitable foraging habitat for bats and both Common and Soprano Pipistrelle (*Pipistrellus* and *P. pygmaeus*) are likely to occur on the site. It is possible that other bat species also occur on the site from time to time.

#### Results of the 2016 survey

At the start of the bat survey, a single Leisler's bat was observed emerging from a mature Ivy covered tree considered a temporary [transitory] roost within a treeline within the site. This tree along with the treeline has subsequently been removed under the permitted Knockharley landfill.

The survey also highlighted that Leisler's bat, brown long-eared bat, common pipistrelle and soprano pipistrelle bats are using some of the site's hedgerows and treelines to forage and/or commute.

## 3.3 2019 Surveys

The results of the 4 no. bat surveys and the static detector surveys carried out at Knockharley Landfill in 2019 are presented below.

### 3.3.1 Survey Visit 1 (28/06/19 – 29/06/19)

Survey conditions were as follows:

- Sunset: 22.01
- Cloud cover 25% (2/8 oktas)
- Calm (F0)
- Dry
- Temperature 13-15 C

The first bats were detected at 22.17; Leisler's bats foraging at 20m-40m. They were mainly above a field of semi-natural grassland which was relatively species rich (field centred at N97205 67685), there were 4 no. individuals foraging in the area. Common and Soprano Pipistrelles were witnessed sporadically during the transect, to the north of the existing facility.

There was good insect activity with moths and other insects on the wing around the areas still vegetated, however there was very little insect activity above the non-vegetated ground within the facility.

These notes taken in the field closely match the results of sound analysis of the calls recorded on the Batlogger detector (Table 3-3). The three species recorded within the facility were Leisler's bat, Soprano Pipistrelle and Common Pipistrelle.



**Table 3-3: Analysis Batlogger Data - Survey 1 Results 28/06/19 – 29/06/19**

Species	No. of Recordings	% Total Recordings
Leisler's Bat	93	6%
Common Pipistrelle	16	1%
Soprano Pipistrelle	2	<1%
Noise	1372	93%
<b>Total</b>	<b>1483</b>	

**3.3.2 Survey Visit 2 (16/08/19 - 17/08/19)**

Dusk survey conditions were as follows:

- Sunset: 21.08
- Cloud cover 0% (0/8 oktas)
- Light breeze (F2)
- Dry
- Temperature 18 C

**Table 3-4: Dusk Survey Results - 16/08/19**

Time	Species
21.25	A single Soprano Pipistrelle was recorded foraging along the treeline to the north of the office block
21.30	One Leisler's bat detected commuting north west towards plantation
22.00-22.30	Track to south of main woodland block – Several Common and Soprano Pipistrelles recorded foraging along the woodland track and on the outer edge of the forestry block
22.30-23.25	Driven transect of perimeter of facility, stopping at selected points to monitor bat activity
22.35	Leachate lagoon – no bat activity
22.45	Falconry shed – no bat activity
22.55	Landfill Gas Utilisation Plant – one Common Pipistrelle foraging in the shelter of leylandii trees
23.20	Two Soprano Pipistrelles at north west corner of site foraging along hedgerow
23.30	Administration building – No bat activity

Dawn survey conditions were as follows:

- Sunset: 06.09
- Cloud cover 0% (0/8 oktas)
- Light breeze (F2)
- Dry
- Temperature 15 C

**Table 3-5: Dawn Survey Results - 17/08/19**

Time	Species
04.30	Northern boundary of facility & perimeter track in the north – No bat activity
05.15	Falconry shed – No bat activity
05.40	Administration building – No bat activity

**3.3.3 Survey Visit 3 (31/08/19 – 01/09/19)**

Dusk survey conditions were as follows:

- Sunset: 20.19
- Cloud cover 10% (1/8 oktas)
- Calm (F0)
- Dry
- Temperature 15 C

**Table 3-6: Dusk Survey Results – 31/08/19**

Time	Species
20.00- 21.35	Emergence survey at agricultural sheds – no bats recorded emerging from buildings
21.45	A Common Pipistrelle and a Soprano Pipistrelle were recorded foraging to the south of the plantation block to the north of the administration building
21.55	One Leisler's bat foraging around the security lights beside the administration building
22.05	One Common Pipistrelle foraging in the lee of the leylandii trees on track to Landfill Gas Utilisation Plant
22.15-22.30	One Daubenton's bat foraging continuously over surface water attenuation pond at southern end of the existing facility
22.25	One Leisler's bat flew briefly over the settlement pond but did not remain to forage

Dawn survey conditions were as follows:

- Sunset: 06.34
- Cloud cover 85% (7/8 oktas),
- Calm (F0)
- Dry
- Temperature 8 C

**Table 3-7: Dawn Survey Results – 01/09/19**

Time	Species
04.50	No bats foraging around security lights at administration building
05.00	At agricultural sheds – One Common pipistrelle on track to agricultural sheds
05.32	One Common pipistrelle foraging on road beside agricultural sheds
06.01	One Common pipistrelle came from the field to the south of the agricultural sheds and flew into the large agricultural shed in the middle of the yard and went to roost. The site may be of use as a transitory roosting site for this one individual but there was no evidence of more prolonged roosting during previous dawn and dusk surveys at the site. This shed is located within the boundary but not within the footprint of the development. It is currently used for storing agricultural machinery. This shed will not be disturbed during the proposed development to the existing facility.

**3.3.4 Survey Visit 4 (24/09/19 – 25/09/19)**

Dusk survey conditions were as follows:

- Sunset: 19.21
- Cloud cover 0% (0/8 oktas)
- Calm (F0)
- Dry
- Temperature 16 C

**Table 3-8: Dusk Survey Results – 24/09/19**

Time	Species
19.48	One Soprano Pipistrelle was recorded mid-way along length of northern land
19.58	One Common Pipistrelle detected south of plantation
20.05	One Soprano Pipistrelle detected foraging along western edge of forestry
20.20	Two Soprano Pipistrelles foraging at security lights at administration buildings
20.40 – 21.00	At agricultural sheds – One Common Pipistrelle intermittently recorded in yard
21.10	One Soprano Pipistrelle and one Leisler's bat foraging around security lights at administration buildings
21.20	Landfill Gas Utilisation Plant – No bat activity
21.30	Surface Water Attenuation Pond – No bat activity

Dawn survey conditions were as follows:

- Sunset: 07.17
- Cloud cover 50% (4/8 oktas)
- Calm (F0)
- Dry
- Temperature 10 C

**Table 3-9: Dawn Survey Results - 25/09/19**

Time	Species
05.45- 07.20	Office block and sheds – No bat activity
05.45-07.20	Leachate lagoon, falconry shed, landfill gas utilisation plant, surface water attenuation pond – No bat activity

Bat activity during the 2019 surveys is presented in Figure 3.1

### 3.4 Static Detector Surveys 2019

Seven species of bats were recorded on both SM4 Songmeters.

Seven species were recorded on Songmeter A with a total of 2,874 recordings over the 57 nights of surveys. The most commonly recorded species was Soprano Pipistrelle, followed by Common Pipistrelle, and Leisler's.

The highest activity level was recorded on Songmeter B, with 7 species and a total of 4,501 recordings over the 58 nights of surveys. The most commonly recorded species was Soprano Pipistrelle followed by Leisler's and Common Pipistrelle.

Much lower levels of activity of Brown Long-eared, Daubenton's, Nathusius Pipistrelle, and Whiskered bats were detected on both songmeters.

Common Name	Species	No. of recordings (Songmeter B)	No. of recordings (Songmeter A)
Daubenton's Bat	<i>Myotis daubentonii</i>	18	19
Whiskered Bat	<i>Myotis mystacinus</i>	14	20
Leisler's Bat	<i>Nyctalus leisleri</i>	775	506
Common Pipistrelle	<i>Pipistrellus pipistrellus</i>	602	691
Soprano Pipistrelle	<i>Pipistrellus pygmaeus</i>	3063	1614
Nathusius' Pipistrelle	<i>Pipistrellus nathusii</i>	5	10
Brown Long-eared	<i>Plecotus auritus</i>	24	24
<b>Total</b>		<b>4501</b>	<b>2874</b>

#### Soprano Pipistrelle

The number of recordings of Soprano Pipistrelle recorded on Songmeter A was 1,614 no. recordings; 56.16% of total recordings. These were recorded over 57 no. nights. This gives an average of 28.3 no. recordings per night, which again is extremely low.

The highest number of recordings for Soprano Pipistrelle on Songmeter B was 3,063 no. recordings; 68.05% of total recordings. These were recorded over 58 no. nights which gives an average of 52.8 no. recordings per night. This is a very low level of recordings. On a good site for Soprano Pipistrelles over 1,000 no. recordings per night would be typical (Caroline Shiel pers comm, 2019).

#### Common Pipistrelle

The total number of recordings for Common Pipistrelle on Songmeter A was 691 no. recordings; 23.70% of total recordings. These were recorded over 57 no. nights which gives an average of 11.9 no. recordings per night.

The total number of recordings for Common Pipistrelle on Songmeter B was 602 no. recordings; 13.37% of total recordings. These were recorded over 58 no. nights which gives an average of 10.5 no. recordings per night.

#### *Leisler's Bat*

The total number of recordings for Leisler's on Songmeter A was 506 no. recordings; 17.61% of total recordings. These were recorded over 57 no. nights which gives an average of 8.9 no. recordings per night.

The total number of recordings for Leisler's on Songmeter B was 775 no. recordings; 17.22% of total recordings. These were recorded over 58 no. nights which gives an average of 13.4 no. recordings per night.

#### *Daubenton's Bat*

The total number of recordings for Daubenton's Bat on Songmeter A was 19 no. recordings; 0.66% of total recordings. These were recorded over 57 no. nights which gives an average of 0.3 no. recordings per night.

The total number of recordings for Daubenton's Bat on Songmeter B was 18 no. recordings; 0.40% of total recordings. These were recorded over 58 no. nights which gives an average of 0.3 no. recordings per night.

Very low levels of Daubenton's were recorded on both Songmeters.

#### *Whiskered Bat*

The total number of recordings for Whiskered Bat on Songmeter A was 20 no. recordings; 0.70% of total recordings. These were recorded over 57 no. nights which gives an average of 0.4 no. recordings per night.

The total number of recordings for Whiskered Bat on Songmeter B was 14 no. recordings; 0.31% of total recordings. These were recorded over 58 no. nights which gives an average of 0.2 no. recordings per night.

#### *Nathusius' Bat*

The total number of recordings for Nathusius' Bat on Songmeter A was 10 no. recordings; 0.35% of total recordings. These were recorded over 57 no. nights which gives an average of 0.18 no. recordings per night.

The total number of recordings for Nathusius' Bat on Songmeter B was 5 no. recordings; 0.11% of total recordings. These were recorded over 58 no. nights which gives an average of 0.09 no. recordings per night.

Nathusius's Pipistelle has been previously recorded close to Slane in Co. Meath during the Car Based Bat Monitoring scheme run by Bat Conservation Ireland (Aughney et al., 2018).

#### *Brown Long-Eared Bat*

The total number of recordings for Brown Long-Eared Bat on Songmeter A was 24 no. recordings; 0.84% of total recordings. These were recorded over 57 no. nights which gives an average of 0.42 no. recordings per night.

The total number of recordings for Brown Long-Eared Bat on Songmeter B was 24 no. recordings; 0.53% of total recordings. These were recorded over 58 no. nights which gives an average of 0.41 no. recordings per night.

**Table 3-10: Emergence times and number of recordings per species for Songmeter A (Bristol Univeristy, 2019)**

Species	No. of recordings	Percentage of total recordings	Earliest call	Sunset on that date	Time after sunset	Typical emergence time for species
<i>Myotis daubentonii</i>	19	0.66%	20:45:51	19:37	1hr 8m	84min
<i>Myotis mystacinus</i>	20	0.70%	20:48:08	19:54	54min	32min
<i>Nyctalus leisleri</i>	506	17.61%	19:43:15	20:03	20min	At sunset
<i>Pipistrellus pipistrellus</i>	681	23.70%	20:07:34	19:40	27min	20 minutes after sunset
<i>Pipistrellus pygmaeus</i>	1614	56.16%	19:50:01	19:35	15min	21 minutes after sunset
<i>Pipistrellus nathusii</i>	10	0.35%	20:41:56	20:03	38min	Early dusk
<i>Plecotus auritus</i>	24	0.84%	21:06:30	19:37	1hr 29min	1 hour after sunset
<b>Total recordings</b>	<b>2874</b>					

**Table 3-11: Emergence times and number of recordings per species for Songmeter B (Bristol Univeristy, 2019)**

Species	No. of recordings	Percentage of total recordings	Earliest call	Sunset on that date	Time after sunset	Average emergence time for species
<i>Myotis daubentonii</i>	18	0.40%	21:33:23	20:37	56m 23s	84min
<i>Myotis mystacinus</i>	14	0.31%	21:00:25	19:54	1hr 6m 25s	32min
<i>Nyctalus leisleri</i>	775	17.22%	19:41:16	19:33	8m	At sunset
<i>Pipistrellus pipistrellus</i>	602	13.37%	20:20:10	19:40	40m 10s	20 minutes after sunset
<i>Pipistrellus pygmaeus</i>	3063	68.05%	19:52:26	19:28	24m 26s	21 minutes after sunset
<i>Pipistrellus nathusii</i>	5	0.11%	20:50:29	19:28	1hr 22m 29s	Early dusk
<i>Plecotus auritus</i>	24	0.53%	21:50:02	19:47	2hr 3min 2s	1 hour after sunset
<b>Total recordings</b>	<b>4501</b>					

### 3.5 Summary of the results of bat surveys

Table 3-12 provides a summary of the bat assessment. It contains information from the EIAR and is updated to include the 2019 desktop and field studies. It outlines whether a bat species identified for the desktop study was subsequently recorded within the existing facility during the bat surveys that took place from 2016 – 2019 and the potential for the species to utilise Knockharley Landfill facility.

**Table 3-12: Bat Survey Summary Results**

Bat Species	Desktop Study (NBDC & NPWS)	2016 Activity Survey	2019 Activity Surveys	2019 Static Detector Surveys	Notes	Potential for species to utilise the existing facility
Common Pipistrelle	✓	✓	✓		Recorded foraging and commuting through the existing facility in 2016 and 2019. One observed entering shed in east of existing facility, outside of the development footprint in 2019. The site may be of use as a transitory roosting site for this one individual but there was no evidence of more prolonged roosting during previous dawn and dusk surveys at the site.	Yes – hedgerows and treelines within the existing facility may be used for foraging and commuting
Soprano Pipistrelle	✓	✓	✓	✓	Recorded foraging and commuting through the facility in 2016 and 2019.	Yes – hedgerows and treelines within the existing facility may be used for foraging and commuting
Leisler's Bat	✓	✓	✓	✓	Recorded foraging and commuting through the facility in 2016 and 2019.	Yes – hedgerows and treelines within the existing facility may be used for foraging and commuting
Daubenton Bat	✗	✗	✓	✓	A single Daubenton was recorded foraging at the attenuation pond in 2019. Extremely low levels of this species were recorded using the static detectors.	Yes – hedgerows and treelines within the existing facility may be used for foraging and commuting
Nathusius Pipistrelle	✓	✗	✗	✓	Extremely low levels of this species were recorded using the static detectors.	Yes – hedgerows and treelines within the existing facility may be used for foraging and commuting

Bat Species	Desktop Study (NBDC & NPWS)	2016 Activity Survey	2019 Activity Surveys	2019 Static Detector Surveys	Notes	Potential for species to utilise the existing facility
Whiskered Bat	X	X	X	✓	Extremely low levels of this species were recorded using the static detectors.	Yes – hedgerows and treelines within the existing facility may be used for foraging and commuting
Brown Long-eared Bat	✓	✓	X	✓	Extremely low levels of this species were recorded.	Yes – hedgerows and treelines within the existing facility may be used for foraging and commuting

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## 4 IMPACTS ON BATS

In the following section the impacts on bats as determined in the EIAR are included verbatim (with grey background and original numbering). Any changes, additions or notes arising from the current assessment based on additional data compiled post submission of the SID application is included in bold below the relevant paragraph.

**No bat roosts were identified within the facility during the 2019 surveys, which reconfirms the findings from the EIAR surveys. Four bat species were observed foraging /commuting at the Knockharley Landfill (Common Pipistrelle, Soprano Pipistrelle, Daubenton's Bat and Lesler's Bat). Static detector monitoring recorded a total of 7 no. species of bats (including the following additional species Brown Long-eared Bat, Nathusius Pipistrelle and Whiskered Bat) at Knockharley Landfill. Bat activity levels were very low which indicates that Knockharley Landfill is currently not a favourable site for bats.**

**As 7 no. bat species were recorded at Knockharley Landfill, there is the potential for negative impacts on bats in the absence of mitigation.**

### 4.1 Construction Phase

The following section details the potential impacts to bats during the construction phase of the development in the absence of mitigation. The potential impact to bats is considered in section 10.5.2.4 of the EIAR.

#### 10.5.2.4 Fauna

During the 2016 bat survey, bats were observed within northern central section of the proposed development site commuting/feeding within/along habitats previously deemed to be of high value to bats. Many of these hedgerows/treelines have or will be removed under the permitted Knockharley landfill. As part of the development, the removal of treelines and hedgerows will be limited and located in the areas of the proposed IBA facility, surface water attenuation lagoon and biological treatment facility. Berms planted within native deciduous trees will also be constructed within the general area of hedgerow and treeline removal and are likely to be used by bats for foraging and commuting.

**[Addendum: No bat roosts were recorded within the facility or the proposed development footprint during the 2019 surveys. One Common Pipistrelle flew into a shed and went to roost during the dawn survey on 1<sup>st</sup> September 2019. This site of the roost was not ascertained. The shed is located within the boundary but not within the footprint of the development and will not be disturbed with as part of the development.**

**Very low levels of bat activity were noted during the 2019 surveys. No bats were detected over the active area of the landfill. Most of the bat activity was concentrated in the northern section of the existing facility.**

**The most common species recorded were Soprano Pipistrelle, Common Pipistrelle and Leisler's Bat. These species were recorded foraging in and commuting through the existing facility. Soprano and Common Pipistrelles were recorded mostly foraging along treelines and woodland edge. Soprano Pipistrelles and Leisler's were recorded foraging around the security lights at the administration buildings during Survey 4.**

**A single Daubenton's Bat was recorded foraging over the surface water attenuation pond on the evening Survey 3. Daubenton's Bats were not recorded foraging there at any other time. In fact, foraging activity over the settlement pond was very low for a waterbody. On inspection, the surface water attenuation pond had very low levels of insect density in the vicinity.**

**Given the loss of hedgerows and treelines during the construction phase it is considered that the proposed development will have] a Medium-term Moderate Impact on bats.**

### 4.2 Operational Phase

The following section details the potential impacts to bats during the operational phase of the development in the absence of mitigation. The potential impact to bats is considered in section 10.5.3.4 of the EIAR.

#### 10.5.3.4 Fauna

Mixed deciduous and coniferous trees felled will be replaced with native broadleaved trees which will be of higher ecological value to local wildlife. This woodland planting will provide cover and foraging habitat for local fauna.

This woodland will be commercial forestry and will therefore be felled in the future. Planting of deciduous woodland will have a Positive Short-Term Moderate impact on local fauna.

**[Addendum: There are no additional significant effects arising above those already set out in the EIAR following the bat surveys.]**

### 4.3 Decommissioning Phase

On cessation of waste acceptance at the facility, a restoration and aftercare plan will be put in place as part of the EPA licence review process (please see Chapter 2 Description of the Proposed Development in Volume 2 of this EIAR) and any structures not required as part of the restoration and aftercare plan will be removed.

**[Addendum: During the removal of structures and restoration works there will be local *short-term slight impact* due to disturbance to bats]**

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## 5 MITIGATION MEASURES

Mitigation measures for the proposed development are outlined in section 10.6 of the EIAR. Mitigation measures specific to bats are presented below.

### 10.6.1 Construction Phase

- The proposed development will require the felling of some mature trees that may be suitable for temporary roosting bats during the spring/summer period. For mature trees noted in the area of the proposed IBA facility and the proposed biological treatment facility, tree-felling will not be undertaken in May, June, July and early August, in order to ensure that breeding populations of bats are protected. Therefore, it is recommended that tree felling of mature trees in these areas will be conducted during the period of September – October/early November as bats are capable of flight and can avoid being injured. Immediately prior to felling, the trees will be examined for the presence or absence of bats, and/or other bat activity. This survey will be carried out by a suitably qualified bat specialist and will include a visual inspection of the tree during daylight hours followed by a night time detector survey. Where an Autumn examination of a tree has shown that bats have not emerged or returned to a tree, it is safe to proceed with the felling of the tree the following day, once the appropriate tree-felling licence, if required, has been secured. In order to ensure the optimum warning for any roosting bats that may still be present, the tree should be pushed lightly two to three times, with a pause of approximately 30 seconds between each nudge to allow bats to become active. The tree should be de-limbed (i.e. all branches removed first) prior to cutting the truck. Day time temperatures of greater than 7°C are favoured for felling to ensure that bats are active and can exit any potential trees being felled. The tree should then be pushed to the ground slowly and should remain in place until it is inspected by a bat specialist. A period of at least 24 hours, and preferably 48 hours, should elapse prior to such operations to allow bats to escape (NRA, 2005).
- Construction operations will take place during the hours of daylight to minimise disturbances to nocturnal mammal species, roosting birds or active nocturnal bird species.

### 10.6.2 Operational Phase

- Replacement tree planting and new tree planting will be comprised of native deciduous tree species (see Landscape Masterplan LW14-821-01-P-0050-012 for more information).
- Excessive additional lighting around the site will be avoided. Lighting will be kept to minimum safe levels to reduce disturbance to nocturnal mammals and birds. Directional lighting will be used to prevent light disturbance in the surrounding area.

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## 6 RESIDUAL IMPACT

**[Addendum: Taking into consideration the updated surveys and mitigation measures proposed, it is reconfirmed that there will be no significant residual impact to bats as per the EIAR.]**

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## 7 CONCLUSION

Bat surveys were continued during 2019. 4 no. bat species have been recorded within 10km of the existing facility (NBDC). No bat roosts are located within 1km of the landfill. 4 no. bat species were observed foraging /commuting at the Knockharley Landfill. Static detector monitoring revealed a total of 7 no. species of bats (the 4 no. species observed during activity/emergence surveys and 3 no. other species) at Knockharley Landfill.

No bat roosts were recorded within Knockharley Landfill which includes the proposed development footprint during the 2019 surveys. One Common pipistrelle flew into the large agricultural shed in the east of the existing facility, outside of the development footprint in 2019. The site may be of use as a transitory roosting site for this one individual but there was no evidence of more prolonged roosting during previous dawn and dusk surveys at the site. Bat activity levels at the existing facility are very low which indicates that Knockharley Landfill is currently not a favourable site for bats.

Nonetheless given the removal of hedgerow and treelines the proposed works have the potential to have a medium term Moderate Impact during the construction phase in the absence of mitigation measures. However, given the implementation of mitigation measures described in section 10.6 of the EIAR, it is concluded that there will be no negative impacts on bats during the construction phase.

During the operational phase, bats are likely to continue using the facility and the new woodland created will provide habitat for foraging. It is considered that the operational phase of the development will not result in a significant negative impact on any bat species.

As outlined in section 10.6 of the EIAR, a pre-felling bat survey will be undertaken prior to works commencing to reconfirm the findings of the EIAR.

Taking into consideration the results of the continued bat surveys and the mitigation measures to be implemented, it is reconfirmed that the proposed development will not result in a significant negative residual impact on bat species.

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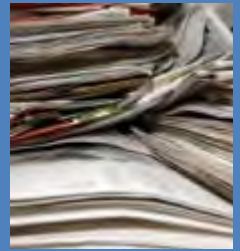
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# Appendix 3

## Knockharley Landfill Mammal Survey 2019

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# KNOCKHARLEY LANDFILL MAMMAL SURVEY 2019

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**CREATED FOR:**

Knockharley Landfill Ltd.



**CREATED:**

October 2019

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## 1 INTRODUCTION

This report details the results of mammal surveys carried out at Knockharley Landfill during 2019. This report should be read in conjunction with Chapter 10 of Volume 2 of the Environmental Impact Assessment Report for Proposed Development at Knockharley Landfill (Fehily Timoney and Company, 2018) (EIAR).

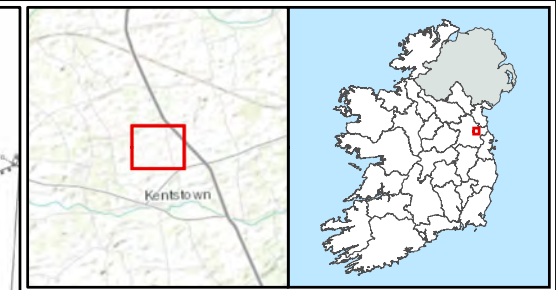
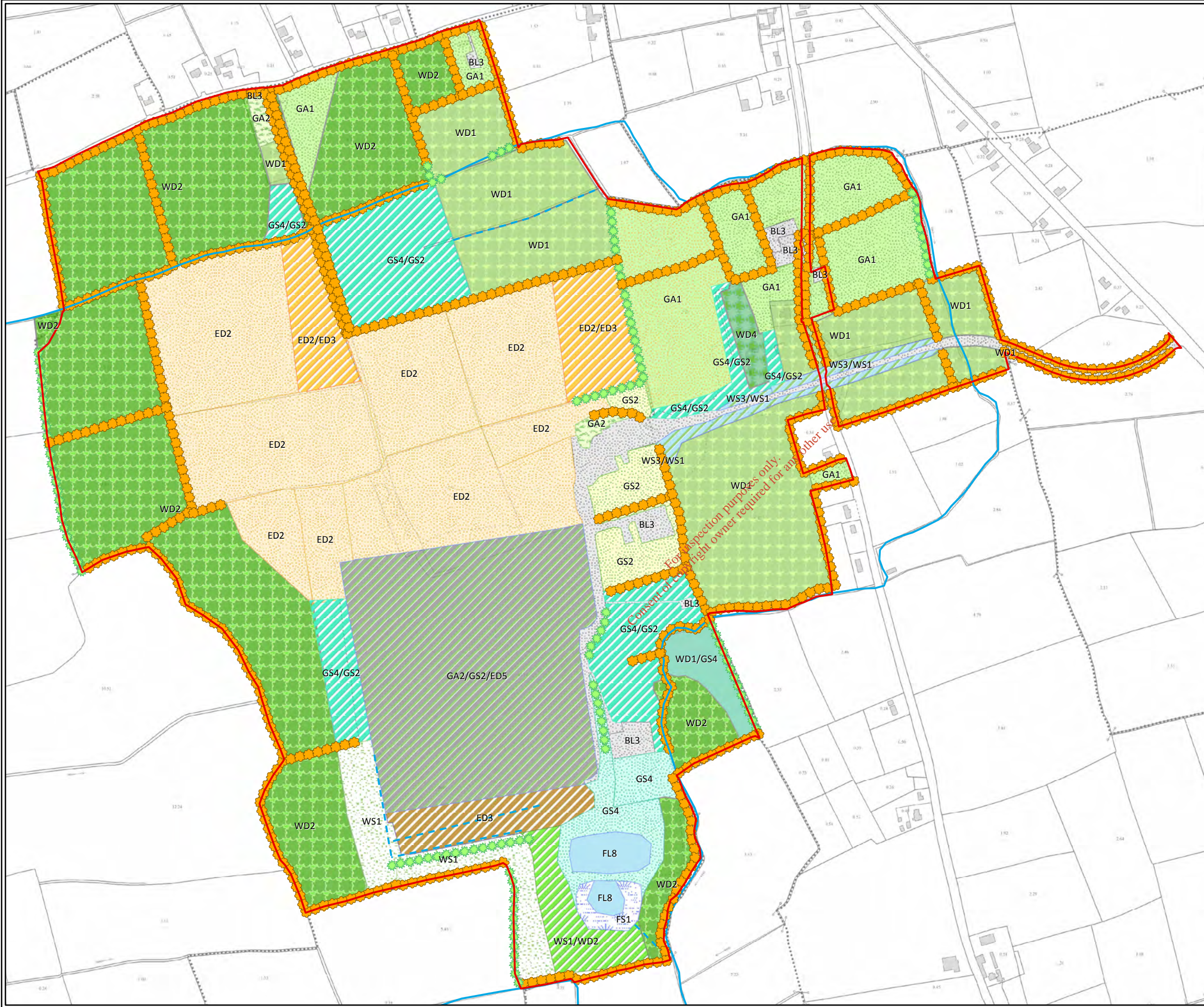
Knockharley Landfill Ltd. proposes to further develop the existing facility. In addition to the desktop study, an extensive field-based assessment was carried out within the boundary of the entire facility. The survey was undertaken to examine the potential impact of the proposed development on terrestrial mammal species.

### 1.1 Habitats at the Site

The following habitats, classified according to Fossitt (2000), are located within the proposed development:

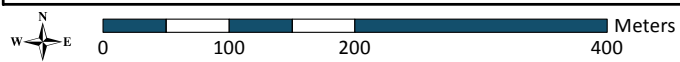
- Improved Agricultural Grassland (GA1)
- Wet Grassland/Dry Meadows and Grassy Verges (GS4/GS2) Mosaic
- Dry Meadows and Grassy Verges (GS2)
- Wet Grassland (GS4)
- Hedgerows (WL1)
- Treelines (WL2)
- (Mixed) Broadleaved woodland (WD1)
- (Mixed) Broadleaved Woodland/Wet Grassland (WD1/GS4) Mosaic
- Conifer Plantation (WD4)
- Mixed Broadleaved/Conifer Woodland (WD2)
- Buildings and Artificial Surfaces (BL1)
- Spoil and Bare Ground (ED2)
- Recolonising Bare Ground (ED3)
- Spoil and Bare Ground/Recolonising Bare Ground (ED2/ED3) Mosaic
- Scrub (WS1)
- Ornamental/Non-native Shrub/Scrub (WS3/WS1) Mosaic
- Drainage Ditches (FW 4)
- Eroding Rivers (FW 1)
- Artificial Lakes and Ponds (FL8)
- Reed and Large Sedge Swamps (FS1)

Figure 1 over illustrates the habitats and their coverage at the site.



- Planning Boundary
- Habitat**
- FW1 - eroding river
- FW4 - drainage ditches
- WL1 - hedgerow
- WL2 - treeline
- BL3 - buildings and artificial surfaces
- ED2 - spoil and bare ground
- ED2 / ED3 - spoil and bare ground / recolonising bare ground mosaic
- ED3 - recolonising bare ground
- FL8 - artificial lakes and ponds
- FS1 - reed and large sedge swamps
- GA1 - improved agricultural grassland
- GA1 / GS4 - improved agricultural grassland / wet grassland mosaic
- GA2 - Amenity
- GA2/GS2/ED5 - amenity grassland / dry meadows and grassy verges / refuse and other waste
- GS2 - dry meadows and grassy verges
- GS4 - wet grassland
- GS4 / GS2 - wet grassland / dry meadows and grassy verges mosaic
- WD1 - (mixed) broadleaved woodland
- WD1 / GS4 - (mixed) broadleaved woodland / wet grassland mosaic
- WD2 - mixed broadleaved / conifer woodland
- WD4 - Conifer Plantation
- WS1 - scrub
- WS1 / WD2 - scrub / mixed broadleaved-conifer woodland mosaic
- WS3 / WS1 - ornamental/non-native shrub / scrub mosaic

<b>TITLE:</b>	Habitats
<b>PROJECT:</b>	Knockharley Landfill, Co. Meath
<b>FIGURE NO.:</b>	1
<b>CLIENT:</b>	Knockharley Landfill Ltd.
<b>SCALE:</b>	1:6000
<b>REVISION:</b>	0
<b>DATE:</b>	21/10/2019
<b>PAGE SIZE:</b>	A3





## 2 METHODOLOGY

### 2.1 Desktop Study

A desktop study was carried out to collate and review available information, datasets and documentation sources pertaining to the site's natural environment. It involved an examination of mammals recorded within the 10km grid square in which the site is located using the National Biodiversity Data Centre (NDBC) mapping system (<http://maps.biodiversityireland.ie/#/Map>) and information on the National Parks and Wildlife Service (NPWS) webpage, metadata available online from the NPWS mapping system (<http://webgis.npws.ie/npwsviewer/>). These databases were accessed on the 8<sup>th</sup> October 2019.

A data request for rare and protected species within 10km of the existing facility was submitted to the NPWS on 8<sup>th</sup> October 2019. This data was received from the NPWS on the 11<sup>th</sup> October 2019 and the information received used within this report.

Identification of mammal field signs was undertaken with reference to; Lawrence & Brown (1973), Clark (1988); Sargent & Morris, (2003) and Bang & Dahlstrom (2004).

### 2.2 EIAR Surveys

Mammal surveys were previously undertaken on 5<sup>th</sup> and 6<sup>th</sup> May 2010 and 26<sup>th</sup> March 2015 to inform EIAR preparation.

As per section 10.3.6 of the EIAR:

*"The mammal surveys consisted of a site walkover, with features such as field boundaries, stream banks and access tracks being closely searched for signs of mammals. Any tracks or signs (including droppings, prints, resting places, burrows and setts) of mammals occurring within or in the vicinity of the site were recorded using field notes and/or handheld GPS units (Garmin). Identification of mammal field signs was undertaken with reference to; Lawrence & Brown (1973), Clark (1988); Sargent & Morris, (2003) and Bang & Dahlstrom (2004). In addition, any direct sighting of mammals made during the walkover were recorded."*

### 2.3 2019 Walkover Survey

An updated walkover mammal survey was conducted within the entire footprint of the Knockharley Landfill between 10:00 and 16:00 on 2<sup>nd</sup> October 2019 to identify and record all mammal signs present. The survey was carried out in accordance with the methodology outlined in the NRA (2009) guidelines. Field signs such as droppings, prints, and feeding remains were recorded, and all mammal excavations were examined and classified (burrows, setts, dens etc.). Surveys were undertaken by Dr Jonathon Dunn (PhD, MSc & BSc) and Orla Coffey (MSc & BSc). Weather conditions were favourable; 10°C, no rain, no wind, 5/8 cloud cover

### 2.4 2019 Trail camera surveys

Trail cameras were placed within the existing facility to complement the walkover mammal survey. These surveys were carried out to obtain a sample of mammal activity within Knockharley Landfill. Two trail cameras were deployed at the existing facility on 1<sup>st</sup> August 2019. Trail camera 1 was placed in a wet grassland / grassy verges mosaic in the south of the existing facility. Trail camera 2 was placed within a mixed broadleaved woodland in the north of the existing facility. Both trail cameras were collected on the 2<sup>nd</sup> October 2019.

## 2.5 Impact Assessment

EPA Guidelines (2017) were used to assess the potential impact and resulting effect of the proposed development on mammalian resources.

In line with the EPA Guidelines (EPA, 2017), the following terms are defined when quantifying duration:

- Momentary: from seconds to minutes
- Brief: up to 1 day
- Temporary: up to 1 year
- Short-term: from 1-7 years;
- Medium-term: 7-15 years;
- Long-term: 15-60 years; and
- Permanent: over 60 years.

The impacts were assessed under a number of parameters such as magnitude, extent, timing, frequency, duration and reversibility. The impact significance criteria (EPA, 2017) as set out in Table 2.1 are used where applicable. A glossary of impacts is further outlined in Appendix 10.3 Volume 3 of the EIAR.

**Table 2-1: Significance of Effects Criteria**

Impact Significance	Criteria
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

### 3 RESULTS

#### 3.1 Desktop survey

A desktop review of information available from the National Biodiversity Data Centre (NBDC) indicates that the following species have been observed within the 10km grid square (N96) in which the existing facility is located: Brown Rat (*Rattus norvegicus*), Badger (*Meles meles*), Grey Squirrel (*Sciurus carolinensis*), Red Squirrel (*Sciurus vulgaris*), Otter (*Lutra lutra*), Irish Hare (*Lepus timidus subsp. Hibernica*), Irish Stoat (*Mustela erminea subsp hibernica*), Rabbit (*Oryctolagus cuniculus*), Pine Marten (*Martes martes*), Red Deer (*Cervus elaphus*), Red Fox (*Vulpes Vulpes*) and Hedgehog (*Erinaceus europaeus*).

The rare and protected species records from the NPWS highlighted one additional species not listed in the 10km grid square N96, namely Pygmy Shrew. However, the latest record for this species was in 1969.

See table 3.1 for more information:

**Table 3-1: Desktop results of mammals within the 10km of the existing facility**

Mammal Name	Legal Protection	Conservation Status (Marnell et al. 2009)
Brown Rat ( <i>Rattus norvegicus</i> )	None	Invasive species
Badger ( <i>Meles meles</i> )	Wildlife Acts	Least Concern
Grey squirrel ( <i>Sciurus carolinensis</i> )	None	Invasive species
Hedgehog ( <i>Erinaceus europaeus</i> )	Wildlife Acts	Least Concern
Irish Hare ( <i>Lepus timidus subsp. Hibernica</i> )	EU Habitats Directive Annex V, Wildlife Acts	Least Concern
Irish Stoat ( <i>Mustela erminea subsp hibernica</i> )	Wildlife Acts	Least Concern
Otter ( <i>Lutra lutra</i> )	EU Habitats Directive Annex II & Annex IV Wildlife Acts	Favourable*
Pine Marten ( <i>Martes martes</i> )	EU Habitats Directive Annex V, Wildlife Acts	Least Concern
Pygmy Shrew ( <i>Sorex minutus</i> )	Wildlife Acts	Least Concern
Rabbit ( <i>Oryctolagus cuniculus</i> )	None	Least Concern
Red Deer ( <i>Cervus elaphus</i> )	Wildlife Acts	Least Concern
Red Fox ( <i>Vulpes Vulpes</i> )	None	Least Concern
Red squirrel ( <i>Sciurus vulgaris</i> )	Wildlife Acts	Near Threatened

\* Conservation Status updated from Near Threatened to Favourable in National Otter Survey of Ireland 2010/2012 (NPWS, 2013)

### 3.2 EIAR surveys

Evidence of seven and five mammal species was recorded during the 2010 and 2015 surveys respectively. Refer to Table 3.2 and Figure 10.4 reproduced from Chapter 10 in the EIAR.

**Table 3-2: Results of 2010 Mammal Survey**

Mammal Name	Year of Survey	Note	Conservation Status
Brown Rat ( <i>Rattus norvegicus</i> )	2010	Tracks along banks of Knockharley Stream, probably widespread.	N/A
	2015	Common species in Ireland.	
Badger ( <i>Meles meles</i> )	2010	Track and latrine found adjacent to access road in the east of the existing facility.	Least Concern
	2015	Track, latrine and hair in south east of the existing facility.	
Irish Hare ( <i>Lepus timidus subsp. Hibernica</i> )	2010	Seen in wet grassland in northwest of the existing facility.	Least Concern
	2015	Tracks seen in grassland in east of the existing facility.	
Otter ( <i>Lutra lutra</i> )	2010	Two spraints found along Knockharley Stream.	Favourable*
	2015	Spraints found along Knockharley Stream and channels in three locations.	
Rabbit ( <i>Oryctolagus cuniculus</i> )	2010	Burrows in earthen bank in west of the existing facility.	Least Concern
Red Fox ( <i>Vulpes Vulpes</i> )	2010	Widespread- prints and scat	Least Concern
	2015	Scat recorded – assumed to be widespread.	
Wood Mouse ( <i>Apodemus sylvaticus</i> )	2010	Nest hole in dry grass in northwest of the existing facility.	Least Concern

### 3.3 Walkover Survey 2019

During the 2019 walkover survey evidence of the following species was recorded; Irish Hare, Red Deer and Fox. The Otter survey conducted in August 2019 also identified Otter spraint. Please refer to Aquatic Ecology Report in Appendix 5 for details of this survey. During the walkover survey it was noted that the Knockharley Landfill is surrounded by secure fencing.

#### Irish Hare

*Legal Status:* EU Habitats Directive [92/43/EEC] Annex V, Wildlife Act, 1976; Wildlife (Amendment) Act, 2000

*Native/invasive status:* Native.

Three live sightings of Irish Hare were recorded in the west of the existing facility. Hare droppings were also recorded within the existing facility (refer to Plate 1 below).



**Plate 1: Irish Hare Droppings**

**Red Deer**

*Legal Status:* Wildlife Act, 1976; Wildlife (Amendment) Act, 2000

*Native/invasive status:* Native

Deer prints were recorded in the west of the existing facility. The large size of the prints indicates that they were made by a stag. Red Deer has previously been noted at the existing facility during bird surveys. Given the previous sightings it is considered that the prints belong to Red Deer.



**Plate 2: Male (Stag) Red Deer Print**

**Fox**

*Legal Status:* None

*Native/invasive status:* Native

Fox droppings were recorded in three areas in the south of the existing facility. No dens or live sightings were recorded during the walkover survey.



**Plate 3 Fox Droppings**

**Otter**

*Legal Status:* EU Habitats Directive [92/43/EEC] Annex II & IV, with 47 SACs listed for otter in the Republic of Ireland; Wildlife Act, 1976; Wildlife (Amendment) Act, 2000.

*Native/invasive status:* Native

No Otter sightings or holts were recorded during the survey. Field signs in the form of spraints were recorded at the inflow pipe culvert of the existing surface water attenuation pond within the site boundary. This appeared to be a regular spraint site. Please refer to Aquatic Ecology Report in Appendix 5 for the details of Otter activity at the existing facility.

**Badger**

*Legal Status:* Wildlife Act, 1976; Wildlife (Amendment) Act, 2000.

*Native/invasive status:* Native

No Badger sightings, field signs or setts were recorded during the walkover survey.

**Pine Marten**

*Legal Status:* EU Habitats Directive [92/43/EEC] Annex II & IV, Wildlife Act, 1976; Wildlife (Amendment) Act, 2000.

*Native/invasive status:* Native.

No Pine Marten sightings, field signs or dens were recorded during the walkover survey.

### **Other Species**

There were no sightings or signs of any other mammal species including, *inter alia*, Red Squirrel, Irish Stoat or Pygmy Shrew, during the walkover survey.

## **3.4 Trail camera surveys 2019**

Only one species was recorded during the trail camera surveys which was a Pine Marten.

### **Trail Camera 1**

One (1 No.) Pine Marten was recorded in the grassland on the 16<sup>th</sup> August 2019. No other mammals were recorded at Trail camera 1 during the survey.



**Plate 4: Pine Marten at Trail Camera 1**

### **Trail Camera 2**

No mammals were recorded at Trail Camera 2 over the survey period 1<sup>st</sup> August 2019 to 2<sup>nd</sup> October 2019.

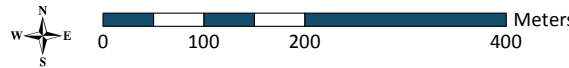
The locations of the trail cameras and the field signs /sightings are presented in Figure 2.



- Planning Boundary
- Trail Camera Locations**
- Trail Camera 1
- Trail Camera 2
- Mammal Signs/Sightings**
- Irish hare sighting
- Irish hare sighting x2
- Fox droppings
- Hare droppings
- Red deer prints
- Red deer sighting 2018

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<b>TITLE:</b>	Mammal Survey 2019
<b>PROJECT:</b>	Knockharley Landfill, Co. Meath
<b>FIGURE NO.:</b>	2
<b>CLIENT:</b>	Knockharley Landfill Ltd.
<b>SCALE:</b> 1:7500	<b>REVISION:</b> 0
<b>DATE:</b> 21/10/2019	<b>PAGE SIZE:</b> A3





### 3.5 Summary of the results of mammal survey

Table 3.3 provides a summary of the mammal assessment. It contains information from the EIAR and is updated to include the 2019 desktop and field studies. It outlines whether a mammal species recorded during the desktop study was subsequently recorded within the existing facility during the mammal surveys that took place from 2010 – 2019 and the potential for the species to utilise the existing facility.

**Table 3-3: Mammal Survey Summary Results**

Mammal Name	Desktop Study (NBDC & NPWS)	2010 Survey	2015 Survey	2019 Survey	Notes	Potential for species to utilise the existing facility
Brown Rat	✓	✓	✓	✗	Tracks seen, common species in Ireland.	Yes – on-site habitats suitable
Badger	✓	✓	✓	✗	Latrines and tracks observed in south of site in 2010 and 2015. No signs noted in 2019 survey.	Yes – on-site habitats suitable
Grey Squirrel	✓	✗	✗	✗	No sightings or field signs.	Yes – on-site habitats suitable
Hedgehog	✓	✗	✗	✗	No sightings or field signs.	Yes – on-site habitats suitable
Irish Hare	✓	✓	✓	✓	Live sightings in 2010 and 2019. Tracks observed in 2015.	Yes – on-site habitats suitable
Irish Stoat	✓	✗	✗	✗	No sightings or field signs.	Yes – on-site habitats suitable
Otter	✓	✓	✓	✓	Sprints recorded in 2010, 2015 and 2019.	Yes – on-site habitats suitable
Pine Marten	✓	✗	✗	✓	Observed on trail camera 2 in wet grassland in 2019.	Yes – on-site habitats suitable
Pygmy Shrew	✓	✗	✗	✗	No sightings or field signs.	Yes-while the species has not been recorded during surveys the habitats on-site offer potential suitable habitat (included based on the precautionary principle)
Rabbit	✓	✓	✗	✗	Burrows observed in 2010.	Yes – on-site habitats suitable
Red Deer	✓	✗	✗	✓	Tracks in 2019. Live sightings during bird surveys in 2018.	Yes- on-site habitats suitable
Red Fox	✓	✓	✓	✓	Prints, droppings and scat observed in 2010, 2015 and 2019.	Yes – on-site habitats suitable
Red Squirrel	✓	✗	✗	✗	No sightings or field signs.	Yes – on-site habitats suitable
Wood Mouse	✓	✓	✗	✗	Nest hole observed in 2010.	Yes – on-site habitats suitable

## 4 Impacts on Mammals

In the following section the impacts on terrestrial habitats as determined in the EIAR are included verbatim (with grey background and original numbering). Any changes, additions or notes arising from the current assessment based on additional data included in bold below the relevant paragraph.

**No dens, holts or setts were recorded within the existing facility. Fourteen mammal species have been recorded within 10km of the existing facility (NBDC), three of which are classified as invasive species, namely Brown Rat, Grey Squirrel and Rabbit. Evidence of seven (in 2010), five (in 2015) and five (in 2019) mammals were recorded with the site boundary during the surveys.**

**Knockharley Landfill Ltd. is applying for permission for the continuation of landfilling activities beyond 2021. Construction of the proposed development will be phased.**

**Given the potential of all fourteen mammal species to utilise the existing facility, it is possible that these mammals may be negatively impacted by the proposed development.**

### 4.1 Construction Phase

The following section details the potential impacts to mammals during the construction phase of the development in the absence of mitigation. The potential impact to mammals is considered in section 10.5.2.4 of the EIAR.

#### 10.5.2.4 Fauna

The mammal species recorded on the site are not of high conservation concern and they are likely to be common and widespread in the surrounding environment. The most abundant species recorded on the site was the Fox, which is an opportunistic forager and readily forages in disturbed environments. The proposed development site is used by a range of mammal species for foraging, however no mammal breeding sites were found on the site. A number of rabbit burrows were found at the site; however, no warren was found and certainly no evidence of breeding was found within the footprint of the proposed development.

The proposed location of the extension to leachate management facility is proximal to an area where badger evidence (latrine) was located, however no evidence of breeding was recorded (setts) and therefore no long-term impacts are predicted.

#### Badger

**[Addendum: No Badger activity was noted during the 2019 surveys. Badger activity in the form of tracks and latrines was recorded during the 2010 and 2015 surveys. No Badger setts were observed within the existing facility during any of the surveys.]**

**Badgers are generally found in areas of deciduous or mixed woodlands which are near farmland or open ground and are likely to utilise the existing facility for foraging purposes. Given the scale and nature of the proposed works, the absence of Badger signs during the 2019 survey and the woodland present within the wider landscape it is considered that]**

There will **[be a]** *Temporary Slight Impact* on Badger via disturbance, as Badgers are likely to avoid this area.

#### Otter

**[Addendum: During the 2019 surveys a regular Otter spraint site was recorded at the inflow pipe culvert of the existing surface water attenuation pond within the Knockharley Landfill site boundary. Otter spraints were also recorded at the Knockharley Stream during the 2015 and 2010 surveys. However, no holts were identified during any of surveys.]**

A culvert is to be installed within the Knockharley stream and the stream is also **[in]** proximity to felling works and to the northern limit of a proposed berm to the west of the site. These works will disturb otters as a result of noise and construction workers in the area which will have a *Temporary Slight Impact* on Otter.

[Addendum: In the absence of mitigation measures, Knockharley Stream has the potential to suffer water quality impacts as a result of run-off during construction. This has the potential to have an indirect impact on species such as Otter and the impact prior to mitigation is considered to a *short to medium term Significant Impact*.

### Irish Hare

Three Irish Hare sightings, in addition to droppings were recorded during the field surveys in 2019. Irish Hares are found in a wide variety of habitats in Ireland from coastal grasslands and salt marshes to upland moors. They are most abundant on lowland pastures and areas that provide short grass, herbs and heather.

The habitats on-site offer suitability for breeding and foraging Irish Hare. However, no forms were observed within the existing facility. It is likely that this species utilises the surrounding landscape for breeding. The sightings of Irish Hare suggest that this species may forage in / commute through the existing facility.

Therefore, given the absence of breeding forms and the abundance of suitable habitat in the wider area, it is considered that a ....]

*Temporary Slight Impact* to hare may occur during construction.

[Addendum: The following provides a detailed account of the potential impact to other mammal species.

### Hedgehog

Hedgehogs are adaptable to different habitat types and changing conditions as they were once found only in deciduous woodlands in Ireland. They are now found in deciduous woodlands, scrub and open grasslands hedgerows, meadows and suburban gardens which are open and un-fenced. No Hedgehog activity was recorded during the surveys since 2010. However, signs of Hedgehog activity are extremely difficult to detect and given their small stature they may not be picked up on trail cameras.

Hedgehog may potentially utilise the habitats on-site for foraging. However, given the abundance of similar habitat in the surrounding area and the adaptable nature of the species, it is considered that the construction of the proposed development will have a *short term slight impact* on Hedgehog in the absence of mitigation.

### Irish Stoat

Irish Stoats have adapted to a large number of different habitat types but prefer an area that provides some cover. They can be found in woodlands, hedgerows, marsh, heather, lowland farms, moorland, coastal areas and on small mountains. Their diet largely comprises rabbits, birds and insects. While not recorded during any of the surveys, this species is likely to occur within the existing facility. Given the scale and nature of the proposed development and the abundance of similar habitat in the surrounding environment it is considered that the construction of the proposed development will have a *short term slight impact* on Irish Stoat in the absence of mitigation.

### Pine Marten

One Pine Marten was recorded during the trail camera surveys in the south of the existing facility in 2019. No other Pine Marten signs were observed during the walkover mammal survey. While Pine Martens generally inhabit forests of coniferous or mixed tree types (both of which are present within the existing facility), the absence of any dens or other Pine Marten signs during the walkover survey indicates that this species does not use the existing facility for breeding purposes.

It is possible that the solitary Pine Marten recorded during the trail camera surveys was foraging within the area. However, given the absence of dens, field signs or other live sightings of the mammal, it is considered that the construction of the proposed development will have a *short term slight impact* on Pine Marten in the absence of mitigation.

### Red Deer

Male (Stag) Red Deer prints were observed in an area of spoil and bare ground in the west of the existing facility. The identification of the prints as red deer was possible given that 3 No. surveyors had noted a single Red Deer within the site on previous occasions.

It is possible that the Stag uses the woodland within the site boundary. Red Deer are mobile and capable of making use of wooded habitats in the wider landscape, of which plantations at the existing facility form a small proportion.

Given that no additional signs of Deer were observed either during the walkover or the trail camera surveys, it is considered that the construction of the proposed development will have a *short term slight impact* on this species in the absence of mitigation.

### Red Squirrel

The Red Squirrel needs a medium to large concentration of trees in order to establish a habitat. They prefer coniferous forests but can create a habitat in mixed deciduous and coniferous woodlands. Red Squirrels are largely vegetarian feeding on a wide selection of fruits, seeds and berries.

No Red Squirrel activity was noted during any of the surveys. However, the potential exists for this species to utilise the woodland on-site for foraging. No Squirrel dreys or evidence of Red Squirrel were observed so it is unlikely that this species uses the existing facility for breeding purposes.

In Ireland as in other countries the red squirrel will usually disappear from an area when the Grey Squirrel species begin to use it as a habitat. As Grey Squirrels have also been recorded in the area and have the potential to use the existing facility it is unlikely that Red Squirrels utilise the existing facility for foraging purposes.

While there was no evidence of the species utilising the existing facility, the species has been recorded within 10km of Knockharley Landfill (NBDC). Therefore, given the potential for possible future colonisation of the existing facility, the construction of the proposed development will have a *short term slight impact* on the Red Squirrel.

### Fox

Fox droppings were noted at two locations within the south of the existing facility in 2019. Foxes are common species within the Irish countryside. They are highly adaptive mammals that can inhabit any type of land area, however they are traditionally associated with woodland and open countryside. Due to the absence of Fox dens within the site boundary and given their widespread nature within the Irish landscape it is considered that construction and operation of the proposed development will have a *short term imperceptible impact* on Fox in the absence of mitigation.

### Wood Mouse

Wood Mouse are found in Irish woodland habitats such as coniferous, deciduous and mixed forests. They are a highly adaptable animal and are now found in a range of different habitat types. Wood mouse are one of Ireland's most common mammals.

A Wood Mouse nest was found within the existing facility in 2010. No sightings or signs were recorded during subsequent surveys. However, signs of Wood Mouse activity are extremely difficult to detect and given their small stature they would not be picked up on trail cameras.

It is considered that construction of the proposed development will have *short term imperceptible impact* on Wood Mouse in the absence of mitigation.

### Pygmy Shrew

Pygmy Shrews are found throughout Ireland in a variety of habitats ranging from areas bordering coniferous and deciduous woodland to any area with good ground cover such as grasslands, heaths, hedgerows, peatlands and sand dunes. The Pygmy Shrew is a favourite prey species for a numerous other animals and birds in Ireland including foxes, pine martens, stoats and owls.

No sightings or signs of Pygmy Shrew were recorded during any of the surveys. However, signs of Pygmy Shrew activity are extremely difficult to detect and given their small stature they would not be picked up on trail cameras.

It is considered that construction of the proposed development will have *short term imperceptible impact* on Pygmy Shrew in the absence of mitigation.

### Brown Rat (invasive species)

The Brown Rat is the most common rodent species found in Ireland. In addition, along with the house mouse the brown rat is considered to be the most widespread terrestrial mammal in Ireland. This species is highly adaptable to most habitat types.

Brown Rat tracks were noted within the existing facility. However, like other rodent species found in Ireland the Brown Rat is not protected under any legislation. As part of their EPA licence Knockharley Landfill Ltd. is required to implement pest management at the site. Knockharley Landfill Ltd. employs the services of a specialist pest control contractor to provide a pest prevention service for the landfill, which includes, *inter alia*, brown rats and mice.

Given the ongoing implementation of pest management at the existing facility it is not considered that the proposed development will lead to the spread of this invasive species.

### Grey Squirrel (invasive species)

Grey Squirrels thrive in any area which provides their main food source of broadleaf tree seeds, these can be found in coniferous forests, deciduous woods, parks, large gardens and hedgerows but they prefer habitats of deciduous or mixed woodlands in Ireland.

Although not observed during the surveys the woodland habitats on-site offer potential habitat for Grey Squirrel.

Given the ongoing implementation of pest management at the existing facility it is not considered that the proposed development will lead to the spread of this invasive species.

### Rabbit (invasive species)

Rabbits occupy a variety of habitats including open grassland, heath land, meadows, fringes of agricultural lands, grassy cliffs, sand dunes and light deciduous woodlands. Rabbit burrows were found at the existing facility in 2010. During subsequent surveys in 2015 and 2019 no sign of Rabbit activity such as burrows, warrens or droppings were observed. This may be in part due to the Fox activity recorded at the existing facility.

Given the ongoing implementation of pest management at the existing facility it is not considered that the proposed development will lead to the spread of this invasive species.

## 4.2 Operational Phase

The following section details the potential impacts to mammals during the operational phase of the development in the absence of mitigation. The potential impact to mammals are considered in section 10.5.3.4 of the EIAR.

#### 10.5.3.4 Fauna

During the operational phase, mammals are likely to continue to use the site and the new woodland created will provide habitat for cover and foraging. The increased activity to the north west of the site where the IBA facility is located may deter mammals from this area, however, resulting in a slight localised disturbance impact. However, as the woodland and landscaping matures this impact shall be reduced.

Mixed deciduous and coniferous trees felled will be replaced with native broadleaved trees which will be of higher ecological value to local wildlife. This woodland planting will provide cover and foraging habitat for local fauna. As these trees mature, they will also provide nesting habitat for birds.

This woodland will be commercial forestry and will therefore be felled in the future. Planting of deciduous woodland will have a Positive **[Long]**-Term Moderate impact on local fauna.

### 4.3 Decommissioning Phase

On cessation of waste acceptance at the facility, a restoration and aftercare plan will be put in place (please see Chapter 2 Description of the Proposed Development in Volume 2 of this EIAR) and any structures not required as part of the restoration and aftercare plan will be removed.

**[Addendum: During the removal of structures and restoration works there will be local *short-term slight impact* due to disturbance to mammals in the absence of mitigation measures]**

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## 5 Mitigation Measures

Mitigation measures for the proposed development are outlined in section 10.6 of the EIAR and in section 2.8 of the EIAR which describes mitigation by design.

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## 6 Residual Impact

**[Addendum: Taking into consideration the updated surveys and mitigation measures proposed, it is reconfirmed that there will be no significant residual impact to mammals as per the EIAR.]**

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## 7 CONCLUSION

Mammal surveys were continued during 2019 . Fourteen mammal species have been recorded within 10km of the site (NBDC). Evidence of seven (in 2010), five (in 2015) and four (in 2019) mammals were recorded with the site boundary during the surveys.

No setts, holt, dens, forms or burrows were recorded within Knockharley Landfill during the 2019 surveys. The only mammal species with the potential to be significantly affected by the proposed development is Otter. The proposed works have the potential to have a short to medium term Significant Impact on Otter due to a deterioration in water quality during construction phase. However, given the implementation of mitigation measures described in section 2.8 and 10.6 of the EIAR, it is concluded that there will be no negative impacts on Otter during the construction phase.

During the operational phase, mammals are likely to continue using the site, albeit the site is securely fenced and the new woodland created will provide habitat for cover and foraging. It is considered that the operational phase of the development will not result in a significant negative impact on any mammal species.

As outlined in section 10.6 of the EIAR, a pre-construction mammal survey will be undertaken prior to works commencing to reconfirm the finding of the EIAR.

Taking into consideration the results of the continued mammal surveys, the habitat preference of the mammals recorded, the habitats within the existing facility and in the surrounding landscape, in addition to mitigation measures, it can be concluded that the proposed development will not result in a significant negative residual impact on mammal species.

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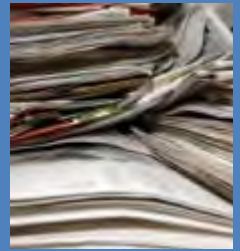
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# Appendix 3

## Knockharley Landfill Mammal Survey 2019

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# KNOCKHARLEY LANDFILL MAMMAL SURVEY 2019

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**CREATED FOR:**

Knockharley Landfill Ltd.



**CREATED:**

October 2019

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## 1 INTRODUCTION

This report details the results of mammal surveys carried out at Knockharley Landfill during 2019. This report should be read in conjunction with Chapter 10 of Volume 2 of the Environmental Impact Assessment Report for Proposed Development at Knockharley Landfill (Fehily Timoney and Company, 2018) (EIAR).

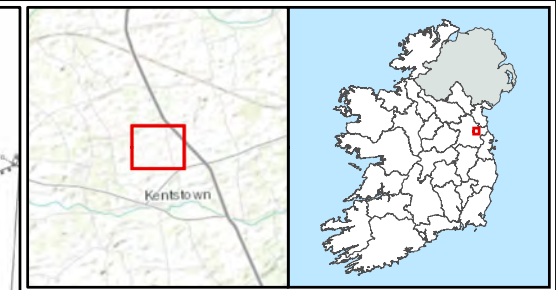
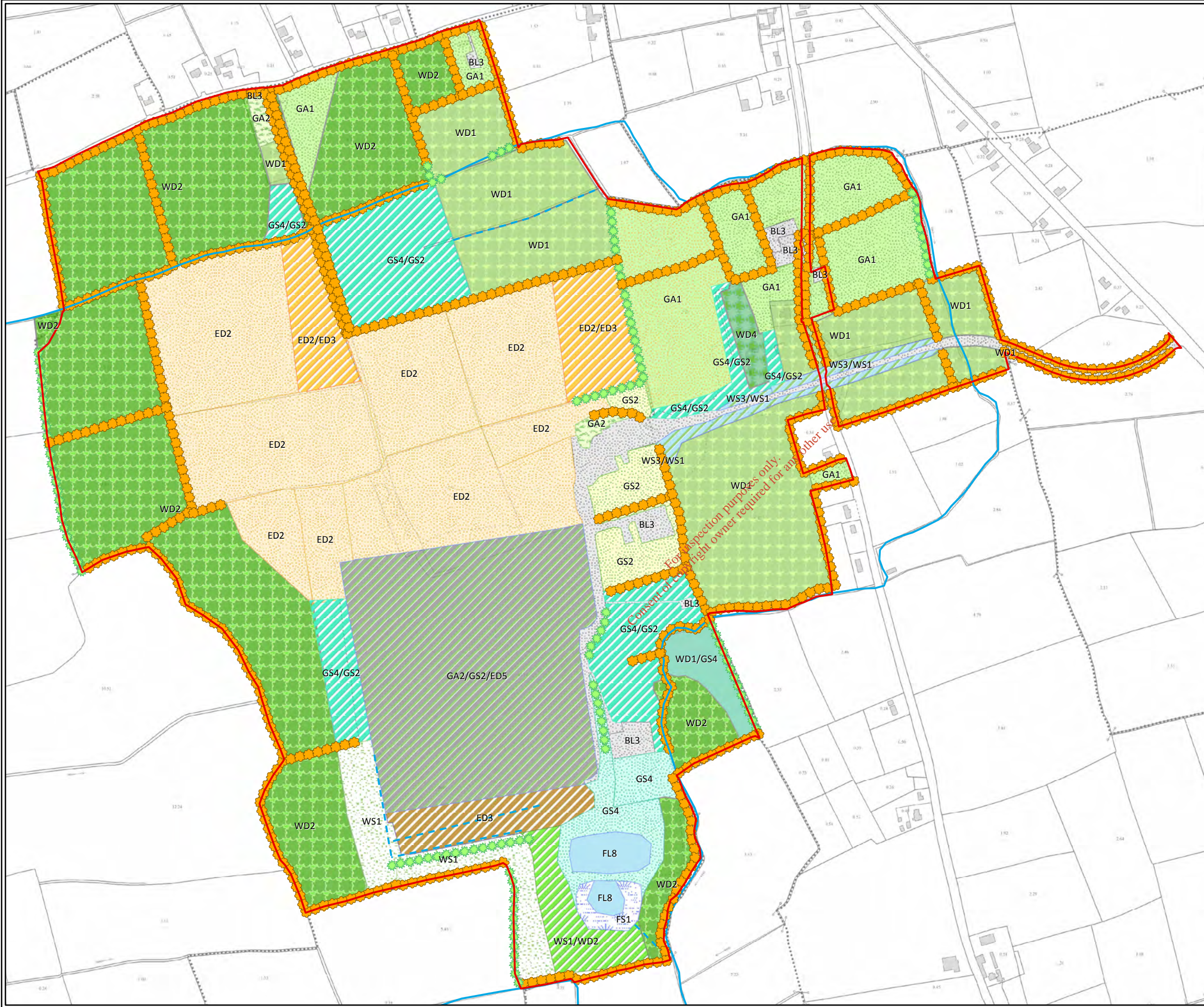
Knockharley Landfill Ltd. proposes to further develop the existing facility. In addition to the desktop study, an extensive field-based assessment was carried out within the boundary of the entire facility. The survey was undertaken to examine the potential impact of the proposed development on terrestrial mammal species.

### 1.1 Habitats at the Site

The following habitats, classified according to Fossitt (2000), are located within the proposed development:

- Improved Agricultural Grassland (GA1)
- Wet Grassland/Dry Meadows and Grassy Verges (GS4/GS2) Mosaic
- Dry Meadows and Grassy Verges (GS2)
- Wet Grassland (GS4)
- Hedgerows (WL1)
- Treelines (WL2)
- (Mixed) Broadleaved woodland (WD1)
- (Mixed) Broadleaved Woodland/Wet Grassland (WD1/GS4) Mosaic
- Conifer Plantation (WD4)
- Mixed Broadleaved/Conifer Woodland (WD2)
- Buildings and Artificial Surfaces (BL1)
- Spoil and Bare Ground (ED2)
- Recolonising Bare Ground (ED3)
- Spoil and Bare Ground/Recolonising Bare Ground (ED2/ED3) Mosaic
- Scrub (WS1)
- Ornamental/Non-native Shrub/Scrub (WS3/WS1) Mosaic
- Drainage Ditches (FW 4)
- Eroding Rivers (FW 1)
- Artificial Lakes and Ponds (FL8)
- Reed and Large Sedge Swamps (FS1)

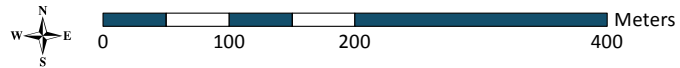
Figure 1 over illustrates the habitats and their coverage at the site.



- Planning Boundary
- Habitat**
- FW1 - eroding river
- FW4 - drainage ditches
- WL1 - hedgerow
- WL2 - treeline
- BL3 - buildings and artificial surfaces
- ED2 - spoil and bare ground
- ED2 / ED3 - spoil and bare ground / recolonising bare ground mosaic
- ED3 - recolonising bare ground
- FL8 - artificial lakes and ponds
- FS1 - reed and large sedge swamps
- GA1 - improved agricultural grassland
- GA1 / GS4 - improved agricultural grassland / wet grassland mosaic
- GA2 - Amenity
- GA2/GS2/ED5 - amenity grassland / dry meadows and grassy verges / refuse and other waste
- GS2 - dry meadows and grassy verges
- GS4 - wet grassland
- GS4 / GS2 - wet grassland / dry meadows and grassy verges mosaic
- WD1 - (mixed) broadleaved woodland
- WD1 / GS4 - (mixed) broadleaved woodland / wet grassland mosaic
- WD2 - mixed broadleaved / conifer woodland
- WD4 - Conifer Plantation
- WS1 - scrub
- WS1 / WD2 - scrub / mixed broadleaved-conifer woodland mosaic
- WS3 / WS1 - ornamental/non-native shrub / scrub mosaic

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<b>TITLE:</b>	Habitats
<b>PROJECT:</b>	Knockharley Landfill, Co. Meath
<b>FIGURE NO:</b>	1
<b>CLIENT:</b>	Knockharley Landfill Ltd.
<b>SCALE:</b>	1:6000
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## 2 METHODOLOGY

### 2.1 Desktop Study

A desktop study was carried out to collate and review available information, datasets and documentation sources pertaining to the site's natural environment. It involved an examination of mammals recorded within the 10km grid square in which the site is located using the National Biodiversity Data Centre (NDBC) mapping system (<http://maps.biodiversityireland.ie/#/Map>) and information on the National Parks and Wildlife Service (NPWS) webpage, metadata available online from the NPWS mapping system (<http://webgis.npws.ie/npwsviewer/>). These databases were accessed on the 8<sup>th</sup> October 2019.

A data request for rare and protected species within 10km of the existing facility was submitted to the NPWS on 8<sup>th</sup> October 2019. This data was received from the NPWS on the 11<sup>th</sup> October 2019 and the information received used within this report.

Identification of mammal field signs was undertaken with reference to; Lawrence & Brown (1973), Clark (1988); Sargent & Morris, (2003) and Bang & Dahlstrom (2004).

### 2.2 EIAR Surveys

Mammal surveys were previously undertaken on 5<sup>th</sup> and 6<sup>th</sup> May 2010 and 26<sup>th</sup> March 2015 to inform EIAR preparation.

As per section 10.3.6 of the EIAR:

*"The mammal surveys consisted of a site walkover, with features such as field boundaries, stream banks and access tracks being closely searched for signs of mammals. Any tracks or signs (including droppings, prints, resting places, burrows and setts) of mammals occurring within or in the vicinity of the site were recorded using field notes and/or handheld GPS units (Garmin). Identification of mammal field signs was undertaken with reference to; Lawrence & Brown (1973), Clark (1988); Sargent & Morris, (2003) and Bang & Dahlstrom (2004). In addition, any direct sighting of mammals made during the walkover were recorded."*

### 2.3 2019 Walkover Survey

An updated walkover mammal survey was conducted within the entire footprint of the Knockharley Landfill between 10:00 and 16:00 on 2<sup>nd</sup> October 2019 to identify and record all mammal signs present. The survey was carried out in accordance with the methodology outlined in the NRA (2009) guidelines. Field signs such as droppings, prints, and feeding remains were recorded, and all mammal excavations were examined and classified (burrows, setts, dens etc.). Surveys were undertaken by Dr Jonathon Dunn (PhD, MSc & BSc) and Orla Coffey (MSc & BSc). Weather conditions were favourable; 10°C, no rain, no wind, 5/8 cloud cover

### 2.4 2019 Trail camera surveys

Trail cameras were placed within the existing facility to complement the walkover mammal survey. These surveys were carried out to obtain a sample of mammal activity within Knockharley Landfill. Two trail cameras were deployed at the existing facility on 1<sup>st</sup> August 2019. Trail camera 1 was placed in a wet grassland / grassy verges mosaic in the south of the existing facility. Trail camera 2 was placed within a mixed broadleaved woodland in the north of the existing facility. Both trail cameras were collected on the 2<sup>nd</sup> October 2019.

## 2.5 Impact Assessment

EPA Guidelines (2017) were used to assess the potential impact and resulting effect of the proposed development on mammalian resources.

In line with the EPA Guidelines (EPA, 2017), the following terms are defined when quantifying duration:

- Momentary: from seconds to minutes
- Brief: up to 1 day
- Temporary: up to 1 year
- Short-term: from 1-7 years;
- Medium-term: 7-15 years;
- Long-term: 15-60 years; and
- Permanent: over 60 years.

The impacts were assessed under a number of parameters such as magnitude, extent, timing, frequency, duration and reversibility. The impact significance criteria (EPA, 2017) as set out in Table 2.1 are used where applicable. A glossary of impacts is further outlined in Appendix 10.3 Volume 3 of the EIAR.

**Table 2-1: Significance of Effects Criteria**

Impact Significance	Criteria
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

## 3 RESULTS

### 3.1 Desktop survey

A desktop review of information available from the National Biodiversity Data Centre (NBDC) indicates that the following species have been observed within the 10km grid square (N96) in which the existing facility is located: Brown Rat (*Rattus norvegicus*), Badger (*Meles meles*), Grey Squirrel (*Sciurus carolinensis*), Red Squirrel (*Sciurus vulgaris*), Otter (*Lutra lutra*), Irish Hare (*Lepus timidus subsp. Hibernica*), Irish Stoat (*Mustela erminea subsp hibernica*), Rabbit (*Oryctolagus cuniculus*), Pine Marten (*Martes martes*), Red Deer (*Cervus elaphus*), Red Fox (*Vulpes Vulpes*) and Hedgehog (*Erinaceus europaeus*).

The rare and protected species records from the NPWS highlighted one additional species not listed in the 10km grid square N96, namely Pygmy Shrew. However, the latest record for this species was in 1969.

See table 3.1 for more information:

**Table 3-1: Desktop results of mammals within the 10km of the existing facility**

Mammal Name	Legal Protection	Conservation Status (Marnell et al. 2009)
Brown Rat ( <i>Rattus norvegicus</i> )	None	Invasive species
Badger ( <i>Meles meles</i> )	Wildlife Acts	Least Concern
Grey squirrel ( <i>Sciurus carolinensis</i> )	None	Invasive species
Hedgehog ( <i>Erinaceus europaeus</i> )	Wildlife Acts	Least Concern
Irish Hare ( <i>Lepus timidus subsp. Hibernica</i> )	EU Habitats Directive Annex V, Wildlife Acts	Least Concern
Irish Stoat ( <i>Mustela erminea subsp hibernica</i> )	Wildlife Acts	Least Concern
Otter ( <i>Lutra lutra</i> )	EU Habitats Directive Annex II & Annex IV Wildlife Acts	Favourable*
Pine Marten ( <i>Martes martes</i> )	EU Habitats Directive Annex V, Wildlife Acts	Least Concern
Pygmy Shrew ( <i>Sorex minutus</i> )	Wildlife Acts	Least Concern
Rabbit ( <i>Oryctolagus cuniculus</i> )	None	Least Concern
Red Deer ( <i>Cervus elaphus</i> )	Wildlife Acts	Least Concern
Red Fox ( <i>Vulpes Vulpes</i> )	None	Least Concern
Red squirrel ( <i>Sciurus vulgaris</i> )	Wildlife Acts	Near Threatened

\* Conservation Status updated from Near Threatened to Favourable in National Otter Survey of Ireland 2010/2012 (NPWS, 2013)

### 3.2 EIAR surveys

Evidence of seven and five mammal species was recorded during the 2010 and 2015 surveys respectively. Refer to Table 3.2 and Figure 10.4 reproduced from Chapter 10 in the EIAR.

**Table 3-2: Results of 2010 Mammal Survey**

Mammal Name	Year of Survey	Note	Conservation Status
Brown Rat ( <i>Rattus norvegicus</i> )	2010	Tracks along banks of Knockharley Stream, probably widespread.	N/A
	2015	Common species in Ireland.	
Badger ( <i>Meles meles</i> )	2010	Track and latrine found adjacent to access road in the east of the existing facility.	Least Concern
	2015	Track, latrine and hair in south east of the existing facility.	
Irish Hare ( <i>Lepus timidus subsp. Hibernica</i> )	2010	Seen in wet grassland in northwest of the existing facility.	Least Concern
	2015	Tracks seen in grassland in east of the existing facility.	
Otter ( <i>Lutra lutra</i> )	2010	Two spraints found along Knockharley Stream.	Favourable*
	2015	Spraints found along Knockharley Stream and channels in three locations.	
Rabbit ( <i>Oryctolagus cuniculus</i> )	2010	Burrows in earthen bank in west of the existing facility.	Least Concern
Red Fox ( <i>Vulpes Vulpes</i> )	2010	Widespread- prints and scat	Least Concern
	2015	Scat recorded – assumed to be widespread.	
Wood Mouse ( <i>Apodemus sylvaticus</i> )	2010	Nest hole in dry grass in northwest of the existing facility.	Least Concern

### 3.3 Walkover Survey 2019

During the 2019 walkover survey evidence of the following species was recorded; Irish Hare, Red Deer and Fox. The Otter survey conducted in August 2019 also identified Otter spraint. Please refer to Aquatic Ecology Report in Appendix 5 for details of this survey. During the walkover survey it was noted that the Knockharley Landfill is surrounded by secure fencing.

#### Irish Hare

*Legal Status:* EU Habitats Directive [92/43/EEC] Annex V, Wildlife Act, 1976; Wildlife (Amendment) Act, 2000

*Native/invasive status:* Native.

Three live sightings of Irish Hare were recorded in the west of the existing facility. Hare droppings were also recorded within the existing facility (refer to Plate 1 below).



**Plate 1: Irish Hare Droppings**

**Red Deer**

*Legal Status:* Wildlife Act, 1976; Wildlife (Amendment) Act, 2000

*Native/invasive status:* Native

Deer prints were recorded in the west of the existing facility. The large size of the prints indicates that they were made by a stag. Red Deer has previously been noted at the existing facility during bird surveys. Given the previous sightings it is considered that the prints belong to Red Deer.



**Plate 2: Male (Stag) Red Deer Print**

**Fox**

*Legal Status:* None

*Native/invasive status:* Native

Fox droppings were recorded in three areas in the south of the existing facility. No dens or live sightings were recorded during the walkover survey.



**Plate 3: Fox Droppings**

**Otter**

*Legal Status:* EU Habitats Directive [92/43/EEC] Annex II & IV, with 47 SACs listed for otter in the Republic of Ireland; Wildlife Act, 1976; Wildlife (Amendment) Act, 2000.

*Native/invasive status:* Native

No Otter sightings or holts were recorded during the survey. Field signs in the form of spraints were recorded at the inflow pipe culvert of the existing surface water attenuation pond within the site boundary. This appeared to be a regular spraint site. Please refer to Aquatic Ecology Report in Appendix 5 for the details of Otter activity at the existing facility.

**Badger**

*Legal Status:* Wildlife Act, 1976; Wildlife (Amendment) Act, 2000.

*Native/invasive status:* Native

No Badger sightings, field signs or setts were recorded during the walkover survey.

**Pine Marten**

*Legal Status:* EU Habitats Directive [92/43/EEC] Annex II & IV, Wildlife Act, 1976; Wildlife (Amendment) Act, 2000.

*Native/invasive status:* Native.

No Pine Marten sightings, field signs or dens were recorded during the walkover survey.

### **Other Species**

There were no sightings or signs of any other mammal species including, *inter alia*, Red Squirrel, Irish Stoat or Pygmy Shrew, during the walkover survey.

## **3.4 Trail camera surveys 2019**

Only one species was recorded during the trail camera surveys which was a Pine Marten.

### **Trail Camera 1**

One (1 No.) Pine Marten was recorded in the grassland on the 16<sup>th</sup> August 2019. No other mammals were recorded at Trail camera 1 during the survey.



**Plate 4: Pine Marten at Trail Camera 1**

### **Trail Camera 2**

No mammals were recorded at Trail Camera 2 over the survey period 1<sup>st</sup> August 2019 to 2<sup>nd</sup> October 2019.

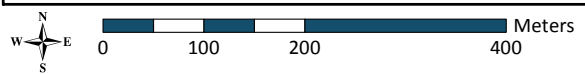
The locations of the trail cameras and the field signs /sightings are presented in Figure 2.



- Planning Boundary
- Trail Camera Locations**
- Trail Camera 1
- Trail Camera 2
- Mammal Signs/Sightings**
- Irish hare sighting
- Irish hare sighting x2
- Fox droppings
- Hare droppings
- Red deer prints
- Red deer sighting 2018

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<b>TITLE:</b>	Mammal Survey 2019		
<b>PROJECT:</b>	Knockharley Landfill, Co. Meath		
<b>FIGURE NO.:</b>	2		
<b>CLIENT:</b>	Knockharley Landfill Ltd.		
<b>SCALE:</b>	1:7500	<b>REVISION:</b>	0
<b>DATE:</b>	21/10/2019	<b>PAGE SIZE:</b>	A3





### 3.5 Summary of the results of mammal survey

Table 3.3 provides a summary of the mammal assessment. It contains information from the EIAR and is updated to include the 2019 desktop and field studies. It outlines whether a mammal species recorded during the desktop study was subsequently recorded within the existing facility during the mammal surveys that took place from 2010 – 2019 and the potential for the species to utilise the existing facility.

**Table 3-3: Mammal Survey Summary Results**

Mammal Name	Desktop Study (NBDC & NPWS)	2010 Survey	2015 Survey	2019 Survey	Notes	Potential for species to utilise the existing facility
Brown Rat	✓	✓	✓	✗	Tracks seen, common species in Ireland.	Yes – on-site habitats suitable
Badger	✓	✓	✓	✗	Latrines and tracks observed in south of site in 2010 and 2015. No signs noted in 2019 survey.	Yes – on-site habitats suitable
Grey Squirrel	✓	✗	✗	✗	No sightings or field signs.	Yes – on-site habitats suitable
Hedgehog	✓	✗	✗	✗	No sightings or field signs.	Yes – on-site habitats suitable
Irish Hare	✓	✓	✓	✓	Live sightings in 2010 and 2019. Tracks observed in 2015.	Yes – on-site habitats suitable
Irish Stoat	✓	✗	✗		No sightings or field signs.	Yes – on-site habitats suitable
Otter	✓	✓	✓	✓	Sprints recorded in 2010, 2015 and 2019.	Yes – on-site habitats suitable
Pine Marten	✓	✗	✗	✓	Observed on trail camera 2 in wet grassland in 2019.	Yes – on-site habitats suitable
Pygmy Shrew	✓	✗	✗	✗	No sightings or field signs.	Yes-while the species has not been recorded during surveys the habitats on-site offer potential suitable habitat (included based on the precautionary principle)
Rabbit	✓	✓	✗	✗	Burrows observed in 2010.	Yes – on-site habitats suitable
Red Deer	✓	✗	✗	✓	Tracks in 2019. Live sightings during bird surveys in 2018.	Yes- on-site habitats suitable
Red Fox	✓	✓	✓	✓	Prints, droppings and scat observed in 2010, 2015 and 2019.	Yes – on-site habitats suitable
Red Squirrel	✓	✗	✗	✗	No sightings or field signs.	Yes – on-site habitats suitable
Wood Mouse	✓	✓	✗	✗	Nest hole observed in 2010.	Yes – on-site habitats suitable

## 4 Impacts on Mammals

In the following section the impacts on terrestrial habitats as determined in the EIAR are included verbatim (with grey background and original numbering). Any changes, additions or notes arising from the current assessment based on additional data included in bold below the relevant paragraph.

**No dens, holts or setts were recorded within the existing facility. Fourteen mammal species have been recorded within 10km of the existing facility (NBDC), three of which are classified as invasive species, namely Brown Rat, Grey Squirrel and Rabbit. Evidence of seven (in 2010), five (in 2015) and five (in 2019) mammals were recorded with the site boundary during the surveys.**

**Knockharley Landfill Ltd. is applying for permission for the continuation of landfilling activities beyond 2021. Construction of the proposed development will be phased.**

**Given the potential of all fourteen mammal species to utilise the existing facility, it is possible that these mammals may be negatively impacted by the proposed development.**

### 4.1 Construction Phase

The following section details the potential impacts to mammals during the construction phase of the development in the absence of mitigation. The potential impact to mammals is considered in section 10.5.2.4 of the EIAR.

#### 10.5.2.4 Fauna

The mammal species recorded on the site are not of high conservation concern and they are likely to be common and widespread in the surrounding environment. The most abundant species recorded on the site was the Fox, which is an opportunistic forager and readily forages in disturbed environments. The proposed development site is used by a range of mammal species for foraging, however no mammal breeding sites were found on the site. A number of rabbit burrows were found at the site; however, no warren was found and certainly no evidence of breeding was found within the footprint of the proposed development.

The proposed location of the extension to leachate management facility is proximal to an area where badger evidence (latrine) was located, however no evidence of breeding was recorded (setts) and therefore no long-term impacts are predicted.

#### Badger

**[Addendum: No Badger activity was noted during the 2019 surveys. Badger activity in the form of tracks and latrines was recorded during the 2010 and 2015 surveys. No Badger setts were observed within the existing facility during any of the surveys.]**

**Badgers are generally found in areas of deciduous or mixed woodlands which are near farmland or open ground and are likely to utilise the existing facility for foraging purposes. Given the scale and nature of the proposed works, the absence of Badger signs during the 2019 survey and the woodland present within the wider landscape it is considered that]**

There will **[be a]** *Temporary Slight Impact* on Badger via disturbance, as Badgers are likely to avoid this area.

#### Otter

**[Addendum: During the 2019 surveys a regular Otter spraint site was recorded at the inflow pipe culvert of the existing surface water attenuation pond within the Knockharley Landfill site boundary. Otter spraints were also recorded at the Knockharley Stream during the 2015 and 2010 surveys. However, no holts were identified during any of surveys.]**

A culvert is to be installed within the Knockharley stream and the stream is also **[in]** proximity to felling works and to the northern limit of a proposed berm to the west of the site. These works will disturb otters as a result of noise and construction workers in the area which will have a *Temporary Slight Impact* on Otter.

[Addendum: In the absence of mitigation measures, Knockharley Stream has the potential to suffer water quality impacts as a result of run-off during construction. This has the potential to have an indirect impact on species such as Otter and the impact prior to mitigation is considered to a *short to medium term Significant Impact*.

### Irish Hare

Three Irish Hare sightings, in addition to droppings were recorded during the field surveys in 2019. Irish Hares are found in a wide variety of habitats in Ireland from coastal grasslands and salt marshes to upland moors. They are most abundant on lowland pastures and areas that provide short grass, herbs and heather.

The habitats on-site offer suitability for breeding and foraging Irish Hare. However, no forms were observed within the existing facility. It is likely that this species utilises the surrounding landscape for breeding. The sightings of Irish Hare suggest that this species may forage in / commute through the existing facility.

Therefore, given the absence of breeding forms and the abundance of suitable habitat in the wider area, it is considered that a ....]

*Temporary Slight Impact* to hare may occur during construction.

[Addendum: The following provides a detailed account of the potential impact to other mammal species.

### Hedgehog

Hedgehogs are adaptable to different habitat types and changing conditions as they were once found only in deciduous woodlands in Ireland. They are now found in deciduous woodlands, scrub and open grasslands hedgerows, meadows and suburban gardens which are open and un-fenced. No Hedgehog activity was recorded during the surveys since 2010. However, signs of Hedgehog activity are extremely difficult to detect and given their small stature they may not be picked up on trail cameras.

Hedgehog may potentially utilise the habitats on-site for foraging. However, given the abundance of similar habitat in the surrounding area and the adaptable nature of the species, it is considered that the construction of the proposed development will have a *short term slight impact* on Hedgehog in the absence of mitigation.

### Irish Stoat

Irish Stoats have adapted to a large number of different habitat types but prefer an area that provides some cover. They can be found in woodlands, hedgerows, marsh, heather, lowland farms, moorland, coastal areas and on small mountains. Their diet largely comprises rabbits, birds and insects. While not recorded during any of the surveys, this species is likely to occur within the existing facility. Given the scale and nature of the proposed development and the abundance of similar habitat in the surrounding environment it is considered that the construction of the proposed development will have a *short term slight impact* on Irish Stoat in the absence of mitigation.

### Pine Marten

One Pine Marten was recorded during the trail camera surveys in the south of the existing facility in 2019. No other Pine Marten signs were observed during the walkover mammal survey. While Pine Martens generally inhabit forests of coniferous or mixed tree types (both of which are present within the existing facility), the absence of any dens or other Pine Marten signs during the walkover survey indicates that this species does not use the existing facility for breeding purposes.

It is possible that the solitary Pine Marten recorded during the trail camera surveys was foraging within the area. However, given the absence of dens, field signs or other live sightings of the mammal, it is considered that the construction of the proposed development will have a *short term slight impact* on Pine Marten in the absence of mitigation.

### Red Deer

Male (Stag) Red Deer prints were observed in an area of spoil and bare ground in the west of the existing facility. The identification of the prints as red deer was possible given that 3 No. surveyors had noted a single Red Deer within the site on previous occasions.

It is possible that the Stag uses the woodland within the site boundary. Red Deer are mobile and capable of making use of wooded habitats in the wider landscape, of which plantations at the existing facility form a small proportion.

Given that no additional signs of Deer were observed either during the walkover or the trail camera surveys, it is considered that the construction of the proposed development will have a *short term slight impact* on this species in the absence of mitigation.

### Red Squirrel

The Red Squirrel needs a medium to large concentration of trees in order to establish a habitat. They prefer coniferous forests but can create a habitat in mixed deciduous and coniferous woodlands. Red Squirrels are largely vegetarian feeding on a wide selection of fruits, seeds and berries.

No Red Squirrel activity was noted during any of the surveys. However, the potential exists for this species to utilise the woodland on-site for foraging. No Squirrel dreys or evidence of Red Squirrel were observed so it is unlikely that this species uses the existing facility for breeding purposes.

In Ireland as in other countries the red squirrel will usually disappear from an area when the Grey Squirrel species begin to use it as a habitat. As Grey Squirrels have also been recorded in the area and have the potential to use the existing facility it is unlikely that Red Squirrels utilise the existing facility for foraging purposes.

While there was no evidence of the species utilising the existing facility, the species has been recorded within 10km of Knockharley Landfill (NBDC). Therefore, given the potential for possible future colonisation of the existing facility, the construction of the proposed development will have a *short term slight impact* on the Red Squirrel.

### Fox

Fox droppings were noted at two locations within the south of the existing facility in 2019. Foxes are common species within the Irish countryside. They are highly adaptive mammals that can inhabit any type of land area, however they are traditionally associated with woodland and open countryside. Due to the absence of Fox dens within the site boundary and given their widespread nature within the Irish landscape it is considered that construction and operation of the proposed development will have a *short term imperceptible impact* on Fox in the absence of mitigation.

### Wood Mouse

Wood Mouse are found in Irish woodland habitats such as coniferous, deciduous and mixed forests. They are a highly adaptable animal and are now found in a range of different habitat types. Wood mouse are one of Ireland's most common mammals.

A Wood Mouse nest was found within the existing facility in 2010. No sightings or signs were recorded during subsequent surveys. However, signs of Wood Mouse activity are extremely difficult to detect and given their small stature they would not be picked up on trail cameras.

It is considered that construction of the proposed development will have *short term imperceptible impact* on Wood Mouse in the absence of mitigation.

### Pygmy Shrew

Pygmy Shrews are found throughout Ireland in a variety of habitats ranging from areas bordering coniferous and deciduous woodland to any area with good ground cover such as grasslands, heaths, hedgerows, peatlands and sand dunes. The Pygmy Shrew is a favourite prey species for a numerous other animals and birds in Ireland including foxes, pine martens, stoats and owls.

No sightings or signs of Pygmy Shrew were recorded during any of the surveys. However, signs of Pygmy Shrew activity are extremely difficult to detect and given their small stature they would not be picked up on trail cameras.

It is considered that construction of the proposed development will have *short term imperceptible impact* on Pygmy Shrew in the absence of mitigation.

### Brown Rat (invasive species)

The Brown Rat is the most common rodent species found in Ireland. In addition, along with the house mouse the brown rat is considered to be the most widespread terrestrial mammal in Ireland. This species is highly adaptable to most habitat types.

Brown Rat tracks were noted within the existing facility. However, like other rodent species found in Ireland the Brown Rat is not protected under any legislation. As part of their EPA licence Knockharley Landfill Ltd. is required to implement pest management at the site. Knockharley Landfill Ltd. employs the services of a specialist pest control contractor to provide a pest prevention service for the landfill, which includes, *inter alia*, brown rats and mice.

Given the ongoing implementation of pest management at the existing facility it is not considered that the proposed development will lead to the spread of this invasive species.

### Grey Squirrel (invasive species)

Grey Squirrels thrive in any area which provides their main food source of broadleaf tree seeds, these can be found in coniferous forests, deciduous woods, parks, large gardens and hedgerows but they prefer habitats of deciduous or mixed woodlands in Ireland.

Although not observed during the surveys the woodland habitats on-site offer potential habitat for Grey Squirrel.

Given the ongoing implementation of pest management at the existing facility it is not considered that the proposed development will lead to the spread of this invasive species.

### Rabbit (invasive species)

Rabbits occupy a variety of habitats including open grassland, heath land, meadows, fringes of agricultural lands, grassy cliffs, sand dunes and light deciduous woodlands. Rabbit burrows were found at the existing facility in 2010. During subsequent surveys in 2015 and 2019 no sign of Rabbit activity such as burrows, warrens or droppings were observed. This may be in part due to the Fox activity recorded at the existing facility.

Given the ongoing implementation of pest management at the existing facility it is not considered that the proposed development will lead to the spread of this invasive species.

## 4.2 Operational Phase

The following section details the potential impacts to mammals during the operational phase of the development in the absence of mitigation. The potential impact to mammals are considered in section 10.5.3.4 of the EIAR.

#### 10.5.3.4 Fauna

During the operational phase, mammals are likely to continue to use the site and the new woodland created will provide habitat for cover and foraging. The increased activity to the north west of the site where the IBA facility is located may deter mammals from this area, however, resulting in a slight localised disturbance impact. However, as the woodland and landscaping matures this impact shall be reduced.

Mixed deciduous and coniferous trees felled will be replaced with native broadleaved trees which will be of higher ecological value to local wildlife. This woodland planting will provide cover and foraging habitat for local fauna. As these trees mature, they will also provide nesting habitat for birds.

This woodland will be commercial forestry and will therefore be felled in the future. Planting of deciduous woodland will have a Positive **[Long]**-Term Moderate impact on local fauna.

### 4.3 Decommissioning Phase

On cessation of waste acceptance at the facility, a restoration and aftercare plan will be put in place (please see Chapter 2 Description of the Proposed Development in Volume 2 of this EIAR) and any structures not required as part of the restoration and aftercare plan will be removed.

**[Addendum: During the removal of structures and restoration works there will be local *short-term slight impact* due to disturbance to mammals in the absence of mitigation measures]**

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## 5 Mitigation Measures

Mitigation measures for the proposed development are outlined in section 10.6 of the EIAR and in section 2.8 of the EIAR which describes mitigation by design.

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## 6 Residual Impact

**[Addendum: Taking into consideration the updated surveys and mitigation measures proposed, it is reconfirmed that there will be no significant residual impact to mammals as per the EIAR.]**

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## 7 CONCLUSION

Mammal surveys were continued during 2019 . Fourteen mammal species have been recorded within 10km of the site (NBDC). Evidence of seven (in 2010), five (in 2015) and four (in 2019) mammals were recorded with the site boundary during the surveys.

No setts, holt, dens, forms or burrows were recorded within Knockharley Landfill during the 2019 surveys. The only mammal species with the potential to be significantly affected by the proposed development is Otter. The proposed works have the potential to have a short to medium term Significant Impact on Otter due to a deterioration in water quality during construction phase. However, given the implementation of mitigation measures described in section 2.8 and 10.6 of the EIAR, it is concluded that there will be no negative impacts on Otter during the construction phase.

During the operational phase, mammals are likely to continue using the site, albeit the site is securely fenced and the new woodland created will provide habitat for cover and foraging. It is considered that the operational phase of the development will not result in a significant negative impact on any mammal species.

As outlined in section 10.6 of the EIAR, a pre-construction mammal survey will be undertaken prior to works commencing to reconfirm the finding of the EIAR.

Taking into consideration the results of the continued mammal surveys, the habitat preference of the mammals recorded, the habitats within the existing facility and in the surrounding landscape, in addition to mitigation measures, it can be concluded that the proposed development will not result in a significant negative residual impact on mammal species.

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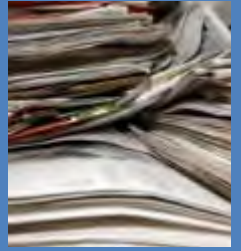
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# Appendix 4

## Knockharley Landfill Botanical and Habitat Surveys 2019

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# KNOCKHARLEY LANDFILL BOTANICAL AND HABITAT SURVEYS 2019

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**CREATED FOR:**

Knockharley Landfill Ltd.



**CREATED:**

October 2019

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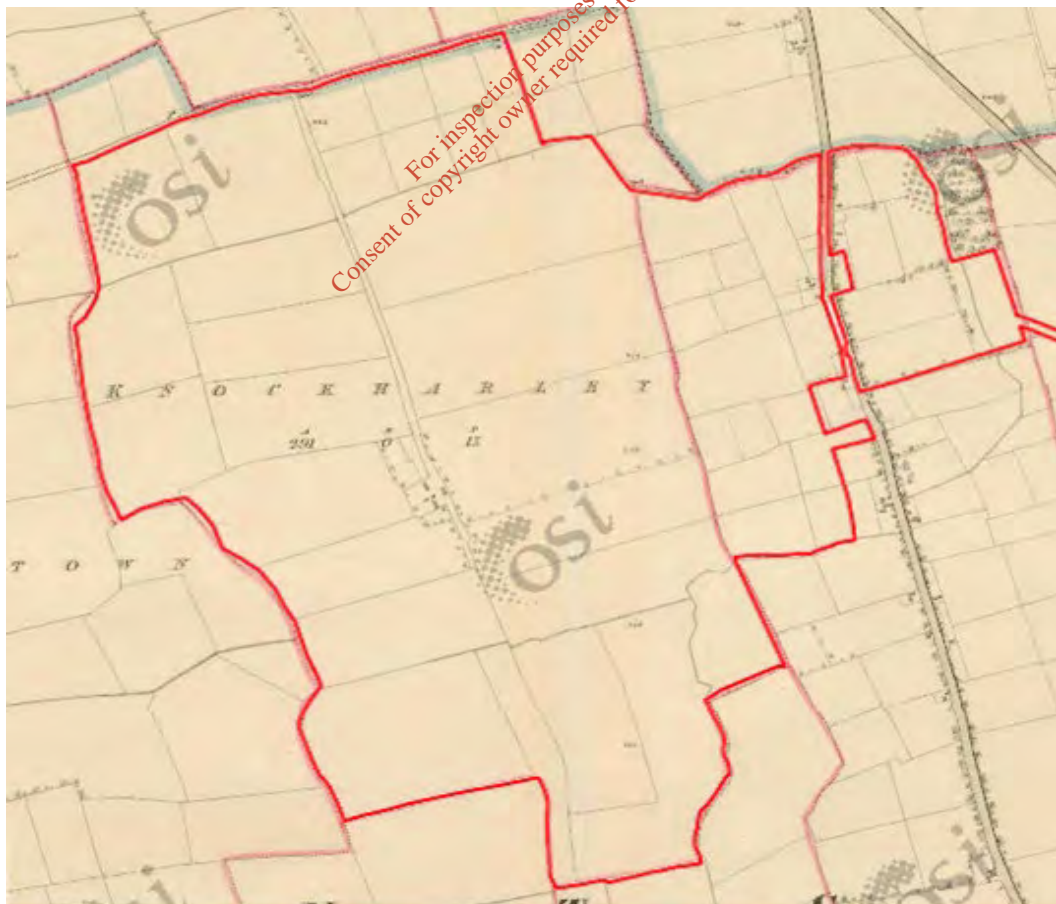
## 1 INTRODUCTION

This report details the results of habitat surveys carried out at Knockharley Landfill site during summer 2019. These survey was undertaken to continue the ongoing environmental works at Knockharley Landfill in accordance with the EIA Directive 2014/52/EU. This report should be read in conjunction with Chapter 10 of Volume 2 of the Environmental Impact Assessment Report for Proposed Development at Knockharley Landfill (Fehily Timoney and Company, 2018) (EIAR). Knockharley Landfill Ltd. proposes to further develop the existing facility as per the 2018 application for permission made directly to An Bord Pleanála. Intensive surveying of plots within the footprint of proposed development and an extensive walkover habitat surveys encompassing the entire study area were undertaken. All species of flora including vascular plants, mosses and lichen (if present) were identified and recorded. Suitable habitats were also searched for lichens. The surveys were undertaken to confirm the information contained in the EIAR.

### 1.1 Soils, Historical Habitats and Management

This section has been included to give an overview of the history of land use and habitats present at the Knockharley Landfill site. This is relevant when considering the habitats currently on site in terms of their origin, age and development.

The predominant soil type covering the site according to Teagasc's Irish Soil Information System is "fine loamy drift with limestones" (soil series Straffan 0700ST), which is a clay loam with neutral pH in the upper horizons, becoming more basic as the bedrock is approached. River alluvium is present in some areas of the site (soil series Boyne 0500SBO), which is a silty river alluvium falling within the sub-group "typical alluvial gleys". Historical 6-inch mapping (1837-1842) (plate 1 below) does not show any wooded areas within the site. A number of fields forming the eastern flank of the site are shown as containing a mix of broadleaved and coniferous trees in mapping from 1888-1913(see plate 2 below).

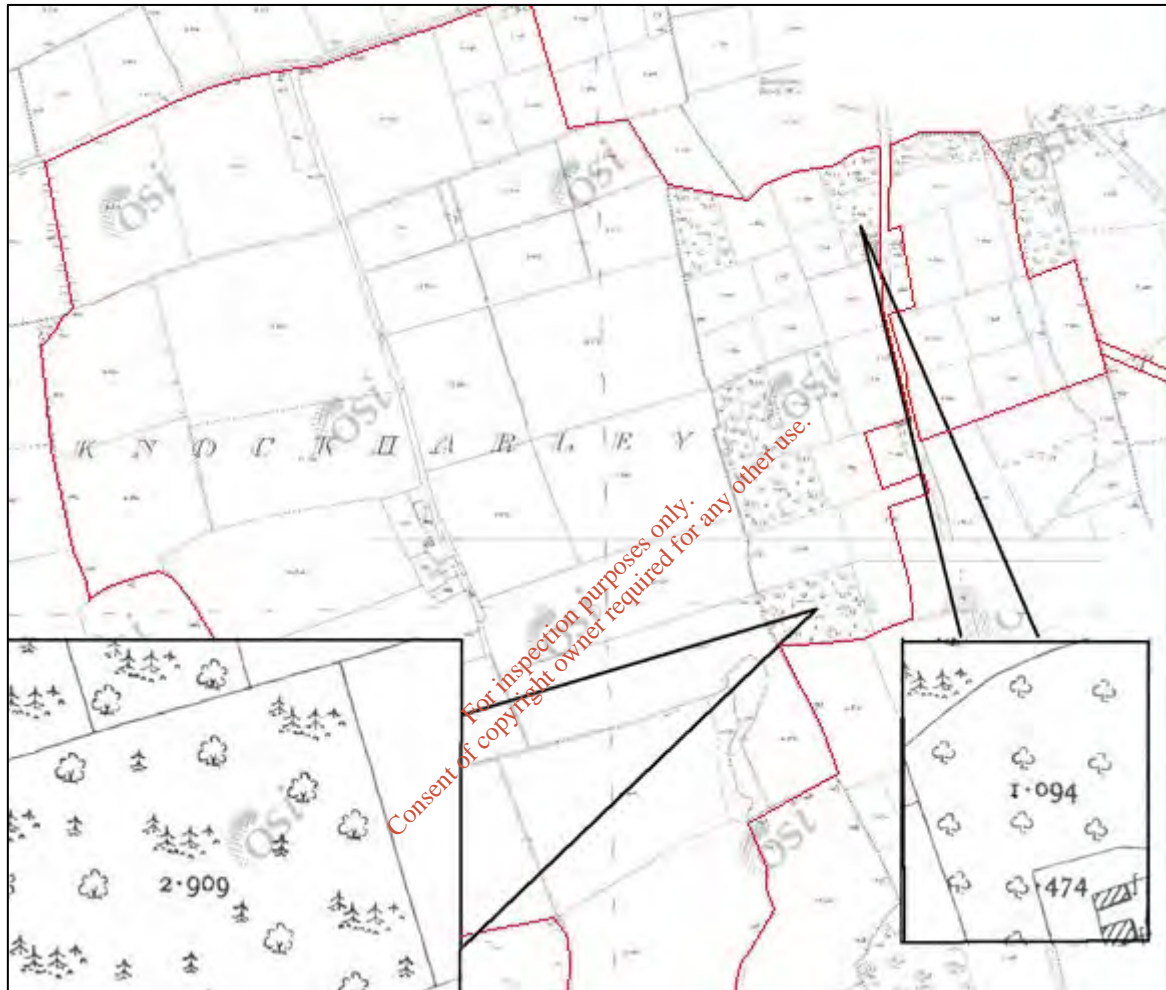


**Plate 1: Historical Mapping of Landfill Site (1837-1842)**

(Source: <http://map.geohive.ie/mapviewer.html>; accessed 03/10/2019)

Historical 25-inch mapping (1888-1913) shows that parts of the site were wooded during this period (see plate 2 below). These blocks of woodland were confined to within pre-existing field boundaries, where no woodland was depicted on previous (1837-1842) mapping, indicating their artificial origin i.e. a plantation.

The composition of the majority of these woodlands as indicated on these maps was mixed broadleaved/conifer (see inset to left in plate 2). Only one parcel of broadleaved woodland is depicted in the area during this time(right inset in plate 2).



**Plate 2: Historical Mapping of Landfill Site (1888-1913)**

(Source: <http://map.geohive.ie/mapviewer.html>; accessed 03/10/2019)

Examination of historical aerial imagery indicates the land within the site was used for a mix of intensive arable and pastoral farming up until at least the year 2000. The imagery from this year shows recently planted arable crops, uniform pastures and fields with exposed soil which indicates re-seeding of pastureland or tilled land in preparation for planting of arable crops. There are no areas of woodland present within the site in aerial imagery from the year 2000 (see plate 3 below).

Aerial imagery from 2005 shows the landfill activity onsite, with extensive areas of stripped soil, excavations and trackways. Outside of constructions areas, the surrounding habitats remained similar to that in 2000, with arable and pasture land dominating, and no evidence of woodlands (see plate 4 below).





**Plate 3: Satellite Imagery (2000)**

(Source: <http://map.geohive.ie/mapviewer.html>; accessed 03/10/2019)



**Plate 4: Satellite Imagery (2005)**

(Source: <http://map.geohive.ie/mapviewer.html>; accessed 03/10/2019)

Within the landfill site boundary no land parcels contained woodland in the era leading up to construction of the landfill. Planting with commercial forestry has taken place since landfill operations commenced. The next available set of aerial imagery (2005-2012) (plate 5 below) has a broad temporal range but shows that forestry plantations surrounding the landfill were established during this timeframe. The recolonisation by grassy vegetation of areas stripped during construction and cessation of intensive agricultural management of two fields to the north of the existing landfill (within footprint of permitted extension) can also be seen in this imagery.



**Plate 5: Satellite Imagery (2005-2012) including site boundary**

(Source: <http://map.geohive.ie/mapviewer.html>; accessed 03/10/2019)

The mapping and aerial imagery referenced was accessed through Ordnance Survey Ireland's online GIS platform *Geohive* at <http://map.geohive.ie/mapviewer.html> (accessed 03/10/2019).

Taken collectively, these images and mapping shows a history of the development on the site since 2000 and shows that no semi-natural habitats occupied the open spaces within the site in the era prior to construction of the landfill. They also show that the grassland communities currently occupying the site developed recently following disturbance and cessation or intensification of management, and that the woodlands within the site were recently planted.

The satellite image post-2012 shown in plate 6 below shows continuing site clearance works associated with the consented landfill development. The aerial photograph below (plate 7) shows the artificial character of the grasslands near the site offices soon after the facility was constructed.



**Plate 6: Satellite Imagery (post-2012) including site boundary**  
(Source: ESRI/ArcMap accessed 09/10/2019)



**Plate 7: Aerial photograph showing artificial character of grasslands around landfill offices after construction**

(From EIAR)

## 1.2 Survey Details

Surveys were undertaken in favourable weather conditions (dry and bright with good visibility), when plants were in suitable condition for identification with sufficient vegetative and reproductive material available to examine.

**Table 1: Survey Details**

Date	Surveys Undertaken	Weather	Surveyor
31/07/2019	Habitat survey, grassland quadrats/relevés	Dry; Wind F3; Cloud 5/8; Visibility Excellent	Ben O'Dwyer
01/08/2019	Habitat survey, plantation woodland relevés	Dry; Wind F2-3; Cloud 4/8; Visibility Excellent	Ben O'Dwyer
26/08/2019	Habitat survey	Dry; Wind F3; Cloud 2/8; Visibility Excellent	Joseph Adamson

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## 2 METHODOLOGY

### 2.1 Habitat and Botanical Surveys

All flora present were identified, and habitats were classified according to Fossitt (2000) "A Guide to Habitats in Ireland" (Fossitt, 2000) with habitat mapping undertaken in accordance with "Best Practice Guidance for Habitat Survey and Mapping" (Smith et. al, 2011).

Ortho-photographs of the landfill site were annotated in the field to delineate each habitat type identified. Target notes were recorded for each habitat polygon and for features of interest recorded during the survey. The minimum size of habitats mapped was 400m<sup>2</sup> for polygons and 20m for linear habitats, in accordance with the recommended guidance (Smith *et al.*, 2011). The position of notable small habitats and features of interest was marked using a GPS and recorded as points of interest. All plant species in each habitat type were recorded, enabling a full species list for the site to be compiled.

To obtain greater detail, quadrats and relevés were used to record vegetation in areas within the footprint of the proposed extensions to the east of the existing (capped) landfill and consented landfill cells.

#### 2.1.1 Grassland Habitats

For grassland areas, the methodology detailed in "The Irish semi-natural grasslands survey 2007-2012" (O'Neill et al, 2013) was used, whereby the number of 2 x 2m quadrats required was determined by the area of habitat present (e.g. 4 quadrats per area >0.25-4 ha). Quadrat locations were assigned randomly prior to survey.

All species were identified and percentage cover was recorded for each species. The percentage cover and median height for graminoids and herbs was also recorded for each quadrat. Where randomly assigned quadrats did not adequately capture the habitats present, additional relevés were surveyed. This approach was used twice. The use of both randomly assigned plots and subjectively located relevés is in accordance with *The Irish semi-natural grasslands survey* methodology.

#### 2.1.2 Plantation Woodland Habitats

Survey of plots in woodland areas was undertaken following the methodology detailed in the "National Survey of Native Woodlands 2003-2008" (Perrin et al. 2008), whereby one 10 x 10 m Relevé was recorded in each habitat type present in woodland blocks. All species were identified and recorded. Canopy and understory cover, stem density and diameter at breast height for mature trees, natural regeneration, dead wood (cover and characteristics) and characteristics such as grazing and invasive species were also recorded.

#### 2.1.3 Flora Keys and Field Guides

The following keys and field guides were used to identify flora species:

- Webb's An Irish Flora (8<sup>th</sup> edition) (Parnell and Curtis, 2012)
- The Wildflower Key (2<sup>nd</sup> edition) (Rose/O'Reilly, 2006)
- Wild Flowers of Britain and Ireland (Blamey et al., 2003)
- Identification Guide to Ireland's Grasses (Fitzpatrick et al., 2016)
- Grasses, Sedges, Rushes and Ferns of the British Isles and Western Europe (Rose, 1989)
- Grasses: A Guide To Their Structure, Identification, Uses and Distribution (Hubbard, 1992)
- Mosses and Liverworts of Britain and Ireland a field guide (Atherton et al., 2010)

### 2.1.4 Analysis

Article 17 Habitats Directive Reports from 2013 and 2019 (The Status of EU Protected Habitats and Species in Ireland – Habitat Assessments) were used to examine whether any of the habitats present within the footprint of proposed development correspond to Annex 1 habitats. The Article 17 reporting document from 2013 (NPWS, 2013) was also used as this contains more specific criteria for assignment, including a minimum number (7) of characteristic species and a list of 'high-quality' species, at least one of which must be present. The same typical species list is given in Article 17 reporting documentation from 2019 (NPWS, 2019), but no minimum number of these are specified, and none are identified as 'high-quality'. These species lists are included in Appendix 1, along with indications of which were recorded in the semi-natural grasslands within the footprint of the proposed development at Knockharley Landfill.

The quadrats and relevés recorded in the semi-natural grasslands within the proposed development footprints were also analysed using ERICA (Engine for Relevés to Irish Communities Assignment).<sup>1</sup>

In addition to assigning communities to more clearly defined groups than the habitats described in Fossitt (2000), the IVC also ties in with the Article 17 (2019) *Status of EU Protected Habitats and Species in Ireland – Habitat Assessments* since the specific IVC communities into which Annex 1 habitats fit are given in this document. The results of this analysis are included in Appendix 2, along with a brief discussion, and commentary on their relationship (if any) with Annex 1 habitats.

The Interpretation Manual of European Union Habitats (EC, 2013) was also consulted.

## 2.2 Impact Assessment

EPA Guidelines (2017) were used to assess the potential impact and resulting effect of the proposed development on habitats and flora.

In line with the EPA Guidelines (EPA, 2017), the following terms are defined when quantifying duration:

- Momentary: from seconds to minutes
- Brief: up to 1 day
- Temporary: up to 1 year
- Short-term: from 1-7 years;
- Medium-term: 7-15 years;
- Long-term: 15-60 years; and
- Permanent: over 60 years.

The impacts were assessed under a number of parameters such as magnitude, extent, timing, frequency, duration and reversibility. The impact significance criteria (EPA, 2017) as set out in Table 2 are used where applicable. A glossary of impacts is further outlined in Appendix 10.3 Volume 3 of the EIAR.

<sup>1</sup> ERICA is an online analysis tool for assigning habitats to the communities of the Irish Vegetation Classification (IVC) using vegetation data available through the National Biodiversity Data Centre (NBDC) website: <http://www.biodiversityireland.ie/projects/national-vegetation-database/irish-vegetation-classification/erica/>.

**Table 2: Significance of Effects Criteria**

Impact Significance	Criteria
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

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### 3 DESKTOP STUDY

A search for records of rare and/or protected flora and lichens in the 10 km grid square (N96) overlapping the Knockharley Landfill site was carried out using the National Biodiversity Data Centre (NBDC) website on 8<sup>th</sup> October 2019. This returned no records of rare or protected vascular plants, and no records of any species of lichen.

The NPWS map viewer was also searched for records of rare/protected species within grid square N96 and no records were returned. A data request for rare and protected species within 10km of the existing facility was submitted to the NPWS on 8<sup>th</sup> October 2019. This data was received from the NPWS on the 11<sup>th</sup> October 2019. There were records of rare or protected flora within the 10km grid square (N96) encompassing the proposed development.

Of the 81 species of bryophyte (mosses and liverworts) recorded within grid square N96, one record was of a rare/threatened species which is slender pocket-moss *Fissidens exilis*. The record is from 1978, and while geographical resolution is low at 10km, the place name Somerville is given, which corresponds to an area c. 500m south-east of the landfill site. *F.exilis* is assessed as Vulnerable in Lockhart et al's 2012 red list '*Rare and threatened bryophytes of Ireland*'.

According to the British Bryological Societies '*Mosses and Liverworts of Britain and Ireland – a field guide*' *F.exilis* inhabits neutral or acidic loam and clay soils in low-lying woodland habitats, on sheltered (often shady) banks, molehills, streamsides, and in damp fields and grassland.

The online mapping tool 'FPO (Flora Protection Order) Bryophytes Map Viewer <http://dahg.maps.arcgis.com/apps/webappviewer/index.html?id=71f8df33693f48edbb70369d7fb26b7e> details the locations of rare and threatened bryophyte species listed on the Flora Protection Order (2015). None of these locations are within or surrounding the proposed development site. The closest sites located in Baltray, Co. Louth c. 19 km to the east of the proposed development, where Pointed Beard-moss *Didymodon acutus* is present. The records for this species in the east of Ireland are limited to the Baltray and Clogherhead areas.

Six lichen species are listed in Kingston's (2012) '*Checklist of protected & rare species in Ireland*'. Of these, scrambled-egg lichen *Fulgensia fulgens* is the only lichen species listed on the Flora Protection Order. This species typically inhabits well-lit calcareous dune systems of the south east of Ireland. It is found only at Ballyteigue Burrow in Co. Wexford.

The remaining five lichen species identified by Kingston (2012) are of the genus *Cladonia* and are listed in Annex V of the EU Habitats Directive (the harvesting of Annex V species is restricted).

- *Cladonia arbuscular* is a common lichen species on acid heathlands, peat, moors and areas of dune – none of these habitats occur at Knockharley.
- *Cladonia ciliata* is common on dunes, moors, heathland and scree – none of these habitats occur at Knockharley.
- *Cladonia portentosa* is common on heaths and peat moors – none of these habitats occur at Knockharley.
- *Cladonia rangiferina* is common in highland areas and on lowland heaths along the coasts – there are no heath habitats at Knockharley.
- *Cladonia azorica* is rare and under recorded in Ireland and is only known from the Dingle peninsula in Co. Kerry.



## 4 HABITATS AT KNOCKHARLEY LANDFILL SITE

The habitats present on site are described and categorised according to Fossitt's (2000) habitat classification system. These predominantly terrestrial habitats are composed mainly of grasslands and blocks of plantation woodland. Hedgerows and treelines, areas of bare and recolonising ground, aquatic habitats and built structures are also present. Several common mosses are present as detailed below; the Vulnerable slender pocket-moss *F. elixis* is not present on site. No lichens are present on site.

Habitats are mapped in Figure 1. Figure 2 shows the locations of the intensive survey plots within the grassland and woodland habitats within the footprint of proposed infrastructure. The results of these quadrat and relevé surveys are detailed in Appendix 3 (Grasslands) and Appendix 4 (Woodlands). Photos of each plot accompany survey results and additional images are included in Appendix 5.

Please note that within the main body of this report, scientific names are given in the first instance only and thereafter the common name is used. Where species belong to the same genus, the first mention is named fully while for any following the genus is abbreviated (e.g. *Cirsium arvense* followed by *C. palustre*).

It should be noted that the EPA's name for streams are used in this report. As such, the Flemigstown 08 stream discussed in this report is the same watercourse as the 'Knockharley Stream' referred to in the EIAR.

### 4.1 Changes to the Habitat Map

Following surveys in 2019, a number of updates were made to the habitat map based on the survey data obtained. This section should be read in conjunction with the updated habitat map Figure 1 and in conjunction with Chapter 10 of the EIAR.

Changes between the current and previous habitat maps (EIAR) occurred for the following reasons:

1. natural processes (grasslands being left unmanaged and reverting to more semi-natural states), agricultural management, and
2. ongoing vegetation and topsoil clearance and spoil deposition associated with the construction of permitted landfill cells have resulted in realised changes on the ground.

Updated habitat maps were prepared to reflect all habitat changes on site. Previously areas were classified according to the dominant habitat type only. These habitat areas have now been split into mosaic-like patterns more reflective of the complexity of these discrete areas, for example, the habitats surrounding the existing surface water attenuation pond.

A number of grassland areas have been re-classified from GA1/GS4 Improved Agricultural Grassland/Wet Grassland Mosaic and GS4 Wet Grassland to GS4/GS2 Wet Grassland/Dry Meadows and Grassy Verges Mosaic due to the lack of management which has resulted in these areas becoming more natural in character, and increased in species richness. Similarly, fields to the south of the landfill offices formerly classified as GA1/GS4 Improved Agricultural Grassland/Wet Grassland Mosaic and GA1 Improved Agricultural Grassland have been allowed to revert to a more natural state, resulting in development of GS2 Dry Meadows and Grassy Verges.

Other areas of grassland have become less natural due to agricultural management, with fields which were formerly classified as GA1/GS4 Improved Agricultural Grassland/Wet Grassland Mosaic and GS4 Wet Grassland now corresponding to GA1 Improved Agricultural Grassland following re-seeding. A fringing area of GS4/GS2 Wet Grassland/Dry Meadows and Grassy Verges Mosaic remains around one of these fields.

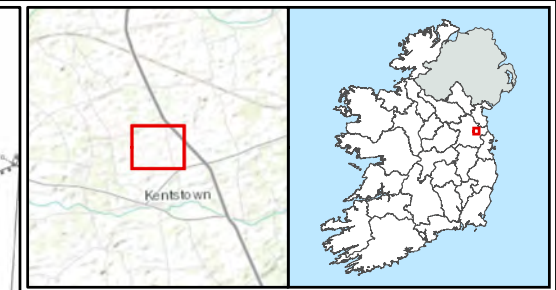
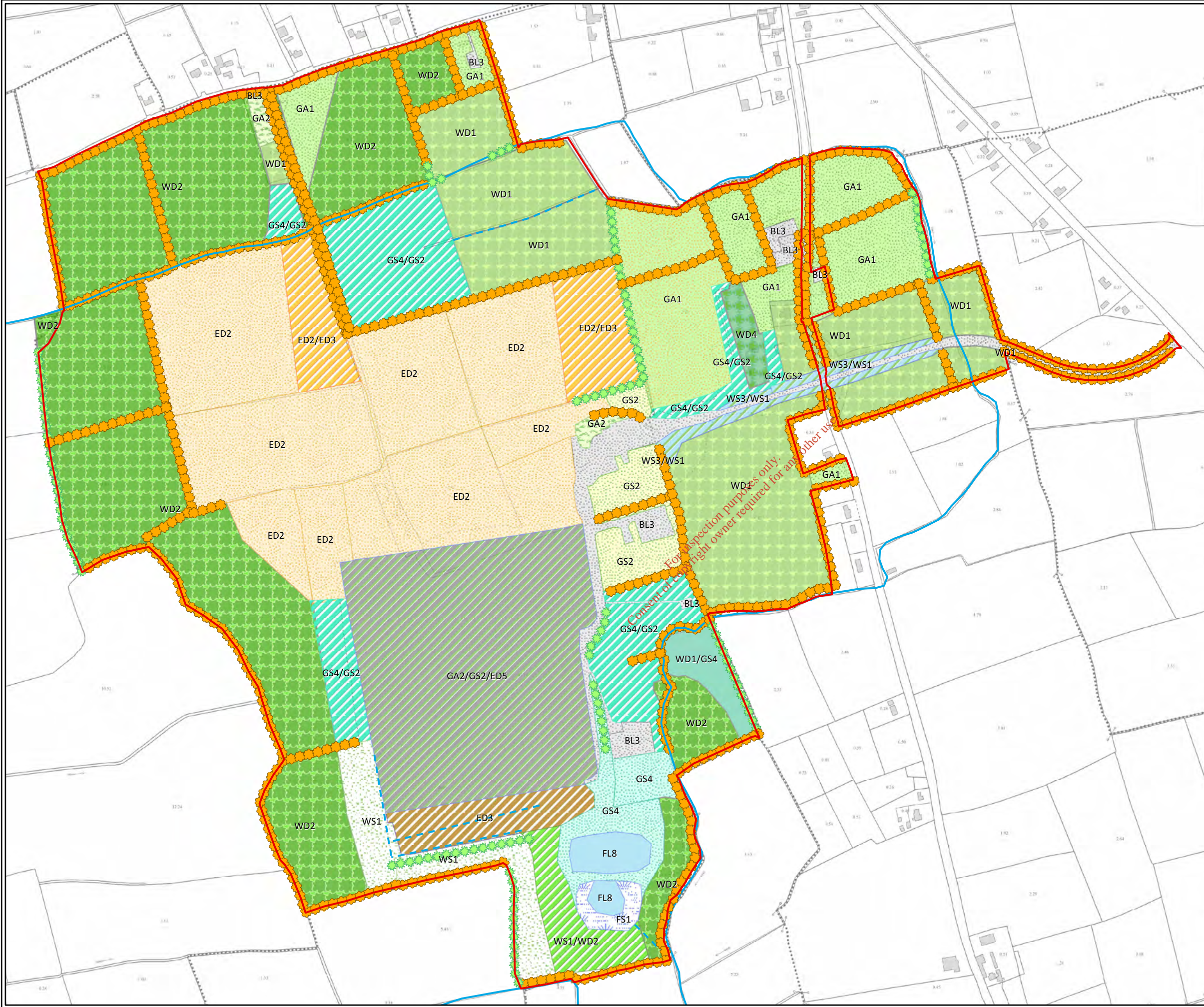
A number of fields within the footprint of the consented landfill which is under construction landfill cells have been cleared, resulting in a change in habitat type from GA1/GS4 Improved Agricultural Grassland/Wet Grassland Mosaic and GS4 Wet Grassland to ED2 Spoil and Bare Ground and ED2/ED3 Spoil and Bare Ground/Recolonising Bare Ground Mosaic. Loss of treelines and hedgerows has also occurred in these areas as part of the development of the consented landfill.

An area previously categorised as GS4 Wet Grassland at the south-western corner of the capped landfill has developed into scrub.

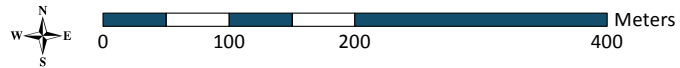
In addition to these updates, a number of new habitat features were also recorded; these are:

- Classification of the capped landfill which was previously excluded from the habitat map as: Amenity Grassland/Dry Meadows and Grassy Verges/Refuse and Other Waste GA2/GS2/ED5 Mosaic.
- Three new sections of treeline (to the south of the capped landfill, between the capped landfill and landfill gas facility). These treelines are of recent origin (planted after construction of the original landfill cells), formed by ash *Fraxinus excelsior* and Leyland cypress *Cupressus × leylandii* trees.
- A new hedgerow of cherry laurel *Prunus laurocerasus* has been planted to the north of the landfill office.
- Man-made drainage channel running through the block of plantation woodland in the north-eastern corner of the consented landfill and from the existing wetland towards the Flemingstown 08 Stream.

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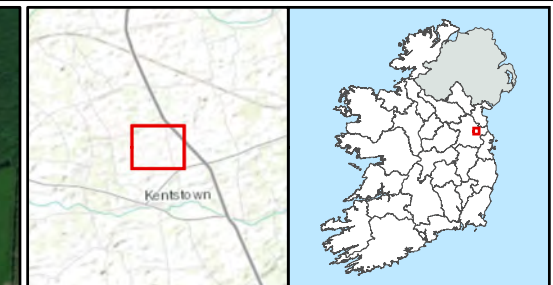


- Planning Boundary
- Habitat**
- FW1 - eroding river
- FW4 - drainage ditches
- WL1 - hedgerow
- WL2 - treeline
- BL3 - buildings and artificial surfaces
- ED2 - spoil and bare ground
- ED2 / ED3 - spoil and bare ground / recolonising bare ground mosaic
- ED3 - recolonising bare ground
- FL8 - artificial lakes and ponds
- FS1 - reed and large sedge swamps
- GA1 - improved agricultural grassland
- GA1 / GS4 - improved agricultural grassland / wet grassland mosaic
- GA2 - Amenity
- GA2/GS2/ED5 - amenity grassland / dry meadows and grassy verges / refuse and other waste
- GS2 - dry meadows and grassy verges
- GS4 - wet grassland
- GS4 / GS2 - wet grassland / dry meadows and grassy verges mosaic
- WD1 - (mixed) broadleaved woodland
- WD1 / GS4 - (mixed) broadleaved woodland / wet grassland mosaic
- WD2 - mixed broadleaved / conifer woodland
- WD4 - Conifer Plantation
- WS1 - scrub
- WS1 / WD2 - scrub / mixed broadleaved-conifer woodland mosaic
- WS3 / WS1 - ornamental/non-native shrub / scrub mosaic



<b>TITLE:</b>	Habitats
<b>PROJECT:</b>	Knockharley Landfill, Co. Meath
<b>FIGURE NO:</b>	1
<b>CLIENT:</b>	Knockharley Landfill Ltd.
<b>SCALE:</b>	1:6000
<b>REVISION:</b>	0
<b>DATE:</b>	21/10/2019
<b>PAGE SIZE:</b>	A3

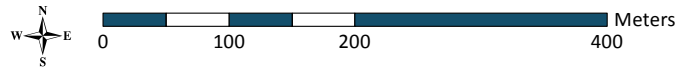




- Botanical Survey Plot Locations
- Planning Boundary

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<b>TITLE:</b>	Botanical Survey Plot Locations		
<b>PROJECT:</b>	Knockharley Landfill, Co. Meath		
<b>FIGURE NO:</b>	2		
<b>CLIENT:</b>	Knockharley Landfill Ltd.		
<b>SCALE:</b>	1:6000	<b>REVISION:</b>	0
<b>DATE:</b>	21/10/2019	<b>PAGE SIZE:</b>	A3



## 4.2 Updated Habitat Descriptions

### Wet Grassland/Dry Meadows and Grassy Verges (GS4/GS2) Mosaic

A mosaic of these habitat types is present in the fields to the east of the capped portion of the existing landfill (within the footprint of the proposed biological treatment facility), bordering agricultural grassland close to the east of the existing landfill offices (within the footprint of the proposed berm surrounding the proposed incinerator bottom ash facility), in the northernmost field within the permitted extension footprint and at the northwest corner of the consented landfill.

These fields are variable in character, containing short, sparse vegetation in drier areas, and tall dense swards in wetter areas. These broad assemblages form mosaics, grading into one another. The dominant grasses are Yorkshire fog *Holcus lanatus*, common couch *Elymus repens* and timothy *Phleum pratense*, the latter forming dense swards on occasion. Hard rush *Juncus acutus* is co-dominant in parts. Soft rush *J. effusus* and sharp-flowered rush *Juncus acutiflorus* are also present. Creeping and common bent-grass *Agrostis stolonifera* and *A. capillaris* are common, with sweet vernal-grass *Anthoxanthum odoratum* dominating patches locally. Reed canary-grass *Phalaris arundinaceae* is present in one area. Other grasses include rough meadow-grass *Poa trivialis*, false oat-grass *Arrhenatherum elatius*, cock's foot *Dactylis glomerata* and red fescue *Festuca rubra*. The latter is more common in drier areas, forming a finer sward.

An array of common herbs are present, ranging from red and white clovers *Trifolium pratense*, *T. repens*, creeping cinquefoil *Potentilla reptans*, cut-leaved cranesbill *Geranium dissectum*, greater birds-foot trefoil *Lotus pedunculatus*, oxeye daisy *Leucanthemum vulgare* and black medick *Medicago lupulina* in drier parts to more widely distributed species such as dandelion *Taraxacum officinale*, creeping thistle *Cirsium arvense*, meadow and creeping buttercup *Ranunculus acris*, *R. repens*, bush vetch *Vicia sepium*, silverweed *Potentilla anserina*, lesser stitchwort *Stellaria graminea*, great willowherb *Epilobium hirsutum*, meadow vetchling *Lathyrus pratensis*, nettle *Urtica dioica*, cleavers *Galium aparine*, common ragwort *Jacobaea vulgaris*, tufted vetch *Vicia cracca*, and broad-leaved and curled docks, *Rumex obtusifolius*, *R. crispus*, and marsh thistle *C. palustre* and spear thistle *C. vulgare*.

Knapweed *Centaurea nigra* is common in the field to the north of the existing landfill (within the consented landfill footprint) but is not present in the footprint of proposed infrastructure. Field horsetail *Equisetum arvense* is present occasionally and meadow sweet *Filipendula ulmaria* was recorded only once.

Sedges are also present, black sedge *Carex nigra* in pockets in drier areas, glaucous sedge *C. flacca* and star sedge *C. echinata* were also recorded. Hairy sedge *C. hirta* and oval sedge *C. leporina* were both recorded amongst dense grassy swards. An unusual record was a single specimen of heath woodrush *Luzula multiflora* subsp. *Congesta*, found growing in a dense sward of grasses and rushes (see Q2 in Appendix 3).

Only one moss species is present (occasionally) in association with this habitat; pointed spear-moss *Calliergonella cuspidata*, a common component of grassland habitats.

While the species present represent a more semi-natural habitat than that recorded during previous surveys, this can be accounted for by the continuation of successional processes which commenced with bare soil and/or previously intensively managed agricultural land subsequent to landfill construction.

While the lack of intensive grassland management has allowed grassland areas to become more natural in character, their recent establishment and history of disturbance on the site associated with landfill cell construction means these areas are not highly valuable in ecological terms, and do not correspond to any Annex 1 grassland habitats. These grasslands are of *Local importance (higher value)*.

Quadrats and one Relevé (Q 1-6, R2) were recorded in this habitat type and these are detailed in Appendix 3, accompanied by photographs. See Figure 2 above for quadrat and relevé locations.

Comparison of the species list recorded for this mosaic within the footprint of the proposed development species lists for the corresponding Annex 1 habitats- [6510] Lowland Hay Meadows and [6410] *Molinia* Meadows was carried out.

The comparison identified a small (sub-threshold) portion of these species are present, with 6 typical species including 1 high quality species for [6510] Lowland Hay Meadows and 6 typical species for [6410] *Molinia* Meadows (See Appendix 1 for details of the comparison).

Analysis of the plots recorded in this mosaic using ERICA classified the semi-natural vegetation in the fields within the proposed development as the communities GL4A *Agrostis capillaris* - *Trifolium repens*, GL2B *Juncus effusus* - *Holcus lanatus* (assigned), GL2C *Holcus lanatus* - *Lolium perenne*, SM4A *Festuca rubra* - *Agrostis stolonifera*, GL2A *Agrostis stolonifera* - *Ranunculus repens* and *Holcus lanatus* - *Lolium perenne* (transitional) (see Appendix 2 for details).

None of these correspond to the IVC grassland communities within which [6510] Lowland Hay Meadows and [6410] *Molinia* Meadows can be classified (GL3E *Festuca rubra* - *Rhinanthus minor* and GL1C *Molinia caerulea* - *Succisa pratensis*) (see Appendix 1 for details).

[6510] Lowland Hay Meadows is also described as being rich in flowers in the EU Habitats Manual (EC, 2013). The grasslands on site are not rich in flowers.

As such this habitat mosaic does not correspond to the Annex I habitat types.



**Plate 8: Wet Grassland/Dry Meadows and Grassy Verges GS4/GS2 Mosaic (east of existing landfill)**

#### Dry Meadows and Grassy Verges GS2

Areas of this habitat type are present within the footprint of the proposed leachate lagoons, the footprint of the proposed extension to the leachate management facility, and to the north of the existing site office. These areas contain a portion of the species present in the GS4/GS2 mosaic described above, but are generally drier, more uniform and have a finer and lower sward. The dominant species are Yorkshire fog and red clover and the lack of rushes contrasts sharply with the GS4/GS2 mosaic found in other areas. Other species present include hop trefoil *Trifolium campestre*, meadow buttercup, dandelion, common bent-grass, timothy-grass, sweet vernal-grass, ragwort, ribwort plantain *Plantago lanceolata*, common sorrel *Rumex acetosa*, lesser stitchwort, tufted and bush vetch.

The finer sward and uniformity are judged to be due to thinner drier soils, with past management and disturbance also potentially contributing. The uniformity observed suggests the area was previously covered by Improved Agricultural Grassland (GA1), which has been allowed to revert to a more natural state.

While more natural in character than intensively managed pasture or amenity grassland, the areas of this habitat within the proposed development footprint are of recent origin and not particularly species-rich. This habitat is considered to be of *Local importance (higher value)*.

One Relevé (R1) was recorded in this habitat type. This is detailed in Appendix 3 accompanied by photographs. See Figure 2 for Relevé location. Comparison of the species list recorded for this habitat within the footprint of proposed development with species lists for the corresponding Annex 1 habitat [6510] Lowland Hay Meadows was carried out. The comparison identified a small (sub-threshold) portion of these are present, with four typical species and no high-quality species for this habitat type present (See Appendix 1 for details of the comparison).

Analysis of the plot recorded in this habitat using ERICA classified the semi-natural vegetation in the fields within proposed development as the community GL2C *Holcus lanatus* - *Lolium perenne* (assigned) (see Appendix 2).

GL2C does not correspond to the IVC grassland community within which [6510] Lowland Hay Meadows can be classified (GL3E *Festuca rubra* – *Rhinanthus minor*) (see Appendix 1 for details).

[6510] Lowland Hay Meadows is also described as being rich in flowers in the EU Habitats Manual (EC, 2013). The grasslands on site are not rich in flowers.



**Plate 9: Dry Meadows and Grassy Verges GS2 (east of existing landfill)**

#### Wet Grassland GS4

An area of wet grassland is present to the south of the existing landfill gas compound and surrounding the existing surface water attenuation pond and wetland. The vegetation is similar to that described above, with Yorkshire fog, sweet vernal-grass, marsh thistle, tormentil *Potentilla erecta*, soft and hard rush recorded in this area.

This habitat type is not within the footprint of any proposed infrastructure. It is of *Local importance (higher value)*. The low species diversity and presence of only 1 characteristic species (*P. erecta*) from the corresponding Annex 1 habitat [6410] *Molinia* Meadows indicates this area has no links with Annex 1.

### Improved Agricultural Grassland GA1

This habitat type is present within the footprint of the proposed incinerator bottom ash (IBA) facility and associated proposed berm to the east, and also in areas along the northern and eastern edges of the site. Yorkshire fog and perennial rye-grass *Lolium perenne* are the dominant grasses, with one or the other of these species being dominant in individual fields. Limited amounts of fescue *Festuca* sp. are present. Forbs represent only a small proportion of the vegetation, the most abundant of these were creeping and meadow buttercup, while dandelion, white clover, lesser chickweed *Stellaria pallida*, thistle seedlings, spear thistle, curled and broad-leaved dock, along with common mouse-ear *Cerastium fontanum* were also present. Capillary thread-moss *Bryum capillare* is present in some areas where soil is exposed. No other bryophytes are present in this habitat type.

The fields within the proposed IBA facility footprint had been recently reseeded and spread with slurry. These intensively managed grasslands are of limited ecological value and are classified as *Locally important (lower value)*.

Quadrats (Q 7-10) were recorded in this habitat type (in fields within the proposed IBA facility footprint). These are detailed in Appendix 3 accompanied by photographs. See Figure 2 for relevé locations. Due to the low biodiversity value and intensive management of this habitat, detailed analysis was not carried out.



**Plate 10: Improved Agricultural Grassland GA1 (north-east of existing landfill)**

### Amenity Grassland GA2

Short, regularly mowed grasslands are present at the landfill office, and a house along the northern landfill boundary. Species diversity is low, with dandelion, white clover and ribwort plantain being common forbs.



Amenity grassland surrounding the existing landfill site office is within the footprint of proposed carpark extension. This type of intensively managed grassland is of limited ecological value and is therefore classified as *Locally important (lower value)*.

#### **Amenity Grassland/Dry Meadows and Grassy Verges/Refuse and Other Waste GA2/GS2/ED5 Mosaic**

This habitat mosaic is represented on the capped re-vegetated landfill. The capped landfill supports a grassland community dominated by Yorkshire fog, false oat-grass and red clover and colt's foot *Tussilago farfara*, particularly along the marginal areas.

This habitat is not within the footprint of the proposed development. It is of *Local importance (higher value)* due to its semi-natural character and low intensity management.

#### **(Mixed) Broadleaved Woodland WD1**

The areas of mixed broadleaved woodland within the site are all plantations of recent origin and uniform age, as described in Section 1.1 above. Aerial imagery indicates these plantations were established between 2005-2012. Two of these blocks are within the footprint of the proposed IBA facility, proposed surface water holding pond, proposed northern attenuation lagoon, proposed screening berm and a consented landfill cells (phase 7) all of which are located in close proximity to each other. Another separate block of planted woodland is within the footprint of another proposed screening berm.

The dominant tree species are ash, alder *Alnus glutinosa* and sycamore *Acer pseudoplatanus*, which have been planted in rows and are of uniform age and size, with an average diameter at breast height (DBH) of c. 30 cm and height of c. 8 m. A shrub layer is absent in most areas, and where present is represented by bramble thickets. The field layer is dominated by grasses, with smooth meadow-grass *Poa pratensis*, false oat-grass, Yorkshire fog and bent-grasses being common along with sheep's fescue which is present occasionally. Some soft rush is also present in wetter sections. The only sedge recorded was remote sedge *Carex remota*, a species commonly associated with woodlands, which is present in limited quantity.

The canopy is markedly more open in parts of the middle block (where the proposed wetland is located) where the trees have not established well. As such, while partially wooded, grassy clearings with stunted trees and large canopy gaps are also present. A dense sward dominated by Yorkshire fog and common bent-grass makes up the field layer in these areas (see WR3 in Appendix 4).

The broadleaved herbs present- cleavers, creeping buttercup, rosebay willowherb, short-fruited willowherb *Epilobium obscurum* great willowherb, dandelion and creeping cinquefoil are common species more often found in open habitats or across habitats, with no woodland specialist forbs present. Single occurrences of short-fruited willowherb *Epilobium obscurum* and wavy bitter-cress *Cardamine flexuosa* were recorded.

Four common mosses associated with woodland, and neutral to basic soils were identified. There are fox-tail feather-moss *Thamnobryum alopecurum*, common feather-moss *Kindbergia praelonga*, mouse-tail moss *Isoetecium myosuroides* and short-leaved/lesser pocket-moss *Fissidens incurvus/bryoides* are fairly evenly distributed throughout this habitat type within this area of the site. Distinction between *F.incurvus/bryoides* requires the presence of capsules, which were absent during the survey. Distribution maps indicate this is more likely to be *F. bryoides*, however this is not sufficient basis for positive identification<sup>2</sup>.

The rarer slender pocket-moss *Fissidens exilis* cannot be mistaken for either of these species, as it forms thin patches and has shoots 1.5-3mm long with 2-4 pairs of leaves which lack borders. *F. incurvus* and *F. bryoides* have shoots from 2-20mm long with leaves, bordered leaves and form distinct cushions.

Up to 9 pairs of leaves on shoots from 3-9mm were present on *F.incurvus/bryoides* specimens collected from this habitat at Knockharley.

<sup>2</sup> *F. incurvus* and *F. bryoides* are both medium-sized *Fissidens* with bordered leaves. While the longer shoot length (max. 9mm) indicates *F. bryoides*, the lack of bud-like male organs indicates *F. incurvus*. *F. incurvus* grows on calcareous to slightly acidic soil, while *F. bryoides* grows on neutral to slightly acidic soil, both in woodlands; as such the habitat is suitable for either species. Therefore, capsules (inclined in *F. incurvus*, erect in *F. bryoides*) are required to differentiate between the two species; none were present during surveys.

Dead wood is made up primarily of occasional twigs scattered on the ground and one standing dead tree of similar size to those surrounding (20 cm DBH) was recorded. No fallen trees or large logs are present. Natural regeneration is most evident in ash-dominated areas, where numerous seedlings of the same species are present. Two pedunculate oak *Quercus robur* saplings and one larger (4m) immature tree are present near Woodland Relevé 1 (WR1) (see Figure 2). A mature pedunculate oak in the nearby hedgerow along the eastern boundary of the plantation is likely to be the parent of these trees, while the location of the younger trees inside the plantation block indicates transport by animals such as squirrels *Sciurus* Sp. or potentially Eurasian jay *Garrulus glandarius*.

No lichens are present in these plantations.

Hedgerows are present fringing and running between plantation blocks, marking field boundaries present before woodland was planted in these areas.

These mixed broadleaved woodlands are considered to be of *Local importance (higher value)*. While of some value to local wildlife, their recent establishment and lack of mature woodlands nearby mean they are artificial in character and of relatively low biodiversity value in comparison with established woodlands.

Relevés (WR1 and WR4) were recorded in this habitat type, see Appendix 4 and Figures 1 and 2 for details.

Detailed analysis of vegetation was not undertaken as the physical characteristics, uniform age of trees and information on site history confirm these woodlands are of recent and artificial origin. It is also noted that these woodlands were not intended to remain within the site in perpetuity. They are currently subject to ongoing forestry management practices including thinning and are intended to be felled once they reach harvestable size or during the course of facility development.



**Plate 11: Mixed Broadleaved Woodland WD1 Plantation (north-east of existing landfill)**

**(Mixed) Broadleaved Woodland/Wet Grassland WD1/GS4 Mosaic**

This habitat mosaic is present to the east of the existing landfill gas compound and adjacent to the proposed biological treatment facility. While trees were planted on a screening berm, the entire area was not covered (isolated islands of trees were planted), and the open areas are being recolonised by alder and grasses.

This mosaic is not within the footprint of any permitted or proposed development and is considered to be of *Local importance (higher value)*.

**Mixed Broadleaved/Conifer Woodland WD2**

Mixed plantations with alternating rows of scot's pine and pedunculate oak form the dominant habitat along the northern and western site boundaries and are present in more limited amounts along the southern and eastern boundaries. A dense canopy results in heavy shading, and the woodland floor being made up of bare soil, leaf litter and needles in most areas. Where light occasionally enters, sparse patches of Yorkshire fog and *Poa* Sp. are present. Ivy *hedera helix* and rosebay willow herb grow sparsely near the edges. Other plants present include bramble, nettle and herb-robert *Geranium robertianum* which form stands where light is available.

A fringing area of the mixed broadleaved woodland plantation abutting the proposed biological treatment facility is made up of recently established naturally regenerating willow and alder woodland, with wide low (4-5m width & height) willow bushes and young alder trees (4-5m, DBH c. 25cm), with a bramble-dominated field layer. This area is within the footprint of the proposed biological treatment facility and associated clearance/levelling works.

A number of Mixed Broadleaved/Conifer Woodland blocks along the western site boundary are within the footprint of a proposed screening berm. Fox-tail feather-moss *Phymatopteris alopecurum*, common feather-moss *Kindbergia praelonga* and mouse-tail moss *Isoetes myosuroides* are present on occasion on the woodland floor and tree bases.

Other trees are also present including birch, alder, willow, sycamore, ash and lodgepole pine.

This habitat is considered to be of *Local importance (higher value)*.



**Plate 12: Mixed Broadleaved/Conifer Woodland WD2 (along north and western boundaries of landfill site)**

### Mixed Broadleaved/Conifer Woodland/Scrub WD2/WS1 Mosaic

A mosaic of these habitats is present to the south and west of the surface water attenuation pond and wetland. Common elements include trees such as alder and lodgepole pine, with growths of gorse and bramble as described in detail for these habitats above. This area is not within the footprint of any permitted or proposed development.

Due to its semi-natural character this habitat is considered to be of *Local importance (higher value)*.

### Conifer Plantation WD4

Conifer plantations made up of lodgepole pine *Pinus contortus* are present to the north of the main access road. These are characterised by rows of trees planted in close proximity, forming a dense thicket with heavy shading and limited plant growth on the woodland floor, similar to that described above for *Mixed Broadleaved/Conifer Woodland WD2*.

These blocks are within the footprint of the proposed screening berm to the east of the proposed IBA facility. This habitat is considered to be of *Local importance (Lower value)*.

### Buildings and Artificial Surfaces BL3

This habitat type is represented by roads, buildings including sheds and landfill office, and landfill infrastructure such as the leachate lagoon and landfill gas compound. The biodiversity value, if any, of these habitats is detailed in the bird and bat survey reports for the site.

### Spoil and Bare Ground ED2

Extensive areas of exposed soil and gravel are present to the north and west of the existing landfill, made up of under-construction permitted cells, and associated spoil mounds. These areas are of limited biodiversity value in their current form.

### Recolonising Bare Ground ED3

An area of recolonising bare ground is present to the south of the capped landfill, formed by a berm running along the southern side of the access road running around the landfill. Vegetation is dominated by coltsfoot *Tussilago farfara*, with some dock *Rumex* Sp. present on occasion.

The non-native invasive species Himalayan balsam *Impatiens glandulifera* is present in the western end of this area i.e. at the southwestern corner of the rectangle formed by the access road running around the capped landfill. This is not within the footprint of any proposed infrastructure. Himalayan balsam is listed on Schedule III under Regulations 49 and 50 of the EC (Birds & Natural Habitats) Regulations.

### Spoil and Bare Ground/Recolonising Bare Ground ED2/ED3 Mosaic

Areas fringing the east and northwest of the consented landfill cells contain this habitat mosaic. In level areas, the ground is being re-colonised by common and ruderal species including coltsfoot *Tussilago farfara*, marsh thistle, goat willow *Salix caprea*, creeping buttercup, American willowherb *Epilobium ciliatum*, white clover, rough hawkbit *Lentodon hispidus*, perennial sow-thistle *Sonchus arvensis*, Yorkshire fog, pointed spear-moss and common ragwort, but vegetation cover is less than 50%.

The recolonising element of the mosaic is represented by densely vegetated spoil heaps and berms, the latter being covered in dense growths of spear thistle, and spoil heaps hosting a higher number of species, with false oat-grass dominating, and curled dock, bush vetch, spear thistle, dandelion, creeping buttercup, common ragwort, creeping cinquefoil, great and rosebay willowherbs also present.

This habitat mosaic resulted from clearance and earthworks associated with ongoing construction of consented landfill cells.

This habitat type is within the proposed IBA facility footprint. It is a transitory and severely disturbed habitat of limited ecological value and it is classified as *Locally important (lower value)*.



**Plate 13: Spoil and Bare Ground/Recolonising Bare Ground ED2/ED3 Mosaic (within proposed IBA facility footprint)**

#### Scrub WS1

Areas of scrub border the existing landfill to the west and south. Extensive patches of bramble are present, with occasional common gorse *Ulex europaeus* bushes and lone trees (ash, alder, willow *Salix* Sp.,) interspersed throughout. Grassy vegetation dominated timothy-grass is present in open areas. This habitat type is not within the footprint of any proposed or permitted development.

This habitat is considered to be of *Local importance (higher value)*.

#### Ornamental/Non-native Shrub/Scrub WS3/WS1 Mosaic

Wide (to 6-7m) hedges dominated by non-native dogwood *Cornus* Sp. and interspersed with occasional sycamore and willow trees, and areas of grassy vegetation and bramble thickets line the main site access road along the straight section approaching the landfill offices.

This mosaic is present within the footprint of the proposed screening berm surrounding the proposed IBA facility, and within the proposed screening berm to the south of the main landfill access road.

This habitat is considered to be of *Local importance (higher value)* due to the presence of scrub.

#### Hedgerows WL1

Hedgerows are present throughout the site, delineating field boundaries and bordering trackways. Hedgerows are also present bordering and sandwiched between blocks of planted woodland.

Hedgerows are dominated by mature ash and hawthorn *Crataegus monogyna* trees, with pedunculate oak *Quercus rubra*, hazel *Corylus avellana*, willows *Salix* spp. and sycamore *Acer pseudoplatanus* also present on occasion; bramble *Rubus fruticosus* Agg. and common gorse *Ulex europaeus* form a thicket underneath. Ivy *Hedera helix* is common on tree crowns.

Other species present include guelder rose *Viburnum opulus*, soft shield fern *Polystichum setiferum*, hart's tongue fern *Asplenium scolopendrium*, dog rose *Rosa canina*, and field horsetail. A section of hedgerow made up of cherry laurel *Prunus laurocerasus* is present around the landfill office.

Moderate quality ash and hawthorn-dominated hedgerows are present in the footprint of the proposed leachate management facility and biological treatment facility.

A lack of connectivity reduces the importance of these hedgerows as wildlife corridors. Good-quality ash-dominated hedgerows are present within the footprint of the proposed IBA facility and associated proposed screening berm.

Hedgerows are considered to be of *Local importance (higher value)* as they are semi-natural habitats, providing foraging grounds, shelter and connectivity in the landscape for wildlife.



**Plate 14: Hedgerows WL1 (within proposed leachate lagoon footprint)**

#### Treelines WL2

A number of treelines are present within and bounding the site. Good-quality established ash-dominated treelines with occasional pedunculate oak are present within the footprint of the proposed IBA facility and associated proposed screening berm.

Outside the proposed development footprint, treelines associated with field boundaries are present in the east and west of the site, while uniform Leyland cypress *Cupressus × leylandii* and ash treelines planted for screening run along the eastern edge of the capped landfill and southern site boundary.

Treelines are considered to be of *Local importance (higher value)*.

#### Artificial Lakes and Ponds FL8

This habitat is represented within the site by the surface water attenuation pond and constructed wetland immediately to the south. The attenuation pond is highly artificial in character, being lined with artificial liner and having regular banks which are devoid of aquatic vegetation.

The constructed wetland immediately to the south is more natural in character, supporting reedbeds dominated by common reed *Phragmites australis*, with some bulrush *Typha latifolia* also present.

An invertebrate sample was also collected from the wetland, with low-moderate species richness recorded (9 common invertebrate species typical of pond environments including gastropods, damselfly larvae and pond olives were recorded). Three-spined stickleback *Gasterosteus aculeatus* were also present.

An adult Kingfisher was observed in flight heading upstream along the Flemingstown 08 (Knockharley) Stream near the landfill boundary, towards the existing wetland<sup>3</sup>.

The wetland is at a lower elevation to the south and is connected to the surface water attenuation pond via an overflow channel/spillway. There is connectivity between the wetland and surrounding stream network, with the outflow joining the Flemingstown 08 stream. This was observed to be dry during surveys, indicating that a hydrological connection exists only during wetter periods.

The surface waste attenuation pond is considered to be of limited ecological value, while the associated wetland to the south is considered to be of *Local importance (higher value)* due to the presence of reedbeds and potential for connectivity with the stream network. This habitat type is not within the footprint of any proposed development.

### Reed and Large Sedge Swamps FS1

This habitat is present in association with the wetland to the south of the surface water attenuation pond, as described in *Artificial Lakes and Ponds FL8* above. Although artificial in origin, this area has developed characteristics similar to natural wetlands.

As such it is considered to be of *Local importance (higher value)*. This habitat type is not within the footprint of any proposed development.

### Eroding Rivers FW1

The Flemingstown 08 (Knockharley) stream flows through the site on a number of occasions, and also skirts its boundary in a number of locations. The Kentstown 08 stream flows along a short length (c. 90m) of the landfill boundary at its southwestern tip. The Flemingstown 08 stream is in poor condition due to human interference; the channel has been straightened, deepened and dredged, resulting in a watercourse with little natural character, more akin to a drainage ditch. Water levels were observed to fluctuate markedly during summer 2019 with extremely low levels during dry periods and higher volumes on occasion following wet periods. The bankside vegetation generally lacks a distinctive riparian character, being made up predominantly of the grassy vegetation which dominates much of the site; great willowherb is common along the banks. In other areas the stream flows through blocks of forestry plantation. The only characteristic vegetation present were marginal growths of water mint *Mentha aquatica* and some filamentous algae *Cladophora* spp.

Kick sampling and subsequent analysis indicated poor water quality Q2-Q3 both up and downstream of the landfill site, due to pressures from agriculture. Three-spined stickleback *Gasterosteus aculeatus* was the only fish species recorded during electrofishing surveys (recorded downstream of the landfill site).<sup>4</sup>

The Flemingstown 08 stream is within the footprint of consented landfill footprint to the north of the existing operational landfill cells, and diversion of the stream in this area is permitted under ABP Reference PL17.220331. Following the diversion, the stream intersects with the footprint of a proposed screening berm, and a culvert is proposed to be installed at this location. The stream diversion runs adjacent to the proposed wetland, which discharges treated surface water to the stream.

While this habitat is automatically classified as *Local importance (higher value)* due to it being an officially mapped stream by the EPA, its current poor condition means that it is in fact of lower ecological value than a similar habitat in a more natural state. However, it forms a hydrological connection to larger watercourses downstream of the landfill site.

<sup>3</sup> <sup>3</sup> Additional data on water quality, aquatic habitats and fauna was obtained from the Aquatic baseline report.

<sup>4</sup> <sup>4</sup> Additional data on water quality, aquatic habitats and fauna was obtained from the Aquatic baseline report.

#### Drainage Ditches FW4

Drainage ditches are present in a number of areas, including within blocks of broadleaved plantation and immediately south of the capped landfill. The ditches to the south of the landfill were dry when observed, and lacking aquatic vegetation. Great willowherb, ragwort and docks grow in these ditches, and gorse is present on the banks.

The drainage channel separating two blocks of broadleaved woodland in the northwest of the site contains water and is more densely vegetated, with wet grassland vegetation dominated by Yorkshire fog and meadowsweet. Other species noted included goat willow, bulrush, duckweed *Lemna* Sp. and wild angelica *Angelica sylvestris* present within and fringing the channel.

The wetter drainage channel is considered to be *Local importance (higher value)* having developed semi-natural characteristics in the absence of management. This channel is within the footprint of the proposed surface water holding pond, proposed northern attenuation lagoon, proposed screening berm and consented landfill cells (phase 7).

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## 5 IMPACTS ON HABITATS AND FLORA

The description of development is presented in Chapter 2 of the EIAR: Description of the Proposed Development.

The proposed site layout is shown in Drawing No.'s LW14-821-01-P-0000-003 through 011 (Proposed Site Layout Plan). The cut/fill phasing plan is shown on Drawing No. LW14-821-01-P-0050-011. These drawings are presented in Volume 4 of the EIAR.

As presented in the EIAR, the construction of these elements requires the felling of plantation woodlands, when constructed, the proposed berms will be planted with trees and both restorative (replanted in previous location) and new planting will be carried out. Restorative planting and a portion of the new planting are considered as compensatory in addition to providing screening. The remainder of new planting is for screening purposes. The felling and re-planting plan is shown on drawing LW14-821-01-P-0050-003. A mix of broadleaved and coniferous forestry re-planting is proposed.

A habitat loss figure distinguishing between consented and proposed development is included below (Figure 3). Table 3 provides an evaluation of each habitat type, determining which are key receptors based on ecological value and location in relation to proposed development footprints, and also includes a defined area or length where habitats are lost within the footprint of proposed infrastructure. Those selected as key receptors are given further consideration in 4.3 Habitats and Flora.

The construction of the IBA facility and associated berm will result in the loss of 4.8 ha of Improved Agricultural Grassland GA1, while 2.3 ha of Spoil and Bare Ground/Recolonising Bare Ground ED2/ED3 Mosaic, 1.3 ha of Spoil and Bare Ground ED2 and 0.09 ha of Amenity Grassland GA2 will be lost within the footprint of the IBA facility. Since none of these habitats are key ecological receptors due to their limited biodiversity value and transient nature, they are not considered further in this assessment.

A total of 1,059m of Hedgerows WL1 and 543m of Tree Lines WL2 will be lost within the footprint of proposed development. Drainage Ditches FW4 totalling 129m in length will also be lost within the proposed development footprint. These semi-natural habitats are classified as Local Importance (higher value) and as such are key ecological receptors.

A section of Eroding Rivers FW1 31m in length lies within the footprint of the proposed eastern screening berm. This section of river will be culverted and as such altered, but not lost completely. Eroding Rivers FW1 is a key ecological receptor.

**Table 3: Habitat Evaluation and Loss Table (Proposed Development Footprint)**

Habitat	Evaluation	Area Lost (ha)	Rationale	Selection as key ecological receptor
Improved Agricultural Grassland GA1	Local Importance (lower value)	4.8	Intensively managed grassland – low biodiversity value	No
Wet Grassland/Dry Meadows and Grassy Verges GS4/GS2 Mosaic	Local Importance (higher value)	2.8	Semi-natural habitat in proposed footprint	Yes
Dry Meadows and Grassy Verges GS2	Local Importance (higher value)	2.1	Semi-natural habitat in proposed footprint	Yes
Wet Grassland GS4	Local Importance (higher value)	0	Semi-natural habitat but outside proposed footprint	No

Habitat	Evaluation	Area Lost (ha)	Rationale	Selection as key ecological receptor
(Mixed) Broadleaved woodland WD1	Local Importance (higher value)	3.6	Semi-natural habitat in proposed footprint	Yes
Conifer Plantation WD4	Local Importance (higher value)	0.6	Of value to local wildlife	Yes
Mixed Broadleaved/Conifer Woodland WD2	Local Importance (higher value)	7.2	Semi-natural habitat in proposed footprint	Yes
Buildings and Artificial Surfaces BL3	Local Importance (lower value)	0.5	Not in proposed footprint	No
Spoil and Bare Ground ED2	Local Importance (lower value)	1.3	Limited biodiversity value; not in proposed footprint	No
Recolonising Bare Ground ED3	Local Importance (lower value)	0	Limited biodiversity value; not in proposed footprint	No
Spoil and Bare Ground/Recolonising Bare Ground ED2/ED3 Mosaic	Local Importance (lower value)	2.3	Limited biodiversity value	No
Scrub WS1	Local Importance (higher value)	0	Not in proposed footprint	No
Amenity Grassland GA2	Local Importance (lower value)	0.09	Limited biodiversity value	No
Ornamental/Non-native Shrub/Scrub WS3/WS1 Mosaic	Local Importance (higher value)	0.2	Semi-natural elements; in proposed footprint	Yes
Artificial Lakes and Ponds FL8	Local Importance (lower value)	0	Artificial character; not in proposed footprint	No
Reed and Large Sedge Swamps FS1	Local Importance (higher value)	0	Semi-natural habitat but not in proposed footprint	No

## 5.1 Habitats and Flora

In the following section the impacts on terrestrial habitats as determined in the EIAR are included verbatim (with grey background and original numbering) where any changes, additions or notes arising from the current assessment based on additional data occur. Additional information is included in bold below the relevant paragraph.

### 5.1.1 Construction Phase Impacts

## 10.5 Potential Impacts of the Proposed Development on Ecology

### 10.5.2.2 Habitats and Flora

The construction phase of the development is broken into four phases; construction year 0,1 & 2, construction year 3 & 4, construction year 5 & 6 and construction year 7 & 8 and includes the creation of berms (presented in Drawing Nos. LW14-821-01-P-0050-011). In terms of habitats, the construction of the IBA facility, biological treatment, surface water pond and berm creation will result in a loss of agricultural grassland (GA1/GS4), wet grassland (GS4), mixed broadleaved/coniferous woodland (WD2) and deciduous woodland (WD1) and section of hedgerow (WL1) and treeline (WL2).

The removal of hedgerow (WL1) and treeline (WL2) will be limited. These habitats provide cover and foraging habitat to local wildlife. Prior to mitigation the loss of these habitats will have a **Permanent Moderate Impact**.

**Sections of Hedgerows WL1 totalling 1,059 m in length will be lost within the footprint of the proposed IBA Facility and associated screening berm. These habitats provide cover and foraging habitat to local wildlife. The loss of these habitats will have a Permanent-Moderate Impact.**

**Sections of Treelines WL2 totalling 543 m in length will be lost within the footprint of the proposed IBA Facility and associated screening berm. Similar to hedgerows, these habitats provide cover and foraging habitat to local wildlife; the loss of these habitats will have a Permanent-Moderate Impact.**

The proposed extension to leachate management facility will result in the loss of improved agricultural grassland/wet grassland mosaic (GA1/GS4). Improved agricultural grassland/wet grassland mosaic (GA1/GS4) is of Local Importance (lower value) and its loss will have a **Permanent Slight Impact**.

Construction of the proposed biological treatment facility will result in the loss of wet grassland (GS4) which provides cover and foraging habitat for local wildlife and is of Local Importance (Higher Value). Wet grassland (GS4) on site is limited in area and will result in a **Permanent Slight Impact**.

**While these areas have been re-classified in terms of habitats, the current impact assessments for semi-natural grasslands are included here for continuity. The assessments refer to the same areas and infrastructure assessed in the EIAR.**

**Dry Meadows and Grassy Verges GS2 totalling 2.1 ha will be lost within the footprint of the proposed additional leachate lagoons, extension to the leachate management facility, and IBA facility. While beginning to take on a more semi-natural character, this area is still relatively species-poor and monotypic. The loss of this will have a Permanent-Slight Impact.**

**The construction of the proposed biological treatment facility will result in the loss of 2.8 ha of Wet Grassland/Dry Meadows and Grassy Verges GS4/GS2 Mosaic. While not particularly unique among rougher less intensively-managed grasslands, this habitat provides cover and foraging habitat for local wildlife, and more habitat for insects than intensively-managed pasture or cropland. The loss of these areas will have a Permanent-Moderate Impact.**

Broadleaved/coniferous woodland (WD2) and deciduous woodland (WD1) has been planted on site for commercial timber production and will be felled when trees reach maturity or felled to facilitate the phased development of the site. Felling of areas of broadleaved/coniferous woodland (WD2) and deciduous woodland (WD1) will be undertaken over the phased 8 year construction phase (see Drawing No. LW14-821-01-P-0050-003, Table 10-16 below and Chapter 2 Proposed development for more information). Most tree felling will occur in the first phase; 7.5ha of deciduous woodland (WD1) will be felled, with no broadleaved/coniferous woodland (WD2) felled. During the following phases (years 3-8) 5ha of broadleaved/coniferous woodland (WD2) will be felled with no deciduous woodland (WD1) felled. During the construction phase a total of 12.5ha of trees will be felled; this accounts for 78.98% of woodland on site.

While woodland will be felled during the construction phase, 14.1ha of woodland will be restored and 29.3ha of native deciduous tree compensation planting will be undertaken as part of the proposed development (presented in Drawing Nos. LW14-821-01-P-0050-003).

With replanting taking into account, as well as the phased manner in which felling will take place, and the young age of the forestry, the impact on broadleaved/coniferous woodland (WD2) and deciduous woodland (WD1) is deemed to be a **Short-Term Moderate Impact**. As woodland on site is for commercial timber production, felling and replanting will occur whether the proposed development goes ahead or not.

**[Table 10-16: Phased felling during construction phase]**

Phase	Ha	% Deciduous woodland plantation (WD1)	% Broadleaved/coniferous woodland plantation (WD2)
Year 0,1,2	7.5	100	0
Year 3-4	2.1	0	100
Year 5-6	1.7	0	100
Year 7-8	1.2	0	100
<b>Total felled</b>	<b>12.5</b>	<b>60</b>	<b>40</b>

Recently established (2005-2012) (Mixed) Broadleaved Woodland WD1 plantation totalling 3.6 ha will be lost within the footprint of the proposed (eastern) screening berm, IBA Facility, surface water holding pond, surface water attenuation lagoon, and constructed wetland. While these plantations are of recent origin, artificial structure, and of low species diversity with few woodland specialists present and ground flora still dominated by the grasses which covered these areas during agricultural use, the use of native species (ash and alder) imparts some degree of naturalness.

Considering that these areas were established for commercial purposes and would ultimately be harvested, and are subject to forestry management, they are of lower value than long-established woodlands. While potentially of limited value to local wildlife, these plantations do not currently correspond to any ecologically valuable habitat. Considering these factors and that they will be replaced with similar planting following completion of proposed construction, a **Short-Term Moderate Impact** is envisaged.

Recently established Mixed Broadleaved/Conifer Woodland WD2 totalling 7.2 ha will be lost within the footprint of the proposed screening berm running along the western boundary. It is of similar or value to the woodlands described above, and when taking re-planting into account, the same **Short-Term Moderate Impact** is envisaged.

Recently established Conifer Plantation WD4 totalling 0.5ha will be lost within the footprint of the proposed screening berm east of the IBA Facility. This woodland type is of lower value in its own right to those described above due to the dominance of non-native conifers, but is of value to local wildlife as a source of food and cover. When taking re-planting into account, a **Short-Term Slight Impact** is envisaged.

A culvert will be installed within the Knockharley Stream, this will require temporary diversion of Knockharley Stream and instream works and will result in the disturbance of the habitat. The river is Eroding/Upland River (FW1) is of Local Importance (higher value) as it acts as a corridor for local wildlife and Otter use has been recorded. The impact on Eroding/Upland River (FW1) is deemed to be **Permanent Slight Impact**.

**A section of Eroding Rivers FW 1 represented by the Flemingstown 08 (Knockharley) stream is the subject of a permitted stream diversion at the northern end of the permitted landfill (phase 7), and the channel runs in close proximity to the proposed wetland (which would discharge to the stream) before intersecting a section of the north-eastern screening berm. A culvert is proposed to be installed at this point, with an access road running along the berm over the stream and leading to the proposed wetland. A baffled overflow chute on the lip of the proposed attenuation pond would also discharge to the Flemingstown 08 downstream of the culvert.**

**Installation of the culvert will require a temporary stream diversion, resulting in disturbance of this habitat. The stream is of Local Importance (higher value) as it acts as a corridor for local wildlife and Otter use has been recorded. The impact arising from the culvert installation is deemed to be a *Permanent-Slight Impact*.**

No protected flora were identified within the site and therefore there will be no impact to protected flora as a result of the proposed development.

**No protected flora were identified on-site during 2019 surveys and therefore there will be no impact to protected flora as a result of the proposed development.**

**Areas of Ornamental/Non-native Shrub/Scrub WS3/WS1 Mosaic totalling 0.2 ha which border the northern and southern sides of the main site access road approaching the landfill offices will be lost within the footprint of proposed screening berms. While scrub is of moderate value to local wildlife, it's transient nature and rapid development means that while it is often cleared, it is constantly forming in new locations. Considering this attendant state of flux and the small amount of this habitat within the proposed berm footprints, a *Short-Term Imperceptible Impact* is envisaged.**

**A section of Drainage Ditches FW 4 129m in length will be lost within the footprint of the proposed surface water holding pond, surface water attenuation lagoon, and (north-eastern) screening berm. Taking into account the semi-natural character this area has taken on in the absence of management and its value to local wildlife, a *Permanent-Moderate Impact* is envisaged.**

## 5.1.2 Operational Phase Impacts

### 10.5.3 Operational Phase

#### 10.5.3.3 Water Quality

The operation of the facility to date has not had a negative impact on surface water quality. The southern and northern surface water management systems will direct surface water flows from the site to the attenuation ponds and wetlands prior to discharge to the Knockharley Stream. The pond will attenuate flows and allow suspended solids to settle. The outlet from the pond can be shut to prevent discharge to watercourse in the event of a suspected contamination incident. Automated monitors will be triggered to close if monitored water quality levels rise/fall above/below acceptable levels or trigger levels; isolating contaminated water. Water is discharged from the pond and through a constructed wetland for final polishing before discharge to the receiving watercourse. Therefore, the potential for sediment release to watercourses is low during the operational phase.

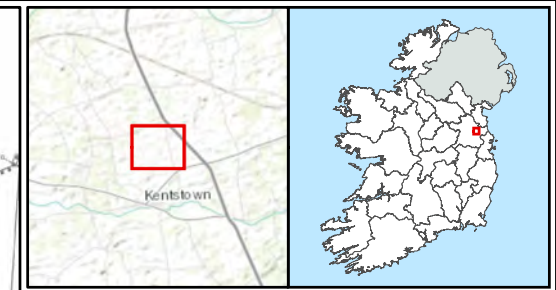
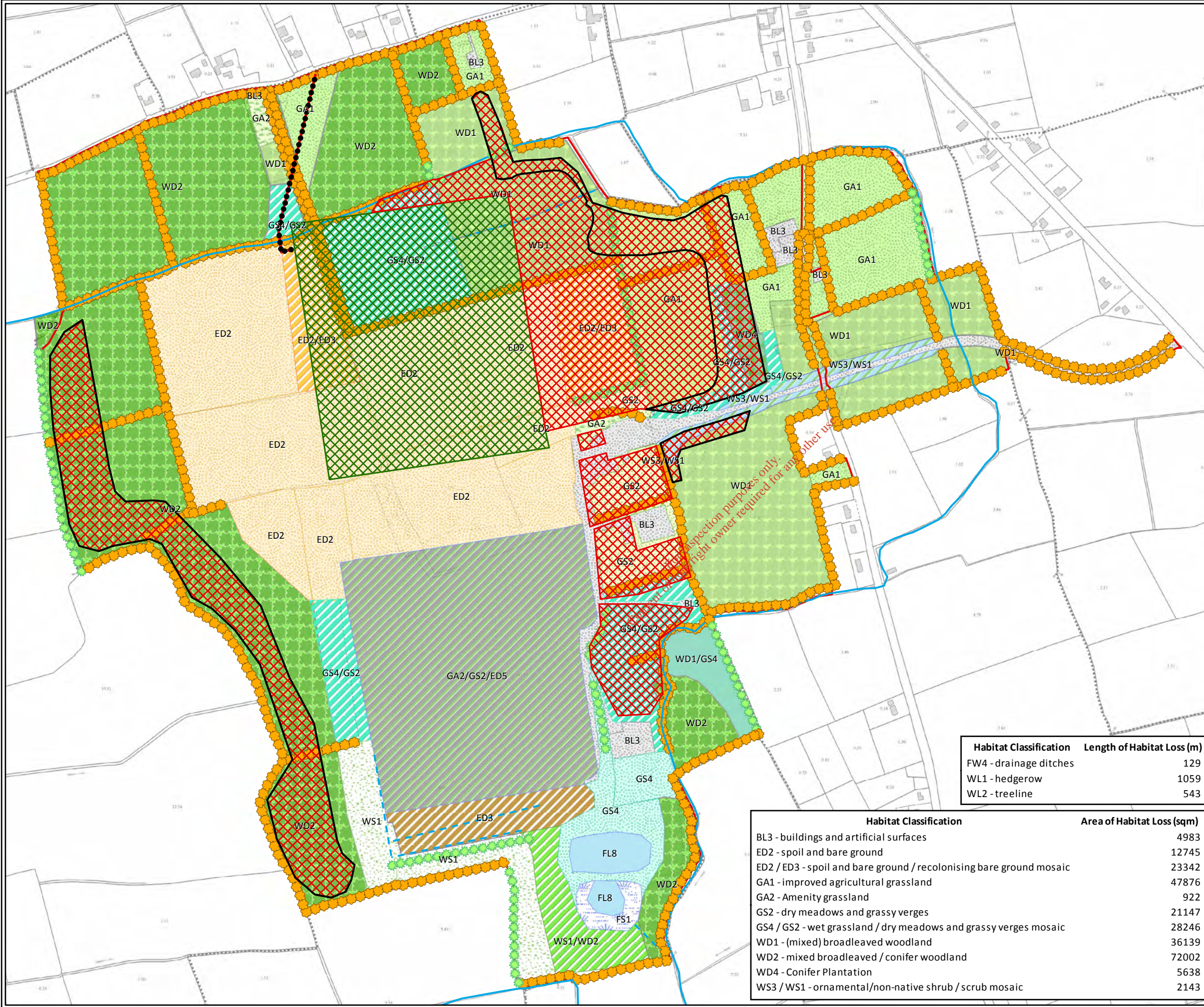
To mitigate the risk of IBA dust or hydrocarbons leaks from vehicles on roads surrounding the IBA facility contaminating the storm water, provision has been made in the design to install french drains adjacent to perimeter roads.

During operations the outfall from this French drainage network will discharge to the leachate collection system. Post capping the outfall will be redirected to the holding pond via a petrol interceptor into the northern storm water management system.

Due to the insignificant increase in potential run-off from the site **no impact** is envisioned on the water quality of Knockharley Stream.

**In the unlikely event of direct overflow discharges from the proposed attenuation pond, a *Temporary-Slight* impact is predicted.**

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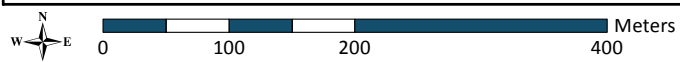


- Proposed Overhead Electricity
- ▭ Berm
- ▭ Planning Boundary
- ▭ Permitted elements not yet
- ▭ Proposed elements
- Habitat**
- FW1 - eroding river
- - - FW4 - drainage ditches
- WL1 - hedgerow
- WL2 - treeline
- ▭ BL3 - buildings and artificial surfaces
- ▭ ED2 - spoil and bare ground
- ▭ ED2 / ED3 - spoil and bare ground /
- ▭ ED3 - recolonising bare ground
- ▭ FL8 - artificial lakes and ponds
- ▭ FS1 - reed and large sedge swamps
- ▭ GA1 - improved agricultural grassland
- ▭ GA1 / GS4 - improved agricultural grassland /
- ▭ GA2 - Amenity grassland
- ▭ GA2/GS2/ED5 - amenity grassland / dry meadows and grassy verges / refuse and other
- ▭ GS2 - dry meadows and grassy verges
- ▭ GS4 - wet grassland
- ▭ GS4 / GS2 - wet grassland / dry meadows and
- ▭ WD1 - (mixed) broadleaved woodland
- ▭ WD1 / GS4 - (mixed) broadleaved woodland /
- ▭ WD2 - mixed broadleaved / conifer woodland
- ▭ WD4 - Conifer Plantation
- ▭ WS1 - scrub
- ▭ WS1 / WD2 - scrub / mixed broadleaved-
- ▭ WS3 / WS1 - ornamental/non-native shrub /

Habitat Classification	Length of Habitat Loss (m)
FW4 - drainage ditches	129
WL1 - hedgerow	1059
WL2 - treeline	543

Habitat Classification	Area of Habitat Loss (sqm)
BL3 - buildings and artificial surfaces	4983
ED2 - spoil and bare ground	12745
ED2 / ED3 - spoil and bare ground / recolonising bare ground mosaic	23342
GA1 - improved agricultural grassland	47876
GA2 - Amenity grassland	922
GS2 - dry meadows and grassy verges	21147
GS4 / GS2 - wet grassland / dry meadows and grassy verges mosaic	28246
WD1 - (mixed) broadleaved woodland	36139
WD2 - mixed broadleaved / conifer woodland	72002
WD4 - Conifer Plantation	5638
WS3 / WS1 - ornamental/non-native shrub / scrub mosaic	2143

<b>TITLE:</b>	Habitat Loss
<b>PROJECT:</b>	Knockharley Landfill, Co. Meath
<b>FIGURE NO:</b>	3
<b>CLIENT:</b>	Knockharley Landfill Ltd.
<b>SCALE:</b>	1:6000
<b>REVISION:</b>	0
<b>DATE:</b>	21/10/2019
<b>PAGE SIZE:</b>	A3



## 5.2 Mitigation

No additional mitigation measures other than those detailed in the EIAR (Section 10.6 Mitigation Measures in Ch. 10 Biodiversity) are required.

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## 6 RESIDUAL IMPACTS

As in the preceding sections, original text and numbering from the EIAR are included in grey text boxes, with additions or alterations arising from additional information included in bold below.

### 10.7 Residual Impacts after Mitigation

A certain amount of permanent habitat loss will be associated with the footprint of the proposed development, however this will be small relative to the value of habitats available on the site.

With the application of the above mitigation measures which includes monitoring, there will be no significant residual impacts from this development are envisaged.

**The permanent loss of 5 ha of moderate value semi-natural grasslands and 1,602 m of established treelines and hedgerows will be associated with the footprint of the proposed development.**

**A total of 129m of Drainage Ditches with semi-natural characteristics will be lost within the proposed development footprint. This will be offset by the proposed wetland.**

**A total of 31m of Eroding Rivers FW1 of low-moderate ecological value overlapped by the proposed screening berm will be altered by culvert installation.**

**The woodlands on-site which are of recent origin and still relatively artificial in character due to their immaturity and silvicultural origin. New planting will replace these during the operational phase.**

**Considering the low to moderate value of habitats within the proposed development footprint, proposed re-planting of forestry and the application of mitigation measures detailed in the EIAR, there will be no significant residual impacts to habitats and flora from this development.**

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# Appendix 1

## Annex 1 Grassland Habitats Comparison

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Typical species lists are taken from NPWS (2013) and NPWS (2019) (Article 17 Habitats Assessments Reports). High-quality indicator species are given in NPWS (2013).

[6510] Lowland Hay Meadows Typical Species (High-Quality species denoted by H)	Present at Knockharley (in GS4/GS2 in proposed development footprint)	Present at Knockharley (in GS2 in proposed development footprint)
<i>Alopecurus pratensis</i>		
<i>Bromus racemosus</i> H		
<i>Centaurea nigra</i>		
<i>Crepis capillaris</i>		
<i>Dactylorhiza fuchsia</i>		
<i>Daucus carota</i>		
<i>Filipendula ulmaria</i>	✓ (not common onsite)	
<i>Heracleum sphondylium</i>		
<i>Hordeum secalinum</i> H		
<i>Hypochaeris radicata</i>		
<i>Knautia arvensis</i> H		
<i>Lathyrus pratensis</i>	✓	
<i>Leontodon autumnalis</i>		
<i>Leontodon hispidus</i>		
<i>Leucanthemum vulgare</i> H	(not common onsite)	
<i>Lotus corniculatus</i> H		
<i>Pimpinella major</i> H		
<i>Plantago lanceolata</i>		✓
<i>Prunella vulgaris</i>		
<i>Ranunculus acris</i>	✓	✓
<i>Rhinanthus minor</i> H		
<i>Sanguisorba officinalis</i> H		
<i>Tragopogon pratensis</i> H		
<i>Trifolium pratense</i>	✓	✓
<i>Trisetum flavescens</i>		
<i>Vicia cracca</i>	✓	✓
All orchid species H		
<b>Total</b>	<b>6</b>	<b>4</b>
<b>Minimum required for Annex I status (NPWS 2013)</b>	<b>7</b>	<b>7</b>
<b>Other factors required for Annex I status</b>	Flower rich, cut 1-2 times per year after grasses flower	Flower rich, cut 1-2 times per year after grasses flower
<b>Conclusion</b>	Not Annex I	Not Annex I

**[6510] Lowland Hay Meadows** can be classified within the IVC community **GL3E *Festuca rubra* – *Rhinanthus minor* grassland**.

The following description of the GL3E *Festuca rubra* – *Rhinanthus minor* grassland community is from the IVC portal on the NBDC website:

### **Vegetation**

The main grass species in this rather attractive community are *Anthoxanthum odoratum*, *Holcus lanatus*, *Festuca rubra*, *Agrostis capillaris* and *Cynosurus cristatus*. Forb cover tends to be high with *Plantago lanceolata* and *Trifolium pratense* being abundant, while other constant forbs include *Trifolium repens*, *Ranunculus acris*, *Cerastium fontanum*, *Rumex acetosa* and the hemiparasite *Rhinanthus minor*. Forbs are tall-growing in comparison to the other drier grassland communities. *Filipendula ulmaria* occurs on wetter sites. Several common moss species form the bryophyte layer with *Calliergonella cuspidata* and *Brachythecium rutabulum* being the most frequent.

### **Ecology**

The *Festuca rubra* – *Rhinanthus minor* grassland is significant for being a community of neutral lowland hay meadows, generally occurring on well-draining, mineral soils of fairly average fertility.

### **Sub-communities**

No sub-communities are described

### **Similar communities**

This grassland differs from the other main meadow community, GL3C *Festuca rubra* – *Trifolium pratense* grassland, by being less base-rich and less fertile. Coarse grasses such as *Agrostis stolonifera*, *Dactylis glomerata* and *Arrhenatherum elatius* are less common here, but it is the high frequency of *Rhinanthus minor* which is the chief indicator for this community and this species is often plentiful.

### **Conservation value**

This is a grassland community of medium species richness. It is the community which corresponds most closely with the EU HD Annex I habitat 6510 Lowland hay meadows, but has some minor affinity with the EU HD Annex I priority habitat 6210 Orchid-rich calcareous grassland\*.

### **Management**

These swards are managed as grazing land (typically for cattle) and/or mown for hay. Cutting may occur once or twice a year between May and September. The main threats to these grasslands include improvement and abandonment."

(<http://www.biodiversityireland.ie/projects/national-vegetation-database/irish-vegetation-classification/explore/gl3e/>)

Typical species lists are taken from NPWS (2013) and NPWS (2019) (Article 17 Habitats Assessments Reports). High-quality indicator species are given in NPWS (2013).

[6410] <i>Molinia</i> Meadows on calcareous, peaty or clayey-silt-laden soils Typical Species (High-Quality species denoted by H)	Present at Knockharley (in GS4/GS2 in proposed development footprint)
<i>Achillea ptarmica</i>	
<i>Carex echinata</i>	✓ (not common onsite)
<i>Carex flacca</i>	✓
<i>Carex nigra</i>	✓
<i>Carex panicea</i>	
<i>Carex pulicaris</i> <b>H</b>	
<i>Carex viridula</i> ,	
<i>Carum verticillatum</i> , <b>H</b>	
<i>Cirsium dissectum</i> <b>H</b>	
<i>Crepis paludosa</i> , <b>H</b>	
<i>Equisetum palustre</i> ,	
<i>Filipendula ulmaria</i> ,	(not common onsite)
<i>Galium palustre</i> ,	
<i>Galium uliginosum</i> , <b>H</b>	
<i>Juncus acutiflorus</i> ,	
<i>Juncus articulatus</i> ,	
<i>Juncus conglomeratus</i> , <b>H</b>	
<i>Lathyrus palustris</i> , <b>H</b>	
<i>Ophioglossum vulgatum</i> , <b>H</b>	
<i>Lotus pedunculatus</i> ,	✓
<i>Luzula multiflora</i> ,	✓ (not common onsite)
<i>Mentha aquatica</i> ,	
<i>Molinia caerulea</i> ,	
<i>Potentilla anglica</i> ,	
<i>Potentilla erecta</i> ,	
<i>Ranunculus flammula</i> ,	
<i>Succisa pratensis</i> ,	
<i>Viola palustris</i> ,	
<i>Viola persicifolia</i> . <b>H</b>	
All orchid species <b>H</b>	
<b>Total</b>	<b>6</b>
<b>Minimum required for Annex I status (NPWS 2013)</b>	<b>7</b>

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<b>[6410] <i>Molinia</i> Meadows on calcareous, peaty or clayey-silt-laden soils Typical Species (High-Quality species denoted by H)</b>	<b>Present at Knockharley (in GS4/GS2 in proposed development footprint)</b>
<b>Other factors required for Annex I status</b>	Strong indicator species such as <i>Succisa pratensis</i> and <i>Juncus acutiflorus</i> and <i>Filipendula ulmaria</i> and <i>Cirsium dissectum</i> common.
<b>Conclusion</b>	Not Annex I

**[6410] *Molinia* Meadows** can be classified within the IVC community **GL1C *Molinia caerulea* – *Succisa pratensis* grassland**

The following description of the GL1C *Molinia caerulea* – *Succisa pratensis* grassland community is from the IVC portal on the NBDC website:

**Vegetation**

This is typically a species-rich grassland community with a number of constant species. *Molinia caerulea* is often an abundant species, but tends not to form large, dominating tussocks and may even be absent. *Succisa pratensis* is a strong indicator and can be plentiful, while *Calliergonella cuspidata* is usually abundant beneath the sward. Other constant graminoids include *Carex panicea*, *Carex flacca*, *Juncus acutiflorus*, *Holcus lanatus*, *Festuca rubra* and *Anthoxanthum odoratum*. Apart from *Succisa*, the main forbs are *Potentilla erecta*, *Ranunculus acris*, *Trifolium* spp., *Plantago lanceolata*, *Prunella vulgaris*, *Filipendula ulmaria* and *Cirsium dissectum*. *Briza media* and *Carex pulicaris* occur on the more calcareous soils.

**Ecology**

The *Molinia caerulea* – *Succisa pratensis* grassland is a wet grassland community that primarily occurs in fairly low-lying areas on gleys but also on basin peats. These areas are often seasonally flooded (e.g. callows grassland). The soils are usually fairly acidic, markedly infertile and organic.

**Sub-communities**

No sub-communities are currently defined for this community.

**Similar communities**

GL1D *Molinia caerulea* – *Potentilla erecta* – *Agrostis stolonifera* grassland is related to this community but is less rich in number of species and *Molinia caerulea* tends to dominate there in a taller, tussocky sward.

**Conservation value**

This is a species-rich grassland community. A high proportion of these plots (particularly those with *Molinia caerulea* and *Cirsium dissectum*) come from grassland classified as EU HD Annex I habitat 6410 *Molinia* meadows. Sites with good populations of *Succisa pratensis* can also be important for the EU HD Annex II species Marsh Fritillary (*Euphydryas aurinia*) as this is the main food plant for this butterfly species.

**Management**

These swards are managed as rough grazing land (typically for cattle) and/or through a traditional regime of mowing during the drier summer months (typically around August). In wetter years, mowing may not be possible. The main threats to these grasslands include improvement, abandonment and afforestation."

[\(http://www.biodiversityireland.ie/projects/national-vegetation-database/irish-vegetation-classification/explore/gl1c/\)](http://www.biodiversityireland.ie/projects/national-vegetation-database/irish-vegetation-classification/explore/gl1c/)

# Appendix 2

## Irish Vegetation Classification /ERICA Analysis

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**Table 4: Results of ERICA analysis (see figure 2 for plot locations)**

Plot	Code	Community	Group	Division	Max	Type	Link
Q1	SM4A	Festuca rubra - Agrostis stolonifera	Festuca rubra - Seriphidium maritimum	Saltmarsh	48.9	Transitional	<a href="#">Web</a>
Q2	GL4A	Agrostis capillaris - Trifolium repens	Nardus stricta - Galium saxatile	Grasslands	72.4	Assigned	<a href="#">Web</a>
Q3	GL4A	Agrostis capillaris - Trifolium repens	Nardus stricta - Galium saxatile	Grasslands	82.0	Assigned	<a href="#">Web</a>
Q4	GL2C	Holcus lanatus - Lolium perenne	Agrostis stolonifera - Ranunculus repens	Grasslands	28.8	Transitional	<a href="#">Web</a>
R1	GL2C	Holcus lanatus - Lolium perenne	Agrostis stolonifera - Ranunculus repens	Grasslands	63.1	Assigned	<a href="#">Web</a>
R2	GL2A	Agrostis stolonifera - Ranunculus repens	Agrostis stolonifera - Ranunculus repens	Grasslands	44.0	Transitional	<a href="#">Web</a>
Q5	GL2B	Juncus effusus - Holcus lanatus	Agrostis stolonifera - Ranunculus repens	Grasslands	76.1	Assigned	<a href="#">Web</a>
Q6	GL2C	Holcus lanatus - Lolium perenne	Agrostis stolonifera - Ranunculus repens	Grasslands	15.8	Transitional	

An excerpt from the ERICA manual (Perrin, 2018), on interpreting results is included below.

## “Interpreting your results

The analysis procedure uses a version of fuzzy clustering called noise clustering. More details on this can be found in the IVC technical reports found here. In brief, what this procedure does is assign each of the plots in the input table a degree of membership to each of the communities defined by the IVC. Membership is also assigned to a ‘noise’ class which represents outliers not adequately described by the current IVC scheme. All these membership values total 1. Under ‘Type’ in the results table (Fig. 4), each input plot is categorised based on membership values following the definitions in Table 1.

**Table 1.** Categorising types of plots using fuzzy membership results from noise clustering analysis (after Wiser & de Cáceres 2013).

Plot Type	Definition
Assigned	The plot has membership $\geq 0.5$ for one of the vegetation communities and therefore relates to the core definition of that vegetation community.
Unassigned	The plot has membership $\geq 0.5$ for the noise class and is poorly represented by the current classification scheme.
Transitional	The plot has membership $< 0.5$ for all vegetation communities and for the noise class. It falls within the scope of the current classification scheme but does not relate to the core definition of any of the vegetation communities.

Under ‘Max’ in the table is the maximum fuzzy membership value (presented here as a percentage rather than a [0, 1] value) and under ‘Code’ is the code of the community to which that maximum membership value has been assigned<sup>2</sup>. The ‘Community’, ‘Group’ and ‘Division’ relating to that code are presented. The table can be navigated, ordered and searched as before. The ‘Link’ column provides a series of buttons each of which links to the relevant community description page on the NBDC website; for an overview of the IVC hierarchy, you should refer here. Mouse over truncated entries to see the full text. Mouse over the column headings for reminders of the data types.

Note that plots defined as transitional are still assigned to a community (or the noise class) under ‘Code’ in this manner. Caution should be exercised in interpreting these transitional results, especially when the ‘Max’ value is particularly low and it may be desirable to exclude these plots from subsequent analysis or to handle them differently. Note also that when you download the results, you are presented with the membership values of each plot for all vegetation communities; this should aid you in interpreting the results.

The communities of the IVC have been defined using quantitative data, and data of this nature are preferable when attempting to classify vegetation. Some degree of caution should be exercised when interpreting the results from presence/absence data.”

## Q1

The transitional assignment of plot Q1 to the saltmarsh community SM4A results from the dominance *Festuca rubra* and *Agrostis stolonifera*:

"This vegetation usually comprises a rank sward dominated by *Festuca rubra* and *Agrostis stolonifera*, which are the only constants. *Glaux maritima*, *Plantago maritima* and *Triglochin maritimum* are each frequent and there are a number of occasional associates including *Leontodon autumnalis*, *Juncus gerardii*, *Trifolium repens*, *Atriplex prostrata*, *Cochlearia officinalis*, *Armeria maritima*, *Plantago coronopus* and *Aster tripolium*." (community description)(<http://www.biodiversityireland.ie/projects/national-vegetation-database/irish-vegetation-classification/explore/sm4a/>).

Based on its location c. 19 km inland and lack of halophytes, this habitat is clearly not saltmarsh, and its (transitional) assignment is based on the dominance of two species which are in fact fairly common across habitats. *Festuca rubra* is present in NBDC records for grid square N96 (10km grid square overlapping site).

The history of disturbance in this area may have allowed them to dominate in an unusual setting, with dry but heavy and compacted soil supporting the sparse sward present in this marginal area fringing the more characteristic rank grassland covering this field.

## Q2 & Q3

These plots were assigned firmly to the GL4A *Agrostis capillaris* – *Trifolium repens* grassland community, with the following descriptions given on the IVC portal on the NBDC website-

### Vegetation

The main grass species in this community are *Agrostis capillaris* (which dominates), *Anthoxanthum odoratum*, *Holcus lanatus* and *Festuca rubra*. Among the forbs, *Trifolium repens* and *Rumex acetosa* are constants, with *Cerastium fontanum*, *Ranunculus repens* and *Plantago lanceolata* also frequent. Of the other species which may occur, some are more characteristic of the uplands (e.g. *Galium saxatile* and *Potentilla erecta*), while others are more characteristic of lowland, dry mesotrophic swards (e.g. *Cynosurus cristatus*, *Ranunculus acris* and *Hypochaeris radicata*) or wet grassland (e.g. *Juncus effusus* and *Lotus pedunculatus*). Some minor degree of improvement is signified by the frequency of *Lolium perenne*. The main component of the bryophyte layer is *Rhytidiadelphus squarrosus*.

### Ecology

The *Agrostis capillaris* – *Trifolium repens* grassland is a variable and rather poorly defined semi-improved community of the lower uplands, which occurs mainly on drained mineral soils or rather peaty gleys.

### Conservation value

This is a fairly species-poor grassland community with relatively little recognised conservation value."

(<http://www.biodiversityireland.ie/projects/national-vegetation-database/irish-vegetation-classification/explore/gl4a/>)

These two plots are characteristic of the dense rank sward present in much of the GS4/GS2 fields within the footprint of the proposed biological treatment facility and leachate management facility extension.

#### **Q4, R1, Q6**

Plot R1 was assigned firmly to the GL2C *Holcus lanatus* – *Lolium perenne* grassland community, while Q4 and Q6 were transitional with lower levels of similarity (28.8 and 15.8 respectively). This community is described as-

#### **Vegetation**

This is a very species-poor assemblage and there are only a few constant species. *Holcus lanatus*, *Agrostis stolonifera* and *Lolium perenne* form the bulk of the medium-height sward alongside *Ranunculus repens* and *Trifolium repens*. *Cerastium fontanum* is frequent and, together with *Lolium perenne* and *Trifolium repens*, is indicative of the agriculturally-improved nature of the community. *Poa trivialis* would have been frequent in this community in the past as it was included in old seed mixes; it is probably less frequent now.

#### **Ecology**

The *Holcus lanatus* – *Lolium perenne* grassland is a variable semi-improved community of wet pastures and meadows found commonly across the country, that occurs on gleyed or drained mineral soils. Soils are fairly acidic and, despite the agricultural improvement, the vegetation suggests that they are only mildly fertile.

#### **Conservation value**

This is a species-poor grassland community of relatively low conservation value.

#### **Management**

These swards are managed as improved grazing land (typically for cattle) and/or for silage. Fertiliser application and re-seeding will typically occur periodically. The main threats to these grasslands include further improvement and abandonment.”

(<http://www.biodiversityireland.ie/projects/national-vegetation-database/irish-vegetation-classification/explore/gl2c/>)

Plot R1 is located within a uniform sward dominated by *Holcus lanatus*; other than this however, none of the species listed in the above description are present; as such although firmly assigned statistically to GL2C based on the dominance of *Holcus lanatus*, the other species recorded in R1 are not reflective of the description. Q4 contains *Agrostis stolonifera* and *Holcus lanatus*, although not in the dominant proportions described above. Q6 contains *Agrostis stolonifera* and *Holcus lanatus*, in even lower proportions, resulting in a transitional assignment.

GL2C is described as a species-poor assemblage with few constants; the low number of relatively common species recorded in plots Q4, Q6 & R1 is reflective of this.

## R2

This plot was categorised on a transitional basis as GL2A *Agrostis stolonifera* – *Ranunculus repens* marsh-grassland based on the dominance of *Agrostis stolonifera*, with none of the other constants, a number of which are associated with marshy or wet grassland vegetation present (either in R2 or the surrounding area). This community is described as-

### Vegetation

*Agrostis stolonifera* is the main species of this marshy community, with *Ranunculus repens*, *Galium palustre* and *Potentilla anserina* being the only other constants. These are frequently accompanied by *Carda.mine pratensis*, *Filipendula ulmaria* and *Trifolium repens*, and less often by *Mentha aquatica*, *Leontodon autumnalis* and *Senecio aquaticus*. The community differs from others in this group (GL2) in its higher forb component and the presence of more species tolerant of seasonal flooding. *Calliergonella cuspidata* tends to be the only bryophyte. The vegetation is typically calf-height.

### Ecology

The *Agrostis stolonifera* – *Ranunculus repens* marsh-grassland is a variable grouping of vegetation from mesotrophic, wet grassland and marsh on gleys and basin peats in the lowlands. Soils are relatively base-rich, quite fertile and fairly organic.

### Sub-communities

Two sub-communities have been described. The *Holcus lanatus* – *Juncus effusus* sub-community (GL2Ai) is the more typical and variable sub-community whilst the *Potentilla anserina* – *Carex hirta* sub-community (GL2Aii) represents wetter, seasonally inundated and probably trampled vegetation.

### Conservation value

This is a species-poor grassland community.”

[\(http://www.biodiversityireland.ie/projects/national-vegetation-database/irish-vegetation-classification/explore/gl2a/\)](http://www.biodiversityireland.ie/projects/national-vegetation-database/irish-vegetation-classification/explore/gl2a/)

R2 and the surrounding grasslands do not support any of the species included in the classification found in marshy habitats (no *Filipendula ulmaria*, *Iris pseudacorus* or *Equisetum fluviatile* are present).

## Q5

This plot was assigned to GL2B *Juncus effusus* – *Holcus lanatus* grassland based on the dominance of *Holcus lanatus*, *Juncus effusus* and *Agrostis stolonifera*. This community is described as-

### “Vegetation

The main graminoids in this rushy, wet grassland community are *Holcus lanatus*, *Juncus effusus*, *Agrostis stolonifera* and *Anthoxanthum odoratum*, which form a fairly tall, rank sward while the forb component consists largely of *Ranunculus repens*, *Ranunculus acris*, *Trifolium repens* and *Rumex acetosa*. Frequent species include *Cirsium palustre*, *Cerastium fontanum*, *Festuca rubra* and *Juncus acutiflorus*. *Calliergonella cuspidata* is the most frequent bryophyte and can form a dense layer with *Brachythecium rutabulum*.

### Ecology

This common grassland community is found across the country on lowland farmland with impeded drainage on flat ground or gentle slopes. It is typical of relatively unimproved, wet pasture and is encountered on gleyed soils and sometimes on basin peats which are mildly fertile.

### Conservation value

This is a fairly species-poor grassland community of relatively low conservation value.”

(<http://www.biodiversityireland.ie/projects/national-vegetation-database/irish-vegetation-classification/explore/gl2b/>)

The description above fits Q5 quite well; it is located in a strip of rough, wet grassland bordering intensively managed pasture. The presence of *Lathyrus pratensis* and 2 sedges *Carex leporina* and *Carex nigra* adds some interest, but these are fairly common across less-intensively managed habitats.

# Appendix 3

## Grassland Botanical Survey Results

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**Table 5: Q1 (Quadrat 1)**

Species Composition & Cover			
Common Name		Scientific Name	Percentage Cover
Red Fescue		<i>Festuca rubra</i>	70 %
Creeping Bent-grass		<i>Agrostis stolonifera</i>	50 %
Red Clover		<i>Trifolium pratense</i>	40 %
Yorkshire fog		<i>Holcus lanatus</i>	30 %
Timothy Grass		<i>Phleum pratense</i>	8 %
White Clover		<i>Trifolium repens</i>	7 %
Creeping Thistle		<i>Cirsium arvense</i>	3 %
Dandelion		<i>Taraxacum officinale</i> Agg.	3 %
Perennial Rye-grass		<i>Lolium perenne</i>	<1 %
Cut-leaved Crane's-bill		<i>Geranium dissectum</i>	<1 %
Structural Data			
Median Vegetation Height		Vegetation Cover	
Graminoids	Forbs	Graminoids	Forbs
60 cm	35 cm	95 %	45 %



**Plate 15: Q1**



**Table 6: Q2 (Quadrat 2)**

Species Composition & Cover			
Common Name	Scientific Name	Percentage Cover	
Sweet Vernal Grass	<i>Anthoxanthum odoratum</i>	40 %	
Common Bent-grass	<i>Agrostis capillaris</i>	40 %	
Soft Rush	<i>Juncus effusus</i>	30 %	
Hard Rush	<i>Juncus acutus</i>	25 %	
Common Couch Grass	<i>Elymus repens</i>	20 %	
Hairy Sedge	<i>Carex_hirta</i>	15 %	
Cocksfoot Grass	<i>Dactylis glomerata</i>	10 %	
Greater Bird's Foot Trefoil	<i>Lotus pedunculatus</i>	10 %	
Timothy-grass	<i>Phleum pratense</i>	5 %	
Meadow Buttercup	<i>Ranunculus acris</i>	5 %	
False Oat-grass	<i>Arrhenatherum elatius</i>	5 %	
Bush Vetch	<i>Vicia sepium</i>	5 %	
Creeping Thistle	<i>Cirsium arvense</i>	3 %	
Yorkshire Fog	<i>Holcus lanatus</i>	3 %	
Dandelion	<i>Taraxacum officinale</i>	1 %	
Heath Woodrush	<i>Luzula multiflora</i> subsp. <i>Congesta</i>	<1 %	
Structural Data			
Median Vegetation Height		Vegetation Cover	
Graminoids	Forbs	Graminoids	Forbs
50 cm (80 cm) *	25 cm	100 %	20 %



**Plate 16: Q2**

**Table 7: Q3 (Quadrat 3)**

Species Composition & Cover			
Common Name		Scientific Name	Percentage Cover
Common Bent-grass		<i>Agrostis capillaris</i>	55 %
Hard Rush		<i>Juncus acutus</i>	25 %
Yorkshire Fog		<i>Holcus lanatus</i>	20 %
Timothy-grass		<i>Phleum pratense</i>	20 %
Field Horsetail		<i>Equisetum arvense</i>	15 %
Silverweed		<i>Potentilla reptans</i>	2 %
Ash		<i>Fraxinus excelsior</i>	2 %
Meadow Buttercup		<i>Ranunculus acris</i>	1 %
Structural Data			
Median Vegetation Height		Vegetation Cover	
Graminoids	Forbs	Graminoids	Forbs
50 cm	30 cm	100 %	5 %



**Plate 17: Q3**

**Table 8: Q4 (Quadrat 4)**

Species Composition & Cover			
Common Name		Scientific Name	Percentage Cover
Meadow Vetchling		<i>Lathyrus pratensis</i>	80 %
Common Bent-grass		<i>Agrostis capillaris</i>	50 %
Creeping Bent-grass		<i>Agrostis stolonifera</i>	30 %
Meadow Buttercup		<i>Ranunculus acris</i>	20 %
Dandelion		<i>Taraxacum officinale</i>	15 %
Yorkshire Fog		<i>Holcus lanatus</i>	15 %
Timothy-grass		<i>Phleum pratense</i>	10 %
Lesser Stitchwort		<i>Stellaria graminea</i>	10 %
Structural Data			
Median Vegetation Height		Vegetation Cover	
Graminoids	Forbs	Graminoids	Forbs
100 cm	70 cm	95 %	85 %



**Plate 18: Q4**

**Table 9: Q5 (Quadrat 5)**

Species Composition & Cover			
Common Name		Scientific Name	Percentage Cover
Yorkshire Fog		<i>Holcus lanatus</i>	30
Soft Rush		<i>Juncus effusus</i>	15
Perennial Rye-grass		<i>Lolium perenne</i>	15
Creeping Bent-grass		<i>Agrostis stolonifera</i>	10
Great Willowherb		<i>Epilobium hirsutum</i>	5
Sweet Vernal Grass		<i>Anthoxanthum odoratum</i>	3
Red Fescue		<i>Festuca rubra</i>	2
Meadow Vetchling		<i>Lathyrus pratensis</i>	2
Oval Sedge		<i>Carex leporina</i>	1
Black Sedge		<i>Carex nigra</i>	<1 %
Red Clover		<i>Trifolium pratense</i>	<1 %
Structural Data			
Median Vegetation Height		Vegetation Cover	
Graminoids	Forbs	Graminoids	Forbs
85 cm	70 cm	100 %	6 %



**Plate 19: Q5**

**Table 10: Q6 (Quadrat 6)**

Species Composition & Cover			
Median Vegetation Height		Vegetation Cover	
Graminoids	Forbs	Graminoids	Forbs
85 cm	70 cm	100 %	6 %
Common Name		Scientific Name	Scientific Name
Cock's Foot Grass		<i>Dactylis glomerata</i>	80 %
Creeping Thistle		<i>Cirsium arvense</i>	8 %
Dandelion		<i>Taraxacum officinale</i>	5 %
Nettle		<i>Urtica dioica</i>	3 %
Cleavers		<i>Galium aparine</i>	2 %
Yorkshire Fog		<i>Holcus_lanatus</i>	1 %
Creeping Bent-grass		<i>Agrostis stolonifera</i>	1 %
Timothy-grass		<i>Phleum pratense</i>	1 %
Creeping Buttercup		<i>Ranunculus repens</i>	<1 %
Structural Data			
Median Vegetation Height		Vegetation Cover	
Graminoids	Forbs	Graminoids	Forbs
110 cm	60 cm	95 %	30 %



**Plate 20: Q6**

**Table 11: Q7 (Quadrat 7)**

Species Composition & Cover			
Common Name		Scientific Name	Percentage Cover
Perennial Rye-grass		<i>Lolium perenne</i>	70 %
Yorkshire Fog		<i>Holcus lanatus</i>	15 %
Dandelion		<i>Taraxacum officinale</i> Agg.	1 %
White Clover		<i>Trifolium repens</i>	<1 %
Structural Data			
Median Vegetation Height		Vegetation Cover	
Graminoids	Forbs	Graminoids	Forbs
10 cm	4 cm	95 %	3 %
Bare Soil: 4 %			



**Plate 21: Q7**

**Table 12: Q8 (Quadrat 8)**

Species Composition & Cover			
Common Name	Scientific Name	Percentage Cover	
Yorkshire Fog	<i>Holcus lanatus</i>	65 %	
Lesser Chickweed	<i>Stellaria pallida</i>	1 %	
Thistle (seedling)	<i>Cirsium</i> Sp.	<1 %	
Structural Data			
Median Vegetation Height		Vegetation Cover	
Graminoids	Forbs	Graminoids	Forbs
12 cm	2 cm	65 %	1 %
Bare Soil: 35 %			



**Plate 22: Q8**

**Table 13: Q9 (Quadrat 9)**

Species Composition & Cover			
Common Name	Scientific Name	Percentage Cover	
Yorkshire Fog	<i>Holcus lanatus</i>	90 %	
Perennial Rye-grass	<i>Lolium perenne</i>	5 %	
Fescue	<i>Festuca</i> Sp.	5 %	
Meadow Buttercup	<i>Ranunculus acris</i>	5 %	
Creeping Buttercup	<i>Ranunculus repens</i>	3 %	
Dandelion	<i>Taraxacum officinale</i> Agg.	1 %	
White Clover	<i>Trifolium repens</i>	<1 %	
Lesser Chickweed	<i>Stellaria pallida</i>	<1 %	
Thistle (seedling)	<i>Cirsium</i> Sp.	<1 %	
Structural Data			
Median Vegetation Height		Vegetation Cover	
Graminoids	Forbs	Graminoids	Forbs
10 cm	14 cm	95 %	8 %
Bare Soil: 5 %			



**Plate 23: Q9**



**Table 14: Q10 (Quadrat 10)**

Species Composition & Cover			
Common Name		Scientific Name	Percentage Cover
Yorkshire Fog		<i>Holcus lanatus</i>	85 %
Fescue		<i>Festuca</i> Sp.	10 %
Meadow Buttercup		<i>Ranunculus acris</i>	5 %
Creeping Buttercup		<i>Ranunculus repens</i>	3 %
Dandelion		<i>Taraxacum officinale</i> Agg.	<1 %
Spear Thistle		<i>Cirsium Vulgare</i>	<1 %
Broad-leaved Dock		<i>Rumex obtusifolius</i>	<1 %
Capillary Thread-moss		<i>Bryum capillare</i>	<1 %
Structural Data			
Median Vegetation Height		Vegetation Cover	
Graminoids	Forbs	Graminoids	Forbs
30 cm	30 cm	65 %	6 %
Bare Soil: 10 %			



**Plate 24: Q10**

**Table 15: R1 (Relevé 1)**

Species Composition & Cover			
Common Name		Scientific Name	Percentage Cover
Yorkshire Fog		<i>Holcus lanatus</i>	80 %
Creeping Bent-grass		<i>Agrostis stolonifera</i>	30 %
Bush Vetch		<i>Vicia sepium</i>	10 %
Red Clover		<i>Trifolium pratense</i>	5 %
Sweet Vernal Grass		<i>Anthoxanthum odoratum</i>	5 %
Ribwort plantain		<i>Plantago lanceolata</i>	5 %
Timothy-grass		<i>Phleum pratense</i>	3 %
Hop Trefoil		<i>Trifolium campestre</i>	2 %
Dandelion		<i>Taraxacum officinale</i>	1 %
Tufted Vetch		<i>Vicia cracca</i>	<1 %
Lesser Stitchwort		<i>Stellaria graminea</i>	<1 %
Common Ragwort		<i>Jacobaea vulgaris</i>	<1 %
Structural Data			
Median Vegetation Height		Vegetation Cover	
Graminoids	Forbs	Graminoids	Forbs
50 cm	30 cm	80 %	70 %



**Plate 25: R1**

**Table 16: R2 (Relevé 2)**

Species Composition & Cover			
Common Name		Scientific Name	Percentage Cover
Creeping Bent-grass		<i>Agrostis stolonifera</i>	70 %
Timothy-grass		<i>Phleum pratense</i>	15 %
Red Clover		<i>Trifolium pratense</i>	10 %
Yorkshire Fog		<i>Holcus lanatus</i>	10 %
Pointed Spear-moss		<i>Calliergonella cuspidata</i>	5 %
Perennial Rye-grass		<i>Lolium perenne</i>	1 %
Bush Vetch		<i>Vicia sepium</i>	<1 %
Structural Data			
Median Vegetation Height		Vegetation Cover	
Graminoids	Forbs	Graminoids	Forbs
50 cm	30 cm	95 %	10 %



**Plate 26: R2**

# Appendix 4

## Woodland Botanical Survey Results

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**Table 17: WR1 (Woodland Relevé 1)**

<b>Species Composition &amp; Cover</b>		
<b>Common Name</b>	<b>Scientific Name</b>	<b>Percentage Cover</b>
<b>Canopy</b>		
Ash	<i>Fraxinus excelsior</i>	95 %
Alder	<i>Alnus glutinosa</i>	5 %
Sycamore	<i>Acer pseudoplatanus</i>	1 %
<b>Field &amp; Ground Layer</b>		
Smooth Meadow-grass	<i>Poa pratensis</i>	95 %
Sheep's Fescue	<i>Festuca ovina</i> Agg.	15 %
Remote Sedge	<i>Carex remota</i>	2 %
Fox-tail Feather-moss	<i>Thamnobryum alopecurum</i>	1.5 %
Common Feather-moss	<i>Kindbergia praelonga</i>	1.5 %
Soft rush	<i>Juncus effusus</i>	<1 %
Mouse-tail Moss.	<i>Isoetecium myosuroides</i>	< 1 %
Short-leaved/Lesser Pocket-moss *	<i>Fissidens incurvus/bryoides</i>	< 1 %
<b>Structural Data</b>		
<b>Percentage Cover of Layers</b>		
Canopy		95 %
Shrub		0 %
Field/Ground		97 %
Bare Soil		3 %
<b>Trunk Diameter at Breast Height</b>		
Range		17-46 cm
Average		30 cm
<b>Stem Density</b>		
3.6/m <sup>2</sup>		
<b>Natural Regeneration</b>		
21 Ash seedlings/young saplings (2.1/m <sup>2</sup> )		
<b>Dead Wood</b>		
1 x standing tree (20cm DBH); occasional twigs on ground		

\* Capsules are required to differentiate these 2 species. More likely *F.bryoides* due to wider distribution in Ireland



**Plate 27: WR1**

**Table 18: WR2 (Woodland Relevé 2)**

<b>Species Composition &amp; Cover</b>		
<b>Common Name</b>	<b>Scientific Name</b>	<b>Percentage Cover</b>
<b>Canopy</b>		
Ash	<i>Fraxinus excelsior</i>	65 %
Alder	<i>Alnus glutinosa</i>	30 %
Sycamore	<i>Acer pseudoplatanus</i>	5 %
<b>Shrub Layer</b>		
Bramble	<i>Rubus fruticosus</i> Agg.	40 %
<b>Field &amp; Ground Layer</b>		
Smooth Meadow-grass	<i>Poa pratensis</i>	40 %
Creeping Bent-grass	<i>Agrostis stolonifera</i>	10 %
Soft rush	<i>Juncus effusus</i>	5 %
Sheep's Fescue	<i>Festuca ovina</i> Agg.	5 %
Timothy-grass	<i>Phleum pratense</i>	2 %
Creeping buttercup	<i>Ranunculus acris</i>	2 %
Fox-tail Feather-moss	<i>Thamnobryum alopecurum</i>	1 %
Common Feather-moss	<i>Kindbergia praelonga</i>	< 1 %
Mouse-tail Moss.	<i>Isoetecium myosuroides</i>	< 1 %
Short-leaved/Lesser Pocket-moss *	<i>Fissidens incurvus/bryoides</i>	< 1 %
Rosebay Willowherb	<i>Chamaenerion angustifolium</i>	< 1 %
False Oat-grass	<i>Arrhenatherum elatius</i>	< 1 %
Short-fruited Willowherb	<i>Epilobium obscurum</i>	< 1 %
<b>Structural Data</b>		
<b>Percentage Cover of Layers</b>		
Canopy		85 %
Shrub		40 %
Field/Ground		59 %
Bare Soil		1 %
<b>Trunk Diameter at Breast Height</b>		
Range		15-50 cm
Average		34 cm
<b>Stem Density</b>		
3.3/m <sup>2</sup>		
<b>Natural Regeneration</b>		
14 Ash seedlings/young saplings (1.4/m <sup>2</sup> )		
<b>Dead Wood</b>		
None		



**Plate 28: WR1**



**Table 19: WR3 (Woodland Relevé 3)**

Species Composition & Cover		
Common Name	Scientific Name	Percentage Cover
<b>Canopy</b>		
Sycamore	<i>Acer pseudoplatanus</i>	21 %
Ash	<i>Fraxinus excelsior</i>	7 %
Alder	<i>Alnus glutinosa</i>	7 %
<b>Field &amp; Ground Layer</b>		
Yorkshire fog	<i>Holcus lanatus</i>	65 %
Common Bent-grass	<i>Agrostis capillaris</i>	33 %
Soft rush	<i>Juncus effusus</i>	1 %
Common Couch-grass	<i>Elymus repens</i>	< 1 %
Timothy-grass	<i>Phleum pratense</i>	< 1 %
Great Willowherb	<i>Epilobium hirsutum</i>	< 1 %
Structural Data		
<b>Percentage Cover of Layers</b>		
Canopy		35 %
Shrub		0 %
Field/Ground		100 %
Bare Soil		0 %
<b>Trunk Diameter at Breast Height</b>		
Range		7-28 cm
Average		20 cm
<b>Stem Density</b>		
		3/m <sup>2</sup>
<b>Natural Regeneration</b>		
		None
<b>Dead Wood</b>		
		None



**Plate 29: WR3**

**Table 20: WR4 (Woodland Relevé 4)**

<b>Species Composition &amp; Cover</b>		
<b>Common Name</b>	<b>Scientific Name</b>	<b>Percentage Cover</b>
<b>Canopy</b>		
Alder	<i>Alnus glutinosa</i>	70 %
Sycamore	<i>Acer pseudoplatanus</i>	20 %
Ash	<i>Fraxinus excelsior</i>	15 %
<b>Shrub Layer</b>		
Bramble	<i>Rubus fruticosus</i> Agg.	10 %
<b>Field &amp; Ground Layer</b>		
False Oat-grass	<i>Arrhenatherum elatius</i>	70 %
Sheep's Fescue	<i>Festuca ovina</i> Agg.	10 %
Fox-tail Feather-moss	<i>Thamnobryum alopecurum</i>	7 %
Dandelion	<i>Taraxacum officinale</i> Agg.	5 %
Great Willowherb	<i>Epilobium hirsutum</i>	1 %
Remote Sedge	<i>Carex remota</i>	<1 %
Soft rush	<i>Juncus effusus</i>	1 %
Creeping cinquefoil	<i>Potentilla reptans</i>	<1 %
Short-leaved/Lesser Pocket-moss *	<i>Fissidens incurvus/bryoides</i>	< 1 %
Common Feather-moss	<i>Kindbergia praelonga</i>	< 1 %
Mouse-tail Moss.	<i>Isoetes macrospora</i>	< 1 %
<b>Structural Data</b>		
<b>Percentage Cover of Layers</b>		
Canopy		80 %
Shrub		10 %
Field/Ground		85 %
Bare Soil		5 %
<b>Trunk Diameter at Breast Height</b>		
Range		7-44 cm
Average		35 cm
<b>Stem Density</b>		
3.4/m <sup>2</sup>		
<b>Natural Regeneration</b>		
1 Ash seedlings/young saplings (0.1/m <sup>2</sup> )		
<b>Dead Wood</b>		
Occasional twigs on ground		



**Plate 30: WR4**

# Appendix 5

## Additional Photographs

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**Plate 31: Broadleaved Woodland WD1**



**Plate 32: Mixed Broadleaved/Conifer Woodland WD2**



**Plate 33: Scrub WS1**



**Plate 34: Treelines WL2**



**Plate 35: Artificial Lakes and Ponds FL8**

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# Appendix 5

## Knockharley Landfill Aquatic Survey Report 2019

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# Knockharley Landfill Aquatic Survey

## Report 2019



Prepared by Triturus Environmental Ltd. for Fehily Timoney & Company

*October 2019*

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A senior ecologist with Triturus Environmental Ltd., Bill Brazier is an aquatic ecologist specialising in freshwater fisheries and aquatic ecology. Having completed a B.Sc. (Hons.) in Applied Freshwater & Marine Biology at GMIT, he is currently completing a Ph.D. in fish genetics and ecology at UCC. With 8 years professional experience, Bill has considerable experience in a range of key areas of aquatic ecology including impact assessment (screening, AA, EIA, EIAR, NIS), invasive alien species assessment, habitat mapping, protected species surveys, biodiversity assessments and fisheries assessments.

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# 1. Introduction

## 1.1 Project background

Triturus Environmental Ltd. were contracted by Fehily Timoney and Company (FTCO) to continue aquatic monitoring along several watercourses in the vicinity of Knockharley Landfill, Kentstown, Navan, Co. Meath.

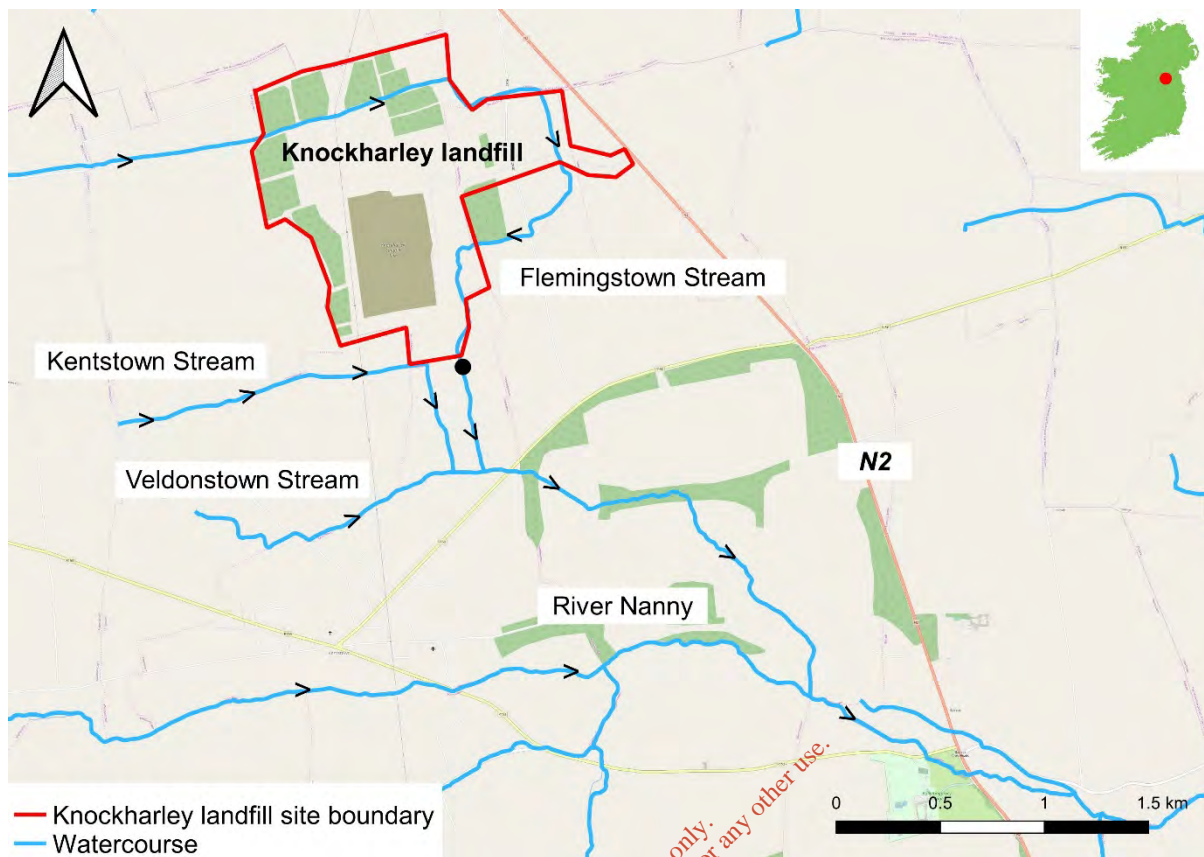
The surveys were undertaken to update the existing survey data used in the preparation of the Environmental Impact Assessment Report (EIAR) for the proposed development. A full description of the proposed works is described in chapter 2 of the EIAR. Four watercourses in the vicinity of the landfill were surveyed, namely, the Flemingstown (Knockharley) Stream, Kentstown Stream, Veldonstown Stream and River Nanny as shown in Figure 1.1 and are also referred to as the study area. These watercourses have downstream connectivity with the River Nanny Estuary and Shore SPA (site code: 004158) via the River Nanny, a site designated for overwintering birds and wetlands habitat (NPWS, 2012).

The purpose of this report was to continue the monitoring of aquatic ecology data for watercourses in the vicinity of the landfill through both desktop reviews and walkover surveys. This would help identify and evaluate the overall fisheries and aquatic value of the watercourses within the vicinity of the landfill site.

The survey was focused on aquatic habitats in relation to fisheries potential (including both salmonid and lamprey species), macro-invertebrates, water quality, macrophytes, aquatic invasive species, and Annex II aquatic species which may use the site and its surrounds.

In order to update the existing data for the proposed development and further assess the potential fisheries value of the relevant watercourses in the vicinity of Knockharley Landfill, an electro-fishing survey across  $n=6$  sites was undertaken (see Figure 2.1 below). The electro-fishing survey were used to identify the fisheries value of watercourses in the vicinity of Knockharley Landfill.

Triturus Environmental Ltd. made an application under Section 14 of the Fisheries (Consolidation) Act, 1959 as substituted by Section 4 of the Fisheries (Amendment) Act, 1962, to undertake an electrofishing survey on the watercourses in the vicinity of Knockharley Landfill, Co. Meath. Permission was granted on Tuesday 2<sup>nd</sup> July 2019 and the survey was undertaken on Thursday 22<sup>nd</sup> August 2019.



**Figure 1.1** Location of the watercourses within the vicinity of Knockharley Landfill (flow direction shown with arrows).

## 1.2 Fisheries asset of streams in the vicinity of Knockharley Landfill Study Area

Knockharley Landfill and those watercourses in its vicinity (namely the Flemingstown (Knockharley) Stream, Kentstown Stream and Veldonstown Stream) are located within the wider Nanny-Delvin catchment (Figure 1.1). The Nanny River flows east from Kentstown, after which it is joined from the south by the River Hurley, which drains the area north of Ashbourne. The Nanny continues east through Duleek before flowing into the Irish Sea at Laytown, adjoining the River Nanny Estuary and Shore SPA (site code 004158). The Nanny channel was subject to historical arterial drainage at various locations, mostly in 1998 (EPA, 2018a).

Limited fisheries data was available for the smaller streams within the study area. However, the lower reaches of the River Nanny at Julianstown Bridge is known to support brown trout (*Salmo trutta*), minnow (*Phoxinus phoxinus*), European eel (*Anguilla anguilla*), stone loach (*Barbatula barbatula*), flounder (*Platichthys flesus*), European eel and three-spined stickleback (*Gasterosteus aculeatus*) (Kelly et al., 2013). The Nanny also maintains a run of Atlantic salmon (*Salmo salar*) and, in the lower

reaches, sea trout. The river has been recognised as both a recreational sea trout and wild brown trout fishery, particularly in the lower reaches (O’Reilly, 2009).

### 1.3 Water Quality in the Knockharley Study Area

Routine biological water quality monitoring was carried out at the Knockharley Landfill site for the years 2007-2018. A total of  $n=4$  sites were monitored historically between 2007 and 2018 in the vicinity of the landfill (Figure 1.2 below). Two additional sampling sites were added in 2019 (sites 5 and 6) on the Kentstown and Veldonstown Streams respectively to obtain additional data on watercourses situated south and south west of the landfill. These sampling sites would also act as further upstream control sites to compare with water quality data downstream of the confluence with the Flemingstown (Knockharley) Stream that receives a licensed discharge from the existing landfill site. A summary of the location  $n=6$  survey locations is also provided on Table 1.2 below. A summary of historical water quality data is provided in the accompanying EIA report. A summary of EPA water quality monitoring is provided in the preceding paragraphs.



**Figure 1.2** Location of the  $n=6$  survey sites in the vicinity of the landfill.

**Table 1.1** Location of  $n=6$  electro-fishing and Q-sampling survey sites in the vicinity of Knockharley landfill.

Site no.	Watercourse & location	X (ITM)	Y (ITM)
1	Flemingstown (Knockharley) Stream, Kentstown	697689	766175
2	Flemingstown (Knockharley) Stream, Curraghtown	696053	767498
3	River Nanny, R153 bridge, Balrath Cross roads	699872	764722
4	River Nanny, East Bridge, Kentstown	697606	764987
5	Kentstown Stream, Kentstown	697555	766153
6	Veldonstown Stream, Veldonstown	696864	765706

### EPA Biological Water Quality Data

Water quality data from the Environmental Protection Agency (EPA) was not available for the smaller watercourses within the Knockharley study area. It has been reported that the River Nanny is known to be suffering from poor water quality, with less than 40% of the river water bodies monitored in the Nanny-Delvin catchment achieving satisfactory ecological status (EPA, 2018b). Under the Water Framework Directive (2000/60/EC) all rivers should aim to have target 'good status' (Q4). Two monitoring sites on the River Nanny in the vicinity of sampling sites for this survey are failing to meet the requirements of the European Communities Environmental Objectives (Surface Water) Regulations 2009 (i.e. not achieving target good status Q4; EPA, 2019).

The most recent EPA water quality data relevant to the Knockharley survey area is as follows:

- River Nanny, East Bridge, Kentstown (2017) **Q3\*** Slightly polluted (WFD Poor status)
- River Nanny, bridge south of Balrath Crossroads (1991, pre-WFD) **Q3-4** Moderately polluted (equivalent to WFD Moderate status)
- River Nanny, bridge downstream Nanny Bridge (2017) **Q3-4\*** Moderately polluted (WFD Moderate status)

Contemporary water quality samples were taken as part of this project (August 2019), the results and analysis are provided in this report.



## 2. Methodology

### 2.1 Desktop review

A desktop survey of published and unpublished reports (see references) for the Flemingstown (Knockharley) Stream, Kentstown Stream, Veldonstown Stream and River Nanny in the vicinity of the Knockharley Landfill site was undertaken for fisheries and general flora and fauna.

Data on protected species and habitats, as well as invasive species listed under Part 1 of the Third Schedule of S.I No. 477 of 2011, European Communities (Birds and Natural Habitats) Regulations, held by the National Parks & Wildlife Service (NPWS) and National Biodiversity Data Centre (NBDC) were reviewed. Water quality data from the Environmental Protection Agency (EPA) was also referred to for the relevant watercourses (although contemporary samples were taken as part of this survey – see Results section).

### 2.2 Walkover surveys

Walkover surveys of the Knockharley study area were conducted on Friday 2<sup>nd</sup> and Thursday 22<sup>nd</sup> August 2019. The  $n=6$  survey locations (Figure 1.2) in the vicinity of the landfill were surveyed in addition to bank walkover surveys to gain an understanding of the longitudinal character of these channels.

Habitat suitability for protected species of conservation interest known or suspected to occur within the study area (e.g. salmonids, lamprey, kingfisher, otter) were conducted, as well as fisheries potential for other species groups, e.g. European eel.

A broad aquatic habitat assessment was conducted utilising elements of the methodology given in the Environment Agency's '*River Habitat Survey in Britain and Ireland Field Survey Guidance Manual 2003*' (EA, 2003) and the Irish Heritage Council's '*A Guide to Habitats in Ireland*' (Fossitt, 2000). All sites were assessed in terms of:

- Stream width and depth and other physical characteristics
- Substrate type, listing substrate fractions in order of dominance, i.e. large rocks, cobble, gravel, sand, mud etc.
- Flow type, listing percentage of riffle, glide and pool in the sampling area
- In-stream vegetation, listing plant species occurring and their percentage coverage of the stream bottom at the sampling site (as applicable) and on the bankside
- Bankside vegetation composition

The existing environment was described in terms of the important aquatic habitats/species in the vicinity of the landfill. This helped to identify and evaluate species and habitats of ecological value and provide data to inform the EIAR preparation.

### 2.3 Fish Stock Assessment (Electro-Fishing)

A state-of-the-art single anode Smith-Root LR24 backpack (12V DC input; 300V, 100W DC output) was used to electro-fish  $n=6$  sites in the vicinity of the landfill (Figure 1.2) on 22<sup>nd</sup> August 2019, under the

conditions of a Department of Communications, Climate Action & Environment (DCCA) license. Both river and holding tank water temperature was monitored continually throughout the survey to ensure temperatures of 20°C were not exceeded, thus minimising stress to the captured fish due to low dissolved oxygen levels. A portable battery-powered aerator was used to maintain dissolved oxygen levels for fish.

Salmonids, European eel and other captured fish species (including three-spined stickleback and minnow) were transferred to a holding container with oxygenated fresh river water following capture, where encountered. All captured fish were anaesthetised using 0.5ml/l clove oil solution (emulsified in ethanol at a ratio of 1:9), measured to the nearest millimetre and released in-situ following a suitable recovery period.

As three primary species groups were targeted during the survey, i.e. lamprey, eel/cyprinids and salmonids, the electro-fishing settings were tailored for each species. By undertaking electro-fishing using the rapid electro-fishing technique (see methodology below), the broad characterisation of the fish community at each sampling reach could be determined as a longer representative length of channel can be surveyed. Electro-fishing methodology followed accepted European standards (CEN, 2003) and this is outlined below.

The electro-fishing survey was undertaken across  $n=6$  (see Figure 2.1). Length frequency graphs and species composition graphs for all species with numbers captured are illustrated in section 3 (results).

### Salmonids, European eel and cyprinids

For salmonid species and European eel, as well as other incidental fish species such as three-spined stickleback and minnow, electro-fishing was carried out in an upstream direction for a 10-minute CPUE, an increasingly common standard approach for wadable streams (e.g. Matson et al., 2018). A channel length approx. 100m was surveyed at each site, where feasible, in order to gain a better representation of fish stock assemblages.

Relative conductivity of the water was checked in-situ with a conductivity meter and the electro-fishing backpack was energised with the appropriate voltage and frequency to provide enough draw to attract salmonids and European eel to the anode without harm. For the relatively high conductivity of watercourses in the vicinity of the landfill (which is due to the calcareous geology), a voltage of 220V, frequency of 40Hz and pulse duration of 4ms was utilised to draw fish to the anode without causing physical damage.

### Lamprey species

Electro-fishing for lamprey ammocoetes was conducted using targeted box quadrat-based electro-fishing (as per Harvey & Cowx, 2003) in objectively suitable areas of sand/silt, where encountered. As lamprey take longer to emerge from silts and require a more persistent approach, they were targeted at a lower frequency (20-30Hz) setting which also allowed detection of European eel, if present. Settings for lamprey followed those recommended and used by Harvey & Cowx (2003), APEM (2004) and Niven & McAuley (2013).

Using this approach, the anode was placed under the water’s surface, approx. 10–15 cm above the sediment, to prevent immobilising lamprey ammocoetes within the sediment. The anode was energised with 100V of pulsed DC for 15-20 seconds and then turned off for approximately five seconds to allow ammocoetes to emerge from their burrows. The anode was switched on and off in this way for approximately two minutes. Immobilised ammocoetes were collected by a second operator using a fine-mesh hand net as they emerged.

Lamprey species were identified to species level where possible, with the assistance of a hand lens, through external pigmentation patterns and trunk myomere counts as described by Potter & Osborne (1975) and Gardiner (2003).

## 2.4 Fisheries habitat

A fisheries appraisal of watercourses in the vicinity of the landfill was also undertaken to establish their importance as salmonid, lamprey, European eel and general fisheries habitat. This assessment considered the quality of spawning, habitat and nursery habitat bordering, and with downstream connectivity to the proposed development site.

### Salmonids

Fisheries habitat for salmonids was assessed using the Life Cycle Unit method (Kennedy, 1984; O’Connor & Kennedy, 2002) to map the  $n=6$  sites as nursery, spawning and holding water, by assigning quality scores to each type of habitat. Those habitats with poor quality substrata, shallow depth and a poorly defined river profile receive a higher score (Table 2.1). Higher scores in the Life Cycle Unit method of fisheries quantification are representative of poorer value, with lower scores being more optimal despite this appearing counter-intuitive. Overall scores are calculated as a simple function of the sum of individual habitat scores.

**Table 2.1** Life Cycle Unit scoring system for salmonid nursery, spawning and holding habitat value (as per Kennedy, 1984 & O’Connor & Kennedy, 2002)

Habitat quality	Habitat score	Overall score
Poor	4	12
Moderate	3	9-11
Good	2	6-8
Excellent	1	3-5

## Lamprey species

An evaluation of the lamprey importance of  $n=6$  sites (see Figure 1.2) was undertaken using the Lamprey Habitat Quality Index (LHQI) scoring system (Macklin et al. 2018) (see Table 2.2).

The LHQI loosely follows the same rationale as the Life Cycle Unit score for salmonids (Kennedy, 1984; O'Connor & Kennedy, 2002). Those habitats with a lack of soft, largely organic sediment areas for ammocoete burrowing, shallow sediment depth (<10cm) or compacted sediment nature receive a higher score. Higher scores in the LHQ method of lamprey fisheries quantification are of poorer value (in a similar fashion to the salmonid Life Cycle Unit Index), with lower scores being more optimal. Overall scores are calculated as a simple function of the sum of individual habitat scores.

Larval lamprey habitat quality as well as the suitability of adult spawning habitat is assessed based on the information provided in Maitland (2003) and other relevant literature (e.g. Gardiner, 2003). Unlike the salmonid Life Cycle Unit index, holding habitat for adult lamprey is not assessed owing to their different migratory and life history strategies, and surveys such as this one routinely only sample larval lamprey.

The LHQI scoring system provides additional information compared to the habitat classification based on the observations of Applegate (1950) and Slade et al. (2003), which deals specifically with larval (sea) lamprey settlement habitat. Under this scheme, habitat is classified into three different types: preferred (Type 1), acceptable (Type 2), and not acceptable for larvae (Type 3) (Slade et al. 2003). Type 1 habitat is characterized by soft substrate materials usually consisting of a mixture of sand and fine organic matter, often with some cover over the top such as detritus or twigs in areas of deposition. Type 2 habitat is characterized by substrates consisting of shifting sand with little if any organic matter and may also contain some gravel and cobble (lamprey may be present but at much lower densities than Type 1). Type 3 habitat consists of materials too hard for larvae to burrow including bedrock and overly-compacted sediment. This classification can also be broadly applied to other lamprey species ammocoetes. The adoption of this system helps inform the LQHI scores.

**Table 2.2** Lamprey Habitat Quality Index (LHQI) scoring system for lamprey spawning and settlement habitat value (Macklin et al. 2018), adapted from Kennedy (1984)

Habitat quality	Habitat score	Overall score
Poor	4	8
Moderate	3	6 - 7
Good	2	3 - 5
Excellent	1	2

## General Fisheries Habitat

A broad appraisal / overview of the upstream and downstream habitat at each site was undertaken to evaluate the wider contribution to salmonid and lamprey spawning and general fisheries habitat. River habitat surveys and fisheries assessments were conducted utilising elements of the approaches in the River Habitat Survey Methodology (Environment Agency, 2003) and Fishery Assessment Methodology (O’Grady, 2006) to broadly characterise the river sites (i.e. channel profiles, substrata etc).

### 2.5 Q-sampling (macroinvertebrates)

The most recent Q sampling survey undertaken in 2019 in the vicinity of the landfill included n=6 sites (n=6 sites, Figure 1.2, Table 1.1). Several sites outside (upstream) of the landfill (i.e. sites 2, 4 & 6) were sampled to collate contemporary water quality data for the wider Knockharley catchment and to provide upstream control data to compare with downstream.

Macro-invertebrate samples were converted to Q-ratings as per Toner et al. (2005). All riverine samples were taken with a standard kick sampling hand net (250mm width, 500µm mesh size) from areas of riffle/glide utilising a two-minute sample, as per ISO standard methodology (ISO 5667-1:2006). Large cobble was washed at each site where present and samples were elutriated and fixed in 70% ethanol for subsequent laboratory identification. Any rare invertebrate species encountered were identified from the NPWS Red List publications for beetles, stoneflies, mayflies and other relevant taxa. EPA water quality was assigned as per defined EPA categories and corresponding Water Framework Directive (2000/60/EC) Status (Table 2.3).

**Table 2.3** Reference Categories for EPA Q Ratings (Q1 to Q5)

Q Value	WFD Status	Pollution Status	Condition
Q5 or Q4-5	High Status	Unpolluted	Satisfactory
Q4	Good Status	Unpolluted	Satisfactory
Q3-4	Moderate Status	Slightly polluted	Unsatisfactory
Q3 or Q2-3	Poor	Moderately polluted	Unsatisfactory
Q2, Q1-2 or Q1	Bad	Seriously polluted	Unsatisfactory

### 2.6 Water Quality (physio-chemical)

Water quality samples were taken from n=6 sites on the Flemingstown (Knockharley) Stream, Kentstown Stream, Veldonstown Stream and River Nanny on the 22<sup>nd</sup> August 2019 (Figure 1.2 and Table 1.1 for sampling locations).

Samples were cooled and delivered to the laboratory on the same day for analysis. To collate updated water quality data for the study area, a range of physio-chemical analysis for each sampling location were laboratory-tested for the following parameters;

- pH
- Alkalinity (mg CaCO<sub>3</sub>/l)
- Conductivity @25°C (µS/cm)
- Suspended solids (mg/L)
- Biochemical Oxygen Demand (BOD) (mg O<sub>2</sub>/l)
- Chemical Oxygen Demand (COD) (mg O<sub>2</sub>/l)
- Total Oxidised Nitrogen (TON) (mg N/l)
- Nitrite (mg N/l)
- Total Ammonia (mg N/l)
- Unionised ammonia (mg N/l)
- Molybdate Reactive Phosphorus (MRP) (mg P/l)

## 2.7 River Hydromorphological Assessment Technique (RHAT)

To evaluate and catalogue the degree of riverine habitat 'naturalness' along the Flemingstown (Knockharley) Stream, Kentstown Stream, Veldonstown Stream, and River Nanny in terms of their overall ecology (fisheries or otherwise), the River Hydromorphological Assessment Technique (RHAT) was used (Murphy & Toland, 2014).

RHAT expands on the previous standards for river surveys, such as the River Habitat Survey (RHS) methodology (EA, 2003). It is assumed that natural systems support ecology better than modified systems. Hence, the RHAT method classifies river hydromorphology based on a departure from naturalness and allows for the assignment of a morphological classification directly related to Water Framework Directive (WFD) status i.e. High, Good, Moderate, Poor or Bad. Score calculation is based on eight semi-qualitative and quantitative hydromorphological criteria, namely:

- Channel morphology and flow types
- Channel vegetation
- Substrate diversity and condition
- Barriers to continuity
- Bank structure and stability
- Bank and bank top vegetation
- Riparian land use
- Floodplain interaction

The RHAT is designed to be a holistic assessment based on information from both desktop and field (walkover) studies incorporating GIS data, aerial photography and historical data. The RHAT method was developed for WFD classification, but it also has other applications including assessing morphological pressures at a riverine site or reach. It can be used as a tool to determine remedial/restoration work required to improve the river habitat as well as to assess conditions before and after riparian and or riverine works are undertaken.

Following best practice (Murphy & Toland, 2014), RHAT walkover surveys were undertaken along the watercourses in August 2019, when instream and riparian vegetation growth was still visible and readily identifiable. Each watercourse was assessed in discrete 500m sections along both banks. The RHAT hydromorph scores and their corresponding Water Framework Directive (WFD) classification are outlined in Table 2.4.

**Table 2.4** RHAT hydromorph scores and their corresponding Water Framework Directive (WFD) classification

Hydromorph score	WFD Status
≥0.8	High Status
≥0.6 ≤0.8	Good Status
≥0.4 ≤0.6	Moderate Status
≥0.2 ≤0.4	Poor
≤0.2	Bad

## 2.8 Kingfisher (Annex II)

An appraisal of kingfisher (*Alcedo atthis*) habitat in the watercourses within the vicinity of Knockharley Landfill was undertaken based on physical channel attributes, prey resources, potential breeding and nesting habitat and overall water quality.

To gather additional data on kingfisher distribution in the vicinity of the proposed development, vantage point (VP) surveys were also undertaken in accordance with best practice (i.e. SNH, 2017). A total of  $n=4$  fixed point VP sites were strategically scoped and utilised to document passing and/or feeding kingfisher moving through areas with good visibility (see Figure 2.2).

As per best practice, VP sites were located at accessible sites with higher visibility and probability of kingfisher occurrence such as bridge crossings or along extensively straightened sections (1 VP within the site boundary and 3 VP's outside of the landfill site boundary). Due to natural site characteristics (e.g. riparian shading), the viewshed for kingfisher VP sites did not exceed 180° visibility nor extend to a distance greater than 2km away (as per SNH (2017) guidelines). Binoculars (8 x 42) were used as required to enhance bird detection. Alarm calls were also listened for as a cue for approaching kingfisher. VP site locations are summarised in Table 2.5.

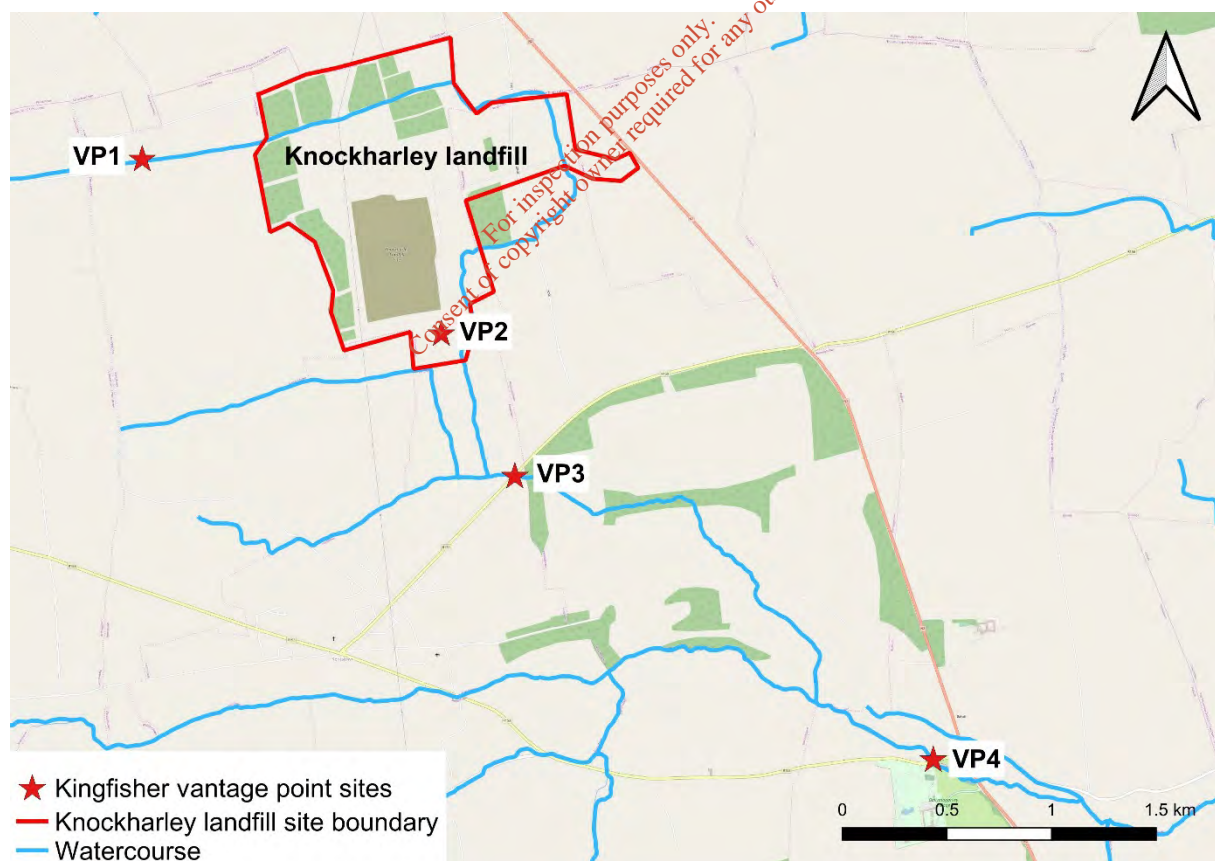
Given that kingfishers are typically most active in the early morning, the timing of VP surveys reflected this (i.e. 7-11am period). One hour was spent at each VP location and each VP location was visited on

two occasions throughout the survey period (August 2<sup>nd</sup> & 22<sup>nd</sup> 2019). Survey efforts were divided equally between two surveyors throughout the monitoring period and VP surveys did not coincide with any other field work activity on site to reduce disturbance.

A desktop review of known distributions of kingfisher within the footprint of Knockharley Landfill and the wider Nanny-Delvin catchment was undertaken (NBDC & NPWS data).

**Table 2.5** Summary of vantage point (VP) survey locations for kingfisher in the vicinity of the landfill, Co. Meath surveyed in August 2019

VP site no.	Watercourse & location	X (ITM)	Y (ITM)
1	Flemingstown (Knockharley) Stream, Curraghtown	696053	767498
2	Knockharley lagoon, Knockharley landfill	697484	766710
3	Flemingstown (Knockharley) Stream, R150 bridge	697849	766046
4	River Nanny, R153 bridge	699872	764722



**Figure 2.2** Location of the  $n=4$  kingfisher VP sites in the vicinity of the landfill.



## 2.9 Otter (Annex II)

Field surveys for otter (*Lutra lutra*) signs along the watercourses in the study area were conducted in August 2019. The survey was deliberately conducted during a prolonged dry period to ensure that all habitat used by otter could be accessed and to ensure that otter signs (spraint, smears etc.) were not washed away due to recent rainfall events.

The walkover surveys broadly followed the best practice survey methodology for otter as recommended by Lenton et al. (1980), Chanin (2003) and Bailey & Rochford (2006). However, the methodology differed in that the entire waterline was surveyed rather than the standard 500-600m sections from accessible points (e.g. bridges). In this respect, this novel survey technique is known as a total corridor otter survey (TCOS) (Macklin et al., 2019), representing riparian zone and in-channel surveys along both banks of an entire river or river section (the former representing disjointed sections of river channel within a catchment).

Surveys involved the use of two surveyors working independently in tandem along opposite banks of an individual watercourse (where applicable). This facilitates one to work from a more elevated position (e.g. bank top) with one surveying (with appropriate PPE such as a wet suit or chest waders) from within the channel, thus greatly increasing the likelihood of otter sign detection. This is especially true of more cryptic signs such as holts, which can be located in areas out of the view of traditional survey methodologies.

Each watercourse or habitat was divided into equal 500m sections of channel to enable more effective data evaluation against other routinely used ecological value indices such as River Hydromorphological Assessment Technique (RHAT) (Murphy & Toland, 2014).

A continuous, labour-intensive survey effort was adopted in order to comprehensively document otter usage at the river scale as otter sign distribution can be lost within wider, macro-scale studies. Arguably, the finer-scale detail is more important as it helps rationalise otter marking preferences and consolidate our understanding of otter habitat usage. Traditional otter survey methodologies involve inspecting rivers from bridges and other more readily accessible areas, whilst only surveying within ~500m upstream or downstream of these points (Bailey & Rochford, 2006; Gallant et al., 2008). Naturally, while surveys at bridges and accessible areas will detect otter, they will miss otherwise cryptic patterns of otter resource utilisation. By surveying discontinuous blocks, such surveys may also fail to locate important otter signs such as holts, which may fall outside the boundaries of traditional survey reaches (e.g. poorly accessible reaches of river).

The overall value of the habitats within and adjoining the proposed development for breeding and foraging otter was also considered. A desktop review of known distributions of otter within the Knockharley Landfill and wider Nanny-Delvin catchment was undertaken.

## 2.10 Biosecurity

The clean-check-dry approach was applied as standard to all equipment and PPE used during all surveys. A strict biosecurity protocol was employed during all surveys including the thorough drying (UV exposure) and disinfection of all equipment before and after use with Virkon® to prevent the transfer of pathogens and/ or invasive species between survey areas. Particular cognisance was given to the potential spread of crayfish plague (*Aphanomyces astaci*) given recent outbreaks across Ireland. Electro-fishing and Q-sample surveys were undertaken across the  $n=6$  sites in a downstream order to minimise the upstream mobilisation of pathogens or invasive propagules. Any aquatic invasive species or pathogens recorded within or adjoining the survey area were geo-referenced and records forwarded to IFI (as part of their typical license conditions).

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### 3. Descriptions of sampling locations

#### Introduction

Please refer to Figure 1.1 when consulting the following site descriptions. Descriptions are provided for the  $n=6$  sites across the Flemingstown (Knockharley) Stream, Kentstown Stream, Veldonstown Stream and River Nanny. Sites were visited on both the 2<sup>nd</sup> August (low water levels) and 22<sup>nd</sup> August 2019 (above-average water levels).

#### 3.1 Site 1 – Flemingstown (Knockharley) Stream

Site 1 was located on the Flemingstown (Knockharley) Stream, approx. 350m south of the Knockharley Landfill boundary and approx. 150m upstream of the confluence with the Veldonstown Stream (Figure 2.1). Situated in an intensive agricultural landscape (improved agricultural grassland fields (GA1) with arable crop plantations (BC1) upstream), the stream sat in a steep, deep V-shaped channel (bank-full height 2-3m) which had evidently been both historically straightened and deepened. Averaging <1.5m wide, the stream featured very high shading in the vicinity of site 1, with narrow riparian treelines and hedgerows of ash (*Fraxinus excelsior*), hawthorn (*Crataegus monogyna*) providing up to 75% cover. Bramble (*Rubus fruticosus* agg.) scrub dominated in isolated open areas, with frequent great willowherb (*Epilobium hirsutum*) and nettle (*Urtica dioica*), in addition to common species such as curled dock (*Rumex crispus*), hogweed (*Heracleum sphondylium*), bitter-sweet (*Solanum dulcamara*), cow parsley (*Anthriscus sylvestris*), angelica (*Angelica sylvestris*) and rank grasses. Ivy (*Hedera helix*) and hart's tongue (*Asplenium scolopendrium*) were frequent in shaded areas, whilst shaded muddy banks supported common liverwort (*Marchantia polymorpha*).

Water levels varied throughout the survey period, with very low water levels recorded on Friday 2<sup>nd</sup> August resulting in some shallow riffles (average depth <0.05m) with much of the site dominated by near-stagnant pooling areas (also very shallow). Evidently, the stream featured fluctuating water levels due to rainfall events, with the second site visit featuring a channel dominated by 0.8m deep glide habitat. Substrata were composed predominantly of compacted clay-silt (90%), mostly >0.1m in depth. Given the high shading, macrophyte growth was largely absent although more open areas supported marginal growth of fool's watercress (*Apium nodiflorum*) and pink water speedwell (*Veronica catenata*).



**Plate 3.1** Representative image of site 1 on the Flemingstown (Knockharley) Stream approx. 0.35km downstream (south) of the Knockharley Landfill site boundary, 2<sup>nd</sup> August 2019.

### Site 2 – Flemingstown (Knockharley) Stream

Site 2 was located at a farm access bridge on the Flemingstown Stream approx. 0.6km upstream of the Knockharley Landfill site boundary (Figure 2.1). Being located upstream of the proposed development. This site acted as a control site in terms of upstream water quality and fisheries habitat.

This site was bordered by intensive agricultural land (GA1) on all sides and featured high riparian shading (up to 90%) from ash and hawthorn-dominated treelines in addition to dense bramble-dominated scrub. Largely due to the high degree of shading and naturally fluctuating water levels, instream macrophyte and bryophyte communities were limited to marginal growth of water mint (*Mentha aquatica*), with some filamentous algae (*Cladophora* spp.). There was frequent in-stream large woody debris blocking the flow in the vicinity of this site (notably downstream).

The stream at this location had evidently been extensively straightened and deepened historically upstream of the landfill site boundary (some limited sinuosity retained downstream) and mostly sat in a steep V-shaped channel with a bank-full height of >1.2 to 2m. The banks were deeply cut and near-vertical at several points. Channel width was typically 2-2.5m but water width was often <1m. Water flow was imperceptible during the first site visit (2<sup>nd</sup> August) with only 0.05-0.1m deep pooling areas present. Rainfall events resulted in much higher temporary flows during the second visit (22<sup>nd</sup> August) and the site was dominated by 0.1-0.2m deep fast glide and riffle habitat, with limited pool. The substrata were dominated by fine to medium gravels and small cobble, with small boulder frequent. These were highly bedded, however. Silt pockets, where present, were also compacted. Fisheries value was very low at the time of survey, apart from three-spined stickleback, which were present in localised pools and lower flow areas.



**Plate 3.2** Representative image of the Flemingstown (Knockharley) Stream downstream of site 2 approx. 0.6km upstream (west) of the Knockharley Landfill site boundary on 22<sup>nd</sup> August 2019

### Site 3 – River Nanny, R153 bridge crossing

Site 3 on the River Nanny was located a short distance upstream from Balrath Crossroads and approximately 3.6km downstream of the Knockharley landfill site boundary. The channel was situated in an intensive agricultural landscape (pasture, GA1) both upstream and downstream of the bridge site, whilst the channel also bordered Ballymacgarvey Village golf course (amenity grassland habitat GA2) for a short distance downstream of the bridge. The river had been historically straightened and to a lesser extent deepened, with flood embankments present upstream of the bridge. The river channel averaged 6-7m in width in a shallow-U profile. Glide habitat dominated throughout although some shallower riffles with associated pools (some >1m) existed upstream. As with other sites, water levels were below basal summer levels on 2<sup>nd</sup> August (average 0.3-0.6m in depth) and, due to rainfall events, above average on 22<sup>nd</sup> August (0.6-1m). Deeper holding habitat for adult salmonids was present underneath and downstream of the bridge structure, with some locally good nursery habitat present upstream.

The site featured open banks (unfenced, little or no riparian zone) exposed to heavy livestock poaching for a considerable distance upstream of the bridge. Siltation was high throughout although some moderate-quality gravels existed in naturally higher-flow areas. A small (15m<sup>2</sup>) area of loose cobble and gravel existed immediately upstream of the bridge and provided valuable salmonid (and probably lamprey) spawning opportunities. Higher flow levels on the second site visit had evidently mobilised much of the silt deposits downstream of the bridge and some moderate to good quality cobble and coarse gravel substrata were exposed. Nevertheless, the substrata was bedded.

Downstream of the bridge, bordering maintained grassland, the river retained some better levels of naturalness (see RHAT section below), with ash-dominated treelines and herbaceous riparian zone composed of reed canary grass (*Phalaris arundinacea*), hedge bindweed (*Calystegia sepium*), nettle, great willowherb, marsh willowherb (*Epilobium palustre*) and occasional hogweed. The channel was heavily silted downstream of the bridge (mostly slower, deeper glide >0.5m) and was often heavily encroached by macrophyte vegetation such as branched bur reed (*Sparganium erectum*), with localised fool's watercress and watercress (*Nasturtium officinale*). On the second site visit, much of the soft sediment in this area was evidently mobilised downstream due to higher flows resulting from rainfall events. Common duckweed (*Lemna minor*) was present marginally. Some limited stream water crowfoot (*Ranunculus pennicillatus*) was present throughout the site, especially upstream of the bridge where faster flow rates were present. During low water levels, filamentous algal cover was high, covering >50% of the substrata and instream submergent macrophyte community. This coverage reduced substantially at higher flows.



**Plate 3.3** Representative image of site 3 on the River Nanny downstream of the R153 road bridge approx. 3.6km downstream of the Knockharley Landfill site boundary on 2<sup>nd</sup> August 2019.



**Plate 3.4** Representative image of site 3 on the River Nanny downstream of the R153 road bridge on 22<sup>nd</sup> August 2019 during higher water levels.

#### Site 4 – River Nanny, East Bridge

Site 4 on the River Nanny was situated in an agriculturally-dominated landscape, bordered by extensive Improved agricultural grassland (GA1). However, a large area of dry meadow (GS2) habitat, dominated by reed canary grass with common forb species such as great willowherb and meadowsweet (*Filipendula ulmaria*), existed upstream of the bridge on the south bank. A similar area of GS2 habitat was present approx. 100m downstream of the bridge on the south bank. A small block of mixed broadleaved woodland (WD1), supporting pedunculate oak (*Quercus robur*), horse chestnut (*Aesculus hippocastanum*), sycamore (*Acer pseudoplatanus*), ash and hawthorn bordered the channel on the south bank immediately downstream of the bridge.

As with downstream, the Nanny at this location has been evidently straightened and deepened historically. Featuring steep U-shaped banks and glide-dominated habitat, the channel averaged 2.5-3m in width and 0.3-0.4m deep at basal summer levels (0.7-1m at higher water levels). The site was heavily silted (90% of substrata) and heavily choked with instream macrophyte vegetation both upstream and downstream of the bridge (often 80% cover). Branched bur-reed dominated with frequent reed canary grass and a high level of encroachment from terrestrial herbaceous species. Although harder substrata (gravels and cobble) existed below, the bed was composed almost entirely of silt at this site, typically >0.1m in depth. This did provide some suitability for larval lamprey although levels of compaction and low basal flows may have reduced this potential. Likewise, although some suitability for salmonids existed, particularly underneath and downstream of the bridge, siltation reduced this considerably.



**Plate 3.5** Representative image of site 4 on the River Nanny at East Bridge, facing downstream.



**Plate 3.6** Representative image of site 4 on the River Nanny at East Bridge, a short distance downstream of the bridge.

### Site 5 – Kentstown Stream

The Kentstown Stream is a small channel which runs through an intensive agricultural landscape, parallel to the Flemingstown (Knockharley) Stream in its lower reaches. The upper reaches flowed through extensive arable crop plantations (BC1) and bordered immature broadleaf plantation (WS2) at the Knockharley Landfill site boundary approx. 650m upstream of the sampling point at site 5.

The channel has been historically straightened and deepened and was more representative of a drainage ditch (FW4) habitat than a small stream. Featuring a bank-full height of 1-1.2m in a steep U-shaped channel, the channel contained little water at the time of survey on 2<sup>nd</sup> August, with an imperceptible flow and only localised standing water present, even near the confluence with the



Veldonstown Stream where the natural gradient increased (site 6). Water levels were higher on the second site visit on 22<sup>nd</sup> August although the channel depth was still only 0.2-0.3m.

Whilst not as heavily shaded as the adjacent Flemingstown (Knockharley) Stream (site 1), the banks were dominated by a high cover of willowherb species, bittersweet, meadowsweet, nettle, rank grasses and creeping thistle (*Cirsium arvense*). Some patchy ash and hawthorn grew along the channel. With an average width of <1m, the stream at this site was choked with both terrestrial and macrophyte vegetation, particularly fool's watercress and duckweed (80% cover overall). Substrate was composed entirely of silt throughout and fisheries value was very low.



**Plate 3.7** Representative image of site 5 on the Kentstown Stream approx. 650m downstream of the Knockharley Landfill site boundary.

### Site 6 – Veldonstown Stream

Site 6 was located at a road crossing in the upper reaches of the Veldonstown Stream approx. 800m upstream of the Kentstown Stream confluence (site 5). The stream sat amidst a landscape of agricultural pasture (GA1) and arable crops (BC1). The stream was (30cm pipe) culverted under several residential properties as well as the road. Downstream of the road crossing, the watercourse had been historically straightened and extensively deepened throughout, with steep, narrow V-shaped banks exceeding 2.5m bank-full height. The channel width was <1.5m and contained little water at the time of survey on 2<sup>nd</sup> August, with stagnant pools present locally (90% dry). A stagnant, heavily-silted pool area, supporting three-spined stickleback and fool's watercress, was present at the road crossing. Water levels were higher on 22<sup>nd</sup> August although the average depth was still appreciably low at 0.1-0.2m. At higher water levels, the stream was dominated by shallow riffle habitat. A discernible foul odour was evident at this site upstream of the road crossing and a slight discolouration (grey) indicating surface water run-off was present. This was not associated with Knockharley Landfill given geographical separation (i.e. located upstream of the confluence with the Knockharley Stream; Figure 1.1). Although some good fractions of fine to medium gravels were present along with frequent small cobble and small boulder, substrata were invariably heavily bedded and compacted.

Riparian shading from hawthorn hedgerows and ash treelines was very high, including at the sampling site itself. Upstream of the site, the channel was culverted under the road (pipe culverts) and several residential properties, with agricultural grassland bordering the uppermost reaches. Given the high shading and evident fluctuating water levels, macrophyte cover was largely absent although some fool's watercress and duckweed was present in wetter areas of channel. Apart from some localised pool areas for three-spined stickleback, the channel offered very little fisheries potential at the time of survey.



**Plate 3.6** Representative image of site 6 on the Veldonstown Stream, located approx. 800m upstream of the Kentstown Stream confluence.

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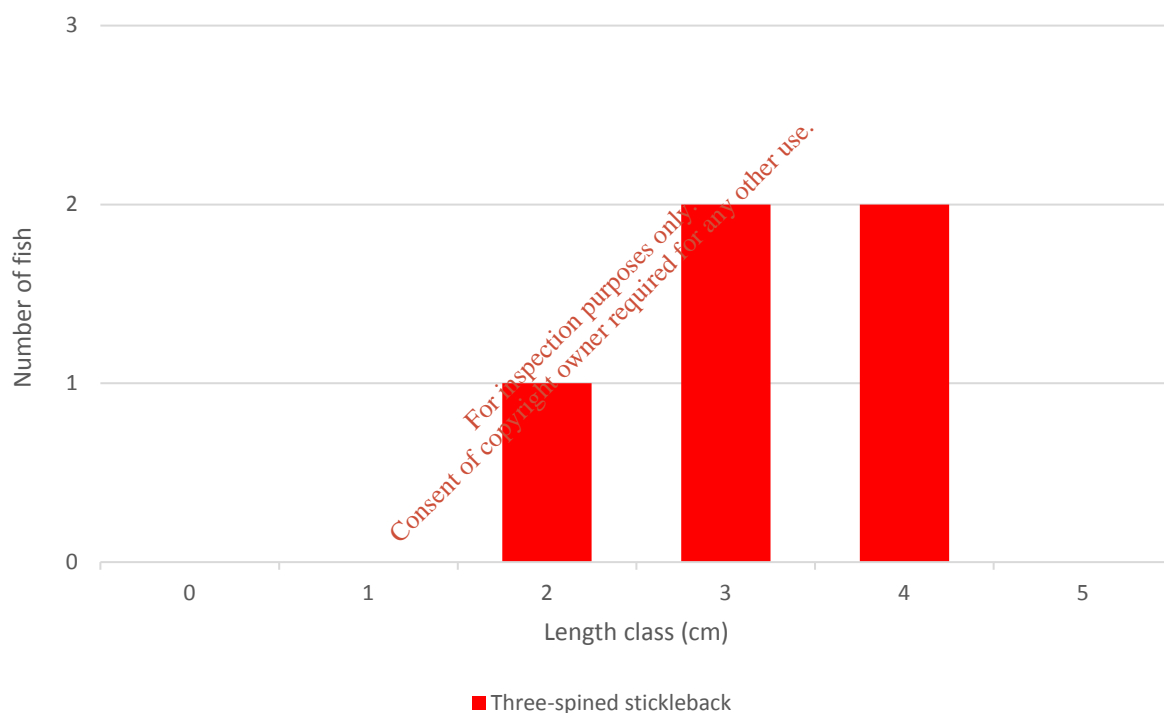
## 4. Results

### Fish Stock Assessment (electro-fishing)

This section presents the results of the electro-fishing survey at  $n=6$  watercourses in the vicinity of the landfill (Figure 1.2). The survey sites were fished on the 22<sup>nd</sup> August 2019.

#### Site 1 – Flemingstown (Knockharley) Stream

Three-spined stickleback was the only species recorded during electro-fishing at site 1. Low numbers were captured from pool areas of the channel ( $n=5$ ). Above-average water levels at the time of survey had likely localised the stickleback population to such slacker areas, which were heavily encroached. Although the site was dominated by silt substrata, no optimal larval lamprey habitat was recorded, with any soft sediment invariably compacted. Banks were heavily encroached by riparian growth of hedgerow and scrub species. No salmonids or eel were captured during the survey.



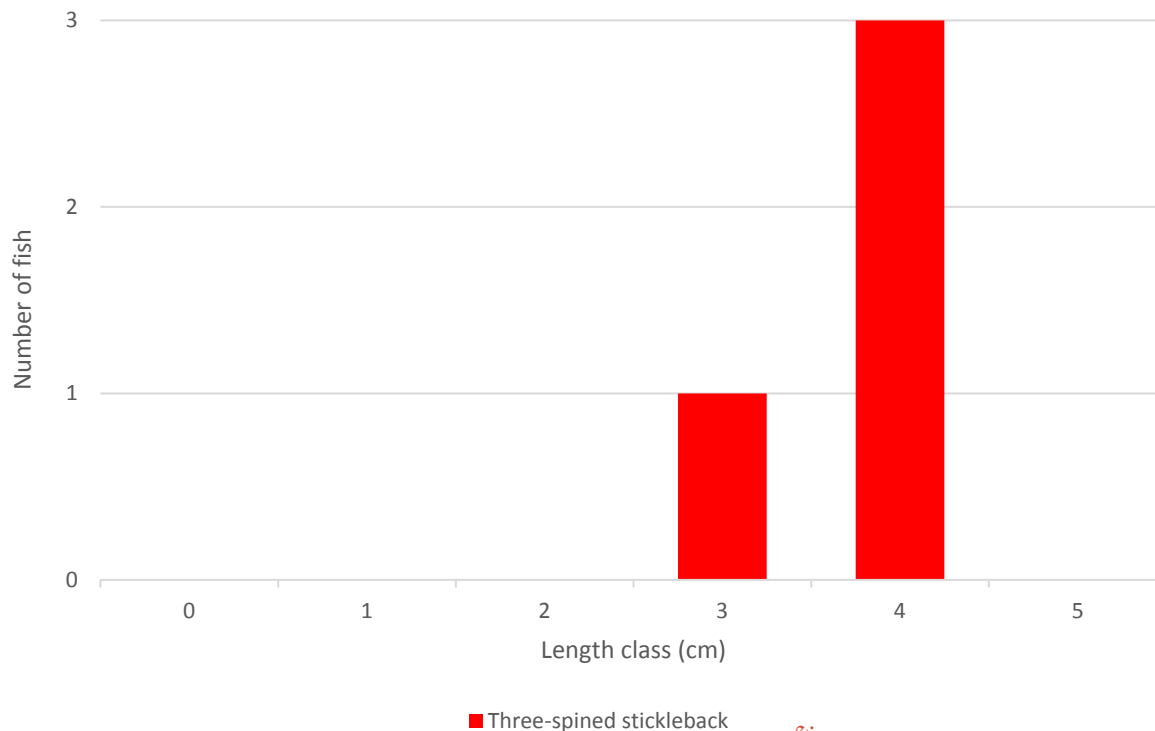
**Figure 4.1** Fish length frequency graph prepared for fish species recorded at site 1 on the Flemingstown (Knockharley) Stream downstream of Knockharley Landfill in August 2019.



**Plate 4.1** Electro-fishing during on the Flemingstown (Knockharley) Stream at site 1, August 2019.

#### Site 2 – Flemingstown (Knockharley) Stream

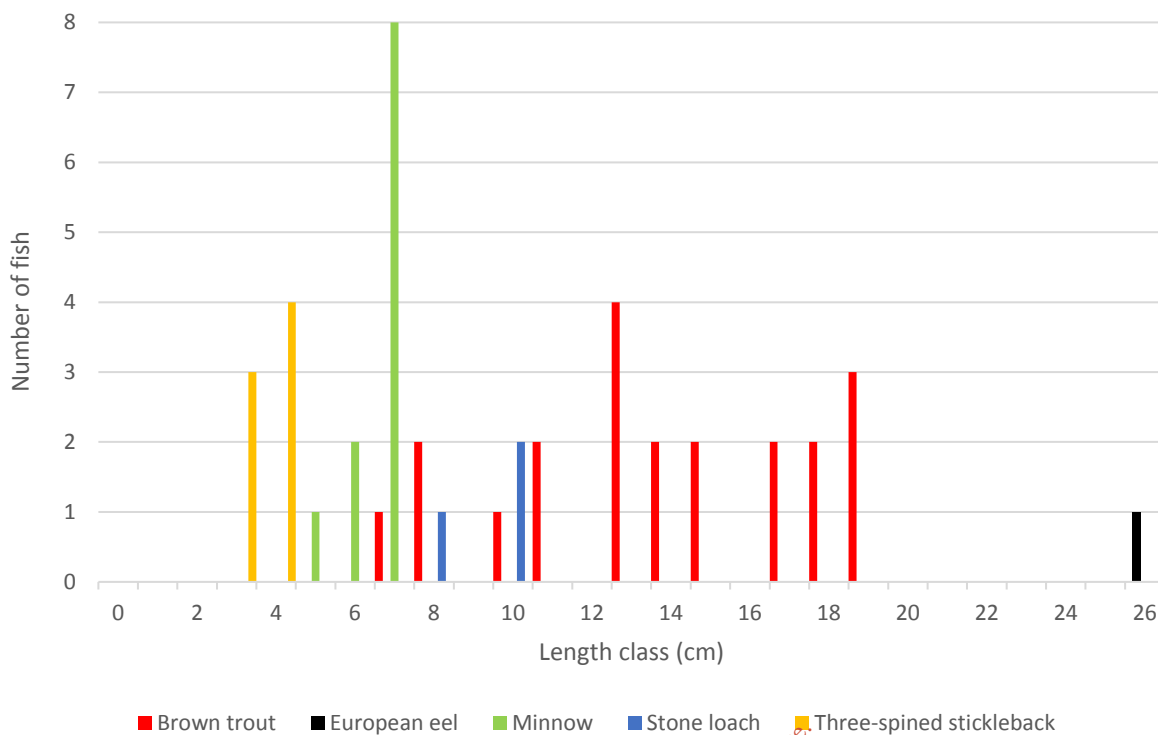
Three-spined stickleback was the only species recorded during electro-fishing at site 2, with low numbers ( $n=4$ ) present in marginal foal's watercress beds and a small pool area underneath the farm access bridge culvert. No optimal larval lamprey habitat was recorded at this site, with any soft sediment present invariably compacted. No salmonids or eel were captured during the survey.



**Figure 4.2** Fish length frequencies recorded via electro-fishing at site 2 on the Flemingstown (Knockharley) Stream upstream of Knockharley landfill in August 2019.

### Site 3 – River Nanny, R153 bridge crossing

Site 3 on the River Nanny supported the most diverse range of fish recorded during this survey, with a total of five fish species captured. Brown trout were the most abundant ( $n=22$ ), followed by minnow ( $n=12$ ). A range of adult and juvenile brown trout size classes were recorded. Stone loach were present in low numbers, with a single European eel recorded from near the bridge structure. Three-spined stickleback were present in modest numbers at this site but were largely confined to a stagnant pooling area underneath the southernmost bridge arch and not in the main flow of the river. No larval lamprey was recorded despite some suitability in marginal soft sediment areas.



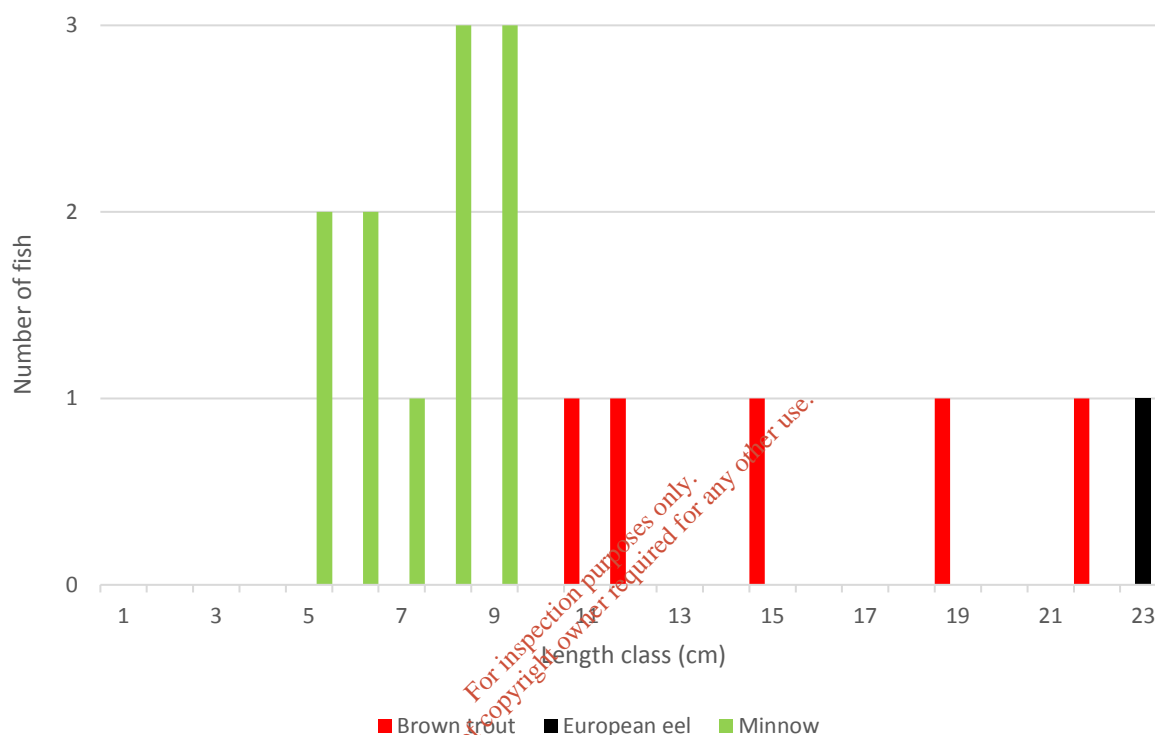
**Figure 4.3** Fish length frequencies recorded via electro-fishing at site 3 on the River Nanny at the R153 bridge crossing in August 2019



**Plate 4.2** Top to bottom: adult brown trout, juvenile brown trout and minnow recorded from site 3 on the River Nanny.

### Site 4 – River Nanny, East Bridge

Minnow was the most numerous species recorded at site 4 on the River Nanny ( $n=11$ ). Brown trout were present in low densities ( $n=5$ ), with no juveniles recorded. A single European eel was also captured, near the bridge structure. Despite some suitability in terms of the presence of soft sediment (silt dominated substrata), no larval lamprey was recorded.



**Figure 4.4** Fish stock length distribution recorded via electro-fishing at site 4 on the River Nanny at East Bridge in August 2019



**Plate 4.3** Adult minnow recorded from site 4 on the River Nanny at East Bridge

#### Site 5 – Kentstown Stream

There were no fish recorded via electro-fishing from site 5 on the Kentstown Stream on 22<sup>nd</sup> August 2019. The fisheries potential was considered very low, with low potential for salmonids at this location given the high levels of siltation and overgrowth nature of the small channel. Evident fluctuating flow rates likely eliminated the potential of the channel to support resident fish stocks, although some suitability for three-spined stickleback was present albeit none were recorded during the current survey.

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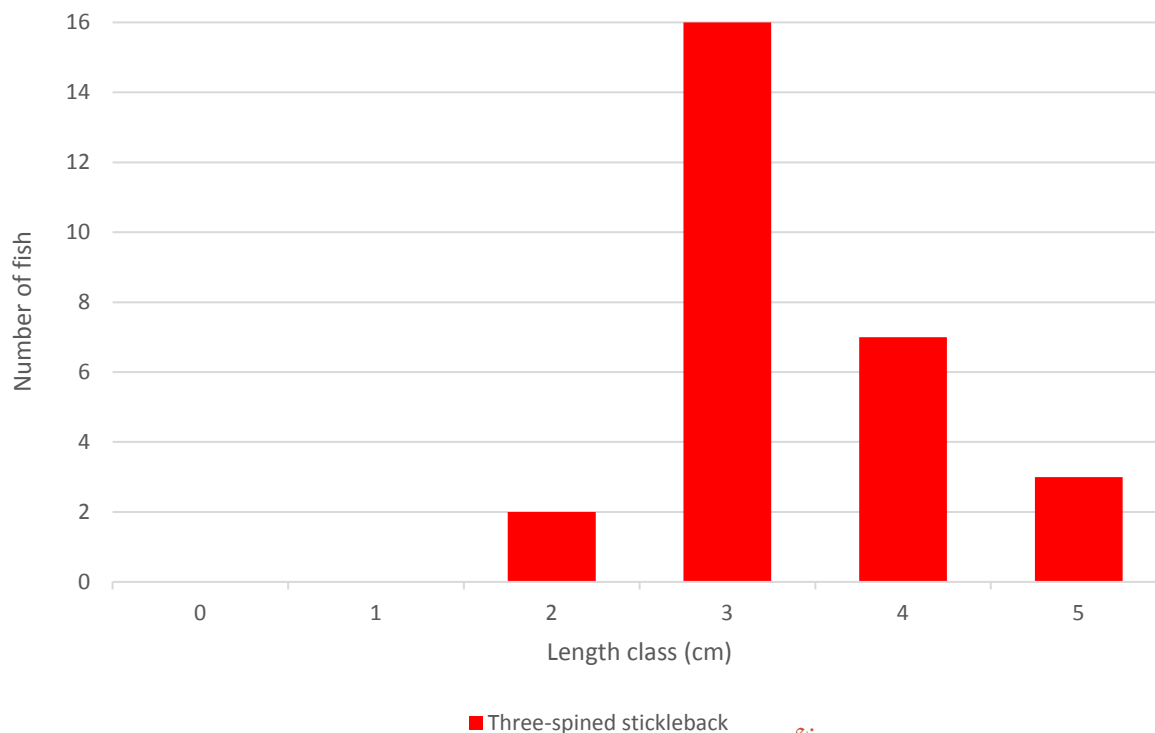




**Plate 4.4** Electro-fishing site 5 on the Kentstown Stream.

#### Site 6 – Veldonstown Stream

Three-spined stickleback was the only fish species captured at site 6 on the Veldonstown Stream, with high densities recorded both upstream and downstream of the road crossing (total  $n=28$ ). A range of size and age classes were present. Fish were largely localised in small pooling areas ( $<0.5\text{m}^2$ ) associated with pipe culverts at the time of survey (above-average water levels). No lamprey, salmonids or eel were recorded during the survey.



**Figure 4.5** Fish stock length frequency distribution recorded via electro-fishing at site 6 on the Veldonstoun Stream in August 2019



**Plate 4.5** High densities of both adult and juvenile three-spined stickleback were the only fish recorded from site 6 on the Veldonstoun Stream.

## Fisheries habitat

### Salmonids

The salmonid habitat quality of the surveyed sites in the vicinity of Knockharley Landfill was poor with only the River Nanny sites (3 & 4) offering good salmonid habitat as summarised in the Life Cycle Unit scores (Kennedy, 1984; O' Connor and Kennedy, 2002) in Table 4.1. Unlike the other smaller watercourses in the vicinity of Knockharley landfill, the two River Nanny sites offered superior salmonid habitat in terms of nursery and (adult) holding, with deeper glides and pools present. Site 3 offered the better quality salmonid habitat given its localised spawning substrata (immediately upstream of the bridge especially) in addition to good quality nursery and holding areas. The improved flows and larger size of the River Nanny (i.e. sites 3 and 4) over other survey sites in the vicinity of the landfill (i.e. 1, 2, 5 and 6) evidently benefited salmonids. Sites 1, 2, 5 and 6 (Flemigstown, Kentstown and Veldonstown Streams) were deemed largely unsuitable for resident salmonids at the time of survey and none were recorded from these sites.

**Table 4.1** Summary of the salmonid Life Cycle Unit scores for the sites in the vicinity of Knockharley Landfill surveyed.

Site	Salmonid habitat value	Spawning	Nursery	Pool (holding)	Total Score	Salmonids recorded
1	Poor	4	4	4	<b>12</b>	No
2	Poor	4	4	4	<b>12</b>	No
3	Good	2	2	2	<b>6</b>	Yes
4	Good	4	2	2	<b>8</b>	Yes
5	Poor	4	4	4	<b>12</b>	No
6	Poor	4	4	4	<b>12</b>	No

**Note:** lower scores indicate superior habitat.

### Lamprey habitat

The lamprey habitat of the n=6 sites surveyed was poor overall as outlined in Table 4.2. The lamprey habitat types according to Applegate (1950) and Slade et al. (2003) fell into type 2 and type 3 categories. Type 2 habitat is characterized by substrates consisting of shifting sand with little if any organic matter and may also contain some gravel and cobble (lamprey may be present but at much

lower densities than Type 1), while type 3 habitat consists of materials too hard for larvae to burrow including bedrock and overly-compacted sediment.

The sites on the smaller watercourses (i.e. sites 1, 2, 5 and 6) offered little or no lamprey spawning or nursery habitat given the bedded / silted nature of substrata as well as low flows and evidently fluctuating water levels. However, the sites on the River Nanny (i.e. sites 3 and 4) offered good and moderate lamprey habitat respectively. Site 3, located at the R153 road bridge, provided the best lamprey habitat overall, with both suitable spawning substrata (especially immediately upstream of the bridge) in addition to suitable soft sediment for ammocoetes, especially downstream of the bridge – much of this, however, appeared transitory in nature. Site 4, at East Bridge, offered some good larval nursery habitat but excessive siltation and a general lack of flow due to heavy instream macrophyte growth reduced the spawning potential for lamprey considerably.

**Table 4.2** Lamprey Habitat Quality Index (LHQI) scoring system for lamprey habitat value for the sites in the vicinity of Knockharley Landfill.

Site	Lamprey habitat value	Spawning	Nursery	Total Score	Habitat type present*
1	Poor	4	4	8	Type 3
2	Poor	4	4	8	Type 3
3	Good	2	3	5	Type 2
4	Moderate	4	2	6	Type 2
5	Poor	4	4	8	Type 3
6	Poor	4	4	8	Type 3

\*Note: Habitat type is assessed according to Applegate (1950) and Slade et al. (2003) – see methodology section

### European eel Habitat

The River Nanny at sites 3 and 4 offered the best eel habitat, with greater refugia (vital for the species) in terms of instream macrophytes and boulders, as well as better prey resources and superior water quality (refer to site description & Q sampling results below). The Flemingstown (Knockharley), Kentstown and Veldonstown Streams (i.e. sites 1, 2, 5 and 6) offered poor eel habitat despite apparent unimpeded access (based on the site walkover) across all sites, again. However low summer water levels may affect eel settlement in the smaller stream sites. In conclusion, European eel habitat was poor overall in the smaller stream sites (1, 2, 5 and 6) but moderate in the River Nanny (sites 3 and 4).

## Aquatic Invasive species

A desktop review of available data (held by the NPWS & NBDC) revealed no existing records of invasive aquatic species within in the vicinity of the proposed development (i.e. located in 10km national grid square N96). This was also confirmed during the aquatic surveys and monitoring.

## Kingfisher

No kingfishers were recorded during vantage point (VP) surveys across  $n=4$  VP sites. However, a single kingfisher was recorded during walkover surveys (Figure 4.6). An adult bird was observed in flight heading upstream along the Flemingstown (Knockharley) Stream near the landfill boundary, between sites VP2 and VP3. The kingfisher was possibly heading to the existing Knockharley surface water attenuation pond where suitable prey resources exist (i.e. three-spined stickleback that were recorded present in the pond during the sweep netting for aquatic invertebrates).

Despite the presence of three-spined stickleback within sections of the Flemingstown (Knockharley) Stream, Kentstown Stream and Veldonstown Stream, along with more diverse fish stocks in the River Nanny, kingfisher habitat was typically considered sub-optimal. The smaller watercourses were invariably heavily overgrown (scrub vegetation) with steep but compacted banks not suitable for kingfisher nesting. Suitable perch sites were also noted as being scarce along large sections of the River Nanny and smaller watercourses. No kingfisher nesting sites were recorded during walkover surveys.

## Otter

A low number of otter signs ( $n=3$ ) were recorded along the watercourses in the vicinity of Knockharley Landfill during walkover surveys in August 2019 (Table 4.3, Figure 4.6). All signs consisted of spraint with two sites recorded at bridges along the River Nanny, at sites 3 and 4, respectively. An additional and very regular spraint site was also recorded on the inflow pipe culvert to the existing landfill surface water attenuation pond. No otter holts were recorded during the site walkover which included the surface water attenuation pond area.

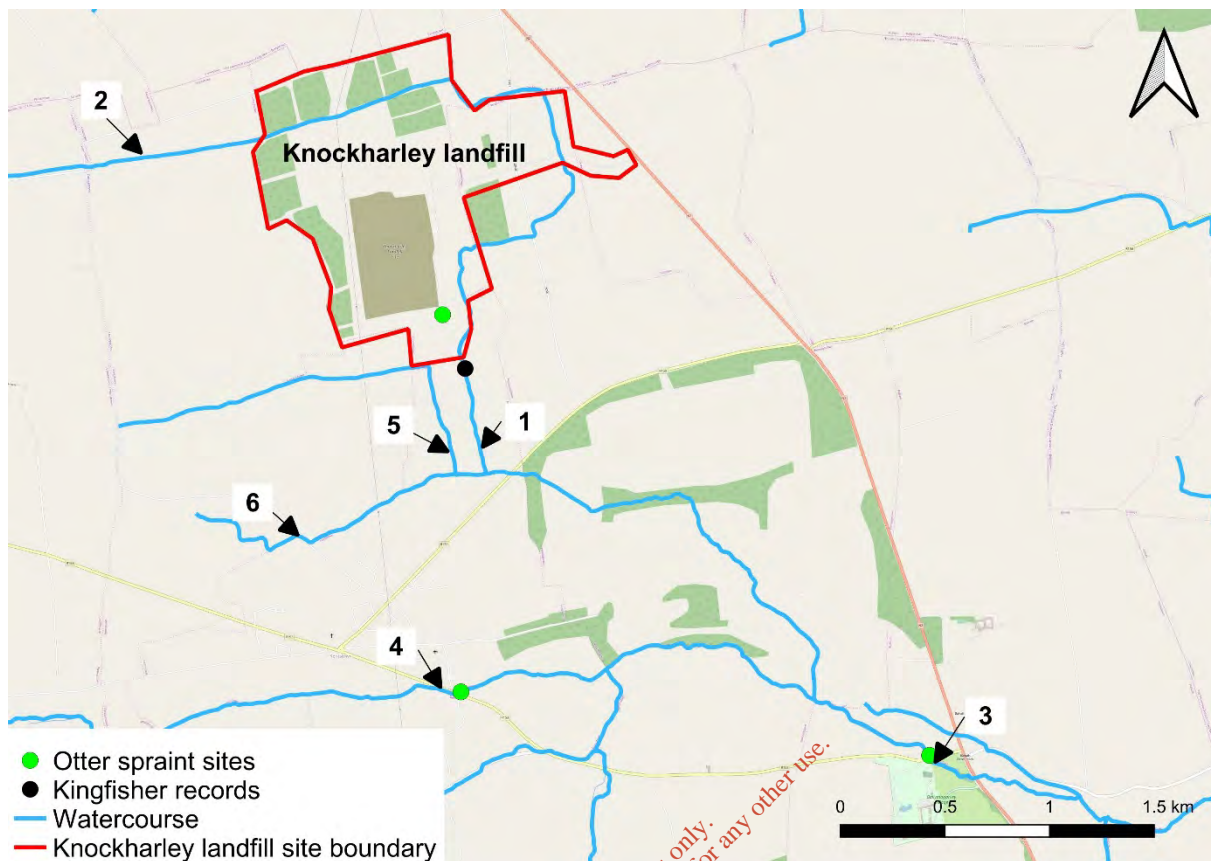
An additional historical record was available for the River Nanny upstream of the R153 road bridge (site 3) (Chapman & Chapman, 1982). According to the EIAR, during 2010, two otter spraint sites were recorded along the Knockharley Stream at monitoring site 2. In 2015, otter spraint was again recorded along the Knockharley Stream (NW of Landfill) as well as on drainage channels to the west and northwest of the Landfill site (FT, 2018).



**Plate 4.6** A regular otter spraint site (with nearby prints) recorded at the inflow culvert to the existing surface water attenuation pond, August 2019

**Table 4.3** Summary of otter signs recorded during walkover surveys of the watercourses and habitats in the vicinity of Knockharley Landfill near Navan, Co. Meath

Nearest site location	Watercourse	Otter sign	Sign age	Comments	ITM x	ITM y
1	Knockharley surface water attenuation pond	Spraint	Mixed	Regular spraint site (10+) at entrance to lagoon culvert	697504	766792
3	River Nanny, R153 bridge	Spraint	Old	Old spraint site on mid-channel rock u/s of bridge	699873	764734
4	River Nanny, East Bridge	Spraint & prints	Fresh	Spraint & prints in paludal mud under 3 <sup>rd</sup> arch of bridge	697625	764990



**Figure 4.6** Location of otter signs and single kingfisher observation as recorded during walkover surveys of watercourses in the vicinity of Knockharley Landfill, August 2019

### Q-sampling (macroinvertebrates)

Q-samples were collected and analysed from  $n=6$  sites watercourses in the vicinity of the landfill. A total of  $n=28$  species across  $n=25$  families were recorded as outlined in Table 4.4.

Samples collected from sites 5 (Kentstown Stream) and 6 (Veldonstown Stream) should be considered as tentative only given that the sites featured an imperceptible flow (virtually stagnant) at the time of sampling. This is considered as Q-samples are typically collected from riffle-glide areas of channel with ample flows according to Toner et al. (2005). Samples collected at sites 1, 2, 3 and 4 were from riffle-glide habitat and therefore comply well with the Q-sampling methodology. The sampling locations monitored were as per previous monitoring, with the addition of sites 5 and 6 to provide additional data on watercourses to the south of the landfill.

Following the methodology of Toner et al. (2005), the Environmental Protection Agency (EPA) which group invertebrates into classes whereby pollution intolerant species are denoted class A, and species with greater pollution tolerance fall into successive classes (B through E, respectively). As such, the presence or absence of these groups and their relative abundance facilitates an assessment of biological river health. The results are discussed in this context in order to interpret potential changes in the river community composition. The taxonomic composition for each site is summarised on Table 4.4. Q sampling ratings for each site are illustrated on Figure 4.7.

Site 1 was located on the Flemingstown (Knockharley Stream) downstream of the landfill site. It had a similar composition to site 2 upstream. There was an absence of clean-water indicator species (i.e. EPA class A and B mayflies and stoneflies). Only a single EPA class B (i.e. cased caddis species) was present (i.e. indicative of better water quality). The presence of good numbers EPA pollution tolerant Class D taxa (*Asellus aquaticus*) and smaller numbers of the very pollution tolerant class E (*Chironomus* spp.) indicated a Q-rating of Q2-3 (moderately polluted, poor WFD status).

Survey site 2 was located on the Flemingstown (Knockharley) Stream upstream of the landfill site and was like site 1 in that there was an absence of clean-water indicator species (i.e. EPA class A and B mayflies and stoneflies). The sample had several EPA class C species at low densities and was more dominated by pollution tolerant gastropods and bivalves i.e. Planorbiidae, Physidae and Sphaeriidae (EPA class D). The sample composition downstream of the landfill indicated the water quality was of Q2-3 (moderately polluted, poor WFD status).

The River Nanny at the R153 bridge crossing, downstream of the landfill (site 3) had biological water quality that slightly improved from sites 1 and 2. The presence of mayfly species Baetidae and Ephemerellidae (EPA Class C) indicated some improvement from upstream as mayflies were absent. The presence of cased caddis (EPA class B) at small numbers also indicated some improvement in biological water quality. Furthermore, the absence of EPA Class D & E (i.e. pollution tolerant species) supported an observed improvement from upstream. In summary the water quality at site 3 while still poor overall, improved from sites 1 and 2 upstream with a Q-rating of Q3 recorded (moderately polluted, poor WFD status).

Site 4 was situated on the River Nanny upstream of the Flemingstown (Knockharley) Stream confluence. The biological water quality was poor as reflected by the absence of EPA class A and B stonefly and mayfly species. The presence of higher numbers of *Asellus aquaticus* (EPA class D) and the presence of leech species *Erpobdella octoculata* and *Glossiphonia complanata* (also EPA class D) further indicated poor water quality. In summary the sample composition at site 4 on the River Nanny (upstream of confluence with the Flemingstown Stream) indicated the water quality was of Q2-3 (moderately polluted, poor WFD status).

Both sites 5 on the Kentstown Stream and site 6 on the Veldonstown Stream were heavily modified watercourses (effectively drainage channels) with imperceptible flows of water at the time of sampling. Both sites had a very low number of invertebrate species present and comprised mainly of the snail species *Radix balthica* (EPA class D) and also *Asellus aquaticus* (EPA class D). Given the condition of the channels as sub-optimal for Q-sampling a **tentative** Q-rating of Q2 (seriously polluted, bad status) was applied for both sites.

No rare macroinvertebrate species were recorded from the  $n=6$  sampling locations.



The surface water attenuation pond at Knockharley had an invertebrate sample collected from the macrophytes present at the margins. Species typical of a pond environment were recorded (i.e. gastropods, damselfly larvae and pond olives). A low to moderate diversity ( $n=9$ ) species was recorded with no rare species present. Three-spined stickleback were also recorded in the sample.

The invertebrate Q-sampling was summarised as follows at the  $n=6$  sampling sites, with no site achieving good status Q4 water quality as required under the Water Framework Directive (2000/60/EC). The WFD is enforced under the European Union Environmental Objectives (Surface Waters) (Amendment) Regulations 2019 which sets targets for Q4 and above (i.e. Q4-5 & Q5) for riverine sites. A summary of the Q-ratings for each site is provided below as illustrated on Figure 4.7;

- Site 1 (Flemingstown (Knockharley) Stream) **Q2-3** Moderately polluted (WFD Poor Status)
- Site 2 (Flemingstown (Knockharley) Stream) **Q2-3** Moderately polluted (WFD Poor Status)
- Site 3 (River Nanny) **Q3** Moderately polluted (WFD Poor Status)
- Site 4 (River Nanny) **Q2-3** Moderately polluted (WFD Poor Status)
- Site 5 (Kentstown Stream) **Q2** Seriously polluted (WFD Bad status)
- Site 6 (Veldonstown Stream) **Q2** Seriously polluted (WFD Bad Status)

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**Table 4.4** Macro-invertebrate composition and associated Q-ratings for the watercourses in the vicinity of Knockharley Landfill.

Group	Family	Species	Site 1	Site 2	Site 3	Site 4	Site 5	Site 6	Lagoon	EPA Class
Baetidae	<i>Cloeon dipterum</i>	Pond olive							2	C
Baetidae	<i>Baetis rhodani</i>	Dark olive		2	12					C
Ephemereillidae	<i>Seratella ignita</i>	Blue winged olive			16					C
Limnephilidae	<i>Limenphilus sp. (young instar)</i>	Cased caddis	1							B
Limnephilidae	<i>Potamophylax latipennis</i>	Cased caddis			2					B
Seracostomatidae	<i>Seracostoma personatum</i>	Cased caddis				2				B
Ryacophilidae	<i>Ryacophila dorsalis</i>	Caseless caddis			2					C
Polycentropodidae	<i>Holocentropus picicornis</i>	Caseless caddis		3					3	C
Gammaridae	<i>Gammarus duebenii</i>	Freshwater shrimp	23		21	9				C
Coenagrionidae	<i>Coenagrion pulchellum</i>	Variable damselfly		1					6	C
Pediciidae	<i>Dicranota sp.</i>	Crane fly larvae	2		4	3				C
Paelobiidae	<i>Hygrobia hermanni</i>	Water beetle		1					2	C
Halplidae	<i>Brychius elevatus</i>	Crawling water beetle			1					C
Elmidae	<i>Elmis aenea</i>	Riffle beetle			3					C
Corixinae	<i>Corixa punctata</i>	Water boatman		3					5	C
Ancylidae	<i>Ancylus fluviatilis</i>	River limpet	2		6					C
Sphaeriidae	<i>Sphaerium corneum</i>	Horny orb mussel		9					2	D
Hydrobiidae	<i>Potamopyrgus antipodarum</i>	Jenkin's spire snail		31					5	C
Planorbiidae	<i>Gyraulus crista</i>	Nautilus ramshorn snail	1	1						D
Asellidae	<i>Asellus aquaticus</i>	Freshwater hoglouse	9	5		41	6	2	4	D

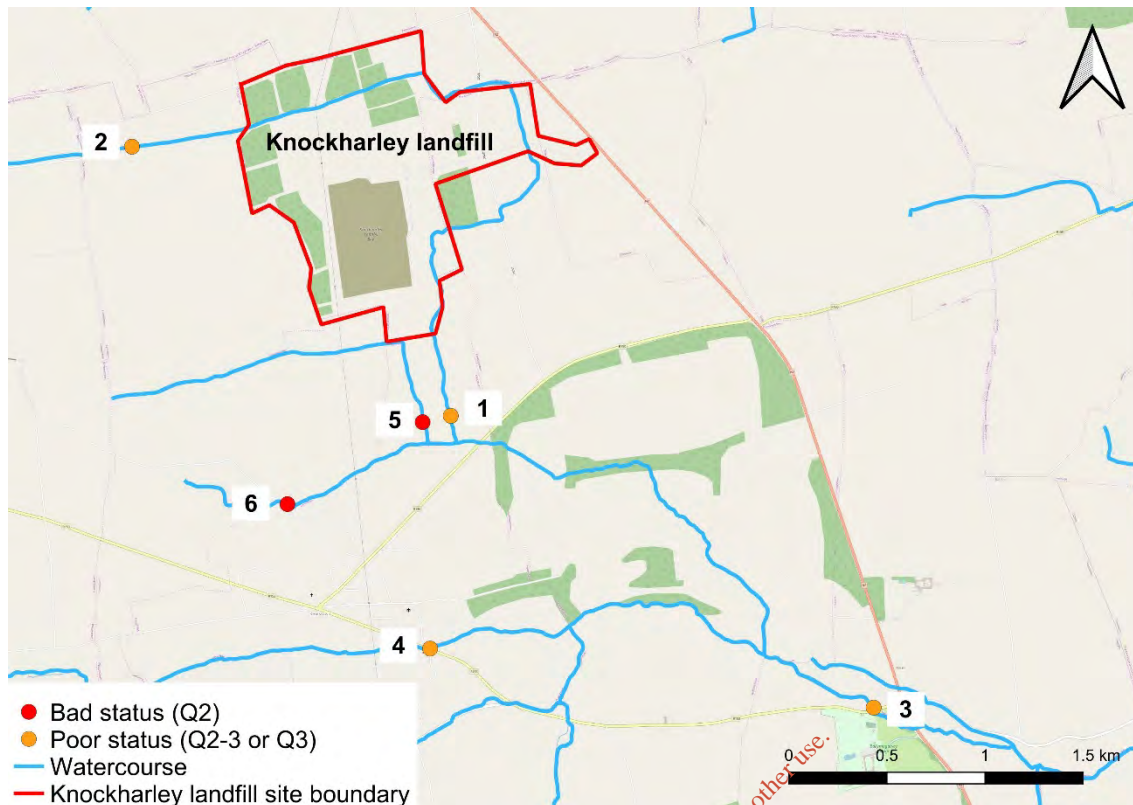
Group	Family	Species	Site 1	Site 2	Site 3	Site 4	Site 5	Site 6	Lagoon	EPA Class
Physidae	<i>Physa fontanalis</i>	Bladder snail				1				D
Lymnaeidae	<i>Radix balthica</i>	Wandering snail	1	4			83	8	6	D
Lymnaeidae	<i>Lymnaea sternalis</i>	Great pond snail						1		C
Valvatidae	<i>Valvata cristata</i>	Flat valve snail						2		C
Erpobdellidae	<i>Erpobdella octoculata</i>	Leech				6				D
Glossiphoniidae	<i>Glossiphonia complanata</i>	Leech				4				D
Tubificidae	<i>Tubifex sp.</i>	Worm				64				E
Chironomidae	<i>Chironomus spp.</i>	Bloodworm	100+	100+			61	4		E
<b>Taxon Richness (n)</b>			<b>8</b>	<b>10</b>	<b>9</b>	<b>8</b>	<b>3</b>	<b>5</b>	<b>9</b>	
<b>Q-Rating</b>			<b>Q2-3</b>	<b>Q2-3</b>	<b>Q3</b>	<b>Q2-3</b>	<b>Q2<sup>1</sup></b>	<b>Q2<sup>2</sup></b>	<b>n/a<sup>3</sup></b>	
<b>WFD Status</b>			<b>Poor</b>	<b>Poor</b>	<b>Poor</b>	<b>Poor</b>	<b>Bad</b>	<b>Bad</b>	<b>n/a</b>	

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<sup>1</sup> Tentative Q-sample only (semi-stagnant site)

<sup>2</sup> Tentative Q-sample only (semi-stagnant site)

<sup>3</sup> Q-samples do not apply to lentic/stillwater habitats



**Figure 4.7** Water quality (WFD) status of the  $n=6$  Q-sampling sites in the vicinity of Knockharley landfill.

### Physio-chemical Water Quality

Physio-chemical water quality samples were collected and analysed from  $n=6$  sites in the vicinity of Knockharley Landfill (see Figure 2.1). Samples were taken on 22<sup>nd</sup> August 2019. Table 4.5 provides a summary of physio-chemical results.

The pH, alkalinity and conductivity were relatively consistent across all sites sampled. Total ammonia levels fell within the levels defining good status waters (i.e.  $\leq 0.065$  mg N/l) under the European Union Environmental Objectives (Surface Waters) (Amendment) Regulations 2019 (S.I. 77 of 2019), for all survey sites with the exception of 2. The total ammonia levels of site 2 on the Flemingstown (Knockharley) Stream which is situated upstream of the landfill were substantially elevated at 0.118mg N/l and thus not achieving good status under the Surface Waters regulations (i.e.  $\leq 0.06$ mg N/l). As this site is situated upstream of the landfill the elevations in total ammonia cannot be associated with the existing landfill operations.

Levels of Total Oxidised Nitrogen (TON) (nitrate + nitrite in combination) were high across all sites. The Surface Water Regulations (S.I. 77 of 2019) sets no specific limits for nitrate however EPA assessment of high-quality water sources has set a limit of 0.8 mg/l  $\text{NO}_3\text{-N}$  for high quality waters and 1.8 mg/l  $\text{NO}_3\text{-N}$  for good quality waters. None of the  $n=6$  sampling sites fell within the good quality class, with all samples containing TON of  $\geq 1.068$ mg N/l. Sites 3, 4 and 5 all exceeded  $>3.3$ mg N/l, indicating

nutrient enrichment. The situation of the observed elevations of TON would indicate that they are not associated with the existing landfill operations (Figure 1.2 for sampling locations).

Nitrite typically accounts for <1% of the TON and, nitrate is the primary variable. The Quality of Salmonid Waters Regulations (S.I. No. 293/1988) sets levels of nitrite at <0.05mg NO<sub>2</sub>/l for healthy salmonid habitat. Therefore, only sites 3 (River Nanny) and 5 (Kentstown Stream) fall below these limits, with all other sites >0.05mg NO<sub>2</sub>/l. Site 6 on the Veldonstown Stream had particularly elevated levels of nitrites (0.16mg NO<sub>2</sub>/l) as outlined Table 4.5. The situation of the observed elevations of Nitrite would indicate that they are not associated with the existing landfill operations (Figure 1.2 for sampling locations).

Molybdate Reactive Phosphorus (MRP) is essentially the amount of phosphorus bioavailable for plant uptake. Levels of MRP levels were consistent across all samples, with the highest levels recorded at sites 2 (Flemingstown (KnockharleyStream) and site 5 (Kentstown Stream), respectively as shown in Table 4.5. Unlike Total Phosphorus, the Surface Water Regulations (S.I. 77 of 2019) sets a target of ≤0.025 mg P/l (high status) and ≤0.035 mg P/l (good status) for rivers specifically. All samples failed to meet good status based on MRP levels, with all sites ≥0.100 mg P/l. As with elevated levels of Total Oxidised Nitrogen, this would indicate heavy enrichment or eutrophication.

Biochemical Oxygen Demand (BOD), for all sites was ≤1.4 mg/l O<sub>2</sub> with the exception of site 2 Flemingstown (Knockharley Stream) which had slightly higher levels of 2.6 mg/l O<sub>2</sub> see Table 4.5. The recorded BOD levels across the n=6 sites fell within acceptable limits for clean river water (i.e. ≤3 mg/l O<sub>2</sub>). Similarly, values for Chemical Oxygen Demand were also relatively low across all sites with the exception of site 2 (i.e. 50.4 mg/l O<sub>2</sub>), indicating lower levels of deoxygenating agents. The elevations at site 2 cannot be associated with existing landfill operations as it is situated upstream of the landfill.

**Table 4.5** Physio-chemical water quality results for the survey sites in the vicinity of Knockharley Landfill, Co. Meath.

Parameter	Site 1	Site 2	Site 3	Site 4	Site 5	Site 6
pH	7.84	7.73	7.94	7.93	7.97	7.94
Alkalinity (mg CaCO <sub>3</sub> /l)	232	220	283	268	282	310
Conductivity (µS/cm)	580	482	667	640	684	658
Suspended solids (mg/l)	10.6	9.8	4.2	4.4	6.8	6.4
BOD (mg O <sub>2</sub> /l)	1.4	2.6	1.0	1.3	0.8	0.9

Parameter	Site 1	Site 2	Site 3	Site 4	Site 5	Site 6
<b>COD (mg O<sub>2</sub>/l)</b>	32.5	50.4	21.5	27	21.9	18.3
<b>Total Oxidised Nitrogen (mg N/l)</b>	1.068	1.618	3.309	3.581	3.367	1.770
<b>Nitrite (mg NO<sub>2</sub>/l)</b>	0.051	0.077	0.040	0.075	0.049	0.160
<b>Total Ammonia (mg N/l)</b>	0.033	0.118	0.032	0.031	0.030	0.024
<b>Unionised ammonia (mg N/l)</b>	0.001	0.003	0.001	0.001	0.001	0.001
<b>MRP (mg P/l)</b>	0.132	0.191	0.107	0.100	0.222	0.106

## RHAT scores

The findings and calculations of the RHAT assessment carried out on 500m sections of watercourses in the vicinity of the landfill during August 2019 are presented in Appendix I. A graphic representation is provided in Figure 4.8.

Scores were calculated based on both banks of the river/stream in a given 500m section according to the criteria of channel morphology and flow types, channel vegetation, substrate diversity and condition, barriers to continuity, bank structure and stability, bank and bank top vegetation, riparian land use and floodplain interactions. Preliminary RHAT scores were calculated and converted to hydromorph scores in order to correspond to the widely used WFD classification scheme, i.e. High status (blue), Good status (green), Moderate status (yellow), Poor status (orange) and Bad status (red) (after Murphy & Toland, 2014).

## Flemingstown (Knockharley) Stream

Much of the Flemingstown (Knockharley) Stream ranged from 'poor' to 'moderate' WFD status according to RHAT scores as shown in Figure 4.8 and outlined in, Table 4.6). This was largely reflective of the extensive historical straightening and deepening of the channel throughout, along with siltation and modified riparian land use pressures (e.g. coniferous plantations, arable crops, intensive agriculture). The worst score was recorded from the section adjoining the landfill boundary (FLE\_08) although this was considered due to adjoining agricultural and livestock pressures rather than the operation of the existing landfill. Only a single 500m section on the Flemingstown (Knockharley) Stream (FLE\_11), located outside of the landfill site, achieved the equivalent of 'good WFD status', largely given that the stream flowed through a block of mixed-broadleaved woodland. RHAT scores improved a considerable distance downstream of the landfill site boundary, notably downstream of the Kentstown Stream confluence.

## Kentstown Stream

The Kentstown Stream was heavily modified, with extensive historical straightening and deepening of the channel throughout. It flowed through an intensive agricultural landscape and RHAT scores ranged from 'bad' to 'poor' as outlined in Table 4.7. Typically, scores decreased moving downstream towards the Flemingstown (Knockharley) Stream confluence, with the channel featuring an increasingly modified riparian zone, and a lack of vegetation and substrata diversity in addition to poor fisheries habitat overall and a lack of floodplain connectivity.

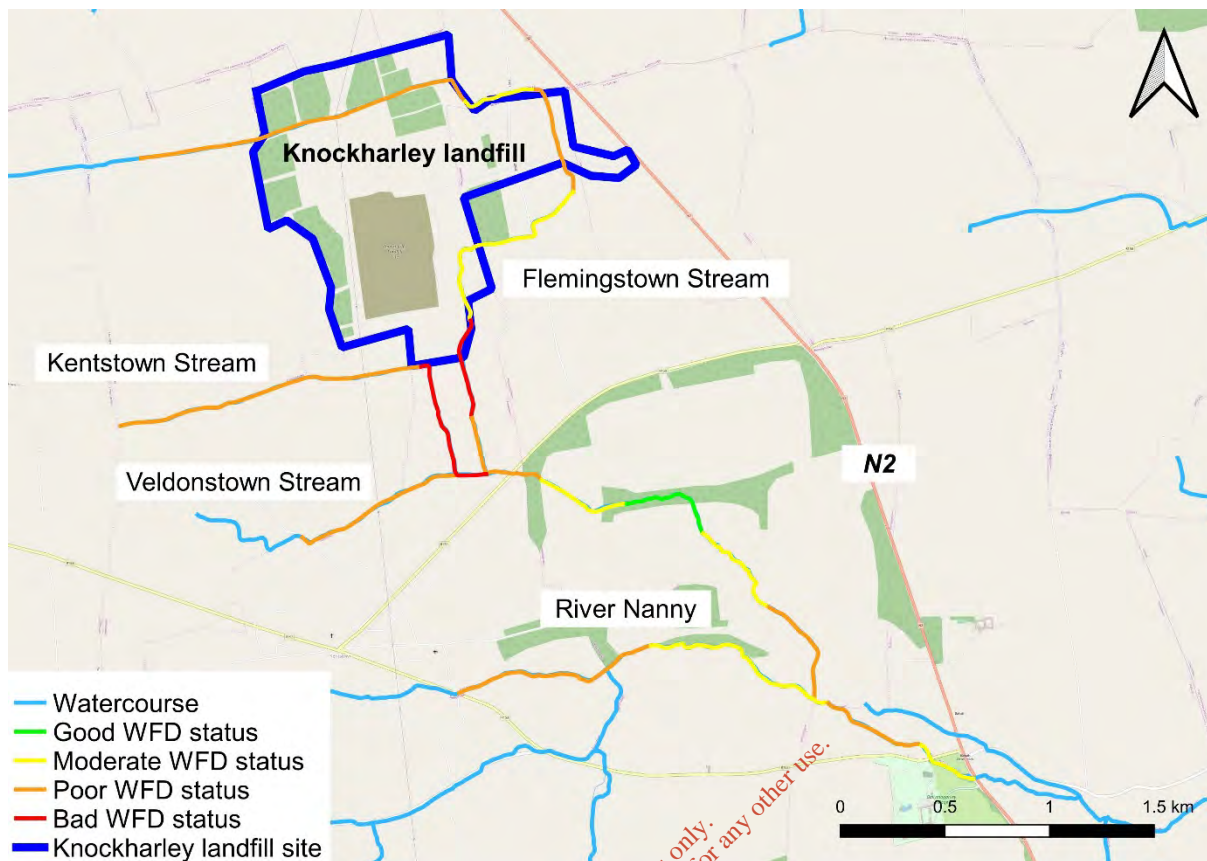
## Veldonstown Stream

An 800 m section of the Veldonstown Stream was surveyed with both RHAT sections achieving 'poor' WFD status equivalent scores as outlined in Table 4.7. Like the Kentstown Stream, the Veldonstown flows through an intensive agricultural landscape, was heavily straightened and deepened, featured a lack of instream vegetation diversity, poor fisheries habitat and a lack of floodplain connectivity.

## River Nanny

The RHAT scores on the River Nanny ranged from 'poor' to 'moderate', with no 500m section achieving a good WFD status equivalent score as outlined in Table 4.8. As with other watercourses in the vicinity of Knockharley Landfill, this score reflected the historically straightened and deepened nature of the channel, intensive agriculture uses to the bank top, often intermittent riparian vegetation, poor substrata diversity -often heavily silted, poor bank structure and stability (widespread livestock poaching) and poor floodplain interactions. However, some locally good overall fisheries habitat and retention of semi-natural profile was present in certain areas between sites 4 (East Bridge) and 3 (R153 Bridge) but overall the degree of naturalness along the River Nanny was poor.

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**Figure 4.8** RHAT score distribution and WFD status equivalence for the watercourses in the vicinity of the Landfill.

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## 5. Discussion

### 5.1 Fisheries Habitat Evaluation (most and least valuable areas)

#### Salmonids

Repeat site visits on the 2<sup>nd</sup> and 22<sup>nd</sup> of August 2019, revealed that the salmonid habitat of the surveyed watercourses in the vicinity of Knockharley landfill was generally poor. Although the larger, downstream-connecting River Nanny offered superior salmonid habitat (good quality according to Life Cycle Unit scores, despite excessive siltation), those smaller watercourses in the vicinity of Knockharley Landfill offered poor quality conditions for salmonids (low flows, heavily silted, often heavily shaded and small in size).

The Flemingstown (Knockharley), Kentstown and Veldonstown Streams are subject to fluctuating water levels with rainfall events largely determining local flows. Low water levels (such as those experienced on the first site visit on 2<sup>nd</sup> August 2019) greatly reduce their capacity to support resident fish populations, with perhaps the exception of three-spined stickleback, a species highly tolerant of low dissolved oxygen, poor water quality and high stress environments (Ostlund-Nilsson et al., 2006). Q-sampling as shown in Table 4.4 and physiochemical water quality analysis as shown in Table 4.5 also indicated that these smaller watercourses were suffering from poor water quality issues, as identified in previous monitoring of the Knockharley Landfill site.

The salmonid habitat value was very low across the survey sites apart from in the River Nanny, where a range of brown trout age classes were recorded. Some locally good nursery and adult holding habitat was present at both sites 3 and 4 (outside of site boundary), with some locally good spawning substrata (gravels, smaller cobble) present at site 3. However, excessive siltation and substrata bedding reduced the salmonid spawning capacity of the river channel, as evident from the low densities of salmonid juveniles recorded via electro-fishing at sites 3 and 4 on the River Nanny. It has been shown that salmonid eggs laid in clean gravels which have subsequently been silted over have failed to hatch (Crisp, 1993, 2000) and siltation would, therefore, appear to be impacting salmonid populations in the River Nanny within the study area.

#### Lamprey

Lamprey potential (namely brook lamprey *Lampetra planeri* given the location of the sites) was poor overall when considering the physical condition of the watercourses and LHQI scores. Although some superior habitat was present on the River Nanny, the smaller watercourses (i.e. sites 1, 2, 5 and 6) were largely unsuitable for lamprey given the excessive siltation / compaction of potential spawning substrata and poor water quality (Q2 or Q2-3, as shown in Table 4.4. The seasonality and fluctuation of (often very low) flows also greatly reduced the lamprey potential of these smaller streams. In addition to an appropriate substrate, larval lamprey require a permanent unidirectional water flow to supply them with the proper nutrients, while promoting the exchange of respiratory gases and metabolic residues (Hardisty & Potter 1971; Ferreira et al., 2013).

Although sites 3 and 4 on the River Nanny offered greater lamprey potential in terms of finer, cleaner (localised) spawning gravels, the presence of optimal soft sediment for ammocoetes was sparse. Invariably such areas were compacted and not ideal for burrowing larvae. The majority of superficially suitable silt accumulations at site 3 (downstream of the bridge) were transient in nature, being mobilised downstream during higher water flows (as observed on 22<sup>nd</sup> August). Temporary, unstable habitat is not optimal for larval lamprey and this may reflect why none were recorded at this site. No records exist for lamprey species in the River Nanny (e.g. Kelly et al., 2013).

### European Eel

Eel potential was poor across the survey sites, with some locally good habitat provided as sites 3 and 4 on the River Nanny. Diurnal refugia such as macrophyte growth, boulders, large cobble and large woody debris – features considered vital for eel (Laffaille et al., 2003) - were more frequent on the Nanny, as were superior foraging habitat and prey resources. The smaller watercourses offered little value to eel although some may be used as migratory routes during higher-flow periods.

### Kingfisher

A single kingfisher was observed in flight on the Flemingstown (Knockharley) Stream during a walkover survey. Given the poor water quality and overgrown nature of the stream, the bird likely utilised the nearby existing surface water attenuation pond where broader prey resource existed (e.g. three-spined stickleback, macro-invertebrates, amphibians etc). Like the Kentstown and Veldonstown Stream, the Flemingstown supported three-spined stickleback locally but nevertheless offered poor water quality and poor overall fisheries potential, thus being less attractive to kingfisher. Although not recorded along the River Nanny, the river provided better foraging habitat in addition to a greater number of perches (for feeding) between sites 3 and 4. Overall the study area offered poor nesting potential for kingfisher given heavily scrubbed over banks with no nesting sites recorded during the walkover survey.

### Otter

A low number of otter signs (spraint and prints) were recorded during site walkovers at sites 3 and 4 on the River Nanny, in addition to the existing surface water attenuation pond in the Knockharley landfill site. The more limited distribution of otter signs is consequential of the poor fisheries habitat and low prey resources present on the smaller Flemingstown, Kentstown and Veldonstown Streams. Although unlikely to be used regularly as foraging habitats, these watercourses are be utilised by commuting otter (i.e. evidence of movement along Knockharley Stream given known records). The existing surface water attenuation pond was evidently regularly used by otters (i.e. given the recorded regular sprainting site). This is likely due to the prey resource range present (i.e. stickleback, snails and small water birds) in addition to typically lower levels of human disturbance (site fenced-off). No holts were located during walkover surveys although several scrubbed-up areas near the lagoon offered good potential for otter breeding.

## 5.2 Water Quality

### Q-Sampling

The biological water quality was of bad to poor status (Q2, Q2-3 or Q3) across all sampling sites and no sites achieved target good status Q4 water quality, as required under the Water Framework Directive (2000/60/EC). Site 3 located on the River Nanny approx. 3.6km downstream of the landfill boundary was the only site to achieve a Q3-rating -poor status, moderately polluted as outlined in Table 4.4 and Figure 4.7.

Whilst the results from sites 5 and 6 should be interpreted **tentatively** given the sub-optimal Q-sampling conditions (i.e. canalised channels with a lack of shallower riffles and predominating deep glides), the water quality results (Table 4.4) indicated that the watercourses in the vicinity of Knockharley landfill were suffering from local eutrophication (elevated nitrogen and phosphorus) as well as historical modification (poor quality physical habitat and flows).

### Physio Chemical Sampling

Water quality across the  $n=6$  sites was poor based on physiochemical water quality results with the exception of total ammonia, BOD and COD as outlined in Table 4.5. The watercourses are suffering from enrichment from nitrates and phosphorus (MRP), which was also reflected in the biological water quality sampling, see Table 4.4.

## 5.3 Conclusions

In summary, the watercourses within the vicinity of Knockharley landfill are generally of poor quality. This is expected for historically modified, straightened and or deepened channels with bordering intensive agricultural pressures. Siltation levels, for example, were evidently excessive on the River Nanny (sites 3 and 4) and this greatly reduced the fisheries potential, especially for salmonids. Biological water quality ranged from bad (Q2) to poor (Q2-3 or Q3) status and thus is not meeting target good status (Q4). The Knockharley study area was of lower overall value for kingfisher apart from transient foraging opportunities. Otter utilisation of watercourses in the vicinity of the landfill appeared to be low as only a small number of spraint sites were recorded. As with kingfisher these watercourses are likely only used for transient foraging. The findings of the aquatic surveys undertaken in 2019 outlined in this report are consistent with the findings of EIAR.

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# Appendix I

## RHAT scores

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**Table I.1** RHAT scores for the surveyed reaches of the Flemingstown (Knockharley) Stream in the vicinity of Knockharley Landfill, Navan, Co. Meath. Each section corresponds to a 500m reach of channel

Criteria	River section						
	FLE_01	FLE_02	FLE_03	FLE_04	FLE_05	FLE_06	FLE_07
Channel morphology & flow types	0	0	0	2	0	2	2
Channel vegetation	1	2	1	2	2	2	3
Substrate diversity & condition	2	2	1	2	1	1	1
Barriers to continuity	2	2	2	3	2	1	3
Bank structure & stability	2	2	2	2.5	1.5	2	3
Bank & bank top vegetation	3	1.5	1	3	1	2.5	3
Riparian land use	1	1.5	1	1.5	2	1	2
Floodplain interactions	0	0	0	0	0	0	0
<b>Total</b>	<b>11</b>	<b>11</b>	<b>8</b>	<b>16</b>	<b>9.5</b>	<b>11.5</b>	<b>17</b>
Hydromorph score	0.3	0.3	0.3	0.5	0.3	0.4	0.5
WFD class	Poor	Poor	Poor	Moderate	Poor	Moderate	Moderate



**Table I.1 (continued)** RHAT scores for the surveyed reaches of the Flemingstown (Knockharley) Stream in the vicinity of Knockharley Landfill, Navan, Co. Meath. Each section corresponds to a 500m reach of channel

Criteria	River section						
	FLE_08	FLE_09	FLE_10	FLE_11	FLE_12	FLE_13	FLE_14
Channel morphology & flow types	0	0	2	3	2	1	1
Channel vegetation	1	2	2	3	2	2	2
Substrate diversity & condition	0	0	1	3	2	2	2
Barriers to continuity	1	2	2	3	2	2	2
Bank structure & stability	2	2	2	3	1	1	1
Bank & bank top vegetation	2	2	2	3	1	1	1
Riparian land use	1	1	2	3	1	1	1
Floodplain interactions	0	0	0	0	0	0	0
<b>Total</b>	<b>7</b>	<b>9</b>	<b>12</b>	<b>21</b>	<b>11</b>	<b>10</b>	<b>10</b>
Hydromorph score	0.2	0.3	0.4	0.7	0.3	0.3	0.3
WFD class	Bad	Poor	Moderate	Good	Poor	Poor	Poor

**Table I.1 (continued)** RHAT scores for the surveyed reaches of the Kentstown Stream and Veldonstown Stream in the vicinity of Knockharley Landfill, Navan, Co. Meath. Each section corresponds to a 500m reach of channel

Criteria	River section						VEL_01	VEL_02
	KEN_01	KEN_02	KEN_03	KEN_04	KEN_05			
Channel morphology & flow types	0	0	0	0	0		0	0
Channel vegetation	2	2	2	1	1		1	1
Substrate diversity & condition	2	2	1	1	0		2	2
Barriers to continuity	1	1	1	0	0		1	2
Bank structure & stability	2	2	2	1.5	1		2	2
Bank & bank top vegetation	3	3	3	1	1		2	2
Riparian land use	1	1	1	1	1		1	1
Floodplain interactions	0	0	0	0	0		0	0
<b>Total</b>	<b>11</b>	<b>11</b>	<b>10</b>	<b>5.5</b>	<b>4</b>		<b>9</b>	<b>10</b>
Hydromorph score	0.3	0.3	0.3	0.2	0.1		0.3	0.3
WFD class	Poor	Poor	Poor	Bad	Bad		Poor	Poor

**Table I.1 (continued)** RHAT scores for the surveyed reaches of the River Nanny in the vicinity of Knockharley Landfill, Navan, Co. Meath. Each section corresponds to a 500m reach of channel

Criteria	River section					
	NAN_01	NAN_02	NAN_03	NAN_04	NAN_05	NAN_06
Channel morphology & flow types	1	1	3	1	1	1
Channel vegetation	2	2	2	3	3	3
Substrate diversity & condition	0	0	1	2	2	0
Barriers to continuity	3	3	3	3	3	3
Bank structure & stability	2	2	2	2	0	3
Bank & bank top vegetation	2	2	2.5	2	1	3
Riparian land use	1	1	2	1	0	2.5
Floodplain interactions	0	0	0	0	1	1
<b>Total</b>	<b>11</b>	<b>11</b>	<b>15.5</b>	<b>13</b>	<b>10</b>	<b>15.5</b>
Hydromorph score	0.3	0.3	0.5	0.4	0.3	0.5
WFD class	Poor	Poor	Moderate	Moderate	Poor	Moderate



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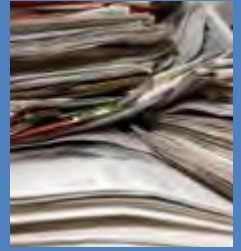
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# Appendix 6

## Knockharley Landfill Viviparous Lizard, *Zootoca vivipara* survey 2019

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# KNOCKHARLEY LANDFILL VIVIPAROUS LIZARD, *Zootoca vivipara* SURVEY 2019

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**CREATED FOR:**

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**CREATED:**

October 2019

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APPENDIX 1: Figure

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# 1 INTRODUCTION

This report details the results of viviparous lizard (*Lacerta (Zootoca) vivipara*) surveys carried out at Knockharley Landfill during 2019. This report should be read in conjunction with Chapter 10 of Volume 2 of the Environmental Impact Assessment Report for Proposed Development at Knockharley Landfill (Fehily Timoney and Company, 2018) (EIAR).

Knockharley Landfill Ltd. proposes to further develop the existing facility. In addition to the desktop study, an extensive field-based assessment was carried out within the boundary of the entire facility. The survey was undertaken to examine the potential impact of the proposed development on viviparous lizard.

Ecology sub consultant Rory Dalton was commissioned by Fehily Timoney Consultants (FT) to carry out a survey of viviparous lizard (*Lacerta (Zootoca) vivipara*) at Knockharley Landfill, Co. Meath.

The viviparous lizard is Ireland's only native lizard. Individuals vary significantly in colour, but usually have a predominantly brownish, sometimes greenish upper body, with a vertebral and two lateral lines of darker markings. Viviparous lizards are ectothermic, meaning require an external boost to their body temperature to become fully active. They achieve this effect by positioning themselves in places of increased warmth. This can involve 'basking' on a heat gathering surface in the sunshine (in the open or amongst vegetation) or under objects (refuges) which absorb heat. Much of this behaviour occurs during the morning and late afternoon but potentially at any time of the day depending on season and weather patterns. This requirement fundamentally affects their habitat requirements and underpins the techniques used to survey them.

In terms of legal status, the viviparous lizard is protected under Section 23 of the Wildlife Act 1976 (Protection of Wild Animals) Regulations, 1980 (S.I. 282 of 1980). The effect of these Regulations is to add these species to the list of protected species mentioned in Schedule V of the Wildlife Act, 1976 as amended. It is an offence to injure these species or wilfully interfere with or destroy its breeding or resting places. Any surveys that might require handling of or other interference with individual animals or disturbance to their habitat should be carried out only by suitably qualified personnel in possession of an appropriate licence. Mitigation measures may also require a licence and should be developed in conjunction with NPWS and other relevant consultees.

This report details the results of viviparous lizard surveys carried out at the Knockharley Landfill site during summer / autumn 2019. Knockharley Landfill Ltd proposes to further develop the existing Knockharley facility. In addition to the desktop study, extensive field-based assessments were carried out within the footprint of the proposed development and the existing facility. This survey is being completed as a result of the protections that the viviparous lizard is offered by legislation (Wildlife Act 1976) and to examine the potential impact of the proposed development on this protected species.

## 1.1 Methodology

Limited Irish guidelines were available, therefore, as often is the case in ecology, UK guidelines were adopted to augment the Irish guidelines as they were found to be more comprehensive. Guidelines utilised can be found below:

- Reading, C.J., (1997). 'A Proposed Standard Method for Surveying Reptiles on Dry Lowland Heath'
- Riddell, A., (1996). 'Monitoring slow-worms and common lizards, with special reference to refugia materials, refugia occupancy and individual recognition in Reptile survey methods: proceedings of a seminar held on 27 November 1995 at the Zoological Society of London's meeting rooms, Regent's Park, London'
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- Gent, A. and Gibson, S., (1998). 'Herpetofauna Workers' Manual'

- NRA, (2009). *Ecological Surveying Techniques for Protected Flora and Fauna during the Planning of National Road Schemes: Version 2*. National Roads Authority (renamed Transport Infrastructure Ireland), Ireland.

### 1.1.1 Desktop Study

A desktop study was carried out to search for historic records of lizard within the 10km grid squares encompassing and surrounding the existing facility in relation to National Biodiversity Data Centre data and within 10km of the existing facility in relation to National Parks and Wildlife Service data. This was done through the assessment of data gathered by the National Biodiversity Data Centre website (concerning squares N96, N97, O06 and O07) and data National Parks and Wildlife Service data request service. This species is likely to be vastly under-recorded due to its nature and size, and therefore the field-based findings are much more reliable.

A data request for rare and protected species within 10km of the existing facility was submitted to the NPWS on 8<sup>th</sup> October 2019. This data was received from the NPWS on the 11<sup>th</sup> October 2019 and the information received used within this report.

### 1.1.2 Location

A mixture of placed refuges and direct observations was utilised in line with best practice guidelines (Reading 1997, Gent 1998, Sewell 2013, NRA 2009). Refuges were placed at a minimum coverage of 10 per hectare as per best practice guidelines (NRA, 2009). The majority of refuges were 500mm x 500mm square cuts of heavy gauge roofing felt. A number of rectangular cuts of the same roofing felt 1000mm x 500mm were used as well as a number of 1000mm x 1000mm squares. Part of each placed refuge was covered with the surrounding vegetation to give shade and cover from predators. It was also insured that a direct route to surrounding cover was maintained to make the refuge more appealing.

Five zones of potential habitat within the facility were identified following an initial site walkover. These 5 zones are shown in Figure 1-2.

Within each zone the refuges were placed along a transect which was walked during each visit. These walked transects were laid out to incorporate as many existing basking spots as could be found within each zone. Many of the refuges were placed in areas offering potentially higher value basking spots i.e. areas with the greatest likelihood of being occupied by a lizard (if present within the facility boundary). Some were placed in areas representative of the wider habitats within the site. At some existing potential basking spots no refuge was placed as it was felt that there was sufficient basking and cover to allow for direct observation without altering the existing habitat.

In determining the conservation value of a potential lizard site, emphasis should be given to the availability of suitable habitat (JNCC, 2004). The suitability of habitats was determined using the 'Habitat Structure' section of JNCC (2004). Areas identified as basking spots had good potential for basking but also good potential for escape to nearby cover and usually had some shade or vegetation cover. Examples of basking spots utilised included: embankments and mounds, hollows, south facing slopes, rolls of plastic stored around the site for later use, tyres, logs, brash piles, posts, rocks, metal objects, stony areas, rocky outcrops, sun traps on open ground surrounded by dense vegetation, the base of hedges and tree lines, paths cut or trodden through denser vegetation, edge of woodland/scrub/ bramble patches and tussocky patches of grass.

Availability of prey (invertebrates) was also taken into account. This was done by direct observation of invertebrates, by density counts of spiderwebs on a dewy morning, inference of the availability of larval state insects by the numbers of adult state insects seen in flight (e.g. moths, butterflies etc).

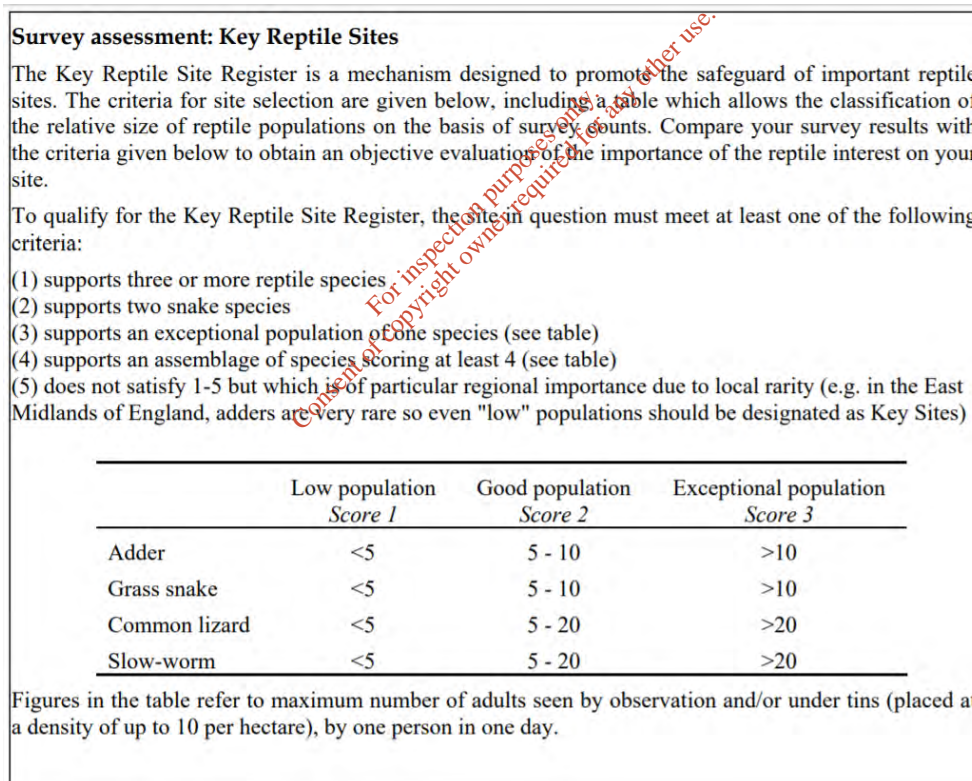
1.1.3 Method

During the initial site visit, a transect within each zone was identified which incorporated as many potential basking spots as possible, all spots were noted, and refuges were placed along the transect.

During each subsequent visit, each transect was walked, each suitable basking spot was checked, each placed refuge was checked, each placed refuge was turned over to check underneath, a vigilant eye was maintained when moving between placed refuges/basking spots.

Lizards have excellent eyesight and hearing (Gent 1998) and so the transect was walked slowly and carefully to minimize disturbance and increase the chances of getting close to a basking lizard. Crouching behind existing cover was carried out where possible. An alertness to rustles in vegetation was maintained. The idea being to return to the spot 10 minutes later as basking lizards will often return. Wind and the direction and angle of the sun was taken into account when approaching a refuge/ basking spot.

The Key Reptile Sites Assessment (KRSA) as discussed by Gent (1998) is a method designed to identify important reptile sites within an area. It allows for the classification of the relative size of reptile populations based on survey counts and allows the user to identify the quality of the reptile population. This method is used below in order to assess the score of the reptile population within the development site. This method is detailed below in Figure 1-1.



**Figure 1-1: Key Reptile Sites Assessment (Gent, 1998).**

1.1.4 Timing and Conditions

The best time to carry out a survey varies with location, weather patterns and season, but generally lizards are active from March to October (Froglife, 2015). Peak months are April and May and, late August to late September can be useful for seeing juvenile animals (Gent 1998).

"September is an excellent month for looking for little black hatchling lizards which are more numerous and bolder than adults and can give an indication about the breeding status of a colony" (Gent 1998). The numbers of young inflate the population for a short period after birth therefore increasing the likelihood of a sighting; this is a positive for a presence/absence survey.

When the weather is generally warmer, reptiles may be found earlier in the morning and later in the afternoon. Ideal air temperature is between 9-18°C. Bright sunshine is favourable on cooler days and hazy or intermittent sunshine is favourable when warmer. Rain or windy weather is unsuitable for surveys.

Weather sequence is important, a hot spell after several days of cold weather, or showery weather after a prolonged dry period are favourable (NRA, 2009).

The month of September was generally bad in terms of weather, however weather conditions and forecasts were closely monitored, and surveys were carried out during optimal conditions. A hot spell after several days of cold weather is favourable (NRA, 2009), as the animals will need to feed following bad weather. Surveys were carried out at different times relative to the sunrise/sunset times. These times were determined by the weather of each respective survey day. If the day was forecasted to be hot, surveying began early as the basking window would be short. Alternatively, if the day was forecasted as being cloudy, surveying would start a little later as the basking window would be longer and therefore more suitable for viviparous lizards to be out longer periods of the day.

#### 1.1.5 Number of Survey Visits

In order to reliably infer absence from a site, the NRA Ecological Surveying Techniques states that it is necessary to carry out survey visits between 5 and 10 times during appropriate weather conditions and during the months viviparous lizards are active (NRA, 2009). For presence/absence purposes, Sewell et al. 2013 recommend that 4-7 survey visits are usually sufficient to detect 95% of occupied sites, and as discussed above, providing artificial refuges are used in addition to transects.

During the survey period in 2019, a total of 11 survey visits to the transects within the viviparous lizard survey zones were completed.

Figure 1-2 details the zones surveyed for the viviparous lizard surveys.



**Figure 1-2: Viviparous lizard survey location map**

## 1.2 Impact Assessment

EPA Guidelines (2017) were used to assess the potential impact and resulting effect of the proposed development on mammalian resources.

In line with the EPA Guidelines (EPA, 2017), the following terms are defined when quantifying duration:

- Momentary: from seconds to minutes
- Brief: up to 1 day
- Temporary: up to 1 year
- Short-term: from 1-7 years;
- Medium-term: 7-15 years;
- Long-term: 15-60 years; and
- Permanent: over 60 years.

The impacts were assessed under a number of parameters such as magnitude, extent, timing, frequency, duration and reversibility. The impact significance criteria (EPA, 2017) as set out in Table 1.1 are used where applicable. A glossary of impacts is further outlined in Appendix 10.3 Volume 3 of the EIAR.

**Table 1-1: Significance of Effects Criteria**

Impact Significance	Criteria
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

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## 2 RESULTS

### 2.1 Desktop Study

The desktop study showed that the nearest documented sighting was 20km from Knockharley Landfill. This record was taken from the National Biodiversity Data Centre website. The sighting was immediately east of Drogheda town and was part of the Reptile and Amphibian Distribution Atlas 1978. The latest record The National Parks and Wildlife Service was identified within the 10km grid square O07 again in Drogheda in 1976. These sightings are spatially and temporally distant from the Knockharley Landfill.

### 2.2 Transects

Following a total of 11 survey visits to the site to carry out transects, **no lizards were observed**. A total of four frogs *Rana temporaria* were seen using the refuges (all seeking shelter under the refuges) and five more seen on the walked transects. Two juvenile smooth newt *Lissotriton vulgaris* (formerly *Triturus vulgaris*) were found under the same refuge in the broadleaf plantation at the north of the site in zone 5. A large range of insects were using the refuges to bask, which included a range of butterfly species (including red admiral *Vanessa atalanta*, painted lady *Vanessa cardui*, peacock *Aglais io*, small tortoiseshell *Aglais urticae*), a number of dragonfly species (particularly the darter *Sympetrum sp*) and a number of grasshopper (*Orthoptera sp*) species.

### 2.3 Habitat Suitability

**Zone number 1** (refer to Figure 1-2) consisted of rough grassland (grassy verge) (GS2) in the north with a mosaic of wet grassland (GS4) and rough grassland (grassy verge) (GS2) in the southern two thirds. Artificial surfaces (BL3) and hedgerows (WL1) were also present locally. There were a number of existing features that were seen as optimal habitats in that they provided good basking and cover. Such features included discarded plastic liner piping, timber, manholes, boreholes for testing groundwater, and the covered leachate lagoon. However, the rank grasses, flattened rushes and other vegetation features provided a lot of opportunity for basking. The amount of this type of basking habitat was difficult to quantify. This high proportion of available basking habitat prompted a high degree of awareness when surveying within this area.

The area of this zone was 3.9 hectares and it was peppered with 40 placed refuges along a transect which included an additional 20 optimal existing basking features, not counting the vegetation-based features described. The southern two thirds of this zone had the most potential for lizards across the whole site. The cover was good with lots of tussocky grasses, rushes and patches of rank grass, there was abundant opportunity for basking, and the area was very productive in terms of invertebrate prey.

Flattened grasses and rushes in zone 1 had the potential to provide ample basking opportunity for lizards. However, direct observation here proved difficult due to the amount of potential basking habitat present while walking the transect. This was negated by being particularly vigilant, and walking slowly and carefully to minimize disturbance and increase the chances of getting close to a basking lizard; crouching behind existing cover was carried out where possible. An alertness to rustles in vegetation was maintained; the idea being to return to the spot 10 minutes later as basking lizards will often return.

Insect activity in Zone 1 was identified as being high due to spider webs and other species present throughout the survey effort.

**Zone number 2** consisted of rough grassland (grassy verge) (GS2); the field had been left uncut and ungrazed. Additional habitats also include; linear oriental/ non-native shrub (WS3) and Scrub (WS1) and Buildings and artificial surfaces (BL3). There was a reasonable assemblage of plant species. However its past use as an improved and managed grassland was evident with the presence of rye grasses, docks, thistles and clover.

The fact that it was recently unmanaged allowed for decent cover, however the cover and basking potential afforded by a truly unmanaged area had not yet fully developed. There was additional basking features which included rolls of plastic liner, tyres and other items stored at the western end of this field. Also, there were iron and plastic sheets found, two gravel clearings as well as two iron manholes set in a concrete frame. Ten artificial refuges were placed throughout this 1 hectare zone.

**Zone number 3** consisted of a mosaic of wet grassland (GS4) and grassy verge (GS2). The southern part of this zone was fringed by a south-facing slope, most of which was covered in a mosaic of linear oriental/ non-native shrub (WS3) and Scrub (WS1), but some of which offered optimal basking habitat in the form of gaps in the scrub. Eight artificial refuges were placed in this zone which had an area of 0.7Ha

**Zone number 4** consisted mixed broadleaved woodland WD1 broadleaf plantation (WS2). Also within this area was a drainage ditch (FW4). There were a number of small clay outcrops associated with the drainage ditch which were seen as optimal basking habitat. There was plenty of cover between the tussocks of grass, the patches of scrub and the adjacent woodland. The strip of grassy verge which constituted this zone was orientated east to west which maximized its exposure to the sun. Four artificial refuges were placed in 0.2Ha of land.

**Zone number 5** was mixed broadleaf woodland (WD1). This 0.13 Ha sample was a sub-sample of a number of patches of stunted growth within this immature woodland which were letting through enough sunlight to warrant investigation in terms of lizard presence. Three artificial refuges were placed close to each other. Few other features that could be seen as optimal basking habitat were present, however sub-optimal basking opportunity on flattened vegetation was widely Table 2.1 below details the zones surveyed during the viviparous lizard surveys carried out in 2019, detailing the habitats, number of artificial refuges placed, and a description of the pre-existing basking/ refuge habitats present within each zone.

**Table 2-1: The Zones surveyed, present**

Zone number	Habitat	Area (Ha)	Number of Placed Refuges	Number of additional pre-existing Basking Spots without Placed Refuge
1	South: Wet grassland GS4/grassy verge GS2 mosaic North: grassy verge GS2. Artificial surfaces (BL3) and hedgerows (WL1) were also present locally	3.9	40	20 additional basking features including discarded plastic sheeting, piping, timber, manholes, boreholes for testing groundwater , and a large plastic covered leachate storage area with a diameter of approx. 40m. However the rank grasses, flattened rushes and other vegetation features provided a lot of opportunity for basking; the amount of this type of basking habitat was difficult to quantify; a watchful eye was kept when surveying
2	Rough grassland (grassy verge) GS2, Additional habitats also include; linear oriental/ non-native shrub (WS3) and Scrub (WS1) and Buildings and artificial surfaces (BL3).	1	10	15 additional basking features; there were many rolls of plastic, tyres and other items stored at the western end of this field
3	Mosaic of wet grassland GS4 and grassy verge GS2	0.7	8	Some south-facing slopes fringed with cover, but mainly sub-optimal vegetation based basking sites



Zone number	Habitat	Area (Ha)	Number of Placed Refuges	Number of additional pre-existing Basking Spots without Placed Refuge
4	Mixed broadleaved woodland WD1	0.2	4	Approximately 4; along with a number of sub-optimal areas
5	Broadleaved Woodland WD1	0.13	3	None, just sub-optimal vegetation based basking sites

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Table 2-2: Lizard Survey Visits

Visit number	Date	Time	Sunrise/Sun set	Weather			Comment
				Temp(°C)	Cloud (Oktas)	Wind (Beaufort)	
1	19.9.19	17.05 - 19.00	19.31	16-18	3/8	F1	Warm day, some areas in shade, optimal conditions
2	20.9.19	07.15 - 08.45	07.06	9-10.5	1/8	F1	Previous few days of warm weather, short basking window due to warm day. However, the early start negated the impact of the short basking time
3	20.9.19	17.45 - 19.30	19.29	12-16	0/8	F1	Previous few days of warm weather, conditions close to optimal if not optimal
4	21.9.19	07.40 - 09.30	07.08	11-17	4/8	F3	Optimal, very good conditions, dry and sunny with some cloud cover delaying the basking period, gentle breeze which was useful when approaching a refuge
5	21.9.19	16.30 - 18.00	19.26	14-17	5/8	F3	Pair of smooth newts found within broadleaved plantation. First half of survey was optimal, second half the cloud cover increased however conditions remained optimal, gentle breeze to aid sneaking up on refuge
6	25.9.19	17.10 - 18.50	19.17	16	5/8	F0-1	Warm, dry evening with good insect activity, optimal conditions
7	26.9.19	07.35 - 09.15	07.18	9-12	5/8	F1	Precipitation overnight so the grass was wet in places; sub-optimal conditions
8	29.9.19	12.10 - 13.40	07.22	14-16	4/8	F1	Couple of days heavy rain proceeded the survey, cloud cleared at mid-day just as the survey started, optimal survey conditions, lots of insect activity with butterflies, crickets and dragonflies all basking on the placed refuges
9	29.9.19	16.40 - 18.00	19.07	14-16	4/8	F1	Couple of days heavy rain proceeded the survey, optimal survey conditions, lots of insect activity
10	7.10.19	17.15 - 18.45	19.02	13-15	2/8	F1	Optimal conditions, dry and warm, survey was carried out in early October, however the weather was mild and suitable conditions for lizard.
11	8.10.19	08.30 - 10.00	07.43	10 - 12	0/8	F2	Optimal conditions, dry and warm, some rain overnight

## 3 POTENTIAL IMPACTS

### 3.1 Construction Phase

No viviparous lizard observations or evidence was recorded during the surveys in 2019. Given that the species were not observed during specific surveys and that historical records of the species indicate that it has not been recorded within 20km of the Knockharley Landfill since 1970, the construction of the proposed development will have no significant impact on viviparous lizard as they are not present on site.

### 3.2 Operation Phase

Given that the species were not observed during specific surveys and that historical records of the species indicate that it has not been recorded within 20km of the Knockharley Landfill since 1970, the operation of the proposed development will have no significant impact on viviparous lizard as they are not present onsite.

### 3.3 Decommissioning Phase

Any decommissioning works at Knockharley Landfill will have no significant impact on viviparous lizard as they are not present on site.

### 3.4 Mitigation Measures

In order to apply the precautionary principle all areas of habitat surveyed as part of this survey (Zones 1 - 5 as shown on Figure 1-2) within the construction zone, with the potential to support reptiles (including tall ruderal vegetation and rough grassland) that will be affected by ground works, should be managed as detailed below, this should encourage dispersal from the site into suitable adjoining habitat.

Precautionary strimming should be carried out to reduce the height of ruderal vegetation, rough grassland and scrub. Strimming will be directional from west to east to flush animals towards existing habitat to the east. Vegetation will be cut no shorter than 10cm above the ground. Arisings should then be left for 24 hours to enable any animals to disperse before ground clearance commences. This action will reduce the quality of the habitat and the risk of killing / injury of any reptiles during works

Construction work should be undertaken shortly after the completion of the precautionary clearance. Vegetation within the construction zone should be kept unsuitable for reptiles during the intervening period by either maintaining the above strimming regime, or by removing topsoil that may support habitat suitable for reptiles.

### 3.5 Residual Impacts

Taking into consideration the updated surveys, it is reconfirmed that there will be no impact to common lizard as they are not present on the site.

## 4 CONCLUSION

A total of 11 site survey visits were carried out during this survey and no lizards were observed inferring that viviparous lizards are most likely not present at Knockharley Landfill.

In Britain, Key Reptile Sites Assessment (Gent 1998), as shown in the methodology section 1.1.3, is a method designed to identify important reptile sites, it states that less than 5 viviparous lizard seen by direct observation and/or using refuges (placed at a density of up to 10 per hectare) by one person in one day is a low population. No lizards were observed during the 11 survey visits confirming that **Knockharley Landfill is not of importance for lizards. The site does not qualify for the Key Reptile Site Register.**

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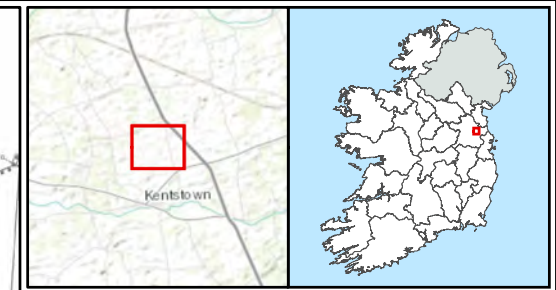
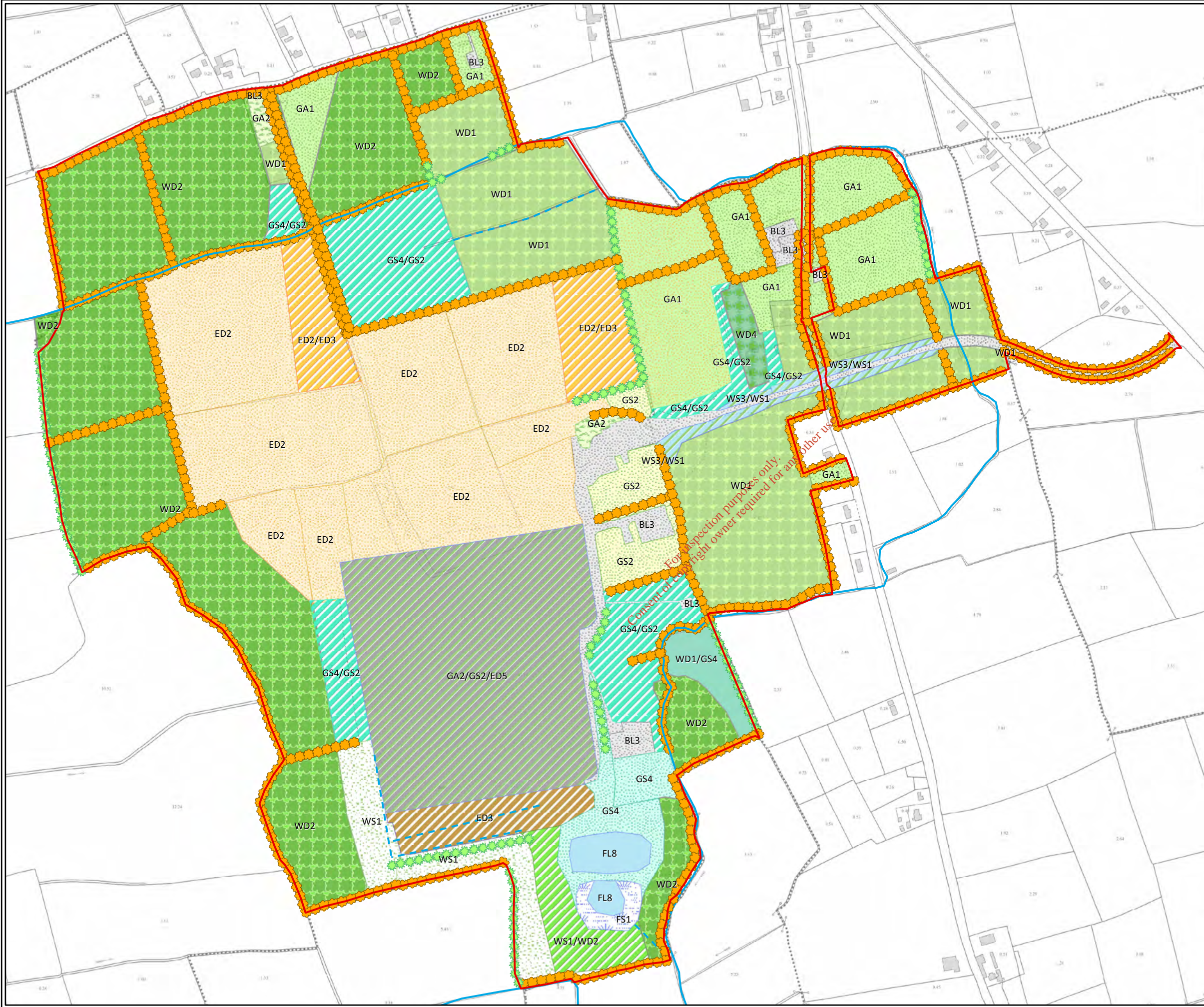
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# Appendix 1

## Figures

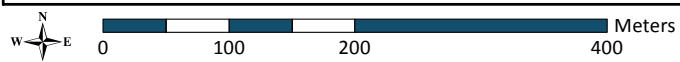
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- Planning Boundary
- Habitat**
- FW1 - eroding river
- FW4 - drainage ditches
- WL1 - hedgerow
- WL2 - treeline
- BL3 - buildings and artificial surfaces
- ED2 - spoil and bare ground
- ED2 / ED3 - spoil and bare ground / recolonising bare ground mosaic
- ED3 - recolonising bare ground
- FL8 - artificial lakes and ponds
- FS1 - reed and large sedge swamps
- GA1 - improved agricultural grassland
- GA1 / GS4 - improved agricultural grassland / wet grassland mosaic
- GA2 - Amenity
- GA2/GS2/ED5 - amenity grassland / dry meadows and grassy verges / refuse and other waste
- GS2 - dry meadows and grassy verges
- GS4 - wet grassland
- GS4 / GS2 - wet grassland / dry meadows and grassy verges mosaic
- WD1 - (mixed) broadleaved woodland
- WD1 / GS4 - (mixed) broadleaved woodland / wet grassland mosaic
- WD2 - mixed broadleaved / conifer woodland
- WD4 - Conifer Plantation
- WS1 - scrub
- WS1 / WD2 - scrub / mixed broadleaved-conifer woodland mosaic
- WS3 / WS1 - ornamental/non-native shrub / scrub mosaic

<b>TITLE:</b>	Habitats
<b>PROJECT:</b>	Knockharley Landfill, Co. Meath
<b>FIGURE NO.:</b>	1
<b>CLIENT:</b>	Knockharley Landfill Ltd.
<b>SCALE:</b> 1:6000	<b>REVISION:</b> 0
<b>DATE:</b> 21/10/2019	<b>PAGE SIZE:</b> A3



# Appendix 7

## Drawings

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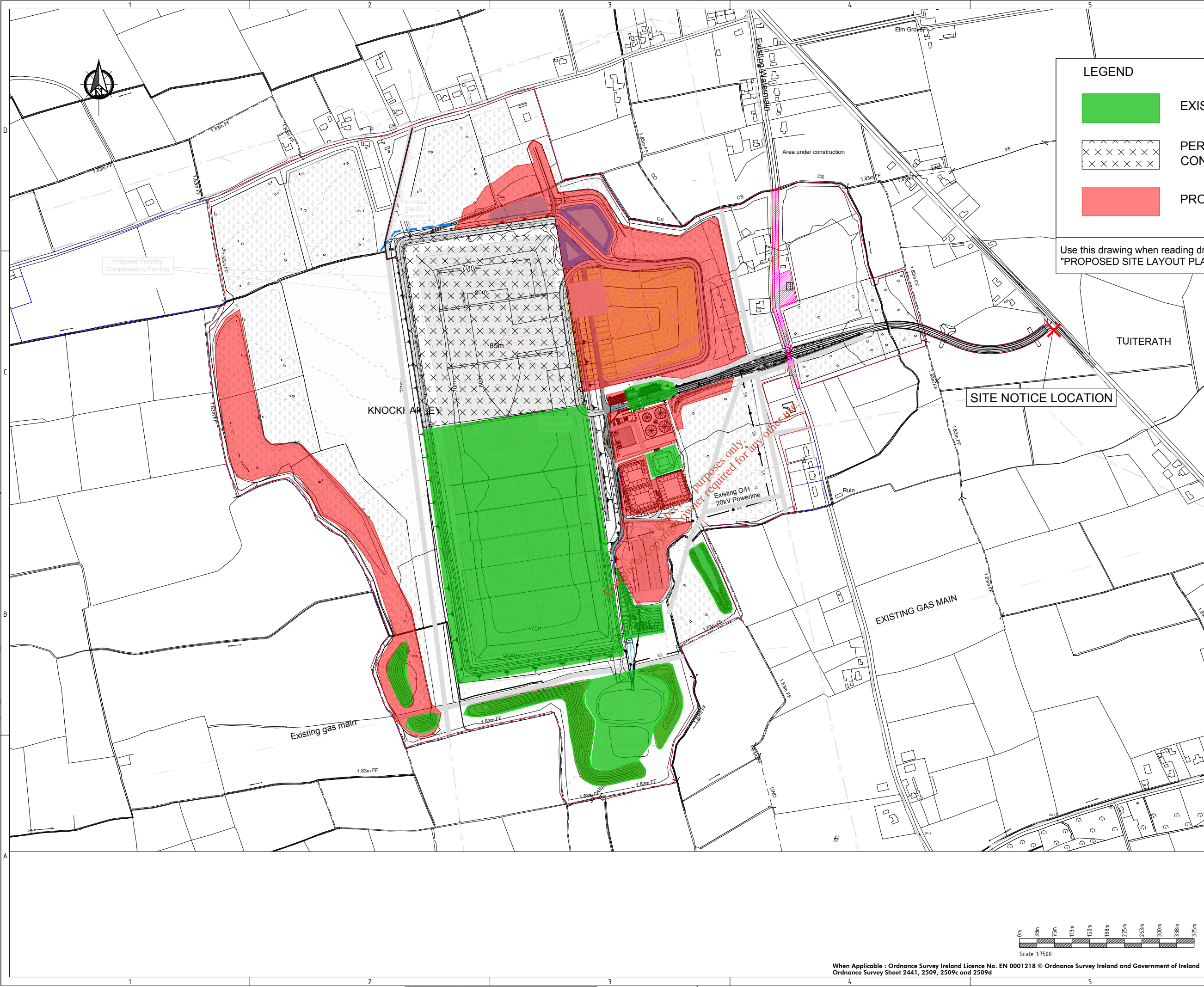
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**LEGEND**

- EXISTING PERMITTED ELEMENTS
- PERMITTED ELEMENTS NOT YET CONSTRUCTED
- PROPOSED ELEMENTS

Use this drawing when reading drawing LW14-821-01-P-0000-003, "PROPOSED SITE LAYOUT PLAN"

Planning Boundary  
 Areas Within Planning Boundary, Not Within Application Site  
 Ownership Boundary  
 Refer to dwg P-0000-BDY For Clarity



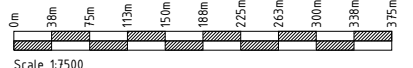
This drawing is for planning purposes only. No other purposes required for any other use.

A	Cork	09.10.19	Issue For Planning RFI
Rev.	Drawn	Rev Origin	Description
	CHK'd	Date	
	App'd	Date	
Revision History A <span style="float: right;">E I A R</span>			
Name of Client			
KNOCKHARLEY LANDFILL LTD.			
Name of Job			
PROPOSED DEVELOPMENT AT KNOCKHARLEY LANDFILL			
Title of Drawing			
OVERVIEW OF EXISTING, PERMITTED AND PROPOSED DEVELOPMENT			
Scales Used			This Drawing was printed to
1:7500			A3-
Dwg. No.			Rev.
LW14-821-01-P-0000-014			A

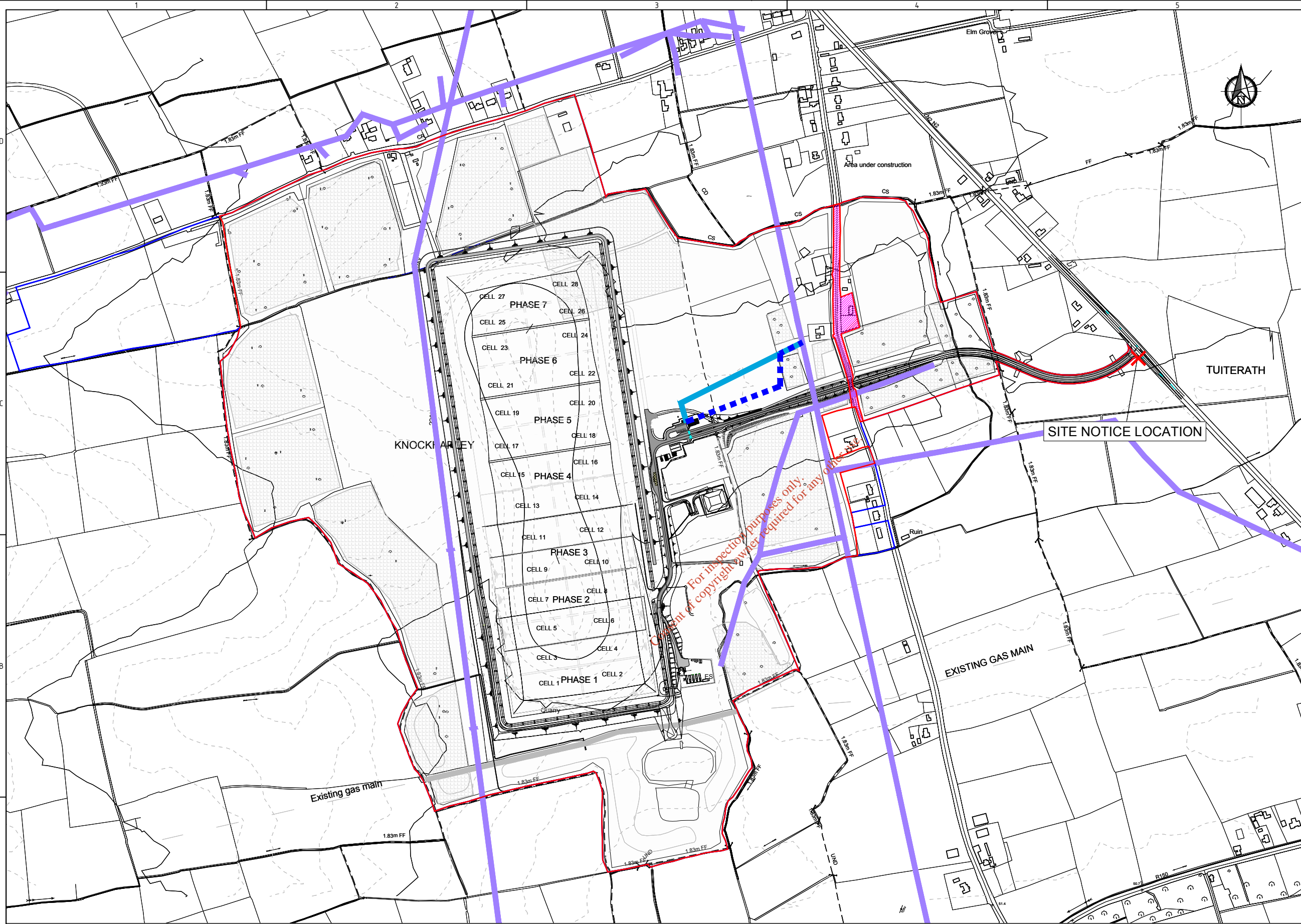
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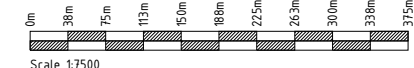
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**LEGEND**

- Planning Boundary
- Areas Within Planning Boundary, Not Within Application Site
- Ownership Boundary  
Refer to dwg P-0000-BDY For Clarity

SCALE - VERTICAL

- EXISTING OVERHEAD ESB POWERLINES
- PROPOSED OVERHEAD ESB POWERLINE
- EXISTING OVERHEAD ESB POWERLINE TO BE RELOCATED
- - - - LOCATION OF RELOCATED ESB POWERLINE



Rev.	Drawn By	Checked	App'd	Rev Origin	Date	Description
A	SK	CC	CC	Cork	09.10.19	Issue For Planning RFI
Revision History						
Name of Client						
KNOCKHARLEY LANDFILL LTD.						
Name of Job						
PROPOSED DEVELOPMENT AT KNOCKHARLEY LANDFILL						
Title of Drawing						
OVERVIEW OF OVERHEAD POWERLINES						
Scales Used						This Drawing was printed to
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Dwg. No.						Rev.
LW14-821-01-P-0050-014						A

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