Vermilion E&P Ireland Limited

CORRIB BIODIVERSITY ACTION PLAN 2021-2026

VERMILION
ENERGY

Front cover:
Sruwaddacon Bay

This page: Offshore pipeline landfall at Glengad

Acknowledgements

This, the second Corrib Biodiversity Action Plan has been prepared, collated and edited on behalf of Vermilion Exploration & Production Ireland Limited (VEPIL) by their consultant Ecological Adviser, Jenny Neff (EACS - Ecological Advisory and Consultancy Services).

Thanks are due to all those who have contributed to the collation of data and provided expert input and advice to this Biodiversity Action Plan in respect of habitats and species, including the ecological team led by Jenny Neff CEcol CEnv FCIEEM, comprising: Dr. John Conaghan MCIEEM, Dr. Gavin Fennessy MCIEEM, Ger Morgan (Aquatic Services Unit, UCC), Dr. Chris Smal MCIEEM; landscape architect, Kate McDermott MILI CMLI; ornithological peer reviewer, John Wilson; the many ecologists who assisted in the wide range of terrestrial ecological surveys since 2001; and to the marine ecological team at RSK, in particular David Watson and Andrew Bendell; and to benthic specialist Ian Wilson, at Benthic Solutions.

Thanks are due to those who kindly provided photographic images for this BAP; and to RPS and RSK for assistance with mapping for Figures 6.1 and 6.2 respectively. Also, to those who have reviewed and proof read drafts of this BAP; and those who have assisted with its publication.

We are grateful to BirdWatch Ireland for undertaking the bird data analyses resulting in the publication of four papers; and to Waterford Institute of Technology for carrying out Otter and Pine Marten DNA analyses. Also, to Bord na Móna, in particular ecologist David Fallon, for help in sourcing and providing donor sites for species transplants and seed used in habitat restoration and enhancement at Aughoose.

Thanks are due to the specialists and local staff of the National Parks and Wildlife Service (NPWS) who have been available for consultation throughout the years and have provided advice in relation to designated conservation sites and protected species.

Finally, but not least to VEPIL's Team, in particular Operations Manager, Jarlath Trench and Environmental Advisor, Catriona King, for their continuing support for, and understanding of, the importance of ecology and biodiversity.

Highlights of the Biodiversity Action Plan 2014-2020*

150
Monitoring survey campaigns completed by specialist ecologists

c.70,000
(10 hectares) native trees and shrubs

Habitat Enhancement

5,200
Sphagnum moss plugs

64,000
Bog-cotton transplants

25
Wetland ponds constructed on the pipeline wayleave and at the Terminal

101
Boxes erected for birds, bats and Pine Martens

60kg
Locally sourced heather and purple moor grass seed sown in areas of bare peat

Collaboration
4 papers published with BirdWatch Ireland on Waterbird and Sand Martin monitoring

DNA analyses
with Waterford Institute of Technology, to study local populations of Otter and Pine Marten

Wildflower
meadow planted for pollinators at the terminal

Protocols
in place for protected species (terrestrial & marine) & invasive species

Land Management Plan
Provides a framework for responsible land stewardship

*See Chapter 4 for details of the key measures implemented

Species rich grassland on LVI side slopes

FOREWORD

The wild beauty of Erris is captivating and it is a privilege to be able to protect the habitats and species in the stewardship of Vermilion. That's why it is our distinct pleasure to welcome you to the second Corrib Biodiversity Action Plan. This document provides an update on the actions from the first BAP and describes our commitments and actions for the next five years.

The first Biodiversity Action Plan for Corrib was published in 2014 and covered all the geographical area of operations for the project, from the wells 83 kilometres offshore to the Bellanaboy Bridge Gas Terminal. This, the second Corrib BAP further exemplifies how we manage our activities with a focus on protecting the habitats and species around us, by proactively identifying our biodiversity risks and opportunities, and implementing associated measures and plans. It demonstrates that it is possible to have a neutral, and in some respects positive, impact on local habitats and biodiversity.

We incorporate the management of impact on biodiversity into the day-to-day running of Corrib. In addition, we are pleased to share with the scientific and wider community data that has been collected over some twenty years of monitoring.

The BAP is an example of how, as a responsible energy producer, Vermilion seeks to operate our business in the most environmentally responsible manner possible. By using environmental risk as part of our development decision criteria, and by continually seeking improved environmental performance in our operations, we follow the Precautionary Principle introduced in 1992 by the United Nations' Rio Declaration on Environment and Development. We understand that protecting biodiversity is of critical importance globally, and that they also form an intrinsic part of local culture and identity.

Furthering this approach, Vermilion renewed its Sustainability strategy in 2021, detailing our long-term commitment to the environment, biodiversity and the communities that we operate in. This includes our target to reach net zero emissions in our own operations, including Scope 1 and Scope 2 emissions, by 2050. To achieve this, we will be setting shorter-term targets every five years, with the initial target to reduce Scope 1 emissions from our operations by 15 to 20% by 2025, using a baseline year of 2019.

Vermilion's partnership with Corrib started in 2009, and we assumed operatorship in late 2018. We are proud to continue the project's history of excellence in environmental stewardship. We particularly want to acknowledge the support of our Joint Venture Partners, Equinor and Nephin Energy Limited, and their commitment to delivering on this plan. Also, we would like to thank our key stakeholders, including our neighbours, local communities, employees and contractors, for their engagement and support as well.

Curtis Hicks
CEO
Vermilion Energy

Ryan Carty
Managing Director
Vermilion E&P Ireland

Terminal - view south across the western fields

Executive Summary

Biodiversity is a contraction of the term 'biological diversity' and includes all macro- and micro-organisms of flora and fauna on Earth, and the habitats in which they live. Biodiversity is vital for sustaining the ecosystems which also have a social and economic value, providing goods and services that intrinsically sustain human life in many ways.

In an attempt to address the global decline in biodiversity in 1992, at the Earth summit in Rio de Janeiro, Brazil, the Convention on Biological Diversity was signed. This, the first global agreement on the conservation and sustainable use of biological diversity, was subsequently ratified by more than 180 countries including Ireland, in 1996.

The Convention has been implemented in Ireland by means of the National Biodiversity Action Plan, the third of which, for 2017-2021, was published in October 2017 - much of which was already legislated for by the Wildlife Act, 1976-2018 (as Amended). The National Biodiversity Action Plan 2017-2021 states its vision as: "That biodiversity and ecosystems in Ireland are conserved and restored, delivering benefits essential for all sectors of society and that Ireland contributes to efforts to halt the loss of biodiversity and the degradation of ecosystems in the EU and globally."

This, the second Biodiversity Action Plan (BAP) for Corrib has been developed in accordance with the national strategy on biodiversity and that of the oil and gas industry. It is in accordance with Vermilion's corporate policy on sustainability, i.e. "As a responsible oil and gas producer, Vermilion Energy Inc. consistently delivers long-term shareholder value by operating in an economically, environmentally and socially sustainable manner that is recognized as a model in our industry".

The Corrib natural gas field is located off the Co Mayo coast, approximately 83 km offshore. The Corrib Asset comprises a subsea 'tie-back' facility, connected by a pipeline to the onshore processing terminal located approximately 9 km inland, the Bellanaboy Bridge Gas Terminal (BBGT) [the Terminal]. Operations commenced at the end of 2015, when the first gas came ashore.

Corrib has been unusual in respect of commercial developments in that the planning and construction phases took longer than originally anticipated. This resulted in a substantial amount of habitat and species data being collected over a significantly longer period of time than would normally be the case, and with a commensurate accumulation of knowledge and understanding of the environment in which the Corrib Asset is placed. Thus, an extensive biodiversity database has been built up since 2001. Much of northwest Mayo is designated for nature conservation under Irish and European legislation. Sites in the wider locality are listed and those sites in close proximity to, or on which the Corrib Asset impinges, are described.

An overview of biodiversity from the Corrib Field to the Terminal site at Bellanaboy is provided, including marine, intertidal, and onshore habitats and species.

The aim of this BAP is to conserve, protect, maintain, and enhance biodiversity and ecosystem services within the zone of influence of the Corrib Asset and its various elements during operations. It provides a review of the outcomes from objectives and actions of the 2014-2019 BAP which covered the transition from construction, through habitat reinstatement and into operations.

In respect of the offshore pipeline, the objectives of the BAP are restricted to Broadhaven Bay and within the Broadhaven Bay SAC itself. Habitats and species in respect of: nearshore and intertidal sections of the offshore pipeline, the entire onshore pipeline (including intertidal habitats), and the Terminal site at Bellanaboy, are included because of their location in relation to the designated conservation sites in the locality. This rationale is consistent with the national biodiversity strategy to put local plans in context, especially in relation to existing designations.

The 2017-2021 National Biodiversity Action Plan objectives include a commitment to "conserve and restore biodiversity and ecosystem services"; an approach in line with the oil and gas industry's policy and its commitment in respect of biodiversity and is included in the Objectives of this BAP.

The Corrib BAP 2021-2026 sets out nine objectives, which are:

1: Protect habitats and species

2: Consult with stakeholders and other interested parties, as appropriate

3: Apply best practice in managing lands under VEPIL's stewardship for the benefit of biodiversity and ecosystem services

4: Explore opportunities to further enhance biodiversity on lands in the stewardship of VEPIL

5: Implement protocols to control invasive species

6: Contribute to awareness and sustainable use of biodiversity through day to day activities

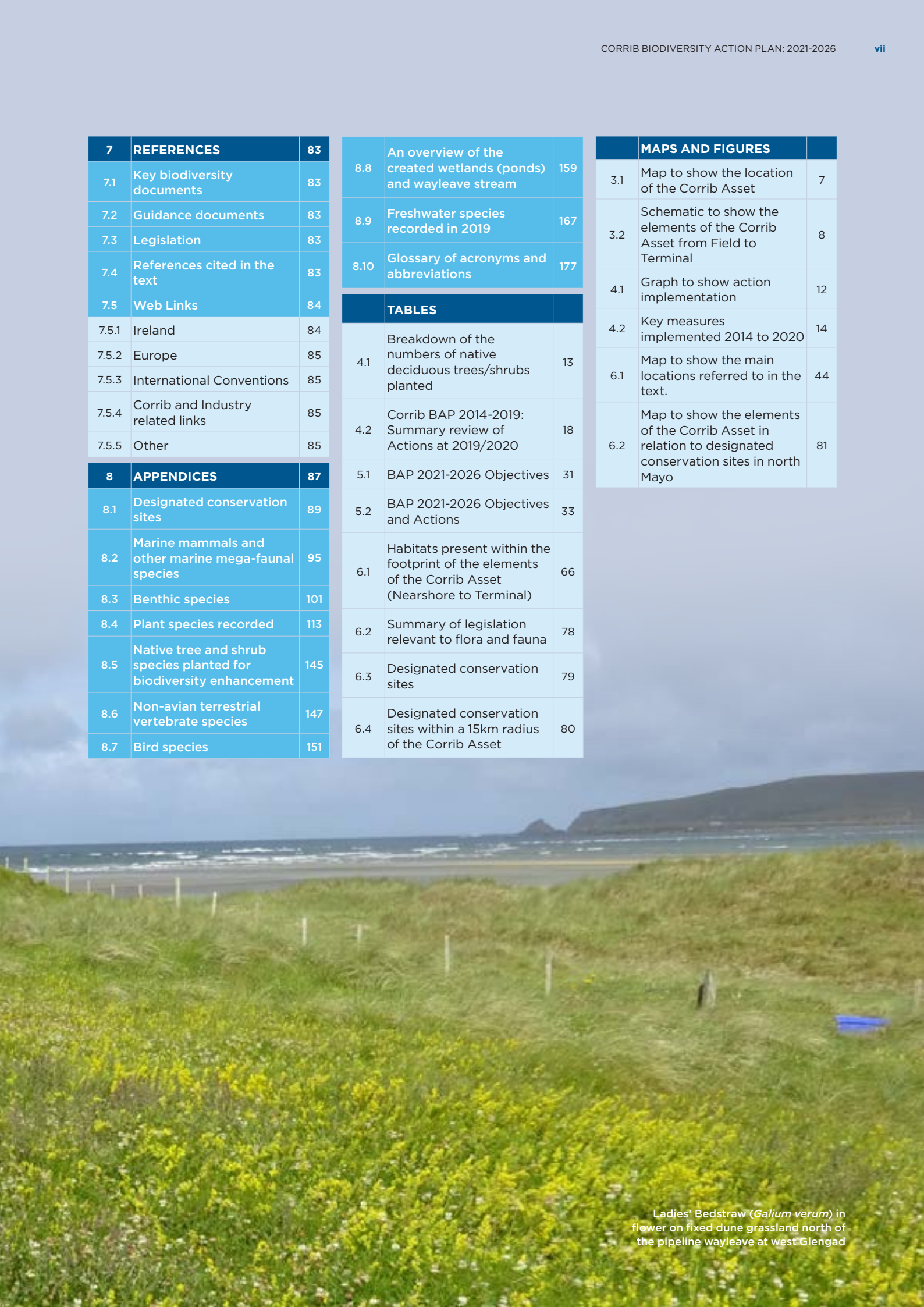
7: Promote the distinctiveness and quality of the area's biodiversity

8: Provide species records and habitat quadrat data to the National Biodiversity Data Centre and share data with the wider scientific community.

9: Review of the Biodiversity Action Plan

A total of 44 Actions are included within these Objectives. The BAP will run for a five-year period which will be reviewed and evaluated at intervals. Provision is made for an interim review and evaluation to commence in 2023.

CONTENTS



Ladies' Bedstraw (*Galium verum*) in flower on fixed dune grassland north of the pipeline wayleave at west Glengad

Bog-Myrtle (*Myrica gale*) on the wayleave

1 INTRODUCTION

This, the second Corrib Biodiversity Action Plan (BAP), has been prepared, collated and edited on behalf of Vermilion Exploration & Production Ireland Limited (VEPIL) by their consultant Ecological Adviser, Jenny Neff (*EACS* - Ecological Advisory and Consultancy Services), with input from specialist experts in the ecological team.

Although the first Biodiversity Action Plan had been scheduled to run from 2014-2019 inclusive, owing to the exceptional circumstances in 2020 caused by the Covid-19 pandemic, the preparation of the second biodiversity action plan was significantly delayed. It was decided, therefore, to include 2020 in the review of the 2014-2019 Plan and for this second BAP to run from 2021 to 2026.

It comprises the following key sections:

- Biodiversity and its importance locally and in the wider context
- An overview of the Corrib Asset
- A summary review of the Objectives and Actions under the Corrib BAP 2014-2019 (2020)
- The Objectives and Actions going forwards, from 2021 to 2026
- An account of the habitat and species within the Corrib Asset's footprint, including: the offshore pipeline; onshore pipeline wayleave; and the Terminal site at Bellanaboy.

A list of relevant references, links and sources is provided.

Species information relating to various habitat types, marine and terrestrial, is provided in the appendices.

Sruwaddacon Bay

Native White water-lily (*Nymphaea alba*) on wayleave wetland 8

2 BIODIVERSITY

2.1 What is biodiversity?

Biodiversity is a contraction of the term 'biological diversity' and includes all macro- and micro-organisms of flora and fauna on Earth, and the habitats in which they live. Biodiversity as we know it today has evolved over aeons and is a complex "web of life", on the interactions of which all species depend, including ourselves as human beings. Biodiversity also includes genetic variability within species, which results in sub-species, and varieties, in the wild and domestically, for example horticultural and domestic animal varieties. This genetic variability is vital for species survival and their ability to continue to adapt (evolve) to changing conditions and local environments.

2.2 Why is biodiversity important?

Biodiversity is vital for sustaining ecosystems which also have a social and economic value, providing goods and services that intrinsically sustain human life in many ways. For example, in the provision of food, shelter, fuel, clothing, clean water, and medicines derived from plants. Habitats and landscapes contribute to our social and mental well-being, and as well as having economic value in terms of recreation and tourism, they reflect human history and culture, thus giving a 'sense of place'. This is aptly demonstrated in Ireland, where tourism has been a vital part of the national economy for decades.

Human influence in recent millennia has increasingly shaped the biodiversity of the world. Not only through the alteration of habitats, and changing landscapes, but often through a loss in species biodiversity, sometimes catastrophically. The modern landscape in Ireland is no less a product of human practices over time, which have included: the felling of native woodlands in tandem with the expansion and intensification of agriculture, and the spread of urbanisation; the exploitation of peat deposits for centuries by hand as a source of fuel for domestic use, and more recently by mechanical means for fuel and horticulture at a commercial level; and the increase of non-native commercial afforestation.

Many species have become extinct and increasing numbers are under threat. In recent years there has been a sharp decline in biodiversity world-wide.

2.3 International and National Context

2.3.1 Convention on Biodiversity

In an attempt to address the global decline in biodiversity in 1992, at the Earth summit in Rio de Janeiro, Brazil, the Convention on Biological Diversity was signed[1]. This, the first global agreement on the conservation and sustainable use of biological diversity, was subsequently ratified by more than 180 countries. The Convention, which was signed by Ireland in 1992 and ratified in 1996, has three main goals:

- The conservation of biodiversity.
- Sustainable use of the components of biodiversity.
- The fair and equitable sharing of the benefits arising out of the utilisation of genetic resources.

The implementation of the Convention requires biodiversity to be integrated across various sectors at international, national and local level, and is overseen and organised by the Conference of Parties. Countries that have ratified the Convention are obliged to submit national status reports at

1 http://www.biodiv.org/

regular intervals, the first being submitted in 1998. Article 6 of the Convention sets out the general measures for conservation and sustainable use, including the provision for national biodiversity strategies or plans and the integration of biodiversity concerns, as follows:

- Article 6(a) *Develop national strategies*, plans or programmes for the conservation and sustainable use of biological diversity or adapt for this purpose existing strategies, plans or programmes which shall reflect, inter alia, the measures set out in this Convention relevant to the Contracting Party concerned.
- Article 6(b) requires each Contracting Party to '*integrate, as far as possible and as appropriate, the conservation and sustainable use of biological diversity into relevant sectoral or cross sectoral plans, programmes and policies*.

2.3.2 National and local implementation

The Convention has been implemented in Ireland by means of the National Biodiversity Action Plan[2], the third of which (2017-2021) was published in October 2017; much of which had already been legislated for by the Wildlife Act, 1976-2018 (as Amended). Parties to the UN Convention on Biological Diversity (CBD) are required by Article 26 of the Convention to submit national reports to the Conference of the Parties on measures taken for the implementation of the Convention and their effectiveness in meeting the objectives of the Convention. The 6th National Report (May 2019)[3] reviewed Ireland's progress on achieving the 20 Aichi Targets in the CBD Strategic Plan for Biodiversity 2011-2020 and noted that progress had been partially effective, but at an insufficient rate. However, it is widely acknowledged that a transformational change is required to achieve the National Biodiversity Action Plan's (2017-2021) vision: "That biodiversity and ecosystems in Ireland are conserved and restored, delivering benefits essential for all sectors of society and that Ireland contributes to efforts to halt the loss of biodiversity and the degradation of ecosystems in the EU and globally."

The national strategy for biodiversity provides for the production of local plans, and sectoral plans, with biodiversity information and data feeding into national resources through facilities such as the National Biodiversity Data Centre (http://www.biodiversityireland.ie/), which was set up as an action under the 2002 National Biodiversity Plan.

The importance of natural capital and ecosystem services is becoming increasingly recognised globally and in Ireland, with businesses being encouraged to develop policies and take action in this regard. Opportunities for Irish businesses to engage with biodiversity and ecosystem services have increased in recent years, with Business in the Community[4] Ireland's Biodiversity Framework for Business putting biodiversity in focus and Natural

2 https://www.npws.ie/sites/default/files/publications/pdf/National%20Biodiversity%20Action%20Plan%20English.pdf
3 https://www.npws.ie/sites/default/files/files/NPWS%20Biological%20Diversity%20web.pdf
4 https://www.bitc.ie/

Sruwaddacon Bay

Capital Ireland[5] (formerly known as the Irish Forum for Natural Capital) taking a leading role.

2.3.3 Why a biodiversity action plan?

For Corrib to have a Biodiversity Action Plan is therefore completely in accordance with the national strategy on biodiversity. The Irish National Biodiversity Action Plan 2017-2021 included commitments to "Mainstream biodiversity into decision-making across all sectors" and to "conserve and restore biodiversity and ecosystem services". The oil and gas industry's (IPIECA[6]) policy and commitment in respect of biodiversity also reflects this approach.

The Corrib Biodiversity Action Plan 2014-2019, published by the developer and first operator, Shell E & P Ireland Ltd. (SEPIL), was in line with the Shell Group's policy on biodiversity and their activities in sensitive areas at that time and took into account the overall goal, objectives and principles of the National Biodiversity Action Plan 2011-2016 together with Shell's Corporate policy in respect of biodiversity.

This second Corrib Biodiversity Action Plan (BAP) 2021-2026 has also been developed in accordance with the national strategy on biodiversity and that of the oil and gas industry. It is in accordance with Vermilion's corporate policy on sustainability[7], which states "As a responsible oil and gas producer, Vermilion Energy Inc. consistently delivers long-term shareholder value by operating in an economically, environmentally and socially sustainable manner that is recognized as a model in our industry". This BAP has been prepared with due reference to the current National Biodiversity Action Plan and the following guidance documents:

- *'Guidelines for the Production of Local Biodiversity Action Plans' (*2003, drafted by the Heritage Council and published by the Department of Environment, Heritage and Local Government (DoEHLG));
- "*A Guide to Developing Biodiversity Action Plans for the Oil and Gas Sector*" (2005, International Petroleum Industry Environmental Conservation Association (IPIECA) and the International Association of Oil and Gas Producers (OGP))
- "*Biodiversity Action Plans for Business*" (2011) published by Notice Nature, Department of Arts Heritage and the Gaeltacht (DAHG).

5 https://www.naturalcapitalireland.com/
6 https://www.ipieca.org/
7 http://sustainability.vermilionenergy.com/ourapproach/sustainability/our-approach-to-sustainability-overview.cfm

03

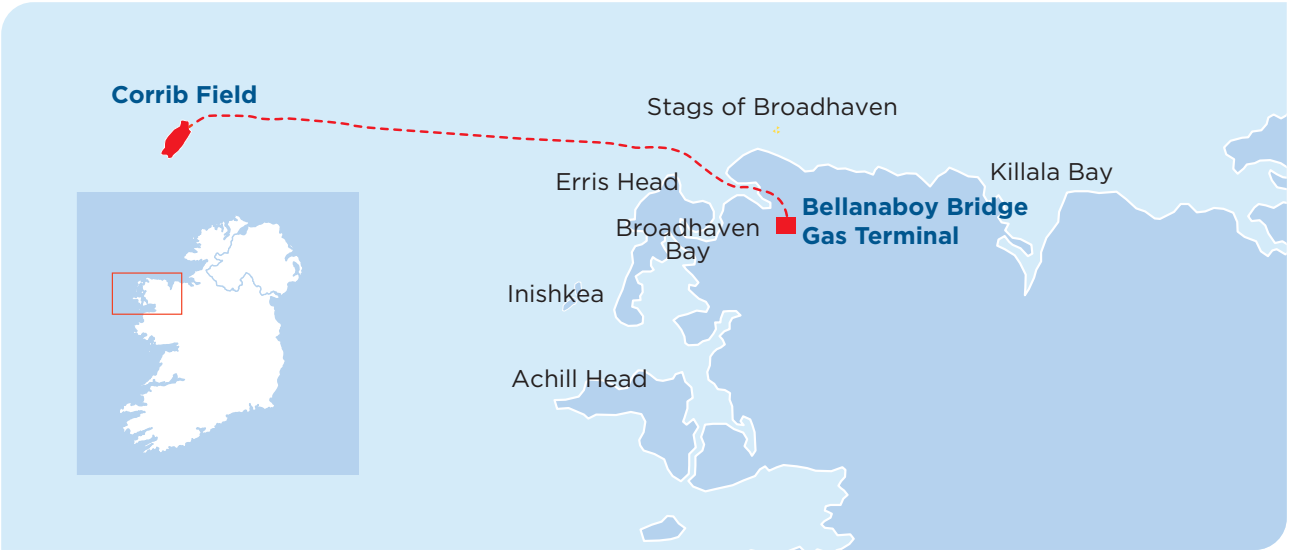
Broadhaven Bay from the Glengad landfall

3 THE CORRIB ASSET - AN OVERVIEW

3.1 Background

The Corrib Gas Field is located off the County Mayo coast, approximately 83 km offshore. (Figure 3.1) It was discovered in 1996 by Enterprise Energy Ireland Ltd, which was subsequently acquired by the Royal Dutch Shell Group in 2002. Vermilion, a Corrib Partner since 2009, took over the running of operations in late 2018.

Figure 3.1 Map to show the location of the Corrib Asset



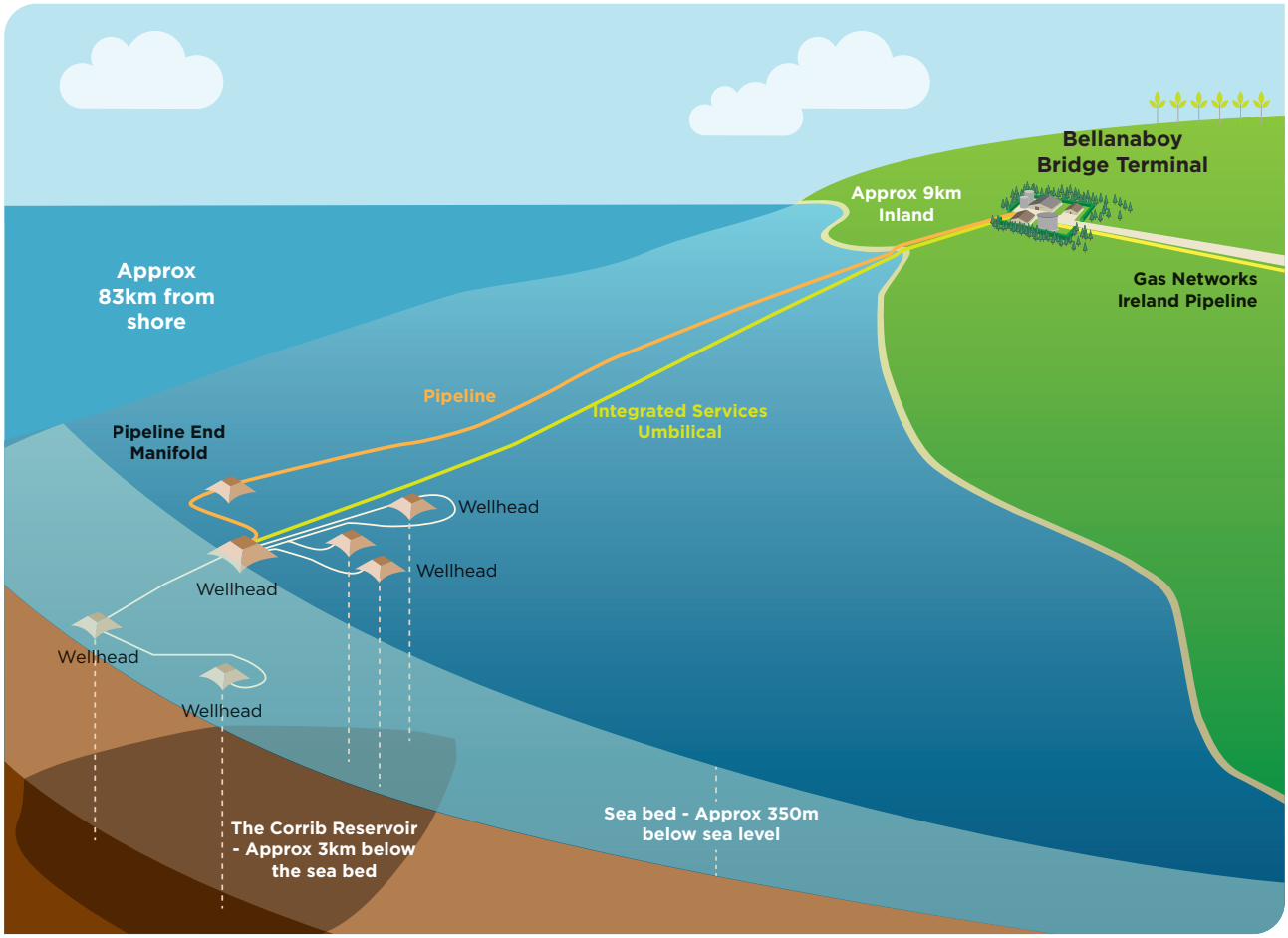
The Corrib Asset comprises a subsea 'tie-back' facility, connected by a pipeline to the onshore Bellanaboy Bridge Gas Terminal (BBGT) located approximately 9 km inland from the landfall. The Field comprises a series of gas wells and seabed infrastructure in the Corrib Field; a manifold that gathers the flow of gas from each of the wells; and a pipeline to the Terminal (Figure 3.2). The pipeline comes ashore at Glengad on the eastern shore of Broadhaven Bay from where runs underground to the Terminal. For 4.9 km of its length the pipeline is installed in a tunnel, of which 4.6 km runs under Sruwaddacon Bay. A multipurpose umbilical runs from the Terminal to the Corrib Field. The treated water outfall pipeline for the discharge of treated surface water run-off from the Terminal runs along the route of the pipeline between the Terminal and a point offshore approximately 12.7 km from the landfall. The Landfall Valve Installation (LVI) is situated at Glengad close to the landfall of the offshore pipeline, its function being to limit the pressure of the gas in the onshore section of the pipeline.

Operations commenced in December 2015, with first gas coming ashore at that time and with treated gas entering the national gas network.

3.2 Habitats and species data collection

Habitat and species data have been collected since 2001 in the course of baseline and monitoring surveys. These data have provided an understanding of the receiving environment and Corrib's context in the wider ecological landscape. Data collection has been undertaken as required, in connection with the various statutory applications, permits and consents for both construction and operations. Since the start of operations, ecological monitoring has continued in accordance with statutory and regulatory consent requirements, also as per requirements set out in the Corrib Biodiversity Action Plan 2014-2019 and Land Management Plan (LMP).

Figure 3.2 Schematic to show the elements of the Corrib Asset from Field to Terminal



View across the Leenamore inlet, from east to west (pipeline marker in foreground)

Species rich grassland on verges at the Terminal

4 REVIEW of the CORRIB BAP 2014-2019 (2020)

4.1 Introduction

Although the first Biodiversity Action Plan had been scheduled to run from 2014-2019, owing to the exceptional circumstances in 2020 caused by the Covid-19 pandemic the preparation of the second biodiversity action plan was significantly delayed. It was decided therefore to include 2020 in the review of the 2014-2019 Plan, with the second BAP running from 2021 to 2026.

The life of the 2014-2019 BAP marked the crucial transition from construction to operations and from the biodiversity perspective included the vital habitat reinstatement phase of construction for the Terminal site and the Pipeline. At the outset of the Corrib Development a commitment was made to reinstate habitats disturbed by construction and, where appropriate / feasible, to put in place biodiversity enhancement measures. As reported in the first BAP, in 2011 Corrib was chosen, amongst others, as a pilot case for the testing of the No Net Loss (NNL) and Net Positive Impact (NPI) principles for the Shell Group. The study was conducted by the Biodiversity Consultancy[8] which took all project elements into consideration and found that "*without any existing NNL policy, best practice at Corrib has resulted in a project design which is predicted to be Net Neutral or Net Positive for biodiversity by 2020*".

This has been borne out by the positive effects from habitat enhancement and diversification measures that are already becoming evident, with, for example, wetland creation attracting a range of invertebrate species and leading to an increase in recorded bat species. Similarly, the extensive planting of native species of deciduous trees and shrubs planting is beginning to show positive effects in terms of observed invertebrate diversity.

Of note too, is the fact that the 2014-2019 BAP was used as a case study in the 2020 Science & Technology Classroom lesson (http://sta.ie/) (See Action 6.19 in Table 4.2).

4.2 Action implementation

As shown in the graph at Figure 4.1, of the 53 actions, 22 were fully implemented during the life of the BAP; and 25 had been fully implemented in respect of construction and habitat reinstatement and have been / are ongoing during Operations, which when taken together equates to c. 89% of the actions being fully implemented by the end of construction and reinstatement. Of the remaining ones, 4 were limited in their implementation and 2 were not implemented owing to changed circumstances, including regulatory requirements.

8 www.thebiodiversityconsultancy.com

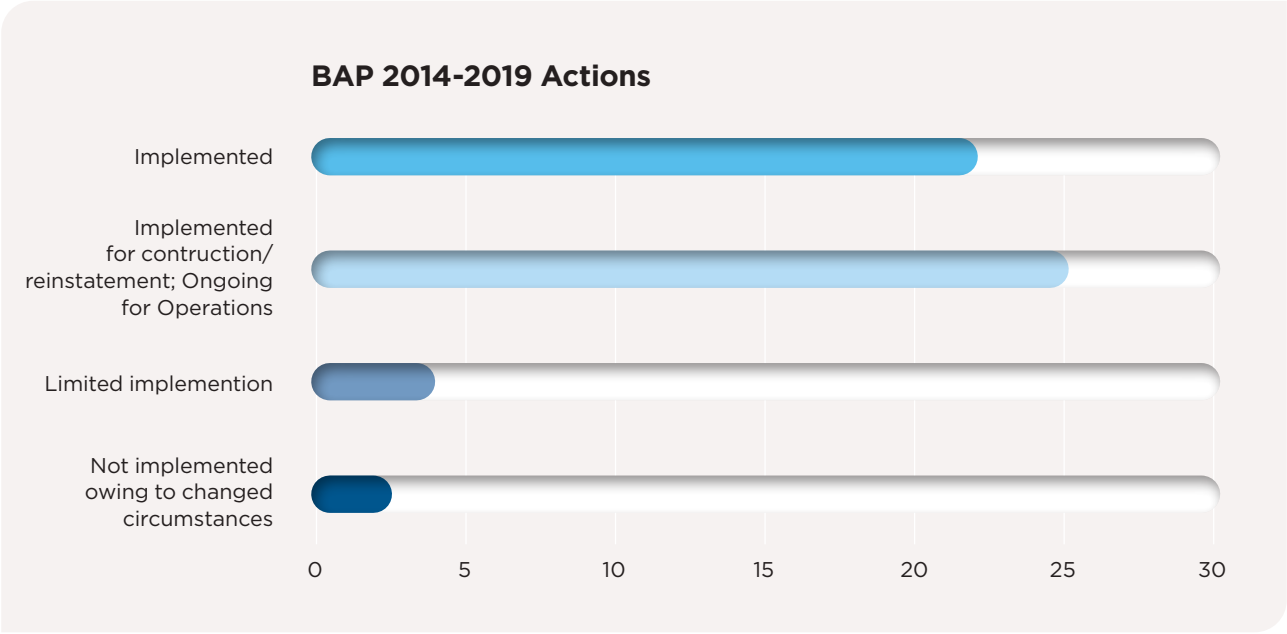


Figure: 4.1 Graph to show action implementation

4.3 Summary review of Actions

A summary review of the 12 Objectives and 53 Actions in the Corrib BAP 2014-2019 (2020) is set out in Table 4.2. The key points in relation to the implementation of Objectives and their constituent Actions are as follows:

- *Objective 1: Protect habitats and species by means of appropriate mitigation measures during the construction and operation of the various elements of the development*

  This objective was primarily concerned with the protection of habitats and species during construction of the Corrib Asset, with all Actions met during that phase.

- *Objective 2: Monitor habitats and species during and following construction of the various elements of the development*

  Monitoring continued throughout the life of the 2014-2019(2020) BAP being fully implemented and compliant in respect of statutory consents for construction of the Terminal and the Pipeline. Monitoring is ongoing for operations. The extensive monitoring effort has included:

  - Habitat and botanical surveys;
  - Otter and general fauna surveys;
  - Bat surveys (active and passive);
  - Winter waterbird surveys (target species - Light-bellied Brent Goose);
  - Summer waterbird surveys;
  - Breeding and general bird surveys;
  - Breeding Sand Martin monitoring surveys;
  - Wetland /pond surveys;
  - Small Stream Risk Surveys (SSRS for Terminal IEL);
  - Marine mammal monitoring; and
  - Marine invasive species monitoring.

- *Objective 3: Consult with stakeholders and other interested parties, as appropriate*

  This has been continuous throughout the life of the BAP and, with new systems in place for operations, is ongoing.

- *Objective 4: Reinstate habitats affected by the construction of the development*

  This was one of the key objectives in biodiversity terms. Reinstatement Plans were developed and fully implemented for the Pipeline (onshore) and Terminal. The key Actions were 4.2 and 4.3, with the latter being one of the success stories of reinstatement as shown in Table 4.1.

  Some 64,000 plantlets of Common Bog-cotton (*Eriophorum angustifolium*) were transplanted from local donor sites to degraded blanket bog habitat at Aughoose where the tunnelling site compound had been located during construction. This species quickly colonised areas of bare peat, thereby reducing the potential for carbon release.

  Seed of native blanket bog species was collected locally and spread on suitable areas of bare peat. This included *Erica* spp, *Calluna* and *Molinia*.

  More than 5000 *Sphagnum* plugs (BeadaHumoks™) that were micro propagated from material collected on site prior to construction commencing) were planted in degraded blanket bog habitat in order to improve the habitat and carbon sequestration in the future. (Plate 1)

Plate 1: BeadaHumok™

In the order of 91,000 native trees and shrubs were planted during reinstatement, across a total approximate area of 10 hectares. The success rate was variable from one location to another, resulting in a net gain of 70,238 deciduous trees and shrubs (Table 4.1). The main contributory factors to failure being poorly drained, wet ground conditions at the time of planting and root establishment; and subsequent Hare damage. Damage by Red Deer was also noted at some locations but far less prevalent than Hare damage.

Table 4.1 Breakdown of the numbers of native deciduous trees/shrubs planted

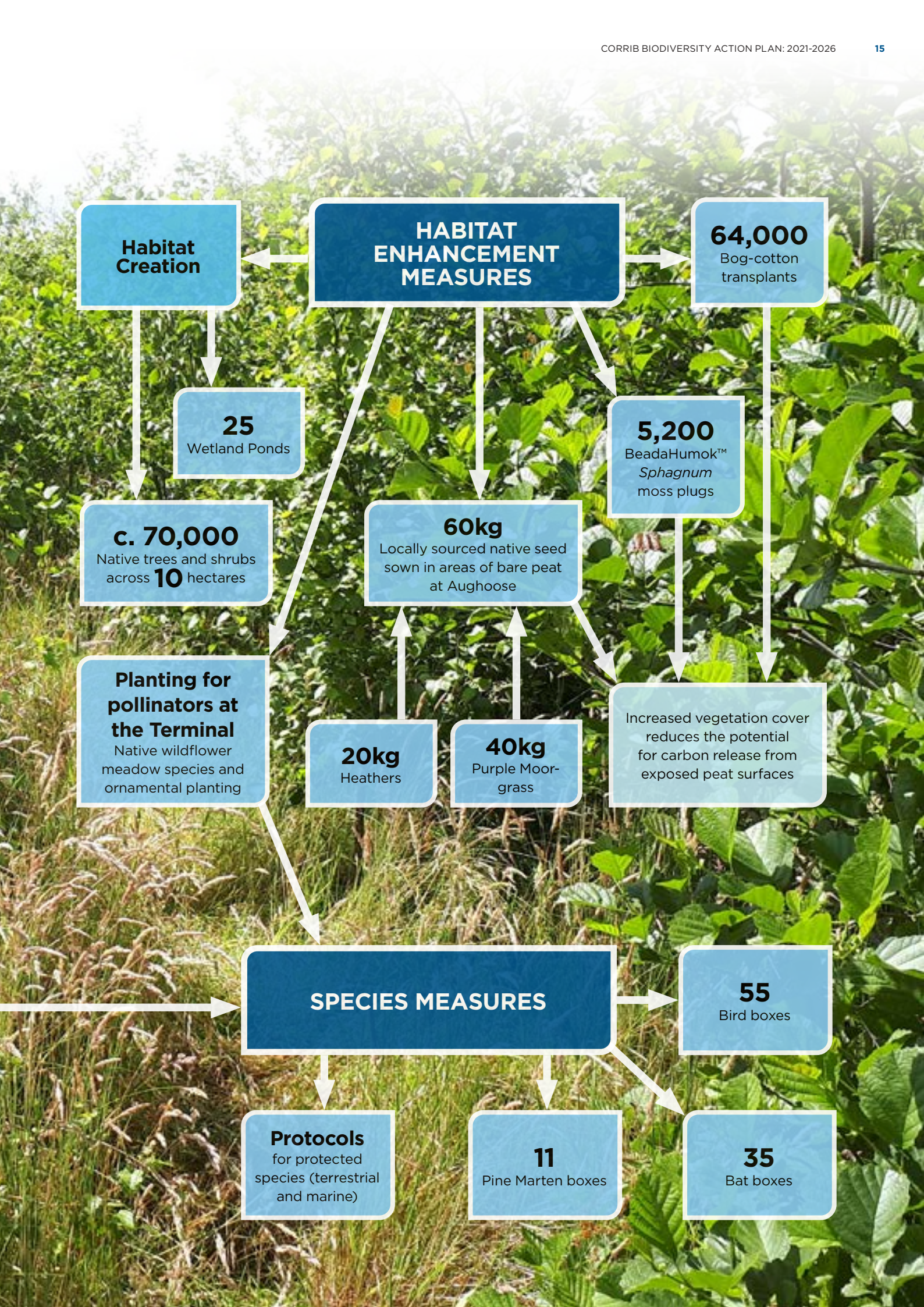
Location	Area planted (m2)	Success rate % (2019)	Net gain of deciduous trees
Pipeline wayleave	77,473	70	54,231
Pipeline, former construction compound beside the L1202 near RDX1	4,560	98	4,800
Terminal site (north of TCF)	8,200	65	5,330
Terminal site (north of Terminal footprint – area of former main car park during construction)	5,800	75	4,350
Terminal site (western fields)	2,020	75	1,527
Totals	**98,053**		**70,238**
Average overall success rate		**76.6%**	

- *Objective 5: During reinstatement to enhance local biodiversity on lands in the stewardship of Shell, and elsewhere where feasible and practical*

  In addition to 5.2 tree planting (see above under Objective 4), key achievements in this respect were under Actions 5.1 and 5.4, as shown Figure 4.2.

  Habitat enhancement for local biodiversity comprised an integral part of reinstatement following construction of Pipeline and the Terminal.

Figure 4.2
Key measures implemented 2014 to 2020


HABITAT ENHANCEMENT MEASURES
Habitat Creation
25
Wetland Ponds
c. 70,000
Native trees and shrubs across 10 hectares
Planting for pollinators at the Terminal
Native wildflower meadow species and ornamental planting
60kg
Locally sourced native seed sown in areas of bare peat at Aughoose
20kg
Heathers
40kg
Purple Moor-grass
64,000
Bog-cotton transplants
5,200
BeadaHumok™ *Sphagnum* moss plugs
Increased vegetation cover reduces the potential for carbon release from exposed peat surfaces
SPECIES MEASURES
55
Bird boxes
Protocols
for protected species (terrestrial and marine)
11
Pine Marten boxes
35
Bat boxes

The construction of a series of wetlands (ponds) was key in order to encourage the establishment of a diverse range of aquatic and semi-aquatic plants and invertebrates; also, to replace common frog breeding sites (drains) that had been lost or impacted during construction. (See also 6.10 below). A total of 25 wetlands (pond/pools) were created in peat in order to keep them as natural as possible with no pond liners or clay being used. As the ponds have become established, the number of bat species recorded on the wayleave and in the vicinity of these wetlands has increased to 6 (from 2). Daubenton's Bat, a species that feeds over water is now habitually present.

Native wildflower seed meadow mix was spread on parts of the Terminal site, in particular the large area to the north of the Terminal footprint that had served as the main car park during construction.

Bat, bird and Pine Marten boxes were first erected at the Terminal site in January 2011 and have been have been subject to annual checks and maintenance (Action 5.4). Some bird nest boxes were lost to predation damage by Pine Martens and were replaced. The total number of bird nest boxes / baskets at the end of 2019 was 51/4. New bat boxes were added in 2018, with the total number of bat boxes in situ at the end of 2019 being 35.

Pine Martens did not use the natal boxes at all and when the fixings deteriorated, leading to health and safety concerns in respect of the potential risk of these large, heavy boxes falling from height, they were finally decommissioned and removed in 2018.

Maintenance and monitoring of bat and bird nest boxes is ongoing.

- *Objective 6: Apply best practice stewardship to manage lands within the development's landholding and lease for biodiversity and ecosystem services; establish and implement a Land Management Plan*

  With 19 Actions, this was a wide ranging objective encompassing some actions included elsewhere. Several of its actions related specifically to construction and these were fully implemented. Some overlap with Actions under Objectives 4 and 5 for enhancement and are included above.

  One of the key achievements has been the development and implementation, under 6.1, of the Land Management Plan (LMP). Its implementation is ongoing and as it is a 'live' Plan it is subject to constant review and updating as the need arises. Part of, and a requirement under the LMP, the Forest Management Plan (FMP) is being developed in respect of those conifer plantations required to be maintained for screening purposes under the Terminal's planning consent.

- *Objective 7: Maintain species numbers, diversity and ecosystem services within, and in the vicinity of, the footprint of the development, including those areas affected by temporary works during construction*

  These actions are ongoing and have been incorporated into this BAP for 2021-2026.

- *Objective 8: Put mechanisms in place to control invasive species in reinstated habitats*

  The Actions under 8 are ongoing, with protocols and systems in place under the LMP to deal with *Gunnera* etc. Staff are instructed in the correct procedures for their removal and are provided with assistance on species identification.

- *Objective 9: Contribute to the conservation and sustainable use of biodiversity through day to day activities, and administrative functions of SEPIL's activities*

  Vermilion has been a partner in the Corrib project since 2009, moving into operatorship of the Asset in 2018. In line with their own policy on sustainability, VEPIL took over the BAP commitments. The 5 Actions under this Objective

have been /are being implemented and are ongoing.

- *Objective 10: Set up partnerships with relevant and appropriate bodies such as: academic institutions, NGOs, peer experts and others*

  The key achievements under this Objective have been under Actions 10.3 and 10.5.

  Action 10.3: The analyses of DNA samples have been completed by WIT, mapping of results is complete and papers for Otter (Sruwaddacon Bay area) and Pine Marten (at the Terminal site) are in preparation.

  Preliminary results of the analyses for these two species are included in the species accounts in Section 6 of this document. It is also worth noting that WIT's' forthcoming paper about Pine Martens in Ireland, "*Not out of the woods yet: genetic insights into the recovery of the pine marten (Martes martes) in Ireland*" *to be published in the* Biological Journal of the Linnean Society (full citation not available) includes some Corrib Pine Marten hair tube DNA sample data.

  Action 10.5: Four peer-reviewed published scientific papers have come from the data collected during breeding and wintering bird surveys that had been carried out in the Sruwaddacon Bay area. BirdWatch Ireland (BWI) was contracted to independently analyse the breeding Sand Martin data collected over more than a decade and waterbird monitoring data collected for more than 15 years. The results of these analyses have been published in four separate peer reviewed papers, three in 'Irish Birds' and one in the Wetlands International publication, the Goose Bulletin. Citations for these four papers are provided under 10.5 in the Table 4.2 and in the References at 7.4.

- *Objective 11: Set up BAP review working groups*

  Action 11.1 The Cetacean monitoring BAP review group was not set up owing to the fact that offshore maintenance activities required marine mammal observations and a rigorous protocol for behaviours in their presence – under consent conditions and in accordance with the Pipeline EMP. Independent monitoring has been ongoing and the resulting MMO reports have been /are provided to the regulator and to NPWS.

  Actions 11.2 and 11.3: These groups were not formally constituted. However, habitat and species monitoring has comprised part of the ecological monitoring and review in accordance with the Pipeline EMP for construction and the EMP for operations. Monitoring of reinstated and created (wetlands) habitats at the Terminal site has continued in accordance with the Terminal Reinstatement and Aftercare Plan and the LMP while monitoring of faunal species at the Terminal site has continued in accordance with the EIS postconstruction recommendations and the LMP.

- *Objective 12: Provision of species records and habitat quadrat data to the national biodiversity data base*

  The terrestrial mammal dataset (including otters) from Corrib's mammal monitoring programme over many years was provided to the NBDC for inclusion in the Mammal Atlas (*Atlas of Mammals in Ireland 2010-2015*). Winter bird and Sand Martin monitoring reports have been and will continue to be provided to NPWS though this is not a statutory requirement under any consent. Occasional records of sightings of invertebrates etc, have been submitted to the NBDC and occasional plant species records of interest (eg. a new record in a 10km square) have been submitted to the Botanical Society of Britain and Ireland (BSBI) for inclusion included in the new Atlas of British and Irish Flora in due course.

Table 4.2: Corrib BAP 2014-2019: Summary review of Actions at 2019/2020

CORRIB BAP 2014-2019 ACTION		SUMMARY REVIEW AT 2019 / 2020
OBJECTIVE 1: Protect habitats and species by means of appropriate mitigation measures during the construction and operation of the various elements of the development		
1.1	Implementation of mitigation measures set out in the EISs and EMPs	Completed for construction phase. Pipeline EMP for Operations: monitoring programme implemented and ongoing with regular reviews. Terminal Operations – environmental management systems in place. Land Management Plan (LMP) in place and implementation ongoing.
1.2	Additional measures may be required as a result of monitoring	None required to date. Monitoring ongoing based on the above. Annual reviews with regulatory bodies for Terminal and Pipeline. Compliance with annual reporting requirements under the Industrial Emissions Licence (IEL, EPA) and Consent to Operate (CtO, DECC - formerly DCCAE and DCENR[9]). LMP – see Action 6 below – implemented.
1.3	Regular monitoring of success of mitigation measures	Completed for construction. Reviewed in the context of anything being required – on ongoing basis.
OBJECTIVE 2: Monitor habitats and species during and following construction of the various elements of the development		
2.1	Monitoring project elements in accordance with Monitoring Programmes set out for the Terminal, Offshore/ Nearshore/Intertidal and Onshore	Compliant to date and ongoing during operations. Monitoring activities included: • Habitat and botanical surveys; • Otter and general fauna surveys; • Bat surveys (active and passive); • Winter waterbird surveys (target species - Light-bellied Brent Goose); • Summer waterbird surveys; • Breeding and general bird surveys; • Breeding Sand Martin monitoring surveys; wetland /pond surveys; • Small Stream Risk Surveys (SSRS for Terminal IEL); • Marine mammal monitoring; and • Marine invasive species monitoring.
2.2	Reporting in accordance with consent conditions	Completed for construction. Ongoing and compliant to date for operations.

9 This Department's name has changed over the life of the BAP from DCENR to DCCAE. At the time of writing, it is the Department of the Environment, Climate and Communications (DECC)

CORRIB BAP 2014-2019 ACTION		SUMMARY REVIEW AT 2019 / 2020
OBJECTIVE 3: Consult with stakeholders and other interested parties, as appropriate		
3	EMPs Monitoring programmes Method Statements Methodologies for protected species	New systems in place for operations. Compliant. Ongoing for Terminal (EPA) and Pipeline (DECC - formerly DCCAE and DCENR). Ongoing consultations with NPWS (DCHG[10]) as needed.
OBJECTIVE 4: Reinstate habitats affected by the construction of the development		
4.1	Develop Reinstatement Plans	Fully completed and implemented (see 4.2).
4.2	Reinstate in accordance with the Reinstatement Plans for the Terminal and Onshore Pipeline	Fully implemented for Pipeline and Terminal.
4.3	Use standard and modern micro-propagation methods to increase the chances of successful and appropriate vegetation establishment	During and since reinstatement: • Some 64,000 plantlets of Common Bog-cotton (*Eriophorum angustifolium*) were transplanted from local donor sites to degraded blanket bog habitat. This blanket bog species quickly colonised areas of bare peat, reducing the potential for carbon release. • Seed of native blanket bog species collected locally and spread on areas of bare peat – included *Erica* spp, *Calluna* and *Molinia*. • c. 5000 Sphagnum plugs (BeadaHumoks™ micro propagated from material collected on site) were planted in degraded blanket bog habitat in order to improve the habitat and carbon sequestration in the future. • In the order of 91,000 native trees and shrubs were planted during reinstatement. Survival rate = 76.6%. Approximate area of trees = 10 hectares.
4.4	Regular monitoring	Completed for construction phase, including regular reporting in accordance with consent conditions. Ongoing during operations, in accordance with the Pipeline EMP, Terminal EMS, BAP and LMP. Annual reporting (Pipeline) to statutory regulator in compliance with consent to operate conditions.

10 The Government Department of which the National Parks and Wildlife Service (NPWS) is part has changed over the life of the BAP. At the time of writing, it is the Department of Housing, Local Government and Heritage (DHLGH).

CORRIB BAP 2014-2019 ACTION		SUMMARY REVIEW AT 2019 / 2020
OBJECTIVE 5: During reinstatement to enhance local biodiversity on lands in the stewardship of Shell, and elsewhere where feasible and practical		
5.1	Habitat creation and diversification during reinstatement on lands affected by construction of the onshore pipeline and at the Bellanaboy	The reinstatement plans for the Pipeline and Terminal site have been fully implemented. These included tree planting (see below) and creation of wetlands (ponds) (see below). Native wildflower seed was spread on parts of the Terminal site (e.g., former construction car park).
5.2	Planting of native shrub species in suitable areas to enhance invertebrate biodiversity, and in turn birds and bat species	In the order of 91,000 native trees and shrubs were planted during reinstatement. of which c. 70,000 have survived. Survival rate = 76.6%. Approximate area = 10 hectares.
5.3	Set up specialist working group of vegetation experts	While not formally constituted, this included specialist expertise within the ecological / landscape team and adhoc consultation with external experts. Vegetation and habitat monitoring has comprised part of the ecological monitoring in accordance with the Pipeline EMP for construction and the EMP for operations.
5.4	Provision of bat boxes, bird nest boxes and pine marten natal boxes at Bellanaboy	Boxes have been subject to annual checks and maintenance. Some bird nest boxes were lost to predation damage by Pine Martens and were replaced. The total number of bird nest boxes / baskets at the end of 2019 = 51/4. New bat boxes were added in 2018. Total number of bat boxes in situ at the end of 2019 = 35. Pine Martens did not use the natal boxes and when the fixings deteriorated, leading to an H&S concern in respect of the potential risk of these heavy boxes falling from height, they were finally decommissioned and removed in 2018.
OBJECTIVE 6: Apply best practice stewardship to manage lands within the development's landholding and lease for biodiversity and ecosystem services; establish and implement a land Management Plan		
6.1	Managing its own land and activities to maximise their contribution to biological diversity by giving a commitment to adhere to or undertake the following:	The Land Management Plan is in place and its implementation is ongoing. A Forest Management Plan is being developed in respect of conifer plantations required to be maintained for screening purposes under the Terminal's planning consent.
6.2	Identify any conservation designations opportunities on land owned and its conservation significance at both a local and a national level	The 7 ha of blanket bog, of which the 190m section is part, has recovered from overgrazing that occurred prior to 2002. It is now equivalent to EU Annex I priority habitat. The 190m section of wayleave through this area is recovering from construction and expected to reach similar Annexed habitat status in a few years' time. Whilst not designated, this 7ha area of blanket bog does have the potential to be so.
6.3	Plant native trees and hedges as determined by the local landscape character	As above, in the order of 91,000 native trees and shrubs were planted during reinstatement, of which c. 70,000 have survived. Survival rate = 76.6%. Approximate area = 10 hectares.

CORRIB BAP 2014-2019 ACTION		SUMMARY REVIEW AT 2019 / 2020
6.4	Use tree stocks from local seed sources (if available)	Naturally regenerated willows were collected at Bellanaboy and transplanted to the former tunnelling site compound at Aughoose.
6.5	Introduce grass cutting and appropriate grazing régimes that are compatible with biodiversity enhancement and species conservation	Included in the Land Management Plan.
6.6	Introduce hedge/ tree cutting and other vegetation maintenance régimes to enhance biodiversity and which adhere to wildlife legislation (generally no cutting between 1st March and 31st August)	Included in the Land Management Plan.
6.7	Reduce and where possible eliminate the use of pesticides, herbicides and chemical fertilisers	The Land Management Plan includes a requirement that such chemicals are not used, except for example in the controlled removal and treatment of alien plant species, such as *Gunnera* and *Rhododendron.*
6.8	Reduce areas of bare peat by vegetation restoration techniques	Following construction of the pipeline and Terminal, the reduction of carbon release from areas of bare peat was a priority, the aim being to establish vegetation cover as quickly as possible. Measures included: In the areas of less sensitive habitat on peat (ie. not blanket bog) of the wayleave and the Terminal site (e.g. old construction car park) were seeded with a sacrificial native meadow mix grass seed. This germinated quickly to form a continuous sward. At the former tunnelling site compound (blanket bog habitat) which had a badly eroded peat surface and reduced blanket bog vegetation cover prior to construction: ● 64,000 plantlets of Common Bog-cotton (*Eriophorum angustifolium*) were transplanted from local donor sites to degraded blanket bog habitat. This blanket bog species quickly colonised areas of bare peat, reducing the potential for carbon release. ● Seed of native blanket bog species collected locally and spread on areas of bare peat – included *Erica* spp, *Calluna* and *Molinia*. ● c. 5000 *Sphagnum* plugs (BeadaHumoks™ micro propagated from material collected on site) were planted in degraded blanket bog habitat in order to improve the habitat and carbon sequestration in the future. In addition to providing ground vegetation cover, approx. 91,000 native trees and shrubs were planted during reinstatement on the pipeline wayleave and at the Terminal site. Survival rate = 76.6%. Approximate area of trees = 10 hectares.

CORRIB BAP 2014-2019 ACTION		SUMMARY REVIEW AT 2019 / 2020
6.9	When considering works on buildings or other structures, ensure, including through survey where appropriate, that protected or other important species are properly protected (e.g. it is an offence to interfere with or destroy the breeding or roosting places of bats)	Ongoing. Protocols for protected species are in place under the Land Management Plan.
6.10	Consider creating ponds or other wetland areas	During habitat reinstatement on the pipeline wayleave and at the Terminal site a total of 25 wetlands (pond/pools) were created in peat. In order to keep them as natural as possible no pond liners or clay were used. As the ponds have become established, the number of bat species recorded on the wayleave and in the vicinity of these wetlands has increased to 6 (from 2). Bat species, such as Daubenton's Bat, that feed over water are now habitually present.
6.11	Restore degraded habitats	See 4.3 and 6.8 above for treatment of area of bare peat.
6.12	Safeguard and manage species of national significance which occur on its land	Protocols are in place for protection of species – as set out in the Land management Plan.
6.13	Ensure that biodiversity surveys are undertaken to inform changes to land use or when undertaking development producing and implementing management plans for locally important sites in its ownership	Ongoing monitoring of habitats and species.
6.14	Erect bird and bat boxes	As above, at 5.4: Boxes are subject to annual checks and maintenance. Some bird nest boxes were lost to predation damage by Pine Martens and were replaced. The total number of bird nest boxes / baskets at the end of 2019 = 51/4. New bat boxes were added in 2018. Total number of bat boxes in situ at the end of 2019 = 35. Pine Martens did not use the natal boxes and when the fixings deteriorated, leading to an H&S concern in respect of the potential risk of these heavy boxes falling from height, they were finally decommissioned and removed in 2018.

CORRIB BAP 2014-2019 ACTION		SUMMARY REVIEW AT 2019 / 2020
6.15	Manage water courses and their margins to benefit biological diversity	Ongoing. The BBGT is subject to strict controls under the EPA IE licence. (Bi-annual SSRS surveys, ongoing water quality discharge monitoring). The LMP provides for maintenance of water courses and water bodies (created wetlands) in all areas.
6.16	Discourage the permanent canalisation or culverting of water courses and ensure the design of culverts and bridges allows for passage of aquatic life	Completed for construction and various works/activities. Frog dams provided in 'new' drains after construction. Where possible, drains allowed to naturally re-vegetate.
6.17	Where relevant and appropriate, provide educational facilities for the public	During reinstatement a series of boardwalks and bridges were constructed in the western fields connecting the five wetland ponds in that location, providing a valuable educational facility for visiting groups.
6.18	Encourage contractors and consultants to adopt the principles of biodiversity enhancement in designing development sites and adhere to best practice	Completed for construction and implemented during reinstatement. Included in the LMP for operations.
6.19	Promote the distinctiveness and quality of the area's biodiversity	By means of the BAP and third party engagement. Long term goal. The 2014-2019 BAP was used as a case study in the 2020 Science & Technology Classroom lesson (http://sta.ie/).
OBJECTIVE 7: Maintain species numbers, diversity and ecosystem services within, and in the vicinity of, the footprint of the development, including those areas affected by temporary works during construction		
7.1	Ensure that mitigation measures are in place and functioning	Completed for construction: Fully compliant during construction and during operations. Ongoing during operations: Supported by the LMP (all areas), Pipeline EMP, and protocols for species and habitats.
7.2	Appropriate grazing regimes to be put in place to maintain /encourage habitats and species diversity	Agreed grazing /mowing régimes are in place for landholdings in the stewardship of VEPIL.
7.3	Monitor and compare against baseline data.	Ongoing species monitoring under the EMP and BAP provisions.

CORRIB BAP 2014-2019 ACTION		SUMMARY REVIEW AT 2019 / 2020
OBJECTIVE 8: Put mechanisms in place to control invasive species in reinstated habitats		
8.1	Monitor reinstated habitats for the invasive species -*Rhododendron* and *Gunnera*	Ongoing. Systems in place under the LMP to deal with *Gunnera* etc. Staff are instructed in the correct procedures for their removal.
8.2	If found, they must be removed by means of the best practice methodology pertaining at the time.	
8.3	Vigilance in case of infestation by other invasive species	Ongoing. The Land Management Plan provides information on how to identify invasive species.
OBJECTIVE 9: Contribute to the conservation and sustainable use of biodiversity through day to day activities, and administrative functions of SEPIL's activities		
9.1	Examine and Implement the National Sustainable Development Strategy as a consumer of materials, furniture, paper, water etc and as a producer of waste	Ongoing. Vermilion has been a partner in the Corrib project since 2009, moving into operatorship of the asset in 2018. [11] Vermilion's sustainability vision is: "As a responsible oil and gas producer, Vermilion Energy Inc. consistently delivers long-term shareholder value by operating in an economically, environmentally and socially sustainable manner that is recognized as a model in our industry". ***Raw materials and Chemicals:*** VEPIL has generated an efficient use of raw materials document as per condition 7.4 of the Industrial Emissions Licence (IEL). This document reviews the Terminal's operating processes, having particular regard to the reduction in waste generated. Where improvements are identified, they are incorporated into the Schedule of Environmental Objectives and Targets. ***Waste Management*** VEPIL has implemented a waste management plan as part of the Environmental Management Plan for the BBGT and Onshore/Offshore Pipeline. A schedule of objectives and targets are maintained onsite and updated on a regular basis based on site Management reviews, site audits etc. Waste generated at the BBGT is documented as part of the Pollution Release Transfer Register (PRTR) and is submitted to the EPA on an annual basis.
9.2	As a consumer of materials, furniture, paper, water etc and as a producer of waste	
9.3	As a consumer of energy	VEPIL has implemented energy management system (EMS) as part of the EMP for the BBGT as required under condition 2.2 of the IEL. This system entails the monitoring and control of energy generation, purchase and consumption, including staff awareness and reduction in overall energy consumption. Energy efficiency audits have been completed and repeated at intervals aligned to condition 7.1 of the IEL.

11 http://sustainability.vermilionenergy.com/ourapproach/sustainability/our-approach-to-sustainability-overview.cfm

CORRIB BAP 2014-2019 ACTION		SUMMARY REVIEW AT 2019 / 2020
9.4	As an operator	See 9.1 above. The Terminal and Pipeline are subject to statutory controls under their permits and consents. The BBGT implements an EMS as required under its Industrial Emissions Licence (IEL). It is subject to review by the EPA. The Pipeline operates in accordance with the EMP under the Section 40 Consent to Operate is reviewed by the DECC (formerly DCCAE).
9.5	As a funder of projects, subsidies and contracts; and provider of educational opportunities etc	The Environmental Stewardship Grant and the Local Grants Programme provide funding for biodiversity and conservation projects. The 2014-2019 BAP was used as a case study in the 2020 Science & Technology Classroom lesson (http://sta.ie/). See also Objective 6 above.
OBJECTIVE 10: Set up partnerships with relevant and appropriate bodies such as: academic institutions, NGOs, peer experts and others		
10.1	Marine Mammal Monitoring	Initially by CMRC (until 2017) and more recently by Ocean Science Consulting (OSC) Ltd. Offshore activities require marine mammal observations and a rigorous protocol for behaviours in their presence – under consent conditions and in accordance with the Pipeline EMP. The resulting independent MMO reports have been /are provided to regulator and to NPWS.
		A partnership per se was not set up, owing to the fact that offshore maintenance activities require independent marine mammal observations and a rigorous protocol for behaviours in their presence – under consent conditions and in accordance with the Pipeline EMP.
10.2	Specialist vegetation working group	While not formally constituted this included specialist expertise within the ecological / landscape team, and adhoc consultation with external experts. Vegetation and habitat monitoring has comprised part of the ecological monitoring in accordance with the Pipeline EMP for construction and the EMP for operations.
10.3	Analysis of Otter spraint and Pine Marten DNA	The analyses of samples have been completed by WIT. Mapping of results is complete and papers for Otter (Sruwaddacon Bay area) and Pine Marten (Terminal site) are in preparation. WIT's' forthcoming paper about Pine Martens in Ireland, "*Not out of the woods yet: genetic insights into the recovery of the pine marten (Martes martes) in Ireland*" to be published in the Biological Journal of the Linnean Society) includes some Corrib Pine Marten hair tube DNA sample data.

CORRIB BAP 2014-2019 ACTION		SUMMARY REVIEW AT 2019 / 2020
10.4	Provision of funding for a salmon conservation measure in respect of the commercial draft net fishery on the Glenamoy River	Subsequent to the funding agreement having been put in place, owing to a significant reduction in wild salmon stocks, a moratorium on the taking of wild salmon for commercial purposes was put in place for fisheries throughout Ireland, including the Glenamoy River.
10.5	Specialist analysis of bird data	The partnership with UCC did not proceed but subsequently an agreement was reached with BirdWatch Ireland (BWI) to independently analyse both the Sand Martin and waterbird monitoring data (collected for >15 years). This was completed and the results of these analyses have been published in four separate peer reviewed papers, three in 'Irish Birds' and one in the Wetlands International publication, the Goose Bulletin: ● Cummins, S., Lewis, L.J. and Fennessy, G. (2017) *Fluctuations in breeding activity of Sand Martins Riparia at a coastal site in the west of Ireland* Irish Birds **10**: 501–510 ● Cummins, S., Lewis, L.J. and Fennessy, G. (2020) *Usage of Sruwaddacon Bay by waterbirds through the winter period* Irish Birds **42**: 13-26 ● Lewis, L.J., Fennessy, G., Cummins, S. (2018). *Light-bellied Brent Goose Branta bernicla hrota at Sruwaddacon Bay, north-west Co. Mayo, Ireland* Goose Bulletin **23**: 5-14 ● Lewis, L.J., Fennessy, G., Cummins, S. (2017). *Using within-site level trends of non-breeding waterbirds as a monitoring tool: a case study using data from Sruwaddacon Bay, County Mayo* Irish Birds **10**: 493–500
OBJECTIVE 11: Set up BAP review working groups		
11.1	Cetacean monitoring BAP review group	This was not set up, owing to the fact that offshore maintenance activities required marine mammal observations and a rigorous protocol for behaviours in their presence – under consent conditions and in accordance with the Pipeline EMP. The resulting independent MMO reports have been /are provided to regulator and to NPWS.
11.2	Habitat monitoring BAP review group	Adhoc. This group was not formally constituted, however habitat monitoring has comprised part of the ecological monitoring and review process in accordance with the Pipeline EMP for construction and the EMP for operations. Monitoring of reinstated and created (wetlands) habitats at the Terminal site has continued in accordance with the Terminal Reinstatement and Aftercare Plan and the LMP.
11.3	Fauna (avian and non-avian) monitoring BAP review group	Adhoc, this group was not formally constituted, however, as with habitats, species monitoring has comprised part of the ecological monitoring and review process in accordance with the Pipeline EMP for construction and the EMP for operations. Monitoring of faunal species at the Terminal has continued in accordance with the EIS postconstruction recommendations and the LMP.

CORRIB BAP 2014-2019 ACTION		SUMMARY REVIEW AT 2019 / 2020
OBJECTIVE 12: Provision of species records and habitat quadrat data to the national biodiversity data base		
12	Species records and habitat quadrat data will, in due course be fed into the national biodiversity data base through the National Biodiversity Centre in Waterford.	Ongoing. The terrestrial mammal dataset (including otters) from Corrib's mammal monitoring programme over many years was provided to the NBDC for inclusion in the Mammal Atlas (Atlas of Mammals in Ireland 2010-2015) Occasional records of sightings of invertebrates etc, have been submitted to the NBDC. Sharing data / reports with other bodies: Shared Winter bird and Sand Martin monitoring reports with NPWS (Note: this is not a statutory requirement under any consent) - ongoing. Occasional plant species records of interest (eg. new records in 10km square) have been submitted to the Botanical Society of Britain and Ireland (BSBI) – these will be included in the new Atlas of British and Irish Flora in due course.

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View west across wayleave wetland 3 with Dooncarton Hill in the distance

5 THE BIODIVERSITY ACTION PLAN 2021 - 2026

5.1 Introduction

This has been prepared, collated and edited on behalf of VEPIL by their consultant Ecological Adviser, with input from specialist experts in the ecological team and support from VEPIL in respect of Company actions.

As explained above, although the first Biodiversity Action Plan was scheduled to run from 2014-2019 inclusive, owing to the exceptional circumstances in 2020 caused by the Covid-19 pandemic the preparation of the second biodiversity action plan was significantly delayed. It was decided, therefore, to include 2020 in the review of the 2014-2019 Plan and for this, the second BAP to run from 2021 to 2026. With many actions being ongoing, continuity between the first and second BAPs is vital. Therefore, ongoing actions have been brought forwards into the 2021-2026 BAP.

5.2 Establishing priorities

Methodology for prioritising species or habitats of special local conservation importance is not included in the various guidelines for the preparation of BAPs, presumably because each case is different. The rationale for deciding which parameters to use for both Corrib BAPs has included the consideration of the habitats and protected species in the context of, not only their conservation status in national terms, but also their role and status in the area in which the Corrib Asset is located. This approach has been informed by the large volume of information on habitats and species already gathered.

The objectives and actions are restricted, in respect of the offshore elements of the Corrib Asset, to Broadhaven Bay and within the Broadhaven Bay SAC itself. Habitats and species in respect of the nearshore and intertidal sections of the offshore pipeline, the entire onshore pipeline wayleave (including intertidal habitats), and the Terminal site at Bellanaboy and surrounding lands, are included because of their location in relation to the designated conservation sites in the locality. This rationale is consistent with Irish national biodiversity strategy, i.e., to put local plans in context, especially in relation to existing designations.

5.2.1 Habitats and Species

"Priority[12]" habitats for the purposes of this BAP are those which, as a result of information gathered to date, are considered key to the continued deliverance of Corrib's biodiversity targets as follows:

- Habitats which are protected by legislation: both EU Habitats Directive Annex I and non-annexed habitats which occur within a designated site.
- Non-annexed recovering blanket bog habitat at Aughoose (including the '190m section of wayleave') is treated as though it were EU Annex I habitat status, although there is no legal obligation to do so. This is in acordance with best practice.
- Habitats which as a result of reinstatement methods and enhancement measures, have shown the potential to become more diverse, including:

12 "Priority" in this context does not equate with, or relate to, EU Annexed Priority habitats.

- wetlands (ponds) in reinstated degraded peatland habitat at Aughoose (former tunnelling site compound), along the pipeline wayleave (previously conifer plantations) and at the Terminal site Bellanaboy;
- areas of planted native trees and shrubs along the pipeline wayleave, at the location of former site compound beside the L1202 to the west of road crossing RDX1, and at the Terminal site.

- Freshwater streams.

"Priority[13]" species, for the purposes of this BAP are: EU Annexed species and species protected under Irish wildlife legislation.

5.3 Aims

The aim of the Biodiversity Action Plan is to conserve, maintain, and enhance biodiversity and ecosystem services within the zone of influence of the Corrib Asset and its various elements.

As referred to above, biodiversity is vital for sustaining the ecosystems which also have natural capital, ie. social and economic value, providing goods and services that intrinsically sustain human life in many ways. The Irish National Biodiversity Action Plan objectives include a commitment to "conserve and restore biodiversity and ecosystem services". This approach is in line with Vermilion's Corporate policy and its commitment in respect of biodiversity and is included in the Objectives (Tables 5.1 and 5.2).

The Corrib Asset has the opportunity to contribute to local biodiversity by maintaining reinstated habitats on modified and marginal lands, and to provide further enhancement where appropriate and or feasible. In others, such as in the agricultural lands and designated Annex I habitats at Glengad in VEPIL's stewardship, habitats will continue to be managed with appropriate grazing régimes in association with local landowners, not only to maintain local and national biodiversity but also to provide and restore ecosystem services. From the marine perspective, rock placement along sections of the offshore pipeline will, in time, provide seabed niche habitats and so increase marine biodiversity in those areas. Already colonisation has been observed on these introduced structures, with various species of flora and fauna present (see marine habitats in Section 6).

As reported in Section 4 above, positive effects from habitat enhancement and diversification measures are already becoming evident. The Corrib BAP 2021-2026 aims to build on this progress and maintain a positive impact on biodiversity, including maintaining an increase of species diversity in maturing habitats as well exploring opportunites for further enhancement measures. This aim is encompassed by Objectives 3 and 4 (Tables 5.1 and 5.2).

The Corrib BAP also aspires to increase societal awareness of the ecological values of the landscape, its habitats and species, in the context of local community engagement and educational opportunities. (Objective 7 - Tables 5.1 and 5.2).

5.4 Objectives and Actions

The BAP 2021-2026 Objectives are summarised in Table 5.1 and further expanded in Table 5.2 which sets out a total of 44 required Actions. They are discussed briefly in the following paragraphs.

13 "Priority" in this context does not equate with, or relate to, EU Priority Species

Table 5.1: BAP 2021-2026 Objectives

Objective		Corrib Asset Element
1	Protect habitats and species	All
2	Consult with stakeholders and other interested parties, as appropriate	All
3	Apply best practice in managing lands under VEPIL's stewardship for the benefit of biodiversity and ecosystem services	Pipeline wayleave and Terminal site
4	Explore opportunities to further enhance biodiversity on lands in the stewardship of VEPIL	Pipeline wayleave and Terminal site
5	Implement protocols to control invasive species	Pipeline wayleave and Terminal site
6	Contribute to awareness and sustainable use of biodiversity through day to day activities	All
7	Promote the distinctiveness and quality of the area's biodiversity	All
8	Provide species records and habitat quadrat data to the National Biodiversity Data Centre and share data with the wider scientific community	All
9	Review of the Biodiversity Action Plan	All

5.4.1 Protection of habitats and species

Objective 1 sets out the actions for the protection of habitats and species. Monitoring is a key part of this and will continue in accordance with regulatory requirements under the Consent to Operate, for example as set out in the Pipeline EMP (onshore and offshore); and the Terminal's Industrial Emissions Licence (IEL) from the EPA, which includes regular SSRS monitoring. (See also Objective 2). In addition to regulatory requirements, protocols for species and habitats are set out in the LMP for the Pipeline (onshore) and the Terminal. The requirement to continue monitoring terrestrial habitats and species in areas of developing /maturing habitats (e.g. deciduous woodland and wetlands) for the long term (see Objective 1, Action 1.1) is important and shows VEPIL's continuing commitment to biodiversity. This goes beyond regulatory and statutory requirements and will outlive the EMP monitoring programmes for terrestrial habitats and species.

Marine monitoring will continue in line with the Consent to Operate and in accordance with the Pipeline EMP (as amended). In summary, the "Consent to Operate" requires that routine monitoring of the Corrib Offshore Pipeline be undertaken for future colonisation by benthic organisms, any movement of rock armour, scour and for the purposes of identifying the introduction of any alien invasive species. In addition, as part of this monitoring, an annual/biennial inspection of the pipeline will be undertaken to ensure integrity of the pipeline and protection measures. During any operational activities with the potential to impact on species of marine mammal or other sensitive mega-faunal species, there is a requirement for marine mammal observers (MMO) to be present to monitor the activities and report on sightings and interactions with potentially sensitive species".

5.4.2 Reporting and Consultation

In respect of monitoring, Objective 2 is closely aligned with Objective 1. Actions 2.1 and 2.2 are in the context of compliance and reporting, while 2.3 is in relation to consultation with the regulators and other statutory bodies including NPWS.

Although not a statutory requirement under any consent species monitoring reports will continue to be provided to NPWS, including those for waterbirds and bats (see also Objective 8, in respect of Data sharing).

5.4.3 Managing lands

As a company with a considerable landholding under its stewardship, VEPIL is committed to continuing to implement the Land Management Plan (LMP) which was developed and first implemented under the 2014-2019 Corrib BAP. Objective 3 is a key objective in this regard for the Corrib Asset going forwards.

The primary aim is to manage lands and activities in accordance with the LMP in order to maximise their contribution to biological diversity by adhering to or undertaking Actions 3.5 to 3.17. These actions are wide ranging and include: routine land maintenance activities including the use of pesticides, herbicides etc.; maintaining vegetation cover to reduce carbon release from bare soils/peat; species protection measures and protocols; maintenance of bird and bat boxes; habitat management; planting requirements for new and replacement planting; biodiversity surveys to inform changes to land use or when undertaking maintenance; provision of educational facilities for the public.

5.4.4 Enhancement

Section 4 above, the review of the first Corrib BAP, describes the biodiversity enhancement measures undertaken when lands were reinstated following construction.

There is a requirement that opportunities to further enhance biodiversity should be explored (Objective 4, Tables 5.1 and 5.2). Actions under this objective include (but not exclusively): planting further areas with native tree and shrub species, for biodiversity enhancement and carbon absorption in the long term; erecting additional bat and bird boxes; planting suitable species to support pollinators throughout the year; exploiting any other enhancement opportunity.

In respect of Action 4.3, as stated above in Section 4 some areas of the Terminal site were planted with native meadow seed during reinstatement, however under Objective 4 there is now a requirement that this should be done in other areas where possible. This action also includes areas of landscape amenity planting located around the Administration Building and at the main entrance to the Terminal, with a view to enhancing existing planting to better fulfil this requirement.

5.4.5 Invasive species

There is an ongoing commitment to deal with occurrence of invasive species and the actions under the first BAP have been brought forwards into this BAP, with protocols and systems in place under the LMP to deal with, eg. Giant-rhubarb (*Gunnera tinctoria*). Staff are instructed in the correct procedures for their removal and are provided with assistance on species identification. Objective 5 specifically refers to land-based species, including those in freshwater habitats therein – as opposed to marine species. Surveys to date have not identified freshwater aquatic invasive species being present in the wetlands (ponds) or watercourses on site however staff and contractors are made aware of the likelihood and encouraged to be vigilant.

As stated above, monitoring for colonising marine invasive species is a regulatory requirement under the Pipeline Consent to Operate so is covered by Objective 2 and is not included here under Objective 5.

5.4.6 Sustainability and day to day activities

Objective 6 is broad-based and provides for the contribution to the conservation and sustainable use of biodiversity through the day to day activities, and administrative functions of VEPIL's activities. It includes its role as a provider of funds for projects, and education. Ongoing and continuing actions have been brought forwards from the first BAP. This objective provides for the implementation of a Sustainable Development Strategy: as a consumer and as a producer of waste; as a consumer of energy - VEPIL will continue to implement the energy management system (EMS); as an operator; and as a funder of projects, subsidies and contracts - for example, the Environmental Stewardship Grant and the Local Grants Programme provide funding for biodiversity and conservation projects ; and provider of educational opportunities etc.- for example, as mentioned above, the 2014-2019 BAP was used as a case study in the 2020 Science & Technology Classroom lesson (http://sta.ie/) VEPIL will continue to support this and other educational opportunities.

Already integral in its operations: Action 6.7 provides for regular trainings and biodiversity awareness

events for staff, contractors and consultants; and Action 6.8, provides for continued engagement with Business in the Community/ Biodiversity in Business.

The actions set out under Objective 6 are consistent with Vermilion's corporate vision for sustainability "As a responsible oil and gas producer, Vermilion Energy Inc. consistently delivers long-term shareholder value by operating in an economically, environmentally and socially sustainable manner that is recognized as a model in our industry".

5.4.7 Promoting biodiversity

Objective 7 provides for VEPIL to seek opportunities to promote biodiversity and the Corrib BAP in the local Community and beyond, building on existing and ongoing relationships. In addition, it provides for the establishment of nature trails in appropriate areas which can be used for educational and training purposes, building on Objective 3, Action 3.7.

5.4.8 Sharing data

There is commitment under Objective 8 (Tables 5.1 and 5.2) to provide species records and habitat data, to the National Biodiversity Data Centre (NBDC); and to share data with the wider scientific community. Also, to liaise with relevant and appropriate bodies for data sharing. Such bodies may include: NBDC, NPWS, BSBI, scientific researchers as well as the wider scientific community by means of publications; and others as appropriate. This is in line with the national strategy on biodiversity and in the interests of best practice and scientific recording.

5.4.9 Review and evaluate

This BAP sets out objectives and targets for a five year period. It is important that progress is reviewed and evaluated along the way. The review programme, under Objective 9, will include an interim review commencing in 2023 which will be carried out by specialist consultants and VEPIL's environmental staff.

Table 5.2: BAP 2021 to 2026 Objectives and Actions

Objective	Action	
Objective 1: Protect habitats and species	1.1	Monitor habitats and species during operations in accordance with regulatory requirements.
	1.2	Follow protocols for species and habitats, as set out in the LMP.
	1.3	Monitor habitats and species during maintenance works / activities as appropriate.
	1.4	Continue habitat and species monitoring in areas of developing /maturing habitats (e.g. deciduous woodland and wetlands) for the long term in order to quantify the resulting effects on bats, breeding birds and plant species diversity.
Objective 2: Consult with stakeholders and other interested parties, as appropriate	2.1	Continue to monitor in accordance with Monitoring Programmes required for the Pipeline and Terminal under statutory consents.
	2.2	Report in accordance with consent conditions, as required.
	2.3	Consult with statutory bodies for the Terminal (EPA) and Pipeline (DECC) in respect of EMP, monitoring programmes, Method Statements and Methodologies as they relate to habitats and species; and with NPWS (DHLGH) as needed.

Objective	Action	
Objective 3: Apply best practice in managing lands under VEPIL's stewardship for the benefit of biodiversity and ecosystem services	3.1	Maintain species numbers, diversity and ecosystem services within, and in the vicinity of, the footprint of the Corrib Asset.
	3.2	Implement the LMP and FMP for the life of the Corrib Asset.
	3.3	Set up review programmes for the LMP and its associated FMP.
	3.4	Manage lands and activities in accordance with the LMP in order to maximise their contribution to biological diversity by giving a commitment to adhere to or undertake the following:
	3.5	Identify any conservation designation opportunities on land owned and its conservation significance at both a local and a national level.
	3.6	New and replacement planting will comprise native trees and hedges as determined by the local landscape character, using stock from local sources if available.
	3.7	Maintain grass cutting and appropriate grazing régimes that are compatible with biodiversity enhancement and species conservation, as set out in the LMP.
	3.8	Maintain hedge/tree cutting and other vegetation maintenance regimes, as set out in the LMP, to enhance biodiversity and which adhere to wildlife legislation.
	3.9	Where possible eliminate the use of pesticides, herbicides and chemical fertilisers.
	3.10	During maintenance activities /site works keep areas of exposed ground to a minimum by vegetation restoration techniques in order to reduce the potential for carbon release.
	3.11	When considering works on buildings or other structures, ensure, including through survey where appropriate, that protected or other important species are properly protected (e.g. it is an offence to interfere with or destroy the breeding or roosting places of bats) and follow species protocols.
	3.12	Manage ponds or other wetland areas to maintain habitat and species diversity.
	3.13	Safeguard and manage species of national significance which occur on its lands.
	3.14	Ensure that biodiversity surveys are undertaken to inform changes to land use or when undertaking maintenance.
	3.15	Annual checks on / maintenance of bird and bat boxes.
	3.16	Manage water courses and their margins to benefit biological diversity; and discourage the permanent canalisation or culverting of water courses and ensure the design of culverts and bridges allows for passage of aquatic life.
	3.17	Where relevant and appropriate, provide educational facilities for the public.
Objective 4: Explore opportunities to further enhance biodiversity on lands in the stewardship of VEPIL	4.1	Plant further areas with native tree and shrub, where appropriate, to enhance invertebrate biodiversity and in turn birds and bat species; and also, to absorb carbon in the long term.
	4.2	Erect bat and bird boxes in areas of developing /maturing deciduous woodland habitat and in the vicinity of wetlands (ponds).
	4.3	Plant suitable species to support pollinators throughout the year.
	4.4	Explore any other opportunities in addition to the above.

Objective	Action	
Objective 5: **Implement protocols to control invasive species**	**5.1**	Monitor reinstated habitats for the invasive species - *Rhododendron* and *Gunnera.*
	5.2	If found, they must be removed by means of the best practice methodology pertaining at the time.
	5.3	Familiarise relevant staff and contractors with regard to likely occurring invasive species and instruct them in correct procedures for the treatment of invasive species.
	5.4	Vigilance in case of infestation by other invasive species – both terrestrial and aquatic.
Objective 6: **Contribute to awareness and sustainable use of biodiversity through day to day activities**	**6.1**	Implement a Sustainable Development Strategy:
	6.2	As a consumer of materials, furniture, paper, water etc. and as a producer of waste.
	6.3	As a consumer of energy, continue to implement the energy management system (EMS).
	6.4	As an operator.
	6.5	As a funder of projects, subsidies and contracts; and provider of educational opportunities etc.
	6.6	Encourage staff, contractors and consultants to adopt the principles of biodiversity enhancement and adhere to best practice.
	6.7	Provide regular trainings and biodiversity awareness events for staff, contractors and consultants.
	6.8	Continue to engage with Business in the Community/ Biodiversity in Business.
Objective 7: **Promote the distinctiveness and quality of the area's biodiversity**	**7.1**	Continue to seek opportunities to promote biodiversity and the Biodiversity Action Plan in the local Community and beyond.
	7.2	Set up nature trails in appropriate areas.
Objective 8: **Provide species records and habitat quadrat data to the National Biodiversity Data Centre and share data with the wider scientific community.**	**8.1**	Liaise with relevant and appropriate bodies for data sharing, including – but not exclusively: NBDC, NPWS, BSBI, scientific researchers etc.
Objective 9: **Review of the Biodiversity Action Plan**	**9.1**	Set up a review programme for the BAP, to include an interim review in 2023.

06

Aughoose wetland 22 with Sruwaddacon Bay and the Glenamoy River in the background

6 CORRIB'S ECOLOGICAL CONTEXT

6.1 Introduction

Corrib has been unusual in respect of commercial developments in that the planning and construction phases took longer than originally anticipated. This resulted in habitat and species data being collected over a significantly longer period of time than would normally be the case, with a commensurate accumulation of knowledge and understanding of the environment in which the Corrib Asset is placed.

Baseline surveys and monitoring (ongoing) have been undertaken since 2000/2001 in respect of the various elements - offshore, nearshore in Broadhaven Bay, intertidal and onshore (for Pipeline and Terminal), resulting in an extensive biodiversity database. This exists in baseline reports, environmental impact statements (EISs), and a wide range of reports. The information gathered to date has informed the various impact assessment processes, given a firm grounding for targeting mitigation measures during construction and works activities during operations; and developing and implementing appropriate monitoring programmes which are ongoing.

Because of the large volume of accumulated data, it is not practical to include it all in this document, but in order to place the Objectives and Actions for 2021 to 2026 described in Section 5 in context, paragraphs 6.2 and 6.3 provide a summary overview of the habitats and species that occur within the footprint of the various elements of the Corrib Asset; and species lists are provided in the appendices.

Much of northwest Mayo is designated for nature conservation under Irish and European legislation. In order to put the Corrib Asset (together with the habitats and species occurring on its footprint) in the context of the wider ecological landscape, designated conservation sites in the wider locality are listed and those sites in close proximity to, or on which the Corrib Asset impinges, are described.

6.2 Habitats

6.2.1 Marine habitats

The location of the offshore elements of the Corrib Asset referred to in the following paragraphs is shown in Figure 3.2.

6.2.1.1 Broadhaven Bay

The exposed, dynamic nature of Broadhaven Bay (Plate 2) combined with the presence of coarse sediments influence the intertidal and near-shore communities such that they are relatively species poor, while the wave exposed rocky subtidal and intertidal shorelines around much of the peripheries of Broadhaven Bay, while not on the route of the pipeline, have a much more diverse species assemblage that contribute significantly to the biodiversity and biomass of the coastal waters.

Plate 2: Broadhaven Bay from the pipeline landfall at Glengad

Plates 3a and 3b show examples of the shallow subtidal habitats in Broadhaven Bay.

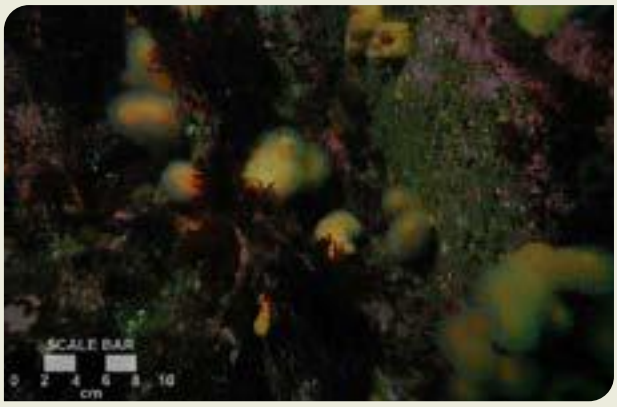


Plate 3a: Shallow subtidal habitats in Broadhaven Bay

Plate 3b: Shallow subtidal habitats in Broadhaven Bay

The landfall at Glengad comprises a relatively high energy sand and cobble beach with areas of boulder scar, which extends into coarse sand in the nearshore waters where the pipeline is protected by a deposited rock berm to ensure integrity. (Plate 4)

Plate 4: The intertidal zone at the Glengad landfall

The offshore pipeline and umbilical occupy a very small footprint through Broadhaven Bay in this highly dynamic EU Annex I marine habitat (Table 6.4). Much of the seabed of the Bay is considered to be a dynamic sandy seabed reflecting the exposed westerly aspect. Whilst not on the route of the pipeline, Eel grass (*Zostera)* beds are located close to Ballyglass pier which has been used by vessels during construction and some boat-based monitoring activities. *Zostera* species are listed as a component of some marine and estuarine EU Annex I habitats (EU Interpretation Manual, 2007) and they have a key role in maintaining coastal biodiversity. Ballyglass Pier is used to support the nearshore components of the annual subsea infrastructure inspection and maintenance monitoring surveys.

Since the installation of the pipeline and the project going into Operations, annual surveys of the pipeline, the subsea and umbilical, and the Terminal treated surface water outfall pipeline have been undertaken using a combination of camera footage and geophysical sensors. Whilst the primary purpose of these surveys has been to monitor the integrity of the subsea infrastructure, but the visual footage obtained has been used to determine the degree of epibenthic colonisation of the introduced structures on the seabed and in particular to monitor any colonisation by species that are classed as invasive or non-native. The introduced structures on the seabed include not just the infrastructure mentioned above, but also associated rock or concrete scour or span protection. For much of the length of the pipeline and umbilical route the pipeline is laid onto the seabed and has been allowed to bury into the seabed sediments, however additional protection measures have been added where the pipeline traverses the Erris Head area and in particular in the nearshore waters of Broadhaven Bay.

Plates 5a to 5c show images of the pipeline and epibenthic colonisation in Broadhaven Bay from visual monitoring in 2020 (RSK, 2021) and show protection measures needed to maintain integrity of the pipeline at certain locations due to the dynamic nature of the seabed sediments. Colonisation on the introduced structures includes various sessile species of flora and fauna including calcareous tubeworms, bryazoan and hydroid mats, macroalgae (especially red algae due to the water depth). The surrounding seabed ranges from clean rippled sands to a seabed of both finer and mixed coarser sediments.

Plate 5a: Concrete Mattresses

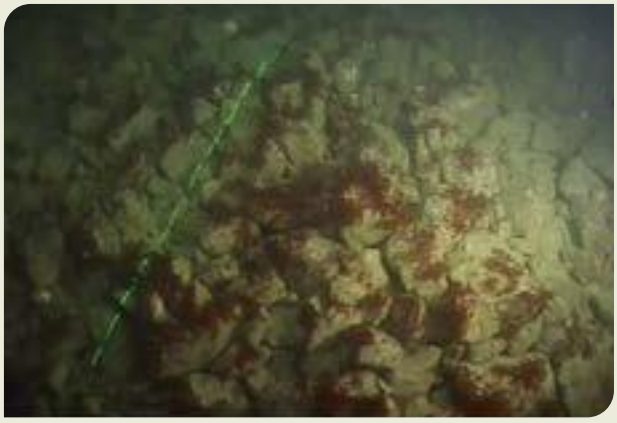


Plate 5b: Rock Protection Water depth 23m

Plate 5c: Mesh rock bag protection (filter units) Water depth 25m

6.2.1.2 Erris Head Area

The benthic macrofaunal communities present at sites sampled north and north east of Erris Head in water depths of approximately 70 m during surveys carried out in 2014 (RSK, 2015) and 2020 exhibited moderate to high diversity, generally with moderate abundance and a high degree of evenness. There was low dominance by single species, indicating a stable seabed ecosystem. The species found were typical of subtidal sandy habitats, ranging from those found in coarse sand and gravel to those preferring more stable fine sand. It should be noted that the macrofaunal communities sampled, are representative of sediment infauna located where grab sampling took place. As a consequence, they do not reflect the communities inhabiting any hard rock substrate present in the area. The findings of these survey campaigns broadly agree with those undertaken in 2007 and 2008 and summarised above.

At a broad taxonomic level, annelid polychaetes were the dominant taxa, while crustaceans, molluscs and echinoderms made up small proportions of the fauna observed across the area. The two principal biotope types off Erris Head are sublittoral coarse sand communities and sublittoral sand communities. The community type typical of coarser sediments is dominated by nematodes, nemerteans and the polychaetes *Pisione remota, Hesionura elongata* and *Polygordius*, species of syllid polychaete, the *polychaetes Glycera lapidum* and *Protodorvillea kefersteini* and robust molluscs such as venerid and *Spisula* bivalves, whereas the communities more typical of finer grained sediments include species such as the pea urchin, *Echinocyamus pusillus*, sea potato, *Echinocardium flavescens*, the tellind bivalve *Abra pristmatica*, the spionid polcyhaete *Spiophanes bombyx* and the sand- tube dwelling polychaete *Owenia borealis*.

The 2020 survey indicated that the two principal biotope communities off Erris Head tended to be differentiated in an east-west orientation with the coarser sediment community dominated by nematodes, nemerteans and polychaetes in the west, with the fine / medium sand community dominated by the anemone *Edwardsia claparedii* and the spionid polychaete *Spiophanes bombyx* in the east. These two principal communities were as identified in the same area in 2014. However, the polychaete *Capitella sp.* was abundant in the east of the area in 2020, whilst it was completely absent in 2014.

It should also be noted that the seabed type and community structure off Erris Head does

not necessarily reflect completely the results of the sampling above because grab sampling can only sample soft sediments (or those that can be sampled by grab) and, as such, only records the infaunal communities associated with these two principal biotopes. The seabed off Erris Head while mostly a mixture of fine and coarse sediments, also comprises exposed bedrock as well as rock overlain by a veneer of sediments. Seabed imagery from the 2014 survey (RSK, 2015) gives an indication of the heterogenous nature of the seabed (Plates 6a to 6f). These communities have associated epifaunal communities comprising a range of species that was recorded in seabed imagery during the survey including ophiuroids (including possibly *Ophiothrix fragilis*), crinoids (possibly *Antedon sp.*), anemones, gastropods (*Calliostoma zizyphinum*) and sea urchins (*Echinus esculentus*), sponges, asteroids (starfish, possibly *Asterina gibbosa* and *Anseropoda placenta*).

Plate 6a: Rippled Sand

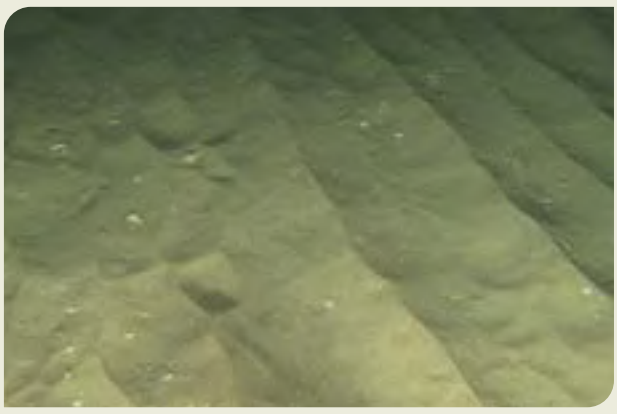


Plate 6b: Rippled bioturbated sand

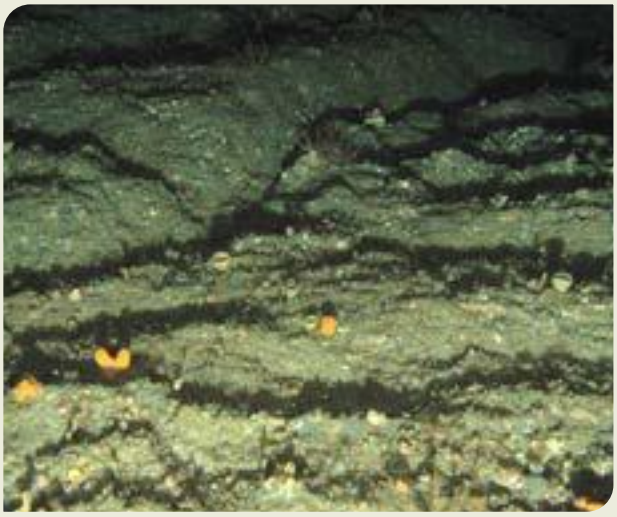


Plate 6c: Coarse sand and gravel with exposed bedrock

Plate 6d: Coarse sand and gravel

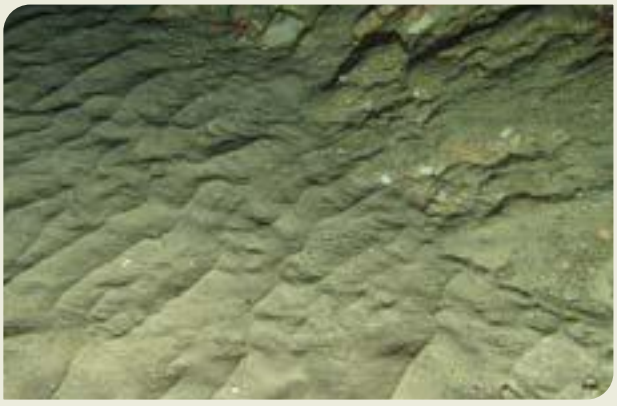


Plate 6e: Coarse rippled sand with exposed bedrock

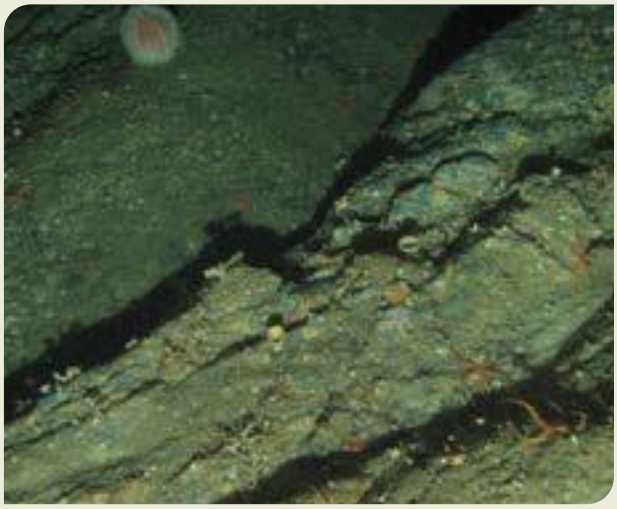


Plate 6f: Exposed bedrock

No species of conservation importance were recorded, and in overall terms the communities recorded are both diverse and stable and relatively typical of the seabed along the Atlantic coasts of North West Ireland.

Plate 7a: Rock Protection -water depth 68m

Plates 7a and 7b show images of the pipeline and epibenthic colonisation in Broadhaven Bay from visual monitoring in 2020 (RSK, 2021). These show the protection measures needed to maintain integrity of the pipeline at certain locations off Erris Head. Rock protection in these deeper waters shows less colonisation. The rocks and the pipeline have a biofilm covering and species such as calcareous tubeworms, occasional sponges dominate. Grazing species such as sea urchins and asteroid starfish are also prevalent. The pipeline can also be seen to offer refuge areas for small demersal fish such as redfish (*Sebastes sp).*

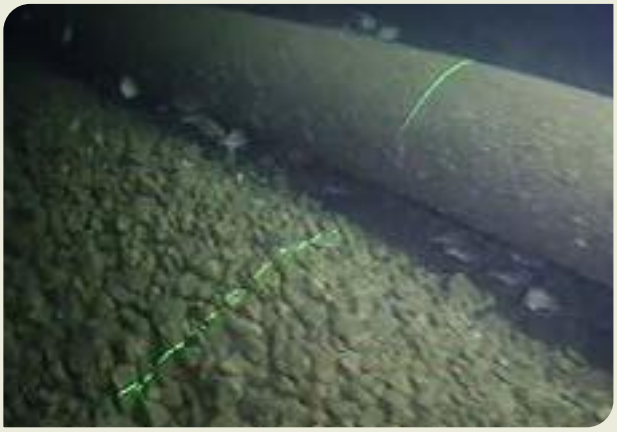


Plate 7b: Rock span protection water depth 80m

6.2.1.3 Corrib Field - Manifold Offshore Area

Further offshore towards the Corrib Field, the communities in deeper water are more stable and diverse, as they are less influenced by the movement of the surface waters. The macrofaunal communities in the vicinity of the Corrib Field Wells and Manifold were sampled and analysed in 2014 and 2020 using comparable techniques and sampling stations to the those used in 2000 and 2008. Overall, the benthic environment consists of fine-grained muddy sand with an infauna that reflects this, being of moderate abundance and moderate to high diversity and demonstrating a high degree of uniformity (low variability) of the infaunal community assemblage across the Corrib Field sampling area.

In this area infauna is numerically dominated by annelid polychaetes (53% of all taxa in 2020), and the tube-dwelling polychaete, *Galathowenia oculata,* is by far the most abundant. Small bivalve molluscs, and to a lesser degree, echinoderms, are also important components of the infauna. The dominance of annelids is expected given the relatively fine grain size of the substrate at this location. Larger organisms are found living

on the surface and include relatively large filter-feeding anemones, burrowing squat lobsters, and echinoderms such as sea urchins. These organisms appear to contribute significantly to the physical structure of the sedimentary environment, by burrowing, feeding and movement. Plates 8a to 8d show surface dwelling fauna captured in seabed imagery. A range of conspicuous surface dwelling faunal species were observed, including ophiuroids, anemones, Pennatulids, the sand mason worm (*Lanice concheliga*) and the Purple heart urchin (*Spantangus purpureus*). Other species included paguroid crabs, asteroid starfish, decapod shrimps, as well as a number of deeper dwelling demersal fish species including hagfish, anglerfish, and a number of species of Gadiforme.

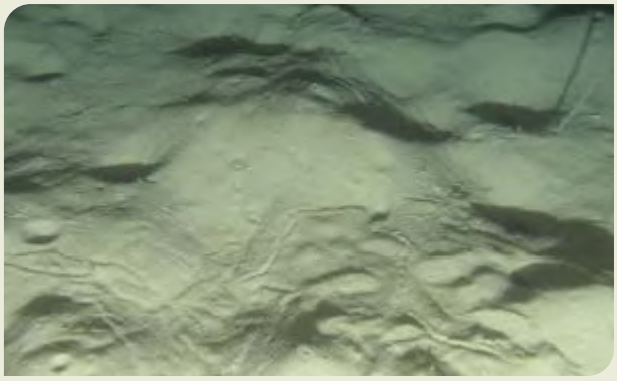


Plate 8a: Bioturbated fine silty sand at the Corrib Field - water depth c. 360m

Plate 8b: *Paguroidea* sp. at the Corrib Field

Plate 8c: Ophiuroid starfish at the Corrib Field

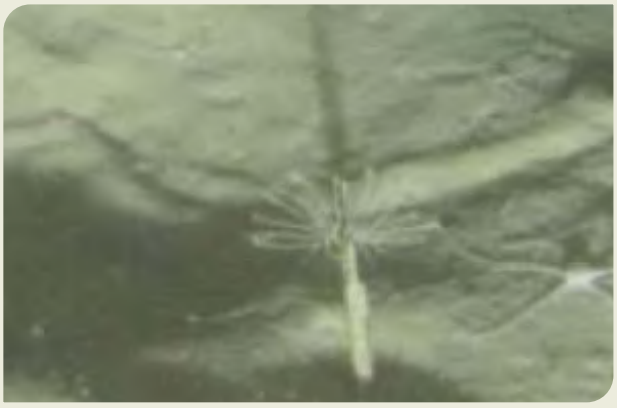


Plate 8d: Terribellidae (*Lanice concheliga*) at the Corrib Field

Very few organic pollution indicator species were identified in the vicinity of the Corrib Field Wells and Manifold area, i.e. the polychaete worms *Capitella* and *Cirratulus*, which were recorded in low numbers and at few stations, suggesting that any organic pollution is minimal. No species of conservation importance were encountered in the vicinity of the Corrib Field Wells and Manifold in the 2014 and 2020 surveys.

6.2.2 Pipeline habitats

The main locations referred to in the following paragraphs are shown on the map in Figure 6.1. Plant species for the key locations are listed in Appendix 8.4.

6.2.2.1 Landfall to Sruwaddacon Bay

The landfall for the offshore pipeline and umbilical is on the westerly shore at Glengad where the low cliffs comprise glacial till, with rock armour at the landfall location. A Sand Martin colony is located in the soft cliff to the north and north east of the landfall at Glengad.

Prior to any construction activity, the area that would become the pipeline temporary working area (TWA) at Glengad was dominated by improved/ semi-improved grassland habitat with wetter, rushy grassland in places. This area had been stripped and reinstated a number of times to facilitate various construction activities between 2002 and 2010. On each occasion the top-soil surface had been stored separately and reinstated, with vegetation becoming rapidly and successfully re-established from the seed bank in the soil. The same approach to top-soil storage was implemented during construction from 2012 to 2015 which facilitated the preservation of the seed bank in preparation for final surface reinstatement in 2015.

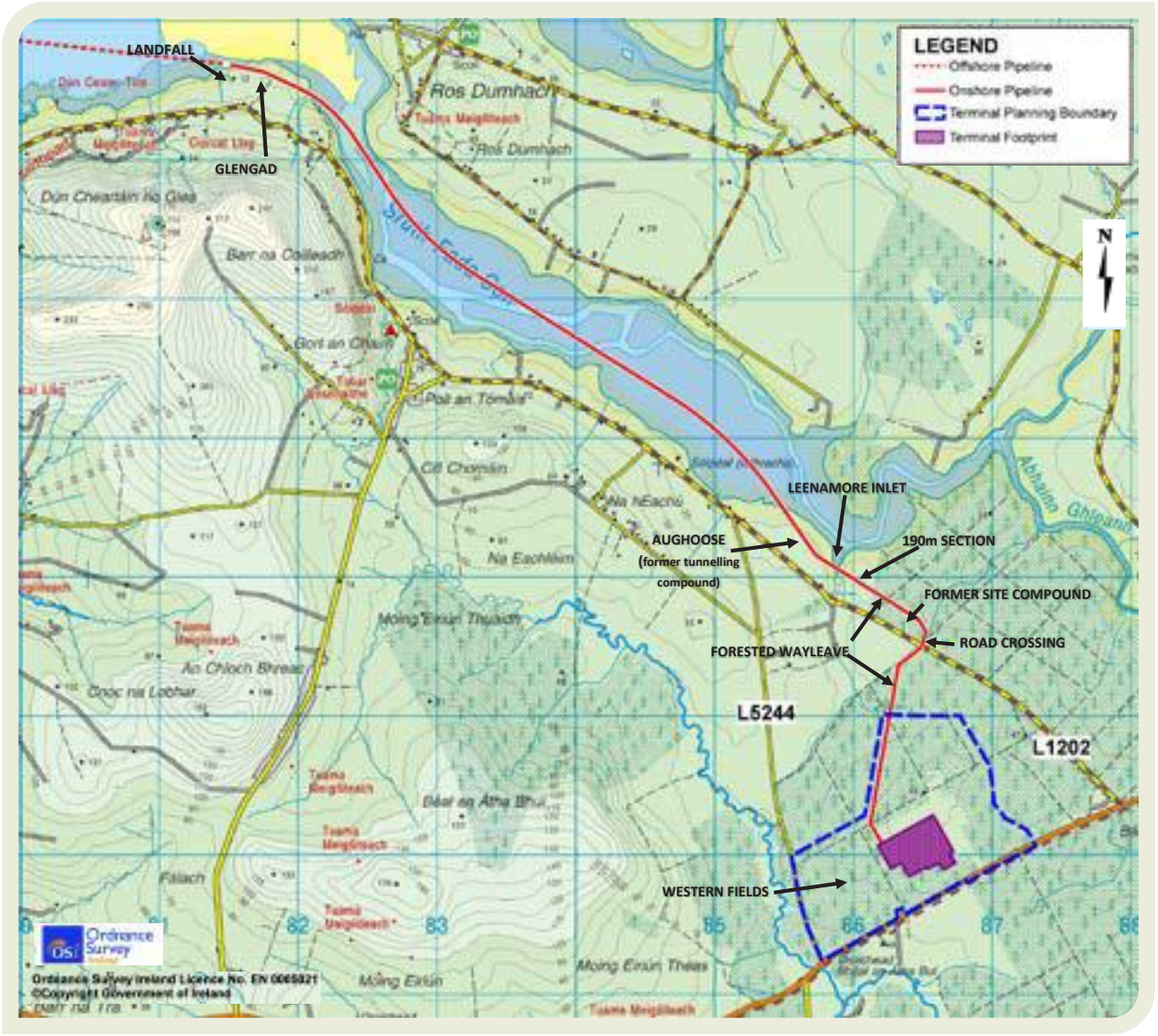
Following surface reinstatement, vegetation colonisation had commenced quickly on the cliff top edge with a grass-dominated sward beginning to develop by the end of 2015. By the end of 2019, there was already a well-established sward of grasses along the cliff top edge, dominated by Creeping Bent (*Agrostis stolonifera*) and Perennial Rye-grass (*Lolium perenne*) with an assemblage of herb species typical of coastal grassland including: Buck's-horn Plantain (*Plantago coronopus*), Creeping Buttercup (*Ranunculus repens*), Red and White Clover (*Trifolium pratense* and *T. repens*), Silverweed (*Potentilla anserina*), Procumbent Pearlwort (*Sagina procumbens*), and species of Dock (*Rumex spp*).

Vegetation on the reinstated soft cliff above the rock armour remains sparse, with Red Fescue (*Festuca rubra*), Buck's Horn Plantain (*Plantago coronopus*), Yarrow (*Achillea millefolium*), Yorkshire Fog (*Holcus lanatus*), White Clover (*Trifolium repens*) and Creeping Thistle (*Cirsium arvense*) being the most frequently occurring species (Plate 9). Given its exposed location, it is unlikely that a continuous sward would develop on the steeper sections owing to their exposure to weather and sea spray. Albeit sparse, any vegetation cover here is important as it gives protection from weathering and erosion and assists in maintaining the integrity of the upper cliff reinstatement. The near vertical west facing stony cliff sections, on either side of the reinstated section of cliff, remain more or less devoid of vegetation, much as they were prior to first construction commencing in 2002. The wayleave immediately to the east of and adjoining the reinstated cliff-top, is dominated by Yorkshire Fog (*Holcus lanatus*), White Clover (*Trifolium repens*) and Jointed Rush (*Juncus articulatus*).

Plate 9: The landfall cliff top at Glengad showing well - established vegetation

The side slopes of the Landfall Valve Installation (LVI) were reinstated between 2014 and 2015, with stored top-soil and quickly became fully vegetated. They now comprise a well-developed and species – rich, meadow vegetation, which flowers profusely during the summer months. The vegetation is dominated by common meadow grassland species such as Yorkshire Fog (*Holcus lanatus*), Red Clover (*Trifolium pratense*), Sweet Vernal-grass (*Anthoxanthum odoratum*) and Bird's-foot Trefoil (*Lotus corniculatus*). In addition to these more robust grassland species a range of more unusual, lower-growing species such as Sheep's-bit Scabious (*Jasione montana*), Common Centaury (*Centaurium erythraea*) and Bog Pimpernel (*Anagallis tenella*) are frequent in the vegetation. Tall flowering spikes

Figure 6.1 Map to show the main locations referred to in the text.



of Northern Marsh-orchid (*Dactylorhiza purpurella*) are visible on the side slopes in late spring /early summer. (Plates 10a to 10f) To date, the vegetation on the LVI side slopes has been self-sustaining, requiring no management or intervention by grazing or mowing.

Plate 10a: LVI Western side slope, with tall flowering spikes of Purple Loosestrife (facing south) 2019

Plate 10b: LVI Southern side slope (facing east) 2019

Plate 10c: Close up of flower – rich, LVI southern side slope 2019

Plate 10d: Northern Marsh -orchid (*Dactylorhiza purpurella*) on LVI sideslope

Plate 10e: Sheep's Bit Scabious (*Jasione montana*) on LVI side slopes

Plate 10f: Common Centaury (*Centaurium erythraea*) on LVI side slopes

Outside the LVI, the west Glengad wayleave, comprises wet grassland dominated by Soft Rush (*Juncus effusus*), a habitat type recorded for this part of the wayleave in the original 2001 baseline survey (Gaynor, 2002), prior to pipeline construction. To the north of the access road (east of the LVI, Plates 11a and 11b) a lower growing grassland vegetation is present, dominated by: Yorkshire Fog (*Holcus lanatus*), Jointed Rush (*Juncus articulatus*), Silverweed (Potentilla anserina), Sweet Vernal-grass (*Anthoxanthum odoratum*) and Marsh Ragwort (*Senecio aquaticus*) – also similar to that recorded in this area in the 2001 survey. The strip of land alongside the access road from the local road L1202 to the pipeline wayleave is also dominated by this type of lower-growing grassland vegetation.

Plate 11a: Glengad wayleave west, facing west towards the LVI and the landfall

Plate 11b: Marsh Ragwort (*Senecio aquaticus*) on the Glengad wayleave

In the Glenamoy Bog Complex (SAC 500), to the north of the wayleave at west Glengad, the grassland habitat immediately adjacent to the wayleave is best described as 'semi-improved dune grassland'. This gradually merges into EU Annex 1 fixed dune grassland, although not a qualifying interest or conservation objective for the SAC. This area to the north of the wayleave was not subject to disturbance / impact during construction. In 2019, the dominant plant species recorded in the 'semi-improved dune grassland' vegetation were Red Fescue (*Festuca rubra*), Yorkshire Fog (*Holcus lanatus*), Sweet Vernal-grass (*Anthoxanthum odoratum*), Crested Dog's tail (*Cynosurus cristatus*), Bird's foot Trefoil (*Lotus corniculatus*) and Common Bent (*Agrostis capillaris*) also frequent, with grassland forb species present where the grass growth was less dense. The grazing régime in this area has resulted in a visible increase in the flowering of some grass and forb species, Ladies Bedstraw (*Galium verum*) being particularly notable and with flowering Wild Carrot (*Daucus carota*) and Red Clover (*Trifolium pratense*) also locally prominent in the vegetation. (Plates 12a to 12d)

Plate 12a: Species-rich Annex I fixed dune grassland to the north of the wayleave at west Glengad, dominated by the yellow flowers of Lady's Bedstraw (*Galium verum*)

Plate 12b: Close up of Lady's Bedstraw (*Galium verum*) at Glengad

Plate 12d: Soldier beetles on Wild Carrot (*Daucus carota*) at Glengad

Plate 12c: Red Clover (*Trifolium pratense*) at Glengad

At the eastern end of the wayleave at Glengad, the area that had been the tunnel reception site compound during construction is characterised by well-developed grassland vegetation with a relatively species-rich sward present. The main species in the vegetation are generally Yorkshire Fog (*Holcus lanatus*), Creeping Clover (*Trifolium repens*), Jointed Rush (*Juncus articulatus*), Red Clover (*Trifolium pratense*), Crested Dog's-tail (*Cynosurus cristatus*), Sweet Vernal-grass (*Anthoxanthum odoratum*) and Lesser Spearwort (*Ranunculus flammula*). (Plates 13a and 13b)

Plate 13a: Glengad east - former tunnel reception site compound (facing towards the north-east)

Plate 13b: Glengad east - former tunnel reception site compound (facing southwards)

The vegetation of the small wet flush in the north-eastern corner of the former site compound continues to be dominated by Floating Sweet-grass (*Glyceria fluitans*) with occasional Jointed Rush (*Juncus articulatus*), Marsh Ragwort (*Senecio aquaticus*), Creeping Bent (*Agrostis stolonifera*) and Marsh Arrow-grass (*Triglochin palustre*). Between the access road and former site compound, the east Glengad wayleave traverses three privately owned fields. The wayleave in these fields has been returned to agricultural use and largely comprises agricultural grassland used for grazing. (Plate 14)

Plate 14: Looking east from the access road along the Glengad east wayleave

Most field boundaries along the wayleave In Glengad comprise post and wire fences, with earthen (sod) banks in places.

6.2.2.2 Habitats over the tunnel - Glengad

The onshore pipeline was installed in a tunnel of approximately 4.9 km in length beneath terrestrial and estuarine habitats, of which 4.6 km is routed underneath Sruwaddacon Bay, which is part of the Blacksod Bay/Broad Haven SPA and the Glenamoy Bog Complex SAC.

Eastwards from the former tunnel reception site compound, the pipeline passes under *Juncus* and *Iris* - dominated grassland areas which merge into a small area of salt marsh at the Glengad side of the estuary. Since 2005 this area of salt marsh had become degraded as a result of runoff from the lands above it, and in places is also deeply rutted leading to encroachment by Soft Rush (*Juncus effusus*). There is no longer a defined boundary to the landward side of the salt marsh, which is species poor and dominated at the estuarine edge by Sea Milkwort (*Lysimachia maritima*) and Common Saltmarsh-grass (*Puccinellia maritima*).

The intertidal sand and mud flats at the Glengad side of the estuary have little vegetation, though to the north there is an area of accretion upon which sparse salt marsh vegetation had become established. Occasional rounded hard “pebbles” of peat occur here also; these are the eroded remnants of peat brought down by the Pollatomish landslide in 2003. They have been noted with Gutweed (*Ulva* spp. formerly known as *Enteromorpha spp.*) and, to a lesser extent, Eel Grass (*Zostera*), attached.

6.2.2.3 Habitats over the tunnel - Sruwaddacon Bay

Sruwaddacon Bay (Plate 15) is an important part of the Glenamoy / Muingnabo River salmonid system, with fish migrations passing through the Bay en route to and from spawning grounds upstream.

All stages of the estuary, from small freshwater streams to fully marine conditions, are represented within a relatively small area. The high-energy nature of the large yet shallow bay has resulted in the sediments being dominated by moderately exposed sands with few areas of low-energy muddy communities, typical of most estuaries, confined to

the upstream end of the Bay and small inlets away from the main channel. No unusual or rare biotopes were recorded within the Bay.

Plate 15: Sruwaddacon Bay

Habitat denominations within the upper inter-tidal areas around the estuary are relatively consistent, with few exceptions. Grass dominated (*Puccinelia* spp,) saltmarsh (EU Annex I habitat) occurs around the majority of the upper inter-tidal zone of the estuary - typically as a fringe between terrestrial vegetation and marine habitats (the latter dominated by algae).

Tidal influences in this zone are often marked by a strandline of decaying fucoid algae, together with an associated community of talitrid amphipods. An exception to this is the seaward end of the northern shore, where steep cliffs of bedrock mark the upper boundary with a zone affected by sea spray and encrusted by lichens.

Between the upper saltmarsh or cliff areas and the homogenous sands that make up the majority of the bay's surface soils, a regular band of mixed sediments supports several discrete but regular communities, with the thickness of the band characterised by the upper tidal range and the gradient of the shore. Traversing down the shore, the upper saltmarsh or bedrock gives way to a succession of varying habitats, starting with the clean coarse gravels with associated crustaceans where freshwater influences are greatest; and Channelled Wrack (*Pelvetia canaliculata)* marks the upper limit of the high water mark.

Below this is a zone of often mixed Spiral wrack (*Fucus spiralis*), Bladder wrack (*F. vesiculosus*) and in areas near freshwater input, Horned wrack (*F. ceranoides)* is attached to large cobbles and boulders. Regular downshore strips of Gutweed (Ulva / *Enteromorpha* spp.) and occasionally Sea Lettuce (*Ulva lactuca)* are also common near freshwater inputs (numerous ditches and small gullies). Further down the shore, Egg wrack (*Ascophyllum nodosum)* and the epiphytic *Polysiphonia lanosa* are dominant. Epifaunal species are common within the fucoids, and include winkles (*Littorina* sp.), amphipods, and occasional juvenile Shore Crab (*Carcinus maenas*). Further seaward (towards fully marine conditions), occasional limpets (*Patella vulgata*), mussels (*Mytilus edulis*), barnacles (*Semibalanus balanoides*) and, less frequently, anemones (*Actinia* sp.) occur attached to boulders. Below this, sedimentary environments are present throughout the remainder of the estuary.

Sandy sediments dominate the Bay. However, a small variation in habitat is noted due to subtle changes in exposure from both channel currents and wave action. In a survey conducted in 2014, the results from analysis indicated that the Sruwaddacon estuary was largely dominated by fine to medium sand and showed a general increase in percentage sands and increased sorting towards the lower end of the estuary. This is a result of increased energy levels through tidal processes towards the mouth of the inlet leading to increased sediment reworking and sorting and decreased sedimentation of fines. No changes were seen in the particle size distribution between the three survey years (2010, 2013 and 2014) or in relation to geographical proximately to the constructed tunnel for the pipeline.

The faunal community showed differences in distribution and abundance based on geographic position and natural temporal variance between survey years. All three surveys indicated a general increase in species numbers and diversity, and a decrease in abundance and biomass, down the course of the estuary towards the mouth. These are related to the changing physical and hydrodynamic characteristics measured in the sediments as well as salinity changes.

By year, species richness showed an increase in 2014 from 2010 and 2013, whilst the total biomass and abundance significantly fell in 2013 and 2014 from the baseline survey in 2010, particularly for the crustaceans, molluscs and annelids. However, all three phyla also showed a distinct increase in biomass in the upper estuary in 2014, likely attributed to the high abundance of two particular species, the crustacean *Corophium volutator* and the annelid *Pygospio elegans*. These are all interpreted as natural population variations within the estuary.

Large areas of anoxic muddy sediments, more typical of many low-energy estuaries, were limited to small sheltered embayment in the upper estuary. Here, there were shallow basins outside the main current flow and sheltered from wave action, which have become a depositional environment. The resulting sediments were soft and unconsolidated with a relatively shallow redox layer.

In terms of benthic fauna, survey results to date suggest that there is a significant biomass of macro-invertebrates amongst the rocks of the bank deposits when compared to the sandy sediments, although the access to many of the species (as beneath the larger rocks) may be limited. The overall numbers of individuals and resulting biomass appear to vary greatly both by geographical location and by survey year.

6.2.2.4 Habitats over the tunnel - south of Sruwaddacon Bay

The pipeline tunnel passes beneath the fringe saltmarsh at the southern shoreline of the Bay and then under an area of undesignated blanket bog which is recovering from former overgrazing but now considered to be of Annex I quality.

6.2.2.5 Aughoose to the Terminal

6.2.2.5.a Aughoose - former tunnelling compound

Prior to construction this area comprised heavily eroded blanket bog. At the start of construction of the tunnelling compound at Aughoose, existing intact surface vegetation was removed and stored as large turves on top of the peat storage areas.

Reinstatement took place during 2015 and 2016 in accordance with the Pipeline Construction EMP, Reinstatement and Aftercare Plan (R&A Plan). Blanket bog turves were placed over the northern two thirds of the site in a chequer-board pattern with bare peat in the interstices of the matrix (Plates 16a and 16b). The southern third of the site was largely reinstated using only peat, resulting in large areas without vegetation.

Plate 16a: Aughoose – overview of matrix of vegetated blanket bog turves and bare peat during the reinstatement of the former tunnelling site compound

Plate 16b: Aughoose - closer view of vegetated blanket bog turves and bare peat with a wetland pond (Facing towards the NW)

During the spring and autumn of 2015, bare peat areas were planted with small transplants of Common Bog-cotton (*Eriophorum angustifolium*) translocated

from commercial cutaway donor sites in the wider locality. Approximately 64,000 Common Bog-cotton plants in total were transplanted and by the end of 2016 most were well-established and had started to spread out and colonise the areas of bare peat. In addition to this, locally collected seed of Purple Moor-grass (*Molinia caerulea*) was spread on the 'bare' peat areas between the turves and across the southern part of the site. Similarly, locally collected seed of heathers (Ling Heather (*Calluna vulgaris*); Bell Heather (*Erica cinerea*) and Cross-leaved Heath (*Erica tetralix*)) was spread in certain locations on the site, particularly in areas of shallower peat.

Blanket bog turves

Since reinstatement in 2015, there has been relatively little change in the vegetation composition of the blanket bog turves. The cover of turve vegetation still remains close to 100% with species occurring prior to construction maintaining their presence, including four key indicator/ character species for Atlantic blanket bog habitat - Hare's-tail Cotton-grass (*Eriophorum vaginatum*), Purple Moor-grass (*Molinia caerulea*), Cross-leaved Heath (*Erica tetralix*) and Black Bog-rush (*Schoenus nigricans*).

Recolonising areas of bare peat

Plate 17a: Aughoose. Some of the 64,000 Common Bog-cotton (*Eriophorum angustifolium*) transplants growing on former bare areas of peat at the former tunnelling site compound

Vegetation cover continues to increase in the former bare peat areas in the monitoring quadrats, with bare peat cover reducing from an average of 28% in 2018 to 17% in 2019, and 12% in 2020. Although Soft Rush is the main colonising species, particularly in the eastern half of the former site compound, Common Bog-cotton (*Eriophorum angustifolium*) remains prominent and increasingly widespread in the southern parts of the site that had been dominated by bare peat, being especially visible during the peak flowering period. (Plates 17a and 17b)

Plate 17b: Close up of Common Bog-cotton (*Eriophorum angustifolium*) growing at Aughoose on former bare peat areas

The increasingly robust growth of Black Bog-rush (*Schoenus nigricans*) has been notable, especially in areas that had been covered by bog mats supporting the perimeter security fence during construction, particularly along the west to north east perimeter of the site (Plate 17c). This species is a key/character species for Atlantic Blanket Bog vegetation so its continuing and increased presence is of significance in the context of the continuing development of key elements of blanket bog vegetation.

Plate 17c: Strong growth of Black Bog-rush (*Schoenus nigricans*) at Aughoose, on areas that had been covered by bog mats supporting the perimeter fence during construction

Wetlands

At the time of reinstatement, in accordance with the EMP R&A Plan, twelve wetlands (ponds) were created for biodiversity enhancement (Plate 18).

Plate 18: Wetland creation for biodiversity enhancement at Aughoose

Plate 19: Water plantain (*Alisma plantago-aquatica*) in wetland 19 at Aughoose

They were excavated in peat in order to keep them as natural as possible, with no pond liners or clay being used. The margins of these wetlands had been planted with a range of native wetland species including: Yellow Flag / Iris (*Iris pseudacorus*), Water Mint (*Mentha aquatica*) and Lesser Reedmace (*Typha angustifolia*). The wetlands continue to develop and water levels fluctuate depending on precipitation levels, with two mainly comprising damp hollows without standing water, but which nonetheless offer niche microclimate and habitat conditions. There has been considerable colonisation of the wetlands/ ponds by native vegetation, e.g. Bog Pondweed (*Potamogeton polygonifolius*) and Bulbous Rush (*Juncus bulbosus*), in a relatively short space of time, often varying markedly from one wetland to another. Plate 19 shows Water Plantain (*Alisma plantago-aquatica*) in one of the wetland ponds at Aughoose. Appendix 8.8 provides an overview of the wetland ponds at Aughoose.

The Aughoose wetlands were sampled in 2019, with some 38 different species of invertebrate being recorded (See Appendix 8.9). This is likely to be an underestimate because some groups such as Diptera (flies) and pea mussels (*Pisidium*) were initially only identified to a high level and will certainly contain several species. The groups with the highest frequency of occurrence were molluscs, present in 63-88% of sites, followed by beetle larvae, and aquatic Hemiptera (water bugs) present in at least 50% of the sites.

In terms of species diversity beetles and aquatic bugs, were the most diverse followed, in decreasing order by: damsel flies and dragonflies; molluscs; true flies; caddis flies; crustacea (fresh water shrimps); segmented worms (oligochaetes); and mayflies. While damsel flies and dragon flies were quite diverse, they only occurred in 4 of the 10 sampled sites and were represented by just one individual at one of these. This suggests that this group needs more permanent, deeper water and probably more aquatic plant cover to flourish. The opposite seems to be the case with the molluscs and the freshwater shrimp *Crangonyx* which occurred in the majority of sites, even when some of those had been dry in May.

The species encountered are generally widespread and common in small water bodies especially in peatland areas although some are more or less universal in small standing waterbodies of all types (e.g. *Corixa punctata* – lesser water boatman and *Hesperocorixa sahlbergi* – water boatman). Some, such as the beetle *Hydroporus pubescens*, are specialists in temporary pools and many of the water bugs are specialists of peaty pools of various configurations of depth and vegetation density.

Sphagnum - BeadaHumok™[14]

Sphagnum moss is a key constituent of functioning peatland ecosystems and is vitally important for peat formation and carbon sequestration. Prior to construction, actions were taken to facilitate the re-establishment of *Sphagnum* at Aughoose. In 2011, strands of five species of Sphagnum[15] were collected from Aughoose and sent to a laboratory in the UK that specialises in micropropagation. In 2017 and 2018 four species of *Sphagnum* (*S. papillosum*, *S. capillifolium*, *S. magellanicum* and *S. tenellum*) were planted as moss plugs (Beadahumok™) from this propagated material - both in monitoring plots and at random across the site (Plates 20a to 20d).

Plate 20s: Bundles of *Sphagnum* moss plugs - BeadaHumok™ for planting at Aughoose

Plate 20b: Bundle of c. 20 BeadaHumok™ plugs

Plate 20c: Individual BeadaHumok™ plugs, separated out and ready for planting using a wooden dibble.

Plate 20d: BeadaHumok™ plug amidst transplanted Common Bog-cotton (*Eriophorum angustifolium*) colonising bare peat

14 http://www.beadamoss.co.uk/page20.html

15 *S. capillifolium, S. cuspidatum, S.magellanicum, S. papillosum* and *S. tenellum*.

Monitoring in 2019 showed that, most continued to grow well and develop, but the plugs that were randomly planted in amongst the vegetation were most successful owing to their benefitting from a shaded micro-climate. Trial plot plugs planted in areas that were subject to inundation as a result of surface water ponding after heavy rain fared least well. As they became established, *S. magellanicum* (Plates 20e and 20f) and *S. capillifolium* plugs in particular began to develop their characteristic colours - red and yellow ochre.

Plate 20e: *Sphagnum magellanicum* BeadaHumok™ with sporangia (2019 - planted in 2017)

Plate 20f: Close up of 20e - *Sphagnum magellanicum* BeadaHumok™

Plate 20g: *Sphagnum papillosum* BeadaHumok™ SC3, one year after planting.

6.2.2.5.b Leenamore Inlet

The Leenamore inlet lies within two European designated conservation sites, namely the Glenamoy Bog Complex SAC and the Blacksod Bay/Broad Haven SPA. The salt marsh and intertidal habitats present at the Leenamore inlet are both EU Annex 1 habitats, though neither are conservation objectives or qualifying interests for the European sites.

The inlet's habitats were successfully reinstated in 2013 following the construction of the pipeline crossing (Plates 21-24).

Plate 21a: Aerial of Leenamore inlet before construction

Plate 21b: Aerial of Leenamore inlet, two years after construction and salt marsh reinstatement

Plate 22: Leenamore inlet saltmarsh facing north, with the river entering the inlet from the south

Plate 23: Leenamore inlet viewed across the inlet at low tide at the centreline of the pipeline wayleave (Note: This was taken from same position as Plate 24, during construction)

Plate 24: For comparison with Plate 23, pipelaying at the Leenamore inlet in 2013 (facing east across the inlet)

Reinstatement included the replacement of temporarily translocated and stored salt marsh habitat in the form of large turves that had been geotagged (Plate 25) during lifting in order to ensure their correct positioning when replaced and stored in an adjacent intertidal zone in order to maintain the correct tidal influence; and the replacement of intertidal habitat layers (cobbles and benthic layers) that had also been temporarily translocated and stored separately from one another.

Plate 25: Map of geo-tagged salt marsh turves at the Leenamore inlet

The salt marsh habitat comprises an area of fringing salt marsh in a small inlet which has a small stream

channel running through it and comprises two types of saltmarsh vegetation namely tall vegetation, dominated by Sea Rush (*Juncus maritimus*) and more low-growing grassy vegetation dominated by Red Fescue (*Festuca rubra*). The main associated plant species occurring are Creeping Bent (*Agrostis stolonifera*), Saltmarsh Rush (*Juncus gerardii*) and Sea Arrowgrass (*Triglochin maritima*). Other frequently occurring species recorded in the vegetation include: Common Saltmarsh-grass (*Puccinellia maritima*), Thrift (*Armeria maritima*), Common Scurvygrass (*Cochlearia officinalis*), Sea Milk-wort (*Lysimachia maritima*), and Sea Aster (*Aster tripolium*).

Recolonisation of the reinstated stony track on the western side of the inlet by salt marsh plant species has been ongoing gradually since reinstatement. The vegetation is dominated by salt marsh species including: Sea Plantain (*Plantago maritima*) and Sea Milkwort (*Lysimachia maritima*) with frequent Sea Arrow-grass (*Triglochin maritima*), Sea Aster (*Aster tripolium*), Creeping Bent (*Agrostis stolonifera*), Sea-spurrey species (*Spergularia* spp), Common Scurvygrass (*Cochlearia officinalis*) and Common Salt-marsh Grass (*Puccinellia maritima*). (Plate 26)

Plate 26: Leenamore inlet: the western track recolonised with salt marsh plant species

Fucoid seaweeds form a thick mat over the intertidal areas of the inlet (see also, Sruwaddacon Bay, intertidal areas above at 6.2.2.3. (Plate 27)

Plate 27: Leenamore River entering Sruwaddacon Bay at the mouth of the inlet

6.2.2.5.c Fields to the west and east of the Leenamore Inlet

Areas of grassland vegetation occur on the sloping ground on both sides of the Leenamore inlet, which for convenience are referred to as the '90m' sections west and east (Plate 28).

Plate 28: Species-rich wet grassland on either side of the Leenamore inlet

Prior to construction some vegetation was lifted as large turves which were stored on site, while the rest was surface stripped. Reinstatement had been by means of a combination of: reseeding the areas of bare peaty topsoil with a sacrificial agricultural meadow mix of selected suitable native species; and replacement of the large turves which were mostly used to re-vegetate areas at the bottom of the slopes, adjacent to the Leenamore inlet, the purpose

being to mitigate against potential surface run off while vegetation was becoming established on the slopes above.

The '90 metre' grassland areas have remained ungrazed since reinstatement in 2013. The vegetation is largely dominated by quite a species-rich, acid grassland/flush flora similar to that present prior to construction, including Black sedge (*Carex nigra*), Devil's-bit scabious (*Succisa pratensis*), Common knapweed (*Centurea nigra*), Sweet Vernal-grass (*Anthoxanthum odoratum*), Tormentil (*Potentilla erecta*), Marsh Pennywort (*Hydrocotyle vulgaris*), Bog Pimpernel (*Anagallis tenella*), Yellow Flag (*Iris pseudacorus*) and Soft Rush (*Juncus effusus*). Orchids occur occasionally on the wayleave but are very frequent adjacent to and to the south of the wayleave – mostly Northern Marsh-orchid (*Dactylorhiza purpurella*), with the occasional Heath Spotted Orchid (*Dactylorhiza maculata*) (Plate 29). Occasional shrubs of Common Gorse (*Ulex europaeus*) have also colonised this area.

Plate 29: Heath Spotted Orchid (*Dactylorhiza maculata*) in species – rich grassland to the east of the Leenamore inlet.

6.2.2.5.d The '190m' Section of Blanket Bog

The wayleave on the 190m section of blanket bog was reinstated in 2013 and this has been closely monitored since then, in accordance with the EMP monitoring programme. The northern third of the 190m wayleave, under which the pipeline is buried, comprises reinstated blanket bog vegetation turves (Plate 30).

Plate 30: Facing east along the 190m section of the wayleave, with cotton grasses (*Eriophorum angustifolium* and *E. vaginatum*) on the reinstated blanket bog turves.

The southern two thirds of the wayleave, where bog mats had been placed for storing turves during construction, are dominated by recovering blanket bog habitat. (Plates 31-33)

Plate 31: The western end of the 190m, facing west towards the Leenamore and Sruwaddacon Bay

Plate 32: Facing westwards along the 190m section of wayleave: showing recovering blanket bog with abundant dark green tussocks of Black Bog-rush (*Schoenus nigricans*) - June 2019

Plate 33: Sundew on the 190m with Cross-leaved Heath (*Erica tetralix*)

Annual surveys have shown a gradual increase in vegetation cover on the southern two thirds of the wayleave, recording and average cover in recorded quadrats from 63% in 2018 to 72% in 2019, and 77% in 2020. Species richness, the average number of species per quadrat, also shows a gradual increase, from 17.7% in 2018 to 19.3% in 2020. Purple Moor-grass (*Molinia caerulea*) remains the main regenerating species. A typical range of blanket bog species is present, with the most notable including Common Bog-cotton (*Eriophorum angustifolium*), Hare's-tail Cotton-grass (*Eriophorum vaginatum*), Purple Moor-grass, Cross-leaved Heath (*Erica tetralix*) and Black bog-rush (*Schoenus nigricans*). The last four of these species are key character / indicator species for Atlantic blanket bog habitat, which is also an EU Annex 1 habitat (priority if active) and their presence indicates continuing satisfactory habitat recovery. Since 2018, there has been a striking increase in the flowering of Black Bog-rush in the areas previously covered by bog mats.

Although *Sphagnum* moss still has a low cover along the southern part of the wayleave where bog-mats had been placed and which tend to be up - slope and better drained, *Sphagnum* does occur extensively in suitably wet areas such as the wet soakaway / flushed areas located towards the eastern end of the 190m section.

The increasing presence of Black Bog-rush (*Schoenus nigricans*) is notable because this species is a key character species for Atlantic Blanket Bog vegetation so its increasing presence is significant (Plate 32). Also of significance is the fact that the recolonising vegetation in the previously bog mat-covered area comprises native blanket bog species with no colonisation by indicators of disturbance such as Soft Rush (*Juncus effusus*). *Sphagnum* growth on the wayleave has increased significantly in surface flushed areas and also in the reinstated old cutover bog area at the western end of the 190m section. Whilst bare peat surface is still apparent in places, colonisation by blanket bog species increases year by year.

The undisturbed area of blanket bog habitat outside the 190m wayleave (to the south and north of the wayleave itself), also under VEPIL's stewardship, continues to be the equivalent of EU Annex I Atlantic Blanket Bog* status (where * denotes priority habitat).

6.2.2.5.e 'Forested' Wayleave

So-called because it passes through an area that had been conifer plantation, of varying ages, prior to construction, this part of the wayleave extends from the eastern end of the 190m section to the L1202 road crossing at RDX1 and then southwards from RDX1 to the Terminal (Plates 34 and 35).

Plate 34: Pipeline wayleave, south of the L1202, facing south towards the Terminal

Plate 35: Heath mosaic habitat on wayleave dominated by Heathers (*Calluna and Erica* spp.)

Prior to tree felling for construction, the ground flora beneath the conifers was largely dominated by Soft Rush, and the seed bank present in the stored peat that was spread during reinstatement has led to a strong growth of this species throughout the section of wayleave, as expected.

In places there are areas and mosaics of other vegetation types, particularly to the north of the L1202 at RDX1 where the forest floor had been moss-dominated prior to tree felling. Here there are bryophyte lawns of *Polytrichum* and *Sphagnum* species; patches of bog/heath vegetation (Plate 35) with species including Ling (*Calluna vulgaris*), Common Bog-cotton (*Eriophorum angustifolium*), Purple Moor-grass (*Molinia caerulea*), Cross-leaved Heath (*Erica tetralix*), *Sphagnum auriculatum*, Tormentil (*Potentilla erecta*), Sundew (*Drosera rotundifolia*), Bell Heather (*Erica cinerea*); and patches of Hare's-tail Bog-cotton (*Eriophorum vaginatum*) and Black Bog-rush (*Schoenus nigricans*). Occasional shallow surface pools occur along the wayleave after periods of rain.

South of the L1202, at the RDX1 end of the wayleave, remnant patches of species rich grassland occur, which have developed from the sacrificial seed mix sown during reinstatement - mainly on the western side of the wayleave which is better drained. Gorse (*Ulex europeaus*) and Willow (*Salix aurita*) continue to spread naturally in parts of the wayleave (Plate 36) – the former particularly on the slopes on either side of the pipeline stream crossing (known as DL16).

Plate 36: Marginal deciduous planting, south of the L1202, with colonising Gorse

The wayleave to the south of the stream is more homogeneous in terms of habitat type, being largely dominated throughout by Soft Rush, with only occasional patches of surviving grassland from seeding and mosaics of various other vegetation types, similar to those described above; and regular surface ponding after heavy or prolonged rain – particularly associated with overspill from the wetland ponds. In some areas, towards the southern part of the wayleave, Horsetails (*Equisetum spp.*) have become locally abundant where waterlogging occurs regularly after rain and in the overflow zones of wetlands.

Wayleave planting

As referred to in Section 4, above, native species of deciduous trees and shrubs, including Alder (*Alnus glutinosa.*), Birch (*Betula spp.),* Hawthorn (*Crataegus monogyna)*, Blackthorn (*Prunus spinosa)*, Willow (*Salix spp.)* were planted along the wayleave margins during reinstatement as a biodiversity enhancement measure and by the end of 2019, the planting survival rate for the wayleave was approximately 70%. Planting at former site compound beside the L1202 (Plates 37a to 37c) has been the most successful to date, with an approximate success rate of 98%.

Plate 37a: Developing woodland at the former construction site compound north of the L1202

Plate 37b: Buff Tip Moth caterpillars on Birch in developing woodland at the former construction site compound north of the L1202

Plate 37c: Four-spot Orb Weaver Spider (*Araneus quadratus*) in the developing woodland at the former construction site compound north of the L1202)

This area was planted with mainly native Alder and Birch, with a central spine of Lodgepole pine (*Pinus contorta)* to reflect the surrounding conifer plantations. The trees are now between 1.5 and 2.5 metres in height and the ground layer of this developing woodland is dominated by Red Fescue (*Festuca rubra*), Yorkshire Fog (*Holcus lanatus*) and Soft Rush (*Juncus effusus*), with frequent Ling/Heather (*Calluna vulgaris*), Purple Moor-grass (*Molinia caerulea*), Gorse (*Ulex europaeus*), Tormentil (*Potentilla erecta*), Sweet Vernal-grass (*Anthoxanthum odoratum*), Marsh Thistle (*Cirsium palustre*), Common Sorrel (*Rumex acetosa*) and Bracken (*Pteridium aquilinum*). Tree and shrub species planted at the various locations are listed in Appendix 8.5.

Wayleave freshwater habitats

As at Aughoose, at the time of reinstatement, wetlands/ ponds were created in peat along the wayleave, seven in total. Water levels fluctuate somewhat during dry weather. There has been a significant increase in the cover of Bog Pondweed (*Potamogeton polygonifolius*) in some of the wetlands, particularly wetlands 7 and 9 (Plate 38).

Plate 38: Dense growth of Bog-pondweed (*Potamogeton polygonifolius*) and Duckweed (*Lemna* spp) at Wetland 7

Other native plants, such as the native White Water-lily (*Nymphaea alba*) are flourishing in wetland ponds

with permanently deeper water, such as wetland 3 and wetland 8 (Plate 39) with others such as Purple Loosestrife (*Lythrum salicaria*) and Horsetail (*Equisetum* species) common in the wetland margins (Plate 40).

Plate 39: White Water-lily (*Nymphaea alba*) at Wetland 3

Plate 40: Purple Loosestrife (*Lythrum salicaria*) and Horsetails (*Equisetum* spp) in the margins of Wetland 6

Appendix 8.8 provides an overview of the wayleave wetland ponds.

The wayleave wetland ponds support and attract a variety of species of wildlife. Species observed (including signs) have included: damsel flies, dragon flies; spiders (Plates 41a to 41c); duck - a pair of Mallard at wetland 4; breeding Common frog; mammals including Otter and Red Deer. In addition, bat species were recorded by passive detectors deployed near the wetlands. (See 6.3.5 below).

Plate 41a: Ruddy Darter on rushes beside Wetland 3

Plate 41b: Black-tailed Skimmer resting on high-viz jacket beside Wetland 4

Plate 41c: Wolf Spider (*Pardosa amentata*) at Wetland 3

The wayleave wetlands were surveyed in 2019 in order to collect macroinvertebrate samples (See Appendix 8.9). A total of at least 39 species were

recorded between the wetlands and a further 10 at least at the stream site (DL16). The groups with the highest frequency of occurrence were freshwater shrimp *Crangonyx* (100% of site), followed by a damselfly nymph Pyrrhosoma nymphula (87%), a beetle (*Hydroporus pubescens*) and the phantom midge (*Chaorobidae*) both at 67%. The latter species is planktonic and moves up and down in the water column. It was entirely absent from Aughoose, which is probably testament to the very shallow and fluctuating water levels in those wetlands.

The most diverse groups were beetles and damselflies & dragonflies with at least 9 species each, followed by molluscs and water bugs each with at least 6 species (Plate 42).

Plate 42: Great Diving Beetle (*Dysticus marginalis*) at Wetland 9

The ability of beetles, aquatic hemipters and damselflies and dragonflies to fly confer an obvious advantage for dispersal to small temporary waterbodies.

Plate 43: Wayleave stream

There was a notable difference between the species present in the stream (Plate 43) and those in the wayleave wetlands, as would be expected given the difference in the habitat type. For example, the freshwater shrimp present in the stream, *Gammarus duebeni*, was not present in any of the wetland pools which were dominated by another crustacean species (*Crangonyx pseudogracilis*). The latter was present in all of the waterbodies sampled along the Wayleave and in 75% of all sites taken together (Wayleave and Aughoose) which indicates a special capacity for dispersal and survival in this invasive species. The stream also had a group which occurred in none of the pools, namely stoneflies (Plecoptera). Many of the latter were covered in a rusty scum derived from iron bacteria, a feature not uncommon in some small upland streams in waterlogged or acid soils.

6.2.3 Terminal site

The Terminal site is located on part of the former Glenamoy Peatland Experimental Station, which was established by the Department of Agriculture in 1955 with the following objectives:

- "to find suitable methods of reclaiming and fertilising blanket bog for agricultural and forestry";
- "to develop suitable animal and crop husbandry systems for peatland".

It was administered by the Soils Division of An Foras Talúntais from 1959 and was wound down in the late 1970s/early 1980s. During that time, a research programme was developed aimed at determining "the best and cheapest methods of reclaiming western blanket peat" (Glenamoy Review Group Report, 1978). A number of issues were investigated at the research station including: drainage, soil fertility and grassland, arable crops, shelterbelts, horticultural and industrial crops etc. Of these, the most relevant in terms of habitats are:

- Drainage: trials of five different methods of drainage were carried out over a period of approximately thirty years.
- Fertiliser applications: with trials using different combinations of chemicals on the native flora.
- Shelterbelt planting: 30 metre wide shelterbelts comprising Lodgepole Pine, Sitka Spruce and Larch.

Subsequently the site was managed by the Forest Service and then by Coillte Teo.

The habitats present on the site had therefore been heavily modified by man's intervention over more than half a century. Baseline surveys in 2001 identified the two main habitat types within the site as being immature conifer plantation, and rank, wet, rushy grassland dominated by Soft Rush. Relatively little semi-natural scrub (Willow and Gorse) occurred on site. Small remnants of modified blanket bog vegetation were present and many of the boundaries and margins alongside roads and tracks were dominated by *Rhododendron*. In habitat terms, apart from those parts of the site affected by construction this is still the case and, apart from permanent infrastructure - the Terminal itself, ancillary infrastructure such as the Administration Building, access roads etc. – other areas were reinstated following the completion of construction.

In addition to the mature and recently planted coniferous areas, native deciduous trees and shrubs, including Alder (*Alnus glutinosa*.), Birch (*Betula spp.*), Willow (*Salix spp.),* and Bog Myrtle (*Myrica gale*) have been planted and are becoming established. Naturally regenerated Willow (mostly *Salix aurita*) occurs throughout the open areas of the site. Self-seeded Lodgepole pine are also frequent and the grass Yorkshire Fog (*Holcus lanatus)* dominates much of the ground cover, with Soft Rush (*Juncus effusus*) which is dominant in places. The variety of habitats and track margins support a range of plant and invertebrate species, some examples of which are shown in Plates 44a to 44d.

Plate 44a: Orchids are abundant on the margins of roads and tracks at the Terminal site, seen here beside the (internal) Gate 2 road.

Plate 44b: Eyebright (*Euphrasia* agg) at the Terminal site

Plate 44c: Rove Beetle on the side slope steps at the Terminal

Plate 44d: Cinnibar moths on Marsh ragwort at the Terminal site

Species-rich native meadow grassland was planted during site reinstatement for biodiversity enhancement, one such area sown with a native wildflower meadow seed being the large area to the north of the Terminal footprint that had been used as the main car park during construction and, while this area has developed into a wet grassland habitat largely dominated by Soft Rush, it has remained species-rich in places (Plates 45a to 45c).

Plate 45a: Wildflower meadow species beside the Terminal footprint

Plate 45b: Close up wildflower meadow species at the Terminal with Ragged Robin (*Silene flos- cuculi*) dominant

Plate 45c: Wildflower meadow species with regenerating willow at the Terminal

Pockets of naturally occurring species rich grassland also occur on site (Plate 46).

Plate 46: Pockets of naturally occurring species rich grassland are present on site

Plant species recorded from the habitats at the Terminal site are listed in Appendix 8.4. Tree and shrub species planted at the various locations are listed in Appendix 8.5.

At the time of reinstatement, five wetlands/ ponds were created in peat, at western fields area of the Terminal site (Plate 47) and, as with the wayleave ponds, they attract a range of wildlife. See also, Appendices 8.8 and 8.9.

Plate 47: Terminal wetland TW1

Areas of ornamental landscaping around the Administration Building and the main entrance to the Terminal site provide an important resource for pollinators, with species including Heathers (*Erica* and *Calluna* spp), *Crocosmia* and *Sedum* species. which provide cross-seasonal pollination opportunities (Plates 48a and 48b).

Plate 48a: Ornamental planting at the main entrance to the Terminal attracts pollinators

Plate 48b: Bees on *Sedum* species at the Terminal

Table 6.1: Habitats present within the footprint of the Corrib Asset (Nearshore to Terminal)

Location	Main habitat(s) present	Heritage Council (Habitat Code)	Equivalent EU Annex I Habitat
Offshore /Nearshore (Broadhaven Bay)	Marine /estuarine	Sea inlets and bays (MW2)	Large shallow inlets and bays [1160]
	Intertidal – sandy shore	Muddy sand shores (LS3)	Mudflats and sand flats not covered by sea water at low tide [1140]
	Intertidal - rocky shore	Mixed substrate shores (LR4)	None
	Upper shore / sand pebbles, rocks	Approximates to Shingle and gravel shores (LS1)	None
Landfall	Landfall cliff, as reinstated and strengthened	Sedimentary sea cliffs (CS3)	None
		Coastal protection: rock armour /boulders (not classified) Built ground (BL3)	None
	Undisturbed sedimentary cliff on either side of the landfall	Sedimentary sea cliffs (CS3)	None
Glengad wayleave	Landfall Valve Installation (LVI) footprint and hard standing	Built ground (BL3)	None
	Grassy LVI side slopes	Approximates to Dry meadows and grassy verges (GS2)	None
	Wet grassland (with high cover of *Juncus articulatus,* Pote*ntilla anserin*a and *Ranunculus repens*)	Wet grassland (GS4)	None for this type of wet grassland
	Earthen/ sod bank field boundaries	Earth banks (BL2)	None
	Wet rushy grassland	Wet grassland (GS4)	None for this type of wet grassland
	Improved agricultural grassland	Improved agricultural grassland (GA1)	None
	Spring in NE corner of the former tunnel reception site compound in east Glengad	Poor fen and flush (PF2)	None
Habitats over the tunnel (Glengad)	Improved agricultural grassland	Improved agricultural grassland (GA1)	None
	Wet rushy grassland	Wet grassland (GS4)	None for wet grassland dominated by *Juncus effusus*
	Lower salt marsh	Lower salt marsh (CM1)	Atlantic salt meadows (Glauco-Puccinellietalia maritimae) [1330]

Location	Main habitat(s) present	Heritage Council (Habitat Code)	Equivalent EU Annex I Habitat
Habitats over the tunnel (Sruwaddacon Bay)	Estuary and intertidal	Muddy sand shores (LS3)	Mudflats and sand flats not covered by sea water at low tide [1140]
Habitats over the tunnel (South of Sruwaddacon Bay)	Lower salt marsh	Lower salt marsh (CM1)	Atlantic salt meadows (Glauco-Puccinellietalia maritimae) [1330]
	Lowland blanket bog (undesignated)	Lowland blanket bog (PB5/ PB3)	(Recovering towards)[16] Blanket bogs* [7130][17]
Former tunneling site compound at Aughoose	Reinstated peatland habitat - mosaic of blanket bog, rush and *Eriophorum* dominated peatland	Lowland blanket bog (PB3)	Blanket bogs* [7130]
		Juncus effusus dominated sward (GS4)	None
		Recolonising bare ground (ED3)	None
	Wetlands /pools created in peat during site reinstatement	Other artificial lakes and ponds (FL8)	None
Fields on the west and east sides of the Leenamore inlet	Wet grassland	Wet grassland (GS4)	None for wet grassland dominated by *Juncus effusus*
Leenamore inlet	Estuary and intertidal	Muddy sand shores (LS3)	Mudflats and sand flats not covered by sea water at low tide (1140)
	Lower salt marsh	Lower salt marsh (CM1)	Atlantic salt meadows (Glauco-Puccinellietalia maritimae) (1330)
	Upper saltmarsh	Upper salt marsh (CM2)	Atlantic salt meadows (Glauco-Puccinellietalia maritimae) (1330)
'190m' section of blanket bog	Recovering eroded blanket bog (undesignated)	Lowland blanket bog (PB5/ PB3)	Blanket bogs* [7130]

16 Formerly heavily grazed lowland blanket bog which shows signs of good recovery (PB5/PB3)
17 * (if active blanket bog) denotes EU Annex I Priority Habitat

Location	Main habitat(s) present	Heritage Council (Habitat Code)	Equivalent EU Annex I Habitat
'Forested wayleave'	Developing deciduous woodland / scrub planted during reinstatement	Immature woodland (WS2)	None
	Mosaic of blanket bog/ heath	Lowland blanket bog (PB3)/ Wet heath (HH3)	Blanket bogs* [7130] Northern Atlantic wet heaths with *Erica tetralix* [4010]
	Wetlands /pools created in peat during site reinstatement along the wayleave	Other artificial lakes and ponds (FL8)	None
	Wet Grassland Dominated by *Juncus effusus*	Wet grassland (GS4)	None for wet grassland dominated by *Juncus effusus*
	Freshwater streams	Eroding upland rivers (FW1)	None relating to the type of stream present
Terminal site	Conifer plantations	Conifer plantation (WD4)	None
	Wet Grassland Dominated by *Juncus effusus*	Wet grassland (GS4)	None for wet grassland dominated by *Juncus effusus*
	Wet Drains Supporting Marsh Vegetation	Drainage ditches (FW4)	None
	Scrub and Hedgerow	Scrub (WS1)	None for species present
	Low Deciduous Scrub Along Track and Plantation Margins	Scrub (WS1)	None for species present
	Rhododendron scrub	Ornamental /non-native shrub (WS3)	None
	Developing deciduous woodland / scrub planted during reinstatement	Immature woodland (WS2)	None
	Wet Grassland enhanced with wild flower meadow mix – *species rich in places (*Dominated by *Juncus effusus)*	Wet grassland (GS4)	None
	Wetlands /pools created in peat during site reinstatement	Other artificial lakes and ponds (FL8)	None
	Ornamental planting / landscaping	Flower beds and borders (BC4)	None
	Terminal buildings, footprint, roads and other infrastructure	Built ground (BL3)	None

6.3 Species

6.3.1 Marine and offshore

6.3.1.1 Marine mammals

Baseline and monitoring surveys have been carried out since 2001 as part of the monitoring programme in connection with offshore works, landfall construction, the laying of the offshore pipeline and subsequent rock placement works in Broadhaven Bay and along the offshore route of the pipeline to the Corrib Field, as well as span correction works, repair and replacement works at the Corrib Field; and the annual inspection and maintenance surveys of all the subsea infrastructure.

In the years immediately following installation of the pipeline and umbilical there was increased activity in the Corrib offshore area when a range of construction and post-installation remedial works were undertaken. Many of these activities required the presence of MMOs onboard vessels to monitor the mitigation zones while operations took place. Activities included rock placement, placement of concrete mattresses and repairs to seabed infrastructure and the associated use of acoustic survey equipment. These activities were undertaken in addition to annual inspection and maintenance surveys of the subsea assets. In more recent years, however, once operations had commenced, offshore works have been rationalised, with any required repair and maintenance activities included within the annual inspection and maintenance survey programmes where possible. Consequently, the marine mammal monitoring effort decreased, resulting in a commensurate reduction in potential opportunities for reportable marine mammal sightings. In accordance with the Consent to Operate consent conditions, monitoring for marine mammals during offshore surveys and maintenance activities is ongoing. A summary of marine mammal sightings data between 2014 and 2020 is provided in Appendix 8.2.

The results of marine mammal surveys have shown: that Broadhaven Bay and neighbouring waters are nationally important in terms of diversity and abundance of cetaceans; that there may be a resident population of bottlenose dolphins; and that the area may be used as a breeding and rearing area by some dolphin species. Nine species of cetacean and two seal species have been recorded in Broadhaven Bay itself from dedicated marine mammal surveys and monitoring, while a total of eighteen species of cetacean have been recorded off the wider northwest coast of County Mayo and are considered to have the potential to occur in the vicinity of the offshore pipeline route at least on a seasonal basis (Gordon *et al.*, 1999; O Cadhla *et al.,* 2004; RSK, 2010). These studies for the wider coastal waters off northwest Mayo include a number of separate studies in addition to the dedicated marine mammal monitoring undertaken on behalf of Corrib.

Monitoring of marine mammals in the vicinity of the Corrib Field and in Broadhaven Bay, along the offshore pipeline route indicates that highest numbers of sightings of cetaceans in occurs during June, followed by August, October and September. This would correlate with the findings of other studies but does also reflect survey effort. In Broadhaven Bay, Harbour and Grey seals are the most commonly sighted species, while further offshore Common and Bottlenose dolphins are sighted most frequently (Plates 49a and 49b).

Plate 49a: Common dolphin - photographed at the Corrib Field

Plate 49b: Bottlenose dolphin calf - photographed in the vicinity of the offshore pipeline

All cetaceans are listed under Annex IV of the Habitats Directive, designating them as "species of community interest in need of strict protection". A further five species of marine mammals occurring in Irish waters are listed under Annex II, designating them as "species of community interest, whose conservation requires the designation of special areas of conservation". Four of these Annex II species, Bottlenose dolphin (*Tursiops truncatus*), Harbour porpoise (*Phocoena phocoena*), Grey seal (*Halichoerus grypus*) and Harbour (Common) seal (*Phoca vitulina*), have been recorded in the bay almost throughout the year.

The European otter (*Lutra lutra*) is protected under Annex II and IV of the Habitats Directive. Dedicated marine mammal monitoring in Broadhaven Bay provides records of otter sightings in the inner parts of Broadhaven Bay (Haberlin *et al.,* 2018) and terrestrial faunal monitoring undertaken since 2001 and ongoing, has shown a constant and frequent presence of otters in and around the coastal areas of Broadhaven and Sruwaddacon Bays throughout. See 6.3.5.2.

The West Connacht Coast Special Area of Conservation (SAC) (Site code: 002998) is designated for the presence of Bottlenose dolphins. It lies approximately 1 km from the offshore pipeline route at its closest point at Erris Head which represents the northernmost extent of the SAC. The site covers an offshore area of 66,016 ha off the coast of counties Mayo and Galway (see Figure 6.2). Bottlenose dolphin are known to occur within this site throughout all seasons and the area comprises a key habitat for the species both regionally and overall, within Irish waters. The site synopsis notes that the SAC may contain a minimum of 123 dolphins, with possibly up to 150-200 individuals or more supported within the site as a whole, with a variety of activities including foraging and resting. Adults closely accompanying calves are commonly observed in summer and autumn months.

6.3.1.2 Fish

Atlantic salmon (*Salmo salar*), an EU Annex II species is present in the Glenamoy River catchment, and migrates through Sruwaddacon Bay. The freshwater catchment is designated for salmonids and comprises part of the Glenamoy Bog Complex SAC for which salmon is a qualifying interest species, and Sea Trout (*Salmo trutta*) a species of conservation interest for the site.

In the Glenamoy River, spawning takes place upstream of Glenamoy Bridge where there are extensive stretches of suitable habitat throughout the system, none of which are in the vicinity of the Corrib Asset. Downstream of Glenamoy Village, the river mainly comprises holding and nursery areas for Salmon and Trout, the most important of which is located near the mouth of Sruwaddacon Bay in a deep bend between Rossport Pier and the seaward side of Pollatomish Pier. Elsewhere the channel within Sruwaddacon Bay is considered too shallow to hold many fish. In contrast to the Carrowmore Lake catchment, the Glenamoy River is a "late river" in terms of salmonids. The Muingnabo River is generally considered to be more important for Trout and Sea trout than Salmon.

Of the other aquatic Annex II species, the Brook lamprey (*Lampetra planeri*), which is non-migratory, is the only lamprey species to have been recorded with certainty in the wider locality (in the Bellanaboy River). However, there have been reports of unidentified lampreys in the Leenamore River at a

point about 200 metres upstream of the Leenamore inlet. This species is likely to be Brook lamprey also but could possibly be River lamprey (*L. fluviatilis*) as they are very difficult to distinguish from each other when immature.

The streams in the Carrowmore Lake catchment are spawning and nursery streams, mostly for Sea trout. Whilst not within the footprint of the Corrib Asset, the Carrowmore catchment receives storm water from non-process areas of the Terminal site.

Offshore, there are important fish spawning and nursery areas for species such as mackerel (*Scomber scombrus*) and a "Biologically Sensitive Area" (BSA) was established by the EU Commission as a result. This BSA is located to the south of the Corrib offshore area, off the south-west coast of Ireland (Marine Institute, 2019). There are spawning grounds off the Mayo coast for many of the demersal fish species found in the vicinity of the Corrib Field and the offshore pipeline route, including Haddock (*Melanogrammus aeglefinus*), Hake (*Merluccius merluccius*), Cod (*Gadus morhua*), Monkfish (*Lophius piscatorius*) and Whiting (*Merlangius merlangus*). Basking sharks (*Cetorhinus maximus*) and Ocean sunfish (*Mola mola*) are regular seasonal visitors to the Corrib offshore area and have been sighted in the outer waters of Broadhaven Bay, along the route of the offshore pipeline and at the Corrib Field. Sightings have been made in the years between 2014-2020 during MMO watches for from offshore vessels as well as from cliff top vantage points during marine mammal monitoring of Broadhaven Bay.

6.3.1.3 Marine Turtles

Five species of marine turtle have been recorded in Irish waters, and all are listed under Annex IV of the Habitats Directive. Of these, only the Leatherback turtle (*Dermochelys coriacea*; IUCN status: vulnerable), has been recorded with any regularity. The waters in the vicinity of the Corrib Asset are not considered of great significance to marine turtles and they have not been recorded in any of the dedicated monitoring between 2014 and 2020.

6.3.1.4 Benthic species

As indicated above, under marine habitats, benthic surveys have been carried out, including: at the Corrib Field area; along the offshore pipeline route; at the Terminal treated surface water outfall; nearshore in Broadhaven Bay; intertidally at the landfall; and within Sruwaddacon Bay. Benthic species recorded are summarised in Appendix 8.3 for surveys conducted in the period 2014-2020 and compared against the data from earlier campaigns.

No species of conservation importance were recorded, and in overall terms, the communities recorded are typical of the seabed along the Atlantic coasts of North West Ireland.

6.3.1.5 Seabirds

A number of seabirds have been recorded offshore in the vicinity of the Corrib Field and in Mayo coastal waters. See also. 6.3.2.3 Avian fauna, in respect of the Sruwaddacon Bay area.

The coastal and offshore waters of Ireland are essential feeding grounds for many seabirds, including non-breeders and passage migrants, throughout the year. Species that have been recorded as present year-round include Fulmar (*Fulmarus glacialis*), Gannet (*Morus bassanus*) (Plate 50) and Shag (*Phalacrocorax aristotelis*).

Plate 50: Gannet

Seasonal migrants present included Manx Shearwater (*Puffinus puffinus*) and Storm Petrel (*Hydrobates pelagicus*), while passage migrants include Great (*Puffinus gravis*), Cory's (*Calonectris borealis*) and Sooty (*Ardenna grisea*) Shearwaters, and Great Skuas (*Stercorarius skua*) (Rogen *et al.*, 2018). Most of these species are summer migrants, occurring in higher abundance between July and August, however some species such as Great-Northern Diver (*Gavia immer*) occur mainly in winter months.

Migrant and resident gull species, such as Sabine's Gull (*Xema sabini*), Glaucous Gull (*Larus hyperboreus*), both species of black-backed Gulls (*Larus marinus* and *Larus fuscus*), and Black-legged Kittiwakes (*Rissa tridactyla*) may also occur in the Corrib offshore area. However, the Corrib offshore area, particularly at the Corrib Field, is regarded to have lower densities of seabirds than areas to the north and south during the summer months (Rogan *et al.*, 2018).

Seabirds present in the vicinity of the Corrib Asset offshore areas include some species listed on Annex I of the EU Birds Directive, and as such have coastal SPAs designated for them. The offshore pipeline traverses the Blacksod Bay / Broad Haven SPA, part of this site also overlaps with the Blacksod Bay and Broadhaven Ramsar site (See 6.4.1 below).

6.3.2 Terrestrial

6.3.2.1 Protected Flora

Desk studies and consultations have confirmed that no rare species of plant, including those on the current Flora Protection Order 2015 (FPO, S.I. No. 356 of 2015) are known to occur on the footprint of the onshore pipeline wayleave. Neither was any FPO species found during the many surveys carried out since 2001.

6.3.5.2 Non-avian vertebrate fauna

Faunal monitoring surveys of the pipeline wayleave and the Terminal site show that there has been little change in the species occurrence and distribution over the years. The occurrence of non-avian vertebrate species in the locality, together with information in respect of their conservation status, is provided in Appendix 8.6. As referred to in the review of the 2014-2019 BAP, DNA studies have been carried out for Otter and Pine Marten in partnership with WIT and papers are in preparation. Summary findings are included below at paragraphs 6.3.5.2 a and b.

A number of non-volant protected mammalian species are known to be present in, or in the vicinity of, the Corrib Asset. These include: Otter (*Lutra lutra*), Badger (*Meles meles*), Pine Marten (*Martes martes*), Irish Stoat (*Mustela erminea hibernica*), Pygmy Shrew (*Sorex minutus*), Hedgehog (*Erinaceus europaeus*), Irish Hare (*Lepus timidus hibernicus*). Most of these species may be considered as common species and ubiquitous through much of the Irish countryside. Once relatively scarce, the Pine Marten has become widespread over much of Ireland. Red Deer (*Cervus elaphus*) is also present, occurring at Bellanaboy and along the pipeline wayleave north to Bellagelly South. Non-protected mammalian species known to occur in the area include the Fox (*Vulpes vulpes*), the non-native introduced American Mink (*Mustela vison*), and species of rodent including Brown Rat (*Rattus norvegicus*) and Long-tailed Field Mouse or Wood Mouse (*Apodemus sylvaticus*). Plates 51a to 54b show images of four faunal species captured by trail cameras at two locations at the terminal site in early 2020.

Plate 51a: Badger by wetland pond TW5 (western fields at the terminal site)

Plate 53a: Hare by wetland pond TW5 (western fields at the terminal site)

Plate 51b: Badger on path through shelter belt

Plate 53b: Hares on path through shelter belt

Plate 52a: Fox with prey in mouth by the bridge over wetland pond TW5 (western fields at the terminal site)

Plate 54a: Pine Marten by wetland pond TW5 (western fields at the terminal site)

Plate 52b: Fox on path through shelter belt

Plate 54b: Pine Marten on path through shelter belt

All bat species are protected, with few being recorded during baseline and monitoring surveys prior to and during construction and then usually only as very occasionally occurring individuals, which was considered attributable to a lack of suitable roosts and feeding areas in a locality which comprises open landscapes and an absence of mature deciduous trees. However, following the completion of habitat reinstatement passive and active surveys (2016-2017 and 2018-2019) have recorded an increased presence of bats both in terms of occurrence and species present. The results of the analysis of the 2019 passive detector recordings revealed that six bat species were recorded locally. These were: Common Pipistrelle, *Pipistrellus pipistrellus*, Soprano Pipistrelle, *Pipistrellus pygmaeus*, Brown Long-eared Bat, *Plecotus auritus*, Natterer's Bat, *Myotis nattereri*, Daubenton's Bat, *Myotis daubentonii* and Leisler's Bat, *Nyctalus leisleri*. This was consistent with the results from the deployment of passive detectors in 2018. The large number of establishing deciduous trees, as well as the created wetlands (ponds), provide attractive foraging habitat for a diverse collection of Irish bat species in this area. Plates 55a to 55c illustrate aspects of bat monitoring.

Plate 55a: Bat monitoring. Passive Bat recorder. (SM4 Passive Detector) deployed on fenceline close to wetland ponds on the wayleave

Plate 55b: Bat box inspection using endoscope (under Wildlife licence)

Plate 55c: Common Pipistrelle Bat, in the hand (under Wildlife Licence)

Non-mammalian protected species of vertebrate present in the area include: Common Lizard (*Lacerta vivipara*), Common Frog (*Rana temporaria*), and the Smooth Newt (*Triturus vulgaris*) are all protected species under the Wildlife Acts. All three are known to occur within the Corrib Asset's footprint, the Smooth Newt having been recorded at Bellanaboy. Common frogs have consistently used the created

wetland ponds on the wayleave and at the Terminal site for spawning since 2016 (Plate 56).

Plate 56: Common Frog with spawn

6.3.5.2a Otter DNA study preliminary results

Over a period of six years otter spraints (faeces) were collected from the shores of Sruwaddacon Bay and surrounding areas - including the Terminal site. In summary:

- Of the 1,691 samples submitted to WIT for genotyping: 1,252 of the samples were identified as otter, of which 349 spraints were identified as female and 417 as male.
- The number of individuals identified from scats was 15 males and 8 females.
- Of the males, 9 were 'captured' less than 5 times and most of these were present for short periods. The maximum number of 'captures' for any male was 43.
- Of the females, 5 were 'captured' only one or two times. The maximum number of times a female was 'captured' was 70.

6.3.5.2b Pine Marten DNA study preliminary results

Sampling took place at the Terminal site from 2014 to 2016. Hair samples were collected from martens by means of plastic tubes baited with chicken. The tubes yielded 40 samples in 2014, 21 in 2015, and 96 in 2016 (with 2 rounds of sampling, more samples were obtained). All hair samples were submitted to WIT for genotyping. In summary:

- 2 males and 2 females were identified from the 2014 samples.
- 4 males and 1 female were identified from the 2015 samples.
- 2 males and 2 females were identified from the 2016 samples.

Scats (faeces) were also collected during annual faunal surveys of the site but no additional Pine Martens were identified from these scats other than those known from the hair tube sampling which suggests that not many martens were missed in hair tube sampling. However, it is known that some martens are trap-shy and will not enter the hair tubes at all and so will not be 'captured' in the hair tube study.

It is interesting to note that certain individuals dominated in the hair tube studies, being 'captured' at many tubes throughout the site, which could lead to underestimation of marten numbers. There was also evidence of more discrete ranges with some overlap of the ranges of different individuals. It is certain that the individuals identified on site had ranges which included forestry outside of the study area.

The results confirm the earlier expectation of fairly low numbers of Pine Martens on site, and an overall low population density.

6.3.5.3 Avian fauna

In respect of the onshore pipeline, avian monitoring includes waterbirds in the wider the Sruwaddacon Bay area, as well as terrestrial species. See also, 6.3.1.5 Seabirds above.

Excluding casually recorded terrestrial species, a total of 54 wintering bird species were recorded during monitoring water bird studies of the Sruwaddacon Bay area (part of the Blacksod Bay / Broad Haven SPA) between 2014 and 2019. This is similar to the diversity recorded in the period 2002 to 2012 (61 species).

In overall terms, the numbers of wintering waterbirds and their pattern of distribution within the Sruwaddacon Bay area recorded in the 2014-2019 period was consistent with that recorded during

previous winter seasons. Some interannual variation was noted but in general the diversity and patterns of relative abundance recorded was similar to that observed in the 2002-2012 period. The numbers of Light-bellied Brent Goose (*Branta bernicla hrota*), the key survey target species and a qualifying interest for the SPA, present in the winters from 2014-2019 were notable in that they remained far lower than the peak counts recorded prior to 2012. As had been noted in some earlier years, the extent of the feeding resource fluctuated visibly over the course of the winter months. Changes in the extent of exposed shingle bank in the mid-bay area off Glengad – the main feeding area for Light-bellied Brent Geese - were particularly obvious in the period 2014-2019 when notable storms were observed to result in dramatic changes in local sand deposition and erosion. Considerable sand deposition after storms visibly diminished the quantity of green algae available to foraging birds and the peak counts of Light-bellied Brent Geese recorded did not approach the peak counts recorded prior to 2011 when the shingle bank off Glengad was much more extensive. (Plates 57a and 57b)

Plate 57a: Brent Geese at Glengad

Plate 57b: Brent Geese at freshwater stream on the beach at the Glengad landfall

A total of 54 species have been recorded during terrestrial based studies along and in the vicinity of the onshore pipeline in the period 2014-2019. Overall, bird diversity and abundance are considered to be low but very similar to the species diversity recorded in this area in the 2002-2012 period (51 species). The continued countrywide expansion of Buzzard, *Buteo buteo*, was reflected in several observations of their presence in the area in the 2014-2019 period. Typical woodland and farmland bird species dominate with species including Robin (*Erithacus rubecula*), Wren (*Troglodytes troglodytes*), Chaffinch (*Fringilla coelebs*), Coal Tit (*Periparus ater*), Meadow Pipit (*Anthus pratensis*) and Corvids are especially common and widespread. In the autumn, Twite (*Carduelis flavirostris)* can be seen in small flocks feeding on seed heads on the west Glengad wayleave. Chough (*Pyrrhocorax pyrrhocorax*), an EU Annex I species, is frequently observed feeding on the pipeline wayleave at east Glengad. Skylark (*Alauda arvensis*) and Stonechat (*Saxicola torquate*) occur on the wayleave at Glengad; and from Aughoose to the Leenamore. Other species frequently heard in the vicinity of the pipeline wayleave, between Bellagelly and Bellanaboy, include: Grasshopper Warbler (*Locustrella naevia*), Crossbill (*Loxia curvirostra)*; with Cuckoo (*Cuculus canorus)* being a regular summer visitor. Plate 58 shows a Grey Heron (*Ardea cinerea)* on the Leenamore River, upstream of the inlet.

Plate 58: Heron on the Leenamore River, upstream of the inlet

The breeding Sand Martin colonies close to the landfall at Glengad, and at nearby Rinroe, were monitored regularly prior to, during and following construction at the landfall and into Operations. In accordance with the Pipeline EMP (under the Consent to Operate) 2019 was the fourth and final year of regular breeding Sand Martin monitoring in the operational (post construction) phase.

Most bird species are protected under the Wildlife Acts 1976 to 2018 (as amended) barring those regarded as pest species, and for those considered as game species (where they may be hunted under conditions). Several species of high conservation concern (i.e. Annex I and/or Red listed species) have been recorded by the field studies in the vicinity of the Corrib Asset, including the following in the 2014-2019 period: Bar-tailed Godwit (*Limosa lapponica*), Barnacle Goose (*Branta leucopsis*), Black-headed Gull (*Chroicocephalus ridibundus*), Chough (*Pyrrhocorax pyrrhocorax*), Common Tern (*Sterna hirundo*), Curlew (*Numenius arquata*), Dunlin (*Calidris alpina*), Golden Plover (*Pluvialis apricaria*), Great Northern Diver (*Gavia immer*), Great White Egret (*Ardea alba*), Hen Harrier (*Circus cyaneus*), Herring Gull (*Larus argentatus*), Lapwing (*Vanellus vanellus*), Little Egret (*Egretta garzetta*), Peregrine Falcon (*Falco peregrinus*), Redshank (*Tringa totanus*), Red-throated Diver (*Gavia stellata*), Sandwich Tern (*Sterna sandvicensis*), Tufted Duck (*Aythya fuligula*), Whooper Swan (*Cygnus cygnus*) & Wigeon (*Anas penelope*). One of the species recorded in the study area in the 2014-2019 period and not previously, was Great White Egret. This large white heron species has been recorded with increasing regularity in Ireland in the past decade having been first recorded in Sligo in 1984. It is considered likely that it will establish as an Irish breeding species in the coming years.

Plates 59a to 59c show bird box maintenance and monitoring at the terminal site.

Plate 59a: Box with peck marks; and hammer for box manitenance

Plate 59b: Moss in bird box

Plate 59c: Pine Marten damage to bird box

As referred to in Section 4, four peer-reviewed published scientific papers have come from the data collected during breeding and wintering bird surveys that have been carried out in the Sruwaddacon Bay area. Three of the papers focused on the patterns of abundance and distribution of wintering waterbirds present in the area (Lewis et al., 2017; Lewis et al., 2018; Cummins et al. 2020) and the other described the ecology of the breeding Sand Martins, looking at the interannual variations in the breeding success over a decade of detailed monitoring effort (Cummins et al. 2017).

Bird species recorded, together with their taxonomic names and conservation status, are listed in Appendix 8.7.

6.4 Designated Conservation Sites

The Wildlife Acts 1976-2018 (as amended), associated statutory instruments, and Regulations for Birds and Natural Habitats, are implemented and controlled by the National Parks and Wildlife Service (NPWS) of the Department of Housing, Local Government and Heritage (DHLGH). NPWS is also responsible for the designation of sites.

Legislation specifically relevant to flora and fauna is summarised in Table 6.2. Other legislation such as national commercial fisheries and planning regulations are not included here.

Table 6.2: Summary of relevant legislation

Jurisdiction	Statute
National	Wildlife Acts 1976 to 2018 (as amended) which includes the Heritage Act 2018; and the Flora Protection Order 2015 (S.I. No. 356 of 2015)
	European Communities (Natural Habitats) Regulations, 1997 (S.I. No. 94 of 1997)
	European Communities (Natural Habitats) (Amendment) Regulations, 1998 (S.I. 233 of 1998) and 2005 (S.I. 378 of 2005)
	S.I. No. 477 of 2011 European Communities (Birds and Natural Habitats) Regulations 2011 (as amended by: S.I. No. 290 of 2013; S.I. No. 499 of 2013; and S.I. No. 355 of 2015)
	European Communities (Quality of Salmonid Waters) Regulations, 1988. S.I. No. 293 of 1988
European	EU Directive 79/409/EEC of 2nd April 1979 on the conservation of wild birds (the Birds Directive)
	EU Directive 92/43/EEC of 21st May 1992, on the conservation of natural habitats and of wild fauna and flora (the Habitats Directive)
	EU Water Framework Directive (2000/60/EC) of 23 October 2000 establishing a framework for Community action in the field of water policy

Site designations for conservation in the context of associated Irish and European legislation, and the Ramsar Convention are summarised in Table 6.3.

6.4.1 Designated sites in the vicinity of the Corrib Asset

An extensive area of north Mayo is designated for nature conservation and Figure 6.2 shows the location of the Corrib Asset in relation to designated conservation sites, including EU Natura 2000 sites (SACs and SPAs), and Natural Heritage Areas (NHAs) which are designated under Irish Wildlife legislation. Sites within 15 km of the Corrib Asset are listed in Table 6.4, along with an indication of their proximity to the nearest point of the Asset.

Designated sites on which the offshore and onshore pipeline elements of the Corrib Asset impinge, together with their conservation interests - namely: Broadhaven Bay Special Area of Conservation (SAC), Glenamoy Bog Complex Special Area of Conservation (SAC), Blacksod Bay/Broad Haven Special Protection Area (SPA); and the Blacksod Bay and Broadhaven Ramsar site are provided in Appendix 8.1. Details of European sites on which the various elements of the Corrib Asset do not directly impinge but are in close proximity (2km or less from the nearest point) are also provided in Appendix 8.1 - namely: Carrowmore Lake Complex SAC, Carrowmore Lake SPA, Slieve Fyagh Bog SAC, Erris Head SAC, and West Connacht Coast SAC.

Full details of all designated sites can be found at: https://www.npws.ie/protected-sites.

Table 6.3: Designated conservation sites

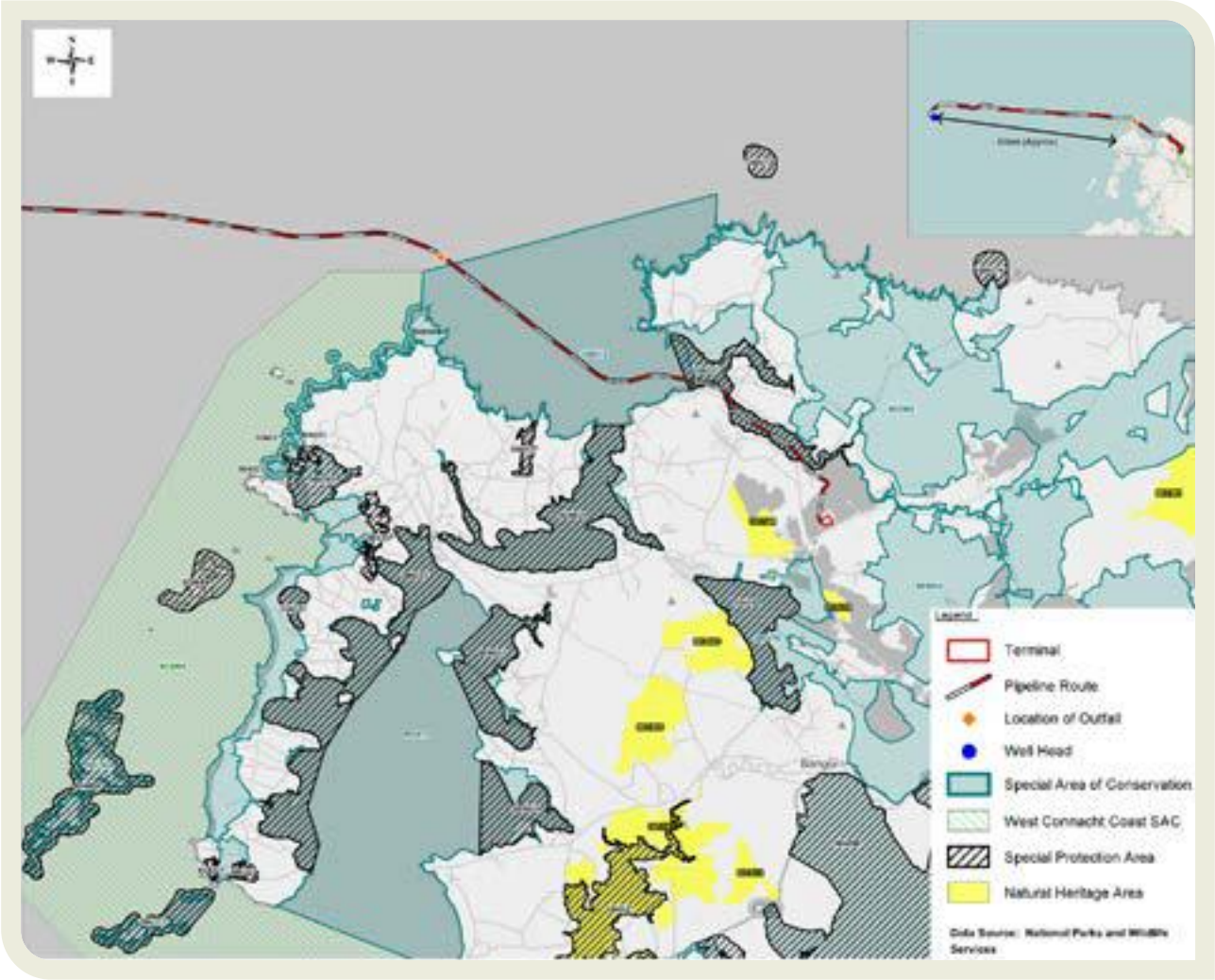
Designation	Legislative basis / Convention
Special Area of Conservation (SAC)	Designated under the EU Habitats Directive, and the natural habitat regulations. Part of the Natura 2000 network comprising Annex I habitats - "natural habitat types of community interest whose conservation requires the designation of Special Areas of Conservation" and the habitats of Annex II species - "animal and plant species of community interest whose conservation requires the designation of Special Areas of Conservation".
Special Protection Area (SPA)	Designated under Directive 79/409/EEC of 2nd April 1979 on the conservation of wild birds (the Birds Directive). Under the Directive, Ireland is obliged to protect the habitats of birds, which are vulnerable to habitat change or to low population numbers. Aspects of habitat protection are in the context of pollution, deterioration of habitat and disturbance. This Directive is implemented in Ireland under Statutory Instrument (1985) and is encompassed by the Wildlife and Amendment Acts, 1976 and 2000. Once designated, measures will be taken to preserve, maintain and restore biodiversity and an area necessary for birds listed in Annex I of the Directive.
Natural Heritage Area (NHA)	Designated under the Wildlife (Amendment) Act 2000 whereby it is considered an area is worthy of conservation for one or more species, communities, habitats, landforms or geological or geomorphological features, or for its diversity of natural attributes.
Ramsar	"Ramsar" refers to an international convention in relation to wetland sites which was ratified by Ireland in 1985. The Convention has its roots in the protection of wetland wildfowl and for many sites it is species-associated. More recently Ramsar has taken on the more all-encompassing wetland habitat approach which in the context of the EU falls in line with site protection under the Habitats Directive. The Ramsar convention has no statutory basis itself, but it is operated through either EU or national legislation. In this case the EU Birds Directive and EU Habitats Directive through the Wildlife and Amendments Acts (1976 and 2000).

Table 6.4: Designated conservation sites within a 15km radius of the Corrib Asset

Designation	Site Name	Site Code	Approximate distance from the nearest point of the Corrib Asset	Corrib Asset element present within site
Special Area of Conservation (SAC)	Glenamoy Bog Complex	0000500	0 km	Landfall / Most of the onshore sections at Glengad /Tunnel/ Leenamore inlet
	Broadhaven Bay	0000472	0 km	Sub-sea pipeline
	Carrowmore Lake Complex	0000476	<1 km	None
	Slieve Fyagh Bog	0000542	1 km	None
	Owenduff/Nephin Complex	0000534	10 km	None
	Bellacorick Bog Complex	0001922	11 km	None
	Mullet/Blacksod Bay Complex (Mullet/Blacksod Bay Complex MPA[18] - OSPAR Site O-IE-0002972)	0000470	10 km	None
	Erris Head	0001501	2 km	None
	West Connacht Coast	002998	1 km	None
Special Protection Area (SPA)	Blacksod Bay/Broad Haven	004037	0 km	Sub-sea pipeline / Landfall / Tunnel / Leenamore inlet
	Carrowmore Lake	004052	1.6 km	None
	Owenduff/Nephin Complex	004098	10 km	None
	Stags of Broadhaven	004072	9 km	None
	Illanmaster	004074	11 km	None
	Termoncarragh Lough and Annagh Machair	004093	9 km	None
	Mullet peninsula	004227	9 km	None
	Inishglora and inishkeeragh	004084	13 km	None
Natural Heritage Area (NHA)	Pollatomish Bog	1548	1.8 km	None
	Glenturk More Bog	2419	2 km	None
	Ederglen Bog	2446	5.3 km	None
	Tristia Bog	1566	8.8 km	None
	Tullaghan Bay and Bog	1567	13.2 km	None
	Inagh Bog	2391	12.5 km	None
Ramsar Site	Blacksod Bay and Broadhaven	844	0 km	Sub-sea pipeline/ Landfall / Tunnel / Leenamore inlet

18 Marine Protected Area (under the OSPAR Convention to Protect the Marine Environment of the North East Atlantic)

Figure 6.2 Map to show the elements of the Corrib Asset in relation to designated conservation sites in North Mayo



Sea Aster (*Aster tripolium*) at the Leenamore inlet

7 REFERENCES

7.1 Key biodiversity documents

- CBD 2005 *Handbook of The Convention on Biological Diversity including its Cartagena Protocol on Biosafety* 3rd Edition
- DCHG (2017) *National Biodiversity Plan 2017-2021* Department of Culture, Heritage and the Gaeltacht
- Glowka, Lyle (1994) *A Guide to the Convention on Biological Diversity* - Environmental Policy and Law Paper No. 30. IUCN, Environmental Law Centre; IUCN, Biodiversity Programme
- DCHG 2019. *Ireland's 6th National Report to the Convention on Biological Diversity*. Department of Culture, Heritage and the Gaeltacht

7.2 Guidance documents

- Heritage Council (2003) *Guidelines for the Production of Local Biodiversity Action Plans* Department of Environment, Heritage and Local Government (DoEHLG)
- Department of Arts Heritage and the Gaeltacht (DAHG) (2011) *Biodiversity Action Plans for Business* Notice Nature
- IPIECA (2005) *A Guide to Developing Biodiversity Action Plans for the Oil and Gas Sector* International Petroleum Industry Environmental Conservation Association (IPIECA) and the International Association of Oil and Gas Producers (OGP).

7.3 Legislation

- *EC Directive 79/409/EEC of 2nd April 1979 on the conservation of wild birds* (the Birds Directive)
- *European Commission 1992 Council Directive No. 92/43/EEC of May 21, 1992* (The Habitats Directive)
- *European Communities (Birds and Natural Habitats) Regulations 2011* (S.I. No. 477 of 2011), (as amended by: S.I. No. 290 of 2013; S.I. No. 499 of 2013; and S.I. No. 355 of 2015)
- *European Communities (Quality of Salmonid Waters) Regulations, 1988* (S.I. No. 293 of 1988)
- *EU Water Framework Directive (2000/60/EC) of 23 October 2000 establishing a framework for Community action in the field of water policy*
- *Flora Protection Order 2015* (S.I. No. 356 of 2015)
- *Wildlife Acts 1976 to 2018 (as amended)* The Stationery Office, Government of Ireland

7.4 References cited in the text

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b Colhoun K and Cummins S. (2013) *"Birds of Conservation Concern in Ireland 2014 –2019". Irish Birds 9:* 523—544

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g Gordon, J. Berrow, S.D., Rogan, E. and Fennelly, S. (1999). *Acoustic and visual survey of cetaceans*

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i Lewis, L.J., Fennessy, G., Cummins, S. (2017). *Using within-site level trends of non-breeding waterbirds as a monitoring tool: a case study using data from Sruwaddacon Bay, County Mayo* Irish Birds 10: 493–500

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s RSK (2016). *Marine Mammal Observations – Annual Report 2016.* Report prepared on behalf of Shell E&P Ireland Ltd.

t RSK (2021). *Corrib Invasive Species Monitoring – 2020.* Report prepared on behalf of Vermilion E&P Ireland Ltd. January 2021

u RSK (2021). *Corrib Marine Mammal Observations – Nearshore and Offshore Pipeline and Umbilical Inspection and Maintenance Survey 2020 – Annual Report*. Report prepared on behalf of Vermilion E&P Ireland Ltd. January 2021

7.5 Web Links

7.5.1 Ireland

- Business in the Community Business in the Community/ Biodiversity in Business: https://www.bitc.ie/
- Department of the Environment Climate and Communications: https://www.gov.ie/en/organisation/department-of-the-environment-climate-and-communications/?referrer=http://www.gov.ie/decc/
- Environmental Protection Agency: www.epa.ie
- Inland Fisheries Ireland (FI): https://www.fisheriesireland.ie/
- Invasive Species Ireland (ISI) www.invasivespeciesireland.com
- Ireland's 6th National Report to the Convention on Biological Diversity: https://www.npws.ie/

sites/default/files/files/NPWS%20Biological%20Diversity%20web.pdf

- Marine Institute: https://www.marine.ie/Home/home
- National Biodiversity Action Plan: https://www.npws.ie/sites/default/files/publications/pdf/National%20Biodiversity%20Action%20Plan%20English.pdf
- National Biodiversity Data Centre: http://www.biodiversityireland.ie/
- National Biodiversity Data Centre All-Ireland Pollinator Plan 2015-2020:
- https://pollinators.ie/wordpress/wp-content/uploads/2018/05/Pollinator-Plan-2018-WEB.pdf
- National Parks and Wildlife Service (NPWS): www.npws.ie; https://www.npws.ie/legislation; https://www.npws.ie/protected-sites; https://www.npws.ie/maps-and-data/designated-site-data
- Natural Capital Ireland: https://www.naturalcapitalireland.com/
- Notice Nature: http://www.noticenature.ie/

7.5.2 Europe

- European Environment Agency: http://www.eea.europa.eu/themes/biodiversity
- European Commission: http://ec.europa.eu/environment/nature/index_en.htm

7.5.3 International Conventions

- Convention on Biological Diversity (CBD): http://www.cbd.int/
- Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES): https://cites.org/eng
- Bern Convention on the Conservation of European Wildlife and Natural Habitats:
- http://www.coe.int/t/dg4/cultureheritage/nature/Bern/
- Bonn Convention on Migratory Species: http://www.cms.int/
- Convention for the Protection of the Marine Environment of the North-East Atlantic (the 'OSPAR Convention') https://www.ospar.org/
- Ramsar Convention on Wetlands: http://www.ramsar.org/
- Ramsar, Irish sites: http://irishwetlands.ie/irish-sites/
- World Heritage Convention: http://whc.unesco.org/en/convention/

7.5.4 Corrib and Industry related links

- Corrib Biodiversity Action Plan 2014-2019:
- http://www.vermilionenergy.ie/our-responsibility/hsepoliciesinitiatives/environmental-protection.cfm
- IPIECA: http://www.ipieca.org/
- Science & Technology Classroom lesson (http://sta.ie/): http://sta.ie/lesson/biodiversity-and-the-corrib-field-development
- Vermilion Energy Ireland: http://www.vermilionenergy.ie
- Vermilion: http://sustainability.vermilionenergy.com/ourapproach/sustainability/our-approach-to-sustainability-overview.cfm

7.5.5 Other

- Micropropagation Services Ltd: BeadaHumok™: http://www.beadamoss.co.uk/page20.html

Common Bog-cotton (*Eriophorum angustifolium*) and Hare's-tail Bog-cotton (*E. vaginatum*) on the 190m blanket bog section of wayleave

8 APPENDICES

Appendix No.	Title
8.1	Designated conservation sites
8.2	Marine mammals and other marine mega-faunal species
8.3	Benthic species
8.4	Plant species recorded
8.5	Native tree and shrub species planted for biodiversity enhancement
8.6	Non-avian terrestrial vertebrate species
8.7	Bird species
8.8	An overview of the created wetlands (ponds) and the wayleave stream
8.9	Freshwater species recorded in 2019
8.10	Glossary of acronyms and abbreviations

Western end of Sruwaddacon Bay

Appendix 8.1

Designated conservation sites

As shown in Table 6.4 of the main text, elements of the Corrib Asset either directly impinge on, or are within 2km distance of, the following European designated Natura sites:

- Broadhaven Bay SAC
- Glenamoy Bog Complex SAC
- Carrowmore Lake Complex SAC
- Slieve Fyagh Bog SAC
- Erris Head SAC
- West Connacht Coast SAC
- Blacksod Bay/Broad Haven SPA
- Carrowmore Lake SPA

Current site details, ie. conservation objectives, Natura Forms, site synopses and supporting documentation, for the sites are available on the National Parks and Wildlife Service website at: https://www.npws.ie/protected-sites and https://www.npws.ie/maps-and-data/designated-site-data. Summary details for these sites are provided below, including extracts from their site synopses. Table 8.1 below sets out the qualifying interests for each site. Summary details of the Blacksod Bay/Broadhaven Ramsar site are also provided below.

8.1.1 Broadhaven Bay SAC (000472)

Broadhaven Bay is a large, north facing bay situated on the north-west Mayo coast. The SAC extends from the innermost part of the bay at Belmullet to the outer marine area between Erris Head and Benwee Head. A site of high conservation importance, the conservation objective for this site is to maintain the favourable conservation condition of the EU Annex I habitats for which the SAC has been selected (as set out in Table 8.1).

Broadhaven Bay has ornithological importance for breeding birds, with Inishderry - a small island in the inner bay - supporting important numbers of breeding terns and Black-headed Gulls. Broadhaven Bay is also an important area for wintering waterfowl, being part of a large complex that includes the Mullet and Blacksod Bay.

This site overlaps with the Blacksod Bay/Broad Haven SPA and the Blacksod Bay/Broadhaven Ramsar site and is adjacent to Glenamoy Bog Complex SAC, Erris Head SAC and West Connacht Coast SAC.

8.1.2 Glenamoy Bog Complex SAC (000500)

The Glenamoy Bog Complex is of ecological importance because of the presence of a number of EU Annex I habitats, including two priority habitats - blanket bog and machair. It supports populations of Annex– listed plant and animal species, as well as six Annex I Birds Directive species. It also has nationally important populations of other seabirds. The conservation objectives for this site are to maintain or restore the favourable conservation condition of the Annex I habitats and Annex II species for which the SAC has been selected (as set out in Table 8.1).

The Glenamoy Bog Complex SAC overlaps with the Blacksod Bay/Broad Haven SPA and the Blacksod Bay/Broadhaven Ramsar site; and is adjoins Broadhaven Bay SAC and Slieve Fyagh Bog SAC.

8.1.3 Carrowmore Lake Complex SAC (000476)

Carrowmore Lake Complex SAC is of considerable ecological value, primarily for its extensive, intact blanket bog, which has a typical range of good-quality habitats, but also as a site for the very rare Marsh Saxifrage and the moss *Drepanocladus vernicous.* The conservation objectives for this site are to restore or maintain the favourable conservation condition of the Annex I habitats and Annex II species for which the SAC has been selected (as set out in Table 8.1). The north-western part of the site supports a number of Greenland White-fronted Goose, while other important bird species which occur are Golden Plover, Merlin, Sandwich Tern and Arctic Tern.

This SAC overlaps with Carrowmore Lake SPA and adjoins Slieve Fyagh Bog SAC.

8.1.4 Slieve Fyagh Bog SAC (000542)

Slieve Fyagh Bog SAC is bounded on the north by the Glenamoy River, on the east and west by forestry plantations, and on the south by the Glencullin River. It is important for the occurrence of mountain blanket bog, a habitat that is uncommon in this region. The conservation objective for this site is to restore the favourable conservation condition of the EU Annex I habitat for which the SAC has been selected (as set out in Table 8.1).

This SAC adjoins Carrowmore Lake Complex SAC and Glenamoy Bog Complex SAC.

8.1.5 Erris Head SAC (001501)

Erris Head SAC is situated on the northern part of the Mullet Peninsula in north Co. Mayo. It comprises approximately 15 km of cliff, plus adjoining habitats. This site is of conservation importance primarily for the cliff and alpine heath habitats, both of which are EU Annex I - listed. The presence of several EU Birds Directive Annex I species and some breeding seabirds adds to the interest of the site. The conservation objective for this site is to maintain the favourable conservation condition of the Annex I habitats for which the SAC has been selected (as set out in Table 8.1).

This SAC adjoins Broadhaven Bay SAC and West Connacht Coast SAC.

8.1.6 West Connacht Coast SAC (002998)

West Connacht Coast SAC comprises marine waters off the coasts of Counties Mayo and Galway. The northern part of the site extends from the coastal waters off Erris Head westwards beyond Eagle Island and the Mullet Peninsula. From there it extends southwards immediately off the coast as far as the entrance to Blacksod Bay. In its southern component, the site stretches from Clare Island and the outer reaches of Clew Bay at Old Head and continues southwards off the Mayo coast to the Connemara coast near Clifden and Ballyconneely, Co Galway.

Bottle-nosed Dolphin occurs within the site in all seasons and the area comprises a key habitat for the species both regionally and within Irish waters as a whole. The conservation objective for this site is to maintain the favourable conservation condition of the Common Bottlenose Dolphin for which the SAC has been selected (as set out in Table 8.1). This site adjoins Broadhaven Bay SAC and Erris Head SAC.

8.1.7 Blacksod Bay/Broad Haven SPA (004037)

Blacksod Bay/Broad Haven SPA comprises the sheltered open waters of the northern part of Blacksod Bay and its various bays and inlets, as well as the inner part of Broadhaven Bay, including the bays and inlets of Sruwaddacon. At low tide extensive areas of intertidal sand and mudflats are exposed. The site supports a wide diversity of wintering waterfowl species and is one of the most important wetland complexes in the west.

The site is a Special Protection Area (SPA) under the EU Birds Directive, of special conservation interest for the following species: Red-throated Diver, Great Northern Diver, Slavonian Grebe, Light-bellied Brent Goose, Common Scoter, Red-breasted Merganser, Ringed Plover, Sanderling, breeding Dunlin (subsp. *schinzii*), Dunlin, Bar-tailed Godwit, Curlew and Sandwich Tern. As required under Article 4 of the Birds Directive, particular attention shall be paid to the protection of the wetlands used by regularly

occurring migratory birds, which are included within Blacksod Bay/Broad Haven SPA.

The conservation objectives for this site are to maintain or restore the favourable conservation condition of the bird species listed as Special Conservation Interests for this SPA (as set out in Table 8.1).This site overlaps with Broadhaven Bay SAC and Glenamoy Bog Complex SAC.

8.1.8 Carrowmore Lake SPA (004052)

Carrowmore Lake SPA is of ornithological importance on account of the nationally important tern colony that once occupied the site. It is a Special Protection Area (SPA) under the EU Birds Directive, of special conservation interest for the following species: Sandwich Tern. The occurrence of Greenland White-fronted Goose is of note as it is a Birds Directive Annex I species (as are the tern species). Part of Carrowmore Lake SPA is a Wildfowl Sanctuary. The conservation objectives for this site are to maintain or restore the favourable conservation condition of the bird species listed as a Special Conservation Interest for this SPA (as set out in Table 8.1).

This SPA overlaps with Carrowmore Lake Complex SAC.

8.1.9 Blacksod Bay/Broadhaven Ramsar site (Code 844)

Designated in 1996 the site covers 683 ha. and is "A composite of diverse marine and coastal habitats that includes vast dune systems and extensive areas of dune grassland with saltmarshes occurring in sheltered bays and inlets. The grasslands are of considerable botanical importance. The site also includes several brackish lakes important to various species of breeding waders, large numbers of wintering waterbirds of various species, and internationally important numbers of Brent geese". (http://irishwetlands.ie/irish-sites/)

Sundews (Drosera spp), Cross-leaved Heath (*Erica tetralix*) and Ling Heather (*Calluna vulgaris*) on the 190m section of wayleave

Table 8.1: Summary of the qualifying interests of designated sites that are impinged on by, or are in close proximity, to elements of the Corrib Asset

Natura 2000 site	Qualifying interests Annexed Habitat / Species for which the site has been selected with code numbers	Location of elements of the Corrib Asset in relation to the designated site
SAC		
Broadhaven Bay **SAC 000472**	1140 Mudflats and sandflats not covered by seawater at low tide 1160 Large shallow inlets and bays 1170 Reefs 1330 Atlantic salt meadows (Glauco-Puccinellietalia maritimae) 8330 Submerged or partially submerged sea caves	• Offshore pipeline laid on the sea bed in Broadhaven Bay.
Glenamoy Bog Complex **SAC 000500**	1230 Vegetated sea cliffs of the Atlantic and Baltic Coasts 21A0 Machairs (* in Ireland) 3160 Natural dystrophic lakes and ponds 4010 Northern Atlantic wet heaths with *Erica tetralix* 5130 *Juniperus communis* formations on heaths or calcareous grasslands 7130 Blanket bogs (* if active bog) 7140 Transition mires and quaking bogs 7150 Depressions on peat substrates of the Rhynchosporion 1393 Slender Green Feather-moss *Drepanocladus vernicosus* 1395 Petalwort *Petalophyllum ralfsii* 1528 Marsh Saxifrage *Saxifraga hirculus* 1106 Salmon *Salmo salar*	• Nearshore: pipeline buried under intertidal zone (non-qualifying habitats) • Landfall and some sections of the Glengad wayleave: onshore pipeline wayleave are in the SAC (non-annexed habitats) • Tunnel: beneath the SAC, Sruwaddacon Bay (non-qualifying habitats) • Leenamore River inlet crossing: pipeline buried under the SAC at the inlet (non-qualifying habitats)
Carrowmore Lake Complex **SAC 0000476**	7130 Blanket bog (*active only) 7150 Depressions on peat substrates of the Rhynchosporion 1393 Slender Green Feather-moss *Drepanocladus vernicosus* 1528 Marsh Saxifrage *Saxifraga hirculus*	• SAC is located south west of the Terminal
Slieve Fyagh Bog SAC 0000542	7130 Blanket bogs (* if active bog)	• SAC is located to the south east of the Terminal
Erris Head SAC 0001501	1230 Vegetated sea cliffs of the Atlantic and Baltic coasts 4060 Alpine and Boreal heaths	• SAC is located c. 2km from the offshore pipeline laid on the seabed.

Natura 2000 site	Qualifying interests Annexed Habitat / Species for which the site has been selected with code numbers	Location of elements of the Corrib Asset in relation to the designated site
West Connacht Coast **SAC 002998**	1349 Common Bottlenose Dolphin *Tursiops truncatus*	• SAC is located c. 1km from the offshore pipeline laid on the seabed
SPA		
Blacksod Bay / Broadhaven SPA 004037	A003 Great Northern Diver *Gavia immer* A046 Brent Goose *Branta bernicla hrota* A065 Common Scoter *Melanitta nigra* A069 Red-breasted Merganser *Mergus serrator* A137 Ringed Plover *Charadrius hiaticula* A144 Sanderling *Calidris alba* A149 Dunlin *Calidris alpina alpina* A157 Bar-tailed Godwit *Limosa lapponica* A160 Curlew *Numenius arquata* A191 Sandwich Tern *Sterna sandvicensis* A466 Dunlin *Calidris alpina schinzii* A999 Wetlands	• Nearshore -pipeline • Pipeline in tunnel beneath the SPA in Sruwaddacon Bay • Leenamore River inlet crossing: pipeline buried under the SPA at the inlet
Carrowmore Lake SPA 004052	A191 Sandwich Tern (*Sterna sandvicensis*)	• SAC is located south west of the Terminal

Bottlenose dolphin calf

Appendix 8.2

Marine mammals and other mega-faunal species recorded in Broadhaven Bay and along the route of the Offshore Pipeline to the Corrib Field, 2014 to 2020

Note: *It should be noted that once operations commenced, offshore works were rationalised - with repair and maintenance activities included within the annual inspection and maintenance survey programmes where possible. Thus, the marine mammal monitoring effort decreased, resulting in a commensurate reduction in potential opportunities for reportable marine mammal sightings. Please refer to the Corrib Biodiversity Action Plan 2014-2019 for marine mammal monitoring up to 2011.*

8.2.1a: Marine mammal observer survey records from vessels engaged in pipeline and umbilical inspection; maintenance survey; rock-placement protection operations; and ongoing subsea replacement and repair operations. Includes the area from the landfall at Glengad to the Corrib Field.

Species		Sightings*					
		2020	2018	2017	2016	2015	2014
Minke whale	*Balaenoptera acutorostrata*	12	-	3	5	2	1
Sei whale	*Balaenoptera borealis*	2	-	-	-	-	-
Killer whale	*Orcinus orca*	-	-	-	-	3	-
Fin whale	*Balaenoptera physalus*	1	-	1	-	-	-
Risso's dolphin	*Grampus griseus*	-	-	1	-	1	-
Bottlenose dolphin	*Tursiops truncatus*	1	1	7	2	4	1
Common dolphin	*Delphinus delphis*	5	2	8	15	53	9
Atlantic white-sided dolphin	*Lagenorhynchus acutus*	-	-	-	-	-	-
White-beaked dolphin	*Lagenorhynchus albirostris*	-	-	2	-	-	-
Harbour porpoise	*Phocoena phocoena*	-	-	4	2	1	2
Unidentified whale		9	-	1	1	5	-
Unidentified dolphin		3	3	15	6	15	16
Grey seal	*Halochoerus grypus*	7	27	2	28	48	26
Harbour seal	*Phoca vitulina*	10	12	1	7	45	15
Unidentified seal		-	-	4	10	14	3
Otter	*Lutra lutra,*	-	-	-	4	1	-
Basking shark	*Cetorhinus maximus*	1	-	-	-	-	-
Ocean Sunfish	*Mola mola*	-	-	-	-	-	-

Species		Sightings*					
		2020	2018	2017	2016	2015	2014
Long-finned pilot whale	*Globicephala melas*	1	-	5	3	3	-
Unidentified rorqual		-	-	-	1	-	-
Unidentified Balaenoptera		-	-	-	1	-	-
Unidentified cetacean		-	-	4	3	-	-
Cuvier's beaked whale (deceased)	*Ziphius cavirostris*	-	-	-	-	-	-
Striped dolphin	*Stenella coeruleoalba*	-	-	1	-	-	-

* ***Note:*** The term 'sighting' can comprise an individual or a cluster (group) of animals
'Unidentified' = sighting was distant and/or brief, which prevented identification of species

8.2.1b: Marine mammal observer survey records from vessels engaged in pipeline and umbilical inspection; maintenance survey; rock-placement protection operations; and ongoing subsea replacement and repair operations. Includes the area from the landfall at Glengad to the Corrib Field.

Species		Number of individuals					
		2020	2018	2017	2016	2015	2014
Minke whale	*Balaenoptera acutorostrata*	13	-	-	6	2	1
Sei whale	*Balaenoptera borealis*	3	-	-	-	-	-
Killer whale	*Orcinus orca*	-	-	-	-	4	-
Fin whale	*Balaenoptera physalus*	1	-	1	-	-	-
Pilot whale	*Globicephala melas*	-	-	-	-	-	-
Risso's dolphin	*Grampus griseus*	-	-	10	-	1	-
Bottlenose dolphin	*Tursiops truncatus*	1	10	76	10	32	12
Common dolphin	*Delphinus delphis*	39	35	36	278	453	-
Atlantic white-sided dolphin	*Lagenorhynchus acutus*	-	-	-	-	-	-
Whitebeaked dolphin	*Lagenorhynchus albirostris*	-	-	-	-	-	-
Harbour porpoise	*Phocoena phocoena*	-	-	-	3	2	109
Unidentified whale		22	-	2	4	13	-
Unidentified dolphin		13	19	315	85	80	93
Grey seal	*Halochoerus grypus*	8	23	30	28	51	26
Harbour seal	*Phoca vitulina*	18	13	-	7	57	18
Unidentified Seal		-	-	-	10	15	3

Species		Number of individuals					
		2020	2018	2017	2016	2015	2014
Otter	*Lutra lutra*	-	-	-	4	1	-
Basking shark	*Cetorhinus maximus*	1	-	-	-	-	-
Sunfish	*Mola mola*	-	-	-	-	-	-
Long-finned pilot whale	*Globiecephala melas*	6	-	26	20	-	-
Unidentified rorqual		-	-	-	1	-	-
Unidentified Balaenoptera		-	-	-	1	-	-
Unidentified cetacean		-	-	-	3	-	-
Cuvier's beaked whale (deceased)	*Ziphius cavirostris*	-	2	-	-	-	-

8.2.2a: Species recorded in Broadhaven Bay (CMRC[19]) - SIghtings

Note: *The CMRC Broadhaven Bay monitoring programme was completed at the end of 2017*

Species		Sightings* (Land-based surveys only)			
		2017	2016	2015	2014
Minke whale	*Balaenoptera acutorostrata*	12	7	2	15
Sei whale	*Balaenoptera borealis*	-	-	-	-
Killer whale	*Orcinus orca*	-	-	-	-
Fin whale	*Balaenoptera physalus*	-	-	-	-
Pilot whale	*Globicephala melas*	-	-	-	-
Humoback whale	*Megaptera novaeangliae*	-	1	-	-
Risso's dolphin	*Grampus griseus*	3	5	3	9
Bottlenose dolphin	*Tursiops truncatus*	3	2	4	11
Common dolphin	*Delphinus delphis*	75	24	32	39
Atlantic white-sided dolphin	*Lagenorhynchus acutus*	-	-	-	2
Whitebeaked dolphin	*Lagenorhynchus albirostris*	-	-	-	-
Harbour porpoise	*Phocoena phocoena*	6	2	8	45
Unidentified whale		-	-	-	-
Unidentified dolphin		15	1	7	42
Unidentified cetacean		1	10	-	4

19 Coastal and Marine Resources Centre, University College Cork (UCC).

Species		Sightings* (Land-based surveys only)			
		2017	2016	2015	2014
Grey seal	*Halochoerus grypus*	27	4	20	67
Harbour seal	*Phoca vitulina*	5	-	5	11
Unidentified seal		10	4	7	89
Otter	*Lutra lutra*	1	1	-	1
Basking shark	*Cetorhinus maximus*	52	-	3	5
Sunfish	*Mola mola*	1	-	-	13
Leatherback turtle	*Dermochelys coriacea*	-	-	-	-
Long-finned pilot whale	*Globiecephala melas*	-	-	-	-
Unidentified rorqual		-	-	-	-
Unidentified Balaenoptera		-	-	-	-

* **Note:** The term 'sighting' can comprise an individual or a cluster (group) of animals

8.2.2b: Species recorded in Broadhaven Bay (CMRC[20]) - Individuals

Note: *The CMRC Broadhaven Bay monitoring programme was completed at the end of 2017*

Species		Individuals (Land-based surveys only)			
		2017	2016	2015	2014
Minke whale	*Balaenoptera acutorostrata*	12	9	2	15
Sei whale	*Balaenoptera borealis*	-	-	-	-
Killer whale	*Orcinus orca*	-	-	-	-
Humpback whale	*Megaptera novaeangliae*	-	2	-	-
Risso's dolphin	*Grampus griseus*	13	17	29	47
Bottlenose dolphin	*Tursiops truncatus*	32	7	46	180
Common dolphin	*Delphinus delphis*	1283	246	893	1,924
Atlantic white-sided dolphin	*Lagenorhynchus acutus*	-	-	-	24
Whitebeaked dolphin	*Lagenorhynchus albirostris*	-	-	-	-
Harbour porpoise	*Phocoena phocoena*	17	3	11	56
Unidentified whale		-	-	-	-
Unidentified dolphin		62	4	137	623
Unidentified cetacean		1	14	-	7

20 Coastal and Marine Resources Centre, University College Cork (UCC).

Species		Individuals (Land-based surveys only)			
		2017	2016	2015	2014
Grey seal	*Halochoerus grypus*	47	4	24	77
Harbour seal	*Phoca vitulina*	5	-	7	11
Unidentified seal		10	4	7	92
Otter	*Lutra lutra*	1	-	-	1
Basking shark	*Cetorhinus maximus*	126	-	-	5
Sunfish	*Mola mola*	-	-	-	15
Leatherback turtle	*Dermochelys coriacea*	-	-	-	-

Intertidal zone at the Glengad landfall

Appendix 8.3

Benthic species

Macrofaunal species recorded during the 2014 and 2020 surveys at Erris Head (SW1) and the Corrib Manifold (SW3) (Counts are individuals per 0.1m^2 (per grab), P = present (colonial/encrusting species)

Taxon	2020-SW1	2020-SW3	2014-SW1	2014-SW3
Abra				80
Abra (juv.)		22		
Abra alba	1			
Abra juv	104			
Abra nitida		1		3
Abra prismatica	7		153	
Abyssoninoe hibernica		1		
Abyssoninoe scopa				3
Acanthocardia juv	23			
Acidostoma obesum	2	2	2	
Acidostoma obesum (sensu Stoddart)				6
Aclis walleri				4
Acrocirridae		32		
Acteon tornatilis	16		4	2
Actinauge richardi				1
Actiniaria				P
ACTINIARIA (juv.)		4		
Adontorhina similis		34		393
Aetea anguina			P	
Alpheus glaber				1
Amaeana trilobata		4		3
Ampelisca				11
Ampelisca (juv.)		2		
Ampelisca aequicornis		18		
Ampelisca brevicornis	2		5	
Ampelisca gibba		14		6
Ampelisca spinipes		2	1	2

Taxon	2020-SW1	2020-SW3	2014-SW1	2014-SW3
Ampelisca spooneri			10	
Ampelisca typica			1	
Ampharete falcata	4			
Ampharete lindstroemi			1	
Ampharete octocirrata	14			
Ampharetidae			1	27
Ampharetidae (juv.)		1		
Amphicorina				68
Amphictene auricoma		2	3	2
Amphitritides gracilis	1			
Amphiura filiformis			12	4
Amphiuridae juv	5			
Amythasides macroglossus				6
Anaitides lineata			6	1
Anaitides longipes			2	
Anaitides rosea			5	
Anapagurus laevis			1	
Ancistrosyllis groenlandica		9		11
Anomiidae				2
Anomiidae (juv.)		1		
Anoplodactylus petiolatus			1	
Antalis agilis				2
Anthoathecata			P	P
Aonides				1
Aonides paucibranchiata	149	11	85	2
Aphelochaeta		13		2

Taxon	2020-SW1	2020-SW3	2014-SW1	2014-SW3
Aphelochaeta "species A"			3	
Aphelochaeta sp A	15			
Aphroditidae				5
Aphroditidae (juv.)		1		
Apistobranchus				3
Apistobranchus tenuis		7		7
APODIDA (juv.)		63		
Aponuphis bilineata	8		1	
Aporrhais (juv.)		7		
Aporrhais serresianus				1
Arachnidium simplex				P
Araphura brevimanus		1		
Arcopagia crassa			1	
Arctica islandica juv	4			
Argissa hamatipes	9		3	
Aricidea				23
Aricidea albatrossae		16		
Aricidea catherinae	1	26		46
Aricidea cerrutii	12		10	
Aricidea laubieri		14		46
Aricidea roberti		2		14
Aricidea simonae			1	
Aricidea simplex	8			
Aricidea suecica				1
Aricidea wassi		97	2	68
Asbjornsenia pygmaea	488			
ASCIDIACEA (juv.)		63		
ASCIDIACEA juv	15			
Aspidosiphon muelleri	5	1		
Asteroidea			1	6
ASTEROIDEA (juv.)	6	276		
Astropecten irregularis	1		1	12
Atelecyclus rotundatus				3

Taxon	2020-SW1	2020-SW3	2014-SW1	2014-SW3
Atylus falcatus			1	
Axinulus croulinensis		136		284
Bathyporeia			2	
Bathyporeia elegans	30			
Bathyporeia gracilis	3			
Bathyporeia guilliamsoniana	2			
Bathyporeia tenuipes	18			
BIVALVIA juv	1			
Bodotria arenosa	1		1	
Bodotria pulchella	4			
Bougainvillia britannica				P
Branchiostoma lanceolatum			1	
Brissopsis lyrifera		3		
Bylgides acutisetis		1		
Cadulus subfusiformis		2		
Caecum glabrum	16			
Callianassa subterranea				1
Calocaris macandreae		1		
Campylaspis glabra		4		
Capitella	2536	1		
Carbasea carbasea			P	
Caridea				1
Caryophyllia smithii	1			
Caulleriella "species B"			1	
Cellaria fistulosa			P	
Cellepora hyalina			P	
Cellepora pumicosa			P	
Centraloecetes kroyeranus	2			
Centraloecetes striatus	5			
CEPHALASPIDEA (juv.)		171		
Cerebratulus	11		8	18

Taxon	2020-SW1	2020-SW3	2014-SW1	2014-SW3
Cerianthidae (juv.)		15		
Cerianthus lloydii	11	33	13	28
Chaetoderma nitidulum				
Chaetognatha				1
Chaetopteridae			3	8
Chaetozone "species D"				2
Chaetozone c.f. elakata	2			
Chaetozone christiei	5		9	
Chaetozone zetlandica	1		3	
Chamelea striatula	4		40	
Chauliopleona armata		14		
Cheirocratus				2
Chirimia biceps		1		
Chone collaris				1
Cirratulus caudatus				1
Cirrophorus furcatus #A		1		
Clausinella fasciata	1			
Claviramus candelus		18		
Clavodorum kristiani		1		
Clymenella cincta			1	
Cochlodesma praetenue	21		23	
Commensodorum commensalis				1
COPEPODA		64		
Crangonidae			1	
Crisia			P	
Crisia cornuta			P	
Crisia denticulata			P	
Crisia eburnea			P	
Ctenodrilidae			11	
Cucumariidae juv	3			
Cumella pygmaea	2			
Cuspidaria				23
Cuspidaria abbreviata				11

Taxon	2020-SW1	2020-SW3	2014-SW1	2014-SW3
Cuspidaria rostrata		2		
Cuspidariidae (juv.)		3		
Cylichna (juv.)		7		
Cylichna cylindracea	10	8	1	13
DECAPODA (zoea)		2		
Dialychone cf longiseta	2			
Dialychone dunerficta	23			10
Dialychone longseta				3
Diaphana minuta	8			
Diastylis			1	
Diastylis bradyi	1			
Diastylis cornuta				4
Diastylis echinata		1		
Diastylis rugosa			3	
Diastyloides biplicatus		34		14
Diplocirrus glaucus		8		19
Diplocirrus stopbowitzi	1			
Dipolydora caulleryi	5			
Dipolydora coeca				6
Dipolydora indet	2			
Dipolydora saintjosephi (?)		56		
Disconectes latirostris		3		
Ditrupa arietina	1	2		
Dodecaceria	10		11	
Dosinia			5	
Dosinia juv	46			
Dosinia lupinus	2		37	
Drilonereis filum		1		
Echinidae juv	3			
Echinocardium				32
Echinocardium flavescens	1		146	36
Echinocyamus pusillus	151		98	

Taxon	2020-SW1	2020-SW3	2014-SW1	2014-SW3
Echinoidea			2	108
Echiurus echiurus		52		241
Eclysippe vanelli		184		180
Edwardsia claparedii	384			
Edwardsiidae		1	48	52
Edwardsiidae (juv.)		11		
Enchytraeidae	248			
Enchytraeidae			32	
Ennucula tenuis		24		
Entalina tetragona		1		
Epilepton clarkiae				1
Eriopisa elongata		3		3
Eteone longa agg	5			
Euchone (juv.)		2		
Euchone anceps		3		
Euchone incolor		73		
Euchone rosea				1
Euchone sp. A		19		
Euchone sp. B		23		
Eudorella (juv.)		1		
Eudorella truncatula		4		16
Eugerda tenuimana		8		1
Eulalia mustela	7		2	
Eulima bilineata	2	2		6
Eumida			3	
Eumida bahusiensis	3			
Eunoe nodosa			1	
EUPHAUSIACEA		1		
Eurydice grimaldii		1		
Eurydice truncata	401		1	1
Euspira fusca		2		1
Euspira nitida	3			
Euspira pulchella			1	

Taxon	2020-SW1	2020-SW3	2014-SW1	2014-SW3
Exogone hebes			3	9
Exogone naidina	2			
Exogone verugera				3
Fabulina fabula	5		23	
Falcidens crossotus		9		
Falcidens crossotus				23
Gadila subfusiformis				2
Galathea (juv.)	1			
Galathowenia oculata	7	1654	5	1524
Gammaropsis cornuta			2	
Gammaropsis sophiae		1		
Gari			1	
Gari juv	62			
Gari tellinella	2		1	
GASTROPODA (dam.)		1		
Gastrosaccus sanctus	1			
Gitana abyssicola		3		
Gitana sarsi	1			
Glossobalanus sarniensis				1
Glycera (juv.)		3		
Glycera alba	3		3	
Glycera capitata		107	1	
Glycera fallax	3			
Glycera lapidum	153		48	88
Glycera oxycephala	26		22	
Glycera rouxii				2
Glycera tridactyla			2	
Glycera unicornis		4		
Glycinde nordmanni	14	1	19	
Glyphohesione klatti		4		17
Gnathiidae		4		
Golfingia elongata				1
Golfingia vulgaris	1			

Taxon	2020-SW1	2020-SW3	2014-SW1	2014-SW3
Golfingia vulgaris vulgaris		5		
Golfingiidae				1
Goniada maculata		2	3	23
Goniada norvegica				1
Goniadella bobretzkii	34		2	
Goniadidae				2
Goodallia triangularis	33		5	
Gouldia minima			1	
Guernea coalita	6		1	
Gyptis				1
Halicoides walkeri		1		
Harmothoe antilopes		1		
Harmothoe glabra	3	30		1
Harpinia			2	3
Harpinia antennaria	21	25	3	16
Harpinia crenulata				1
Harpinia laevis		31		2
Harpinia pectinata		4		11
HEMICHORDATA		6	1	4
Henricia juv	1			
Hesionura elongata	218		5	
Hiatella arctica		2		
Hippomedon denticulatus	10	1	4	13
HOLOTHURIOIDEA	110			
Hyalinoecia tubicola			2	
Hydroides norvegica	2	1		
Hypererythrops serriventer				1
HYPERIIDEA		5		
Ilyarachna longicornis		13		
Iphinoe (juv. male)		2		
Iphinoe trispinosa			1	
Kellia suborbicularis				1

Taxon	2020-SW1	2020-SW3	2014-SW1	2014-SW3
Kelliella abyssicola				98
Kirkegaardia		3		
Kurtiella bidentata	3		6	
Kurtiella tumidula		2		
Labidoplax				3
Labidoplax buskii		50	1	98
Labidoplax digitata				8
Laevicardium crassum			1	
Lagis koreni	11		1	
Lanice conchilega		23	2	
Laonice				5
Laonice (juv.)		14		
Laonice bahusiensis	9		4	6
Laonice sarsi		44		12
Lepidasthenia				1
Lepidepecreum longicorne	1		4	
Leptocheirus pectinatus	14			
Leptognathia breviremis		2		
Leucon nasica				2
Leucothoe incisa				6
Levinsenia flava		40		
Levinsenia gracilis		38		134
Limacina retroversa				1
Limatula gwyni	5			
Limatula subovata				1
Liocarcinus marmoreus			1	
Litocorsa stremma		4		14
Loimia medusa				1
Lophogaster typicus				1
Lovenella clausa			P	
Lucinoma borealis			2	
Lucinoma borealis juv	2			
Lumbrineridae				1

Taxon	2020-SW1	2020-SW3	2014-SW1	2014-SW3
Lumbrineridae (juv.)		16		
Lumbrineris c.f. cingulata		21		8
Lumbrineris futilis	10		1	
Lumbrineris gracilis			8	
Lumbrineris nr cingulata	1			
Lutraria juv	3			
Macrochaeta	11			
Macrochaeta polyonyx				17
Macropipus tuberculatus				1
Mactra stultorum			1	
Mactridae			5	
Mactridae juv	4			
Magelona alleni	3		2	
Magelona filiformis	98		51	
Magelona johnstoni			2	
Magelona minuta		18		28
Maldanidae				2
Maldanidae (juv.)		3		
Malmgrenia darbouxi		1		
Mediomastus fragilis	160		38	
Megaluropus agilis	9		17	
Megatrema anglicum			P	
Melaenis loveni				9
Melanella polita	1			
Melphidippella macra	1			
Mendicula ferruginosa		11		21
Microjaera anisopoda	5			
Micromaldane ornithochaeta				2
Microphthalmus	10			
Microprotopus maculatus	4			
Minuspio cirrifera			5	94
Minuspio multibranchiata				1
Modeeria rotunda				P

Taxon	2020-SW1	2020-SW3	2014-SW1	2014-SW3
Modiolus			1	
Moerella pygmaea			31	
Molgula occulta		4		
Monoculodes carinatus			1	
Montacuta substriata	1	2	3	21
Monticellina dorsobranchialis				6
Munida (juv.)		3		
Munida intermedia				2
Myriochele danielsseni	24	37		3
Mysia undata	1		2	
MYSIDA		1		
Mystides caeca	15			
Mytilidae juv	6			
Naididae	59			
Natatolana borealis		45		20
Naticidae			1	3
Naticidae (juv.)		10		
NEMATODA	3375	1	213	3
NEMERTEA	231	64	32	50
Neogyptis rosea		2		
Neomenia		3		
Nephtys			8	4
Nephtys (juv.)		79		
Nephtys assimilis	2		1	
Nephtys cirrosa	20		12	
Nephtys hombergii		1	4	5
Nephtys hystricis		61		5
Nephtys kersivalensis				2
Nereididae (juv.)		1		
Nicippe tumida		5		12
Nolella dilatata				P
Notocirrus scoticus				1
Notomastus	24	11	7	27

Taxon	2020-SW1	2020-SW3	2014-SW1	2014-SW3
Nototropis falcatus	13			
Nototropis swammerdamei	13			
Nototropis vedlomensis	31			
Nucula (juv.)		5		
Nuculidae				4
Nuculidae (juv.)		1		
Nuculoma tenuis				24
Obelia				P
Obtusella intersecta	59			
Odontosyllis fulgurans			1	
Oedicerotidae			1	
Oestergrenia thompsoni				1
Onchnesoma steenstrupi		7		6
Ophelia celtica	1		1	
Ophelina				1
Ophelina (juv.)		4		
Ophelina acuminata			1	
Ophelina cylindricaudata		27		50
Ophiocten affinis	1		3	581
Ophiodromus flexuosus				7
Ophiura			6	
Ophiura albida			1	
Ophiuridae juv	21			
Ophiuroidea			29	71
OPHIUROIDEA (juv.)		281		
OPHIUROIDEA juv	43			
Opisthodonta pterochaeta			2	
Orbinia			10	
Orbinia sertulata			4	
OSTRACODA		96	1	28
Owenia	388			
Owenia (juv.)		57		

Taxon	2020-SW1	2020-SW3	2014-SW1	2014-SW3
Owenia borealis				2
Owenia fusiformis		3		
Oxydromus flexuosus		2		
Pagurus cuanensis				2
Palmiskenea skenei			P	
Palposyllis prosostoma	3			
Pandeiidae			P	P
Papillicardium minimum		29		
Paramphinome jeffreysii		11		33
Paramphitrite birulai		4		
Paramunna bilobata		1		
Paranaitis uschakovi				1
Paranymphon spinosum		8		1
Paraonidae				5
Paraonides myriamae		3		2
Pardaliscidae				1
Parexogone hebes	36	4		
Pariambus typicus			1	
Parougia eliasoni		1		
Parvicardium minimum				13
Pectinariidae				1
Pectinoidea				2
Pelecypoda				2
Pennatulidae				P
Pentapora fascialis			P	
Peresiella clymenoides	109	77	44	87
Perioculodes longimanus	11	1	12	7
Pharidae			7	
Phascolion strombus	7			
Philine catena				1
Philine scabra			27	
Philinidae	86	86		
PHILINOIDEA (juv.)		17		

Taxon	2020-SW1	2020-SW3	2014-SW1	2014-SW3
Philocheras (dam.)		1		
Philocheras echinulatus				1
Phisidea aurea	2		1	1
Pholoe inornata (sensu petersen)			1	
Phoronis	188	20	41	20
Phtisica marina				12
Phyllodoce (juv.)		1		
Phyllodoce groenlandica	5			
Phyllodoce lineata	2	5		
Phyllodoce mucosa	171			
Phyllodoce rosea	28			
Phylo (juv.)		1		
Phylo grubei		1		
Pisione remota	447		33	
Pista				2
Pista (juv.)		14		
Pista bansei	5	1		
Pista cristata				6
Pista mediterranea				1
Plagioecia patina			P	
PLATYHELMINTHES	2	1	3	3
Podarkeopsis capensis	1	1	2	1
Poecilochaetus serpens	1	37	1	4
Polycirrus	24	6	5	1
Polycirrus medusa			6	
Polycirrus norvegicus			2	
Polygordiidae	459			
Polygordius			56	
Polynoidae			11	6
Polynoidae (juv.)		76		
Pontocrates arenarius	6		2	
Porella			P	
Poromya granulata				1

Taxon	2020-SW1	2020-SW3	2014-SW1	2014-SW3
Praxillella affinis		5		4
Praxillura longissima				4
Prionospio			24	23
Prionospio (dam.)		1		
Prionospio (juv.)		37		
Prionospio c.f. aluta		164		
Prionospio cirrifera	13			
Prionospio dubia		31		29
Prionospio fallax		368	6	133
Prionospio steenstrupi		61		
Procampylaspis		1		
Processa				2
Processa nouveli holthuisi				2
Protodorvillea kefersteini	243		20	
Protodrilus	5			
Psamathe fusca	13			
Pseudocuma simile	31		30	
Pseudomma affine				1
Pseudomystides limbata			1	
Pseudopolydora paucibranchiata				5
Pseudopolydora sp A	8	170		
Pulsellum affine				11
PYCNOGONIDA (juv.)		3		
Retusa			1	2
Retusa obtusa	162		1	1
Retusa truncatula	1			
Retusa umbilicata	31	55	1	
Roxania utriculus	16	2		
Sabellidae (juv.)		17		
Sabellides octocirrata			1	
Sabidius antennatus		3		
Samytha sexcirrata		1		
Sarsinebalia urgorrii	1			

Taxon	2020-SW1	2020-SW3	2014-SW1	2014-SW3
Scalibregma celticum				1
Scalibregma hanseni		12		
Scalibregma inflatum		9	2	5
Scaphander lignarius		2		
Scaphander punctostriatus				1
SCAPHOPODA (juv.)		22		
Schizoporella			P	P
Schizoporella errata				P
Scleractinia				P
Scolelepis			1	3
Scolelepis (juv.)		1		
Scolelepis bonnieri			5	
Scolelepis korsuni	1	2		
Scolelepis squamata	25			
Scoletoma magnidentata			2	
Scoloplos armiger	25		1	
Scruparia chelata			P	
Scrupocellaria scruposa			P	
Scutopus ventrolineatus		15		
Sigalion mathildae	2			
Similipecten similis		2		1
Siphonoecetes kroyeranus			7	
Siphonoecetes striatus			3	
SOLENOGASTRES	2	20		
Solenogastres				2
SOLENOIDEA juv	1			
Sosane wahrbergi		19		
Sosane wireni		25		
SPATANGOIDA (juv.)		8280		
Spatangoida juv	2702			
Spatangus purpureus				2
Spatangus raschi				1

Taxon	2020-SW1	2020-SW3	2014-SW1	2014-SW3
Sphaerodoridium minuta	1			
Sphaerosyllis bulbosa	16		8	
Sphaerosyllis taylori	20		2	
Sphheillol cEh&ePraIsre-blaisnpdinLotds.us			3	
Spio decorata	23		3	
Spio filicornis			5	
Spio symphyta	17			
Spiochaetopterus		2		
Spiophanes				3
Spiophanes bombyx			57	9
Spiophanes bombyx (agg.)		24		
Spiophanes bombyx agg	72			
Spiophanes kroyeri			5	49
Spiophanes kroyeri (agg.)	39	116		
Spiophanes wigleyi		14		60
Spisula elliptica	4		14	
Spisula juv	250	250		
Sthenelais			3	1
Sthenelais (juv.)		93		
Sthenelais boa				1
Sthenelais limicola	7	1	5	13
Streptodonta pterochaeta	61			
Streptosyllis bidentata	61		4	
Streptosyllis websteri	21			
Syllides benedicti			1	
Syllidia armata			1	
Syllis mauretanica	1			
Syllis parapari	18			
Syllis pontxioi	57		14	
Synaptidae				2
Synchelidium maculatum	1		2	3

Taxon	2020-SW1	2020-SW3	2014-SW1	2014-SW3
Syrrhoe affinis				1
Tanaidacea			7	25
Tanaissus danica	12			
Tanaopsis graciloides	18			
Tellimya (juv.)		1		
Tellimya ferruginosa	11		11	6
Tellimya tenella		1		
Tellinidae			3	
Terebellidae (juv.)		8		
Terebellides shetlandica		64		
Terebellides stroemi				14
Teretia teres		2		
Thalassinidae				13
Tharyx		20		1
Tharyx killariensis				3
Thracia juv	9			
Thracia villosiuscula	1		3	
Thraciidae			5	1
THRACIOIDEA juv	71			
Thyasira				3
Thyasira (juv.)		1		
Thyasira flexuosa	4		15	
Thyasiridae juv	2			
Thysanocardia procera		4		4
Timoclea ovata	10		2	25
Tmetonyx similis			1	
Trichobranchus (juv.)		1		
Trichobranchus roseus				1
Tropidomya abbreviata		11		
Trypanosyllis coeliaca	9			
Tryphosites longipes	1			
Tubulanus polymorphus	91		16	106
Turbonilla	2			

Taxon	2020-SW1	2020-SW3	2014-SW1	2014-SW3
Urothoe elegans		29	1	240
Veneridae			8	
Veneridae juv	11			
Verruca stroemia		2	P	
Vesicomya atlantica		101		
Vitreolina philippi		2		
Yoldiella lenticula				6
Yoldiella philippiana		36		

Broadhaven Bay from the Glengad landfall

Botanical survey of Glengad wayleave

Appendix 8.4

Plant species

8.4.1: Plant species recorded at the reinstated Landfall cliff at Glengad

Note: *(year) = date of reinstatement*

SPECIES	COMMON NAME	2011 Survey (2009)	2012 Survey (2009)	2019 Survey (2015)
Agrostis stolonifera	Creeping Bent	-	✓	✓
Ammophila arenaria	Marram Grass	✓	✓	✓
Bellis perennis	Daisy	✓	✓	✓
Cerastium fontanum	Common Mouse-ear	✓	-	✓
Cirsium vulgare	Spear Thistle	✓	✓	✓
Festuca rubra	Red Fescue	✓	✓	✓
Holcus lanatus	Yorkshire Fog	✓	✓	✓
Juncus articulatus	Jointed Rush	✓	-	✓
Leontodon autumnalis	Autumn Hawkbit	-	✓	-
Plantago lanceolata	Ribwort Plantain	✓	✓	✓
Plantago major	Greater Plantain	-	✓	✓
Plantago maritima	Sea Plantain	✓	✓	✓
Poa annua	Annual Meadow-grass	✓	✓	-
Prunella vulgaris	Selfheal	✓	-	-
Ranunculus repens	Creeping Buttercup	✓	✓	✓
Rumex acetosa	Sorrel	✓	✓	✓
Rumex acetosella	Sheep's Sorrel	✓	-	-
Rumex crispus	Curled Dock	✓	✓	✓
Rumex obtusifolius	Broad-leaved Dock	✓	✓	-
Sagina procumbens	Procumbent Pearlwort	✓	✓	✓
Senecio jacobea	Ragwort	✓	✓	-
Sonchus asper	Prickly Sow-thistle	✓	✓	✓
Stellaria sp.	Chickweed species	✓	-	-
Taraxacum officinale agg.	Dandelion	✓	-	✓
Trifolium pratense	Red Clover	-	✓	✓
Trifolium repens	White Clover	✓	✓	✓

SPECIES	COMMON NAME	2011 Survey (2009)	2012 Survey (2009)	2019 Survey (2015)
Tussilago farfara	Colt's-foot	✓	✓	-
Achillea millefolium	Yarrow	-	-	✓
Cirsium arvense	Creeping thistle	-	-	✓
Daucus carota	Wild Carrot	-	-	✓
Plantago coronopus	Buck's horn Plantain	-	-	✓

8.4.2: Plant species recorded on the low cliff to the north of the landfall and LVI at Glengad

Note: *This is outside the footprint of the Corrib Asset*

SPECIES	COMMON NAME	2011	2012	2019
Higher plants				
Ammophila arenaria	Marram Grass	✓	✓	✓
Armeria maritima	Thrift	✓	✓	✓
Bellis perennis	Daisy	✓	✓	✓
Cardamine pratensis	Cuckoo Flower	✓	-	-
Festuca rubra	Red Fescue	✓	✓	✓
Holcus lanatus	Yorkshire Fog	✓	✓	✓
Hypochoeris radicata	Cat's-ear	-	✓	✓
Lotus corniculatus	Bird's-foot Trefoil	✓	✓	✓
Osmunda regalis	Royal Fern	✓	✓	✓
Plantago coronopus	Buck's-horn Plantain	✓	✓	✓
Plantago lanceolata	Ribwort Plantain	✓	✓	✓
Plantago maritima	Sea Plantain	✓	✓	✓
Poa annua	Annual Meadow-grass	✓	-	-
Primula vulgaris	Primrose	✓	✓	✓
Rumex acetosa	Sorrel	✓	✓	✓
Rumex crispus	Curled Dock	✓	✓	-
Sagina procumbens	Procumbent Pearlwort	✓	✓	✓
Senecio jacobea	Ragwort	✓	✓	✓
Taraxacum officinale agg.	Dandelion	✓	-	✓
Trifolium repens	White Clover	✓	✓	✓
Tussilago farfara	Colt's-foot	✓	✓	✓

SPECIES	COMMON NAME	2011	2012	2019
Viola riviniana	Common Dog-violet	✓	-	✓
Agrostis stolonifera	Creeping Bent	-	-	✓
Anagallis tenella	Bog Pimpernel	-	-	✓
Catapodium marinum	Sea Fern-grass	-	-	✓
Cerastium fontanum	Common Mouse-ear	-	-	✓
Cirsium arvense	Creeping Thistle	-	-	✓
Cirsium vulgare	Spear Thistle	-	-	✓
Jasione montana	Sheep's bit Scabious	-	-	✓
Juncus articulatus	Jointed Rush	-	-	✓
Prunella vulgaris	Self-heal	-	-	✓
Senecio aquaticus	Marsh Ragwort	-	-	✓
Thymus polytrichus	Thyme	-	-	✓
Trifolium pratense	Red Clover	-	-	✓
Ferns				
Dryopteris dilatata	Broad Buckler Fern	✓	-	-
Phyllitis scolopendrium	Hart's-tongue Fern	✓	-	-
Osmunda regalis	Royal Fern	✓	✓	✓

8.4.3: Plant species recorded in grassland habitat on the west Glengad wayleave

***Notes**:* 2001 = pre-construction baseline; 2011 = after reinstatement in 2009; 2016 onwards = following final reinstatement (*1 = wayleave west Glengad; 2 = LVI side slopes).*

SPECIES	COMMON NAME	2001	2011	2016	2017	2018	2019/2020
				1 - reinstated wayleave		2- LVI side slopes	
Higher plants							
Achillea millefolium	Yarrow	✓	-	✓ 1	✓ 1	✓ 1	✓ 1
Agrostis capillaris	Common Bent	✓	-	✓ 1,2	✓ 1,2	✓ 1,2	✓ 1,2
Agrostis stolonifera	Creeping Bent	✓	✓	✓ 1,2	✓ 1,2	✓ 1,2	✓ 1,2
Alopecurus geniculatus	Marsh Foxtail	-	✓	✓ 1,2	✓ 1	✓ 1	✓ 1
Anagallis tenella	Bog Pimpernel	✓	✓	✓ 1,2	✓ 1,2	✓ 1,2	✓ 1,2
Anthoxanthum odoratum	Sweet Vernal-grass	✓	✓	✓ 1,2	✓ 1,2	✓ 1,2	✓ 1,2
Bellis perennis	Daisy	✓	✓	✓ 1,2	✓ 1,2	✓ 1,2	✓ 1,2
Bromus hordaceus	Soft Brome	✓	-	-	-	-	-
Cardamine pratensis	Cuckoo Flower	✓	-	-	-	-	-

SPECIES	COMMON NAME	2001	2011	2016	2017	2018	2019/2020
				1 - reinstated wayleave		2- LVI side slopes	
Carex flacca	Glaucous Sedge	-	✓	-	✓1	-	-
Carex viridula subsp. oedocarpa	Short-stalked Yellow-sedge	-	✓	✓1	✓1	✓1	✓1,2
Centaurea nigra	Knapweed	✓	-	-	-	-	✓1
Centaurium erythraea	Common Centaury	-	✓	✓1,2	✓1,2	✓1,2	✓1,2
Cerastium fontanum	Common Mouse-ear	✓	✓	✓1,2	✓1,2	✓1,2	✓1,2
Cirsium arvense	Creeping Thistle	✓	-	✓1,2	✓1,2	✓1,2	✓1,2
Cirsium palustre	Marsh Thistle	✓	-	✓1	✓1	✓1	✓1
Cirsium vulgare	Spear Thistle	-	✓	✓1,2	✓1	✓1	✓1,2
Cynosurus cristatus	Crested Dog's-tail	✓	-	✓1,2	✓1,2	✓1,2	✓1,2
Euphrasia tetraquetra	Eyebright	✓	-	-	-	-	-
Festuca rubra	Red Fescue	✓	-	✓1,2	✓1,2	✓1,2	✓1,2
Galium verum	Ladies Bedstraw	✓	-	-	-	-	-
Geranium molle	Dove's-foot Cranesbill	✓	-	-	-	-	-
Glyceria sp.	Sweet-grass species	-	✓	✓1	✓1	-	-
Heracleum sphondylium	Hogweed	✓	-	-	-	-	-
Holcus lanatus	Yorkshire Fog	✓	✓	✓1,2	✓1,2	✓1,2	✓1,2
Hypericum humifusum	Trailing St. John's-wort	-	✓	✓2	✓2	✓1,2	✓1,2
Hypochoeris radicata	Cat's Ear	✓	✓	✓1,2	✓1,2	✓1,2	✓1,2
Isolepis setacea	Bristle Club-rush	-	✓	✓1	-	-	-
Juncus articulatus	Jointed Rush	✓	✓	✓1,2	✓1,2	✓1,2	✓1,2
Juncus bufonius	Toad Rush	✓	✓	-	-	-	-
Juncus bulbosus	Bulbous Rush	-	✓	-	✓1	-	-
Juncus effusus	Soft Rush	-	✓	✓1	✓1	✓1,2	✓1,2
Leontodon autumnalis	Autumn Hawkbit	✓	✓	✓1,2	✓1,2	✓1,2	✓1,2
Leontodon taraxacoides	Lesser Hawkbit	✓	-	-	-	-	-
Leucanthemum vulgare	Oxeye Daisy	-	✓	✓1,2	✓1,2	✓1,2	✓1,2
Lolium perenne	Perennial Rye-grass	✓	✓	✓1	✓1	✓1	✓1
Lotus corniculatus	Bird's-foot Trefoil	✓	✓	✓1,2	✓1,2	✓1,2	✓1,2
Luzula campestris	Field Woodrush	✓	-	-	✓2	✓2	-
Myosotis arvensis	Field Forget-me-not	-	✓	-	-	-	-
Plantago coronopus	Buck's-horn Plantain	✓	-	✓1	✓1	✓1,2	✓1,2
Plantago lanceolata	Ribwort Plantain	✓	-	✓1	✓1	✓1	✓1

SPECIES	COMMON NAME	2001	2011	2016	2017	2018	2019/2020
				1 - reinstated wayleave		2- LVI side slopes	
Plantago major	**Greater Plantain**	✓	✓	✓ 1,2	✓ 1,2	✓ 1,2	✓ 1,2
Poa annua	**Annual Meadow-grass**	✓	✓	✓ 1	✓ 1	✓ 1	✓ 1
Poa pratensis	**Smooth Meadow-grass**	✓	✓	✓ 1	✓ 1	✓ 1,2	✓ 1,2
Polygonum aviculare	**Knotgrass**	✓	-	✓ 1	✓ 1	✓ 1	✓ 1
Potentilla anserina	**Silverweed**	✓	-	✓ 1,2	✓ 1,2	✓ 1,2	✓ 1,2
Potentilla reptans	**Creeping Cinquefoil**	✓	-	-	-	-	-
Prunella vulgaris	**Selfheal**	✓	-	✓ 1,2	✓ 1,2	✓ 1,2	✓ 1,2
Ranunculus acris	**Meadow Buttercup**	✓	-	✓ 1	✓ 1	✓ 1	✓ 1
Ranunculus flammula	**Lesser Spearwort**	-	✓	✓ 1,2	✓ 1,2	✓ 1	✓ 1
Ranunculus repens	**Creeping Buttercup**	✓	✓	✓ 1,2	✓ 1,2	✓ 1,2	✓ 1,2
Rumex acetosa	**Sorrel**	✓	✓	✓ 1	✓ 1	✓ 1,2	✓ 1,2
Rumex acetosella	**Sheep's Sorrel**	-	✓	✓ 1,2	✓ 1,2	✓ 1,2	✓ 1,2
Rumex crispus	**Curled Dock**	-	✓	✓ 1	✓ 1,2	✓ 1,2	✓ 1
Sagina procumbens	**Procumbent Pearlwort**	✓	✓	✓ 1,2	✓ 1,2	✓ 1,2	✓ 1,2
Senecio jacobea	**Ragwort**	✓	✓	✓ 1	✓ 1	✓ 1	✓ 1
Sonchus sp.	**Sow Thistle species**	-	✓	✓ 1,2	✓ 1,2	✓ 1,2	✓ 1,2
Stellaria graminea	**Lesser Stitchwort**	✓	-	-	✓ 1	-	-
Stellaria media	**Common Chickweed**	✓	✓	-	-	-	✓ 1
Taraxacum officinale	**Dandelion**	✓	✓	✓ 1	✓ 1	✓ 1,2	✓ 1
Trifolium pratense	**Red Clover**	✓	-	✓ 1	✓ 1	✓ 1,2	✓ 1,2
Trifolium repens	**White Clover**	✓	✓	✓ 1,2	✓ 1,2	✓ 1,2	✓ 1,2
Veronica arvensis	**Wall Speedwell**	✓	-	-	-	-	-
Jasione montana	**Sheep's bit Scabious**	-	-	✓ 2	✓ 2	✓ 2	✓ 2
Veronica serpyllifolia	**Heath speedwell**	-	-	✓ 1,2	✓ 1,2	✓ 1,2	✓ 1,2
Senecio aquaticus	**Marsh Ragwort**	-	-	✓ 1,2	✓ 1,2	✓ 1,2	✓ 1,2
Isolepis cernua	**Slender Club-rush**	-	-	✓ 1,2	✓ 1,2	✓ 1,2	✓ 1,2
Equisteum arvense	**Field Horsetail**	-	-	✓ 1,2	✓ 1,2	✓ 1,2	✓ 1,2
Lythrum salicaria	**Purple Loosestrife**	-	-	✓ 1,2	✓ 1,2	✓ 1,2	✓ 1,2
Rumex obtusifolius	**Broad-leaved Dock**	-	-	✓ 1,2	✓ 1,2	✓ 1,2	✓ 1,2
Spergula arvensis	**Corn spurrey**	-	-	✓ 1	-	-	-
Dactylorhiza purpurella	**Northern Marsh-orchid**	-	-	-	-	✓ 2	✓ 2
Carex hirta	**Hairy Sedge**	-	✓	✓ 1,2	✓ 2	✓ 2	✓ 2
Angelica sylvestris	**Wild Angelica**	-	-	✓ 1	✓ 1	✓ 1	✓ 1

SPECIES	COMMON NAME	2001	2011	2016	2017	2018	2019/2020
				1 - reinstated wayleave		2- LVI side slopes	
Epilobium brunnescens	New Zealand Willowherb	-	-	✓ 1,2	✓ 1,2	✓ 1,2	✓ 1,2
Crepis capillaris	Smooth Hawk's-beard	-	-	✓ 1,2	✓ 1,2	✓ 1,2	✓ 1,2
Carex ovalis	Oval Sedge	-	-	-	-	✓ 1,2	✓ 1,2
Stachys palustris	Marsh Woundwart	-	-	✓ 2	✓ 1	✓ 1	✓ 1
Daucus carota	Wild Carrot	-	-	-	-	-	✓ 1
Hydrocotyle vulgaris	Marsh Pennywort	-	-	✓ 1,2	✓ 1,2	✓ 1,2	✓ 1,2
Urtica dioica	Common Nettle	-	-	-	-	-	✓ 1
Iris pseudacorus	Flag Iris	-	-	-	-	-	✓ 1
Lathyrus pratensis	Meadow Vetchling	-	-	-	-	-	✓ 1
Vicia cracca	Tufted Vetch	-	-	-	-	-	✓ 1
Juncus conglomeratus	Compact Rush	-	-	-	-	-	✓ 1
Bryophytes (Mosses and Liverworts)							
Brachythecium rutabulum	Rough-stalked Feather-moss	✓	-	✓ 1,2	✓ 1,2	✓ 1,2	✓ 1,2
Bryum sp.		-	✓				
Kindbergia praelonga (formerly Eurhynchium praelongum)	Common Feather-moss	✓	-	✓ 1,2	✓ 1,2	✓ 1,2	✓ 1,2
Lophocolea bidentata	Bifid Crestwort	✓	-	-	-	-	-
Plagiomnium undulatum	Hart's-tongue Thyme-moss	✓	-	-	-	-	-
Rhytidiadelphus squarrosus	Spring Turf-moss	✓	✓	✓ 1,2	✓ 1,2	✓ 1,2	✓ 1,2
Calliergonella cuspidata	Pointed Spear-Moss	-	-	✓ 1,2	✓ 1,2	✓ 1,2	✓ 1,2
Polytrichum sp.	Haircap moss	-	-	-	-	✓ 1,2	✓ 1,2

8.4.4: Plant species recorded in wet grassland on the East Glengad wayleave at the former tunnel reception site compound

***Notes**: 2001 = pre-construction baseline; 2016 onwards = following final reinstatement*

SPECIES	COMMON NAME	2001	2016	2017	2018	2019 / 2020
Higher plants						
Agrostis capillaris	Common Bent	✓	✓	✓	-	-
Agrostis stolonifera	Creeping Bent	✓		✓	✓	✓
Anagallis tenella	Bog Pimpernel	-	✓	✓	✓	✓
Anthoxanthum odoratum	Sweet Vernal-grass	✓	✓	✓	✓	✓
Cardamine pratensis	Cuckoo Flower	-	-	-	✓	✓
Carex disticha	Brown Sedge	-	-	-	-	✓
Carex echinata	Star Sedge	-	-	-	-	✓
Carex nigra	Common Sedge	-	-	-	-	✓
Cynosurus cristatus	Crested Dog's-tail	✓	✓	✓	✓	✓
Dactylis glomerata	Cock's Foot	✓	-	-	-	✓
Festuca rubra	Red Fescue	-	-	-	-	-
Galium palustre	Common Marsh-bedstraw	✓	-	-	-	✓
Gnaphalium uliginosum	Marsh Cudweed	-	✓	✓	✓	✓
Holcus lanatus	Yorkshire Fog	✓	✓	✓	✓	✓
Hydrocotyle vulgaris	Marsh Pennywort	-	-	✓	-	-
Juncus articulatus	Jointed Rush	✓	✓	✓	✓	✓
Juncus bufonius	Toad Rush	-	✓	✓	✓	-
Juncus bulbosus	Bulbous Rush	-	✓	✓	-	-
Juncus conglomeratus	Compact Rush	✓	-	-	-	-
Juncus effusus	Soft Rush	✓	-	✓	✓	✓
Juncus inflexus	Hard Rush	-	-	-	✓	✓
Iris pseudacorus	Yellow Flag	✓		✓	✓	✓
Leontodon autumnalis	Autumn Hawkbit	-	✓	✓	✓	✓
Phleum pratense	Timothy	-	-	-	-	✓
Poa pratensis	Smooth Meadow-grass	✓	-	-	-	-
Prunella vulgaris	Selfheal	✓	✓	✓	✓	✓
Ranunculus acris	Meadow Buttercup	✓	✓	✓	✓	✓
Ranunculus flammula	Lesser Spearwort	-	✓	✓	✓	✓
Ranunculus repens	Creeping Buttercup	✓	✓	✓	✓	✓
Rumex acetosa	Sorrel	✓	-	✓	✓	-

SPECIES	COMMON NAME	2001	2016	2017	2018	2019 / 2020
Sagina procumbens	Procumbent Pearlwort	-	✓	✓	✓	✓
Senecio aquaticus	Marsh Ragwort	-	✓	✓	✓	✓
Taraxacum officinale	Dandelion	✓	-	-	-	-
Trifolium repens	White clover	✓	✓	✓	✓	✓
Veronica serpyllifolia	Thyme-leaved Speedwell	-	-	-	-	✓
Bellis perennis	Daisy	-	-	-	-	✓
Carex flacca	Glaucous sedge	-	✓	✓	✓	✓
Carex ovalis	Oval sedge	-	-	✓	✓	✓
Carex viridula oedocarpa	Short-stalked yellow sedge	-	✓	✓	✓	✓
Centaurium erythraea	Common centuary	-	-	✓	-	✓
Cerastium fontanum	Common mouse-ear	-	✓	-	-	✓
Cirsium arvense	Creeping thistle	-	-	-	-	✓
Cirsium palustre	Marsh thistle	-	✓	✓	✓	✓
Dactylorhiza fuchsii	Common spotted-orchid	-	-	-	-	✓
Daucus carota	Wild Carrot	-	✓	-	-	-
Equisetum arvense	Field horsetail	-	✓	✓	✓	✓
Hypochoeris radicata	Cat's ear	-	✓	✓	✓	-
Isolepis cernua	Slender club-rush	-	✓	✓	✓	-
Juncus acutiflorus	Sharp-flowered rush	-	-	-	-	✓
Lolium perenne	Perennial rye-grass	-	-	✓	✓	✓
Lotus corniculatus	Bird's foot trefoil	-	-	-	✓	✓
Odontites vernus	Red bartsia	-	✓	✓	✓	✓
Persicaria maculosa	Redshank	-	✓	-	-	-
Plantago lanceolata	Ribwort plantain	-	✓	✓	✓	✓
Plantago major	Greater plantain	-	✓	✓	✓	✓
Potentilla anserina	Silverweed	-	✓	✓	✓	✓
Trifolium pratense	Red clover	-	✓	✓	✓	✓
Triglochin palustre	Marsh Arrow-grass	-	✓	-	-	-
Vicia cracca	Tufted vetch	-	✓	✓	✓	✓
Epiloium palustre	Marsh willowherb	-	✓	✓	-	-
Bryophytes (Mosses and Liverworts)						
Brachythecium rutabulum	Rough-stalked Feather-moss	-	-	✓	-	✓
Calliergonella cuspidata	Pointed Spear-Moss	✓	-	✓	✓	✓

SPECIES	COMMON NAME	2001	2016	2017	2018	2019 / 2020
Kindbergia praelonga *(formerly Eurhynchium praelongum)*	Common Feather-moss	-	✓	-	-	-
Rhytidiadelphus squarrosus	Spring Turf-moss	-	-	✓	-	✓

8.4.5: Plant species recorded in grassland to the north of the wayleave at west Glengad on lands not affected by construction

***Notes**: 2001 = baseline survey; 2016 onwards = monitoring.*

SPECIES	COMMON NAME	2001	2016	2017	2018	2019
Higher plants						
Achillea millefolium	Yarrow	✓	✓	✓	✓	✓
Agrostis capillaris	Common Bent	✓	✓	✓	✓	✓
Agrostis stolonifera	Creeping Bent	-	-	-	-	✓
Ammophila arenaria	Marram Grass	✓	✓	✓	✓	✓
Anthoxathum odoratum	Sweet Vernal Grass	✓	✓	✓	✓	✓
Arctium minus	Burdock	-	-	-	-	✓
Bellis perennis	Daisy	✓	✓	✓	✓	✓
Bromus hordaceus	Soft Brome	-	-	-	✓	✓
Cardamine pratensis	Cuckoo flower	-	✓	-	-	-
Carex arenaria	Sand Sedge	✓	✓	✓	✓	✓
Carex flacca	Glaucous Sdge	✓	-	-	-	✓
Carex nigra	Common Sedge	✓	✓	✓	✓	-
Carex hirta	Hairy Sedge	-	-	✓	✓	✓
Carex ovalis	Oval sedge	-	✓	✓	-	-
Centaurea nigra	Knapweed	-	-	-	-	✓
Cerastium fontanum	Common Mouse-ear	✓	✓	✓	✓	✓
Cirsium arvense	Creeping Thistle	✓	✓	✓	✓	✓
Cirsium vulgare	Spear Thistle	-	-	-	-	✓
Crepis capillaris	Smooth Hawksbeard	-	-	-	-	✓
Cynosurus cristatus	Crested Dog's-tail	✓	✓	✓	✓	✓
Dactylis glomerata	Cock's-foot	-	✓	✓	-	✓
Daucus carota	Wild Carrot	-	-	-	-	✓

SPECIES	COMMON NAME	2001	2016	2017	2018	2019
Equisetum arvense	Field Horsetail	-	-	-	-	✓
Euphrasia sp.	Eyebright species	✓	-	--	-	✓
Festuca rubra	Red Fescue	✓	✓	✓	✓	✓
Galium verum	Ladies Bedstraw	✓	✓	✓	✓	✓
Geranium molle	Doves's-foot Crane's-bill	-	-	-	-	✓
Heracleum sphondylium	Hogweed	-	-	-	-	✓
Hypochoeris radicata	Cat's ear	✓	-	-	✓	✓
Holcus lanatus	Yorkshire Fog	✓	✓	✓	✓	✓
Juncus effusus	Soft Rush	-	-	-	✓	-
Koeleria macrantha	Oat Grass	-	✓	-	-	-
Lolium perenne	Perennial Rye-grass	✓	✓	✓	✓	✓
Lotus corniculatus	Bird's-foot Trefoil	✓	✓	✓	✓	✓
Leontodon autumnalis	Autumn hawkbit	✓	✓	-	-	-
Luzula campestris	Field Wood-rush	-	✓	-	✓	-
Matricaria discoidea	Pineappleweed	-	-	-	-	✓
Odontites vernus	Red Bartsia	-	✓	✓	✓	✓
Plantago lanceolata	Ribwort Plantain	✓	✓	✓	✓	✓
Poa pratensis	Common Meadow-grass	✓	✓	✓	✓	✓
Ranucnulus repens	Creeping Buttercup	✓	-	-	✓	✓
Ranucnulus acris	Meadow Buttercup	✓	✓	✓	✓	✓
Ranunculus bulbosus	Bulbous buttercup	-	-	-	✓	✓
Rhinanthus minor	Yellow Rattle	-	✓	✓	✓	✓
Rumex acetosa	Common Sorrel	✓	✓	✓	✓	✓
Rumex acetosella	Sheep's Sorrel	-	✓	✓	✓	-
Rumex obtusifolius	Broad-leaved Dock	-	-	-	-	✓
Senecio jacobea	Common Ragwort	✓	✓	-	-	✓
Spergula arvensis	Corn Spurrey	-	-	-	-	✓
Stellaria gramineae	Lesser Stitchwort	-	✓	✓	✓	✓
Trifolium pratense	Red Clover	✓	✓	✓	✓	✓
Trifolium repens	White Clover	✓	✓	✓	✓	✓
Urtica dioica	Common Nettle	-	-	-	-	✓
Bryophytes (Mosses and Liverworts)						
Rhytidiadelphus squarrosus	Spring Turf-moss	✓	✓	✓	✓	✓
Brachythecium rutabulum		-	-	-	✓	✓

8.4.6: Plant species recorded at the Aughoose former tunnelling site compound.

Notes: ✓ = present. *2011 = pre-construction baseline of severely eroded blanket bog habitat,* § = more frequent in the very heavily eroded areas*; 2012: plant species recorded on stored vegetation turves during construction; 2016 onwards = following reinstatement (*✓ = present; *1 = reinstated turves; 2 = recolonising bare peat; 3 = created wetland ponds and margins).*

SPECIES	COMMON NAME	2011	2012	2016	2017	2018	2019
Higher plants							
Agrostis sp.	**Bent grass species**	✓ §	-	✓1,2	✓1,2	✓1,2	✓1,2
Calluna vulgaris	**Ling, Heather**	✓	✓	✓1,2	✓1,2	✓1,2	✓1,2
Carex binervis	**Green-ribbed Sedge**	✓ §	-	✓2	✓2	✓2	✓2
Carex echinata	**Star Sedge**	✓ §	-	✓2	✓2	✓2	✓2
Carex panicea	**Carnation Sedge**	✓	✓	✓1,2	✓1,2	✓1,2	✓1,2
Danthonia decumbens	**Heath Grass**	✓ §	-	-	-	-	-
Drosera rotundifolia	**Round-leaved Sundew**	✓	✓	✓1,2	✓1,2	✓1,2	✓1,2
Eleocharis multicaulis	**Many-stalked Spike-rush**	✓ §	✓	-	-	-	-
Erica cinerea	**Bell Heather**	✓	✓	✓1,2	✓1,2	✓1,2	✓1,2
Erica tetralix	**Cross-leaved Heath**	✓	✓	✓1,2	✓1,2	✓1,2	✓1,2
Eriophorum angustifolium	**Common Bog-cotton**	✓	✓	✓1,2,3	✓1,2,3	✓1,2,3	✓1,2,3
Eriophorum vaginatum	**Hare's tail Bog Cotton**	✓	✓	✓1,2	✓1,2	✓1,2	✓1,2
Festuca ovina	**Sheep's Fescue**	✓	-	-	-	-	-
Holcus lanatus	**Yorkshire Fog**	-	✓	✓ 2	✓ 2	✓ 2	✓ 2
Juncus bulbosus	**Bulbous Rush**	✓ §	✓	✓1,2,3	✓1,2,3	✓1,2,3	✓1,2,3
Juncus effusus	**Soft Rush**	✓	-	✓1,2,3	✓1,2,3	✓1,2,3	✓1,2,3
Juncus squarrosus	**Heath Rush**	✓ §	-	-	-	-	-
Molinia caerulea	**Purple Moor-grass**	✓	✓	✓1,2	✓1,2	✓1,2	✓1,2
Myrica gale	**Bog Myrtle**	✓	✓	✓1	✓1	✓1	✓1
Nardus stricta	**Mat Grass**	✓ §	-	-	-	-	-
Narthecium ossifragum	**Bog Asphodel**	✓	✓	✓1,2	✓1,2	✓1,2	✓1,2
Pedicularis sylvatica	**Lousewort**	-	✓	✓1	✓1,2	-	✓2
Pinus contorta (seedlings)	**Lodgepole Pine**	-	✓	✓ 2	-	-	-
Polygala serpylifolia	**Heath Milk-wort**	✓	✓	✓1,2	✓1,2	✓1,2	✓1,2
Potentilla erecta	**Tormentil**	✓	✓	✓1,2	✓1,2	✓1,2	✓1,2
Rhynchospora alba	**White-beaked Sedge**	✓	✓	✓1,2	✓1,2	✓1,2	✓1,2
Schoenus nigricans	**Black Bog-rush**	✓	✓	✓1,2	✓1,2	✓1,2	✓1,2
Tricophorum cespitosum	**Deer Grass**	✓	✓	✓1,2	✓1,2	✓1,2	✓1,2
Ulex europaeus	**Gorse**	✓	-	-	-	✓2	✓2

SPECIES	COMMON NAME	2011	2012	2016	2017	2018	2019
Blechnum spicant	**Hard Fern**	-	-	-	-	✓1,2	✓1,2
Achillea millefolium	**Yarrow**	-	-	✓2	✓2	✓2	✓2
Anagallis tenella	**Bog Pimpernel**	-	-	✓2	✓2	-	-
Alisma plantago-aquatica	**Water Plantain**	-	-	-	✓3	✓3	✓3
Angelica sylvestris	**Wild Angelica**	-	-	✓2	✓2	✓2	✓2
Anthoxathum odoratum	**Sweet Vernal-grass**	-	-	-	-	✓1,2	✓1,2
Callitriche sp.	**Starwort species**	-	-	✓2	✓2	✓2	✓2
Carex viridula oedocarpa	**Short-stalked Yellow Sedge**	-	-	✓2	✓2	✓2	✓2
Cerastium fontanum	**Common Mouse-ear**	-	-	-	✓2	✓2	✓2
Cirsium palustre	**Marsh Thistle**	-	-	✓2	✓2	✓1,2	✓1,2
Daucus carota	**Wild Carrot**	-	-	-	-	-	✓2
Dryopteris sp.	**Buckler Fern species**	-	-	✓2	✓2	✓2	✓2
Epilobium brunnescens	**New Zealand Willowherb**	-	-	-	-	✓2	-
Epilobium palustre	**Marsh Willowherb**	-	-	✓2	✓2	✓2	✓2
Equisetum arvense	**Field Horsetail**	-	-	-	-	✓1,2	✓1,2
Equisetum fluviatile	**Water Horsetail**	-	-	-	-	✓3	✓3
Equisetum palustre,	**Marsh Horsetail**	-	-	-	-	✓3	✓3
Filipendula ulmaria	**Meadowsweet**	-	-	-	✓3	✓3	✓3
Gnaphalium uliginosum	**Marsh Cudweed**	-	-	✓2	✓2	-	-
Hypochoeris radicata	**Cat's Ear**	-	-	✓2	✓2	✓2	✓2
Juncus articulatus	**Jointed Rush**	-	-	✓2	✓2	✓2	✓2
Lythrum salicaria	**Purple-loosestrife**	-	-	-	✓3	✓3	✓3
Mentha aquatica	**Water Mint**	-	-	-	✓3	✓3	✓3
Myositis spp	**Forget-me-not**	-	-	-	✓3	✓3	✓3
Phragmites australis	**Common Reed**	-	-	-	✓3	✓3	✓3
Ranunculus flammula	**Lesser Spearwort**	-	-	✓2	✓2	✓2	✓2
Sagina procumbens	**Procumbent Pearlwort**	-	-	✓2	✓2	✓2	-
Sonchus asper	**Prickly Sow-thistle**	-	-	✓2	✓2	✓2	✓2
Stellaria uliginosa	**Bog Stitchwort**	-	-	✓2	✓2	-	-
Succisa pratensis	**Devil's bit Scabious**	-	-	✓2	✓2	✓2	✓2
Typha angustifolia	**Lesser Bulrush**				✓3	✓3	✓3
Bryophytes (Mosses and Liverworts)							
Calliergonella cuspidata	**Pointed Spear-moss**	-	-	-	-	✓3	✓3
Campylopus atrovirens	**Bristly Swan-neck Moss**	✓	-	✓1,2	✓1,2	✓1,2	✓1,2

SPECIES	COMMON NAME	2011	2012	2016	2017	2018	2019
Campylopus introflexus	**Heath Star-moss**	✓ §	✓	✓1,2	✓1,2	✓1,2	✓1,2
Hylocomium splendens	**Glittering wood-moss**	✓	✓	-	-	-	-
Hypnum jutlandicum	**Heath Plait-moss**	✓	✓	✓1,2	✓1,2	✓1,2	✓1,2
Odontoschisma sphagni	**Bog-moss Flapwort**	✓	-	✓1,2	✓1,2	✓1,2	✓1,2
Pleurozia purpurea	**Purple Spoonwort**	✓	✓	✓1	-	-	✓1
Pleurozium schreberi	**Red-stemmed Feather-moss**	✓	-	-	-	-	✓1
Racomitrium lanuginosum	**Woolly Fringe-moss**	✓	✓	✓1	✓1	✓1	✓1
Rhytidiadelphus loreus	**Little Shaggy-moss**	✓	✓	-	-	-	-
Sphagnum capillfolium	**Acute-leaved /Red Bog-moss**	✓	✓	✓1,2	✓1,2	✓1,2	✓1,2
Sphagnum cuspidatum	**Feathery Bog-moss**	✓	✓	✓1,2,3	✓1,2,3	✓1,2,3	✓1,2,3
Sphagnum denticulatum	**Cow-horn Bog-moss**	✓	✓	✓1	✓1	✓1	✓1
Sphagnum magellanicum	**Magellanic Bog-moss**	✓	-	-	-	-	-
Sphagnum papillosum	**Papillose Bog-moss**	✓	✓	✓1	✓1	✓1	✓1
Sphagnum subnitens	**Lustrous Bog-moss**	✓	-	✓1	✓1	✓1	✓1
Sphagnum tenellum	**Soft Bog-moss**	✓	✓	-	✓1	-	✓1
Rhytidiadelphus squarrosus	**Spring Turf-moss**	-	-	-	-	-	✓2
Polytrichum commune		-	-	✓2	✓2	✓2	✓2
Dicranum scoparium		-	-	✓1	✓1	-	-
Sphagnum palustre		-	-	✓1	✓1	-	-
Lichens							
Cladonia portentosa		✓	✓	✓1,2	✓1,2	✓1,2	✓1,2
Cladonia uncialis		✓	✓	✓1	✓1	-	-

8.4.7: Plant species recorded at the Leenamore Inlet (salt marsh, margins, western track and intertidal)

Notes: *2008 and 2012 = pre-construction baseline surveys; 2016 & 2019 = post reinstatement (1 = salt marsh; 2 = margins; 3 = western track; 4 = intertidal).*

SPECIES	COMMON NAME	2008	2012	2016	2019
Higher plants					
Agrostis stolonifera	**Creeping Bent**	✓	✓	✓1,2,3	✓1,2,3
Anagallis tenella	**Bog Pimpernel**	✓	✓	-	-
Anthoxanthum odoratum	**Sweet Vernal-grass**	✓	✓	✓ 2	✓ 2
Armeria maritima	**Thrift**	✓	✓	✓1,2,3	✓1,2,3
Aster tripolium	**Sea Aster**	-	✓	✓1,2,3	✓1,2,3
Carex extensa	**Long-bracted Sedge**	✓	✓	✓1,2,3	✓1,2,3
Carex panicea	**Carnation Sedge**	✓	✓	-	-
Cochlearia officinalis	**Common Scurvy-grass**	✓	✓	✓1,2,3	✓1,2,3
Eleocharis uniglumus	**Slender Spike-rush**	-	✓	✓ 3	✓ 3
Festuca rubra	**Red Fescue**	✓	✓	✓1,2,3	✓1,2,3
Hydrocotyle vulgaris	**Marsh Pennywort**	✓	✓	-	-
Isolepis setacea	**Bristle Club-rush**	-	✓	✓ 3	✓ 3
Juncus gerardii	**Salt-marsh Rush**	✓	✓	✓1,2,3	✓1,2,3
Juncus maritimus	**Sea Rush**	✓	✓	✓1,2,3	✓1,2,3
Leontodon autumnalis	**Autumn Hawkbit**	✓	✓	✓1,2	✓1,2
Lysimachia maritima	**Sea Milkwort**	✓	✓	✓1,2,3	✓1,2,3
Plantago coronopus	**Buck's-horn Plantain**	✓	✓	✓1,2,3	✓1,2,3
Plantago maritima	**Sea Plantain**	-	✓	✓1,2,3	✓1,2,3
Puccinellia maritima	**Common Salt-marsh grass**	✓	✓	✓1,2,3	✓1,2,3
Spergularia sp.	**Sea-spurrey species**	✓	✓	✓ 3	✓ 3
Trifolium repens	**White Clover**	✓	✓	✓ 1,2	✓ 1,2
Triglochin maritima	**Sea Arrow-grass**	-	✓	✓ 1,3	✓ 1,3
Angelica sylestris	**Wild Angelica**	-	-	-	✓ 1,2
Carex distans	**Distant Sedge**	-	✓	✓ 3	✓ 3
Juncus articulatus	**Articulated rush**	-	-	✓ 2, 3	✓ 2, 3
Holcus lanatus	**Yorkshire Fog**	-	-	✓1,2	✓1,2
Iris pseudacorus	**Yellow Flag**	-	-	-	✓1,2
Samolus valerandii	**Brookweed**	-	-	✓1	✓1
Juncus bufonius	**Toad Rush**	-	-	✓ 1,3	✓ 1,3
Trifolium pratense	**Red Clover**	-	-	✓1	-

SPECIES	COMMON NAME	2008	2012	2016	2019
Bryophytes (Mosses and Liverworts)					
Calliergonella cuspidata	**Pointed Spear-Moss**	✓	✓	-	-
Kindbergia praelonga (formerly Eurhynchium praelongum)	**Common Feather-moss**	✓	✓	✓1,2	-
Rhytidiadelphus squarrosus	**Spring Turf-moss**	✓	✓	✓1,2	✓1,2
Algae - seaweeds					
Ascophyllum nodosum	**Knotted wrack**	✓	✓	✓4	✓4
Fucus ceranoides	**Horned wrack**	✓	✓	✓4	✓4
Fucus serratus	**Toothed wrack**	-	✓	_	✓4
Fucus vesiculosus	**Bladder wrack**	✓	✓	✓4	✓4

8.4.8: Plant species recorded in the fields of wet grassland on either side of the Leenamore Inlet, (west and east)

Notes: *2008 and 2012 = pre-construction baseline surveys; 2016 & 2019 = post reinstatement (1 = field to the west of the inlet; 2 = field to the east)*

SPECIES	COMMON NAME	2008	2012	2016	2019
Higher plants					
Agrostis capillaris	**Common Bent grass**	-	✓	✓1,2	✓1, 2
Agrostis stolonifera	**Creeping Bent grass**	-	✓	✓1,2	✓1, 2
Anagallis tenella	**Bog Pimpernel**	✓	✓	✓1,2	✓1, 2
Anthoxanthum odoratum	**Sweet Vernal grass**	-	✓	✓1,2	✓1, 2
Bellis perennis	**Daisy**	-	✓	✓1,2	✓1, 2
Cardamine pratensis	**Cuckoo Flower**	✓	✓	✓1,2	✓1, 2
Carex binervis	**Green-ribbed Sedge**	✓	✓	✓1,2	✓1, 2
Carex echinata	**Star Sedge**	✓	✓	✓1,2	✓1, 2
Carex flacca	**Glaucous Sedge**	-	✓	✓1,2	✓1,2
Carex nigra	**Common sedge**	-	-	✓1,2	✓1, 2
Carex panicea	**Carnation Sedge**	-	✓	✓1,2	✓1, 2
Carex pulicaris	**Flea Sedge**	-	✓	✓2	✓1, 2
Carex viridula subsp. oedocarpa	**Short-stalked Yellow Sedge**	-	✓	✓1,2	✓1, 2
Cerastium fontanum	**Common Mouse ear**	✓	✓	✓1,2	✓1
Cirsium palustre	**Marsh Thistle**	✓	✓	✓1,2	✓1, 2
Cirsium vulgare	**Spear Thistle**	✓	-	-	-
Cynosurus cristatus	**Crested Dog's tail**	✓	✓	✓1,2	✓1, 2

SPECIES	COMMON NAME	2008	2012	2016	2019
Dactylorhiza purpurella	Northern Marsh-orchid	-	✓	✓ 2	-
Danthonia decumbens	Heath Grass	-	✓	✓ 1	✓ 1, 2
Epilobium palustre	Marsh Willowherb	-	✓	✓ 1,2	✓ 1, 2
Eriophorum angustifolium	Common Bog-cotton	✓	✓	✓ 1,2	✓ 1, 2
Festuca rubra	Red Fescue	-	✓	✓ 2	✓ 1, 2
Filipendula ulmaria	Meadowsweet	-	✓	-	✓ 1, 2
Galium palustre	Marsh Bedstraw	✓	-	✓ 1	✓ 1, 2
Galium saxatile	Heath Bedstraw	-	✓	✓ 1,2	✓ 1, 2
Holcus lanatus	Yorkshire Fog	✓	✓	✓ 1,2	✓ 1, 2
Hydrocotyle vulgaris	Marsh Pennywort	✓	✓	✓ 1,2	✓ 1, 2
Iris pseudacorus	Yellow Flag	-	✓	✓ 1,2	✓ 1, 2
Juncus acutiflorus	Sharp-flowered Rush	-	✓	-	-
Juncus articulatus	Jointed Rush	✓	✓	✓ 1,2	✓ 1, 2
Juncus bulbosus	Bulbous Rush	-	✓	✓ 1,2	✓ 1, 2
Juncus effusus	Soft rush	✓	✓	✓ 1,2	✓ 1, 2
Lolium perenne	Perennial Rye-grass	✓	✓	-	-
Luzula multiflora	Heath Wood-rush	-	✓	✓ 1,2	✓ 1, 2
Molinia caerulea	Purple Moor-grass	-	✓	✓ 1,2	✓ 1, 2
Montia fontana	Blinks	✓	-	-	-
Nardus stricta	Mat Grass	✓	✓	✓ 1,2	✓ 1, 2
Ophioglossum vulgatum	Adder's-tongue	-	✓	✓ 2	
Poa pratensis	Common Meadow-grass	-	✓	✓ 1,2	✓ 1, 2
Potentilla erecta	Tormentil	-	✓	✓ 1,2	✓ 1, 2
Prunella vulgaris	Selfheal	-	✓	✓ 1,2	✓ 1, 2
Ranunculus acris	Meadow Buttercup	-	✓	✓ 1,2	✓ 1, 2
Ranunculus flammula	Lesser Spearwort	✓	✓	✓ 1,2	✓ 1, 2
Ranunculus repens	Creeping Buttercup	✓	✓	✓ 1,2	✓ 1, 2
Rubus fruticosus	Bramble	-	✓	✓ 2	✓ 1, 2
Succisa pratensis	Devil's-bit Scabious	-	✓	✓ 2	✓ 1, 2
Taraxacum officinale agg.	Dandelion	-	✓	✓ 1,2	✓ 1, 2
Trifolium pratense	Red Clover	-	✓	✓ 1,2	✓ 1, 2
Trifolium repens	White Clover	✓	✓	✓ 1,2	✓ 1, 2
Viola palustris	Marsh Violet	-	✓	✓ 1,2	✓ 1, 2
Wahlenbergia hederacea	Ivy-leaved Bellflower	✓	-	-	-

SPECIES	COMMON NAME	2008	2012	2016	2019
Angelica sylvestris	Wild Angelica	-	-	✓ 1	✓ 1, 2
Calluna vulgaris	Ling Heather	-	-	✓ 1,2	-
Carex ovalis	Oval Sedge	-	-	✓ 1,2	-
Cirsium vulgare	Spear Thistle	-	-	✓ 2	✓ 1
Dacyllorhiza purpurella	Northern Marsh Orchid	-	-	✓ 2	✓ 2
Digitalis purpurea	Foxglove	-	-	✓ 2	-
Eleocharis multicaulis	Many-stalked Spike-rush	-	-	✓ 1	✓ 1,2
Eleocharis palustris	Common Spike-rush	-	-	✓ 2	✓ 2
Epilobium parviflorum	Hoary Willowherb	-	-	✓ 1	-
Equisetum fluviatile	Water Horsetail	-	-	✓ 1	✓ 1, 2
Epilobium hirsutum	Great Willowherb	-	-	-	✓ 1
Equisetum palustre	Marsh horsetail	-	-	✓ 2	✓ 1
Erica tetralix	Cross-leaved Heath	-	-	✓ 2	-
Hypericum humifusum	Trailing St. John's Wort	-	-	✓ 1,2	-
Hypericum tetrapetrum	Square-stemmed St. John's Wort	-	-	✓ 2	✓ 1
Isolepis setacea	Bristle Club-rush	-	-	✓ 2	-
Leontodon autumnalis	Autumn Hawkbit	-	-	✓ 2	✓ 1
Lythrum salicaria	Purple Loosestrife	-	-	-	✓ 1
Phleum pratense	Timothy	-	-	✓ 1,2	✓ 1
Plantago lanceolata	Ribwort Plantain	-	-	✓ 1,2	✓ 1,2
Radiola linoides	Allseed	-	-	✓ 1	-
Rumex acetosa	Sorrel	-	-	✓ 1,2	✓ 1,2
Sagina procumbens	Procumbent Pearlwort	-	-	✓ 1,2	✓ 1
Samolus valerandii	Brookweed	-	-	✓ 1	-
Schoenus nigricans	Black Bog Rush	-	-	✓ 1	✓ 1,2
Senecio aquaticus	Marsh Ragwort	-	-	✓ 1	✓ 1
Senecio jacobea	Common Ragwort	-	-	-	✓ 1
Stachys palustris	Marsh Woundwort	-	-	-	✓ 1
Stellaria alsine	Bog Stitchwort	-	-	✓ 1	-
Ulex europaeus	Common Gorse	-	-	✓ 1,2	✓ 1,2
Bryophytes (Mosses and Liverworts)					
Aulocomium palustre	Bog Bead-moss	-	✓	✓ 1,2	-
Calliergonella cuspidata	Pointed Spear-moss	✓	✓	✓ 1,2	✓ 1,2

SPECIES	COMMON NAME	2008	2012	2016	2019
Fissidens adianthoides	Maidenhair Pocket-moss	-	✓	✓ 1	-
Hylocomium splendens	Glittering Wood-moss	✓	✓	✓ 1,2	✓ 1,2
Lophocolea bidentata	Bifid Crestwort	-	✓	✓ 1	-
Philonotis fontana	Fountain Apple-moss	✓	✓	-	✓ 1,2
Plagiomnium undulatum	Hart's-tongue Thyme-moss	-	✓	✓ 2	-
Rhytidiadelphus squarrosus	Spring Turf-moss	✓	✓	✓ 1,2	✓ 1,2
Pseudoscleropodium purum	Neat Feather-moss	-	✓	✓ 2	✓ 1
Thuidium tamariscinum	Common Tamarisk-moss	✓	✓	✓ 1,2	✓ 1,2

8.4.9: Plant species recorded in the "190m section" area of blanket bog

Notes: *2008 to 2012 = pre-construction baseline surveys; 2016 to 2019 = post reinstatement (1 = turved area; 2 = area covered by bog mats during construction; 3 = reinstated old cutover at western end of the 190m section; 4 = undisturbed blanket bog outside the wayleave).*

SPECIES	COMMON NAME	2008	2010	2012	2016	2017	2018	2019
Higher plants								
Agrostis sp.	Bent Grass species	✓	✓	✓	✓1, 2,3,4	✓1, 2,3,4	✓1, 2,3,4	✓1, 2,3,4
Calluna vulgaris	Ling, Heather	✓	✓	✓	✓1, 2,3,4	✓1, 2,3,4	✓1, 2,3,4	✓1, 2,3,4
Carex binervis	Green-ribbed Sedge	-	✓	✓	-	-	-	-
Carex panicea	Carnation Sedge	✓	✓	✓	✓1, 2,3,4	✓1, 2,3,4	✓1, 2,3,4	✓1, 2,3,4
Drosera rotundifolia	Round-leaved Sundew	✓	✓	✓	✓1, 2,3,4	✓1, 2,3,4	✓1, 2,3,4	✓1, 2,3,4
Drosera intermedia	Oblong-leaved sundew	-	-	-	✓, 2	✓, 2	✓, 2	✓, 2
Eleocharis multicaulis	Many-stalked spike rush	-	-	-	✓, 2	✓, 2	✓, 2	✓, 1,2
Erica cinerea	Bell Heather	✓	✓	✓	✓1, 2,3,4	✓1, 2,3,4	✓1, 2,3,4	✓1, 2,3,4
Erica tetralix	Cross-leaved Heath	✓	✓	✓	✓1, 2,3,4	✓1, 2,3,4	✓1, 2,3,4	✓1, 2,3,4
Eriophorum angustifolium	Common Bog-cotton	✓	✓	✓	✓1, 2,3,4	✓1, 2,3,4	✓1, 2,3,4	✓1, 2,3,4
Eriophorum vaginatum	Hare's-tail Bog Cotton	✓	✓	✓	✓1, 2,3,4	✓1, 2,3,4	✓1, 2,3,4	✓1, 2,3,4
Holcus lanatus	Yorkshire fog	-	-	-	-	✓, 1	✓, 1	✓, 1
Juncus effusus	Soft rush	-	-	-	-	✓, 1	✓, 1	✓, 1
Hypochoeris radicata	Cat's ear	-	-	-	-	✓, 2	✓, 2	✓, 2
Molinia caerulea	Purple Moor-grass	✓	✓	✓	✓1, 2,3,4	✓1, 2,3,4	✓1, 2,3,4	✓1, 2,3,4
Myrica gale	Bog Myrtle	✓	✓	✓	✓1, 2,3,4	✓1, 2,3,4	✓1, 2,3,4	✓1, 2,3,4
Narthecium ossifragum	Bog Asphodel	✓	✓	✓	✓1, 2,3,4	✓1, 2,3,4	✓1, 2,3,4	✓1, 2,3,4

SPECIES	COMMON NAME	2008	2010	2012	2016	2017	2018	2019
Pedicularis sylvatica	**Heath Lousewort**	-	✓	✓	✓,4	✓,4	✓,4	✓, 2,4
Pinguicula lusitanica	**Pale Butterwort**	✓	✓	-	✓, 2	✓, 2	-	-
Pinus contorta (seedlings)	**Lodgepole Pine**	✓	✓	✓	✓,1, 2,3,4	✓,1, 2,3,4	✓,1, 2,3,4	✓,1, 2,3,4
Polygala serpyllifolia	**Heath Milkwort**	✓	✓	✓	✓,1, 2,4	✓,1, 2,4	✓,1, 2,4	✓,1, 2,4
Potentilla erecta	**Tormentil**	✓	✓	✓	✓,1, 2,3,4	✓,1, 2,3,4	✓,1, 2,3,4	✓,1, 2,3,4
Rhododendron ponticum (seedlings)	**Rhododendron**	-	✓	✓	✓, 2,3	✓, 3	✓, 3	✓, 3
Rhynchospora alba	**White-beaked Sedge**	✓	✓	✓	✓,1, 2,3,4	✓,1, 2,3,4	✓,1, 2,3,4	✓,1, 2,3,4
Schoenus nigricans	**Black Bog-rush**	✓	✓	✓	✓,1, 2,4	✓,1, 2,4	✓,1, 2,4	✓,1, 2,4
Succisa pratensis	**Devil's-bit Scabious**	-	-	✓	✓,1,4	✓,1,4	✓,1,4	✓,1, 2,3,4
Tricophorum cespitosum	**Deer Grass**	✓	✓	✓	✓,1, 2,4	✓,1, 2,4	✓,1, 2,4	✓,1, 2,4
Bryophytes (Mosses and Liverworts)								
Campylopus introflexus		✓	✓	✓	✓, 2,3	✓, 2,3	✓, 2,3	✓, 2,3
Campylopus atrovirens	**Bristly Swan-neck Moss**	-	✓	✓	✓, 2,4	✓, 2,4	✓, 2,4	✓, 2,4
Dicranum scoparium	**Broom Fork-moss**	✓	✓	✓	✓,1,4	✓,1,4	✓,1,4	✓,1,4
Frullania tamarisci	**Tamarisk Scalewort**	✓	✓	✓	✓,4	✓,4	✓,4	✓,4
Hypnum jutlandicum	**Heath Plait-moss**	✓	✓	✓	✓,1, 2,3,4	✓,1, 2,3,4	✓,1, 2,3,4	✓,1, 2,3,4
Hylocomium splendens		-	-	-	✓,1	✓,1	✓,1	✓,1
Leucobryum glaucum	**Large White-moss**	-	✓	✓	✓,1, 2,4	✓,1, 2,4	✓,1, 2,4	✓,1, 2,4
Odontoschisma sphagni	**Bog-moss Flapwort**	✓	✓	✓	✓,4	✓,4	✓,4	✓,4
Pleurozia purpurea	**Purple Spoonwort**	✓	✓	✓	✓, 2	✓,4	✓,4	✓,4
Pleurozium schreberi	**Red-stemmed Feather-moss**	✓	✓	✓	✓,1	✓,1	✓,1	✓,1
Racomitrium lanuginosum	**Woolly Fringe-moss**	✓	✓	✓	✓,1, 2,3,4	✓,1, 2,3,4	✓,1, 2,3,4	✓,1, 2,3,4
Scapania sp.	**Earwort**	-	✓	✓	-	-	-	-
Sphagnum capillifolium	**Acute-leaved /Red Bog-moss**	✓	✓	✓	✓,1, 2,3,4	✓,1, 2,3,4	✓,1, 2,3,4	✓,1, 2,3,4
Sphagnum cuspidatum	**Feathery Bog-moss**	✓	✓	✓	✓,1, 2,3,4	✓,1, 2,3,4	✓,1, 2,3,4	✓,1, 2,3,4
Sphagnum magellanicum	**Magellanic Bog-moss**	✓	✓	✓	✓,2,3,4	✓,2,3,4	✓,2,3,4	✓,2,3,4
Sphagnum papillosum	**Papillose Bog-moss**	✓	✓	✓	✓,1, 2,3,4	✓,1, 2,3,4	✓,1, 2,3,4	✓,1, 2,3,4
Sphagnum tenellum	**Soft Bog-moss**	✓	✓	✓	✓,1, 2,3,4	✓,1, 2,3,4	✓,1, 2,3,4	✓,1, 2,3,4
Lichens								
Cladonia floerkeana	**n/a**	-	-	✓	-	-	-	-
Cladonia portentosa	**n/a**	✓	✓	✓	✓,1, 2,3,4	✓,1, 2,3,4	✓,1, 2,3,4	✓,1, 2,3,4
Cladonia uncialis	**n/a**	✓	✓	✓	✓,1, 2,3,4	✓,1, 2,3,4	✓,1, 2,3,4	✓,1, 2,3,4

8.4.10: Plant species recorded from the 'forested wayleave'

Notes:

- North of the L1202: 1 = Wetlands & margins; 2 = planted trees and shrubs - marginal and former site compound beside the L1202; 3 = General wayleave north of the L1202
- South of the L1202: 1 = Wetlands & margins; 2 = planted trees and shrubs – marginal; 3 = General wayleave south of the L1202

SPECIES	COMMON NAME	2019 /2020	
		Wayleave north of the L1202	Wayleave south of the L1202
Agrostis capillaris	**Common Bent**	✓ 2,3	✓ 2,3
Alnus glutinosa	**Common alder**	✓ 2	✓ 2
Anagallis tenella	**Bog Pimpernel**	✓ 1,3	✓ 2,3
Angelica sylvestris	**Angelica**	✓ 1,2	-
Anthoxanthum odoratum	**Sweet Vernal Grass**	✓ 2,3	✓ 2,3
Apium nodiflorum	**Fool's Water-cress**	-	✓ 1
Betula pendula	**Silver Birch**	✓ 2	✓ 2
Betula pubescens	**Downy Birch**	✓ 2	✓ 2
Calluna vulgaris	**Ling**	✓ 2.3	✓ 2,3
Carex paniculata	**Greater tussock-sedge**	-	✓ 1
Cirsium palustre	**Marsh Thistle**	✓ 3	✓ 1
Crataegus monogyna	**Hawthorn**	✓ 2	✓ 2
Cynosurus cristatus	**Crested Dog's tail**	-	✓ 3
Dactylis glomerata	**Cocks Foot**	-	✓ 3
Dactylorhiza maculata	**Heath Spotted Orchid**	-	✓ 3
Dactylorhiza fuchsii	**Common spotted Orchid**	-	✓ 3
Drosera rotundifolia	**Round-leaved Sundew**	✓ 1,3	✓ 1
Erica cinerea	**Bell Heather**	✓ 3	✓ 3
Erica tetralix	**Cross-leaved Heath**	✓ 3	✓ 3
Eriophorum angustifolium	**Common Bog-cotton**	✓ 1,2,3	✓ 1
Festuca rubra	**Red Fescue**	✓ 2.3	✓ 3
Frangula alnus	**Alder Buckthorn**	✓ 2	✓ 2
Glyceria fluitans	**Floating Sweet-grass**	✓ 1	✓ 1
Holcus lanatus	**Yorkshire Fog**	✓ 2,3	✓ 2,3
Hypercium pulchrum	**Heath St. John's-wort**	✓ 3	✓ 3
Hypochoeris radicata	**Cat's Ear**	✓ 3	✓ 3

SPECIES	COMMON NAME	2019 /2020	
		Wayleave north of the L1202	Wayleave south of the L1202
Hydrocotyle vulgaris	Marsh pennywort	-	✓ 1
Iris pseudacorus	Yellow Flag	✓ 1	✓ 1
Juncus articulatus	Jointed Rush	✓ 1,3	✓ 1
Juncus bulbosus	Bulbous Rush	✓ 1,3	✓ 1,3
Juncus effusus	Soft Rush	✓ 1,2,3	✓ 1,3
Lemna minor	Common duck-weed	✓ 1	✓ 1
Lythrum portula	Water-purslane	✓ 1	✓ 1
Lythrum salicaria	Purple Loosestrife	✓ 1	✓ 1
Mentha aquatica	Water Mint	✓ 1	✓ 1
Molinia caerulea	Purple Moor-grass	✓ 1,2,3	✓ 1,2,3
Myosotis laxa	Tufted Forget-me-not	-	✓ 1
Myrica gale	Bog myrtle	✓ 2	✓ 2
Nymphaea alba	White	✓ 1	✓ 1
Phragmites australis	Common Reed	✓ 1	✓ 1
Picea sitchensis	Sitka spruce (self-seeded seedlings)	✓ 3	✓ 3
Pinus contorta	Lodgepole Pine	✓ 2,3	✓ 2,3
Plantago lanceolata	Ribwort Plantain	✓ 3	✓ 3
Potamogeton natans	Broad-leaved Pondweed	-	✓ 1
Potamogeton polygonifolius	Bog Pondweed	✓ 1	✓ 1
Potentilla erecta	Tormentil	✓ 2,3	✓ 2,3
Prunus spinosa	Blackthorn	✓ 2	✓ 2
Rorippa spp	Yellow-cress species	-	✓ 1
Rumex acetosa	Common Sorrel	✓ 2,3	✓ 3
Ranunculus flammula	Lesser spearwort	✓ 1,3	✓ 1,3
Ranunculus repens	Creeping Buttercup	✓ 3	✓ 1,3
Rosa spp	Rose species	✓ 2	✓ 2
Rubus fruticosus.	Bramble	✓ 2	✓ 2
Salix aurita	Eared Willow	✓ 2,3	✓ 1,3
Salix caprea	Goat Willow	✓ 2	✓ 2
Salix cinerea	Grey Willow	✓ 2	✓ 2
Sparganium erectum	Branched Bur-reed	-	✓ 1
Typha anugustifolia	Lesser Bulrush	✓ 1	✓ 1

SPECIES	COMMON NAME	2019 /2020	
		Wayleave north of the L1202	Wayleave south of the L1202
Ulex europaeus	Common Gorse	✓ 2,3	✓ 2,3
Viburnum opulus	Guelder Rose	✓ 2	✓ 2
Ferns			
Blechum spicant	Hard Fern	✓ 2,3	✓ 3
Equisetum arvense	Field Horsetail	✓ 3	✓ 3
Dryopteris dilatata	Broad-Buckler fern	✓ 2,3	✓ 3
Pteridium aquilinum	Bracken	✓ 2,3	-
Bryophytes (Mosses and liverworts)			
Calliergonella cuspidata	Pointed Spear-Moss	✓ 1	✓ 1,3
Calliergon giganteum	Giant Spear-moss	-	✓ 1
Polytrichum commune	Common Haircap	✓ 2,3	✓ 3
Hypnum jutlandicum	Heath Plait-moss	✓ 3	-
Pseudoscleropodium purum	Neat Feather-moss	✓ 2,3	✓ 3
Rhytidadelphus squarrosos	Springy Turf-moss	✓ 2,3	✓ 3
Sphagnum auriculatum	Cow-horn Bog-moss	✓ 1	✓ 1
Sphagnum capillifolium	Red Bog-moss	✓ 3	✓ 1,3
Sphagnum cuspidatum	Feathery Bog-moss	-	✓ 1,3
Sphagnum fallax	Flat-topped Bog-moss	-	✓ 1

8.4.11: Plant species recorded from wet, rushy grassland at the Terminal site

SPECIES	COMMON NAME	Up to 2012	2019 / 2020
Higher plants			
Agrostis canina	Velvet Bent	✓	✓
Agrostis stolonifera	Creeping Bent	✓	✓
Angelica sylvestris	Wild Angelica	✓	✓
Anthoxanthum odoratum	Sweet Vernal Grass	✓	✓
Bellis perennis	Daisy	✓	✓
Calluna vulgaris	Ling	✓	✓
Calystegia sepium	Hedge Bindweed	✓	-
Carex echinata	Star Sedge	✓	✓
Carex nigra	Common Sedge	✓	✓

SPECIES	COMMON NAME	Up to 2012	2019 / 2020
Carex pulicaris	Flea Sedge	✓	-
Cerastium fontanum	Common Mouse-Ear	✓	✓
Cirsium palustre	Marsh Thistle	✓	✓
Dactylis glomerata	Cocks' Foot	✓	✓
Dactylorhiza incarnata	Early Marsh Orchid	✓	-
Dactylorhiza maculata	Heath Spotted Orchid	✓	✓
Epilobium palustre	Marsh Willow-herb	✓	✓
Erica tetralix	Cross-leaved Heath	✓	✓
Glyceria fluitans	Floating Sweet-Grass	✓	-
Holcus lanatus	Yorkshire Fog	✓	✓
Hydrocotyle vulgaris	Marsh Pennywort	✓	✓
Juncus articulatus	Jointed Rush	✓	✓
Juncus bulbosus	Bulbous Rush	✓	✓
Juncus effusus	Soft Rush	✓	✓
Leontodon autumnalis	Autumn Hawkbit	✓	✓
Lolium perenne	Perennial.Rye Grass	✓	✓
Myosotis laxa	Tufted Forget-me-not	✓	✓
Plantago lanceolata	Ribwort Plantain	✓	✓
Platanthera bifolia	Lesser Butterfly Orchid	✓	-
Poa trivialis	Rough Meadow-grass	✓	✓
Potentilla erecta	Tormentil	✓	✓
Prunella vulgaris	Selfheal	✓	✓
Ranunculus acris	Meadow Buttercup	✓	✓
Ranunculus flammula	Lesser Spearwort	✓	✓
Ranunculus repens	Creeping Buttercup	✓	✓
Rumex acetosa	Sorrel	✓	✓
Sagina procumbens	Procumbent Pearlwort	✓	✓
Senecio aquaticus	Marsh Ragwort	✓	✓
Stellaria uliginosa	Bog Stitchwort	✓	✓
Succisa pratensis	Devils' Bit Scabious	✓	✓
Taraxacum officinale agg.	Dandelion	✓	✓
Trifolium repens	White Clover	✓	✓
Vicia cracca	Common Vetch	✓	✓
Viola palustris	Marsh Violet	✓	✓

SPECIES	COMMON NAME	Up to 2012	2019 / 2020
Ferns			
Dryopteris aemula	Hay-Scented Buckler	✓	-
Dryopteris dilatata	Broad Buckler Fern	✓	✓
Osmunda regalis	Royal Fern	✓	✓
Bryophytes (Mosses and Liverworts)			
Aulacomium palustre	Bog Bead-moss	✓	✓
Bryum pseudotriquetrum	Marsh Bryum	✓	-
Calliergonella cuspidata	Pointed Spear-Moss	✓	✓
Kindbergia praelonga (formerly Eurhynchium praelongum)	Common Feather-moss	✓	✓
Lophocolea bidentata	Bifid Crestwort	✓	✓
Marchantia polymorpha	Star-headed Liverwort	✓	-
Philonotis fontana	Fountain Apple-moss	✓	-
Plagiomnium affine	Many-fruited Thyme-moss	✓	-
Plagiomnium undulatum	Waved silk-moss	✓	✓
Polytrichum commune	Common Haircap	✓	✓
Pseudoscleropodium purum	Neat Feather-moss	✓	✓
Rhytidiadelphus squarrosus	Springy Turf-moss	✓	✓
Thuidium tamariscinum	Common Tamarisk-moss	✓	✓
Lichens			
Peltigera spp.	n/a	✓	✓

8.4.12: Plant species recorded from tracks and margins at the Terminal site

SPECIES	COMMON NAME	Up to 2012	2019 / 2020
Higher plants			
Achillea ptarmica	Sneezewort	✓	-
Agrostis stolonifera	Creeping Bent	✓	✓
Alnus incana	Grey Alder	✓	✓
Alopecurus geniculatus	Marsh Foxtail	✓	-
Anthoxanthum odoratum	Sweet Vernal Grass	✓	✓
Arrhenatherum elatius	False Oat-Grass	✓	✓
Bellis perennis	Daisy	✓	✓
Betula spp.	Birch	✓	✓

SPECIES	COMMON NAME	Up to 2012	2019 / 2020
Bromus hordeaceus	Soft Brome	✓	✓
Carex disticha	Brown Sedge	✓	-
Carex flacca	Glaucous Sedge	✓	✓
Carex leporina	Oval Sedge	✓	✓
Carex pilulifera	Pill Sedge	✓	✓
Carex pulicaris	Flea Sedge	✓	-
Carex viridula subsp. *oedocarpa*	Short-stalked Yellow.sedge	✓	✓
Centaurea nigra	Knapweed	✓	✓
Cerastium fontanum	Common Mouse-Ear	✓	✓
Cirsium palustre	Marsh Thistle	✓	✓
Cirsium vulgare	Spear Thistle	✓	✓
Crocosmia x crococsmiiflora	Montbretia	✓	✓
Cynosurus cristatus	Crested Dogs' Tail	✓	✓
Dactylis glomerata	Cocks' Foot	✓	✓
Dactylorhiza fuchsii	Common spotted-orchid		✓
Digitalis purpurea	Foxglove	✓	✓
Euphrasia officinalis agg.	Eyebright	✓	✓
Festuca rubra	Red Fescue	✓	✓
Geranium dissectum	Cut-leaved Cranesbill	✓	✓
Glyceria fluitans	Floating Sweet-Grass	✓	✓
Gnaphalium uliginsum	Marsh Cudweed	✓	✓
Holcus lanatus	Yorkshire Fog	✓	✓
Hypericum pulchrum	Heath St. John's-wort	✓	✓
Hypericum tetrapterum	Square Stalked St. John's-wort	✓	✓
Hypochoeris radicata	Cats' Ear	✓	✓
Isolepis setacea	Bristle Club-Rush	✓	-
Juncus articulatus	Jointed Rush	✓	✓
Juncus bufonius	Toad Rush	✓	✓
Juncus bulbosus	Bulbous Rush	✓	✓
Juncus effusus	Soft Rush	✓	✓
Lathyrus pratensis	Meadow Vetchling	✓	✓
Lolium perenne	Perennial.Rye Grass	✓	✓
Lotus uliginosus	Marsh Bird's Foot Trefoil	✓	✓
Luzula multiflora	Heath Woodrush	✓	✓

SPECIES	COMMON NAME	Up to 2012	2019 / 2020
Lysmachia nemorum	Yellow Pimpernel	✓	✓
Lythrum portula	Water Purslane	✓	-
Lythrum salicaria	Purple Loosestrife	✓	✓
Matricaria discoidea	Pineapple Weed	✓	✓
Molinia caerulea	Purple Moor-Grass	✓	✓
Nardus stricta	Mat Grass	✓	✓
Odontites verna	Red Bartsia	✓	✓
Olearia macrodonta	Daisy Bush	✓	✓
Persicaria maculosa	Redshank	✓	✓
Phragmites australis	Common Reed	✓	✓
Plantago lanceolata	Ribwort Plantain	✓	✓
Plantago major	Greater Plantain	✓	✓
Poa annua	Annual Meadow-Grass	✓	✓
Poa trivialis	Rough Meadow-grass	✓	✓
Potentilla anserina	Silverweed	✓	✓
Potentilla erecta	Tormentil	✓	✓
Primula vulgaris	Primrose	✓	✓
Prunella vulgaris	Selfheal	✓	✓
Pteridium aquilinum	Bracken	✓	✓
Ranunculus acris	Meadow Buttercup	✓	✓
Ranunculus flammula	Lesser Spearwort	✓	✓
Ranunculus repens	Creeping Buttercup	✓	✓
Rhododendron ponticum	Rhododendron	✓	✓
Rubus fruticosus agg.	Bramble	✓	✓
Rumex acetosa	Sorrel	✓	✓
Rumex crispus	Curled Dock	✓	✓
Rumex obtusiflous	Broad-Leaved Dock	✓	✓
Sagina procumbens	Procumbent Pearlwort	✓	✓
Salix aurita	Eared Willow	✓	✓
Salix caprea	Goat Willow	✓	✓
Salix cinerea subsp. *oleifolia*	Grey Willow	✓	✓
Scrophularia auriculata	Water Figwort	✓	-
Senecio aquaticus	Marsh Ragwort	✓	✓
Senecio jacobea	Ragwort	✓	✓

SPECIES	COMMON NAME	Up to 2012	2019 / 2020
Sonchus asper	Prickly Sow-thistle	✓	✓
Sorbus aucuparia	Rowan	✓	✓
Succisa pratensis	Devil's bit scabious	-	✓
Taraxacum officinale agg.	Dandelion	✓	✓
Trifolium dubium	Lesser Trefoil	✓	✓
Trifolium repens	White Clover	✓	✓
Ulex europaeus	Gorse	✓	✓
Urtica dioica	Common Nettle	✓	✓
Veronica beccabunga	Brooklime	✓	✓
Veronica chamaedrys	Germander Speedwell	✓	✓
Veronica officinalis	Heath Speedwell	✓	✓
Veronica serpyllifolia	Thyme-Leaved Speedwell	✓	✓
Vicia cracca	Common Vetch	✓	✓
Vulpia bromoides	Squirrel-tail Fescue	✓	✓
Ferns			
Athyrium filix-femina	Lady Fern	✓	✓
Blechnum spicant	Hard Fern	✓	✓
Dryopteris affinis	Scaly Male Fern	✓	✓
Dryopteris dilatata	Broad Buckler Fern	✓	✓
Dryopteris filix-mas	Male Fern	✓	✓
Equisetum palustre	Marsh Horsetail	✓	✓
Equisetum arvense	Field Horsetail	-	✓
Bryophytes (Mosses and Liverworts)			
Calliergonella cuspidata	Pointed Spear-Moss	✓	✓

8.4.13: Plant species recorded from created wetland ponds, drains and watercourses at the Terminal site

SPECIES	COMMON NAME	Up to 2012	2019 / 2020
Higher plants			
Agrostis stolonifera	Creeping Bent	-	✓
Callitriche stagnalis agg.	Common Water-starwort	✓	✓
Cardamine pratensis	Cuckoo Flower	✓	✓
Carex disticha	Brown Sedge	✓	-

SPECIES	COMMON NAME	Up to 2012	2019 / 2020
Carex echinata	Star Sedge	✓	✓
Carex nigra	Common Sedge	✓	✓
Eleocharis palustris	Common Spike-rush	-	✓
Epilobium palustre	Marsh Willowherb	✓	✓
Epilobium parviflorum	Hoary Willowherb	✓	✓
Eriophorum angustifolium	Common Bog-cotton	✓	✓
Festuca arundinacea	Tall Fescue	✓	✓
Filipendula ulmaria	Meadowsweet	✓	✓
Galium palustre	Marsh Bedstraw	✓	✓
Glyceria fluitans	Floating Sweet-grass	-	✓
Holcus lanatus.	Yorkshire Fog	-	✓
Hydrocotyle vulgaris	Marsh Pennywort	✓	✓
Hypericum tetrapterum	Square Stalked St. John's-wort	✓	✓
Iris pseudacorus	Yellow Flag	✓	✓
Juncus articulatus	Jointed Rush	✓	✓
Juncus bulbosus	Bulbous Rush	✓	✓
Juncus effusus	Soft Rush	✓	✓
Lemna minor	Common Duckweed	✓	✓
Lythrum portula	Water purslane	-	✓
Lythrum salicaria	Purple Loosestrife	✓	✓
Myosotis laxa	Tufted Forget-me-not	✓	✓
Phalaris arundinacea	Canary Reed-Grass	✓	✓
Phragmites australis	Common Reed	✓	✓
Potamogeton polygonifius	Bog Pond-weed	-	✓
Ranunculus flammula	Lesser Spearwort	✓	✓
Rorippa nasturtium-aquaticum	Water Cress	✓	✓
Rumex crispus	Curled Dock	✓	✓
Scrophularia auriculata	Water Figwort	✓	✓
Stellaria uliginosa	Bog Stitchwort	✓	✓
Sparganium erectum	Branched Bur-reed	-	✓
Typha anugustifolia	Lesser Bulrush	-	✓
Typha latifolia	Bulrush	✓	✓
Veronica beccabunga	Brooklime	✓	✓
Viola palustris	Marsh Violet	✓	-

SPECIES	COMMON NAME	Up to 2012	2019 / 2020
Ferns			
Blechnum spicant	Hard Fern	✓	✓
Dryopteris dilatata	Broad Buckler Fern	✓	✓
Equisetum palustre	Marsh Horsetail	✓	✓
Bryophytes (Mosses and Liverworts)			
Aulacomium palustre	Bog Bead-moss	✓	✓
Bryum pseudotriquetrum	Marsh Bryum	✓	-
Calliergonella cuspidatum	Pointed Spear-Moss	✓	✓
Philonotis fontana	Fountain Apple-moss	✓	-
Sphagnum cuspidatum	Feathery Bog-moss	-	✓

8.4.14: Plant species recorded from remnant blanket bog at the Terminal site

SPECIES	COMMON NAME	All years
Higher plants		
Anagallis tenella	Bog Pimpernel	✓
Calluna vulgaris	Ling	✓
Carex binervis	Green-Ribbed Sedge	✓
Carex panicea	Carnation Sedge	✓
Carex viridula subsp. *oedocarpa*	Short-stalked Yellow.sedge	✓
Cirsium dissectum	Meadow Thistle	✓
Dactylorhiza maculata	Heath Spotted Orchis	✓
Drosera rotundifolia	Round-Leaved Sundew	✓
Erica tetralix	Cross-leaved Heath	✓
Eriophorum angustifolium	Common Bog-cotton	✓
Galium saxatile	Heath Bedstraw	✓
Luzula multiflora	Heath Woodrush	✓
Molinia caerulea	Purple Moor-Grass	✓
Nardus stricta	Mat Grass	✓
Narthecium ossifragum	Bog Asphodel	✓
Pedicularis sylvatica	Heath Lousewort	✓
Pinguicula lusitanica	Pale Butterwort	✓
Polygala serpyllifolia	Heath Milkwort	✓

SPECIES	COMMON NAME	All years
Potentilla erecta	Tormentil	✓
Rhynchospora alba	White-beaked Sedge	✓
Schoenus nigricans	Black Bog Rush	✓
Succisa pratensis	Devils' Bit Scabious	✓
Taraxacum officinale agg.	Dandelion	✓
Trichophorum caespitosum	Deer Grass	✓
Veronica officinalis	Heath Speedwell	✓
Bryophytes (Mosses and Liverworts)		
Hypnum cupressiforme	Cypress-leaved Plait-moss	✓
Pleurozium schreberi	Red-stemmed Feather-moss	✓
Polytrichum commune	Common Haircap	✓
Rhytidiadelphus loreus	Little Shaggy-moss	✓
Rhytidiadelphus squarrosus	Spring Turf-moss	✓
Sphagnum denticulatum (formerly auriculatum)	Cow-horn Bog-moss	✓
Sphagnum capillifolium	Acute-leaved / Red Bog-moss	✓
Sphagnum palustre	Blunt-leaved Bog-moss	✓
Sphagnum papillosum	Papillose Bog-moss	✓
Thuidium tamariscinum	Common Tamarisk-moss	✓
Cladonia portentosa	n/a	✓

8.4.15: Plant species recorded from plantations and Rhododendron thickets at the Terminal site

SPECIES	COMMON NAME	SPECIES	COMMON NAME
Higher plants			
Betula spp.	**Birch**	*Calluna vulgaris*	**Ling, Heather**
Epilobium angustifolium	**Rosebay**	*Molinia caerulea*	**Purple Moor-grass**
Olearia macrodonta	**Daisy Bush**	*Phormium tenax*	**New Zealand Flax**
Picea sitchensis	**Sitka Spruce**	*Pinus contorta*	**Lodgepole Pine**
Rhododendron ponticum	**Rhododendron**	*Rubus fruticosus* agg.	**Bramble**
Salix aurita	**Eared Willow**	*Salix cinerea* subsp. *oleifolia*	**Grey Willow**
Solidago virgaurea	**Golden Rod**	*Ulex europaeus*	**Gorse**
Bryophytes (Mosses and Liverworts)			
Hypnum cupressiforme	**Cypress-leaved Plait-moss**	*Leucobryum glaucum*	**Large White-moss**
Plagiothecium undulatum	**Waved Silk-moss**	*Pleurozium schreberi*	**Red-stemmed Feather-moss**
Polytrichum commune	**Common Haircap**	*Rhytidiadelphus loreus*	**Little Shaggy-moss**
Sphagnum palustre	**Blunt-leaved Bog-moss**	*Thuidium tamariscinum*	**Common Tamarisk-moss**
Ferns			
Blechnum spicant	**Hard Fern**	*Dryopteris dilatata*	**Broad Buckler Fern**

Willow and Gorse on the wayleave margins north of the Terminal

Appendix 8.5

Native deciduous tree and shrub species planted for biodiversity enhancement

Location	Species planted	
PIPELINE		
Wayleave margins	**Alder**	*Alnus glutinosa*
	Silver Birch	*Betula pendula*
	Downy Birch	*Betula pubescens*
	Hazel	*Corylus avellana*
	Alder Buckthorn	*Frangula alnus*
	Bog Myrtle	*Myrica gale*
	Blackthorn	*Prunus spinosa*
	Rose species	*Rosa spp.*
	Goat Willow	*Salix caprea*
	Grey Willow	*Salix cinerea*
	Bramble	*Rubus fruiticosus*
	Guelder Rose	*Viburnum opulus*
Former site compound beside the L1202	**Alder**	*Alnus glutinosa*
	Silver Birch	*Betula pendula*
	Downy Birch	*Betula pubescens*
TERMINAL SITE		
Area north of TCF, beside Gate 1 road	**Alder**	*Alnus glutinosa*
	Silver Birch	*Betula pendula*
	Downy Birch	*Betula pubescens*
	Hazel	*Corylus avellana*
	Alder Buckthorn	*Frangula alnus*
	Bog Myrtle	*Myrica gale*
	Blackthorn	*Prunus spinosa*
	Rose species	*Rosa spp.*
	Bramble	*Rubus fruiticosus*
	Rowan	*Sorbus aucuparia*
	Guelder Rose	*Viburnum opulus*

Location	Species planted	
Area north of the Terminal footprint (used as car park during construction)	**Alder**	*Alnus glutinosa*
	Silver Birch	*Betula pendula*
	Downy Birch	*Betula pubescens*
	Hazel	*Corylus avellana*
	Alder Buckthorn	*Frangula alnus*
	Bog Myrtle	*Myrica gale*
	Blackthorn	*Prunus spinosa*
	Rose species	*Rosa spp.*
	Bramble	*Rubus fruiticosus*
	Rowan	*Sorbus aucuparia*
	Guelder Rose	*Viburnum opulus*
Western fields	**Downy Birch**	*Betula pubescens*
	Hazel	*Corylus avellana*
	Alder Buckthorn	*Frangula alnus*
	Rosa canina	*Rosa canina*
	Eared Willow	*Salix aurita*
	Goat Willow	*Salix caprea*
	Grey Willow	*Salix cinerea*
	Guelder Rose	*Viburnum opulus*

Trail camera in situ at Terminal western fields

Appendix 8.6

Non-avian terrestrial vertebrates known to occur in the locality

ORDER Common name	SPECIES	Level of protection / Legislation EU Habitats Directive Annex II, IV, V Irish Wildlife Acts (Irish) Other protection	Current conservation status - Irish Red Lists[21] [22]	Occurrence in the area
CARNIVORA				
Otter	*Lutra lutra*	II, IV Irish CITES Appendix 1	Near threatened	Common, frequent, mainly near aquatic habitats. Present throughout the Sruwaddacon Bay area, and utilises streams and rivers. Will forage and commute across terrestrial habitats, occasionally occurring several hundred metres from water. Known to forage at the Terminal during the frog breeding season.
Badger	*Meles meles*	Irish	Least concern.	Widespread in the area. Locally uncommon but ranges appear to have increased over period of studies. Known to be present at Glengad and the terminal site.
Pine Marten	*Martes martes*	V Irish	Least concern	Relatively frequent in areas of coniferous plantation, scrub areas and woodland. Occurs on site in coniferous plantations including at the terminal site.
American Mink	*Mustela vison*	None Introduced species.	-	Occasional, infrequent. In association with aquatic habitats. Known to occur in the Bay area and in the general locality.
Irish Stoat	*Mustela erminea hibernica*	Irish	Least concern	Scarce. A species that is widespread but infrequent in the Irish countryside. Occasionally observed in the locality. For instance, crossing or hunting along the road margins.
Fox	*Vulpes vulpes*	None	Least concern	Widespread and common in the area. Ranges across all habitat types, and will also forage along shorelines. Signs frequently found and sightings relatively common.

21 Ireland Red List no 3 – Terrestrial mammals. National Parks & Wildlife Service (NPWS, 2009)
22 Ireland Red List no 5 – Amphibians, Reptiles and Freshwater Fish. National Parks & Wildlife Service (NPWS, 2011)

ORDER Common name	SPECIES	Level of protection / Legislation EU Habitats Directive Annex II, IV, V Irish Wildlife Acts (Irish) Other protection	Current conservation status - Irish Red Lists[21 22]	Occurrence in the area
LAGOMORPHA				
Irish Hare	*Lepus timidus hibernicus*	V Irish	Least concern	Frequent, locally common, in the Bay area. Forages on pasture grasslands, wet grasslands and also along shorelines, including at Glengad. Also frequent along the forested wayleave and at the Terminal – evidenced by droppings, damage to saplings and frequent sightings. Also captured on trail cameras in western fields and on paths at the terminal site.
Rabbit	*Oryctolagus cuniculus*	None	Least concern	Scarce in the area presently, probably due to myxomatosis and nature of the dominant habitats.
INSECTIVORA				
Hedgehog	*Erinaceus europaeus*	Irish	Least concern	Occasional, scarce.
Pygmy Shrew	*Sorex minutus*	Irish	Least concern	Present, frequent on pastures and wet grasslands; also occurs in woodlands, scrub etc.
ARTIODACTYLA				
Red Deer	*Cervus elaphus*	Irish	Least concern	Signs frequently noted at Bellanaboy and along the wayleave, north to Bellagelly. Present although not frequently observed in the immediate area. Known to be fairly common in coniferous plantations in the wider area e.g. Sheskin Forest.
RODENTIA				
Brown Rat	*Rattus norvegicus*	None	-	Known on site, widespread. Occurs in many terrestrial habitats.
Long-tailed Field Mouse or Wood Mouse	*Apodemus sylvaticus*	None	Least concern	Known on site, widespread. Occurs in all terrestrial habitats.
House mouse	*Mus musculus domesticus*	None	Least concern	May occur in the locality. Not recorded on site to date. Usually associated with agriculture or domestic dwellings.
CHIROPTERA (BATS)				
Common pipistrelle	*Pipistrellus pipistrellus*	IV Irish	Least concern	Known to occur widely in the locality. Relatively common and recorded in a wide range of habitats by passive detectors deployed in the area.

ORDER Common name	SPECIES	Level of protection / Legislation EU Habitats Directive Annex II, IV, V Irish Wildlife Acts (Irish) Other protection	Current conservation status - Irish Red Lists[21 22]	Occurrence in the area
Soprano pipistrelle	*Pipistrellus pygmaeus*	IV Irish	Least concern	Known to occur widely in the locality. Relatively abundant and recorded in a wide range of habitats by passive detectors deployed in the area. The most frequently recorded species in the area.
Brown Long-eared bat	*Plecotus auritus*	IV Irish	Least concern	Less widespread than the Pipistrelles or Leisler's Bat but evidence of increasing numbers in maturing broadleaved woodland on the import line and around several of the created wetland areas.
Leisler's bat	*Nyctalus leisleri*	IV Irish	Least concern	IUCN Near Threatened species for which Ireland is considered a stronghold. Relatively common and widespread in the area, as established by the deployment of passive bat detectors.
Daubenton's bat	*Myotis daubenntonii*	IV Irish	Least concern	Species associated with foraging over water. Had not been confirmed to occur in the area until 2016. Now regularly recorded foraging around created wetlands on the import line and also at the terminal site in recent years.
Natterer's Bat	*Myotis nattereri*	IV Irish	Least concern	Had not previously been recorded in the 10km Grid Squares in which the study area is located. Deployment of passive bat detectors in the area confirmed the presence of this bat in 2016. Regularly recorded foraging at woodland edge locations close to the terminal site.
AMPHIBIA				
Common Frog	*Rana temporaria*	V Irish	Least concern	Widespread in area, and locally common. Frequent on wet grasslands, also pasture grasslands and marginal wet heath /bog habitats. Breeding sites known on site.
Smooth Newt	*Triturus vulgaris*	Irish	Least concern	Scarce. Known to occur in the locality of the Bellanaboy Bridge Gas Terminal.
REPTILIA				
Common Lizard	*Lacerta vivipara*	Irish	Least concern	This is a widespread species occurring on bogs, heath, and a range of terrestrial habitats, but infrequently observed. Known to occur at Aughoose.

Grey Heron (*Ardea cinerea*) on the Leenamore River upstream of the inlet

Appendix 8.7

Bird species recorded between 2002 and 2019

8.7.1 Bird species recorded (x) in the vicinity of the onshore pipeline from all aquatic studies, and their conservation status

COMMON NAME	SCIENTIFIC NAME	CONSERVATION STATUS			2002-2012	2014-2019
		EU Birds Directive	Current BoCCI*[23]	Previous BoCCI[24]		
American Golden Plover	*Pluvialis dominica*		N/A	N/A	x	
Auk sp.			N/A	N/A	x	x
Bar-tailed Godwit	*Limosa lapponica*	Annex I	Amber[8]	Amber	x	x
Barnacle Goose	*Branta leucopsis*	Annex I	Amber[8,9]			x
Black Guillemot	*Cepphus grylle*		Amber[1]	Amber	x	x
Black-headed Gull	*Chroicocephalus ridibundus*		Red[2,3]	Red	x	x
Black-legged Kittiwake	*Rissa tridactyla*		Amber[2]	Amber	x	x
Black-tailed Godwit	*Limosa limosa*		Amber[1,5,8,9]	Amber	x	x
Chough	*Pyrrhocorax pyrrhocorax*	Annex I	Amber[1]	Amber	x	x
Commic Tern	*Sterna hirundo/ paradisaea*	Annex I	Amber[3,5,6]	Amber	x	x
Common Tern	*Sterna hirundo*	Annex I	Amber[3,5,6]	Amber	x	
Common Gull	*Larus canus*		Amber[1,3]	Amber	x	x
Common Sandpiper	*Actitis hypoleucos*		Amber[1]	Amber	x	x
Cormorant	*Phalacrocorax carbo*		Amber[3,6]	Amber	x	x
Curlew	*Numenius arquata*		Red[1,2,3,7,8]	Red	x	x
Dunlin	*Calidris alpina*	Annex I	Red[1,2,3,7,8]	Amber	x	x
Eider	*Somateria mollissima*		Amber[8]	Amber	x	
Fulmar	*Fulmaris glacialis*		Green	Green	x	x
Gannet	*Morus bassanus*		Amber[6]	Amber	x	x

23 Colhoun & Cummins 2013
24 Lynas et al. 2007

COMMON NAME	SCIENTIFIC NAME	CONSERVATION STATUS			2002-2012	2014-2019
		EU Birds Directive	Current BoCCI*[23]	Previous BoCCI[24]		
Golden Plover	*Pluvialis apricaria*	Annex I	Red[2,3,7]	Red	x	x
Great Black-backed Gull	*Larus marinus*		Amber[2,3]	Amber	x	x
Great-northern Diver	*Gavia immer*	Annex I	Amber[9]	Green	x	x
Greenshank	*Tringa nebularia*		Green	Amber	x	x
Great White Egret	*Ardea alba*	Annex I	N/A	N/A		x
Grey Heron	*Ardea cinerea*		Green	Green	x	x
Hen Harrier	*Circus cyaneus*	Annex I	Amber[1]	Amber	x	x
Herring Gull	*Larus argentatus*		Red[2,3]	Red	x	x
Hooded Crow	*Corvus cornix*		Green	Green	x	x
Iceland Gull	*Larus glaucoides*		Green	Green	x	
Kestrel	*Falco tinnunculus*		Amber[1]	Amber	x	x
Knot	*Calidris canutus*		Amber[1,7]	Amber		x
Lapwing	*Vanellus vanellus*		Red[1,2,3,7,8]	Red	x	x
Lesser Black-backed Gull	*Larus fuscus*		Amber[3,6]	Amber	x	x
Light-bellied Brent Goose	*Branta bernicla hrota*		Amber[1,8,9]	Amber	x	x
Little Egret	*Egretta garzetta*	Annex I	Green	Green	x	x
Little Grebe	*Tachybaptus ruficollis*		Amber[7]	Amber	x	x
Little Tern	*Sterna albifrons*	Annex I	Amber[1,3,6]	Amber	x	
Mallard	*Anas platyrhynchos*		Green	Green	x	x
Merlin	*Falco columbarius*	Annex I	Amber[3]	Amber	x	
Mute Swan	*Cygnus olor*		Amber[4,9]	Amber	x	x
Oystercatcher	*Haematopus ostralegus*		Amber[8]	Amber	x	x
Peregrine Falcon	*Falco peregrinus*	Annex I	Green	Green	x	x
Raven	*Corvus corax*		Green	Green	x	x
Razorbill	*Alca torda*		Amber[6]	Amber	x	x
Red-breasted Merganser	*Mergus serrator*		Green	Green	x	x
Redshank	*Tringa totanus*		Red[2,3,8]	Red	x	x
Red-throated Diver	*Gavia stellata*	Annex I	Amber[1,5]	Amber	x	x
Ringed Plover	*Charadrius hiaticula*		Green	Amber	x	x
Rock Pipit	*Anthus petrosus*		Green	Green	x	x

COMMON NAME	SCIENTIFIC NAME	CONSERVATION STATUS			2002-2012	2014-2019
		EU Birds Directive	Current BoCCI*[23]	Previous BoCCI[24]		
Sand Martin	*Riparia riparia*		Amber[1]	Amber	x	x
Sanderling	*Calidris alba*		Green	Green	x	x
Sandwich Tern	*Sterna sandvicensis*	Annex I	Amber[1,3,6]	Amber	x	x
Shag	*Phalocrocorax aristotelis*		Amber[6]	Amber	x	x
Shelduck	*Tadorna tadorna*		Amber[8]	Amber	x	x
Shoveler	*Anas clypeata*		Red[5,7,8]	Red	x	
Snipe	*Gallinago gallinago*		Amber[1]	Amber	x	x
Sparrowhawk	*Accipiter nisus*		Amber[2]	Green	x	x
Spotted Redshank	*Tringa erythropus*		Amber[1]	Green	x	?
Teal	*Anas crecca*		Amber[3]	Amber	x	x
Tufted Duck	*Aythya fuligula*		Red[7,8]	Amber	x	x
Turnstone	*Arenaria interpres*		Green	Green	x	x
Whimbrel	*Numenius phaeopus*		Green	Green	x	x
Whooper Swan	*Cygnus cygnus*	Annex I	Amber[5,8,9]	Amber	x	x
Wigeon	*Anas penelope*		Red[7]	Amber	x	x

*Reasons for BoCCI Conservation Status (as listed by Colhoun & Cummins 2013)	
1 (Number) = SPEC 1, 2 or 3	6 = BL
2 = BDp (for *Red listed*) or BDMp (for *Amber listed*)	7 = WDp (for Red-listed) or WDMp (for Amber-listed)
3 = BDr (for *Red listed*) or BDMr (for *Amber listed*)	8 = WL
4 = BI	9 = WI
5 = BR	

8.7.2: Bird species recorded (x) in the vicinity of the onshore pipeline from all terrestrial bird studies, and their conservation status

COMMON NAME	SCIENTIFIC NAME	CONSERVATION STATUS			2002-2012	2014-2019
		EU Birds Directive	Current BoCCI*[25]	Previous BoCCI[26]		
Blackbird	*Turdus merula*		Green	Green	x	x
Blackcap	*Sylvia atricapilla*		Green	Green	x	x
Blue Tit	*Cyanistes caeruleus*		Green	Green	x	x
Bullfinch	*Pyrrhula pyrrhula*		Green	Green	x	x
Buzzard	*Buteo buteo*		Green	Green		x
Chaffinch	*Fringilla coelebs*		Green	Green	x	x
Chough	*Pyrrhocorax pyrrhocorax*	Annex I	Amber	Amber	x	x
Coal Tit	*Periparus ater*		Green	Green	x	x
Collared Dove	*Streptopelia decaocto*		Green	Green	x	x
Crossbill	*Loxia curvirostra*		Green	Green	x	x
Cuckoo	*Cuculus canorus*		Green	Green	x	x
Dunnock	*Prunella modularis*		Green	Green	x	x
Goldcrest	*Regulus regulus*		Amber	Green	x	x
Goldfinch	*Carduelis carduelis*		Green	Green	x	x
Grasshopper Warbler	*Locustrella naevia*		Green	Amber	x	x
Great Tit	*Parus major*		Green	Green	x	x
Greenfinch	*Carduelis chloris*		Amber	Green	x	x
Grey Wagtail	*Motacilla cinerea*		Red	Green	x	x
Hen Harrier	*Circus cyaneus*	Annex I	Amber	Amber	x	x
Hooded Crow	*Corvus cornix*		Green	Green	x	x
House Sparrow	*Passer domesticus*		Amber	Amber	x	x
Jackdaw	*Corvus monedula*		Green	Green	x	x
Lesser Redpoll	*Acanthis cabaret*		Green	Green	x	x
Linnet	*Carduelis cannabina*		Amber	Amber	x	x
Long-tailed Tit	*Aegithalos caudatus*		Green	Green	x	x
Magpie	*Pica pica*		Green	Green	x	x
Meadow Pipit	*Anthus pratensis*		Red	Green	x	x
Merlin	*Falco columbarius*	Annex I	Amber	Amber	x	x

25 Colhoun & Cummins 2013
26 Lynas et al. 2007

COMMON NAME	SCIENTIFIC NAME	CONSERVATION STATUS			2002-2012	2014-2019
		EU Birds Directive	Current BoCCI*[25]	Previous BoCCI[26]		
Mistle Thrush	*Turdus viscivorus*		Amber	Green		x
Mute Swan	*Cygnus olor*		Amber	Amber	x	x
Peregrine Falcon	*Falco peregrinus*	Annex I	Green	Green	x	x
Pheasant	*Phasianus colchicus*		Green	N/A	x	x
Pied Wagtail	*Motacilla alba*		Green	Green	x	x
Raven	*Corvus corax*		Green	Green	x	x
Reed Bunting	*Emberiza schoeniclus*		Green	Green	x	x
Robin	*Erithacus rubecula*		Amber	Green	x	x
Rock Dove	*Columba livia*		Green	Green	x	x
Rook	*Corvus frugilegus*		Green	Green	x	x
Sand Martin	*Riparia riparia*		Amber	Amber	x	x
Sedge Warbler	*Acrocephalus schenobaenus*		Green	Green	x	x
Siskin	*Carduelis spinus*		Green	Green	x	x
Skylark	*Alauda arevensis*		Amber	Amber	x	x
Snipe	*Gallinago gallinago*		Amber	Amber	x	x
Song Thrush	*Turdus philomelos*		Green	Green	x	x
Sparrowhawk	*Accipiter nisus*		Amber	Green	x	x
Stonechat	*Saxicola torquata*		Amber	Green	x	x
Swallow	*Hirundo rustica*		Amber	Amber	x	x
Swift	*Apus apus*		Amber	Amber	x	x
Tree Sparrow	*Passer montanus*		Amber	Amber	x	
Treecreeper	*Certhis familiaris*		Green	Green	x	
Twite	*Carduelis flavirostris*		Red	Red	x	
Water Rail	*Rallus aquaticus*		Green	Amber	x	
Waxwing	*Bombycilla garrulus*		Green	Green		x
Wheatear	*Oenanthe oenanthe*		Amber	Amber	x	x
Whitethroat	*Sylvia communis*		Green	Green	x	x
Willow Warbler	*Phylloscopus trochilus*		Green	Green	x	x
Woodpigeon	*Columba palumbus*		Green	Green	x	x
Wren	*Troglodytes troglodytes*		Green	Green	x	x

8.7.3: Species recorded (x) during Breeding Bird Surveys 2008 to 2012 and 2014 to 2019 at the Bellanaboy Bridge Gas Terminal site

COMMON NAME	SCIENTIFIC NAME	CONSERVATION STATUS			2002-2012	2014-2019
		EU Birds Directive	Current BoCCI*[27]	Previous BoCCI[28]		
Blackbird	*Turdus merula*		Green	Green	x	x
Blackcap	*Sylvia atricapilla*		Green	Green	x	x
Black-headed Gull	*Chroicocephalus ridibundus*		Red[2,3]	Red	x	x
Blue Tit	*Cyanistes caeruleus*		Green	Green	x	x
Bullfinch	*Pyrrhula pyrrhula*		Green	Green	x	
Chaffinch	*Fringilla coelebs*		Green	Green	x	x
Chiffchaff	*Phylloscopus collybita*		Green	Green	x	x
Coal Tit	*Periparus ater*		Green	Green	x	x
Collared Dove	*Streptopelia decaocto*		Green	Green	x	
Common Gull	*Larus canus*		Amber[1,3]	Amber	x	
Cormorant	*Phalocrocorax carbo*		Amber[3,6]	Amber	x	x
Crossbill	*Loxia curvirostra*		Green	Green	x	x
Cuckoo	*Cuculus canorus*		Green	Green	x	x
Dunnock	*Prunella modularis*		Green	Green	x	x
Goldcrest	*Regulus regulus*		Amber[2]	Green	x	x
Goldfinch	*Carduelis carduelis*		Green	Green	x	x
Grasshopper Warbler	*Locustrella naevia*		Green	Amber	x	x
Great Tit	*Parus major*		Green	Green	x	x
Greenfinch	*Carduelis chloris*		Amber[2]	Green	x	x
Grey Heron	*Ardea cinerea*		Green	Green	x	
Hooded Crow	*Corvus cornix*		Green	Green	x	x
Kestrel	*Falco tinnunculus*		Amber[1]	Amber	x	
Linnet	*Carduelis cannabina*		Amber[1]	Amber	x	x
Long-tailed Tit	*Aegithalos caudatus*		Green	Green	x	x
Magpie	*Pica pica*		Green	Green	x	x

27 Colhoun & Cummins 2013
28 Lynas et al. 2007

COMMON NAME	SCIENTIFIC NAME	CONSERVATION STATUS			2002-2012	2014-2019
		EU Birds Directive	Current BoCCI*[27]	Previous BoCCI[28]		
Mallard	*Anas platyrhynchos*		Green	Green	x	x
Meadow PipIt	*Anthus pratensis*		Red[2]	Green	x	x
Pheasant	*Phasianus colchicus*		Green	N/A	x	x
Pied Wagtail	*Motacilla alba*		Green	Green	x	x
Lesser Redpoll	*Carduelis flammea*		Green	Green	x	x
Reed Bunting	*Emberiza schoeniclus*		Green	Green	x	x
Robin	*Erithacus rubecula*		Amber[2]	Green	x	x
Rook	*Corvus frugilegus*		Green	Green	x	x
Sedge Warbler	*Acrocephalus schoenobaenus*		Green	Green	x	x
Siskin	*Carduelis spinus*		Green	Green	x	x
Skylark	*Alauda arvensis*		Amber[1,2]	Amber	x	x
Snipe	*Gallinago gallinago*		Amber[1]	Amber	x	x
Song Thrush	*Turdus philomelos*		Green	Green	x	x
Spotted Flycatcher	*Muscicapa striata*		Amber[1]	Green	x	
Starling	*Sturnus vulgaris*		Amber[1]	Amber	x	x
Swallow	*Hirundo rustica*		Amber[1]	Amber	x	x
Whitethroat	*Sylvia communis*		Green	Green	x	x
Willow Warbler	*Phylloscopus trochilus*		Green	Green	x	x
Woodpigeon	*Columba palumbus*		Green	Green	x	x
Wren	*Troglodytes troglodytes*		Green	Green	x	x

***Reasons for BoCCI Conservation Status (as listed by Colhoun & Cummins 2013)**	
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4 = BI	9 = WI
5 = BR	

Native White water-lily (*Nymphaea alba*) on wayleave wetland 3

Appendix 8.8

An overview of the created wetlands / ponds and the wayleave stream

8.8.1: Wayleave

Wetland No.	Notes	Photograph
3	This circular wetland is dominated by open water and low plant density. Plants of *Nymphaea alba* along the western shore of the wetland were. A number of dragonflies and a large marsh grasshopper were also noted along the western margins of the wetland. Great Diving beetle (*Dytiscus marginalis)* and some Whirlygig beetles. Frog breeding site.	 View across W3 towards the west
4	A wetland with two interconnected basins. Very little submerged vegetation. In the western pond there is colonisation/growth by *Typha angustifolia* and *Phragmites australis*. A number of dragonflies were seen along the margins of this wetland. Water snails (*Lymnaea stagnalis*) visible in the shallows. Beetles, damselfly nymphs and *Notonecta*. Frog breeding site.	 W4 View towards the east
5	A long, narrow wetland with no large areas of open water. The wetland is damp and flushed with frequent *Phragmites australis, Sphagnum recurvum / cuspidatum, Holcus lanatus, Juncus effusus, Typha angustifolia* and *Hydrocotyle vulgaris*. *Libellula quadrimaculata* (Brown darter) on the wing.	 Southern end of W5
6	The surface of the wetland is dominated by a floating raft of *Sphagnum cuspidatum* with *Typha angustifolia* also prominent. Other frequent species growing in the shallow wetland margins include *Phragmites australis, Juncus bulbosus, Ranunculus flammula, Molinia caerulea, Polytrichum commune* and *Glyceria* species. *Lythrum portula present.* Dragonflies including Brown darter on the wing, and large marsh grasshopper noted. Beetles, Gerrids. Frog breeding site.	 View southwards across W6

Wetland No.	Notes	Photograph
[Stream DL16]	Approximately 0.6m wide, gravel substrate. Float grass (*Glyceria* sp.), *Callitriche*. Nemouridae.	 **Stream with pipeline marker on southern bank (on RHS)**
7	This is a small circular wetland. The water surface is dominated by *Potamogeton polygonifolius* with *Lemna minor* also common. Closer to the wetland margins there is some sparse *Typha angustifolia, Sparganium erectum, Phragmites australis, Juncus effusus, Juncus articulatus, Calliergon giganteum* and *Myosotis* sp. Red damsel flies and two species of dragonfly were seen on the wing. Frog breeding site.	 **View across W7 southwards**
8	*Potamogeton natans and P. polygonifolius* dominates the water surface. *Typha angustifolia, Phragmites australis, Calliergon giganteum, Glyceria spp.* and *Rorippa* sp. were also frequent with *Nymphaea alba* present. *Apium nodiflorum* at the margins. Red damselflies on the wing, Baetids, dragonfly nymphs, whirly-gigs (Gyrinids), and *Notonecta (frequent)* Frog breeding site.	 ***Nymphaea alba* in flower at W8**
9	This wetland comprises a large northern section and small southern section with a narrow 'canal' linking both parts of this wetland. Dominated by *P. polygonifolius*, with scattered *Mentha aquatica* in drier area, stand of *Typha angustifolia.* Red damselflies, *Gammarus*, Gerrids, Hydrometra, *Dytiscus marginalis*, *Notonecta* Frog breeding site.	 **View northwards of the northern section of W9**

8.8.2: Aughoose (former tunnelling site compound)

Wetland No.	Notes	Photograph
12	A small wetland with a variable water level depending on recent rainfall amounts. Small stand of *Typha*, much *J. bulbosus* throughout. Dragonflies on the wing. *Notonecta, Sigara, Asellus*	 **W12 after a period of heavy rain**
13	The centre of the wetland is dominated by a tall stand of *Typha angustifolia* with frequent *Myosotis* sp., *Mentha aquatica, Phragmites australis, Eriophorum angustifolium* and the moss *Calliergonella cuspidata*. *Stagnicola* snails on surface. Frog breeding site.	 ***Typha* dominating W13**
14	The wetland area has a large stand of *Typha latifolia* dominating the eastern shore. *Juncus effusus* and *Juncus bulbosus* are starting to colonize the, peaty, western bed of the wetland. *Gammarids*	 **W14 from western margins**
15	More or less always dry, as has been the case since shortly after construction. Surface pooling after heavy rain. The bottom of the wetland is dominated by *Eriophorum angustifolium* with frequent *Equisetum palustre, Equisetum fluviatile* and *Holcus lanatus*. Frog breeding site if water present	**No photograph**

Wetland No.	Notes	Photograph
16	A shallow wetland, with surface cracking of peat is frequent at margins. There is very little aquatic or emergent vegetation present. Many *Potamopyrgus*; and large beetle larva Frog breeding site.	 Facing NW across W16 towards Sruwaddacon Bay
17	Dry, which has been the case since shortly after construction. The bed of the depression is dominated by *Juncus effusus* with frequent *Cirsium palustre, Carex panicea, Lythrum salicaria, Hypochoeris radicata* and *Holcus lanatus*.	No photograph
18	More or less dry, except after heavy rain. The bed of wetland 18 is dominated by *Eriophorum angustifolium* and *Juncus bulbosus* with some sparse *Juncus effusus*. Frog breeding site.	 Facing NW across W18
19	This narrow wetland is connected to W18 by 'channel' which is dry except after heavy, prolonged rain. The margins are dominated by *Eriophorum angustifolium*, *Juncus bulbosus* and *Eleocharis multicaulis*. Plants of *Alisma plantago-aquatica* (Water plantain) are prominent. Frog breeding site.	 W19 with large clumps of *Alisma* visible
20	An open water pond connected to W21 by a small channel. Margins are mostly colonised by *Eriophorum angsutifolium* with one large clump of *Eleocharis multicaulis* near the centre of the open water. Frog breeding site.	 Facing east from western end of W20 (Sruwaddacon Bay in background, left)

Wetland No.	Notes	Photograph
20/21 (connecting channel)	There is little plant cover here. *J. bulbosus*, *Typha*, *Lythrum*, *E. angustifolium* and *Carex echinata*. Whirligig beetles – plentiful. *Notonecta*, Gammarids and *Sigara*. Frog breeding site.	 **Pond in connecting channel between W20 and W21**
21	Open water dominates throughout the year with a large clump of *Typha angustifolia* in the centre. *Potamopyrgus antipodarium* present. Whirligigs Frog breeding site.	 **W21 Viewed from east to west**
22	This wetland has a steep slope to the west and south and it holds water well throughout the year. The water surface dominated by an extensive floating raft of *Potamogeton polygonifolius*. *Filipendula ulmaria*, *Lythrum salicaria*, *J. bulbosus*, *Juncus articulatus*, Small stand of *Typha*. *Eriophorum* encroaching, with *Mentha*, *Myosotis* and *Equisetum* also present. Blue-tailed Damselfly (Common Bluetip) (*Ischnura. elegans*) Frog breeding site.	 **W22 View from SE to NW**
23	A small shallow wetland. The main species growing are *Eriophorum angustifolium*, *Eleocharis multicaulis* and *Potamogeton polygonifolius*. Fine green algae common. Frog breeding site.	 **W23 Viewed from NW to SE**

8.8.3: Terminal site

Wetland No.	Notes (2019/ 2020)	Photograph
TW1	The well-developed vegetation is dominated by tall *Typha angustifolia* with abundant floating *Sphagnum cuspidatum/ recurvum*. Other occasional species seen were *Agrostis stolonifera, Phragmites australis, Potamogeton polygonifius, Mentha aquatica, Lythrum salicaria, Lythrum portula* and *Juncus effsus*. Large marsh grasshopper and meadow brown butterfly were seen closeby. Damsel fly on wing Chaoboridae, Corixidae (*Sigara*), *Velia*/Gerrids, Whirly-gigs, Dragonfly nymph. Frog breeding site.	 TW1 facing south
TW2	A small wetland with no open water. The main plant species growing are *Eleocharis palustris, Agrostis stolinifera, Typha angustifolia* and *Potamogeton polygonifolius*. Additional species present with a lower cover include *Ranunculus flammula, Lythrum portula, Juncus articulatus* and *Holcus lanatus*. Damsel fly on the wing, transparent, green - possibly *Lestes* spp. Frog breeding site.	 TW2 showing dense vegetation
TW3	A small wetland is dominated by *Typha angustifolia* and floating *Callitriche* sp. Other common species include *Lythrum portula, Juncus bulbosus, Potamogeton polygonifolius, Ranunculus flammula, Glyceria* sp. and *Agrostis stolonifera*. Red damsel fly (*Pyrrhosoma nymphula*) on the wing. Frog breeding site.	 Boardwalk bridge over TW3
TW4	A relatively long wetland which is dominated by *Sphagnum cuspidatum on the surface*. Water levels stable throughout the year. Occasional *Sparganium erectum, Agrostis stolonifera, Juncus bulbosus, Eleocharis palustris, Carex echinata* and *Juncus effusus on the margins*. Frog breeding site.	 View southwards across TW4

Wetland No.	Notes (2019/ 2020)	Photograph
TW5	A small, open, oligotrophic water body. *Sphagnum cuspidatum* and *Potamogeton polygonifolius* dominate the water surface. Other species which grow sparsely in shallow water include *Juncus articulatus, Agrostis stolonifera, Juncus effusus, Typha angustifolia* and *Callitriche* sp. Red damselflies on the wing, and a nymph present in strained water sample. Frog breeding site.	 View north across TW5
TW6	Usually dry except after prolonged heavy rainfall. *Plant species include Typha*, *Iris pseudacorus*, *Jacobea aquatica*, 2-spotted burnet	 More or less dry depression - TW6 (Facing north)  TW6 after heavy rain (Facing south)

Dragonfly at wayleave wetland 3

Appendix 8.9

Freshwater species recorded in 2019

The following tables show the results of the survey of the created wetland ponds by the Aquatic Services Unit (ASU) of UCC. The results of sampling at the wayleave stream (DL16) are also included. Please refer to Appendix 8.8 for wetland (pond) numbering.

8.9.1: Diversity of invertebrates taken in the 19 surveyed ponds.

Main Groups	No. of Taxa
Coleoptera (beetles)	16
Hemiptera (water bugs)	10
Mollusca (snails & bivalves)	7
Odonata (damselflies & dragonflies)	6
Diptera (true flies)	4
Crustacea (freshwater shrimps)	2
Trichoptera (caddisflies)	2
Ephemeroptera (mayflies)	1
Oligochaeta (segmented worms)	1

8.9.2: Diversity and overall number of individuals collected from all the ponds sampled combined, compared with Wayleave and Terminal ponds only

All ponds sampled (Aughoose, Wayleave and Terminal)		Wayleave and Terminal only	
Main Groups	No. of Taxa	Main Groups	No. of Taxa
Coleoptera (beetles)	16	Coleoptera (beetles)	14
Hemiptera (water bugs)	10	Hemiptera (water bugs)	9
Mollusca (snails & bivalves)	7	Odonata (damselflies & dragonflies)	6
Odonata (damselflies & dragonflies)	6	Mollusca (snails & bivalves)	6
Diptera (true flies)	5	Diptera (true flies)	4
Crustacea (freshwater shrimps etc.)	2	Trichoptera (caddisflies)	2
Trichoptera (caddisflies)	2	Ephemeroptera (mayflies)	1
Ephemeroptera (mayflies)	1	Crustacea (freshwater shrimps)	1
Oligochaeta (segmented worms)	1	Oligochaeta (segmented worms)	0
Total species number	50	Total species number	43

8.9.3: Aughoose (former tunnelling site compound): comparison of diversity and overall number of individuals collected in all of the ponds sampled combined against those ponds which were dry, or nearly so in May, and re-wetted in October ('seasonal ponds').

All Aughoose ponds		Aughoose - Seasonal Ponds (W12, 13, 14, 23)	
Main Groups	**No. of Taxa**	**Main Groups**	**No. of Taxa**
Hemiptera (water bugs)	9	Hemiptera (water bugs)	6
Coleoptera (beetles)	7	Coleoptera (beetles)	5
Odonata (damselflies & dragonflies)	6	Mollusca (snails & bivalves)	4
Mollusca (snails & bivalves)	6	Odonata (damselflies & dragonflies)	2
Crustacea (freshwater shrimps)	2	Crustacea (freshwater shrimps)	2
Diptera (true flies)	1	Diptera (true flies)	1
Trichoptera (caddisflies)	1	Trichoptera (caddisflies)	1
Oligochaeta (segmented worms)	1	Oligochaeta (segmented worms)	1
Ephemeroptera (mayflies)	1	Ephemeroptera (mayflies)	1
Total species number	**34**	**Total species number**	**23**

8.9.4: Frequency of occurrence of the 20 most numerous taxa taken in 19 ponds (n = the number of ponds in which a taxon occurred)

	Species/Group	Scientific Group	Common name	% Occurrence in 19 ponds (n)
1	*Crangonyx pseudogracilis*	Crustacea	**FW shrimp**	84 (16)
2	Chironomidae	Diptera	**midges**	63 (12)
3	*Notonecta sp*	Hemiptera	**back-swimmers**	63 (12)
4	*Pisidium/Sphaerium*	Mollusca	**snail**	53 (10)
5	*Gerris sp.*	Hemiptera	**pond skaters**	53 (10)
6	*Stagnicola palustris*	Mollusca	**snail**	47 (9)
7	Limnephilidae	Trichoptera	**caddis fly**	47 (9)
8	*Pyrrhosoma nymphula*	Odonata	**Large Red damselfly**	42 (8)
9	*Planorbis planorbis*	Mollusca	**snail**	42 (8)
10	*Hydroporus pubescens*	Coleoptera	**beetle**	42 (8)
11	*Hesperocorixa castanea*	Hemiptera	**water boatman**	42 (8)
12	*Gyrinus spp*	Coleoptera	**beetle**	42 8)
13	*Aeshna sp.*	Odonata	**dragon fly (Hawker spp)**	37 (7)
14	*Sigara scotti*	Hemiptera	**water boatman**	37 (7)
15	*Potamopyrgus antepodarum*	Mollusca	**snail**	32 (6)

	Species/Group	Scientific Group	Common name	% Occurrence in 19 ponds (n)
16	*Ishnura elegans*	Odonata	**Blue-tailed damselfly**	32 (6)
17	Chaoboridae	Diptera	**pond skater**	32 (6)
18	*Coenagrionidae spp. (not Pyrrhsoma)*	Odonata	**damsel fly**	26 (5)
19	*Sigara nigrolineata*	Hemiptera	**water boatman**	26 (5)
20	*Radix balthica*	Mollusca	**snail**	21 (4)

8.9.5: Percentage composition by numbers from ponds sampled

All Ponds		Wayleave & Terminal Ponds	
Main Groups	**% Numbers**	**Main Groups**	**% Numbers**
Crustacea (freshwater shrimps)	23	Crustacea (freshwater shrimps)	24
Mollusca (snails & bivalves)	22	Odonata (damselflies & dragonflies)	21
Odonata (damselflies & dragonflies)	17	Coleoptera (beetles)	17
Coleoptera (beetles)	13	Diptera (true flies)	16
Diptera (true flies)	12	Hemiptera (water bugs)	10
Hemiptera (water bugs)	10	Mollusca (snails & bivalves)	8
Trichoptera (caddisflies)	2	Trichoptera (caddisflies)	3
Ephemeroptera (mayflies)	1	Ephemeroptera (mayflies)	1
Oligochaeta (segmented worms)	7	Oligochaeta (segmented worms)	0

8.9.6: Percentage composition by numbers from ponds sampled at Aughoose Ponds

All Aughoose Ponds		Aughoose - Seasonal Ponds (W12, 13, 14, 23)	
Main Groups	**% Numbers**	**Main Groups**	**% Numbers**
Mollusca (snails & bivalves)	43	Crustacea (freshwater shrimps)	32
Crustacea (freshwater shrimps)	20	Mollusca (snails & bivalves)	27
Hemiptera (water bugs)	13	Hemiptera (water bugs)	15
Coleoptera (beetles)	8	Diptera (true flies)	8
Odonata (damselflies & dragonflies)	7	Coleoptera (beetles)	7
Diptera (true flies)	4	Trichoptera (caddisflies)	5
Trichoptera (caddisflies)	2	Ephemeroptera (mayflies)	2
Oligochaeta (segmented worms)	1	Odonata (damselflies & dragonflies)	2
Ephemeroptera (mayflies)	1	Oligochaeta (segmented worms)	2

8.9.7: Macroinvertebrates collected in a kick-sample at the wayleave stream (DL16)

Group	Species	Nos.
Ephemeroptera (Mayflies)	*Baetis scambus*	27
Plecoptera (Stoneflies)	*Nemurella picteti*	1
	Nemoura sp.	22
	Leuctra sp.	1
Crustacea (Freshwater shrimps)	*Gammarus duebeni*	7
Diptera (True flies)	Chironomidae	8
	Diptera sp	4
Trichoptera (Caddisflies)	Limnephilidae	1
	Plectrocnemia conspersa	2
Oligochaeta		2

8.9.8: List of invertebrates and numbers collected from the ponds sampled at the Terminal site, Wayleave; and at the stream (DL16)

	TW1	TW4	W3	W3	W4	W6	W6	W7	W7	W8	W8	W9	W9	DL16
	May	May	May	Oct	Oct	May	Oct	May	Oct	May	Oct	May	Oct	May
Ephemeroptera (Mayflies)														
Cloen dipterum										15	1			
Baetis scambus														27
Plecoptera (Stoneflies)														
Nemurella picteti														1
Nemoura sp.														22
Leuctra sp.														1
Mollusca (snails & bivalves)														
Lymnaea stagnalis					5									
Potamopyrgus antepodarum								13	12					
Planorbis planorbis					6									
Stagnicola palustris								36	25					
Radix balthica								10	1					
Pisidium/Sphaerium									2	20	1			
Crustacea (Freshwater shrimps)														
Crangonyx pseudogracilis			16		17	1	3	105	13	23	39	41	49	
Gammarus duebeni														7

	TW1	TW4	W3	W3	W4	W6	W6	W7	W7	W8	W8	W9	W9	DL16
	May	May	May	Oct	Oct	May	Oct	May	Oct	May	Oct	May	Oct	May
Coleoptera (Beetles)														
Acilius canaliculatus					1									
Dytiscus marginalis			1									1		
Hydroporus pubescens			20					3	1	5		7		
H. memnonius												3		
Hydrobius fusipes								1						
Agabus bipustulatus						1		2						
Ilybius montanus						1								
Ilybius fuliginosus									1					
Agabus strummi										1				
Haliplus lineatocollis				1										
H. flavipes								44	2			67		
H. aequalis								11		1		13		
Anacaena limbata/ lutescens								1				6		
Gyrinus observed	x			x						x				
G. substriatus														
Gyrinid larva			1											
Beetle indet.												5		
Beetle larvae						1							6	
Odonata (Damselflies & Dragonflies)														
Ishnura elegans	36	20	4	7				1		1				
Lestes sponsa	8		30											
Pyrrhosoma nymphula		1	1	6	4	28	9	5	11	2	6			
Aeshna sp.	1			1	3		6		2					
Aeshna juncea								1			1			
Coenagrionidae spp. (not *Pyrrhsoma*)	1		4		29									
S. sanguineum/ striolatum	1					13								
Sympetrum sp.	6				3					1				
Libellulidae							23							
Libellula quadrimaculata			x	1	2			x						

	TW1	TW4	W3	W3	W4	W6	W6	W7	W7	W8	W8	W9	W9	DL16
	May	May	May	Oct	Oct	May	Oct	May	Oct	May	Oct	May	Oct	May
Hemiptera (Water Bugs)														
Notonecta obliqua				3	1						x		x	
Notonecta imm.	7	5	18							5		3		
Corixide imm	3	1					6	1		3				
Corixa punctata														
Callicorixa sp.	1													
Hesperocorixa sahlbergi							1			5	3	2		
H. castanea	1		1	2	1		14		1					
H. sp													2	
Sigara nigrolineata	1						1							
S. scotti			1	4	2									
S. semistriata					1									
S. indet														
Gerris sp.	1	2	1	1		1		1			1	9	6	
True Flies (Diptera)														
Chaoboridae	3				3		4	2		15	6	1		
Chironomidae	27	4	17			7				102	6			8
Ceratopogonidae	3	2				3				4				
Dixidae sp.							1							
Diptera spp.		1	2											4
Caddis fies (Trichoptera)														
Limnephilidae				3	2			1	1			1		1
Holocentropus dubius				4	16						5			
Plectrocnemia conspersa														2
Oligochaetae														2

8.9.9: List of invertebrates and numbers collected from the ponds sampled at Aughoose

	W12	W13	W14	W16	W16	W18	W19	W20	W20/21	W21	W21	W22	W22	W23
	Oct	Oct	Oct	May	Oct	Oct	Oct	Oct	May	May	Oct	May	Oct	Oct
Ephemeroptera (Mayflies)														
Cloen dipterum														6
Mollusca (snails & bivalves)														
Potamopyrgus antepodarum				1	12	3			25		2	30	2	
Planorbis planorbis		11			1			10	3	11	7	2	4	19
Stagnicola palustris		12			5		2	11	4	2	5	9	31	14
Radix balthica				6	1			1					5	
Radix imm.	1	4												
Pisidium/Sphaerium	4	1	5	17		2			4	2	2	3		
Crustacea (Freshwater shrimps)														
Asellus aquaticus	13					4								
Crangonyx pseudogracilis	21	11	39	15		1								
Coleoptera (Beetles)														
Hydroporus pubescens			1	1					4			10		
Agabus bipustulatus												1		
Ilybius montanus												1		
Helophorus sp. 1	1	1												2
H. minutus												4		
Anacaena limbata/ lutescens						2								
Gyrinus observed									x	x	x			
Gyrinus minutus	1													
G. substriatus											2			
Beetle indet			1											
Beetle larvae	5	1	2				10	1					3	1
Odonata (Damselflies & Dragonflies)														
Damsel fly nymph indet.														
Ishnura elegans												1	x	
Lestes sponsa												1		
Pyrrhosoma nymphula												8	1	1

	W12	W13	W14	W16	W16	W18	W19	W20	W20/21	W21	W21	W22	W22	W23
	Oct	Oct	Oct	May	Oct	Oct	Oct	Oct	May	May	Oct	May	Oct	Oct
Aeshna sp.													3	
Coenagrionidae spp. (not Pyrrhsoma)												10	6	
S. sanguineum/ striolatum												1	3	
Libellulidae						5								
Libellula sp.												6		3
Libellula quadrimaculata														1
Hemiptera (Water Bugs)														
Notonecta obliqua	2				2			1			2		1	
Notonecta imm.				4					5	1		3		
Corixidae indet		3												
Corixid imm					1			4	1			2	2	3
Corixa sp				1										
Corixa punctata													2	
Hesperocorixa sahlbergi														1
H. castanea	1												14	1
Sigara distincta										1				
S. nigrolineata	2			2	1									22
S. scotti	2			1			1		1				2	
S. semistriata													1	2
S. indet					1									
Gerris sp.									1		1		3	
True Flies (Diptera)														
Chironomidae	3		17			6		1			1			1
Diptera spp.					1									
Caddis fies (Trichoptera)														1
Limnephilidae	9		3			1			2					
Oligochaetae			5		1				1					

Wayleave stream, north of the Terminal

Northern Marsh-orchid (*Dactylorhiza purpurella*) on the LVI side slopes

Appendix 8.10

Glossary of acronyms and abbreviations

ASU	Aquatic Services Unit, UCC
BAP	Biodiversity Action Plan
BBGT	Bellanaboy Gas Terminal
BITCI	Business in the Community Ireland
BNG	Biodiversity Net Gain
BSA	Biologically Sensitive Area
BSBI	Botanical Society of Britain and Ireland
BWI	BirdWatch Ireland
CBD	Convention on Biodiversity
CIEEM	Chartered Institute of Ecology and Environmental Management
CMRC	Coastal and Marine Resources Centre, University College Cork (UCC).
CtO	Consent to Operate under the Section 40 of the Gas Act
DAHG	(the former) Department of Arts, Heritage and the Gaeltacht
DCCAE (now DECC)	(the former) Department of Communications, Climate Action and Environment
DCENR (now DECC)	(the former) Department of Communications, Energy and Natural resources
DECC	Department of the Environment, Climate and Communications
DHLGH	Department of Housing, Local Government and Heritage
DL16	Pipeline stream crossing north of the Terminal
DoEHLG	(the former) Department of Environment, Heritage and Local Government
EACS	Ecological Advisory and Consultancy Services
EMP	Environmental Management Plan
EMS	Energy Management System
EPA	Environmental Protection Agency
EU	European Union
FMP	Forest Management Plan
FPO	Flora Protection Order (Under the Wildlife Acts)
H&S	Health and Safety
ha	hectare
IEL	Industrial Emissions Licence
IFI	Inland Fisheries Ireland
ILI	Irish Landscape Institute
IPIECA	International Petroleum Industry Environmental Conservation Association
ISI	Invasive Species Ireland (ISI)
LI	Landscape Institute
LMP	Land Management Plan
LVI	Landfall Valve Installation
MMO	Marine mammal observer
MPA	Marine Protection Area
NBAP	National Biodiversity Action Plan
NBDC	National Biodiversity Data Centre
NCI	Natural Capital Ireland
NGO	Non-governmental organisation
NHA	Natural Heritage Area
NNL	No Not Less
NPI	Net Positive Gain
NPWS	National Parks and Wildlife Service (now in DHLGH)
OGPI	International Association of Oil and Gas Producers
OSPAR	Site designated under the OSPAR Convention to Protect the Marine Environment of the North East Atlantic
RDX1	Pipeline road crossing
SAC	Special Area of Conservation
SC	Former site compound for construction (as at Aughoose and beside the L1202)
SEPIL	Shell Exploration and Production Ireland Ltd
SI	Statutory Instrument
SPA	Special Protection Area
SSRS	Small Stream Risk Survey
SW1	Terminal treated surface water discharge point (2 km off Erris Head)
SW3	Terminal treated produced water discharge point at the Corrib Field Manifold
TCF	Temporary Construction Facility at the Terminal
TWA	Temporary working area during construction
UCC	University College, Cork
VEPIL	Vermilion Exploration and Production Ireland Ltd
WIT	Waterford Institute of Technology

Notes

Notes

This page: Sruwaddacon Bay

Back cover: Wildflower meadow species at the Terminal

VERMILION ENERGY

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