

6.3.1 Statement of Authority

Ecological surveys and habitat mapping of the Proposed Project site were carried out by Jackie Hunt (M.Sc.) and Louise Scally (M.Sc., Ph.D.) to assess the feasibility of the habitat restoration project (ANIAR Ecology, 2021). Additional ground truthing surveys were carried out by MKO ecologists Sarah Mullen (B.Sc., Ph.D., ACIEEM) and Pat Roberts (B.Sc. Env.) on the 30th of July, 6th of August and the 9th and 10th of September 2021. The site was visited again by Laoise Chambers (B.Sc.) and Patrick O' Boyle (B.Sc., M.Sc.) on the 27th of October and 15th of November 2022. These additional surveys also provided additional information on the ecology of the site and surrounding area. All staff have relevant academic qualifications and are competent experts in undertaking multidisciplinary ecological surveys to this level.

This EIAR chapter has been prepared by Pádraig Desmond (B.Sc.) and reviewed by Sarah Mullen and Pat Roberts. Pádraig is an ecologist with over 2 years professional experience. Sarah is an experienced ecologist who has over 6 years' professional experience in ecological consultancy and Pat has over 16 years post graduate experience in ecological assessment and reporting.

6.4 Methodology

The following sections describe the methodologies followed to establish the baseline ecological condition of the Proposed Project site and surrounding area. Assessing the impacts of any project and associated activities requires an understanding of the ecological baseline conditions prior to and at the time of the project proceeding. Ecological baseline conditions are those existing in the absence of proposed activities (CIEEM, 2018).

6.4.1 Desk study

The desk study undertaken for this assessment included a thorough review of available ecological data including the following:

- Review of online web-mappers: National Parks and Wildlife Service (NPWS), EPA (Envision), Water Framework Directive (WFD) and Inland Fisheries Ireland (IFI).
- Data on potential occurrence of protected bryophytes – as per NPWS online map viewer; Flora Protection Order Map Viewer – Bryophytes².
- Review of the publicly available National Biodiversity Data Centre (NBDC) web-mapper
- Inland Fisheries Ireland (IFI) Reports, where available.
- Records from the NPWS web-mapper and review of specially requested records from the NPWS Rare and Protected Species Database for the hectads in which the Proposed Project is located.
- Review of existing reports and assessments in relation to the current project.

6.4.2 Scoping and Consultation

MKO undertook a scoping exercise during preparation of this EIAR, as described in Chapter 2, Section 2.7 of this EIAR.

Copies of all scoping responses are included in **Appendix 2.1** of this EIAR. The recommendations of the consultees have informed the EIAR preparation process and the contents of this chapter. Table 2.2 in Chapter 2 of this EIAR describes where the comments raised in the scoping responses received have been addressed in this assessment.

² NPWS, 2019, Online map viewer; Flora Protection Order Map Viewer – Bryophytes. Online, Available at: <http://dahg.maps.arcgis.com/apps/webappviewer/index.html?id=71f8df33693f48edbb70369d7fb26b7e>, Accessed: 26/06/2019.

4.3 Field Surveys

Detailed habitat surveys and mapping of the site were undertaken by Jackie Hunt and Louise Scally on the following dates:

- > 15th to 18th June 2021
- > 7th and 16th July 2021

The purpose of the additional surveys undertaken to inform the EIAR by MKO ecologists was to ground truth the findings of the Ecological reporting that was previously undertaken and to provide additional information on the ecology of the site and surrounding area. They also undertook more general ecological multidisciplinary surveys that included an assessment of the significance of the site for fauna and to determine whether further, more detailed surveys for any habitats or species were necessary.

The habitats on site were classified according to Fossitt (2000) and a detailed habitat map of the site was prepared. The results of the previous surveys (ANIR Ecology, 2021) are given in the ecological report provided in **Appendix 6-1** of this EIAR.

4.3.1 Ecological Multidisciplinary Walkover Surveys

Multi-disciplinary walkover surveys of the site were undertaken by MKO ecologists on the 30th of July, 6th of August and the 9th and 10th of September 2021 and again on the 27th of October and 15th of November 2022. The aim of the surveys was to ground-truth and update where necessary, the results of the ecological surveys undertaken by Jackie Hunt and Louise Scally in 2021 (ANIR Ecology, 2021). This report is provided in **Appendix 6-1** of this EIAR.

The walkover surveys were also designed to detect the presence, or likely presence, of a range of protected species. The surveys included a search for signs of otter, badger, red squirrel and areas of suitable habitat, potential features likely to be of significance to bats and additional habitat features for the full range of other protected species that are likely to occur in the vicinity of the Proposed Project (e.g. otter etc.). The surveys were carried in accordance with NRA Guidelines on Ecological Surveying Techniques for Protected Flora and Fauna on National Road Schemes (NRA, 2009).

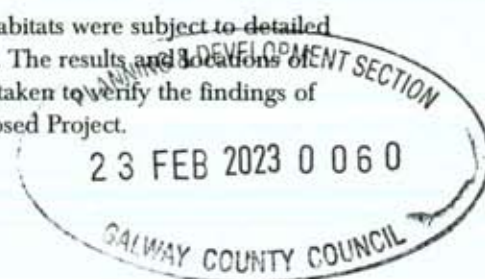
6.4.3.2 Dedicated Habitat and Vegetation Composition Surveys

Detailed habitat surveys and habitat mapping of the Proposed Project site were carried out by Jackie Hunt and Louise Scally from the 15th to 18th June 2021 and the 7th and 16th July 2021 (ANIR Ecology, 2021).

To ground truth the previous habitat surveys, MKO ecologists carried out additional multidisciplinary surveys on 30th of July, 6th of August and the 9th and 10th of September 2021 and again on the 27th of October and 15th of November 2022. Any changes in the habitats that were identified on the site during the ground truthing were mapped and are discussed in this EIAR.

Plant nomenclature for vascular plants follows '*New Flora of the British Isles*' (Stace, 2010), while mosses and liverworts nomenclature follows '*Mosses and Liverworts of Britain and Ireland - a field guide*' (British Bryological Society, 2010).

Habitats within the Proposed Project site with potential to conform to Annex I habitats were subject to detailed botanical assessments and detailed relevés (small plots) were carried out in each. The results and locations of these relevés are given in **Appendix 6-2** of this EIAR. These surveys were undertaken to verify the findings of the ecological report (**Appendix 6-1**) that was carried out in support of the Proposed Project.



6.4.3.3 Terrestrial Fauna Surveys

6.4.3.3.1 Badger Survey

As part of the multidisciplinary survey, a search for indications of badger was carried out. This search was conducted in order to determine the presence or absence of badger within Proposed Project site. This involved a search for all potential badger signs as per NRA (2009) (latrines, badger paths and setts). Following the results of the multi-disciplinary surveys, no requirement for further, more detailed surveys for badger was identified.

6.4.3.3.2 Otter Survey

As part of the multidisciplinary survey, a search for indications of otter was carried out. This search was conducted in order to determine the presence or absence of otter within Proposed Project site. This involved a search for all potential indications of otter, as per NRA (2008) (spraint, tracks, couches, holts). Searches were carried along watercourses within the Proposed Project site and on the western banks of Lough Inagh and Derryclare Lough. Following the results of the multi-disciplinary surveys, no requirement for further, more detailed surveys for otter was identified.

6.4.3.3.3 Red Squirrel

As part of the multidisciplinary survey, a search for indications of red squirrel was carried out. This search was conducted in order to determine the presence or absence of red squirrel within Proposed Project site. This involved a search for all potential indications of red squirrel, as per NRA (2008) (feeding remains, dreys). Following the results of the multi-disciplinary surveys, no requirement for further, more detailed surveys for red squirrel was identified.

6.4.3.4 Invasive species survey

During the multi-disciplinary walkover surveys, a search for non-native invasive species was undertaken. The survey focused on the identification of invasive species listed under the Third Schedule of the European Communities (Birds and Natural Habitats) Regulations 2011 (As Amended) (S.I. 477 of 2015).

6.4.4 Methodology for Assessment of Impacts and Effects

6.4.4.1 Identification of Target Receptors and Key Ecological Receptors

The methodology for assessment followed a precautionary screening approach with regard to the identification of Key Ecological Receptors (KERs). Following a comprehensive desk study, initial site visits were carried out in 2021 with additional visits carried out on the 30th of July, 6th of August, the 9th and 10th of September 2021 and again on the 27th of October and 15th of November 2022 to ground truth the previous surveys and to provide additional information on the ecology of the site and surrounding area. "Target receptors" likely to occur in the zone of influence of the development were identified. The target receptors included habitats and species that were protected under the following legislation:

- Annexes of the EU Habitats Directive
- Qualifying Interests (QI) of Special Areas of Conservation (SAC) within the likely zone of impact.
- Species protected under the Wildlife Acts 1976-2022
- Species protected under the Flora Protection Order 2022

6.4.4.2 Determining Importance of Ecological Receptors

The importance of the ecological features identified within the study area was determined with reference to a defined geographical context. This was undertaken following a methodology that is set out in Chapter 3 of the

'Guidelines for Assessment of Ecological Impacts of National Roads Schemes' (NRA, 2009). These guidelines set out the context for the determination of value on a geographic basis with a hierarchy assigned in relation to the importance of any particular receptor. The guidelines provide a basis for determination of whether any particular receptor is of importance on the following scales:

- > International
- > National
- > County
- > Local Importance (Higher Value)
- > Local Importance (Lower Value)

The Guidelines clearly set out the criteria by which each geographic level of importance can be assigned. Locally Important (lower value) receptors contain habitats and species that are widespread and of low ecological significance and of any importance only in the local area. Internationally Important sites are either designated for conservation as part of the Natura 2000 Network (SAC or SPA) or provide the best examples of habitats or internationally important populations of protected flora and fauna. Specific criteria for assigning each of the other levels of importance are set out in the guidelines and have been followed in this assessment. Where appropriate, the geographic frame of reference set out above was adapted to suit local circumstances. In addition, and where appropriate, the conservation status of habitats and species is considered when determining the significance of ecological receptors.

Any ecological receptors that are determined to be of National or International, County or Local importance (Higher Value) following the criteria set out in NRA (2009) are considered to be Key Ecological Receptors (KERs) for the purposes of ecological impact assessment if there is a pathway for effects thereon. Any receptors that are determined to be of Local Importance (Lower Value) are not considered to be Key Ecological Receptors.

6.4.4.3 Characterisation of Impacts and Effects

The Proposed Project will result in a number of impacts. The ecological effects of these impacts are characterised as per the CIEEM 'Guidelines for Ecological Impact Assessment in the UK and Ireland' (2018). These guidelines are the industry standard for the completion of Ecological Impact Assessment in the UK and Ireland. This chapter has also been prepared in accordance with the corresponding EPA guidance (EPA 2022). The headings under which the impacts are characterised follow those listed in the guidance document and are applied where relevant. A summary of the impact characteristics considered in the assessment is provided below:

- > **Positive or Negative.** Assessment of whether the Proposed Project results in a positive or negative effect on the ecological receptor.
- > **Extent.** Description of the spatial area over which the effect has the potential to occur.
- > **Magnitude** Refers to size, amount, intensity and volume. It should be quantified if possible and expressed in absolute or relative terms e.g. the amount of habitat lost, percentage change to habitat area, percentage decline in a species population.
- > **Duration** is defined in relation to ecological characteristics (such as the lifecycle of a species) as well as human timeframes. For example, five years, which might seem short-term in the human context or that of other long-lived species, would span at least five generations of some invertebrate species.
- > **Frequency and Timing.** This relates to the number of times that an impact occurs and its frequency. A small-scale impact can have a significant effect if it is repeated on numerous occasions over a long period.
- > **Reversibility.** This is a consideration of whether an effect is reversible within a 'reasonable' timescale. What is considered to be a reasonable timescale can vary between receptors and is justified where appropriate in the impact assessment section of this report.



6.4.4.4 Determining the Significance of Effects

The ecological significance of the effects of the Proposed Project are determined following the precautionary principle and in accordance with the methodology set out in Section 5 of CIEEM (2018).

For the purpose of Ecological Impact Assessment (EcIA), 'significant effect' is an effect that either supports or undermines biodiversity conservation objectives for 'important ecological features' or for biodiversity in general. Conservation objectives may be specific (e.g. for a designated site) or broad (e.g. national/local nature conservation policy) or more wide-ranging (enhancement of biodiversity). Effects can be considered significant at a wide range of scales from international to local (CIEEM, 2018).

When determining significance, consideration is given to whether:

- Any processes or key characteristics of key ecological receptors will be removed or changed.
- There will be an effect on the nature, extent, structure and function of important ecological features.
- There is an effect on the average population size and viability of ecologically important species.
- There is an effect on the conservation status of important ecological habitats and species.

The EPA draft Guidelines on information to be included in Environmental Impact Assessment Reports (EPA, 2022) and the *Guidelines for assessment of Ecological Impacts of National Road Schemes*, (NRA, 2009) were also considered when determining significance and the assessment is in accordance with those guidelines.

The terminology used in the determination of significance follows the suggested language set out in the Draft EPA Guidelines (2022) as shown in Table 6-1.

Table 6-1 Criteria for determining significance of effect, based on (EPA, 2022) guidelines.

Effect Magnitude	Definition
No change	No discernible change in the ecology of the affected feature.
Imperceptible effect	An effect capable of measurement but without noticeable consequences.
Not Significant	An effect which causes noticeable changes in the character of the environment but without significant consequences.
Slight effect	An effect which causes noticeable changes in the character of the environment without affecting its sensitivities.
Moderate effect	An effect that alters the character of the environment that is consistent with existing and emerging trends.
Significant effect	An effect which, by its character, its magnitude, duration or intensity alters a sensitive aspect of the environment.
Very Significant	An effect which, by its character, magnitude, duration or intensity significantly alters most of a sensitive aspect of the environment.
Profound effect	An effect which obliterates sensitive characteristics.

As per TII (NRA, 2009) and CIEEM (2018) best practice guidelines, the following key elements should also be examined when determining the significance of effects:

- The likely effects on 'integrity' should be used as a measure to determine whether an impact on a site is likely to be significant (NRA, 2009).
- A 'significant effect' is an effect that either supports or undermines biodiversity conservation objectives (CIEEM, 2018).

In the context of EcIA, 'integrity' refers to the coherence of the ecological structure and function, across the entirety of a site, that enables it to sustain all of the ecological resources for which it has been valued (NRA, 2009). Impacts resulting in adverse changes to the nature, extent, structure and function of component habitats and effects on the average population size and viability of component species, would affect the integrity of a site, if it changes the condition of the ecosystem to unfavourable.

Conservation status

An impact on the conservation status of a habitat or species is considered to be significant if it will result in a change in conservation status. According to CIEEM (2018) guidelines the definition for conservation status in relation to habitats and species are as follows:

- Habitats – conservation status is determined by the sum of the influences acting on the habitat that may affect its extent, structure and functions as well as its distribution and its typical species within a given geographical area.
- Species – conservation status is determined by the sum of influences acting on the species concerned that may affect its abundance and distribution within a given geographical area.

As defined in the EU Habitats Directive 92/43/EEC, the conservation of a habitat is favourable when:

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

The conservation of a species is favourable when:

- Population dynamics data on the species concerned indicate that it is maintaining itself on a long-term basis as a viable component of its natural habitats.
- The natural range of the species is neither being reduced nor is likely to be reduced for the foreseeable future.
- There is and will probably continue to be, a sufficiently large habitat to maintain its population on a long-term basis.

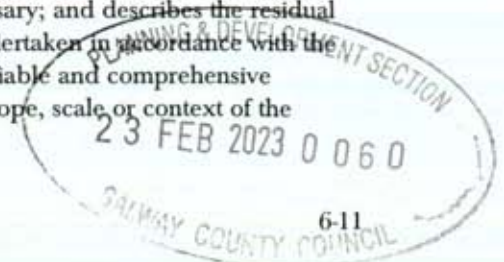
According to the NRA/CIEEM methodology, if it is determined that the integrity and/or conservation status of an ecological feature will be impacted on, then the level of significance of that impact is related to the geographical scale at which the impact will occur (i.e. local, county, national, international).

6.4.4.5 Incorporation of Mitigation

Section 6.7 of this EIAR assesses the potential effects of the Proposed Project to ensure that all effects on sensitive ecological receptors are adequately addressed. Where significant effects on sensitive ecological receptors are predicted, mitigation is incorporated into the project design or layout to address such impacts. The implemented mitigation measures avoid or reduce or offset potential significant residual effects, post mitigation.

6.4.4.6 Limitations

The information provided in this assessment accurately and comprehensively describes the baseline ecological environment following surveys on numerous dates, provides an accurate prediction of the likely ecological effects of the Proposed Project; prescribes best practice and mitigation as necessary; and describes the residual ecological impacts. The specialist studies, analysis and reporting have been undertaken in accordance with the appropriate guidelines. The habitats and species on the site were readily identifiable and comprehensive assessments were made during the field visit. No significant limitations in the scope, scale or context of the assessment have been identified.



6.5 Establishing the Ecological Baseline

6.5.1 Desk Study

The following sections describe the results of a survey of published material that was consulted as part of the desk study for the purposes of the ecological assessment. It provides a baseline of the ecology known to occur in the existing environment. Material reviewed includes the Site Synopses for designated sites within the zone of influence, as compiled by the National Parks and Wildlife Service (NPWS) of the Department of Housing, Local Government and Heritage, bird and plant distribution atlases and other research publications.

6.5.1.1 Designated Sites

6.5.1.1.1 Identification of the Designated Sites within the Likely Zone of Influence of the Proposed Project

The potential for the Proposed Project to impact on sites that are designated for nature conservation was considered in this Chapter of the EIAR.

Special Areas of Conservation (SACs) and Special Protection Areas for Birds (SPAs) are designated under the EU Habitats Directive and EU Birds Directive, respectively and are collectively known as 'European Sites'. The potential for significant effects and/or adverse impacts on the integrity of European Sites is fully assessed in the Natura Screening Report and Natura Impact Statement that accompanies this application. As per EPA Guidance 2022, "a biodiversity section of an EIAR, should not repeat the detailed assessment of potential effects on European sites contained in a Natura Impact Statement" but should "incorporate their key findings as available and appropriate". Section 6.5.1 of this EIAR provides a summary of the key assessment findings with regard to European Designated Sites.

Natural Heritage Areas (NHAs) are designated under Section 18 the Wildlife (Amendment) Act 2000 and their management and protection is provided for by this legislation and planning policy. The potential for effects on these designated sites is fully considered in this EIAR.

Proposed Natural Heritage Areas (pNHAs) were listed on a non-statutory basis in 1995 but have not since been statutorily proposed or designated. However, the potential for effects on these sites is fully considered in this EIAR.

The following methodology was used to establish which sites that are designated for nature conservation have the potential to be impacted by the Proposed Project:

- Initially the most up to date GIS spatial datasets for European and Nationally designated sites and water catchments were downloaded from the NPWS website (www.npws.ie) and the EPA website (www.epa.ie) on the 01/02/2023. The datasets were utilised to identify Designated Sites which could feasibly be affected by the Proposed Project.
- All Designated Sites that could potentially be affected were identified using a source-pathway - receptor model. To provide context for the assessment, National and European Sites surrounding the Proposed Project site are shown on Figures 6-2 and 6-3 respectively. Sites that were further away from the Proposed Project were also considered and, in this case, no potential source-pathway-receptor chain for effect on any additional Designated Site Proposed Project was identified.
- Information on European Sites is provided in the Natura Impact Statement that accompanies this planning application and the European Sites considered in NIS are listed below in Table 6-2. Table 6-2 also provides information on Nationally Designated Sites in the vicinity of the Proposed Project.
- Sites that were further away from the Proposed Project were also considered and in this case connectivity with sites that were further than 15km downstream in the catchment were identified but given the nature, scale and location of the Proposed Project and the attenuating properties of the intervening waterbodies, no potential pathway for significant effects was identified.

- > Table 6-2 provides details of all relevant designated sites as identified in the preceding steps and assesses which are within the likely Zone of Impact. All relevant European Designated Sites are fully described and assessed in the Screening for Appropriate Assessment and Natura Impact Statement reports submitted as part of this planning application.
- > The designation features of these sites, as per the NPWS website (www.npws.ie), were consulted and reviewed at the time of preparing this report.

Where potential pathways for Significant Effect are identified, the site is included within the Likely Zone of Impact and further assessment is required.





Map Legend

- Site Boundary
- National Heritage Areas (NHAs)
- Proposed National Heritage Areas (pNHAs)
- WFD Catchments



Drawing Title
National Sites in the wider vicinity of the Proposed Project

Project Title
Proposed Derryclare Wild Western Peatlands Project

Drawn By PD	Checked By SM
Project No. 210603	Drawing No. 6-2
Scale 1:180000	Date 13/02/2023

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Map Legend

- Site Boundary
- Special Areas of Conservation (SACs)
- Special Protected Areas (SPAs)
- WFD Catchments



Drawing Title
European Sites in the wider vicinity of the Proposed Project

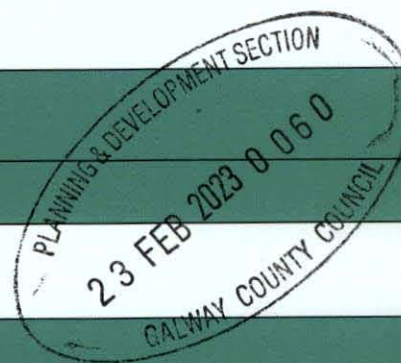
Project Title
Proposed Derryclare Wild Western Peatlands Project

Drawn By PD	Checked By SM
Project No. 210603	Drawing No. 6-3
Scale 1:180000	Date 13/02/2023

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Table 6-2 Identification of Nationally designated sites within the Likely Zone of Impact

Designated Site	Distance from Proposed Project (km)	Likely Zone of Impact Determination
Natural Heritage Areas (NHA)		
No Natural Heritage Areas were identified within the Likely Zone of Impact	-	-
Proposed Natural Heritage Area (pNHA)		
The Twelve Bens/Garraun Complex [002031]	0.00 km	<p>The Proposed Project is located partially within the boundary of this pNHA. Therefore, there is potential for direct effects on this Designated Site via habitat loss/degradation as result of the construction phase of the Proposed Project.</p> <p>The Proposed Project site is drained by the Derryclare stream and other unnamed first order streams, which discharge into Lough Inagh and Derryclare Lough, both of which are located within this pNHA and are adjacent to the Proposed Project site. Therefore, there is potential for indirect impacts on this pNHA via deterioration in water quality arising from the runoff of pollutants into surface water systems, during the construction phase of the Proposed Project.</p> <p>Therefore, the National Site is located within the Likely Zone of Impact and further assessment is required.</p>
Maumturk Mountains [002008]	0.29 km to the east of the Proposed Project site	<p>The Proposed Project is located entirely outside the boundary of this pNHA and there is no potential for direct effect.</p> <p>No source-pathway-receptor chain for potential indirect impacts on this pNHA has been identified. There is hydrological connectivity between the Proposed Project and this pNHA via multiple EPA mapped watercourses which drain the Proposed Project site and discharge into Lough Inagh and Derryclare Lough, both of which are adjacent to the Proposed Project site, however, given that the pNHA is upstream of the Proposed Project site, there is no potential for indirect impact on this site.</p> <p>No pathway for effect was identified and the site is not within the Likely Zone of Impact.</p>
Connemara Bog Complex [002034]	1.52 km to the south of the Proposed Project site	<p>The Proposed Project is located entirely outside the boundary of this pNHA and there is no potential for direct effect.</p>

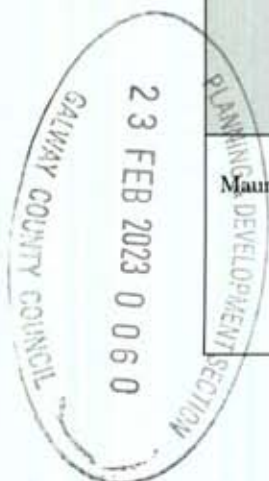


Designated Site	Distance from Proposed Project (km)	Likely Zone of Impact Determination
		<p>There is hydrological connectivity between this Site and the Proposed Project site via the Recess river. Therefore, there is potential for indirect impacts on this pNHA via deterioration in water quality arising from the runoff of pollutants into surface water systems, during the construction phase of the Proposed Project.</p> <p>Therefore, the National Site is located within the Likely Zone of Impact and further assessment is required.</p>
Dernasliggaun Wood [001253]	7.27 km to the north of the Proposed Project site	<p>The Proposed Project is located entirely outside the boundary of this pNHA and there is no potential for direct effect.</p> <p>No source-pathway-receptor chain for potential indirect impacts on this pNHA has been identified. There is no hydrological connectivity between the Proposed Project and this pNHA which is located in a separate hydrological catchment and is over 7 km to the Proposed Project site. Therefore, there is no potential for indirect effects on this site.</p> <p>No pathway for effect was identified and the site is not within the Likely Zone of Impact.</p>
Bertraghboy Bay [001234]	7.35 km to the south of the Proposed Project site	<p>The Proposed Project is located entirely outside the boundary of this pNHA and there is no potential for direct effect.</p> <p>No source-pathway-receptor chain for potential indirect impacts on this pNHA has been identified. This pNHA is located in a separate hydrological catchment and is over 7 km to the Proposed Project site. Therefore, there is no potential for indirect effects on this site.</p> <p>No pathway for effect was identified and the site is not within the Likely Zone of Impact.</p>
Maumtrasna Mountain Complex [00735]	8.46 km to the northeast of the Proposed Project site	<p>The Proposed Project is located entirely outside the boundary of this pNHA and there is no potential for direct effect.</p> <p>No source-pathway-receptor chain for potential indirect impacts on this pNHA has been identified. This pNHA is located in a separate hydrological catchment and is over 8 km from the Proposed Project site. No source-pathway-receptor chain was identified and there is no pathway for indirect effects on this pNHA.</p> <p>No pathway for effect was identified and the site is not within the Likely Zone of Impact.</p>



Designated Site	Distance from Proposed Project (km)	Likely Zone of Impact Determination
Rosroe Bog [000324]	8.77 km to the south of the Proposed Project site	<p>The Proposed Project is located entirely outside the boundary of this pNHA and there is no potential for direct effect.</p> <p>No source-pathway-receptor chain for potential indirect impacts on this pNHA has been identified. This pNHA is located in a separate hydrological catchment and is over 8 km to the Proposed Project site. Therefore, there is no potential for indirect effects on this pNHA.</p> <p>No pathway for effect was identified and the site is not within the Likely Zone of Impact.</p>
Mweelrea/Sheeffry/Erriff Complex [001932]	9.03 km to the north of the Proposed Project site	<p>The Proposed Project is located entirely outside the boundary of this pNHA and there is no potential for direct effect.</p> <p>No source-pathway-receptor chain for potential indirect impacts on this pNHA has been identified. This pNHA is located in a separate hydrological catchment and is over 9 km to the Proposed Project site. Therefore, there is no potential for indirect effects on this pNHA.</p> <p>No pathway for effect was identified and the site is not within the Likely Zone of Impact.</p>
Letterfrack Hostel [002080]	12.26 km to the west of the Proposed Project site	<p>The Proposed Project is located entirely outside the boundary of this pNHA and there is no potential for direct effect.</p> <p>No source-pathway-receptor chain for potential indirect impacts on this pNHA has been identified. This pNHA is located in a separate hydrological catchment and is over 12 km to the Proposed Project site. Therefore, there is no potential for indirect effects on this Designated Site.</p> <p>No pathway for effect was identified and the site is not within the Likely Zone of Impact.</p>
Lough Corrib [000297]	13.42 km to the east of the Proposed Project site	<p>The Proposed Project is located entirely outside the boundary of this pNHA and there is no potential for direct effect.</p> <p>No source-pathway-receptor chain for potential indirect impacts on this pNHA has been identified. This pNHA is located in a separate hydrological catchment and is over 8 km to the Proposed Project site. Therefore, there is no potential for indirect effects on this pNHA.</p> <p>No pathway for effect was identified and the site is not within the Likely Zone of Impact.</p>

Designated Site	Distance from Proposed Project (km)	Likely Zone of Impact Determination
Cregduff Lough [001251]	13.47 km to the south of the Proposed Project site	<p>The Proposed Project is located entirely outside the boundary of this pNHA and there is no potential for direct effect.</p> <p>No source-pathway-receptor chain for potential indirect impacts on this pNHA has been identified. This pNHA is located in a separate hydrological catchment and is over 13 km to the Proposed Project site. Therefore, there is no potential for indirect effects on this pNHA.</p> <p>No pathway for effect was identified and the site is not within the Likely Zone of Impact.</p>
Special Areas of Conservation (SACs)		
The Twelve Bens/Garraun Complex SAC [002031]	Partially within the Proposed Project site	<p>Small Areas of the Proposed Project site are partially within this SAC. Therefore, there is potential for direct impacts on the QI habitats of the SAC via habitat loss/degradation and on the QI species via disturbance and loss/degradation of suitable habitat.</p> <p>Multiple EPA mapped watercourses drain the Proposed Project site and discharge into Lough Inagh and Derryclare Lough, both of which are adjacent to the proposed site and form part of the Twelve Bens/Garraun Complex SAC. There is potential for indirect effects on the QIs of the SAC, via deterioration in water quality arising from run-off of pollutants to surface water during felling and construction activities associated with the Proposed Project.</p> <p>There is potential for indirect effects on faunal QIs of the SAC via disturbance arising from felling and construction activities associated with the Proposed Project.</p> <p>Therefore, in absence of best practice and mitigation, there is potential for the Proposed Project to result in likely significant effects on this SAC.</p> <p>Therefore, the European Site is located within the Likely Zone of Impact and further assessment is required.</p>
Maumturk Mountains SAC [002008]	0.47 km to the east of the Proposed Project site	<p>There will be no direct effects as the project footprint is located entirely outside the designated site.</p> <p>No source-pathway-receptor chain for potential indirect impacts on the QIs of the SAC has been identified.</p> <p>The SAC is located upstream of the Proposed Project and therefore there is no potential for indirect effects due to the run-off of pollutants during the development.</p>



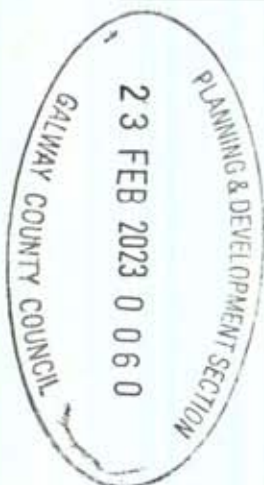
Designated Site	Distance from Proposed Project (km)	Likely Zone of Impact Determination
		<p>Given the terrestrial distance of 0.47 km between the Proposed Project site and the SAC, and the nature and scale of the Proposed Project, there is no potential for indirect effects on the QI habitats of the SAC.</p> <p>No pathway for effect was identified and the site is not within the Likely Zone of Impact.</p>
Connemara Bog Complex SAC [002034]	1.45 km to the south of the Proposed Project site	<p>There will be no direct effects as the project footprint is located entirely outside the designated site.</p> <p>There is hydrological connectivity between the Proposed Project and this SAC via multiple EPA mapped watercourses which drain the Proposed Project site and discharge into Lough Inagh and Derrylane Lough, both of which are adjacent to the proposed site. The Loughs have connectivity to the SAC via the Recess River which drains the southern section of Derrylane Lough.</p> <p>Taking a precautionary approach, and in the absence of best practice and mitigation, there is potential for indirect effects on the SAC via deterioration in water quality arising from run-off of pollutants to surface water during felling and construction activities associated with the Proposed Project.</p> <p>Taking the precautionary approach, there is potential for indirect effects on ex-situ otter of the SAC via disturbance arising from felling and construction activities associated with the Proposed Project.</p> <p>Therefore, the European Site is located within the Likely Zone of Impact and further assessment is required.</p>
Rosroe Bog SAC [000324]	8.77 km to the southwest of the Proposed Project site	<p>There will be no direct effects as the project footprint is located entirely outside the designated site.</p> <p>The QI habitats for which the site is designated are terrestrially based. Additionally, there is no hydrological connectivity between the Proposed Project and this SAC and they located in separate hydrological catchments. Taking the above into account, there is no potential for indirect effects on the QIs of the SAC as a result of the Proposed Project.</p> <p>No pathway for effect was identified and the site is not within the Likely Zone of Impact.</p>
Mweelrea/Sheeffry/Erriff Complex SAC [001932]	9.03 km to the north of the Proposed Project site	<p>There will be no direct effects as the project footprint is located entirely outside the designated site.</p> <p>There is no hydrological connectivity between the Proposed Project site and this SAC, which is located in different hydrological and groundwater catchments to the Proposed Project. Given the nature and scale of the</p>

Designated Site	Distance from Proposed Project (km)	Likely Zone of Impact Determination
		works, the terrestrial distance, and the absence of connectivity, no pathway for indirect effects was identified between the Proposed Project and the SAC. No pathway for effect was identified and the site is not within the Likely Zone of Impact.
Kilkieran Bay And Islands SAC [002111]	11.99 km to the south of the Proposed Project site	There will be no direct effects as the project footprint is located entirely outside the designated site. There is no hydrological connectivity between the Proposed Project site and this SAC, which is located in different hydrological and groundwater catchments to the Proposed Project. Given the terrestrial distance, nature and scale of the works and the absence of connectivity, no pathway for indirect effects was identified between the Proposed Project and the SAC. No pathway for effect was identified and the site is not within the Likely Zone of Impact.
Lough Corrib SAC [000297]	13.33 km to the east of the Proposed Project site	There will be no direct effects as the project footprint is located entirely outside the designated site. There is no hydrological connectivity between the Proposed Project site and this SAC, which is located in different hydrological and groundwater catchments to the Proposed Project. Given the nature and scale of the works and the absence of connectivity, no pathway for indirect effects was identified between the Proposed Project and the SAC. No pathway for effect was identified and the site is not within the Likely Zone of Impact.
West Connacht Coast SAC [002998]	13.41 km to the west of the Proposed Project site	There will be no direct effects as the project footprint is located entirely outside the designated site. There is no hydrological connectivity between the Proposed Project site and this SAC, which is located in different hydrological and groundwater catchments to the Proposed Project. Given the nature and scale of the works and the absence of connectivity, no pathway for indirect effects was identified between the Proposed Project and the SAC. No pathway for effect was identified and the site is not within the Likely Zone of Impact.
Creggan Lough SAC [001251]	13.48 km to the southwest of the Proposed Project site	There will be no direct effects as the project footprint is located entirely outside the designated site. There is no hydrological connectivity between the Proposed Project site and this SAC, which is located in different hydrological and groundwater catchments to the Proposed Project. Given the nature and scale of the



Designated Site	Distance from Proposed Project (km)	Likely Zone of Impact Determination
		works and the absence of connectivity, no pathway for indirect effects was identified between the Proposed Project and the SAC. No pathway for effect was identified and the site is not within the Likely Zone of Impact.
Special Protected Areas (SPAs)		
Connemara Bog Complex SPA [004181]	2.15 km to the south of the Proposed Project site	The Proposed Project site is within approx. 2.15 km of this SPA. This is within the breeding season core foraging range for Species of Conservation Interest (SCIs) of the SPA, as per Scottish Natural heritage (SNH) (2013). The Proposed Project site provides suitable foraging and breeding for these species. Therefore, a source-pathway-receptor chain for potential impacts on ex-situ SCIs of this SPA has been identified, via disturbance and habitat loss arising from the construction phase of the Proposed Project. Therefore, the European Site is located within the Likely Zone of Impact and further assessment is required.
Lough Corrib SPA [004042]	13.43 km to the east of the Proposed Project site	There will be no direct effects as the project footprint is located entirely outside the designated site. There is no hydrological connectivity between the Proposed Project site and this SPA, which is located in different hydrological and groundwater catchments to the Proposed Project. Therefore, there is no potential for indirect effects on the SPA via run off of pollutants and deterioration of water quality. The site is located outside the core foraging range and maximum range for hen harrier and Greenland white-fronted goose, as per Scottish Natural Heritage (2013). And therefore, there is no potential for disturbance/displacement of this species. Given the nature and scale of the works, the terrestrial distance between the SPA and Proposed Project site, and the absence of connectivity, no pathway for indirect effects was identified between the Proposed Project and the SPA. No pathway for effect was identified and the site is not within the Likely Zone of Impact.
Illeannan SPA [004221]	14.13 km to the west of the Proposed Project site	There will be no direct effects as the project footprint is located entirely outside the designated site. There is no hydrological connectivity between the Proposed Project site and this SPA, which is located in different hydrological and groundwater catchments to the Proposed Project.

Designated Site	Distance from Proposed Project (km)	Likely Zone of Impact Determination
		<p>The Proposed Project site does not provide suitable supporting habitat for the sandwich tern, the single SCI of the SPA and therefore, there is no potential for disturbance/displacement of this species.</p> <p>Given the nature and scale of the works, the terrestrial distance between the SPA and Proposed Project site, and the absence of connectivity, no pathway for indirect effects was identified between the Proposed Project and the SPA.</p> <p>No pathway for effect was identified and the site is not within the Likely Zone of Impact.</p>
Slyne Head To Ardmore Point Islands SPA [004159]	14.64 km to the west of the Proposed Project site	<p>There will be no direct effects as the project footprint is located entirely outside the designated site.</p> <p>There is no hydrological connectivity between the Proposed Project site and this SPA, which is located in different hydrological and groundwater catchments to the Proposed Project. Therefore, there is no potential for deterioration of water quality due to run-off of pollutants arising from the Proposed Project.</p> <p>The Proposed Project site does not provide suitable supporting habitat for the SCIs of the SPA and therefore, there is no potential for disturbance/displacement of this species.</p> <p>Given the nature and scale of the works, the terrestrial distance between the SPA and Proposed Project site, and the absence of connectivity, no pathway for indirect effects was identified between the Proposed Project and the SPA.</p> <p>No pathway for effect was identified and the site is not within the Likely Zone of Impact.</p>



No source-pathway-receptor chain for potential impacts on any NHA was identified and therefore, no NHA was identified within the Likely Zone of Influence of Proposed Project.

The Twelve Bens/Garraun Complex pNHA [002031] is partially located within the Proposed Project site. Connemara Bog Complex pNHA [002034] is located downstream from the Proposed Project site, via the Recess River. A potential pathway for effect was identified via the deterioration of surface water quality arising from the construction phase of the Proposed Project and therefore, these Nationally Designated Sites/pNHAs are within the Likely Zone of Influence and further assessment is undertaken within Section 6.7 of this Chapter.

The remaining Nationally Designated Sites/pNHAs listed in Table 6-2 above, are designated for terrestrial habitats, or are located upstream or within separate hydrological and ground water catchments to the Proposed Project site and, given the absence of hydrological connectivity, are not considered to be within the Likely Zone of Influence.

The AA Screening that accompanies this planning application identifies the following European Sites as being within the Likely Zone of Impact, which have been assessed in relation to the Proposed Project in the Natura Impact Statement that accompanies this planning application:

- The Twelve Bens/Garraun Complex SAC [002031]
- Connemara Bog Complex SAC [002034]
- Connemara Bog Complex SPA [004181]

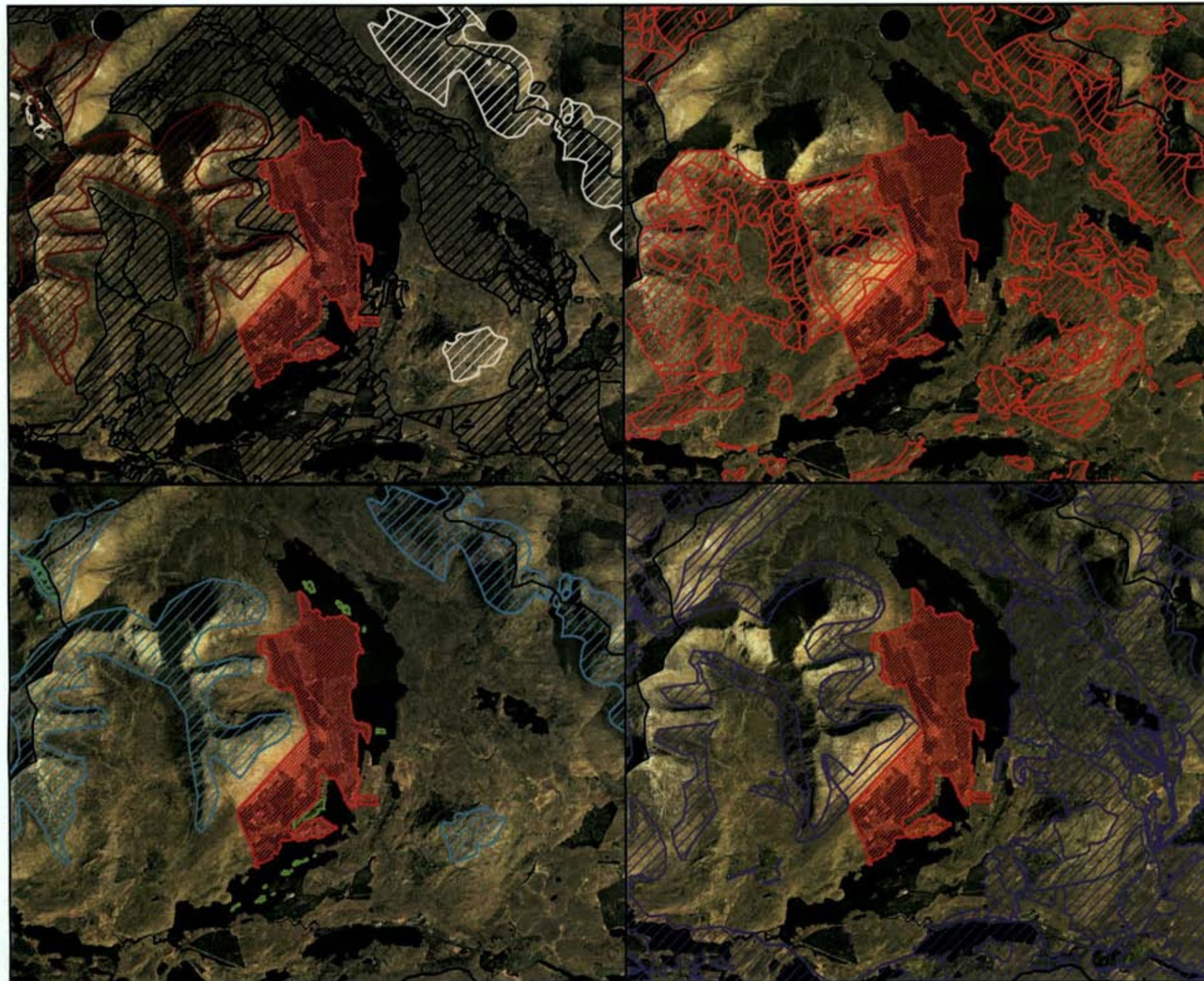
6.5.1.2 NPWS Article 17 Reporting

A review of the Irish Reports for Article 17 of the Habitats Directive (92/42/EEC), including the National Survey of Native Woodlands and Ancient and Long-Established Woodland datasets were conducted prior to undertaking the multi-disciplinary walkover survey.

Available NPWS datasets were downloaded and overlain on the Proposed Project study area. Several Article 17 Annex I habitats are mapped adjacent or in close proximity to the Proposed Project site. These include the following which are mapped in Figure 6-4;

- Northern Atlantic wet heaths with *Erica tetralix* [4010]
- European dry heaths [4030]
- Blanket bogs (* if active bog) [7130]
- Alpine and Boreal Heath [4060]
- Calcareous rocky slopes with chasmophytic vegetation [8210]
- Siliceous rocky slopes with chasmophytic vegetation [8220]
- Old sessile oak woods with *Ilex* and *Blechnum* in the British Isles [91A0]

As per the National Survey of Native Woodlands and Ancient and Long-Established Woodland datasets, Derryclare Nature Reserve, located adjacent to the southern section of the Proposed Project site, is mapped as both native woodland (Wet willow alder ash woodland (WN6) and Oak birch holly woodland (WN1) and ancient/long established woodland.



Map Legend

-  Site Boundary
-  Active Blanket Bog Poly
-  Alpine and Subalpine Heath
-  Calcareous Scree Polys
-  Dry Heath Poly
-  Old Oak Woodlands
-  Silaceous Scree Polys
-  Wet Heath Poly



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Drawing Title
Article 17 Mapping in the vicinity of the
Proposed Project

Project Title
Proposed Derryclare Wild Western
Peatlands Project

Drawn By PD	Checked By SM
Project No. 210603	Drawing No. 6-4
Scale 1:90000	Date 13/02/2023

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6.5.1.3 Vascular plants

A search was made in the New Atlas of the British and Irish Flora (Preston *et al*, 2002) to investigate whether any rare or unusual plant species listed under Annex II of the EU Habitats Directive, The Irish Red Data Book - 1 Vascular Plants (Curtis, 1988) or the Flora (Protection) Order (1999, as amended 2022) had been recorded in the relevant 10km squares in which the study site is situated (L85 and L84). Each hectad contains 100 whole one kilometre squares containing terrestrial and freshwater habitats. Species of conservation concern are given in Table 6-3. There is a single species listed in Annex II of the Habitats Directive and six species protected under the Flora (Protection) Order shown in the atlas for squares L85 and L84.

Table 6-3 Species listed designated under the Flora Protection Order or the Irish Red Data Book within Hectad L85 and L84

Common Name	Scientific Name	Hectad	Status
Slender naiad	<i>Najas flexilis</i>	L85	FPO, Annex II, NT
Heath cudweed	<i>Gnaphalium sylvaticum</i>	L85	FPO, CR
Small white orchid	<i>Pseudorchis albida</i>	L85	FPO, VU
Alpine clubmoss	<i>Diphasiastrum alpinum</i>	L85	NT
Pipewort	<i>Eriocaulon aquaticum</i>	L85	NT
Brown Beak-sedge	<i>Rhynchospora fusca</i>	L85	NT
Bog Hair-grass	<i>Deschampsia setacea</i>	L84	FPO
Slender cottongrass	<i>Eriophorum gracile</i>	L84	FPO, NT
Pillwort	<i>Pilularia globulifera</i>	L84	FPO, VU
Rock whitebeam	<i>Sorbus rupicola</i>	L84	VU
Awlwort	<i>Subularia aquatica</i>	L84	VU
Chaffweed	<i>Anagallis minima</i>	L84	NT
Roman chamomile	<i>Chamaemelum nobile</i>	L84	NT
Basil thyme	<i>Clinopodium acinos</i>	L84	NT
Frog orchid	<i>Coeloglossum viride</i>	L84	NT
Sea kale	<i>Crambe maritima</i>	L84	NT
Hounds tongue	<i>Cynoglossum officinale</i>	L84	NT
Quillwort	<i>Isoetes echinospora</i>	L84	NT
Least bur-reed	<i>Sparganium natans</i>	L84	NT

Floral Protection Order (FPO), Annex II of the Habitats Directive, Near Threatened (NT), Vulnerable (VU), Critically Endangered (CR), Regionally Extinct (RE)

6.5.1.4 Bryophytes

A search of the NPWS online data map for bryophytes (NPWS, 2018) was also undertaken with no protected bryophytes recorded within or adjacent to the Proposed Project site.

6.5.1.5 National Biodiversity Data Centre (NBDC) Records

A search of the National Biodiversity Data Centre (NBDC) website was conducted on the 01/02/2023. This helped to inform survey effort and provide a baseline of likely species composition in the area. Records of protected fauna recorded from hectads L85 and L84 are provided in Table 6-4.

Table 6-4 NBDC records for species of conservation interest in hectads L85 and L84

Common name	Scientific name	Designation	Hectad
Large white-moss	<i>Leucobryum glaucum</i>	HD Annex IV	L84, L85
Fir Club moss	<i>Huperzia selago</i>	HD Annex V	L85
Common frog	<i>Rana temporaria</i>	HD Annex V, WA	L84, L85
European Golden Plover	<i>Pluvialis apricaria</i>	BD Annex I, BOCCI Red list	L84, L85
Merlin	<i>Falco columbarius</i>	BD Annex I, BOCCI Amber list	L84, L85
Common Seal	<i>Phoca vitulina</i>	HD Annex II, V, WA	L84
Grey Seal	<i>Halichoerus grypus</i>	HD Annex II, V, WA	L84

Pine Marten	<i>Martes martes</i>	HD Annex V, WA	L84, L85
Leisler's bat	<i>Nyctalus leisleri</i>	HD Annex IV, WA	L84, L85
Daubenton's bat	<i>Myotis daubentonii</i>	HD Annex IV, WA	L84, L85
Soprano pipistrelle	<i>Pipistrellus pygmaeus</i>	HD Annex IV, WA	L84, L85
Otter	<i>Lutra lutra</i>	HD Annex II, IV, WA	L84, L85
Badger	<i>Meles meles</i>	WA	L85
Eurasian Red squirrel	<i>Sciurus vulgaris</i>	WA	L84, L85

HD = EU Habitats Directive; WA = Wildlife Acts (Ireland).

6.5.1.6 NPWS

National Parks and Wildlife Service (NPWS) online records were searched to see if any rare or protected species of flora or fauna have been recorded from hectads L85 and L84. An information request was also sent to the NPWS scientific data unit requesting records from the Rare and Protected Species Database on the 24th of October 2022. A response was received on the 28th of October 2022. Table 6-5 lists rare and protected species records obtained from NPWS.

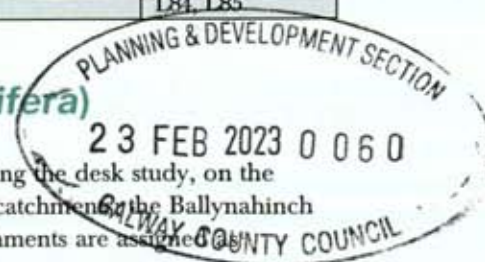
Table 6-5 NPWS records for rare and protected species

Common name	Scientific name	Designation	Hectad
Six-stamened Waterwort	<i>Elatine hexandra</i>	NT	L84
Bog hair grass	<i>Deschampsia setacea</i>	FPO, NT	L84
Heath cudweed	<i>Gnaphalium sylvaticum</i>	FPO, CR	L84, L85
Small white orchid	<i>Pseudorchis albida</i>	FPO, VU	L85
Floating water plantain	<i>Luronium natans</i>	Annex II	L84
Alpine saw-wort	<i>Saussurea alpina</i>	VU	L85
Rock whitebeam	<i>Sorbus rupicola</i>	VU	L84
Awlwort	<i>Subularia aquatica</i>	VU	L84, L85
Whorled Caraway	<i>Carum verticillatum</i>	NT	L84
Chaffweed	<i>Anagallis minima</i>	NT	L85
Alpine clubmoss	<i>Diphasiastrum alpinum</i>	NT	L85
Pipewort	<i>Eriocaulon aquaticum</i>	NT	L84
Quillwort	<i>Isoetes echinospora</i>	NT	L84
Allseed	<i>Radiola linoides</i>	NT	L84
Brown Beak-sedge	<i>Rhynchospora fusca</i>	NT	L85
Pillwort	<i>Pilularia globulifera</i>	FPO, VU	L84, L85
Holly-fern	<i>Polystichum lonchitis</i>	VU	L85
Grey Seal	<i>Halichoerus grypus</i>	HD Annex II, V, WA	L84
Harbour seal	<i>Phoca vitulina</i>	HD Annex II, V, WA	
Common Lizard	<i>Zootoca vivipara</i>	WA	L84
Slender Cottongrass	<i>Eriophorum gracile</i>	FPO, NT	L84
Bog Orchid	<i>Hammarbya paludosa</i>	FPO, NT	L84
Irish Hare	<i>Lepus timidus subsp. Hibernicus</i>	Annex V, WA	L84, L85
Badger	<i>Meles meles</i>	WA	L84, L85
Otter	<i>Lutra lutra</i>	HD Annex II, IV, WA	L84, L85
Pine Marten	<i>Martes martes</i>	HD Annex V, WA	L84, L85
Common frog	<i>Rana temporaria</i>	HD Annex V, WA	L84, L85
Slender Naiad	<i>Najas flexilis</i>	FPO, Annex II, NT	L84, L85
Red Deer	<i>Cervus elaphus</i>	WA	L84, L85

FPO = Flora Protection Order; RL = Red List, VU = Vulnerable, WA = Wildlife Act

6.5.1.7 Freshwater Pearl Mussel (*Margaritifera margaritifera*)

The NPWS *Margaritifera* Sensitive Area map (Version 8, 2017) was consulted during the desk study, on the 04/11/2022. The Proposed Project site is located within two *Margaritifera* sensitive catchments, the Ballynahinch - Inagh Lough and the Ballynahinch - Ballynahinch Lake catchments. These catchments are assigned as 'Catchments with previous records of *Margaritifera*, but current status unknown'.



There is no hydrological connectivity between the Proposed Project site and any additional *Margaritifera* sensitive catchments.

6.5.1.8 Inland Fisheries Ireland Data

The Proposed Project site drains into Lough Inagh and Derryclare Lough, to the east, both of which are located within the Ballynahinch WFD hydrological catchment. A search of the wdfish.ie website on the 04/11/2022 found Inland Fisheries Ireland (IFI) Fish stock survey reports for surveys carried out in 2019. These are summarized below.

Lough Inagh

A total of four fish species (sea trout are included as a separate 'variety' of trout) were recorded in Lough Inagh in September 2019, with 244 fish being captured. These included Perch (*Perca fluviatilis*), brown trout (*Salmo trutta*), Atlantic salmon (*Salmo salar*), and European eel (*Anguilla anguilla*). Perch was the dominant species in terms of both abundance (CPUE) and biomass (BPUE) captured in the survey gill nets during the 2019 survey. This contrasts with the previous survey in 2002 when brown trout and Arctic char were the dominant fish species in the lake (Corcoran *et al.*, 2020).

Derryclare Lough

A total of four fish species were recorded in Derryclare Lough in September 2019, with 171 fish being captured. These included Perch (*Perca fluviatilis*), brown trout (*Salmo trutta*), Arctic char (*Salvelinus alpinus*), and European eel (*Anguilla anguilla*). Minnow and three-spined stickleback were recorded in 2014 but were absent in 2019. Perch was the dominant species in terms of both abundance (CPUE) and biomass (BPUE) captured in the survey gill nets during the 2019 survey (Corcoran *et al.*, 2020a).

6.5.1.9 Invasive Species

The NBDC database also contains records of invasive species identified within the relevant hectad. Records of 'high impact' invasive species for hectads L85 and L84 are provided in Table 6-6.

Table 6-6 NBDC records for invasive species (hectads L85 and L84)

Common Name	Scientific Name	Hectad
American Mink	<i>Mustela vison</i>	L84, L85
Wireweed	<i>Sargassum muticum</i>	L84
Broad-leaved Rush	<i>Juncus planifolius</i>	L84, L85
Canadian waterweed	<i>Elodea canadensis</i>	L84
Giant rhubarb	<i>Gunnera tinctoria</i>	L84, L85
Himalayan Knotweed	<i>Persicaria wallichii</i>	L84
Greylag Goose	<i>Anser anse</i>	L85
Rhododendron	<i>Rhododendron ponticum</i>	L84, L85
Fallow deer	<i>Dama dama</i>	L84

Regulations 49 and 50 of the European Communities (Birds and Natural Habitats) Regulations 2011 (S.I. 477 of 2011) include legislative measures to deal with the introduction, dispersal, dealing in and keeping of non-native species. The above listed species are subject to restrictions under Regulations 49 and 50 and are included in the Third Schedule of the European Communities (Birds and Natural Habitats) Regulations 2011 (S.I. No. 477 of 2011).

6.5.1.10 Regional Hydrology

Regionally the Derryclare site is located in the Galway Bay North WFD catchment and Hydrometric area 31 of the Western River Basin District.

This catchment has a total area of 936km² and includes the area drained by all streams entering the tidal water between Nimmo's Pier and Syne Head, Co. Galway. The largest urban centre in the catchment is the western part of Galway city, with Bearna and Spiddle being the other main urban centres.

Locally, the site is located within the Recess river sub-catchment (Recess_SC_010) and the Recess_020 WFD river sub-basin. In the vicinity of the site, EPA mapping shows several watercourses (mountain streams) originating on the eastern slopes of Bencorr and Derryclare Mountains. In the north of the site, these watercourses are unnamed and flow to the east from Bencorr Mountain into Lough Inagh. To the south, the Derryclare stream (EPA Code: 31D10) flows to the east from Derryclare Mountain and discharges into Lough Inagh. Further south, 3 no. unnamed streams rise on the slopes of Derryclare mountain and flow to the southeast, discharging into Derryclare Lough. Derryclare Lough itself is also fed by the Tooreenacoona river (EPA Code: 31T01) which provides a hydrological connection between Lough Inagh in the north to Derryclare Lough in the south.

Downstream of Derryclare Lough, the Recess River (EPA Code: 31R01) crosses the N59 before discharging into Ballynahinch lake. Ballynahinch Lake is an east-west elongated lake which lies to the south of the Galway to Clifden Road. This lake is noted for salmon and sea-trout fishing. Downstream of Ballynahinch Lake, the Owenmore River flows to the south before it discharges into Roundstone Bay estuary. Further downstream the estuary discharges to the Betraghboy Bay coastal waterbody and the Aran Islands, Galway Bay, Connemara coastal waterbody.

A regional hydrology map is shown in Figure 9-2 of Chapter 9 of this EIAR.

6.5.1.10.1 Water Quality

River Basin Management Plans (RBMPs) have been published for all River Basin Districts in Ireland in accordance with the requirements of the Water Framework Directive. The online EPA Envision map viewer provides access to water quality information at individual waterbody status for all the River Basin Districts in Ireland. The EPA Envision map viewer was consulted on 01/02/2023 regarding the water quality status of the lakes adjacent and downstream and rivers which run within and directly adjacent to the Proposed Project site. The WFD River Waterbody Status 2013 – 2018 for the watercourses which flow through the site are shown in Table 6-7.

Table 6-7 Watercourses and waterbodies on site or adjacent to the site with relevant water quality statuses

Name	Location	Status	Risk
Tooreenacoona_010	Located north of and upstream of the site.	Moderate	At Risk
Recess_020	Located within and northwest of proposed site and upstream of the development.	Good	Not at Risk
Recess_030	Located southwest and downstream of the site.	Good	Not at Risk
Lough Inagh	Adjacent to the Proposed Project site	High	Not at Risk
Derryclare Lough	Adjacent to the Proposed Project site	High	Not at Risk
Ballynahinch Lake	Southwest of and downstream of the Proposed Project	High	Not at Risk

Status- WFD River Waterbody Status 2013-2018 Risk - WFD River Waterbodies Risk

Table 6-8 illustrates the respective Q-value status results from monitoring stations located along rivers which flow through the site or along rivers which are fed directly by watercourses which flow through or around the site.



Table 6-8 Water quality monitoring stations and associated Q values

Watercourse Name	Sampling Station	Location	Sampling Year	Q-Value & Water Quality Status
Tooreenacoona_010	Bridge u/s Lough Inagh (Upstream of site)	E82445.8 N255514	2021	4, Good
Recess_010	Weir Bridge (Upstream of site)	E83493.57 N247655.35	2021	4, Good
Recess_040	Cloonbeg Bridge (downstream of site)	E75895.45 N246570.53	2021	4-5, High
Recess_040	RECESS - 1 km u/s Toombeola Bridge (downstream of site)	E 75317.8 N 245167	1990	4, Good

Birds

A search of the National Biodiversity Data Centre (NBDC) website was conducted on the 24/01/2023. This helped to inform survey effort and provide a baseline of likely bird species in the area. Records of protected birds recorded from hectads L85 and L84 Red Listed, as per the Birds of Conservation Concern Ireland (BOCCI) or listed under Annex I of the EU Bird Directive (BD) and are provided in Table 6-4.

Table 6-9 NBDC records for bird species of conservation interest in hectads L85 and L84

Common name	Scientific name	Designation	Hectad
Black-headed Gull	<i>Larus ridibundus</i>	BOCCI – red list	L84, L85
Common Redshank	<i>Tringa totanus</i>	BOCCI – red list	L84
Corn Crake	<i>Crex crex</i>	BOCCI – red list, EU BD – Annex I	L84
Eurasian Curlew	<i>Numenius arquata</i>	BOCCI – red list	L84, L85
European Golden Plover	<i>Pluvialis apricaria</i>	BOCCI – red list, EU BD – Annex I	L84, L85
Herring Gull	<i>Larus argentatus</i>	BOCCI – red list	L84
Northern Lapwing	<i>Vanellus vanellus</i>	BOCCI – red list	L84, L85
Red Grouse	<i>Lagopus lagopus</i>	BOCCI – red list	L84, L85
Yellowhammer	<i>Emberiza citrinella</i>	BOCCI – red list	L84, L85
Great Northern Diver	<i>Gavia immer</i>	EU BD – Annex I	L84
Greater White-fronted Goose	<i>Anser albifrons</i>	EU BD – Annex I	L84
Merlin	<i>Falco columbarius</i>	EU BD – Annex I	L84, L85
Peregrine Falcon	<i>Falco peregrinus</i>	EU BD – Annex I	L84
Whooper Swan	<i>Cygnus cygnus</i>	EU BD – Annex I	L84, L85
Common Kingfisher	<i>Alcedo atthis</i>	EU BD – Annex I	L84
Grey Partridge	<i>Perdix perdix</i>	BOCCI – red list	L85
Red-billed Chough	<i>Pyrrhocorax pyrrhocorax</i>	EU BD – Annex I	L85

Merlin

Through consultation with the NPWS local staff, it was confirmed that Merlin are known to nest in woodland on an island in the southern section of Derryclare Lough. No records of nesting merlin within the Proposed Project site were identified.

6.5.1.12 Red Squirrel

In 2005, 19 red squirrels were translocated into Derryclare Nature Reserve, which is directly adjacent to the southern boundary of the Proposed Project site. The population at Derryclare has continued to increase and has expanded into much of the Proposed Project site, but numbers are concentrated around Derryclare Nature reserve and adjacent conifer plantations (Waters & Lawton, 2011). There are currently an estimated 20 red

squirrel in Derryclare woods. Based on ongoing monitoring studies from NUIG, the nature reserve and surrounding conifer plantations are considered the most important areas for this species in the area. Red squirrel are strongly associated with conifer plantation habitat, but their preferred habitat is mixed broadleaved woodland (FRSF, 2023).

6.5.1.13 Conclusions of the Desktop Study

The desktop study has provided information about the existing environment in Hectads L85 and L84, within which the Proposed Project site is located. The site is located in the Ballynahinch surface water catchment within Hydrometric Area 31 of the Western River Basin District.

On a more local scale, the Proposed Project site is located in the Recess_SC_010 WFD sub-catchment (Catchment 31) and within the RecesS_020 WFD river sub basin.

Multiple first and second order watercourses drain the Proposed Project site east into the either Lough Inagh or Derryclare Lough. Watercourses Tooreenacoona_010 and Recess_020 feed Lough Inagh from the north which in turn feeds Derryclare lough to the south.

The Proposed Project site is partially located within the Twelve Bens/Garraun Complex SAC [002031]. There is upstream hydrological connectivity to the Maumturk Mountains SAC [002008] and downstream hydrological connectivity to the Connemara Bog Complex SAC [002034].

Several Article 17 Annex I habitats are mapped adjacent or in close proximity to the Proposed Project site. These include the following which are mapped in Figure 6-4;

- Northern Atlantic wet heaths with *Erica tetralix* [4010]
- European dry heaths [4030]
- Blanket bogs (* if active bog) [7130]
- Calcareous rocky slopes with chasmophytic vegetation [8210]
- Siliceous rocky slopes with chasmophytic vegetation [8220]
- Old sessile oak woods with *Ilex* and *Blechnum* in the British Isles [91A0]

The desktop study has provided information about the existing environment in Hectad L85 and L84, within which the Proposed Project site is located.

The desk study identified that a variety of protected faunal species are known to occur within the study area, including red squirrel, otter, Atlantic salmon, and badger. The mammal species recorded during the desk study informed the survey methodologies undertaken during the site visits.



6.6 Description of the Existing Environment

6.6.1 Description of Habitats

The habitat descriptions below are derived from the findings of the ground truthing exercises carried out by MKO. Where differences have been identified from the previous habitat descriptions carried out Jackie Hunt (M.Sc.) and Louise Scally (M.Sc., Ph.D.) (Appendix 6-1), these have been highlighted below. The habitat classifications and codes correspond to those described in 'A Guide to Habitats in Ireland' (Fossitt 2000). Updated habitat maps of the site are provided in Figures 6-5 to 6-6. This also shows the smaller areas of peatland habitat within the site.

As explained in Section 6.1 of this report, and indicated in Figure 6-1, the EIAR Study Area is divided into three main divisions, Areas A, B, and C, as well Area D which captures outlying sections of the Proposed Project. Abundance of specific plant species are given in DAFOR scores: D = Dominant (>75%), A = Abundant (51-75%), F = Frequent (26-50%), O = Occasional (11-25%), R = Rare (1-10%).

Area A:

Area A, the northernmost section of the site of the Proposed Project, begins on the western slopes of Bencorr mountain, and initially sloped steeply in an easterly direction before flattening towards the shores of Lough Inagh.

The northern section of Area A was dominated by *Lowland blanket bog (PB3)*, that was historically planted but has been felled and has not been replanted since 2009 (Aniar, 2021). This habitat was dominated by species such as Purple Moor-grass (*Molinia caerulea*), Ling Heather (*Calluna vulgaris*), and hummocks of *Sphagnum* spp. (Plate 6-1). Other species recorded included Round-Leaved Sundew (*Drosera rotundifolia*), Bell Heather (*Erica cinerea*), Tormentil (*Potentilla erecta*), Small Lousewort (*Pedicularis sylvatica*), Deergrass (*Trichophorum germanicum*), and Beak Sedge (*Rhynchospora alba*). As this section transitions downslope towards Lough Inagh, regenerating native species, including Rowan (*Sorbus aucuparia*), Holly (*Ilex aquifolium*), and Birch (*Betula* spp.), along with Sitka Spruce (*Picea sitchensis*) and *Rhododendron*, become more prevalent.

Further south, a small stream rises in close proximity to the shores of Lough Inagh, supports *Non-calcareous spring (FP2)* habitat, dominated by Common Haircap Moss (*Polytrichum commune*) and *Sphagnum* spp. (Plate 6-2). This habitat also supported regenerating conifers, including Sitka Spruce and Lodgepole Pine (*Pinus contorta*).

Continuing south, an area categorised as *Other artificial lakes and ponds (FL8)*, was identified in a previously excavated area of ground, associated with the construction of the nearby access road (Plate 6-3) which runs throughout a large portion of the EIAR Study Area. Following this road south, a large expanse of *Recently-felled woodland (WS5)* is present (Plate 6-4) and, in nearing the boundary between Area A and Area B, an area of *Conifer plantation (WD4)*, consisting of Lodgepole Pine and Sitka Spruce, planted in the 1960s, was recorded.

Also located within Area A and categorised as Conifer plantation (WD4), were numerous stands of failed conifers, previously planted on deep peats in 1963. These deep peat habitats support abundant *Sphagnum* spp., mosses, Ling Heather, Round-leaved Sundew, Bell Heather, Tormentil, Star Sedge (*Carex echinate*), and Purple Moor-grass. *Rhododendron*, in the form of small-to-medium-sized clumps and seedlings was recorded and was noted as being "Occasional" as per the DAFOR scale.

The boundary between Area A and Area B is demarcated by *Eroding upland river (FW1)* habitat (Plates 6-4 & 6-5). Numerous streams are also located throughout Area A, which flowed north and east within the EIAR Study Area, discharging into Lough Inagh.

Where the previous habitat description refers to sections of Wet heath and Immature conifer plantation (HH3_WS2), this has been classified as Conifer plantation (WD4). Additionally, between the time of the

previous habitat survey and the ground truthing exercise, sections of Conifer Plantation (WD4) have been felled and are now classified as Recently felled woodland (WS5). All other habitats were in accordance with the previous habitat survey and mapping.

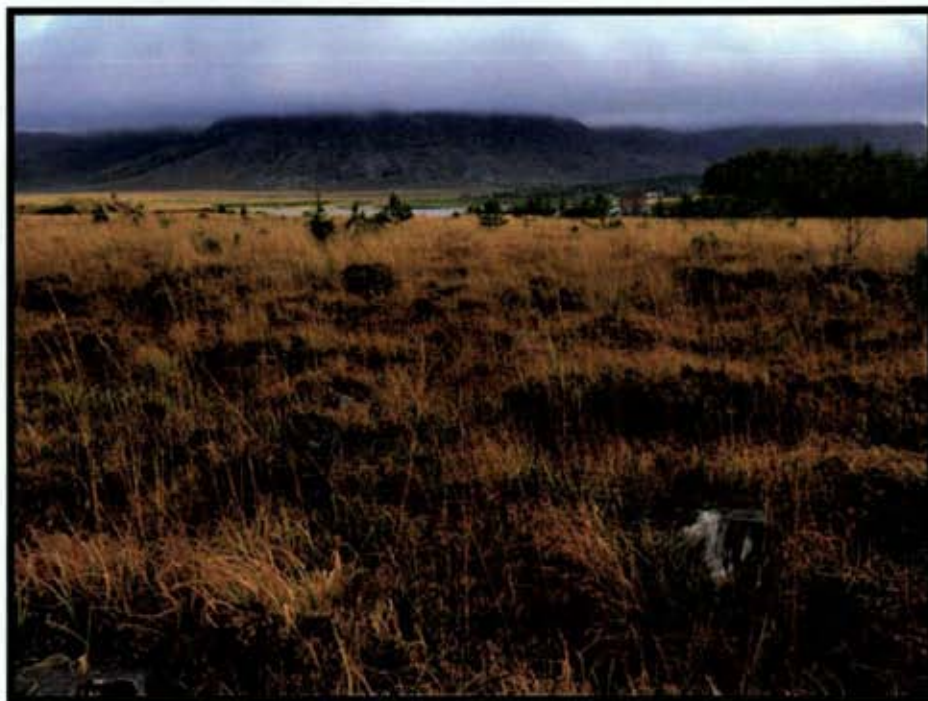


Plate 6-1 Lowland blanket bog (PB3) with Conifer plantation (WD4) and Lough Inagh in distance.



Plate 6-2 Non-calcareous spring (FP2) orientated northeast towards Lough Inagh.

PLANNING & DEVELOPMENT SECTION
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GALWAY COUNTY COUNCIL



Plate 6-3 Excavated ground categorised as Other artificial lakes and ponds (FL8) habitat.



Plate 6-4 Recently-felled woodland (WS5) and Eroding upland river (FW1) orientated to the south.

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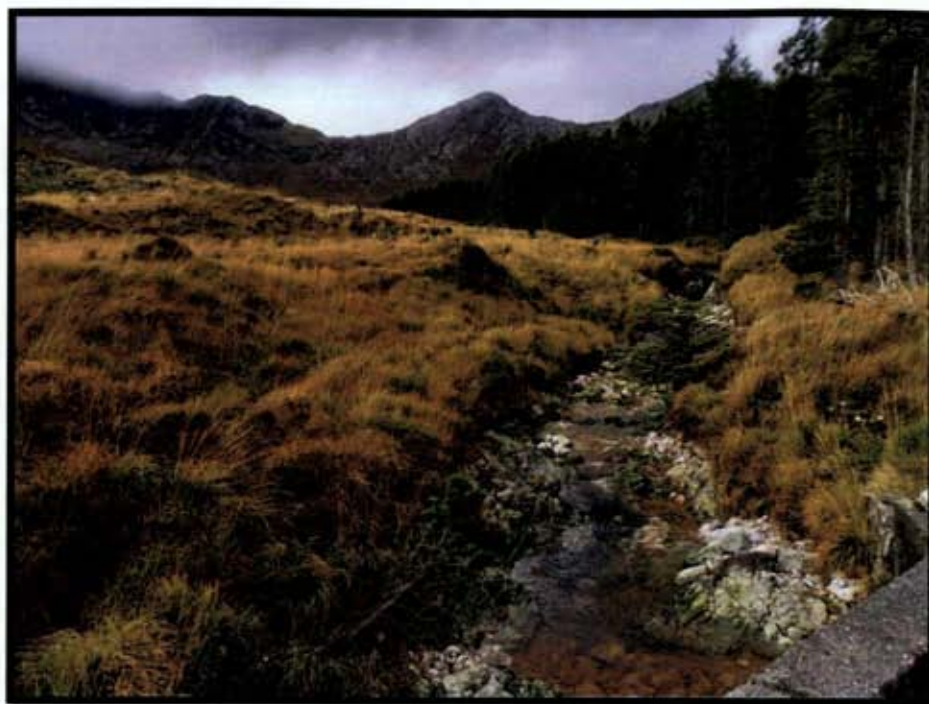


Plate 6-5 Eroding/upland river (FW1) orientated to the west.



Area B:

Area B, the central section of the ELAR Study Area, is located on the lower flanks of Derryclare mountain, and initially slopes steeply, but then more gradually as it proceeds east towards the shores of Lough Inagh. The area has been extensively modified by afforestation and was dominated by Conifer plantation (WD4) and Recently-felled woodland (WS5).

The eastern and more moderate slopes towards Lough Inagh were dominated by second rotation Conifer plantation. These plantations were predominantly comprised of younger trees (10-20-years old) and were yet to form an entire closed canopy. Furthermore, there are numerous areas within Area B where trees were previously planted and have since failed and/or where the land was too rocky or wet for trees to have been planted. While the peatland habitats underlying these conifer plantations have been modified by previous planting and afforestation, elements of the peatland community remain intact, including such indicator species as Ling Heather, Bell Heather, Tormentil, Star Sedge, Purple Moor-grass, and *Sphagnum* spp. mosses. Drier habitat, in the brash, stems, and stumps of failed forestry support additional species including Broad-leaved Enchanter's Nightshade (*Circaea lutetiana*), European Blackberry (*Rubus fruticosus*), *Polytrichum* spp. and a number of "dry" mosses. Natural regeneration of conifers was evident and as per the DAFOR scale, *Rhododendron* was considered to be "occasional".

Also located within the area, to the west and towards Derryclare mountain is a rocky summit with unplanted wet heath, categorised as a mosaic of *Wet heath (HH3)* and *Exposed siliceous rock (ER1)* (Plate 6-6). This area has not been previously modified by afforestation and retains a peat depth of <50 cm and a community reflective of wet heath habitat, including Ling Heather, Cross-leaved Heath (*Erica tetralix*), Bell Heather, Tormentil, Purple Moor-grass, Bog Asphodel (*Narthecium ossifragum*), Small Lousewort (*Pedicularis sylvatica*), Common Cottongrass (*Eriophorum angustifolium*), Black Bog-rush (*Schoenus nigricans*), and *Sphagnum* spp. mosses.

The above habitats were in accordance with the previous habitat survey and mapping.

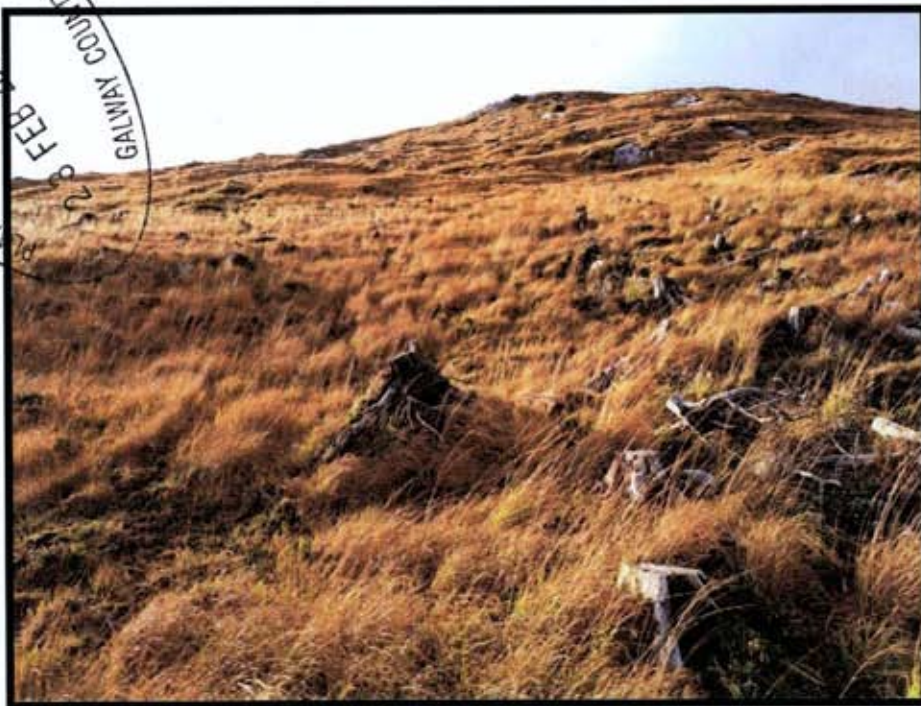


Plate 6-6 Mosaic of Wet heath (HH3) and Exposed siliceous rock (ER1) on the upper slopes of the Derryclare mountain, with Recently-felled woodland (WS5) to the foreground.

Area C:

Area C is located on the lower flanks of Derryclare mountain and slopes moderately to the east, where it reaches Derryclare Lough. The area has been extensively modified by afforestation and remains largely dominated by Conifer Plantation (WD4) but also supports significant Wet Heath (HH3) and Upland Blanket Bog (PB3) habitat (Plate 6-7).

The first and second rotation conifer plantations present within Area C are largely planted on moderately sloping areas and either blanket bog or a mosaic of blanket bog and wet heath habitat. These plantations are also characterised by the presence of rocky knolls, bare rock, windblown forestry (often dense and extensive in places), and areas of both deeper and shallower peat. As is the case through the majority of the site of the Proposed Project, drains, furrows, and ridges/mounds are common. Significant variation in canopy cover, reflective of variations in peat depth, water-table depth, and the presence of rocky knolls, are evident. As per the DAFOR scale, the abundance of *Rhododendron* within Area C is recorded as being "occasional to rare".

The upper slopes of Area C, on the lower flanks of Derryclare mountain were unplanted and dominated by blanket bog, wet heath, or a mosaic of blanket bog and wet heath habitat. An area of Wet willow alder ash woodland (WN6), located along the access track to the east (Plate 6-8), comprising Willow (*Salix spp.*), Alder (*Alnus glutinosa*), and Birch (*Betula pubescens*), is also located within Area C. On the day of the site visit in October 2022, harvesting was underway, and a new area of recently-felled woodland had been cleared (Plate 6-9). Additionally, an area categorised as a mosaic of Wet Grassland (GS4) and Scrub (WS1) (Plate 6-10), dominated by Purple Moor-grass, Rushes (*Juncus spp.*), and encroaching Sitka Spruce (*Picea sitchensis*) was located towards the southern extent of the access road located within the area.

During the ground truthing surveys, an area of Wet willow alder ash woodland (WN6) was identified along the site access track within this block, which was not recorded in the previous surveys. All other habitats were in accordance with the previous habitat surveys and mapping.



Plate 6-7 Unplanted upper slopes of Area C, orientated in a south-easterly direction towards Derryclare Lough, comprising Upland blanket bog (PB2) and Wet heath (HH3).





Plate 6-8 Pocket of wet willow alder ash woodland (WN6) located to the east of the access road.

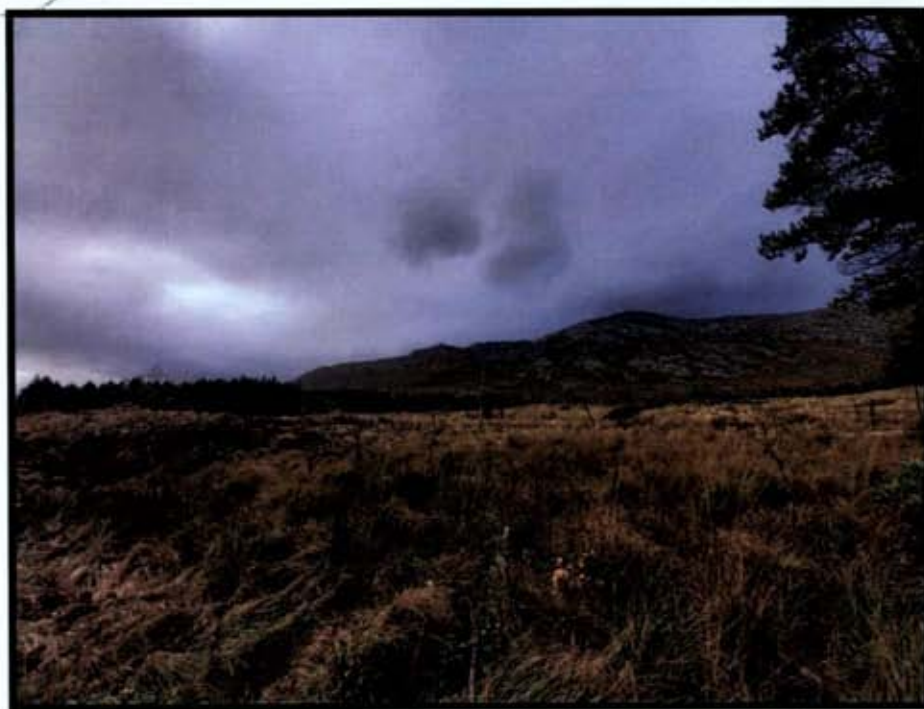


Plate 6-9 Area of Recently-felled woodland (WS5) located towards the southern boundary of Area C.



Plate 6-10 Mosaic of Wet grassland (GS4) and Scrub (WS1) with encroaching Sitka Spruce (*Picea sitchensis*) saplings.



Area D:

Area D encompasses a large peninsula along the south-eastern boundary of the Proposed Project, which extends east and into Derryclare Lough. It also includes lands further north, which separate Derryclare Lough and Lough Inagh. The peninsula was categorised as a mosaic of Conifer Plantation (WD4) and Wet Heath (HH3) (Plate 6-11). Evidence of recent planting was seen in the tree guards placed around saplings to protect them from foraging deer. The area to the north, separating the lakes, comprised a mixture of recently-planted and mature Conifer Plantation (WD4) (Plate 6-12).

The above habitats were in accordance with the previous habitat surveys and mapping.



Plate 6-11 Recently-planted Conifer plantation (WD4) located on the peninsula extending east into Derryclare Lough.

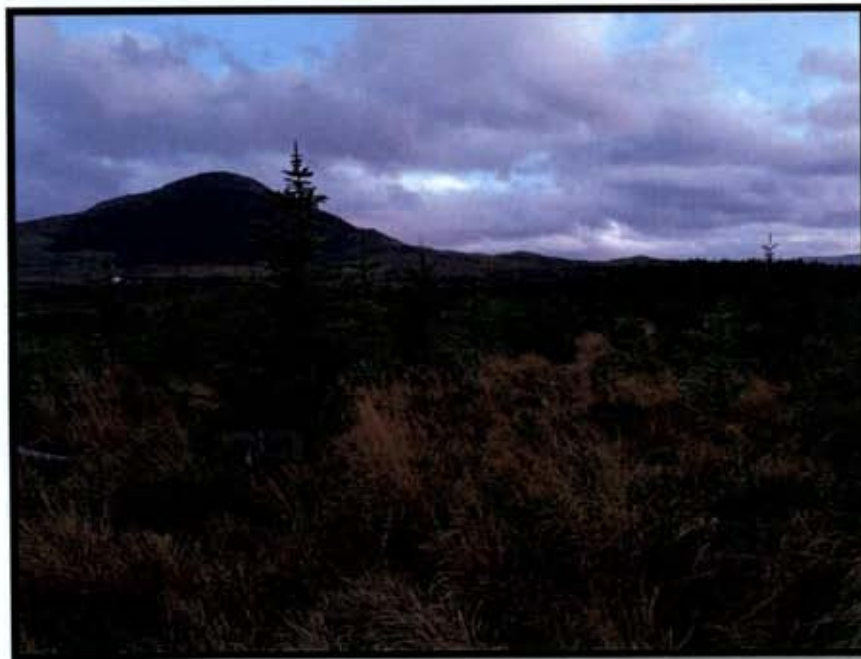
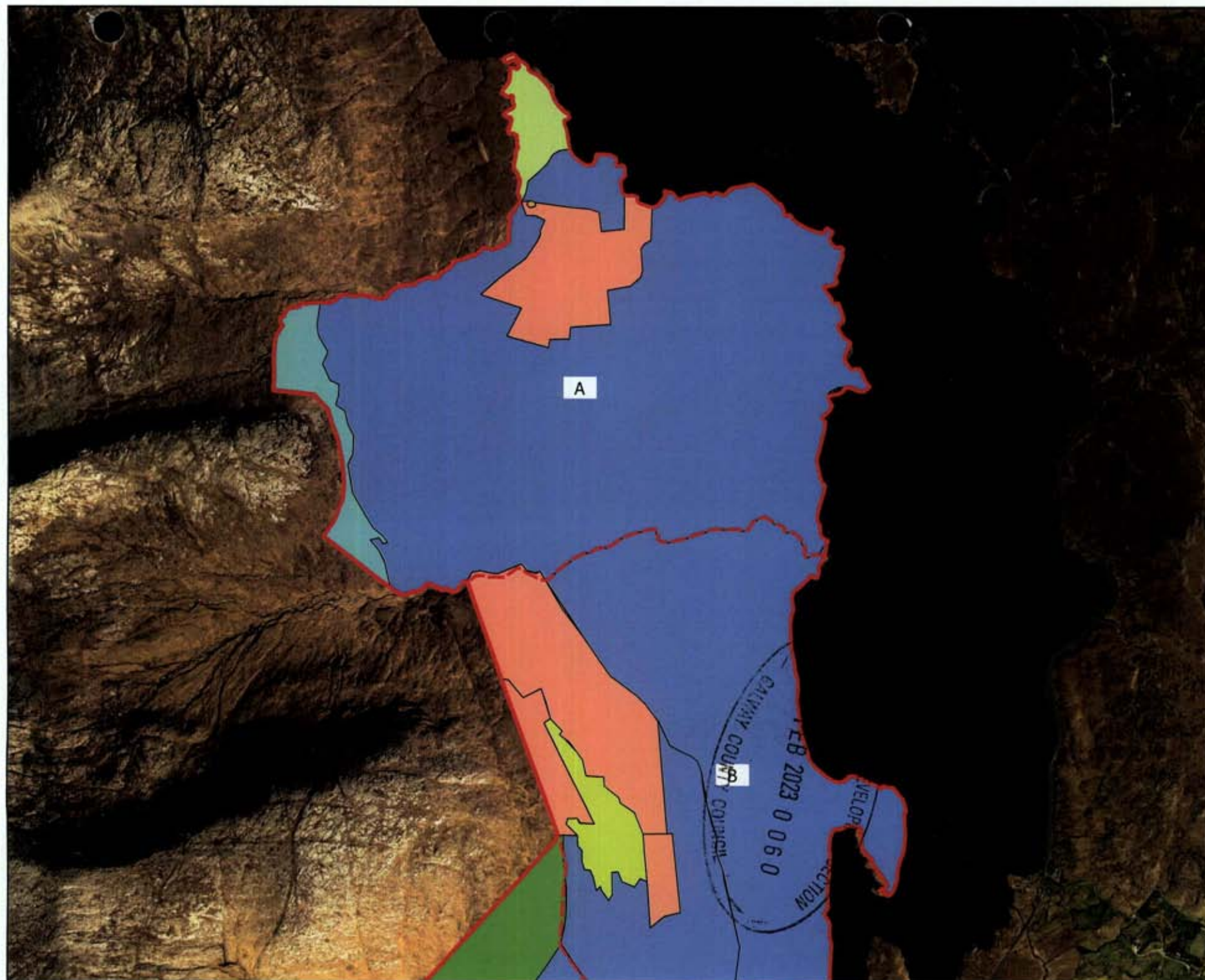


Plate 6-12 Recently-planted and mature Conifer plantation (WD4) on lands separating Derryclare Lough and Lough Inagh, orientated to the east towards the entrance to the site of the Proposed Project.



Map Legend

- Site Boundary
- Recolonizing bare ground/ Wet heath (ED3/HH3)
- Other artificial lakes and ponds (FL8)
- Wet Grassland / Scrub (GS4/WS1)
- Wet Heath (HH3)
- Wet heath/ Exposed siliceous (HH3/ER1)
- Heath Heath/ Blanket bog (HH3/PB2)
- Lowland Blanket bog (PB3)
- Conifer Plantation (WD4)
- Conifer Plantation/ Wet heath (WD4/HH3)
- Scrub (WS1)
- Recently felled woodland (WS5)



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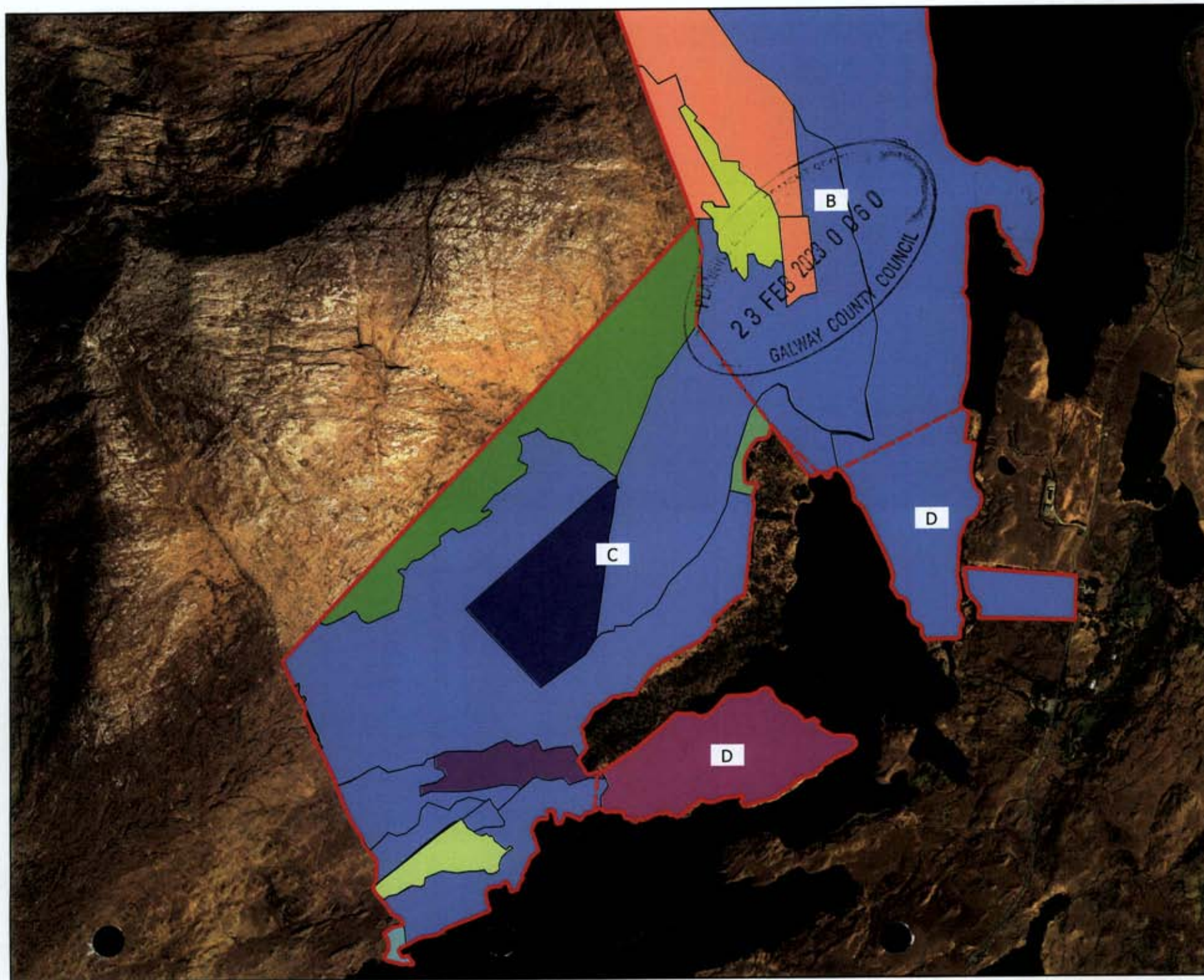
Drawing Title

Habitat Map (North)

Project Title
Proposed Derryclare Wild Western Peatlands Project

Drawn By PD	Checked By SM
Project No. 210603	Drawing No. 6-5
Scale 1:16000	Date 13/02/2023

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Map Legend

- Site Boundary
- Recolonizing bare ground/ Wet heath (ED3/HH3)
- Other artificial lakes and ponds (FL8)
- Wet Grassland / Scrub (GS4/WS1)
- Wet Heath (HH3)
- Wet heath/ Exposed siliceous (HH3/ER1)
- Heath Heath/ Blanket bog (HH3/PB2)
- Lowland Blanket bog (PB3)
- Conifer Plantation (WD4)
- Conifer Plantation/ Wet heath (WD4/HH3)
- Scrub (WS1)
- Recently felled woodland (WS5)



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Drawing Title

Habitat Map (South)

Project Title

Proposed Derryclare Wild Western Peatlands Project

Drawn By

PD

Checked By

SM

Project No

210603

Drawing No

6-6

Scale

1:16000

Date

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6.2 Fauna in the Existing Environment

6.6.2.1 Otter

No evidence of otter was recorded during the surveys. However, watercourses within the Proposed Project site provide suitable foraging and commuting habitat for this species and otter are likely to occur within the EIAR Study Area, at least on occasion. Additionally, Lough Inagh and Derryclare Lough adjacent to the Proposed Project site, provide suitable breeding, resting, foraging, and commuting habitat for otter. However, no evidence of otter was recorded.

6.6.2.2 Badger

No signs of badger foraging activity were recorded within or adjacent to the EIAR study area boundary, and no badger sett was recorded within the EIAR Study Area. The Proposed Project site does, however, provide suitable supporting habitat for this species and is likely to occur within the EIAR site boundary, at least on occasion.

6.6.2.3 Red Squirrel

No signs of red squirrel were recorded, including dreys and feeding remains. The Proposed Project site does, however, provide suitable supporting habitat for this species. Additionally, red squirrel were translocated into the Derryclare Nature Reserve in 2005, which is directly adjacent to the Proposed Project site.

6.6.2.4 Birds

Bird that were recorded during the walkover surveys included species that are typical of conifer plantation habitats with surrounding peatlands, mountains and lakes such as chaffinch (*Fringilla coelebs*), wood pigeon (*Columba palumbus*), goldcrest (*Regulus regulus*), Raven (*Corvus corax*), Rook (*Corvus frugilegus*), Hooded crow (*Corvus cornix*), blackcap (*Sylvia atricapilla*), wren (*Troglodytes troglodytes*), and dunnoek (*Prunella modularis*).

Although no species listed under Birds of Conservation Concern Irelands (BOCCI) Red List or under Annex I of the EU Birds Directive were identified during the site visits, the site does provide potential suitable supporting habitat for bird species typical of peatland habitats. The site also provides suitable habitat for merlin although none were recorded on the site during any of the surveys undertaken.

6.6.2.5 Other Species

Red Deer (*Cervus elaphus*) was observed within the Proposed Project site during the multi-disciplinary walkover surveys. Pine martin scat was also recorded within the site. No significant areas of suitable habitat for other taxa including invertebrates or amphibians, species listed in Annex II or IV of the EU Habitats Directive, or other species of conservation concern was identified within the boundaries of the Proposed Project site.

6.6.3 Invasive species

During field surveys, a search for Invasive Alien Species (IAS) listed under the Third Schedule of the European Communities Regulations 2011 (S.I. 477 of 2015) was conducted. Occasional recordings of *Rhododendron ponticum* was recorded throughout the Proposed Project site.

6.6.4 Importance of Ecological Receptors

Table 6-10 lists all identified receptors and assigns them an ecological importance in accordance with the *Guidelines for Assessment of Ecological Impacts of National Road Schemes* (NRA, 2009). This table also



provides the rationale for this determination and identifies the habitats and species that are Key Ecological Receptors (KERs). The potential for impacts on these ecological receptors is considered in Section 6.7 of this report and mitigation measures will be incorporated into the Proposed Project where required, to avoid potential significant impacts on the features.

Table 6-10 Key Ecological Receptors identified during the assessment.

Ecological feature or species	Reason for inclusion as a KER	KER
Designated sites	<p>A potential pathway for significant effects was identified on the following National Sites via habitat loss and deterioration in water quality arising from the felling and construction activities associated with the Proposed Project:</p> <p>Nationally Important Sites (NHAs & pNHAs)</p> <ul style="list-style-type: none"> ➤ The Twelve Bens/Garraun Complex pNHA [002031] ➤ Connemara Bog Complex pNHA [002034] <p>These sites are assigned <i>National Importance</i> and are included as a KER as there is potential for significant effect.</p> <p>Therefore, these Nationally Importance Sites have been included as a KER.</p>	Yes
	<p>European Designated Sites</p> <p>The following European Designated Sites were identified in the AA Screening which accompanies the planning application as being within the Likely Zone of Impact and are assessed fully in the NIS that accompanies this application:</p> <ul style="list-style-type: none"> ➤ The Twelve Bens/Garraun Complex SAC [002031] ➤ Connemara Bog Complex SAC [002034] ➤ Connemara Bog Complex SPA [004181] <p>These sites are assigned <i>International Importance</i> and are included as a KER as there is potential for adverse effects on these sites due to habitat loss/degradation and deterioration in water quality.</p> <p>Note: European Sites within the Likely Zone of Impact are considered in the NIS that accompanies this planning application.</p>	Yes
Wet grassland (GS4)	Wet grassland (GS4) has been classified as being of <i>Local importance (lower value)</i> as this habitat is common and widespread, highly modified and managed and of low biodiversity value. This habitat is therefore not included as a KER.	No
Upland blanket bog (PB2) Lowland blanket bog (PB3) Wet heath (HH3))	Upland blanket bog (PB2), Lowland blanket bog (PB3) and Wet Heath (HH3) cover areas of the Proposed Project site with upland blanket bog and wet heath forming a habitat mosaic in areas. Upland and lowland blanket bog conform to the Annex I listed habitat of the EU Habitats Directive 'Blanket bogs (if active bog) [7130]' and wet heath conforms to the Annex I habitat Northern Atlantic wet heaths with <i>Erica tetralix</i> [4010]. These habitats have been assigned County Importance as they are " <i>Sites containing area or areas of the habitat types listed in Annex I of the Habitats Directive that do not fulfil the criteria for valuation as of International or National importance</i> ". Where small sections of these habitats overlap with the Twelve Bens/Garraun Complex SAC, they have been assigned <i>International Importance</i> .	Yes

Ecological feature or species	Reason for inclusion as a KER	KER
	<p>The project will have an overall positive impact on the peatland habitats within the site. However, taking the precautionary approach, there is also potential for accidental loss or degradation of these habitats during felling and construction works associated with the proposed restoration project and therefore these habitats have been included as a KER.</p> <p>Therefore, it has been included as a KER.</p>	
Conifer plantation (WD4) Recently-felled woodland (WS5)	Conifer plantation (WD4) and felled conifer plantation classified as Recently-felled woodland (WS5) have been classified as being of <i>Local importance (lower value)</i> as these habitats are common and widespread in the wider environment, are highly modified and managed and are of low biodiversity value. This habitat is therefore not included as a KER.	No
Broadleaved Woodland	<p>A small area of Wet willow alder ash woodland (WN6) was recorded within the site and has been assigned <i>Local importance (higher value)</i> as this is a semi-natural habitat and is of high biodiversity value. However, there are no works proposed within or adjacent to this habitat and therefore, as there is no potential for impacts on this habitat, Wet willow alder ash woodland is not included as a KER.</p> <p>The proposed restoration works will involve the planting of 62.26 ha of native woodland throughout the site which has potential to have a positive impact on biodiversity within the site. Therefore, woodland is included as a KER.</p>	Yes
Exposed siliceous rock (ER1)	Exposed siliceous rock (ER1) has been classified as being of <i>Local importance (lower value)</i> as this habitat is common and widespread and is of low biodiversity value. This habitat is therefore not included as a KER.	No
Non-calcareous spring (FP2)	Non-calcareous spring (FP2) has been classified as being of <i>Local importance (higher value)</i> . However, as there will be no impact on this habitat, it has not been included as a KER.	No
Other artificial lakes and ponds (FL8)	Other artificial lakes and ponds (FL8) have been classified as being of <i>Local importance (lower value)</i> as this habitat is highly modified and is of low biodiversity value. This habitat is therefore not included as a KER.	No
Acid oligotrophic lake (FL2)	Lough Inagh and Derryclare Lough, both classified as Acid oligotrophic lakes (FL2), are located directly adjacent to the east boundary of the Proposed Project. Additionally, multiple watercourses drain the EIAR Study Area into these lakes. This habitat has been assigned <i>International Importance</i> as it is within the Twelve Bens/Garraun Complex SAC and is likely to conform to the Annex I listed habitat of the EU Habitats Directive 'Oligotrophic waters containing very few minerals of sandy plains' <i>Littorelletalia uniflorae</i> [3110]. Therefore, this habitat has been included as a KER.	Yes
Upland/eroding river (FW1) and aquatic receptors	There is potential for the Proposed Project to result in the surface runoff of pollutants into the Derryclare stream and other first order unnamed streams, located within the EIAR Study Area. This habitat has been assessed as <i>Local importance (higher value)</i> as it	Yes



Ecological feature or species	Reason for inclusion as a KER	KER
	serves as a conduit to areas of higher biodiversity value. Therefore, this habitat has been included as a KER .	
Birds	<p>The majority of bird species within the Proposed Project site comprised an assemblage of common birds typical of conifer plantation habitats with surrounding peatlands, mountains and lake habitats and have been assessed as Local Importance (higher value).</p> <p>Merlin are known to occur in the area of the Proposed Project and the Proposed Project site offers suitable habitat for this species. This species is listed as an SCI of Connemara Bog SPA, and this European Site is within 3 km of the Proposed Project site. This is within the core foraging range of merlin and therefore, merlin is assessed as <i>International Importance</i>.</p> <p>Therefore, birds have been included as a KER</p>	Yes
Otter	<p>No signs of otter activity and no otter breeding sites were identified during the site visit. The watercourses within the Proposed Project site were small, however they provide suitable commuting and foraging habitat for otter. Lough Inagh and Derryclare Lough, which are directly adjacent to the Proposed Project site, provide suitable breeding, resting, and foraging habitat for otter.</p> <p>Otter are listed as a QI of the Twelve Bens/Garraun Complex SAC, which is partially within the Proposed Project site, and are likely to occur within or adjacent to the Proposed Project site. Otter have been, therefore, assessed as <i>International Importance</i>.</p> <p>Therefore, otter have been included as a KER</p>	Yes
Red Deer	Red deer were identified within the Proposed Project site during the site visit. This species has been assessed as Local importance (<i>higher value</i>). However, habitat for this species is widespread in the area and there will be no significant impact on this species as a result of the restoration project. This species is therefore, not included as a KER.	No
Badger	No Badger setts were recorded within the site. While the site provides suitable habitat for badger and is likely to be used by a population of badger of local importance (<i>higher value</i>), suitable badger habitat is widespread in the area and no significant impact on this species as a result of works associated with the restoration project are anticipated. Therefore, badger is not included as a KER.	No
Red squirrel	<p>Red squirrel are known to occur within the Proposed Project site as they were translocated (19 individuals) into native woodland in Derryclare Nature Reserve in 2005, which is located adjacent to the southern boundary of the proposed restoration project. No evidence of red squirrel was recorded within the Proposed Project site during the 2022 multidisciplinary surveys. However, the Proposed Project site provides suitable foraging and breeding habitat for red squirrel, and this species is likely to utilise the site.</p> <p>This species is therefore, included as a KER</p>	Yes

Ecological feature or species	Reason for inclusion as a KER	KER
Pine marten	<p>The Proposed Project site is dominated by Conifer plantation which provides suitable foraging and breeding habitat for pine martin. This species has been assessed as Local importance (<i>higher value</i>).</p> <p>While large sections of this habitat are proposed to be removed, this habitat is common and widespread in the wider environment and the loss of suitable habitat for pine martin is not expected to be significant. This species is therefore, not included as a KER.</p>	No



6.7 Ecological Impact Assessment

6.7.1 Do-Nothing Effect

In the event that the proposed peatland restoration project does not go ahead, the existing Coillte conifer plantations, which occupy the majority of the Proposed Project site, will result in continued peat degradation resulting from conventional forestry practices that maintain an aerated soil through effective drainage. As the crop (forestry) moves into a new rotation, the site will be cultivated to maintain or improve the drainage to facilitate tree growth. This practice aerates the soils and results in oxidation and degrades the peat. The other habitats identified within the ELAR study area, including peatlands and associated habitats, would likely remain in their current condition or deteriorate further. In some drier, shallower areas of the peatland habitat, scrub is likely to develop and in time, this may undergo succession to small areas of woodland. The general biodiversity on the site, as described in this chapter, would likely deteriorate further due to increasing pressures from invasive conifers and Rhododendron and potentially increased grazing pressure from deer.

6.7.2 Likely Significant Effects During Construction Phase

Effects on Habitats During Construction

Table 6-11 below provides details of the extent of the recorded habitats within the ELAR Study Area, the extent of the habitat that will be lost to facilitate the Proposed Project and the percentage of the total area of that habitat in the ELAR study area that it represents.

Table 6-11 Extent of habitat lost to the Proposed Project and the percentage of the total area of that habitat on site

Habitat	Total Area (Ha) /Length (Km) in the site	Area (ha)/length (km) to be lost to development footprint	% of total to be lost	KER?
Wet grassland (GS4)	6.44 ha	0	0	No
Upland blanket bog (PB2)/ Wet heath (HH3) mosaic	32.53 ha	0	0	Yes
Upland blanket bog (PB2) Lowland blanket bog (PB3)	42.99 ha	0	0	Yes
Wet heath (HH3)	82.87 ha	0	0	Yes
Conifer plantation (WD4)/Recently Felled woodland (WS5)	387 ha	343 ha	88.6%	No
Wet willow alder ash (WN6)	1.09 ha	0	0	Yes
Exposed siliceous rock (ER1)	6.8 ha	0	0	Yes
Non-calcareous spring (FP2)	1.19 ha	0	0	Yes
Other artificial lakes and ponds (FL8)	0.045 ha	0	0	No
Acid oligotrophic lake (FL2)	0	0	0	Yes
Upland/eroding river (FW1) and aquatic receptors	-	0	0	Yes

6.7.2.2 Effects on non-KER habitats During Construction

The Proposed Project aims to restore approximately 281 ha of peatland habitat and plant 62.26 ha of native woodland within the site boundary. This represents a positive impact on these habitats within the site. The Proposed Project site includes habitats of Local Importance (*Lower Value*), including Wet grassland (GS4), Conifer plantation (WD4), Recently Felled woodland (WS5), and Other artificial lakes and ponds (FL8). These habitats have not been included as KERs (see Table 6-9).

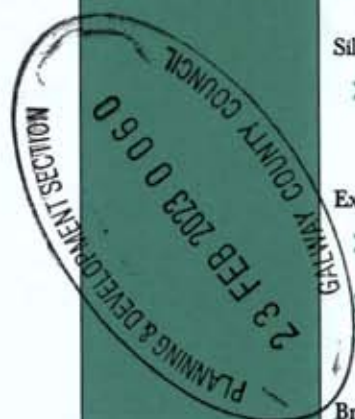
In order to facilitate the proposed restoration project, the Proposed Project will involve the felling/loss of approximately 343 ha of conifer plantation/recently felled conifer woodland habitats. There will be no loss of any other habitats of Local Importance (*Lower Value*) associated with the Proposed Project. There is no potential for significant loss of habitats of Local Importance (*Lower Value*).

The effects on habitats that are identified as KERs are described in the below tables.

6.7.2.2.1 Assessment of Potential Effects on Rivers, Streams, and Lakes and Sensitive Aquatic Faunal Species

Table 6-12 Potential for impact on rivers, streams and Sensitive Aquatic Species

Description of Effect	<p>This section assesses the potential for likely significant effects on aquatic receptors including aquatic habitats (i.e., watercourses and lakes), salmonids, lamprey, coarse fish, European eel, aquatic invertebrates, molluscs and other aquatic species identified during the desk study and field surveys, and which are likely to occur downstream of the Proposed Project.</p> <p>There is potential for felling of conifer plantation and construction activities, including the construction of new and upgrading of existing access roads and the upgrade to the surface of the existing carpark to result in the runoff of silt, nutrients and other pollutants such as hydrocarbons into the watercourses and waterbodies within and adjacent to the site. This represents a potential indirect effect on the aquatic receptors mentioned above in the form of habitat degradation through water pollution. The Proposed Project also involves a number of temporary watercourse crossings to facilitate harvesting of felled timber. Four natural watercourses and multiple man-made drains will require crossing. There will be no instream works associated with these temporary water crossings. All crossings will be clear span and will comprise of standard log bridge crossings typically used in normal forest operations.</p> <p>Additionally, felling operations disrupt the forestry nutrient cycle and there is the potential for phosphorous to be released into downstream watercourses resulting in nutrient enrichment i.e. eutrophication.</p> <p>These effects on water quality are fully described in Chapter 8 'Water' of this EIAR and are described here in relation specifically to ecology.</p> <p>Note: Whilst this impact assessment is in the habitats section, it also assesses the impact of the Proposed Project on aquatic species listed above.</p>
Characterisation of unmitigated effect	In the absence of mitigation, the indirect effect of water pollution on aquatic receptors during construction has the potential to be a short-term, significant, reversible impact on aquatic habitats and the aquatic fauna they support.
Assessment of Significance prior to mitigation	In the absence of mitigation and following the precautionary principle, there is potential for the Proposed Project to result in significant indirect effects on the identified aquatic habitats and species at an International scale in the form of pollution during the construction phase of the Proposed Project.
Mitigation	<p>A detailed Surface Water Management Plan for the Proposed Project is provided as Appendix 4.5 of this EIAR. This plan provides details of how surface water quality will be protected during the construction of the Proposed Project. In addition to this, specific mitigations are provided in relation to water quality in Chapter 8: 'Hydrology and Hydrogeology' of this EIAR. In addition, the Construction Environmental Management Plan (CEMP) that is provided as Appendix 4.3 of the EIAR, provides the details of exactly how the measures will be implemented during construction.</p>



	<p>Harvest management plans provided by Coillte, which are included as Appendix 4-2 of this ELAR, detail the standard mitigations and industry best practice measures which will be implemented during felling.</p> <p>The project will also adhere to all best practice water protection measures, set out in the Forest Harvesting & the Environment Guidelines (DAFM, 2000) and Felling & Reforestation Standards (v. Oct. 2019). Mitigation measures will include:</p> <p>Exclusion zones for machinery</p> <ul style="list-style-type: none"> Exclusion zones will be implemented, to ensure that machines will not traverse close to aquatic zones during forestry operations. With respect to exclusion zones, measures outlined in Section 6.1 of the Standards for Felling & Reforestation, (DAFM, 2019), will be adhered to. <p>Silt and sediment control during felling and reforestation</p> <ul style="list-style-type: none"> Barrier silt traps with geotextile and/or small logs will be deployed to control movement of silt/sediment, as specified in Section 7 of the Standards for Felling & Reforestation, (DAFM, 2019). <p>Extraction and removal of felled timber</p> <ul style="list-style-type: none"> Extraction routes will be carefully designed to avoid soil disturbance and brash mats will be put in place to protect soils. Locate timber landing bays at least 50m from the nearest aquatic zone. All measures outlined in section 9 of the Standards for Felling & Reforestation (DAFM, 2019) will be adhered to. <p>Brash management</p> <ul style="list-style-type: none"> Brash mats will be put in place to facilitate movement of machinery around the project area but will avoid proximity to relevant watercourses and aquatic zones as far as possible. Extraction racks will be aligned to the contour where possible, reducing the rate of water flow towards the receiving waters. Extra brash will be applied along extraction racks and at timber stacking areas, to accommodate higher levels of machine tracking, using extra lengths of timber to protect sensitive locations. No snedding (delimbing) will be carried out within environmental setbacks along aquatic zones/relevant watercourses. <p>Otter Mitigation</p> <ul style="list-style-type: none"> During felling and extraction, a minimum 10m exclusion zone will be applied along the edge of any aquatic zone on or adjoining site. Machine traffic and timber stacking will not be permitted within this zone. Trees within the reach of the harvester arm will be felled by harvester, and snedded and bunched outside the exclusion zone. Trees outside machine reach will be felled manually. Felled trees will be winched out of the exclusion zone where appropriate and safe to do so, or removed by extended harvester arm, for subsequent snedding and processing outside the exclusion zone avoiding mobilisation of soils. All other requirements relating to water exclusion zones, as set out in Section 6.1 of the Standards for Felling & Reforestation will be adhered to (DAFM, 2019). There will be no cleaning of any machinery within 50m of an aquatic zone.
<p>Residual Effect following Mitigation</p>	<p>Following the implementation of the mitigation measures as described above, there will be no significant residual effect on aquatic habitats or species as a result of the Proposed Project. The Proposed Project will not cause any waterbodies to deteriorate, irrespective of their current condition, and will not in any way prevent any waterbodies from meeting the biological and chemical characteristics for good ecological status.</p>

6.2.2.2 Assessment of Potential Effects on Peatlands and Associated Habitats

Table 6-13 Loss of peatlands and associated habitats

Description of Effect	<p>The Proposed Project involves measures to restore and rehabilitate approximately 281 ha of blanket bog and wet heath habitat that is currently planted with conifer plantation. The main restoration measures will include forestry felling, drain blocking and ground reprofiling. This will have an overall positive effect on the peatland habitats within the site.</p> <p>Whilst the impacts of the Proposed Project are predominantly positive in nature, taking a highly precautionary approach, there is also potential for accidental loss of or encroachment onto peatland habitats during felling and extraction works and during works involved in the upgrade of existing roads and construction of new access roads. Taking a precautionary approach there is also potential for degradation of peatland habitats due to run-off of pollutants as a result of the above works.</p>
Characterisation of unmitigated effect	<p>The restoration and enhancement of approx. 281 ha of blanket bog and wet heath habitats will have a permanent positive effect on these habitats within the site.</p> <p>The potential loss of or degradation of peatland habitats as result of encroachment of machinery or the run-off of pollutants has the potential to result in a long-term slight negative effect on peatland habitats.</p>
Assessment of Significance prior to mitigation	<p>The restoration and enhancement of approximately 281 ha of blanket bog and wet habitat is likely to be a significant positive impact on these habitats.</p> <p>There is no potential for any significant negative effect on peatland habitats as a result of encroachment of machinery or the run-off of pollutants during the construction of the Proposed Project.</p>
Mitigation	<p>The following mitigations and best practice measures will be applied during the construction phase to avoid encroachment on peatland habitat;</p> <ul style="list-style-type: none"> ➤ Where ground re-profiling is required, a 10 meter will be applied where only drain blocking and manual conifer removal or ring barking will occur. ➤ Where peatland habitats are located adjacent to felling and construction activities associated with the development, including construction of a new and upgrading of existing access roads, fencing will be erected between the works area and this habitat to ensure no machinery encroaches onto the peatland habitat. ➤ All machinery operators will be made aware of the sensitive nature of peatland habitats by the site manager. ➤ Mitigations provided in Table 6.12 under Section 6.7.2.1.1 above provide measures that will be put into place to avoid the run-off of pollutants into adjacent and downstream habitats.
Residual Effect following Mitigation	<p>Following the standard procedures for peatland restoration and enhancement as detailed Section 4.7.7 of Chapter 4; Description of this EIAR, adhering to the mitigations and best practice measures detailed above and the continued maintenance and monitoring of the Proposed Project, the Proposed Project will have a significant positive impact on peatland habitats within the site.</p>

6.7.2.2.3 Assessment of Potential Effects on Woodland Habitats

Table 6-14 Loss of peatlands and associated habitats

Description of Effect	<p>The Proposed Project includes the replanting approximately 62.26 ha of native pioneer woodland in place of existing conifer plantation. To achieve this, activities will mainly include forestry felling, windrowing and scrap mounding, bare root planning and seed planting, and the construction of deer fencing.</p>
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	<p>The replanting of native pioneer woodland aims to extend the area of existing native woodland within and adjacent to Derryclare Nature Reserve, which is adjacent to the southern boundary of the Proposed Project site. It also aim to extend the existing Annex I listed Sessile Oak woodland, within Derryclare Nature Reserve.</p> <p>This will have an overall positive effect on native woodland habitats within the site.</p> <p>Whilst the impacts of the Proposed Project are predominantly positive in nature, taking an extremely precautionary approach there is also potential for accidental loss of or encroachment onto existing woodland habitat during felling and extraction works and during works involved in the upgrade of existing roads and construction of new access roads.</p>
Characterisation of unmitigated effect	<p>The replanting of approx. 62.26 ha of native pioneer woodland in place of conifer plantation will have a permanent positive effect on woodland habitats within the site.</p> <p>The potential loss of or degradation of woodland habitats as result of encroachment of machinery has the potential to result in a long term slight negative effect on woodland habitats.</p>
Assessment of Significance prior to mitigation	<p>The replanting of approx. 62.26 ha of native pioneer woodland in place of conifer plantation will have a permanent significant positive effect on woodland habitats within the site.</p> <p>There is no potential for any significant negative effect on broadleaved woodland habitats as a result of as result of encroachment of machinery or the run-off of pollutants during the construction of the Proposed Project.</p>
Mitigation	<p>The Proposed Project will result in an overall positive effect on woodland habitats within the Proposed Project site. Nonetheless the following maintenance and monitoring measures will be implemented to ensure the success of the habitat restoration and enhancement project.</p> <ul style="list-style-type: none"> ➤ Annual monitoring of tree survival rates will occur in the areas where native woodland has been planted. If necessary supplemental planting of trees (i.e. filling in) will occur to ensure that the target density is achieved by year 4. Supplemental planting, if necessary, will occur in the autumn or spring planning windows. ➤ Invasive species management for Rhododendron and deer will continue on an annual basis following the completion of the construction phase of the project. The proposed methodology for invasive species management is described in Section 4.7.10 of Chapter 4; Description of this EIAR. <p>The following mitigations and best practice measures will be applied during the construction phase to avoid encroachment into existing woodland habitats;</p> <ul style="list-style-type: none"> ➤ Where woodland habitats are located adjacent to felling and construction activities associated with the development, including construction of a new and upgrading of existing access roads, fencing will be erected between the works area and this habitat to ensure no machinery encroaches onto the woodland habitat. ➤ All machinery operators will be made aware of the sensitive nature of peatland habitats by the site manager.
Residual Effect following Mitigation	<p>Following the standard procedures for replanting woodland as detailed Section 4.7.4 of Chapter 4; Description of this EIAR, adhering to the mitigations and best practice measures detailed in the CEMP, and the continued maintenance and monitoring of the Proposed Project, the Proposed Project will have a significant positive impact on woodland habitats within the site.</p>

2.3 Effects on Protected Fauna During Construction

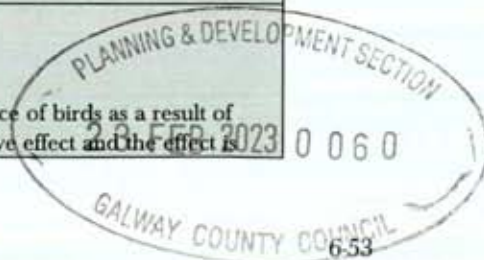
The construction phase of the Proposed Project has the potential to result in habitat loss/degradation and disturbance impacts on faunal species that were recorded on the site but were not included as KERs, see Table 6-9. Given the extensive area of habitat that will remain undisturbed throughout the site and the avoidance of the most significant areas of faunal habitat (peatlands and watercourses), no significant effects on non-KER faunal biodiversity is anticipated as a result of the Proposed Project. Therefore, these species were excluded from further assessment.

The potential for significant effects on aquatic species is restricted to indirect effects on their habitat resulting from water pollution. This has been assessed in Section 6.7.2.1.1 above and is not repeated below.

6.7.2.3.1 Assessment of Potential Effects on Birds

Table 6-15 Assessment of Potential Impacts on Birds

Description of Effect	Habitat Loss/ Degradation
	<p>The bird species recorded within the Proposed Project site during the walkover surveys were common and widespread and the Proposed Project is unlikely to result in any significant loss or degradation of habitat for these species.</p> <p>Whilst merlin were not recorded from the site of the Proposed Project, the species has been recorded breeding on an island in the southern section of Derryclare Lough. Merlin are known to breed between the months of the March and August, inclusive and occupy vacant corvid nests within 100m of the forestry edge (Lusby <i>et al.</i>, 2017). Taking a precautionary approach, there is potential for the felling associated with Proposed Project to result in the loss of some suitable habitat for merlin.</p> <p>The restoration of blanket bog and wet heath within the site has potential to result in an increase in habitat for bird species typical of such peatland habitats.</p>
Characterisation of unmitigated effect	Disturbance
	<p>Activities associated with the Proposed Project include the felling of conifer plantations, habitat restoration and enhancement, upgrading of existing road and construction of new access roads, temporary water crossings, the resurfacing of an existing carpark and fencing. These activities all require the use of heavy machinery and increased anthropogenic activity. There is, therefore, potential for the Proposed Project to result in disturbance to breeding birds, potentially resulting in mortality to juvenile birds.</p>
Characterisation of unmitigated effect	Habitat Loss/ Degradation
	<p>Taking a precautionary approach, the felling of conifer plantation has potential to result in a permanent negative effect on nesting habitat for a range of common bird species. Although merlin are known to utilise conifer plantation, the known records for breeding merlin in the area are from an island in the southern section of Derryclare Lough. Given the presence of abundant suitable habitat for nesting birds in the wider area the impact is assessed as slight.</p> <p>The restoration of blanket bog and wet heath will result in an overall increase of peatland habitat area and therefore an increase in suitable potential habitat for bird species typical of peatland habitats. This has potential to have a permanent significant positive effect.</p>
Characterisation of unmitigated effect	Disturbance
	<p>Taking a precautionary approach, the potential for disturbance of birds as a result of construction activities is assessed as a slight short-term negative effect and the effect is</p>



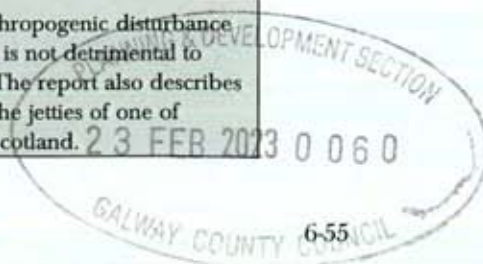
	reversible given the temporary nature of the works. The magnitude of this impact has the potential to be moderate if the works result in mortality of young birds in the nest.
Assessment of Significance prior to mitigation	Habitat Loss/ Degradation There is no potential for significant effects on bird species as a result of habitat loss. There is potential for significant positive effects for peatland bird species, as a result of habitat restoration.
	Disturbance There is potential for significant effects on bird species as a result of disturbance from the construction works associated with the Proposed Project.
Mitigation	Habitat Loss/ Degradation Following a precautionary approach, a pre-commencement bird survey will be carried out to identify whether merlin are nesting within the Proposed Project site. This will be undertaken within the merlin breeding season (1st March to 31st August inclusive). Should nests be identified, an exclusion zone of 500m will be established until the end of the breeding season. Additionally, the following mitigations and best practice procedures will be followed regardless of if merlin are recorded, to ensure that no felling of breeding merlin habitat will occur during the breeding season. <ul style="list-style-type: none"> ➤ No felling or other forestry operations associated with the Proposed Project shall take place during the period 1st March to 31st August inclusive, within 100 metres of the forest edge, where such forest edge is immediately adjacent to moors, heathland, peat bogs or natural grassland; or within 100 metres of a clearing in the forest of larger than one hectare. ➤ Such operations can commence in sections of the project area furthest away from the 100-metre exclusion zone. Such operations can progress towards this exclusion zone but can only enter it during the period 1st September to 29th February inclusive.
	Disturbance Disturbance limitation measures will be adhered to, which include the following: <ul style="list-style-type: none"> ➤ All plant and equipment for use will comply with Statutory Instrument No 359 of 1996 "European Communities (Construction Plant and Equipment) (Permissible Noise Levels) Regulations 1996". ➤ Plant machinery will be turned off when not in use. ➤ Operating machinery will be restricted to the proposed works site area. ➤ Construction works will be limited to daylight hours and artificial lighting to facilitate works will not be permitted.
Residual Effect following Mitigation	Following the implementation of the mitigation measures as described above, there will be no significant residual effect on birds, including merlin. The Proposed Project will not result in significant habitat loss for any bird species and provided disturbance limitation measures are followed, there will be no significant impacts via disturbance.

6.7.2.3.2 Assessment of Potential Effects on Otter

Table 6-16 Assessment of Potential Impacts on Otter

	Habitat Loss/ Degradation
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Description of Effect	<p>The felling and construction activities associated with the Proposed Project have the potential to result in deterioration of water quality within and downstream of the Proposed Project site. Deterioration of water quality, which could result in degradation of otter foraging habitat, is considered in Table 6-11 above and is not repeated in this section. No otter resting or breeding sites were identified within the site and there will be no loss of otter breeding habitat. There are no instream works proposed as part of the Proposed Project.</p>
	<p>Disturbance</p> <p>Although no signs of breeding otter, including holts, slides, and couches, were recorded within the Proposed Project site, Lough Inagh and Derryclare Lough, which are adjacent to the Proposed Project site, provide potential suitable breeding, resting, and foraging habitat for otter.</p> <p>Taking the precautionary approach, the construction phase of the Proposed Project has the potential for some localised disturbance to otter resulting from noise and increased anthropogenic activities.</p>
Characterisation of unmitigated effect	<p>Habitat Loss/ Degradation</p> <p>The potential for degradation of otter habitat due to deterioration of water quality is assessed in Table 6-12 above.</p>
	<p>Disturbance</p> <p>In the absence of mitigation and best practice measures, and taking the precautionary approach, there is potential for the construction phase of the Proposed Project to result in short-term slight impacts on otter.</p>
Assessment of Significance prior to mitigation	<p>Habitat Loss/ Degradation</p> <p>The potential for degradation of otter habitat due to deterioration of water quality is assessed in Table 6-12 above.</p>
	<p>Disturbance</p> <p>There is no potential for significant effects on otter species as a result of disturbance.</p>
Mitigation	<p>Habitat Loss/ Degradation</p> <p>Mitigations provided for in Table 6-11 above prevent the runoff of pollutants into surface systems and to suitable otter habitat.</p>
	<p>Disturbance</p> <p>Otter are predominantly crepuscular in nature and are unlikely to be adversely impacted by the proposed works. Construction activity will be confined to daytime hours, thus minimizing potential disturbance related impacts to the species. The NPWS Threat Response Plan for Otter acknowledges that "Little evidence has come to light in recent studies to suggest that disturbance by recreation is a significant pressure." It also identifies that Otter are known to travel significant distances from streams and lakes in search of new territory and feeding areas.</p> <p>Channin P (2003)¹ provides a literary review with regard to anthropogenic disturbance and refers to several reports which have found that disturbance is not detrimental to Otters (Jefferies (1987), (Durbin 1993). (Green & Green 1997). The report also describes successful breeding in towns, under ferry terminals and under the jetties of one of Europe's largest oil and gas terminals at Sullom Voe in North Scotland.</p>



	<p>Irish Wildlife Manual No 23 (National Otter Survey of Ireland 2004/2005) found no significant relationship between disturbance and otter occurrence. In addition, no significant difference in otter presence was found between sites with and without recreational activity. It also states, "the lowest percentage occurrence was found at the sites with the lowest recorded disturbance!" Irish Wildlife Manual No 76 (National Otter Survey of Ireland 2010/2012) notes that the occurrence of Otter was unaffected by perceived levels of disturbance at the survey sites. It also notes that there is little published evidence demonstrating any consistent relationship between Otter occurrence and human disturbance (Mason & Macdonald 1986, Delibes et al. 1991; Bailey & Rochford, 2006).</p> <p>Based on the above review of scientific literature and on the best practice disturbance limitation measures included below the potential for adverse impact on the integrity of the Otter population associated with the Twelve Bens/Garraun Complex SAC [002031] as a result of the construction and operational phases of the Proposed Project can be excluded.</p> <p>No disturbance related impacts on otter will therefore occur.</p> <p>Best practice disturbance limitation measures.</p> <ul style="list-style-type: none"> ➤ All construction plant and equipment to be used on-site will be modern equipment and will comply with the European Communities (Construction Plant and Equipment) (Permissible Noise Levels) Regulations 1998, and any subsequent amendments. ➤ Plant machinery will be turned off when not in use. Machines, which are used intermittently, will be shut down during those periods when they are not in use. ➤ Operating machinery will be restricted to the Proposed Project site boundary. ➤ It is expected that works will occur during normal working hours which will be agreed with the local authority in consultation with the appointed contractor prior to works commencing. ➤ Light spills during construction works will be minimised where possible thus reducing the effect on areas outside the Proposed Project, and consequently on fauna of conservation value including otter.
Residual Effect following Mitigation	Following the implementation of the mitigation measures as described above, there will be no significant residual effect on otter.

6.7.2.3.3 Assessment of Potential Effects on Red Squirrel

Table 6-17 Assessment of Potential Impacts on red squirrel

Description of Effect	<p>Habitat Loss/Degradation</p> <p>Red squirrel are known to occur within the Proposed Project site and the site provides suitable habitat for red squirrel. The felling activities associated with the Proposed Project have the potential to result in the loss/degradation of suitable habitat for red squirrel within the proposed restoration site.</p>
	<p>Disturbance</p> <p>Activities associated with the Proposed Project include the felling of conifer plantations, habitat restoration and enhancement, upgrading of existing road and construction of new access roads, temporary water crossings, the resurfacing of an existing carpark and fencing. These activities all require the use of heavy machinery and increased anthropogenic activity. There is, therefore, potential for the Proposed Project to result in disturbance to red squirrel, potentially resulting in mortality to juveniles.</p>

Characterisation of unmitigated effect	Habitat Loss/ Degradation <p>Given the abundance of suitable habitat in the wider area, the retention of large sections of 2nd rotation forestry, the sequential approach to the felling activities (20 felling blocks over 5 years), the development of mixed conifer/native woodland via natural regeneration, and the proposed planting of 62.26 ha of permanent native woodland within the site, the Proposed Project has potential to result in a permanent slight negative effect on red squirrel.</p>
	Disturbance <p>Taking a precautionary approach, the potential for disturbance of red squirrel as a result of felling and construction activities is assessed as a slight short-term negative effect and the effect is reversible given the temporary nature of the works. The magnitude of this impact has the potential to be moderate if the works result in mortality of juveniles.</p>
Assessment of Significance prior to mitigation	Habitat Loss/ Degradation <p>There is no potential for significant effects on red squirrel as a result of habitat loss.</p>
	Disturbance <p>There is potential for significant effects on red squirrel as a result of disturbance from the construction phase of the Proposed Project.</p>
Mitigation	Habitat Loss/ Degradation <p>Following a precautionary approach, a pre-commencement red squirrel survey for each felling block will be carried in advance of felling, to identify whether any breeding red squirrel or dreys are located within that felling block. Surveys will be carried out as per NRA guidance (NRA, 2009, Ecological Surveying Techniques for Protected Flora and Fauna during the Planning of National Road Schemes. Dublin: National Roads Authority).</p> <p>Should active dreys be identified within the felling block to be felled, the following mitigations and best practice procedures will be followed to ensure that no breeding red squirrel sites are impacted:</p> <ul style="list-style-type: none"> ➤ avoid clearfelling in the breeding season from February – September. Where this is not possible, zone felling away from the any identified dreys up to the end of June. <p>Additionally, the following measures will be followed on a precautionary basis:</p> <ul style="list-style-type: none"> ➤ As the proposed felling will result in a temporary reduction of food resources, supplementary feeding of red squirrel will be carried out. <p>The proposed restoration project will include the replanting of 62.26 ha of native scrub woodland, which will potentially result in a permanent significant positive effect on red squirrel as it will provide suitable habitat for this species.</p>
	Disturbance <p>Disturbance limitation measures will be adhered to, which include the following:</p>



	<ul style="list-style-type: none"> › All plant and equipment for use will comply with Statutory Instrument No 359 of 1996 "European Communities (Construction Plant and Equipment) (Permissible Noise Levels) Regulations 1996". › Plant machinery will be turned off when not in use. › Operating machinery will be restricted to the proposed works site area. › Construction works will be limited to daylight hours and artificial lighting to facilitate works will not be permitted.
Residual Effect following Mitigation	Following the implementation of the mitigation measures as described above, there will be no significant residual effect on red squirrel. The Proposed Project will not result in significant habitat loss for this species and provided disturbance limitation measures are followed, there will be no significant impacts via disturbance.

Vegetation Control/Invasive Species

The Third Schedule invasive species *Rhododendron ponticum* was recorded throughout the site. From a precautionary perspective, a pre-construction invasive species survey will be undertaken as part of the proposed project. This will provide updated data in advance of any construction given the intervention time period between the original survey work and any future grant of permission/ construction. Section 4.7.10 of this ELAR details measures to control and manage this invasive species. Below outlines standard best practices procedures to be implemented to ensure there is no further spread of this invasive species.

6.7.3.1.1 Proposed Mitigation Measures

An invasive species Management Plan will be produced to ensure sufficient management of *Rhododendron* is carried out within the site and that there is no continued spread as a result of the Proposed Project.

Best practice measures in relation to invasive species are described below:

- › Good construction site hygiene will be employed to prevent introduction of problematic invasive alien plant species (e.g. Japanese knotweed, *Rhododendron*, Giant Rhubarb etc.) by thoroughly washing vehicles prior to entering the site.
- › Any soil and topsoil required on the site will be sourced from a stock that has been screened for the presence of any invasive species and where it is confirmed that none are present.
- › The treatment and control of invasive alien species will follow guidelines issued by the National Roads Authority – The Management of Noxious Weeds and Non-native Invasive Plant Species on National Roads (NRA 2010).

6.7.3.1.2 Residual Impact

No impact.

6.7.3.1.3 Significance of Effects

With the above mitigation in place there will be no significant effect with regard to Third Schedule invasive species as a result of the proposed projects.

6.7.4 Likely Significant Effects During Operational Phase

6.7.4.1 Effects on Habitats during Operation

The operational phase of the Proposed Project will not result in any additional land take or loss of peatland habitats and as such there is no potential for any significant effects in this regard.

As part of the Proposed Project, approx. 281 hectares of existing forestry will be restored to blanket bog and wet heath habitat. This will be achieved through the felling of existing forestry, blocking site drains and where suitable reprofiling of ploughed areas. Additionally, approx. 62.26 hectares of coniferous forestry will be felled and replanted with native scrub woodland. Once the felling and construction activities associated with the Proposed Project cease, it is anticipated that the target peatland and woodland habitats become established during the operational phase of the Proposed Project. Therefore, there is potential for a positive effect on peatland and woodland habitats.

As a result of the change of land use, from commercial forestry to restored peatland and woodland habitats, existing pressures on water quality will be lessened as a result of the Proposed Project. Forestry activities within the Proposed Project site, including felling, replanting, fertilizer application, and timber extraction will cease, lessening the potential for the runoff of pollutants associated with these activities into downstream watercourses and waterbodies.

Therefore, there is likely to be a positive effect on rivers, streams, and lakes and sensitive aquatic faunal species within and downstream of the Proposed Project site, as a result of the operational phase of the Proposed Project.

6.7.4.2 Effects on Fauna during Operation

The operation of the Proposed Project will not result in any additional habitat loss or deterioration for faunal species, nor will it result in an increase in anthropogenic activity. There is no potential for significant negative effects on terrestrial fauna such as birds and otter, which were identified as KERs, during the operational phase of the development. The increase in peatland habitat area has potential to have a positive impact on peatland bird species by providing additional areas of suitable habitat.

6.7.5 Likely Significant Effects During Decommissioning phase

It is not intended that the proposed peatland restoration project will be reversed or removed as permanent planning permission is being sought for the change of land use from forestry to other habitat types. Therefore, it is intended that the Proposed Project will be retained as permanent and will not be decommissioned.

6.7.6 Effects on Designated Sites

6.7.6.1 Impacts on Nationally Designated Sites

The following pNHAs were identified to be within the Likely Zone of Influence of the Proposed Project;

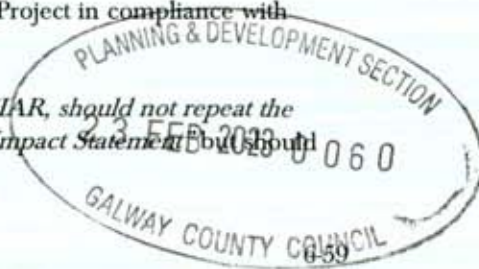
- The Twelve Bens/Garraun Complex [002031]
- Connemara Bog Complex [002034]

Potential for direct and indirect effects on these Nationally Designated sites are fully considered under the European Designated sites of the same names and which overlap with these pNHAs and are summarised in the section below. No significant impacts on these pNHAs are anticipated.

6.7.6.2 Impacts on European Sites

In relation to European sites, an Appropriate Assessment Screening Report and Natura Impact Statement (NIS) have been prepared (and accompany this planning application) to provide the competent authorities with the information necessary to complete an Appropriate Assessment for the Proposed Project in compliance with Article 6(3) of the Habitats Directive.

As per the aforementioned EPA Guidance (2022), "a biodiversity section of an ELAR, should not repeat the detailed assessment of potential effects on European sites contained in a Natura Impact Statement but should



“incorporate their key findings as available and appropriate”. This section provides a summary of the key assessment findings with regard to Special Areas of Conservation (SACs) and Special Protection Areas (SPAs).

The Screening for Appropriate Assessment identified the following potential pathways for impact on European Sites included:

- Direct habitat loss/degradation
- Direct disturbance
- Indirect deterioration in water quality

The screening process concluded the following:

‘it cannot be excluded beyond reasonable scientific doubt, in view of best scientific knowledge, on the basis of objective information and in light of the conservation objectives of the relevant European sites, that the Proposed Project, individually or in combination with other plans and projects, would be likely to have a significant effect on the following sites:

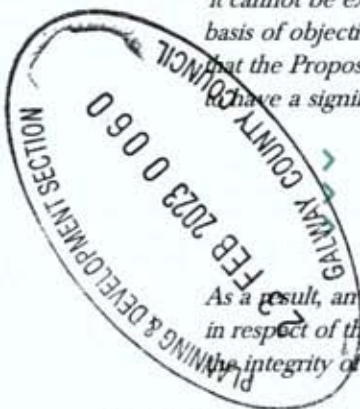
- Twelve Bens/Garraun Complex SAC [002031]
- Connemara Bog Complex SAC [002034]
- Connemara Bog Complex SPA [004181]

As a result, an Appropriate Assessment is required, and a Natura Impact Statement has been prepared in respect of the Proposed Project in order to assess whether the Proposed Project will adversely impact the integrity of these European Sites’.

The NIS concludes:

‘Where the potential for any adverse effect on any European Site has been identified, the pathway by which any such effect may occur has been robustly blocked through the use of avoidance, appropriate design and mitigation measures as set out within this report and its appendices. The measures ensure that the construction, operation and decommissioning of the Proposed Project will not adversely affect the integrity of European sites.

Therefore, it can be objectively concluded that the Proposed Project, individually or in combination with other plans or projects, will not adversely affect the integrity of any European Site’.



Cumulative Impact

The Proposed Project was considered in combination with other plans and projects in the area that could result in cumulative impacts on the Key Ecological Receptors (KERs) identified in Section 6.6.4 of this report, including European and Nationally designated sites. This included a review of online Planning Registers and served to identify past, present and future plans and projects, their activities and their predicted environmental effects. The projects considered are listed in Section 2.4.2 of Chapter 2 of this EIAR: Background.

6.8.1 Assessment of Plans

The following development plans have been reviewed and taken into consideration as part of this assessment:

- > Galway County Development Plan 2022 – 2028
- > Northern and Western Regional Assembly Regional Spatial and Economic Strategy 2020-2032
- > National Biodiversity Action Plan 2017-2021
- > Draft National Biodiversity Action Plan 2023 - 2027

The review focused on policies and objectives that relate to designated sites for nature conservation, biodiversity and protected species. Policies and objectives relating to the conservation of peatlands and sustainable land use were also reviewed, particularly where the policies relate to the preservation of surface water quality. An overview of the search results with regard to plans is provided in Table 6-18.



Table 6-18 Assessment of plans

Plans	Key Policies and Objectives directly related to European Sites and Biodiversity in the Zone of Influence	Assessment of Potential Impact on European Sites
Galway County Development Plan 2022 – 2028	<p>NHB 1 Natural Heritage and Biodiversity of Designated Sites, Habitats and Species Protect and where possible enhance the natural heritage sites designated under EU Legislation and National Legislation (Habitats Directive, Birds Directive, European Communities (Birds and Natural Habitats) Regulations 2011 and Wildlife Acts) and extend to any additions or alterations to sites that may occur during the lifetime of this plan.</p> <p>Protect and, where possible, enhance the plant and animal species and their habitats that have been identified under European legislation (Habitats and Birds Directive) and protected under national Legislation (European Communities (Birds and Natural Habitats) Regulations 2011 (SI 477 of 2011), Wildlife Acts 1976-2010 and the Flora Protection Order (SI 94 of 1999).</p> <p>Support the protection, conservation and enhancement of natural heritage and biodiversity, including the protection of the integrity of European sites, that form part of the Natura 2000 network, the protection of Natural Heritage Areas, proposed Natural Heritage Areas, Ramsar Sites, Nature Reserves, Wild Fowl Sanctuaries (and other designated sites including any future designations) and the promotion of the development of a green/ecological network.</p> <p>NHB 2 European Sites and Appropriate Assessment To implement Article 6 of the Habitats Directive and to ensure that Appropriate Assessment is carried out in relation to works, plans and projects likely to impact on European sites (SACs and SPAs), whether directly or indirectly or in combination with any other plan(s) or project(s). All assessments must be in compliance with the European Communities (Birds and Natural Habitats) Regulations 2011. All such projects and plans will also be required to comply with statutory Environmental Impact Assessment requirements where relevant.</p> <p>NHB 3 Protection of European Sites No plans, programmes, or projects etc. giving rise to significant cumulative, direct, indirect or secondary impacts on European sites arising from their size or scale, land take, proximity, resource requirements, emissions (disposal to land, water or air), transportation requirements, duration of construction, operation, decommissioning or from any other effects shall be permitted on the basis of this Plan (either individually or in combination with other plans, programmes, etc. or projects).</p> <p>NHB 4 Ecological Appraisal of Biodiversity Ensure, where appropriate, the protection and conservation of areas, sites, species and ecological/networks of biodiversity value outside designated sites. Where appropriate require an ecological appraisal, for development</p>	<p>The development plan was comprehensively reviewed, with particular reference to Policies and Objectives that relate to the biodiversity, protected species and designated sites.</p> <p>The Proposed Project has been designed in order to avoid likely significant effect on biodiversity. Where the potential for adverse effect on biodiversity has been identified, mitigation will be implemented as prescribed within this chapter to ensure that there is no significant impact.</p> <p>Additionally, the Proposed Project aims to have an overall positive impact on biodiversity of Galway county, targeting the restoration and enhancement of peatland and woodland habitats, which will have potential benefits in terms of carbon sequestration.</p> <p>Where pathways for effects on Designated Sites have been identified, mitigation shall also be implemented to ensure that there are no significant effects.</p> <p>No potential for negative cumulative impacts when considered in conjunction with the current proposal were identified.</p>

Plans	Key Policies and Objectives directly related to European Sites and Biodiversity in the Zone of Influence	Assessment of Potential Impact on European Sites
	<p>not directly connected with or necessary to the management of European Sites, or a proposed European Site and which are likely to have significant effects on that site either individually or cumulatively.</p> <p>NHB 5 Ecological Connectivity and Corridors Support the protection and enhancement of biodiversity and ecological connectivity in non-designated sites, including woodlands, trees, hedgerows, semi-natural grasslands, rivers, streams, natural springs, wetlands, stonewalls, geological and geo-morphological systems, other landscape features and associated wildlife areas where these form part of the ecological network and/or may be considered as ecological corridors in the context of Article 10 of the Habitats Directive.</p>	
<p>Northern and Western Regional Assembly Regional Spatial and Economic Strategy 2020-2032</p>	<p>Regional Policy Objective 5.5 – Ensure efficient and sustainable use of all our natural resources, including inland waterways, peatlands, and forests in a manner which ensures a healthy society a clean environment and there is no net contribution to biodiversity loss arising from development supported in this strategy. Conserve and protect designated areas and Natural Heritage Area. Conserve and protect European sites and their integrity.</p> <p>Regional Policy Objective 5.7 - Ensure that all plans, projects and activities requiring consent arising from the RSES are subject to the relevant environmental assessment requirements including SEA, EIA and AA as appropriate.</p>	<p>The development plan was comprehensively reviewed, with particular reference to Policies and Objectives that relate to the biodiversity, protected species and designated sites.</p> <p>The Proposed Project has been designed in order to avoid likely significant effect on biodiversity. Where the potential for adverse effect on biodiversity has been identified, mitigation will be implemented as prescribed within this chapter to ensure that there is no significant impact.</p> <p>Additionally, the Proposed Project aims to have an overall positive impact on biodiversity of Galway county, targeting the restoration and enhancement of peatland and woodland habitats, which will have potential benefits in terms of carbon sequestration.</p> <p>Where pathways for effects on Designated Sites have been identified, mitigation shall also be implemented to ensure that there are no significant effects.</p> <p>No potential for negative cumulative impacts when considered in conjunction with the current proposal were identified.</p>



Plans	Key Policies and Objectives directly related to European Sites and Biodiversity in the Zone of Influence	Assessment of Potential Impact on European Sites
National Biodiversity Action Plan 2017-2021	<p>Objective 1 - Mainstream biodiversity into decision-making across all sectors</p> <p>Developments in the area of Green Infrastructure are being initiated at the local and regional level. Green Infrastructure is a strategically planned network of natural and semi natural areas with other environmental features designed and managed to deliver a wide range of ecosystem services such as water purification, air quality, space for recreation and climate mitigation and adaptation.</p> <p>Objective 4 - Conserve and restore biodiversity and ecosystem services in the wider countryside</p> <p>Target 6.2 - Sufficiency, coherence, connectivity, and resilience of the protected areas network substantially enhanced by 2020.</p>	<p>The action plans were comprehensively reviewed, with particular reference to Policies and Objectives that relate to the biodiversity, protected species and designated sites.</p> <p>The Proposed Project has been designed in order to avoid likely significant effect on biodiversity. Where the potential for adverse effect on biodiversity has been identified, mitigation will be implemented as prescribed within this chapter to ensure that there is no significant impact.</p>
Draft National Biodiversity Action Plan 2023 - 2027	<p>Objective 2 - Meet Urgent Conservation and Restoration Needs</p> <p>Introduction to this Objective</p> <p>Outcome 2A: The protection of existing designated areas and species is strengthened and conservation and restoration within the existing protected area network are enhanced.</p> <p>Outcome 2B: Biodiversity and ecosystem services in the wider countryside are conserved</p>	<p>Additionally, the Proposed Project aims to have an overall positive impact on biodiversity of Galway county, targeting the restoration and enhancement of peatland and woodland habitats, which will have potential benefits in terms of carbon sequestration.</p> <p>Where pathways for effects on Designated Sites have been identified, mitigation shall also be implemented to ensure that there are no significant effects.</p> <p>No potential for negative cumulative impacts when considered in conjunction with the current proposal were identified.</p>

6.8.2

Assessment of Projects

As described in Section 2.4 of the EIAR, relevant projects have been assessed in-combination with the Proposed Project and include planning applications in the vicinity of the site and within the zone of influence of all habitats and species considered in this report. These are summarized below, and they have been fully considered in this assessment, with Section 6.8.4 concluding on their potential for impact on biodiversity.;

- PI Ref: 2193: Permission sought for the erection of a new 30m multi-user telecommunications support structure carrying 9 No. antennas, 6 No. communication dishes, 8 No. remote radio units, 3 No. lighting finials and 5 No. outdoor cabinets and all enclosed within a security compound by a 2.4m high palisade fence with a 4m access gate, site access and site works. The development will provide significant improvements in voice and broadband data services along the N59 National Road and the R340 and R344 Regional Roads. Applicant: Cignal Infrastructure Ltd. Granted (10/05/2021) subject to 9 conditions
- PI Ref: 201078: Permission sought for a new dwelling house and garage/shed and to replace existing septic tank with a new wastewater treatment system and to demolish existing dwelling house with all associated works and ancillary services. Gross floor space of proposed works; 204sqm (house) 60sqm (garage) Applicant: Cathal Staunton. Granted (15/03/2021) subject to 13 conditions.
- PI Ref: 191879. To demolish an old house, and a new house, sewage system and garage. Gross floor space of proposed works: 191 sqm. Gross floor space for any demolition: 40 sqm. Applicant: Festus O Toole. Granted (16/03/2020) subject to 12 conditions.
- PI Ref: 181719. For an agricultural building and yard with all associated works and ancillary services. A Natura Impact Statement for the Proposed Project will be submitted with this application. Gross floor space of proposed works: 352.2 sqm. Applicant: Cathal Staunton. Granted (11/03/2019) subject to 10 conditions.
- PL Ref: 191669. For development of site at Eir Exchange, Lissoughter, Recess. The development will consist of the replacement of an existing telecommunications support structure (overall structure height of 18 meters), together with adjacent equipment cabinet, previously granted under planning reference no. 13/436, with a proposed new lattice tower structure (overall structure height of 22 metres) carrying the telecommunications equipment transferred from the existing structure and the addition of new telecommunications antennas, dishes and associated equipment, together with ground equipment cabinets, new wall and fencing. Applicant: Eircom Limited. Granted (17/12/2019) subject to 9 conditions.
- PI Ref: 171026 To (1) demolish existing stone structure on site, previously granted under PI Ref No. 08/2093 and 13/1223, (2) Permission to retain and complete existing blockwork structure on site on revised house plans (3) relocate proposed site entrance (4) Permission to construct a new domestic garage as well as all ancillary site works. Gross floor space of proposed works 106.10sqm, demolition 74sqm. Applicant: Robert Needham & Megan Burke. Granted (05/03/2018) subject to 12 conditions.
- PI Ref: 171381: Permission (previous ref. no. 11/387) for an existing development consisting of an existing 24-metre-high telecommunications support structure, antennas, equipment container and associated equipment within a fenced compound and access track. The development forms part of Vodafone Ireland Limited's existing GSM and 3G Broadband telecommunications network. Applicant: Vodafone Ireland Limited. Granted on (18/12/2017) subject to 7 conditions.

6.8.3

Existing Habitats and Land Uses

The potential for the Proposed Project to result in a cumulative loss or deterioration of habitats, or impact on protected species, was considered in relation to the existing land uses in the area. The dominant land uses in the



wider area are low intensity agriculture and forestry. These land uses have been considered in the cumulative assessment for the proposed restoration project.

The proposed works are primarily located within highly disturbed or managed habitats, which generally provide low value habitats for faunal species. Provided that construction best practice and mitigation measures are implemented, the potential for likely significant effect on degraded peatland habitats within the site has been avoided.

6.8.4 Assessment of Cumulative Effects

Following the thorough consideration of plans, projects and land uses including those listed above, it is concluded that, the development will not result in any likely significant negative effects on biodiversity either within the site or outside it. Having considered other projects in the area including those listed above, no potential for the development to contribute to any likely significant negative cumulative effects on biodiversity was identified when considered in-combination with other plans and projects.

In the review of the projects that was undertaken, no connection, that could potentially result in additional or negative cumulative impacts was identified. Neither was any potential for different (new) impacts resulting from the combination of the various projects and plans in association with the development.

The implementation of the Proposed Project will have a significant positive long-term impact on the peatland and broadleaved woodland habitats within the site as well as on downstream water quality and therefore will not contribute to any negative effects on biodiversity when considered cumulatively with other projects and plans.



Conclusion

Following consideration of the residual effects (post mitigation) it is concluded that the Proposed Project will not result in any residual significant negative effects on any of the identified KERs. No significant residual negative effects on any ecological receptors were identified at any geographic scale. The Proposed Project will have an overall positive effect on peatland and woodland habitat within the site which has potential to have a positive impact on water quality and faunal species that utilise peatland habitats.

The potential for effects on the European Designated Sites are fully described in the Natura Impact Statement that accompanies this application. The NIS concludes that:

'in view of best scientific knowledge and on the basis of objective information, the Proposed Project either individually or in combination with other plans or projects, is not likely to have significant effects on the European Sites that were assessed as part Appropriate Assessment process'.

No potential for impacts on any nationally designated site was identified.

Provided that the Proposed Project is operated in accordance with the design, best practice and mitigation that is described within this application, significant individual or cumulative negative effects on ecology are not anticipated at any geographic scale or on any of the identified KERs and the Proposed Project has been designed to result in significant positive effects in the form of native broadleaved woodland creation and peatland restoration.



7. LAND SOILS AND GEOLOGY

7.1 Introduction

7.1.1 Background and Objectives

Hydro-Environmental Services (HES) was engaged by MKO to carry out an assessment of the potential impacts of the proposed Derryclare Wild Western Peatlands Project on the land, soils and geological environment.

The site at Derryclare (the “project site”) lies to the west of Lough Inagh and Derryclare Lough in Connemara, Co. Galway. The project site lies to the north of the N59 which joins Galway in the east to Clifden in the west. The project site is owned by Coillte and was planted with coniferous forestry in the 1960s. The overall Coillte landholding at Derryclare is ~567ha. Topography is highly variable within the project site, ranging from 10-180mOD (meters above Ordnance Datum). The project site lies on the eastern slopes of Derryclare and Bencorr mountains with topography sloping steeply to the east towards Lough Inagh and Derryclare Lough.

The Derryclare Wild Western Peatlands Project (the “Proposed Project”) aims to remove approximately 343 hectares of conifer plantation for the purposes of peatland restoration and the establishment of native woodland. Measures to restore and rehabilitate ~281 hectares (ha) of Atlantic Bog and heathland that is currently planted with lodgepole pine and Sitka spruce forests and managed for commercial forestry will include felling of the existing forestry plantations and a series of rehabilitation works, including drain blocking and ground reprofiling. An additional 62 hectares of conifer forestry will be felled and converted to native woodland.

The objectives of the assessment are:

- Produce a baseline study of the existing land, soils and geological environment in the area of the Proposed Project;
- Identify likely significant effects of the Proposed Project on land, soils and geological environment during construction and operational phases of the project;
- Identify mitigation measures to avoid, reduce or offset significant negative effects;
- Assess significant residual effects; and
- Assess cumulative effects of the Proposed Project and other local developments.

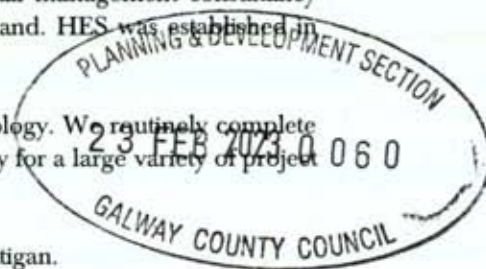
7.1.2 Statement of Authority

Hydro-Environmental Services (HES) are a specialist geological, hydrological, hydrogeological, and environmental practice which delivers a range of water and environmental management consultancy services to the private and public sectors across Ireland and Northern Ireland. HES was established in 2005, and our office is located in Dungarvan, County Waterford.

Our core areas of expertise and experience includes soils, subsoils and geology. We routinely complete impact assessments for land, soils and geology, hydrology and hydrogeology for a large variety of project types.

This chapter of the EIAR was prepared by Michael Gill and Conor McGettigan.

Michael Gill (BA, BAI, Dip Geol., MSc, MIEI) is an Environmental Engineer and Hydrogeologist with over 22 years' environmental consultancy experience in Ireland. Michael has completed numerous hydrological and hydrogeological impact assessments for a wide range of proposed developments including wind farms, renewable projects and bog restoration in Ireland. In addition, he has substantial



experience in surface water drainage design and SUDs design and surface water/groundwater interactions. For example, Michael has worked on the EIS/EIAR for Oweninny WF, Cloncreen WF, and Yellow River WF, and over 100 other forestry and wind farm related projects across the country.

Conor McGettigan (BSc, MSc) is an Environmental Scientist with 3 years' experience in the environmental sector in Ireland. Conor holds an M.Sc. in Applied Environmental Science (2020) and a B.Sc. in Geology (2016) from University College Dublin. Conor has prepared the land, soils and geology chapters of environmental impact assessment reports for a wide range of developments including several wind farm developments on peatlands.

7.1.3

Scoping and Consultation

The scope for this assessment has been informed by consultation with statutory consultees, bodies with environmental responsibility and other interested parties as summarised in Section 2.6 of Chapter 2 of the EIAR. Consultation responses relating to the land, soils and geological environment were received from the Geological Survey of Ireland. Details of these scoping responses and actions taken to address them are outlined in Section 2.6.2 of this EIAR.

7.1.4

Relevant Legislation

The EIAR is prepared in accordance with the requirements of European Union Directive 2011/92/EU on the assessment of the effects of certain public and private projects on the environment (the 'EIA Directive') as amended by Directive 2014/52/EU. The requirements of the following legislation are complied with:

- Planning and Development Acts, 2000-2021;
- Planning and Development Regulations, 2001 (as amended);
- Directives 2011/92/EU and 2014/52/EU on the assessment of the effects of certain public and private projects on the environment, including Circular Letter PL 1/2017: Implementation of Directive 2014/52/EU on the effects of certain public and private projects on the environment (EIA Directive);
- S.I. No. 296/2018 European Union (Planning and Development) (Environmental Impact Assessment) Regulations 2018;
- European Communities (Environmental Impact Assessment) Regulations 1989/2017; and,
- S.I. No. 4/1995: The Heritage Act 1995, as amended.

7.1.5

Relevant Guidance

The land, soils and geology chapter of this EIAR was prepared having regard, where relevant, to guidance contained in the following documents:

- Environmental Protection Agency (2022): Guidelines on the Information to be contained in Environmental Impact Assessment Reports;
- Environmental Protection Agency (2015): Draft - Advice Notes on Current Practice (in the preparation of Environmental Impact Statements);
- Environmental Protection Agency (2003): Advice Notes on Current Practice (in the Preparation of Environmental Impact Statements);
- Institute of Geologists Ireland (2013): Guidelines for the Preparation of Soils, Geology and Hydrogeology Chapters of Environmental Impact Statements;
- National Roads Authority (2008): Guidelines on Procedures for Assessment and Treatment of Geology, Hydrology and Hydrogeology for National Road Schemes;
- COFOR (2004) Forest Road Manual – Guidelines for the Design, Construction and Management of Forest Roads;
- PPG1 – General Guide to Prevention of Pollution (UK Guidance Note);

- Guidelines for Planning Authorities and An Bord Pleanála on carrying out Environmental Impact Assessment (DoHPLG, 2018);
- Environmental Requirements for Afforestation (Forest Service, 2016a);
- Land Types for Afforestation (Forest Service, 2016b);
- Forest Protection Guidelines (Forest Service, 2002);
- Forest Operations and Water Protection Guidelines (Coillte, 2013);
- Forestry and Water Quality Guidelines (Forest Service, 2000b);
- Forests and Water, Achieving Objectives under Ireland's River Basin Management Plan 2018-2021 (DAFM, 2018);
- NatureScot (Scotland's Nature Agency), Peatland Action – Technical Compendium - Restoration – 8 Forest to bog Restoration (2022); and
- Peat Landslide Hazard and Risk Assessment: Best Practice Guide for Proposed Electricity Generation Developments (PLHRAG, Scottish Government, 2017).

7.2 Assessment Methodology

7.2.1 Desk Study

A desk study of the project site and the surrounding area was completed in advance of undertaking the walkover survey and site investigations. This involved collecting all relevant geological data for the project site and surrounding area. This included consultation with the following data sources:

- Environmental Protection Agency soils and subsoils mapping (www.epa.ie);
- Geological Survey of Ireland – Geological databases (www.gsi.ie);
- Bedrock Geology 1:100,000 Scale Map Series, Sheet 10 - Geology of Connemara and South Mayo (GSI, 2003); and,
- Geological Survey of Ireland – 1:25,000 Field Mapping Sheets.

7.2.2 Baseline Monitoring and Site Investigations

Geological mapping and a detailed walkover survey of the project site was undertaken by HES on 22nd and 23rd November 2022.

Field observations made by HES during the site surveys were supplemented by previous site investigations completed by RPS in July and August 2021 (RPS, 2021) and recent site investigations completed by FT in November and December 2022. The site investigations included the following:

- Site walkover surveys (HES, FT, RPS);
- 44 no. peat probes (RPS, 2021);
- 73 no. peat probes (FT, 2022);
- Installation of 29 no. piezometers (RPS, 2021); and,
- Measuring of groundwater levels in the installed piezometers on 2 no. occasions (RPS, 2021).

The combined geological dataset collated by HES, FT and RPS has been used in the preparation of this EIAR Chapter.

In summary, the combined HES, FT and RPS site investigations used to address the land, soils and geology chapter of this EIAR included the following:

- A total of 117 no. peat probe depths/investigations points (RPS, 2021 and FT, 2022);
- A geotechnical assessment of peat stability for the project site was completed by Fehily Timoney (FT, 2023);



- Logging of subsoil exposures across the project site where mineral soils and peat profiles are exposed; and,
- Mineral subsoils and peat were logged according to BS: 5930 and Von Post Scale respectively.

Impact Assessment Methodology

Using information from the desk study and data from the site investigations, an assessment of the importance of the soil and geological environment within the study area and project site is assessed using the criteria set out in Table 7-1 (NRA, 2008).

Table 7-1 Estimation of Importance of Soil and Geology Criteria (NRA, 2008).

Importance	Criteria	Typical Example
Very High	Attribute has a high quality, significance or value on a regional or national scale. Degree or extent of soil contamination is significant on a national or regional scale. Volume of peat and/or soft organic soil underlying route is significant on a national or regional scale.	Geological feature rare on a regional or national scale (NHA). Large existing quarry or pit. Proven economically extractable mineral resource
High	Attribute has a high quality, significance or value on a local scale. Degree or extent of soil contamination is significant on a local scale. Volume of peat and/or soft organic soil underlying site is significant on a local scale.	Contaminated soil on site with previous heavy industrial usage. Large recent landfill site for mixed wastes Geological feature of high value on a local scale (County Geological Site). Well drained and/or highly fertility soils. Moderately sized existing quarry or pit Marginally economic extractable mineral resource.
Medium	Attribute has a medium quality, significance or value on a local scale. Degree or extent of soil contamination is moderate on a local scale. Volume of peat and/or soft organic soil underlying site is moderate on a local scale.	Contaminated soil on site with previous light industrial usage. Small recent landfill site for mixed Wastes. Moderately drained and/or moderate fertility soils. Small existing quarry or pit. Sub-economic extractable mineral Resource.
Low	Attribute has a low quality, significance or value on a local scale. Degree or extent of soil contamination is minor on a local scale. Volume of peat and/or soft organic soil underlying site is	Large historical and/or recent site for construction and demolition wastes. Small historical and/or recent landfill site for construction and demolition wastes. Poorly drained and/or low fertility soils. Uneconomically extractable mineral Resource.

Importance	Criteria	Typical Example
	small on a local scale.	

The guideline criteria (EPA, 2022) for the assessment of likely significant effects require that likely effects are described with respect to their extent, magnitude, type (i.e., negative, positive or neutral) probability, duration, frequency, reversibility, and transfrontier nature (if applicable). The descriptors used in this environmental impact assessment report are those set out in the EPA (2022) Glossary of effects as shown in Chapter 1 of this EIAR. In addition, the two impact characteristics proximity and probability are described for each impact and these are defined in Table 7-2.

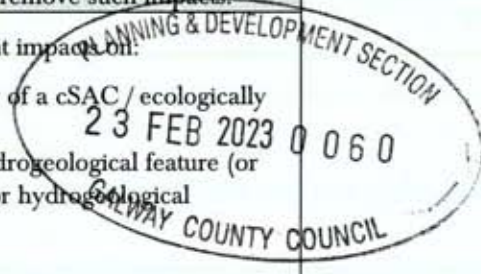
In order to provide an understanding of this descriptive system in terms of the geological/hydrological environment, elements of this system of description of effects are related to examples of potential likely significant effects on the geology and morphology of the existing environment, as listed in Table 7-3.

Table 7-2: Additional Impact Characteristics.

Impact Characteristic	Degree/Nature	Description
Proximity	Direct	An impact which occurs within the area of the proposed project, as a direct result of the proposed project.
	Indirect	An impact which is caused by the interaction of effects, or by off-site developments.
Probability	Unlikely	A low likelihood of occurrence of the impact.
	Likely	A medium likelihood of occurrence of the impact.

Table 7-3: Impact descriptors related to the receiving environment.

Impact Characteristics		Potential Geological and Hydrological Impacts
Quality	Significance	
Negative only	Profound	<p>Widespread permanent impact on:</p> <ul style="list-style-type: none"> > The extent or morphology of a cSAC. > Regionally important aquifers. > Extents of floodplains. <p>Mitigation measures are unlikely to remove such impacts.</p>
Positive or Negative	Significant	<p>Local or widespread time-dependent impact on:</p> <ul style="list-style-type: none"> > The extent or morphology of a cSAC / ecologically important area. > A regionally important hydrogeological feature (or widespread effects to minor hydrogeological features). > Extent of floodplains. <p>Widespread permanent impacts on the extent or morphology of an NHA/ecologically important area. Mitigation measures (to design) will reduce but not completely remove the impact – residual impacts will occur.</p>



Impact Characteristics		Potential Geological and Hydrological Impacts
Quality	Significance	
Positive or Negative	Moderate	<p>Local time-dependent impacts on:</p> <ul style="list-style-type: none"> > The extent or morphology of a cSAC / NHA / ecologically important area. > A minor hydrogeological feature. > Extent of floodplains. <p>Mitigation measures can mitigate the impact OR residual impacts occur, but these are consistent with existing or emerging trends</p>
Positive, Negative or Neutral	Slight	Local perceptible time-dependent impacts not requiring mitigation.
Neutral	Imperceptible	No impacts, or impacts which are beneath levels of perception, within normal bounds of variation, or within the bounds of measurement or forecasting error.

7.3

Existing Environment

7.3.1

Site Description and Topography

The Coillte property at Derryclare (the “project site”) lies to the west of Lough Inagh and Derryclare Lough in Connemara, Co. Galway. The project site lies to the north of the N59 which joins Galway in the east to Clifden in the west.

The project site is owned by Coillte and was planted with Sitka Spruce and Lodgepole Pine in the 1960s. The overall Coillte landholding at Derryclare is ~567ha with the majority of the project site being dominated by coniferous forests (76%). The forestry plantations at Derryclare are of low to moderate productivity. Approximately 6% of the project site is unplanted, comprising of blanket bog or wet heath habitats or is located along riparian buffer zones. An additional 18% of the forest cover has been felled or burnt and is reverting naturally wet heath or blanket bog.

The project site can be accessed from the R344, which branches off the N59 to the southeast of the project site and extends northwards travelling to the east of Derryclare Lough. A forestry track extends westwards from the R344 into the project site between Lough Inagh and Derryclare Lough. The project site is currently served by approximately 6.8km of forestry roads and tracks.

Topography of the project site is highly variable, ranging from 10-180mOD (meters above Ordnance Datum). The project site lies on the eastern slopes of Derryclare and Bencorr mountains with topography sloping steeply to the east towards Lough Inagh and Derryclare Lough. The western section of the project site contains the steepest gradients. Meanwhile, the eastern section of the project site, adjacent Lough Inagh and Derryclare Lough, is comparatively flatter but is undulating in places.

Coillte have subdivided the Derryclare landholding into a total of 22 no. forestry harvest blocks. A total of 2 no. harvest blocks (GY27_HB0025 and GY27_HB0026) are not included in the Proposed Project as GY27_HB0025 is already natural bogland and does not require restoration and while GY27_HB0026 will be retained as commercial forestry. As part of the Proposed Project the other 20 no. harvest blocks will be subject to felling (where felling has not already been completed) and the implementation of restoration measures.

7.3.2

Land and Landuse

Corine land cover maps (2018) show that the project site comprises of coniferous forests, mixed forests and transitional woodland scrub. Land cover in the surrounding areas is mapped largely as peat bogs with some sparsely vegetated areas on the elevated ground to the west of the project site. Historic Corine land cover maps (1990-2018) do not record any significant land cover changes at Derryclare with the 1990 Corine land cover map showing the entire project site as coniferous forestry.

Land cover at the project site has been verified during site walkover surveys and from the inspection of aerial imagery. The project site comprises a mosaic of forestry and transitional woodland scrub habitats. As stated above, the project site was planted in the 1960s for the purpose of timber production. Approximately 39% of the project site is currently on its second rotation having been previously felled and replanted. In terms of forest productivity, much of the first rotation conifer plantation (trees originally planted in the 1960s and not yet felled) at Derryclare is below the accepted threshold Yield class of 14, below which forest returns are deemed to be uncommercial and not suitable for commercial timber production.

7.3.3

Peat/Soils and Subsoils

The published soils map (www.epa.ie) for the local area shows that the project site is predominantly overlain by blanket peat (BktPt) with some acid shallow, rocky, peaty mineral soil (AminSRPT) located on the higher ground in the west. Acid shallow, rocky, peaty mineral soils are also mapped along the western shores of Derryclare Lough in the south of the project site. Other soils mapped within the project site include acid deep well drained mineral soils (AminDW) in the southwest. Soils in the surrounding lands are mapped largely as blanket peat with acid shallow, rocky, peaty mineral soils on Bencorr and Derryclare Mountains to the west of the project site.

The published subsoils map (www.gsi.ie) shows that the north of the project site, along the western shores of Lough Inagh, is underlain by blanket peat (BktPt). Further south, till derived from metamorphic rocks (TmP) is mapped along the western shores of Derryclare Lough. Meanwhile, bedrock outcrop or subcrop (Rck) is mapped on the elevated ground in the west of the project site and on Derryclare and Bencorr Mountains.

A local subsoils map is included below as **Figure 7-1**.

The soils and subsoils present at the project site have been verified during site walkover surveys completed by HES in November 2022 and by intrusive site investigations conducted by RPS in July 2021 (RPS, 2021) and FT in November and December 2022 (FT, 2022). A total of 117 no. peat probes have been completed at the project site. Where present the peat depths range from 0.1 – 4.7m (refer to **Figure 7-2**), with an average peat depth of 1.17m. 59% of the probes completed at the project site encountered peat depths less than 1m, while 81% recorded peat depths less than 2m. During these site investigations the peat was found to be underlain by till (silts, clays, sands and gravels) or solid bedrock.



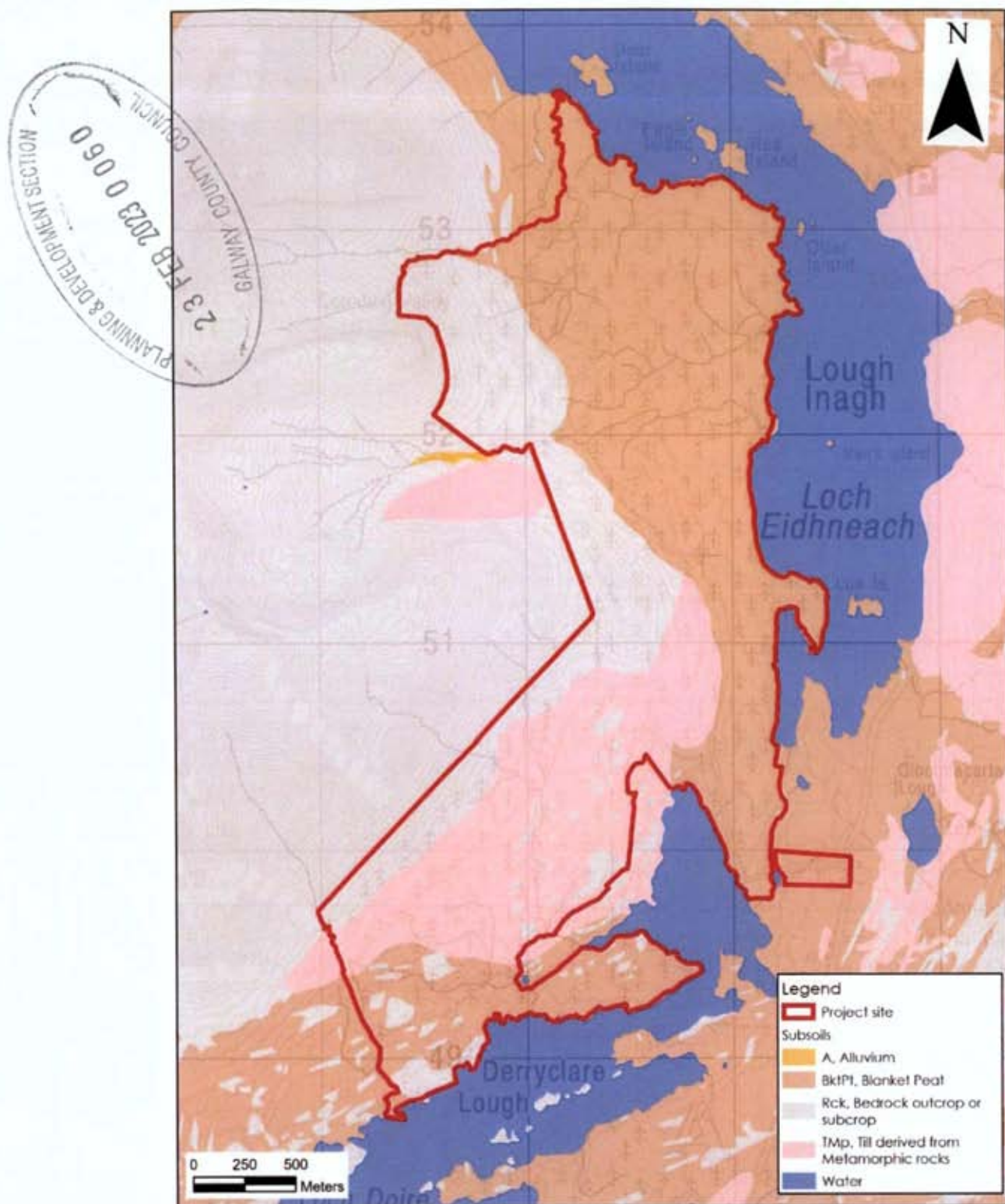


Figure 7-1: Local subsoil map of the project site (www.gsi.ie)

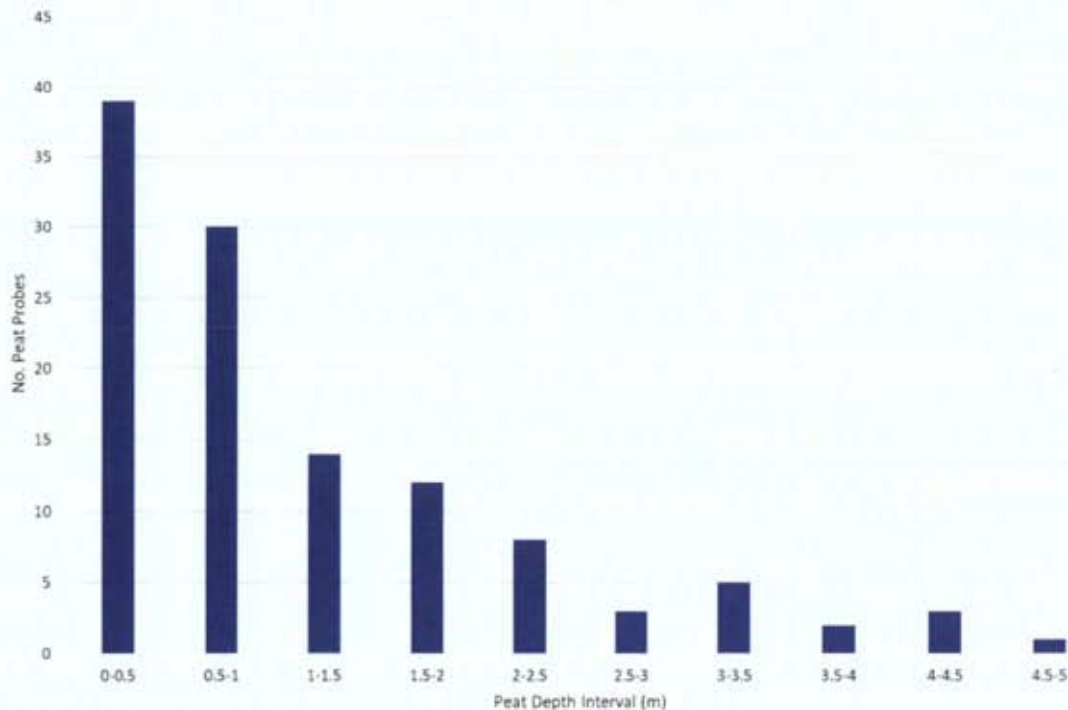


Figure 7-2: Peat depths at the project site (RPS (2021) and FT (2022) peat probes)

7.3.4 Bedrock Geology

The GSI map the bedrock underlying the project site to comprise predominantly of Precambrian Quartzites, Gneisses and Schists of the Streamstown Schist Formation, the Bennabeola Quartzite Formation and the Barnanoraun Schist Formation. Furthermore, Precambrian Marbles of the Lake Marbles formation are mapped in a small area of the project site along the western shores of Lough Inagh and again further south near Derryclare Lough.

The Streamstown Schist Formation underlies much of the project site. The GSI state that this “*formation comprises an interbedded sequence of massive or banded grey-brown psammitic schists with less abundant semi-pelitic and feldspathic semi-pelitic schists and even more subordinate and thinner pelitic schists and quartzites*”. The Bennabeola Formation is largely located on the elevated ground in the west of the project site, however, faulting has also resulted in its occurrence further east. This formation is “*dominated by white or very pale green or grey, massive or bedded quartzites, which weather to a very pale yellow, orange-brown or pink colour. The beds range up to 1m in thickness any may be flaggy or finely bedded*”. Furthermore the Barnanoraun Schist Formation is mapped in the south of the project site and comprises of aluminous schists and hornblendic rocks. A thin stratigraphic unit referred to as the Connemara Marble Formation, comprising dolomitic green marbles, is also mapped in the south of the project site. Finally, the Lake Marbles Formation, mapped in the northeast and south of the site, comprises of marbles, metavolcanics, schists and grits.

The project site is crosscut by several northwest – southeast orientated faults. An east – west orientated anticlinal fold axis is also mapped in the north of the project site.

The GSI map the presence of bedrock outcrop in the south of the project site. Furthermore, large areas of bedrock exposure are located to the west of the project site on Derryclare and Bencorr Mountains.

A bedrock geology map of the area is attached as **Figure 7-3**.



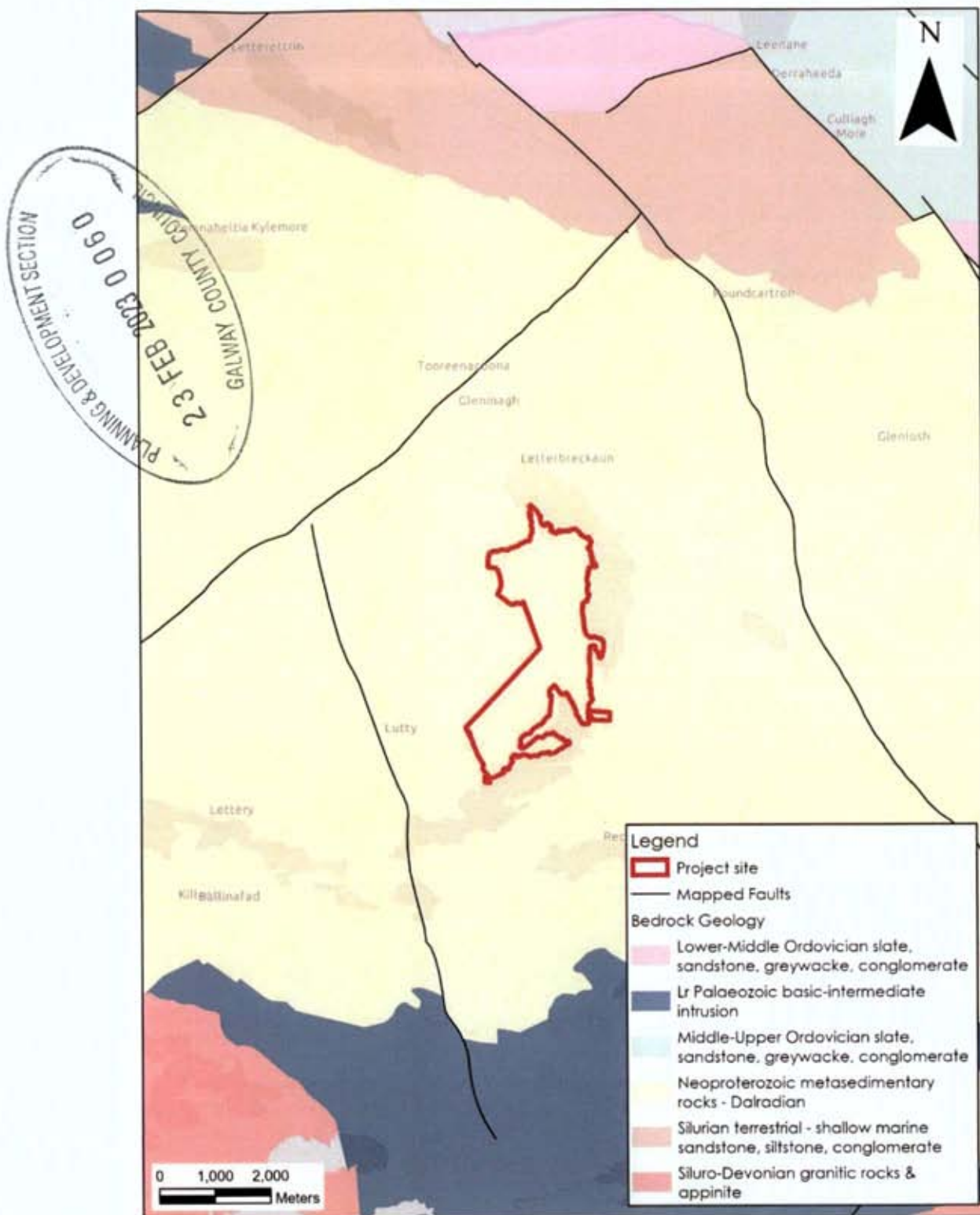


Figure 7.3: Bedrock Geology Map (www.gsi.ie)

7.3.5

Soil Contamination

According to the EPA online mapping (www.epa.ie), there are no licenced waste facilities or dump sites in the project site or its immediate environs. The closest EPA mapped waste locality is Carrowbrowne Landfill located approximately 51km southeast of the project site.

Furthermore, according to the EPA online mapping (www.epa.ie), there are no Industrial Emissions Licences (IEL) or Integrated Pollution Control (IPC) facilities in the area of the project site or in the surrounding lands. The closest mapped IEL Licence (P0355) is located at Corr na Mona Galway, ~19km northeast of the project site.

The GSI do not map the presence of any active or historic quarries or pits within the project site.

During the site walkovers, no large areas of particular contamination concern were identified within the project site. Some minor fly-tipping was noted along the edge of access tracks but these were very localised.

7.3.6

Economic Geology

The GSI online Aggregate Potential Mapping Database (www.gsi.ie) does not map the project site as an area for granular aggregate potential (i.e., potential for gravel reserves) due the presence of peat and peaty soils. The overlying peat deposits at the project site could be classified as “Low” importance as the peat is not designated in this area and is significantly degraded in most places at the project site as a result of forestry plantations and associated drainage. Refer to Table 7-1 for definition of these criteria.

The GSI online Aggregate Potential Mapping Database (www.gsi.ie) shows that the crushed rock aggregate potential of the project site ranges from Low to High. The areas of high potential are located on the elevated ground in the west of the project site and in the south of the project site where the GSI map the presence of bedrock outcrop or subcrop. The bedrock underlying the project site could be classified as “Medium” importance. The bedrock could be used on a “sub-economic” local scale for construction purposes. The bedrock has not been used in the past at the project site for this purpose, most likely because of the covering of peat.

The GSI Online Minerals Database accessed via the Public Data Viewer (www.gsi.ie) maps the presence of quartz in a 450m long vein towards the centre of the project site. No other mineral localities are mapped within the site boundaries. In the surrounding lands, the presence of quartz is also mapped near the summit of Bencorr mountain, while further south in the townland of Glencoaghan, serpentine has been recorded in an outcrop of dolomitic marble. 2 no. mineral localities are also mapped on the eastern shores of Derryclare Lough where marble and serpentine are recorded at Cloonnacartan.

The GSI does not record the presence of any active quarries or pits in the project site or in the surrounding lands. The closest mapped active quarry to the site is Lissoughter Green Marble Quarry located ~2.2km southeast of the project site.

No historic quarries or pits are mapped within the project site. A historic quarry is mapped on the eastern shores of Derryclare Lough in the townland of Cloonnacartan. Several historic quarries are also mapped in the townland of to the southeast of the project site. The GSI state that one of these quarries was operational from 1975-1995 and was a large quarry in the Streamstown Schist Formation which produced aggregate for much of Connemara.



7.3.7

Geological Heritage Sites

There are no geological heritage sites within the project site (www.gsi.ie).

However, the Glencoaghan County Geological Site (Site Code: GY061) is located to the west of the project site. This is a south-facing valley in the glaciated Beanna Beola mountains and is described as a key locality for understanding the stratigraphy and metamorphic history of the Connemara Dalradian. This site is recommended for designation as a Geological National Heritage Area.

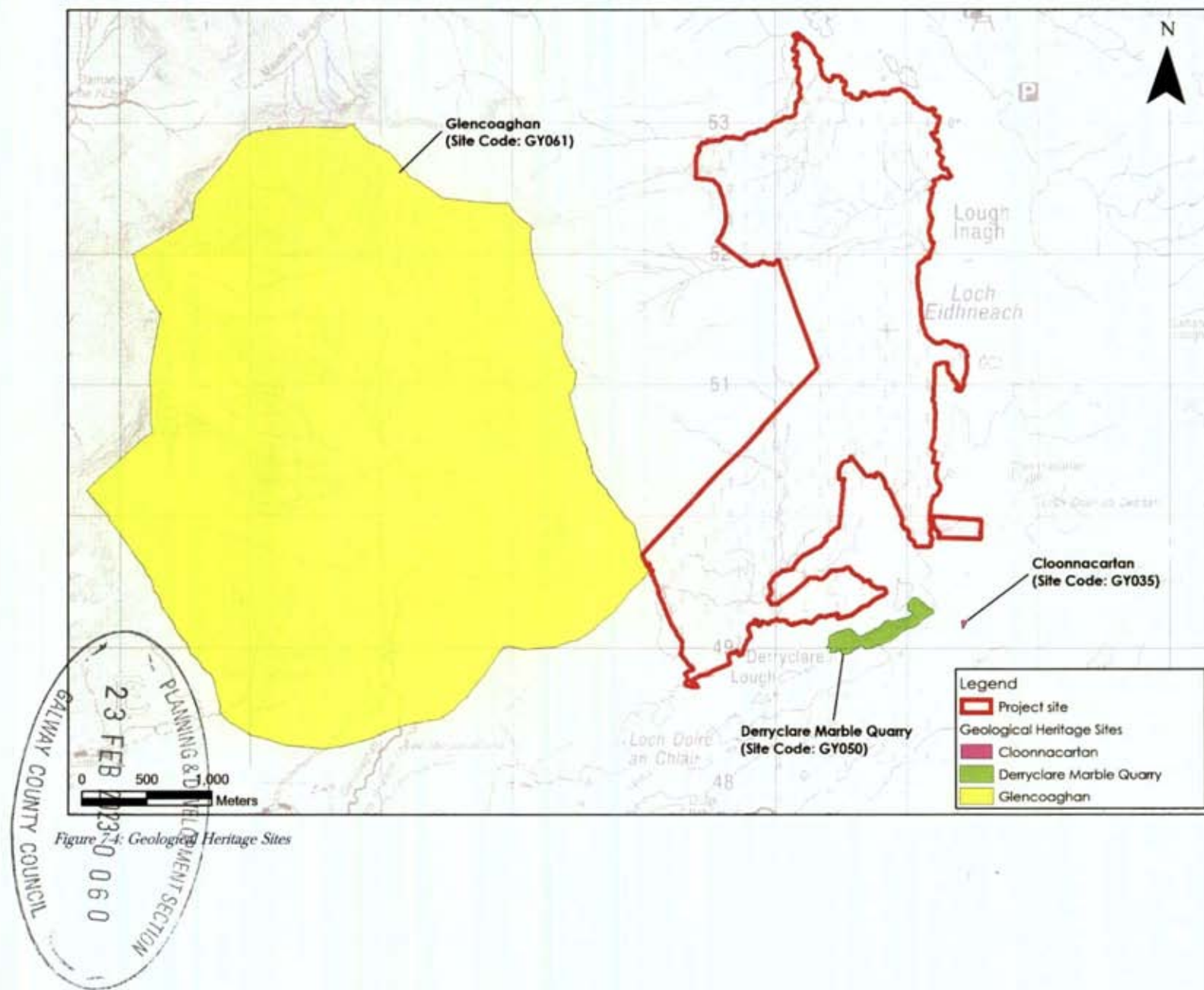
The Derryclare Marble Quarry County Geological Site (Site Code: GY050) is located on the eastern shores of Derryclare Lough and is described as a disused marble quarry. The site represents one of almost a dozen Connemara Marble Formation localities in Connemara.

Cloonnacartan County Geological Site (Site Code: GY035) is mapped ~500 east of the project site along the R344. This site is described as a small roadside excavation where the occurrence of unusual minerals, including some very unusual garnet minerals, make the site worthy of designation.

There are no other geological heritage sites within 5km of the project site.

A map of local geological heritage sites is attached as **Figure 7-4**.





Geohazards

The GSI do not record the occurrence of any historic landslides at the project site or in the surrounding lands. The closest landslide event recorded by the GSI is mapped ~1.8km south of the project site in the townland of Garroman. No landslides have been recorded at Derryclare or Bencorr Mountains.

The GSI Landslide Susceptibility Map (www.gsi.ie) classifies the probability of a landslide occurring at the project site as ranging from low to high. The greatest probability of a landslide occurring is in the west of the project site where the greatest gradients are found as the land rises towards Derryclare and Bencorr Mountains. The probability of a landslide occurring in the centre and east of the project site is typically moderate to low due to the lower topographic gradients.

During walkover surveys FT identified a shallow (<1m deep) historic peat landslip immediately to the west of the restoration harvest block GY27_HB00012 but within the overall Coillte landholding at Derryclare. No signs of instability were noted either upslope, downslope or along the strike of the failure. FT recorded shallow peat depths (<0.4m) at this location. The shallow peat coupled with the presence of bedrock outcrop downslope indicate that there is little possibility of this feature being reactivated. This landslip has been deemed to be an isolated occurrence and is discussed in full in the Geotechnical and Peat Stability Assessment (FT, 2023) included as **Appendix 7-1**.

7.3.9

Peat Stability Assessment

A Geotechnical and Peat Stability Assessment Report (FT, 2023) has been completed for the project site and is included as **Appendix 7-1**.

FT completed an analysis of peat sliding at 73 no. locations within the project site (within the harvest blocks and along proposed roads) for both the undrained and drained conditions. The purpose of the analysis was to determine the Factor of Safety (FoS) of the peat slopes. The minimum required Factor of Safety (FoS) is 1.3 based on BS6031:1981: Code of Practice for Earthworks (BSI, 2009). A general guide to FoS limits for peat slopes is presented in **Table 7-4**.

Table 7-4: Probability Scale for Factor of Safety for Peat

Factor of Safety	Probability
Less than 1	Unstable
Between 1.0 and 1.3	Marginally stable
1.3 or greater	Acceptable

7.3.9.1

Peat Stability Assessment Results

Stability of a peat slope is dependent on several factors working in combination. The main factors that influence peat stability are slope angle, shear strength of peat, depth of peat, pore water pressure and loading conditions (FT, 2023).

An adverse combination of factors could potentially result in peat sliding. An adverse condition of one of the above-mentioned factors alone is unlikely to result in peat failure. The infinite slope model (Skempton and DeLory, 1957) is used to combine these factors to determine a factor of safety for peat sliding. This model is based on a translational slide, which is a reasonable representation of the dominant mode of movement for peat failures.

To assess the factor of safety for a peat slide, an undrained (short-term stability) and drained (long-term stability) analysis has been undertaken to determine the stability of the peat slopes on site.

- The undrained loading condition applies in the short-term during construction and until construction induced pore water pressures dissipate.
- The drained loading condition applies in the long-term. The condition examines the effect of in particular, the change in groundwater level as a result of rainfall on the existing stability of the natural peat slopes.

As mentioned above, the Geotechnical and Peat Stability Assessment Report (FT, 2023) is attached in Appendix 7-1.

Undrained Analysis

The results of the undrained analysis for the peat at the 73 no. locations are presented in Table 7-5. The analysis was done for 2 no. conditions: Condition 1 with no surcharge loading and Condition 2 with a surcharge loading of 10kPa, representing temporary loading from site traffic and forestry machinery. As outlined above the undrained loading condition applies in the short-term during construction and until construction induced pore water pressures dissipate.

The calculated FoS (factor of safety) for Condition 1 is in excess of 1.30 for each of the 73 no. locations. The calculated FoS for Condition 1 was found to range from 1.78 to 58.48, indicating a low risk of peat instability.

The calculated FoS for Condition 2 is in excess of 1.30 for 72 no. locations. The exception was at peat probe location PO10080 which had an FoS of 0.89. This location represents an isolated historic peat failure and is located outside of the project site and shows no signs of recent instability. The calculated FoS for Condition 2 at the other 72 no. locations was found to range from 1.40 to 8.02, indicating a low risk of peat instability.



Table 7.5: Factor of Safety Results (undrained condition)

Location ID	Easting	Northing	Factor of Safety for Load Condition ¹	
			Condition (1)	Condition (2)
Harvest Blocks				
GY27_3_09	482827	749973	3.65	2.25
GY27_HB0009	483856	753047	2.6	2.05
GY27_HB0010	483852	752726	2.55	1.91
GY27_HB0011	483800	752243	3.06	2.19
GY27_HB0012	482865	752344	1.97	1.4
GY27_HB0013	483493	750691	3.63	1.49
GY27_HB0014	482481	749694	9.07	2.83
GY27_HB0015	482161	749574	3.9	2.34
GY27_HB0016	482461	749191	6.75	4.25
GY27_HB0017	482701	749106	14.4	2.4
GY27_HB0018	483725	752502	18.14	5.18
GY27_HB0020	482900	749603	5.46	2.59
GY27_HB0021	483159	752945	1.92	1.44
GY27_HB0022	483382	751458	3.29	1.92
GY27_HB0023	482714	749676	8.06	3.82
GY27_HB0024	482819	749388	5.73	3.82
GY27_HB0027	483361	749396	2.87	2.29
GY27_HB0028	483366	749952	2.66	1.83
GY27_HB0029	483472	750413	5.39	2.22
GY27_HB0030	483121	749806	5.18	3.02
Existing Access Roads				
GY27R0025	483687	751453	4.86	2
GY27R0026	484034	751590	30.61	6.12

¹ For the stability analysis two load conditions were examined, namely
Condition (1): no surcharge loading – natural peat slopes
Condition (2): surcharge of 10 kPa peat assumed as a worst case.

Location ID	Easting	Northing	Factor of Safety for Load Condition ¹	
			Condition (1)	Condition (2)
GY27R0027	483407	750208	5.18	2.22
GY27R0049	484363	749945	4.25	2.73
GY27R0052	483290	750552	No Peat	
GY27R0054	482692	749385	5.46	2.59
Proposed Access Roads				
Access Road North	483727	752817	10.43	2.83
Access Road South	482567	749472	1.92	1.44
Locations outside of Harvest Blocks				
POI008	482611	752382	1.78	0.89
PP001	482609	749095	3.33	2.32
PP002	482320	749000	2.44	2.01

Drained Analysis

Drained analysis results are presented in Table 7-6. Similar to the undrained analysis, the drained analysis was done for 2 no. conditions: Condition 1 with no surcharge loading and Condition 2 with a surcharge of 10kPa, representing temporary loading from site traffic and forestry machinery. As outlined above, the drained loading condition applies in the long-term. The condition examines the effect of in particular, the change in groundwater level as a result of rainfall on the existing stability of the natural peat slopes.

The calculated FoS for Condition 1 was in excess of 1.30 at 69 of the 73 no. analysed locations. At these 69 no. locations the FoS ranged from 1.45 to 46.07. Meanwhile, 3 no. peat probe locations gave an FoS of between 1 and 1.3 and one location gave an FoS of <1. In general the results indicate that the project site has a low risk of peat instability.

The calculated FoS for Condition 2 was in excess of 1.30 at 70 no. analysed locations with the FoS ranging from 1.96 to 13.79. Meanwhile the FoS was below 1.3 at 3 no. locations. In general the results indicate a low risk of peat instability.



Table 7-6: Factor of Safety Results (drained condition)

Location ID	Easting	Northing	Factor of Safety for Load Condition ²	
			Condition (1)	Condition (2)
Harvest Blocks				
GY27_3_09	482827	749973	1.46	1.92
GY27_HB0009	483856	753047	1.04	1.76
GY27_HB0010	483852	752726	2.55	4.14
GY27_HB0011	483800	752243	3.06	4.73
GY27_HB0012	482865	752344	0.79	1.15
GY27_HB0013	483493	750691	1.45	1.16
GY27_HB0014	482481	749694	3.63	2.30
GY27_HB0015	482161	749574	1.56	1.99
GY27_HB0016	482461	749191	6.75	3.78
GY27_HB0017	482701	749106	5.76	1.92
GY27_HB0018	483725	752502	7.26	4.44
GY27_HB0020	482900	749603	2.19	2.19
GY27_HB0021	483159	752945	1.67	2.45
GY27_HB0022	483382	751458	3.29	2.85
GY27_HB0023	482714	749676	8.50	8.71
GY27_HB0024	482819	749388	5.73	4.15
GY27_HB0027	483361	749396	2.76	3.23
GY27_HB0028	483366	749952	1.06	1.56
GY27_HB0029	483472	750413	2.16	1.84
GY27_HB0030	483121	749806	2.07	2.59
Existing Access Roads				
GY27R0025	483687	751453	1.94	1.64
GY27R0026	484034	751590	16.53	5.92

² For the stability analysis two load conditions were examined, namely
Condition (1): no surcharge loading – natural peat slopes
Condition (2): surcharge of 10 kPa peat assumed as a worst case.

Location ID	Easting	Northing	Factor of Safety for Load Condition ²	
			Condition (1)	Condition (2)
GY27R0027	483407	750208	2.07	1.84
GY27R0049	484363	749945	4.25	5.91
GY27R0052	483290	750552	No Peat	
GY27R0054	482692	749385	2.19	2.19
Proposed Access Roads				
Access Road North	483727	752817	10.43	2.30
Access Road South	482567	749472	1.92	3.10
Locations outside of Harvest Blocks				
POI008	482611	752382	1.02	0.99
PP001	482609	749095	3.33	5.02
PP002	482320	749000	2.44	4.35

Following the above analysis further consideration was given to the following harvest blocks: GY27_HB0009, GY27_HB0012, GY27_HB0013 and GY27_HB0028.

FT completed a sensitivity analysis at these locations using varying degrees of saturation. Based on water level monitoring data at the project site (RPS, 2021 and FT, 2022) a water level of 50% was chosen to reflect actual site conditions. This was deemed to be a conservative estimate. Using this 50% water level, the FoS was recalculated and all locations with the exception of PO1008 had an FoS >1.3. The results are presented in Table 7-7.

Table 7-7: Comparison of FoS Results at 100% and 50% Peat Water Levels

Location ID	FoS for Load Condition (100% Water)		FoS for Load Condition (50% Water)	
	Condition (1)	Condition (1)	Condition (1)	Condition (2)
GY27_HB0009	1.04	1.76	3.26	3.51
GY27_HB0012	0.79	1.15	1.88	1.37
GY27_HB0013	1.45	1.16	1.93	1.36
GY27_HB0028	1.06	1.56	2.39	2.47
POI008*	1.02	0.99	1.49	1.22

*POI008 is a point of analysis completed by Fehily Timoney (at ITM 482611, 752382).



7.3.9.2 Peat Assessment Summary

An analysis of peat stability was completed at 73 no. locations at the project site. The purpose of the analysis was to the Factor of Safety (FoS) of the peat slopes.

An undrained analysis was carried out by Fehily Timoney, which applies in the short-term during construction. For the undrained condition, the calculated FoS for load conditions (1) & (2) for the locations analysed, show that all locations within the restoration harvest block and along new and existing roads have an acceptable FoS of greater than 1.3, indicating a low risk of peat failure.

A drained analysis was also completed, which examined the effect of rainfall on peat stability. For the drained condition (100% water) the FoS for load conditions (1) and (2) was generally greater than 1.3, indicating a low risk of peat failure. However, a total of 5 no. locations returned an FoS less than 1.3. When analysed using 50% water, which is more representative of the existing site conditions, the FoS values were all in excess of 1.3 for load condition 1.

Nevertheless, the areas which have an FoS less than 1.3 for the 100% water level will be subject to monitoring during and post works and the level of drain blocking in these areas will be reduced. No bog restoration will be completed in GY27_HB0013 and GY27_HB0028, as they will be replanted with native woodland.

The findings of the peat stability assessment showed that the project site (harvest blocks, new and existing roads) generally has an acceptable margin of safety, is at low risk of peat failure and is suitable for the Proposed Project. The Geotechnical and Peat Stability Assessment Report (FT, 2023) includes control measures for the proposed works to ensure that all works adhere to an acceptable standard of safety.

7.3.10 Receptor Sensitivity

Based on the criteria set out in Table 7-1 above, the soils and peat at the project site can be classed as being of low importance as the overlying peat deposits are not designated in this area and are significantly degraded as a result of forestry operations and associated drainage. The bedrock geology underlying the project site can be classed as being of medium importance where the bedrock could be used on a sub-economic scale. However, the bedrock at the project site has not been extracted in the past due to the covering of peat.

Due to the nature of the Proposed Project (felling, bog restoration, etc) comprising of near surface activities, effects on the underlying bedrock are likely to be negligible with land and soils being the main receptors to be assessed during in the impact assessment.

The proposed works have the potential to disturb and erode the peat deposits at the project site due to machine movements, drain blocking and surface reprofiling. Furthermore, the risk of hydrocarbon spillages and leaks from machinery has the potential to contaminate peat, soils and the underlying bedrock. Comprehensive mitigation measures and controls are outlined below to ensure that the disturbance of peat and subsoils is minimised during the proposed felling and restoration works and that contamination of peat, subsoils and bedrock is prevented.

Characteristics of the Proposed Project

The Proposed Project comprises:

- The felling/removal of approximately 343 hectares of conifer plantation for the purposes of peatland restoration and the establishment of native woodland. The forestry will be removed in 20 no. harvest blocks (felled or mulched) spread out over a period of 5-7 years.
- Measures to restore and rehabilitate approximately 281 hectares of Atlantic blanket bog and heathland that is currently planted with lodgepole pine and Sitka spruce forests and managed for forestry.
- Conversion of 62 hectares of conifer forestry to native woodland.
- Main peatland restoration measures will include tree removal, drain blocking (manual and mechanical) and ground reprofiling.
- The control of existing invasive species on site and continued control during the restoration works to prevent their spread.
- Drain-blocking all existing artificial drainage and artificial land drains currently existing on site in order to restore the high water table which is necessary for blanket bog growth.
- Provision of silt traps at outflows to block the pathway to the Twelve Bens/Garraun Complex SAC.
- Installation of deer fencing to protect the proposed 62 hectares of native woodland.
- Provision of a Harvest Management Phasing Plan for the Proposed Project.
- Provision of new internal access road extending to 1.58km.
- Across the site there will be 4 no. temporary water crossings.
- Provision of information signage.
- Resurfacing of up to 8.23km of existing forestry roads.
- Resurfacing of the existing car park.
- Installation of water monitoring stations.
- Cutting of roadside trees to improve sightline visibility at site entrance.



Likely Significant Effects and Associated Mitigation Measures

Do Nothing Scenario

If the Proposed Project were not to proceed the project site would continue to function as a coniferous forestry plantation. Currently felling operations are ongoing in some areas of the project site and, in the Do Nothing Scenario, such forestry operations would continue at the project site. The forestry operations would comprise of felling and replanting of certain harvest blocks depending on the productivity of each block. We note that much of the project site is of low to moderate productivity. Nevertheless, all operations at the project site would continue to conform with the current best practice Forest Service regulations, policies and guidance documents as well as Coillte and DAFM guidance documents.

If the Do Nothing Scenario was to occur the proposed restoration measures would not be implemented. In the case that the restoration plan is not implemented, it is likely that felled areas of the project site would be replanted as coniferous forestry. In the Do Nothing Scenario the potential positive environmental effects (primarily hydrological and ecological effects) would not be realised at the project site. If the restoration plan is not implemented the effect on the land, soils and geological environment would be insignificant.

7.5.2

Construction Phase - Likely Significant Effects and Mitigation Measures

In relation to the Proposed Project the construction phase encompasses tree felling, habitat restoration and enhancement and all associated siteworks.

The likely significant effects of the construction phase of the Proposed Project, including construction works at the project site and mitigation measures that will be put in place to eliminate or reduce them are shown below. These relate to the construction stage and should be noted that the main potential effects on the soils and geology environment will occur during the construction stage.

7.5.2.1

Effects on Landcover/Land-Take

The overall aim of The Derryclare Wild Western Peatlands Project is to primarily put the project site on a trajectory towards becoming a naturally functioning peatland. It is proposed to achieve this by restoring and rehabilitating the project site that is currently planted with lodgepole pine and Sitka spruce forests and managed as a forestry plantation.

Over the course of 7 no. years (2023- 2029) a total of 281 hectares of forestry will be felled and harvested with the proposed target habitat type for this area identified as being blanket bog / wet heath. Furthermore, a total of 62 hectares of commercial forestry will be felled and harvested with the proposed target habitat being native pioneer woodland. Approximately 56 hectares of this forestry plantation has already been recently felled under licence from the Forest Service as part of ongoing forestry operations at Derryclare. This 56 hectares will not be replanted but will be restored to blanket bog/wet heath.

Post felling, the harvest blocks targeted for blanket bog and wet heath habitats will be subject to targeted restoration measures including drain blocking, surface smoothing and re-profiling. Drain blocking is a very important part of the bog restoration process and will encourage colonisation of the felled areas and will establish a more suitable hydrological/hydrogeological regime for the establishment of bog habitats. Meanwhile, surface smoothing and re-profiling aims to reverse the ridge-furrow forestry cultivation process, and the reprofiled smooth surface will persist post felling. These measures will raise

the bog water table within the underlying peat mass which was damaged by the afforestation process very close to the bog surface. Methods comprising of various surface smoothing techniques and drain blocking have shown good potential in restoring active blanket bog habitats in Scotland.

The harvest blocks targeted for the establishment of native woodland habitats will be planted and seeded with native broadleaf species including birch, willow (cuttings), rowan, sessile oak and alder as well as Scots pine. In some areas planting will be supplemented by natural colonisation.

Pathway: Felling, targeted restoration measures including drain blocking and surface smoothing, planting and natural colonisation.

Receptor: Land and Landcover

Potential Pre-mitigation Effect: Significant, positive, direct, likely, permanent effect on land and landcover.

Impact Assessment

The loss of ~343 hectares of commercial forestry will have a significant effect on landcover at the project site. The current landcover at Derryclare is dominated by coniferous forestry with ~76% of the project site. Following the proposed felling, restoration and planting works ~343 hectares of coniferous forestry will be replaced by bog and native woodland habitats. This represents a change in landcover across ~60% of the project site.

Following the proposed works, only 1 no. harvest block (GY27_HB0026 with a total area of ~182ha) will remain as commercial forestry. Therefore, commercial coniferous forestry will represent only ~32% of the entire project site. In addition, ~326ha (281ha plus GY27_HB0025 which currently contains bog habitats) of the project site will comprise of bog and wet heath habitats while the remaining 62ha will comprise of native woodland habitats.

Residual Effect: The likely effect on land following the implementation of the proposed felling, restoration and planting is a Significant, Positive, Direct, Permanent effect at the project site due to the replacement of commercial forestry with natural bog, heath and native woodland habitats.

Significance of Effects: For the reasons outlined above, we consider that there will be a significant positive effect on landcover as a result of the Proposed Project.

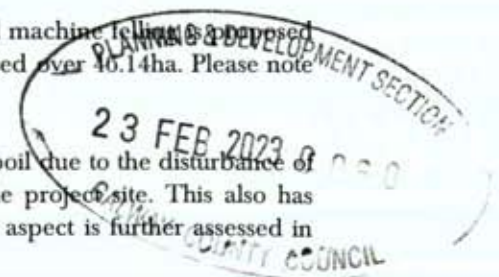
7.5.2.2 Erosion of Exposed Subsoils and Peat During Tree Felling

Tree felling is a major component of the proposed works at the project site. Initially the works will focus on harvest blocks where the existing pine and spruce have reached maturity and are starting to die off and where the likelihood of habitat restoration is most likely to succeed. However, over the course of 6 no. years a total of 343ha will be felled in 20 no. harvest blocks. Only 2 no. harvest blocks (GY27_HB0025 and GY27_HB0026) at Derryclare not being subjected to felling operations.

3 no. forms of felling will be implemented at the project site. Conventional machine felling is proposed over ~196ha, fell to waste is proposed over ~43ha while mulching is proposed over ~14ha. Please note that ~56ha have already been felled under the existing forestry licence.

During felling operations there is a high likelihood of erosion of peat and spoil due to the disturbance of soils and subsoils associated with vehicle and plant movements across the project site. This also has associated potential effects on the aquatic environment, and therefore this aspect is further assessed in detail in Chapter 9.

Pathway: Vehicle movement, surface water and wind action.



Receptor: Peat, subsoil and weathered bedrock.

Pre-Mitigation Potential Effect: Negative, direct, slight, likely effect on peat, subsoils and weathered bedrock due to disturbance associated with felling operations.

Proposed Mitigation Measures:

The size, shape and scheduling of the harvest blocks has been designed to align with operational considerations in terms of access and brash management. Furthermore, the scheduling of felling across the project site aims to ensure that the local environment including the local peat and subsoils are protected. The scheduling of the harvest blocks is in line with current best practice guidelines with all coupes being under 25ha, with the exception of one 36ha coupe. The coupe sizes and their scheduling have been carefully considered as normally felled trees have to be removed via one or two extraction locations in order to avoid rock outcrops, steep topography or saturated/aquatic areas. Therefore, the planning and scheduling of the harvest coupes has been completed to facilitate practical harvesting that will minimise potential negative effects.

Furthermore, all proposed felling works at the project site will be in accordance with the best practice Forest Service regulations, policies and strategic guidance documents as well as Coillte and Forest Service guidance documents to ensure that felling results in minimal potential negative effects on the local peat, soil and subsoil environment.

In addition, the following mitigation measures will be implemented during felling operations:

- Before any works are completed silt fences will be installed to limit the movement of entrained sediment in surface water runoff;
- The harvester and the forwarder are designed specifically for the forest environment and are low ground pressure machines;
- All machinery will be operated by suitably qualified personnel;
- These machines will traverse the site along specified off-road routes (referred to as racks or brash mats);
- Brash mats will be placed on all routes off the forest road to support the vehicles on soft ground, reducing peat and mineral soil disturbance, compaction and erosion and avoiding the formation of rutted areas, in which surface water ponding can occur;
- As felling progresses, the harvester will collect brash produced by the felling and place it in front of the machine before it advances forward along the rack;
- The condition of the racks will be continually monitored and fresh brash will be applied when the brash mat becomes heavily used and worn, ensuring that the mat remains effective throughout the construction phase; and,
- The location of racks will be chosen to avoid wet and potentially sensitive areas.

Residual Effect Assessment: The proposed felling works will result in the disturbance and erosion of peat and subsoils within the project site. However, with the implementation of mitigation measures outlined above the residual effect is a Negative, direct, insignificant, likely effect on peat, subsoils and weathered bedrock due to disturbance associated with felling operations.

Significance of Effects: For the reasons outlined above, and with the implementation of the listed mitigation measures, no significant effects on peat, subsoils and weathered bedrock will occur.

7.5.2.3 Effects on Peat due to Proposed Bog Restoration Measures

It is proposed to restore ~281ha of commercial forestry to blanket bog and wet heath habitats. Following felling, bog restoration measures will be implemented in these harvest blocks. The main restoration measures proposed include drain blocking and where suitable, surface smoothing and re-profiling.

Drain blocking will be achieved through the use of plastic dams, peat dams and log dams designed to raise the groundwater level in the surrounding peat soils.

- Plastic dams will be used in areas of the project site which are inaccessible by machinery and will be installed at 10-20m intervals on flat ground, with closer spacing on sloping ground. The installation methodology involves the driving piles into the ground until they are ~30cm above the bank level.
- Peat dams will be installed using an excavator whereby consolidated peat will be taken from an in-ditch borrow pit upstream to create a dam. Peat dams will only be installed in the east of the project site where the slope is less than 6 degrees.
- Log dams will be used to block smaller ditches and will be installed using an excavator.

These drain blocking activities will disturb local peat deposits and increase the likelihood of erosion of peat and subsoils.

Surface smoothing and re-profiling are bog restoration techniques designed to reverse the effect of the ridge-furrow forestry cultivation process. Ideally, where suitable the site should be reprofiled as this is a more effective restoration measure than drain blocking alone. The techniques include reprofiling, stump flipping, stump mulching, and cross-tracking.

- Reprofiling involves the levelling off-of the original plough furrow using an excavator;
- Stump flipping is the process whereby the root of a stump is pried off the bog surface using an excavator and turned upside down into the adjacent furrow. The plough ridges are then reprofiled by sliding the ridge material into the furrows with an excavator bucket;
- Stump mulching involves the removal of the stump using a stump removal attachment fitted to an excavator. This process is similar to stump removal, except that the stump is mulched instead of flipped before the ground is reprofiled, and;
- Cross-tracking involves an excavator tracking over the bog surface whereby the weight of the machine compresses the surface.

These surface smoothing and re-profiling activities will disturb local peat deposits and increase the likelihood of erosion of peat and subsoils.

Pathway: Vehicle movement, restoration works, surface water and wind action.

Receptor: Peat, subsoil and weathered bedrock.

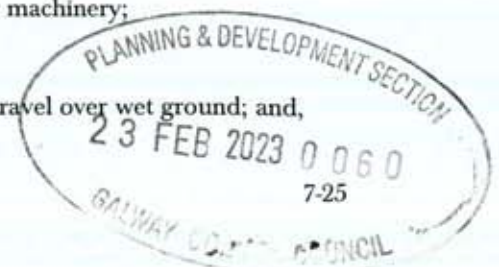
Pre-Mitigation Potential Effect: Negative, direct, slight, likely effect on peat, subsoils and weathered bedrock due to disturbance associated with proposed restoration works.

Proposed Mitigation Measures:

All proposed bog restoration works at the project site will be in accordance with the best practice Forest Service regulation, policies and strategic guidance documents as well as Coillte, DAFM and NatureScot guidance documents to ensure minimal potential negative effects on the local peat, soil and subsoil environment.

Given the nature of the restoration measures the following mitigation measures are proposed:

- Before any works are completed silt fences will be installed to limit the movement of entrained sediment in surface water runoff;
- Proposed off-road routes will be walked in advance of any machinery;
- All machinery operators will be experienced;
- The site will be walked before a machine goes off-road;
- Bog mats will be used where the excavator is required to travel over wet ground; and,



- A low ground pressure excavator with wide tracks (1.9m or greater) will be used to reduce compaction of the peat and subsoils.

In terms of drain blocking the main collector drains nearest the natural watercourses will be blocked first and silt traps will be inserted as required. Then the operators shall begin work at the highest point and work systematically downslope towards the watercourse as restoration work proceeds. All outlets of the collector and peripheral drains will be blocked. This has implications for surface water quality (refer to Chapter 9).

Residual Effect Assessment: The proposed bog restoration works will result in the disturbance and erosion of peat and subsoils within the project site. However, with the implementation of mitigation measures outlined above the residual effect is a Negative, direct, insignificant, likely effect on peat, subsoils and weathered bedrock due to disturbance associated with felling operations.

Significance of Effects: For the reasons outlined above, and with the implementation of the listed mitigation measures, no significant effects on peat, subsoils and weathered bedrock will occur.

Effects on Peat and Subsoils due to Proposed Planting

It is proposed fell ~62ha of coniferous forestry and to replant this area with pioneer native woodland. As stated in Chapter 4, it is very difficult to establish new native woodland on peaty soils, with the chosen areas located where peat depth is shallow (< 25cm) or on mineral soils especially floodplains adjacent to streams and the lakeshore.

The area will be established (i.e. planted, seeded and willow cuttings) using the establishment methodology described in Chapter 4 of this EIAR.

To ensure that no additional site drainage is required, scrap mounding will be used to plant trees where necessary. Scrap mounding involves the use of an excavator to turn over a mound to plant the tree on, thus alleviating the need to install drains and ensure competition from competing vegetation is reduced.

Where scrap mounding is not required, all other planting methodologies are small scale, with a spade being the primary tool. While the peat and soil at the project site will be disturbed during the planting process, the peat and soil will be placed back in the hole once the tree is in place.

Pathway: Tree planting.

Receptor: Peat and subsoil.

Pre-Mitigation Potential Effect: Negative, direct, imperceptible, unlikely effect on peat and subsoils due to disturbance associated with the proposed native woodland establishment.

Proposed Mitigation Measures:

Given the small-scale nature of the proposed woodland establishment works there is limited ability for any significant effects on peat and subsoils.

All proposed planting works at the project site will be in accordance with the best practice Forest Service regulations, policies and strategic guidance documents as well as Coillte and DAFM guidance documents to ensure minimal potential negative effects on the local peat, soil and subsoil environment.

Establishment works will include minimal site cultivation (scrap mounding with machine) with all other works, including planting, being carried out manually further limiting potential effects.

Residual Effect Assessment: The proposed establishment works will involve minimal site cultivation using machines and will be completed in accordance with all forestry guidelines and best practices. Furthermore

due to the small scale of the proposed works the residual effect is a negative, direct, insignificant, unlikely effect on peat and subsoils.

Significance of Effects: For the reasons outlined above, there will be no significant effects on peat and subsoils.

7.5.2.5 Proposed Roads and Carparking

The Proposed Project includes the construction of ~1.58km of new floating forest road extensions. The proposed construction methodology is by floated road construction, with no requirement for additional excavation or spoil generation. The proposed roads will be created on the existing ground surface by adding crushed stone sourced locally to reflect underlying geology. These floating road extensions were deemed the best way to minimise site disturbance when accessing the remoter areas to be felled and they will be removed as part of the restoration works.

The Proposed Project also includes the resurfacing of up to 8.23km of existing forestry roads, while the existing site entrance and carpark will also be upgraded using locally sourced material.

Pathway: Earthworks (excavation) of peat soil/subsoil.

Receptor: Peat and subsoil.

Pre-Mitigation Potential Effect: Negative, direct, slight, likely effect on peat and subsoils due to disturbance associated with felling operations.

Proposed Mitigation Measures:

The proposed forestry road extensions will be constructed using floating roads over peat which minimises the effect on peat and reduces the volumes of peat requiring management as no excavation is required. While the roads extension will remain in situ, it is intended to remove all temporary watercourse crossings.

Mitigation measures to prevent soil / subsoils contamination are dealt with in Section 7.5.2.6.

Residual Effect Assessment: It is proposed to construct new road extensions and upgrade existing roads at Derryclare. Ground disturbance and peat and/or spoil relocation during these works will be minimal due to the chosen construction methodology for the proposed roads and the small-scale nature of road upgrades. As such the residual effects of these works are considered - Negative, imperceptible, direct, likely permanent effect on peat and subsoils.

Significance of Effects: For the reasons outlined above, and with the implementation of the proposed mitigation measures, no significant effects on peat and subsoils will occur.

7.5.2.6 Contamination of Soil by Leakages and Spillages and Alteration of Peat/Soil Geochemistry

Accidental spillage during refuelling of plant with petroleum hydrocarbons is a pollution risk. The accumulation of small spills of fuels and lubricants during routine plant use can also be a significant pollution risk. Hydrocarbon has a high toxicity to humans, and all flora and fauna, including fish, and is persistent in the environment. Large spills or leaks have the potential to result in significant effects (i.e. contamination of peat, subsoils and pollution of the underlying aquifer) on the geological and aquatic environment.

Pathway: Peat and subsoil and underlying bedrock pore space.

Receptor: Peat and subsoil, bedrock.



Pre-Mitigation Potential Effect: Negative, slight, direct, short-term, likely effect on peat, subsoils and bedrock.

Proposed Mitigation Measures:

- All road-going vehicles will be refuelled off-site;
- On-site re-fuelling will be required for forestry and excavator machinery which will be based continuously at the site;
- The on-site refuelling will be undertaken using a mobile double skinned bowser with spill kits kept on site for accidental leakages or spillages;
- The bowser will be refilled off-site and will be towed around the site by a 4x4 jeep;
- The 4x4 jeep will carry absorbent materials and pads in the event of accidental spillages;
- The fuel bowser will be parked on a level area on the construction compound when not in use;
- Only designated trained operatives will be authorised to refuel plant on-site;
- Taps, nozzles or valves associated with refuelling equipment will be fitted with a lock system;
- Fuels stored on-site will be minimised. All storage areas will be bunded appropriately for the duration of the construction phase. All bunded areas will be fitted with a storm drainage system and an appropriate oil interceptor. Ancillary equipment such as hoses, pipes will be contained within the bunded area;
- Fuel and oil stores including tanks and drums will be regularly inspected for leaks and signs of damage;
- The plant used during construction will be regularly inspected for leaks and fitness for purpose; and,
- An emergency response plan for the construction phase to deal with accidental spillages will be contained within the Construction Environmental Management Plan (which is contained in Appendix 4.3).

Residual Effect Assessment: The use and storage of hydrocarbons and small volumes of chemicals is a standard risk associated with all construction sites. Proven and effective measures to mitigate the risk of spills and leaks have been proposed above and will break the pathway between the potential source and the receptor. The residual effect is considered to be - Negative, imperceptible, direct, short-term, unlikely effect on peat and subsoils and bedrock.

Significance of Effects: For the reasons outlined above, and with the implementation of the proposed mitigation measures, no significant effects on peat, subsoils and bedrock will occur.

7.5.2.7 Peat Instability and Failure

Peat instability or failure refers to a significant mass movement of a body of peat that would have an adverse effect on the local soil/subsoils and the surrounding environment. The potential significant effects of peat failure at the project site may result in:

- Death or injury to site personnel;
- Damage to machinery;
- Damage or loss of infrastructure;
- Drainage disruption by blockage of drainage pathway by relocated peat and spoil;
- Site works damaged or unstable;
- Contamination of watercourses, water supplies by particulates;
- Damage to aquatic biodiversity, especially salmonid populations; and,
- Degradation of the peat environment by relocation of peat and spoil.

The primary risk to peat stability at the project site is the construction of the new proposed floating road extensions in the north and south of the project site.

Pathway: Vehicle movement and excavations.

Receptor: Peat and subsoils.

Pre-Mitigation Potential Effect: Negative, significant, direct, unlikely permanent effect on peat and subsoils.

Impact Assessment / Proposed Mitigation Measures:

The following general control measures incorporated into the construction phase of the project will assist in the management of the risks for the project site:

- Appointment of trained, experienced and competent contractors;
- The site will be supervised by experienced and qualified personnel;
- Allocate sufficient time for the project (be aware that decreasing the construction time has the potential to increase the risk of initiating a localised peat movement);
- Prevent undercutting of slopes and unsupported excavations;
- Maintain a managed robust drainage system;
- Prevent placement of loads/overburden on marginal ground;
- Set up, maintain and report findings from monitoring systems (as outlined in the Geotechnical and Peat Stability Assessment);
- Ensure construction method statements are developed and agreed before commencement of construction and are followed by the contractor; and,
- Revise and amend the Construction Risk Register as construction progresses to ensure that risks are managed and controlled for the duration of construction.

Furthermore, the following mitigation measures are proposed in relation to the new floating roads:

- Prior to commencing floating road construction movement monitoring posts will be installed in areas where the peat depth is greater than three metres.
- Trees growing on the road line will be felled close to ground level and stumps left *in situ*.
- Base layer of geogrid to be laid directly onto the existing peat surface along the line of the road in accordance with geogrid provider's requirements.
- Construction of road to be in accordance with appropriate design from the designer.
- The typical make-up of the new floated access road is 500 to 750mm of selected granular fill with 2 no. layers of geogrid.
- Locally-derived stone delivered to the floating road construction shall be end-tipped onto the constructed floating road. Direct tipping of stone on to the peat shall not be carried out.
- To avoid excessive impact loading on the peat due to concentrated end-tipping all stone delivered to the floating road shall be tipped over at least a ten metres length of constructed floating road.
- Where it is not possible to end-tip over a 10m length of constructed floating road then dumpers delivering stone to the floating road shall carry a reduced stone load (not greater than half full) until such time as end-tipping can be carried out over a ten metre length of constructed floating road.
- Following end-tipping a suitable bull-dozer or excavator shall be employed to spread and place the tipped stone over the base geogrid along the line of the road.
- A final surface layer shall be placed over the floating road, as per design requirements, to provide a road profile.
- The surface profile should be maintained as settlement proceeds, preferably by the redistribution of existing formation material rather than by the addition of further material.

A Geotechnical and Peat Stability Risk Assessment (FT, 2023) has been completed for the project site. The assessment found that the project site generally has an acceptable margin of safety, a low risk of peat failure and is suitable for the proposed works. However, a total of 5 no. locations were found to be unsuitable FoS for the drained condition. One of the locations has been discounted as per Note 1 to

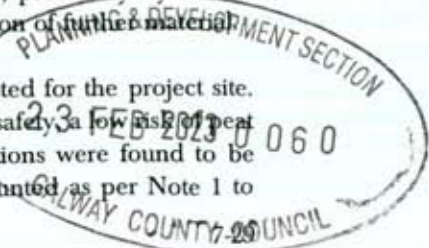


Table 6-5 in the Geotechnical and Peat Stability Risk Assessment (FT, 2023). A second location (GY27_HB0028) is in a harvest block where no restoration works are proposed. For the remaining 3 no. locations, the following control measures will be implemented within those harvest blocks (i.e. GY27_HB0009, GY27_HB0012, GY27_HB0013, as detailed in **Appendix 7-1**).

- The locations will be monitored during and post-works.
- The appointed forestry contractor will ensure that the natural site drainage (EPA streams) is maintained during the works, reducing the likelihood of abrupt or rapid short term water levels changes.

Residual Effect Assessment: With the implementation of the control measures outlined above the residual effect is considered - Negative, imperceptible, direct, unlikely permanent effect on peat and subsoils.

Significance of Effects: For the reasons outlined above, and with the implementation of the proposed mitigation measures, no significant effects on soils and subsoils will occur.

Operational Phase - Likely Significant Effects and Mitigation Measures

Very few potential direct negative effects are envisaged during the operational phase of the Proposed Project.

During the operational phase some construction vehicles may be required to access the project site to allow suitably qualified personnel to complete the proposed monitoring of tree survival rates, water quality monitoring, and invasive species management.

Due to the non-intrusive nature of the maintenance works during this phase of the Proposed Project, the potential effects on the land, soils and geology environment are limited to potential contamination from hydrocarbon spills and leaks as discussed in **Section 7.5.3.1**.

7.5.3.1 Site Vehicle/Plant Use

Plant and site vehicles used in site maintenance will operate on fossil fuels and use hydraulic oils. Accidental spillage during refuelling of construction plant with petroleum hydrocarbons is a significant pollution risk to land, soils and associated ecosystems. The accumulation of small spills of fuels and lubricants during routine plant use can also be a pollution risk. Hydrocarbon has a high toxicity to humans, and all flora and fauna, and is persistent in the environment.

Pathway: Peat, subsoil and bedrock pore space.

Receptor: Peat, subsoil and bedrock.

Potential Pre-Mitigation Effect: Negative, direct, slight, short term, unlikely effect on peat, subsoil and bedrock.

Proposed Mitigation Measures:

- Vehicles used during the operational phase will be refuelled where possible off site before entering the site;
- Spill kits will be available in all site vehicles to deal with an accidental spillage and breakdowns; and,
- An emergency plan for the operational phase to deal with accidental spillages and breakdowns will be contained in the Environmental Management Plan.

Residual Effect: The use of hydrocarbons in plant and vehicles is a standard risk associated with all sites. Proven and effective measures to mitigate the risk of spills and leaks have been proposed above and will break the pathway between the potential source and the receptor. The residual effect is considered to be - Negative, imperceptible, direct, short-term, unlikely effect on peat and subsoils and bedrock.

Significance of Effects: For the reasons outlined above, no likely significant effects on land, soils, subsoils or bedrock will occur.

7.5.4

Decommissioning Phase - Likely Significant Effects and Mitigation Measures

It is not intended that the proposed peatland restoration project will be reversed or removed as permanent planning permission is being sought for the change of land use from forestry to other (restored) habitat types. Therefore, it is intended that the Proposed Project will be retained as permanent and will not be decommissioned.

As such, no additional effects can occur.

7.5.5

Risk of Major Accidents and Disasters

None, as indicated above the risk of a landslide at the project site is determined to be negligible/none.

7.5.6

Potential Cumulative Effects

Due to the localised nature of the proposed construction works which will be kept within the project site boundary, there is no potential for significant cumulative effects in-combination with other local developments on the land, soils and geology environment. The only way the Proposed Project can have in combination effects with other off site projects and plans is via the drainage and off site surface water network, and this hydrological pathway is assessed in Chapter 9.

7.5.7

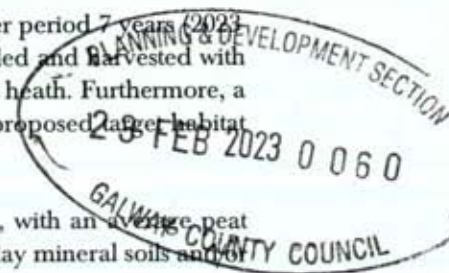
Conclusion

The project site lies to the west of Lough Inagh and Derryclare Lough in Connemara, Co. Galway. The site lies to the north of the N59 which joins Galway in the east to Clifden in the west. The site is owned by Coillte and was planted with coniferous forestry plantations in the 1960s.

The Derryclare Wild Western Peatlands Project aims to restore and rehabilitate ~281 hectares (ha) of Atlantic Bog and heathland at the project site that is currently planted with lodgepole pine and Sitka spruce plantations and managed for commercial forestry. The project site will comprise of felling of the existing forestry plantations and a series of rehabilitation works, including drain blocking and ground reprofiling, designed to restore the peatland habitats at the project site.

The felling and restoration works associated with the project will be completed over period 7 years (2023-2029). During this period a total of 281 hectares of commercial forestry will be felled and harvested with the proposed target habitat type for this area identified as being blanket bog / wet heath. Furthermore, a total of 62 hectares of commercial forestry will be felled and harvested with the proposed target habitat being native pioneer woodland.

The peat depth information for site ranges from 0.1 – 4.7m (refer to Figure 7-2), with an average peat depth of 1.17m. The peat deposits at the site are underlain largely by gravelly silt/clay mineral soils and shallow bedrock. These glacial tills are underlain by schists and quartzites.



The Proposed Project will typically involve felling, bog restoration measures (drain blocking and/or reprofiling) and native woodland establishment (planting, cuttings and seeding). Storage and handling of hydrocarbons/chemicals will be carried out using best practice methods. Measures to prevent peat and subsoil erosion during excavation and reinstatement will be undertaken to prevent negative water quality effects.

No significant effects on the land and soils and geology environment are anticipated during construction, operation phases of the Proposed Project.

Our assessment confirms there will be no cumulative effects on land soil and geology environment as a result of the Proposed Project.



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8.

HYDROLOGY AND HYDROGEOLOGY

8.1

Introduction

8.1.1

Background and Objectives

Hydro-Environmental Services (HES) was engaged by MKO to carry out an assessment of the potential effects of the proposed Derryclare Wild Western Peatlands Project on the hydrological and hydrogeological environment.

The project site at Derryclare lies to the west of Lough Inagh and Derryclare Lough in Connemara, Co. Galway. The project site lies to the north of the N59 which joins Galway in the east to Clifden in the west. The project site is owned by Coillte and was planted with coniferous forestry in the 1960s. The overall Coillte property at Derryclare is ~567ha (the “project site”, refer to **Figure 1-1**). Topography is highly variable within the project site, ranging from 10-180mOD (meters above Ordnance Datum). The site lies on the eastern slopes of Derryclare and Bencorr mountains with topography sloping steeply to the east towards Lough Inagh and Derryclare Lough.

The Derryclare Wild Western Peatlands Project (the “Proposed Project”) aims to restore and rehabilitate ~281 hectares (ha) of Atlantic Bog and heathland that is currently planted with lodgepole pine and Sitka spruce forests and managed for commercial forestry. The Proposed Project will comprise of felling of the existing forestry plantations and a series of restoration works, including drain blocking and ground reprofiling designed to aid the restoration of the peatland at the project site. The Proposed Project also aims to convert ~62 ha. of coniferous forestry to native scrub woodland.

The objectives of the assessment are:

- Produce a baseline study of the existing water environment (surface water and groundwater) in the area of the project site;
- Identify likely significant effects of the Proposed Project on surface water and groundwater during construction, operational and decommissioning phases of the Proposed Project;
- Identify mitigation measures to avoid, reduce or offset significant negative effects;
- Assess significant residual effects; and,
- Assess cumulative effects of the Proposed Project and other local developments.

8.1.2

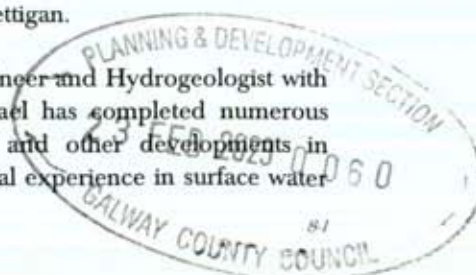
Statement of Authority

Hydro-Environmental Services (HES) are a specialist geological, hydrological, hydrogeological and environmental practice that delivers a range of water and environmental management consultancy services to the private and public sectors across Ireland and Northern Ireland. HES was established in 2005, and our office is located in Dungarvan, County Waterford.

Our core areas of expertise and experience include upland hydrology and forestry and windfarm related drainage design. We routinely complete impact assessments for hydrology and hydrogeology for a large variety of project types. We also specialise in the area of wetland hydrology, ecohydrology, an bog restoration.

This chapter of the EIAR was prepared by Michael Gill and Conor McGettigan.

Michael Gill (BA, BAI, Dip Geol., MSc, MIEI) is an Environmental Engineer and Hydrogeologist with over 22 years' environmental consultancy experience in Ireland. Michael has completed numerous hydrological and hydrogeological impact assessments of wind farms and other developments in coniferous forestry plantations and bogs in Ireland. Michael has substantial experience in surface water



drainage design and SUDs design and surface water/groundwater interactions. For example, Michael has worked on the EIS for Oweninny WF, Cloncreen WF, Derrinlough WF, and Yellow River WF, and over 100 other forestry and wind farm-related projects. Michael also routinely provides hydrological/hydrogeological support and input to bog and wetland restoration projects.

Conor McGettigan (BSc, MSc) is an Environmental Scientist with 3 years' experience in the environmental sector in Ireland. Conor holds an MSc in Applied Environmental Science and a BSc in Geology from University College Dublin. Conor has prepared the hydrology and hydrogeology chapter of EIARs for numerous projects including wind farms, grid connections and quarries. Conor has also been involved in several bog restoration projects including the restoration of Clonaslee Fen and the Liffey Head Bog.

8.1.3

Scoping and Consultation

The scope for this assessment has been informed by consultation with statutory consultees, bodies with environmental responsibility and other interested parties as summarised in Section 2.7 of Chapter 2 of the EIAR. Consultation responses relating to the water environment were received from the Geological Survey of Ireland, Department of Agriculture, Food and the Marine (response was related to forestry) and the Health Services Executive. Details of these scoping responses and actions taken to address them are outlined in Section 2.7.2 of this EIAR.

8.1.4

Relevant Legislation

The EIAR is prepared in accordance with the requirements of European Union Directive 2011/92/EU on the assessment of the effects of certain public and private projects on the environment (the 'EIA Directive') as amended by Directive 2014/52/EU.

The following legislation has been complied with:

- Planning and Development Acts, 2000-2021;
- Planning and Development Regulations, 2001 (as amended);
- S.I. No 296/2018: European Union (Planning and Development) (Environmental Impact Assessment) Regulations 2018 which transposes the provisions of the EIA Directive as amended by the Directive 2014/52/EU into Irish Law;
- S.I. No. 94/1997: European Communities (Natural Habitats) Regulations, resulting from EU Directives 92/43/EEC on the conservation of natural habitats and of wild fauna and flora (the Habitats Directive) and 79/409/EEC on the conservation of wild birds (the Birds Directive);
- S.I. No. 293/1988: Quality of Salmon Water Regulations;
- S.I. No. 272/2009: European Communities Environmental Objectives (Surface Waters) Regulations 2009, as amended, and S.I. No. 722 of 2003 European Communities (Water Policy) Regulations, as amended, which implement EU Water Framework Directive (2000/60/EC) and provide for the implementation of 'daughter' Groundwater Directive (2006/118/EC);
- S.I. No. 684/2007: Waste Water Discharge (Authorisation) Regulations, resulting from EU Directive 80/68/EEC on the protection of groundwater against pollution caused by certain dangerous substances (the Groundwater Directive);
- S.I. No. 249/1989: Quality of Surface Water Intended for Abstraction (Drinking Water), resulting from EU Directive 75/440/EEC concerning the quality required of surface water intended for the abstraction of drinking water in the Member States (as amended by 2000/60/EC in 2007);
- S.I. No. 122/2014: European Union (Drinking Water) Regulations, arising from EU Directive 98/83/EC on the quality of water intended for human consumption (the Drinking Water Directive) and WFD 2000/60/EC (the Water Framework Directive);

- S.I. No. 9/2010: European Communities Environmental Objectives (Groundwater) Regulations 2010, as amended;
- S.I. No. 296/2009: European Communities Environmental Objectives (Freshwater Pearl Mussel) Regulations 2009, as amended; and,
- S.I. 191/2017, Forestry Regulations, Felling Licence, Department of Agriculture, Food and the Marine (DAFM).

8.1.5 Relevant Guidance

The Hydrology and Hydrogeology chapter of the EIAR is carried out in accordance with the guidance contained in the following:

- Environmental Protection Agency (2022): Guidelines on the Information to be Contained in Environmental Impact Assessment Reports;
- Environmental Protection Agency (2015): Draft - Advice Notes on Current Practice (in the preparation of Environmental Impact Statements);
- Environmental Protection Agency (2003) Advice Notes on Current Practice (in the preparation of Environmental Impact Statements);
- Environmental Protection Agency (2006): Environmental Management in the Extractive Industry;
- Institute of Geologists Ireland (2013) Guidelines for Preparation of Soils, Geology & Hydrogeology Chapters in Environmental Impact Statements;
- National Roads Authority (2008) Guidelines on Procedures for Assessment and Treatment of Geology, Hydrology and Hydrogeology for National Road Schemes;
- Forestry Commission (2004) Forests and Water Guidelines, Fourth Edition. Publ. Forestry Commission, Edinburgh;
- Forestry Standards and Procedures Manual, Forest Service, Department of Agriculture, Food and the Marine (DAFM) (2015);
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- Inland Fisheries Ireland (2016): Guidelines on Protection of Fisheries during Construction Works in and Adjacent to Watercourses;
- PPG1 - General Guide to Prevention of Pollution (UK Guidance Note);
- PPG5 - Works or Maintenance in or Near Water Courses (UK Guidance Note);
- CIRIA (Construction Industry Research and Information Association) Guidance on 'Control of Water Pollution from Linear Construction Projects' (CIRIA Report No. C648, 2006); and,
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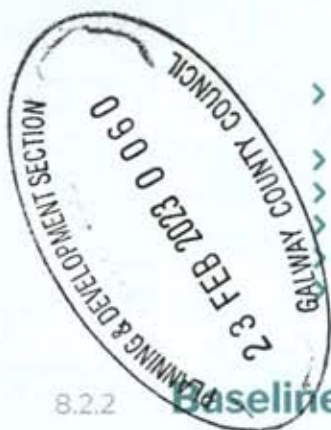
8.2 Methodology

8.2.1 Desk Study

A desk study of the project site and the surrounding area was completed prior to the undertaking of field mapping and walkover assessments. The desk study involved collecting all relevant geological, hydrological, hydrogeological and meteorological data for the area. This included consultation of the following:

- Environmental Protection Agency database (www.epa.ie);
- Geological Survey of Ireland - Groundwater Database (www.gsi.ie);
- Met Eireann Meteorological Databases (www.met.ie);
- National Parks & Wildlife Services Public Map Viewer (www.npws.ie);
- Water Framework Directive "catchments.ie" Map Viewer (www.catchments.ie);





- Bedrock Geology 1:100,000 Scale Map Series, Sheet 10 (Geology of Connemara and South Mayo); Geological Survey of Ireland (GSI, 1999);
- Geological Survey of Ireland - Groundwater Body Characterisation Reports;
- OPW Indicative Flood Maps (www.floodmaps.ie);
- Environmental Protection Agency - "Hydrotool" Map Viewer (www.epa.ie);
- CFRAM Preliminary Flood Risk Assessment (PFRA) maps (www.cfram.ie); and,
- Department of Environment, Community and Local Government on-line mapping viewer (www.myplan.ie).

8.2.2

Baseline Monitoring and Site Investigations

A hydrological walkover survey, including detailed drainage mapping and baseline monitoring was undertaken by HES on 22nd and 23rd November 2022.

Field observations made by HES during the site surveys were supplemented by previous site investigations completed by RPS on July and August 2021 (RPS, 2021) and recent site investigations completed by FT in November and December 2022. The site investigations included the following:

- Site walkover surveys;
- Drainage mapping;
- HES completed field hydrochemistry at 14 no. locations on 22nd and 23rd November 2023;
- 43 no. peat probes (RPS, 2021),
- 73 no. peat probes (FT, 2022),
- 2 no. rounds of surface water sampling (10 no. samples) was completed by Coillte on 10th August 2022 and 24th October 2022,
- Installation of 29 no. piezometers (RPS, 2021); and,
- Measuring of groundwater levels in the installed piezometers on 2 no. occasions (RPS, 2021).

The combined geological dataset collated by HES, FT, MKO and RPS has been used in the preparation of this EIAR Chapter.

In summary, the combined HES and RPS site investigations used to define the baseline for the Water chapter of this EIAR includes the following:

- Walkover surveys and hydrological mapping of the project site and the surrounding areas were undertaken whereby water flow directions and drainage patterns were recorded;
- Completion of a preliminary flood risk assessment;
- Field hydrochemistry and laboratory analysis of surface water samples to determine baseline surface water quality;
- A total of 117 no. peat probe/investigation points were carried out by RPS (RPS, 2021 and FT, 2022) to determine the thickness and geomorphology of the peat at the project site; and,
- A geotechnical assessment of peat stability for the project site was completed by Fehily Timoney (FT, 2023).

8.2.3

Impact Assessment Methodology

The guideline criteria (EPA, 2022) for the assessment of likely significant effects require that likely effects are described with respect to their extent, magnitude, type (i.e. negative, positive or neutral) probability, duration, frequency, reversibility, and transfrontier nature (if applicable). The descriptors used in this environmental impact assessment are those set out in the EPA (2022) Glossary of effects as shown in Chapter 1 of this EIAR.

In addition to the above methodology, the sensitivity of the water environment receptors was assessed on completion of the desk study and baseline study. Levels of sensitivity which are defined in **Table 8-1** for hydrology and **Table 8-2** for hydrogeology are used to assess the potential effect that the Proposed Project may have on them.

Table 8-1: Estimation of Importance of Hydrology Criteria (NRA, 2008)

Importance	Criteria	Typical Example
Extremely High	Attribute has a high quality or value on an international scale	River, wetland or surface water body ecosystem protected by EU legislation, e.g. 'European sites' designated under the Habitats Regulations or 'Salmonid waters' designated pursuant to the European Communities (Quality of Salmonid Waters) Regulations, 1988.
Very High	Attribute has a high quality or value on a regional or national scale	River, wetland or surface water body ecosystem protected by national legislation – NHA status. Regionally important potable water source supplying >2500 homes. Quality Class A (Biotic Index Q4, Q5). Flood plain protecting more than 50 residential or commercial properties from flooding. Nationally important amenity site for a wide range of leisure activities.
High	Attribute has a high quality or value on a local scale	Salmon fishery locally important potable water source supplying >1000 homes. Quality Class B (Biotic Index Q3-4). Flood plain protecting between 5 and 50 residential or commercial properties from flooding.
Medium	Attribute has a medium quality or value on a local scale	Coarse fishery. Local potable water source supplying >50 homes Quality Class C (Biotic Index Q3, Q2-3). Flood plain protecting between 1 and 5 residential or commercial properties from flooding.
Low	Attribute has a low quality or value on a local scale	Locally important amenity site for small range of leisure activities. Local potable water source supplying <50 homes. Quality Class D (Biotic Index Q2, Q1) Flood plain protecting 1 residential or commercial property from flooding. Amenity site used by small numbers of local people.

Table 8-2: Estimation of Importance of Hydrogeology Criteria (NRA, 2008)

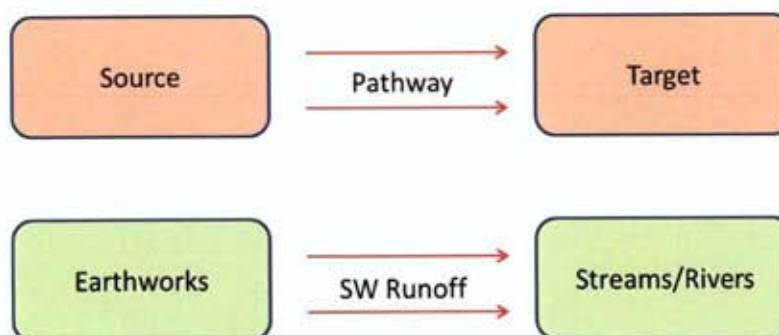
Importance	Criteria	Typical Example
Extremely High	Attribute has a high quality or value on an international scale	Groundwater supports river, wetland or surface water body ecosystem protected by EU legislation, e.g. SAC or SPA status.
Very High	Attribute has a high quality or value on a	Regionally Important Aquifer with multiple wellfields.

Importance	Criteria	Typical Example
	regional or national scale	Groundwater supports river, wetland or surface water body ecosystem protected by national legislation - NHA status. Regionally important potable water source supplying >2500 homes Inner source protection area for regionally important water source.
High	Attribute has a high quality or value on a local scale	Regionally Important Aquifer Groundwater provides large proportion of baseflow to local rivers. Locally important potable water source supplying >1000 homes. Outer source protection area for regionally important water source. Inner source protection area for locally important water source.
Medium	Attribute has a medium quality or value on a local scale	Locally Important Aquifer. Potable water source supplying >50 homes. Outer source protection area for locally important water source.
Low	Attribute has a low quality or value on a local scale	Poor Bedrock Aquifer Potable water source supplying <50 homes.

8.2.4

Overview of Impact Assessment Process

The conventional source-pathway-target model (see below, top) was applied to assess potential effects on downstream environmental receptors (see below, bottom as an example) as a result of the Proposed Project.



Where potential effects are identified, the classification of impacts in the assessment follows the descriptors provided in the Glossary of Impacts contained in the following guidance documents produced by the Environmental Protection Agency (EPA):

- Advice Notes on Current Practice in the Preparation of Environmental Impact Statements (EPA, 2003); and,
- Guidelines on the Information to be contained in Environmental Impact Statements (EPA, 2022).

The description process clearly and consistently identifies the key aspects of any potential impact source, namely its character, magnitude, duration, likelihood and whether it is of a direct or indirect nature.

In order to provide an understanding of the stepwise impact assessment process applied below (Sections 9.4.2 to 9.4.4), a summary guide is presented below in Table 8-3, which defines the steps (1 to 7) taken in each element of the impact assessment process. The guide also provides definitions and descriptions of the assessment process and shows how the source-pathway-target model and the EPA impact descriptors are combined.

Using this defined approach, this impact assessment process is then applied to all construction, operation and decommissioning activities which have the potential to generate a source of significant adverse impact on the geological and hydrological/ hydrogeological (including water quality) environments.

Table 8.3: Impact Assessment Process Steps

Step 1	<p>➤ Identification and Description of Potential Impact Source</p> <p>➤ This section presents and describes the activity that brings about the potential impact or the potential source of pollution. The significance of effects is briefly described.</p>	
Step 2	➤ Pathway / Mechanism:	➤ The route by which a potential source of impact can transfer or migrate to an identified receptor. In terms of this type of development, surface water and groundwater flows are the primary pathways, or for example, excavation/movement or soil erosion are physical mechanisms by which potential impacts are generated.
Step 3	➤ Receptor:	➤ A receptor is a part of the natural environment which could potentially be impacted upon, e.g. human health, plant / animal species, aquatic habitats, soils/geology, water resources, water sources. The potential impact can only arise as a result of a source and pathway being present.
Step 4	➤ Pre-mitigation Impact:	Impact descriptors which describe the magnitude, likelihood, duration and direct or indirect nature of the potential impact before mitigation is put in place.
Step 5	Proposed Mitigation Measures:	Control measures that will be put in place to prevent or reduce all identified significant adverse impacts. In relation to this type of development, these measures are generally provided in two types: (1) mitigation by avoidance, and (2) mitigation by (engineering) design.
Step 6	➤ Post-Mitigation Residual Impact:	➤ Impact descriptors which describe the magnitude, likelihood, duration and direct or indirect nature of the potential impacts after mitigation is put in place.
Step 7	➤ Significance of Effects:	➤ Describes the likely significant post-mitigation effects of the identified potential impact source on the receiving environment.

8.2.5 Limitations and Difficulties Encountered

No limitations or difficulties were encountered during the preparation of the Hydrology and Hydrogeology Chapter of the EIAR.



8.3

Receiving Environment

8.3.1

Site Description and Topography

The Coillte property at Derryclare (the “project site”) lies to the west of Lough Inagh and Derryclare Lough in Connemara, Co. Galway. The project site lies to the north of the N59 which joins Galway in the east to Clifden in the west.

The project site is owned by Coillte and was planted with Sitka Spruce and Lodgepole Pine in the 1960s. The overall Coillte landholding at Derryclare is ~567ha with the majority of the project site being dominated by coniferous forests (76%). The forestry plantations at Derryclare are of low to moderate productivity. Approximately 6% of the project site is unplanted, comprising of bog or wet heath habitats or is located along riparian buffer zones. An additional 18% of the forest cover has been felled or burnt and is reverting naturally wet heath or blanket bog.

The project site can be accessed from the R344, which branches off the N59 to the southeast of the project site and extends northwards travelling to the east of Derryclare Lough. A forestry track extends westwards from the R344 into the project site between Lough Inagh and Derryclare Lough. The project site is currently served by approximately 6.8km of forestry roads and tracks.

Topography of the project site is highly variable, ranging from 10-180mOD (meters above Ordnance Datum). The project site lies on the eastern slopes of Derryclare and Bencorr mountains with topography sloping steeply to the east towards Lough Inagh and Derryclare Lough. The western section of the project site contains the steepest gradients. Meanwhile, the eastern section of the project site, adjacent Lough Inagh and Derryclare Lough, is comparatively flatter.

Coillte have subdivided the Derryclare landholding into a total of 22 no. forestry harvest blocks. A total of 2 no. harvest blocks (GY27_HB0025 and GY27_HB0026) are not included in the Proposed Project. GY27_HB0025, located in the south and west of the project site is already natural bogland and does not require restoration. Meanwhile, GY27_HB0026 located towards the centre of the project site and along the western shores of Lough Inagh will be retained as commercial forestry. As part of the Proposed Project the other 20 no. harvest blocks will be subject to felling (where felling has not already been completed) and the implementation of restoration measures.

A local topography map is included as **Figure 8-1** below.

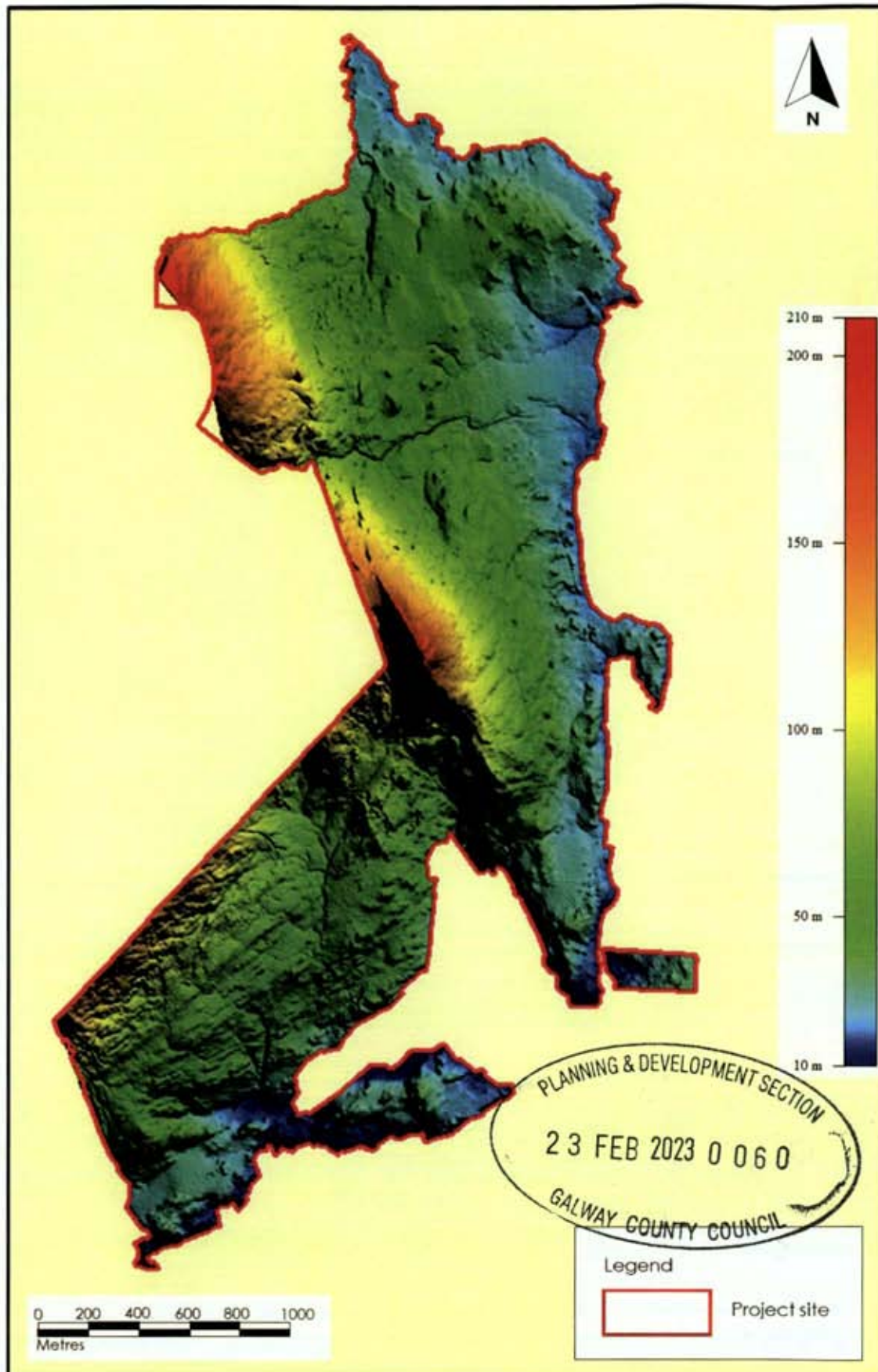


Figure 8.1: Local Topography

8.3.2

Water Balance

Long term rainfall and evaporation data were sourced from Met Éireann. The 30-year annual average rainfall recorded at the Ballynahinch rainfall station, located ~7km southwest of the project site is presented in **Table 8-4**. The standard annual average rainfall for the project site varies between 2056mm and 2285mm.

Table 8-4 Local average long-term rainfall data (mm)

Station	X-Coord		Y-Coord		Ht (MAOD)		Opened		Closed		
Ballynahinch	75300		248600		27		1962		1985		
Jan	Mar	Apr	May	Jun	July	Aug	Sept	Oct	Nov	Dec	Total
86	94	92	92	83	64	89	95	136	140	123	1211

The closest synoptic station where the average potential evapotranspiration (PE) is recorded is at Claremore, approximately 54km northeast of the project site. The long-term average PE for this station is 408mm/yr. This value is used as the best estimate of the project site PE. Actual Evaporation (AE) at the project site is estimated as 387mm/yr (which is $0.95 \times \text{PE}$).

The effective rainfall (ER) represents the water available for runoff and groundwater recharge. The ER for the project site is calculated as follows:

$$\text{Effective rainfall (ER)} = \text{AAR} - \text{AE}$$

$$= 1211\text{mm/yr} - 387\text{mm/yr}$$

$$\text{ER} = 824\text{mm/yr}$$

Groundwater recharge coefficient estimates from the GSI (www.gsi.ie) vary across the project site from 4% where the project site is overlain by peat to 85% where bedrock outcrop is present. Due to the extensive coverage of blanket peat at the site, a recharge coefficient of 10% is taken for the project site. Based on this coefficient, an estimate of 82.4mm/year average annual recharge is given for the project site. This means that the hydrology of the project site is characterised by very high surface water runoff rates and very low groundwater recharge rates. Therefore, conservative annual recharge and runoff rates for the project site are estimated to be 82.4mm/yr and 741.6mm/yr respectively.

In addition to average rainfall data, extreme value rainfall depths are available from Met Éireann. A summary of various return periods and duration rainfall depths for the project site are presented in **Table 8-5**.

Table 8-5 Project site return period rainfall depths (mm)

Storm Duration	Return Period (Years)			
	1	5	30	100
5 mins	4.4	6.1	8.5	10.4
15 mins	7.3	10.0	14.0	17.1
30 mins	10.2	14.0	19.5	23.9
1 hour	14.2	19.5	27.1	33.3
6 hours	33.5	46.2	64.1	78.6
12 hours	46.7	64.4	89.5	109.7

Storm Duration	Return Period (Years)			
	1	5	30	100
24 hours	65.2	89.8	124.8	153.0
2 days	83.3	110.6	148.1	177.3

8.3.3 Regional Hydrology

Regionally the project site is located in the Galway Bay North WFD catchment and Hydrometric area 31 of the Western River Basin District.

This catchment has a total area of 936km² and includes the area drained by all streams entering the tidal water between Nimmo's Pier and Syne Head, Co. Galway. The largest urban centre in the catchment is the western part of Galway city, with Bearna and Spiddle being the other main urban centres.

Locally, the project site is located within the Recess river sub-catchment (Recess_SC_010) and the Recess_020 WFD river sub-basin. In the vicinity of the project site, EPA mapping shows several watercourses (mountain streams) originating on the eastern slopes of Bencorr and Derryclare Mountains. In the north of the project site, these watercourses are unnamed and flow to the east from Bencorr Mountain into Lough Inagh. To the south, the Derryclare stream (EPA Code: 31D10) flows to the east from Derryclare Mountain and discharges into Lough Inagh. Further south, 3 no. unnamed streams rise on the slopes of Derryclare mountain and flow to the southeast, discharging into Derryclare Lough. Derryclare Lough itself is also fed by the Tooreenacoona river (EPA Code: 31T01) which provides a hydrological connection between Lough Inagh in the north to Derryclare Lough in the south.

Downstream of Derryclare Lough, the Recess River (EPA Code: 31R01) crosses the N59 before discharging into Ballynahinch lake. Ballynahinch Lake is an east-west elongated lake which lies to the south of the Galway to Clifden Road. This lake is noted for salmon and sea-trout fishing. Downstream of Ballynahinch Lake, the Owenmore River flows to the south before it discharges into Roundstone Bay estuary. Further downstream the estuary discharges to the Betraghboy Bay coastal waterbody and the Aran Islands, Galway Bay, Connemara coastal waterbody.

A regional hydrology map is shown in Figure 8-2.



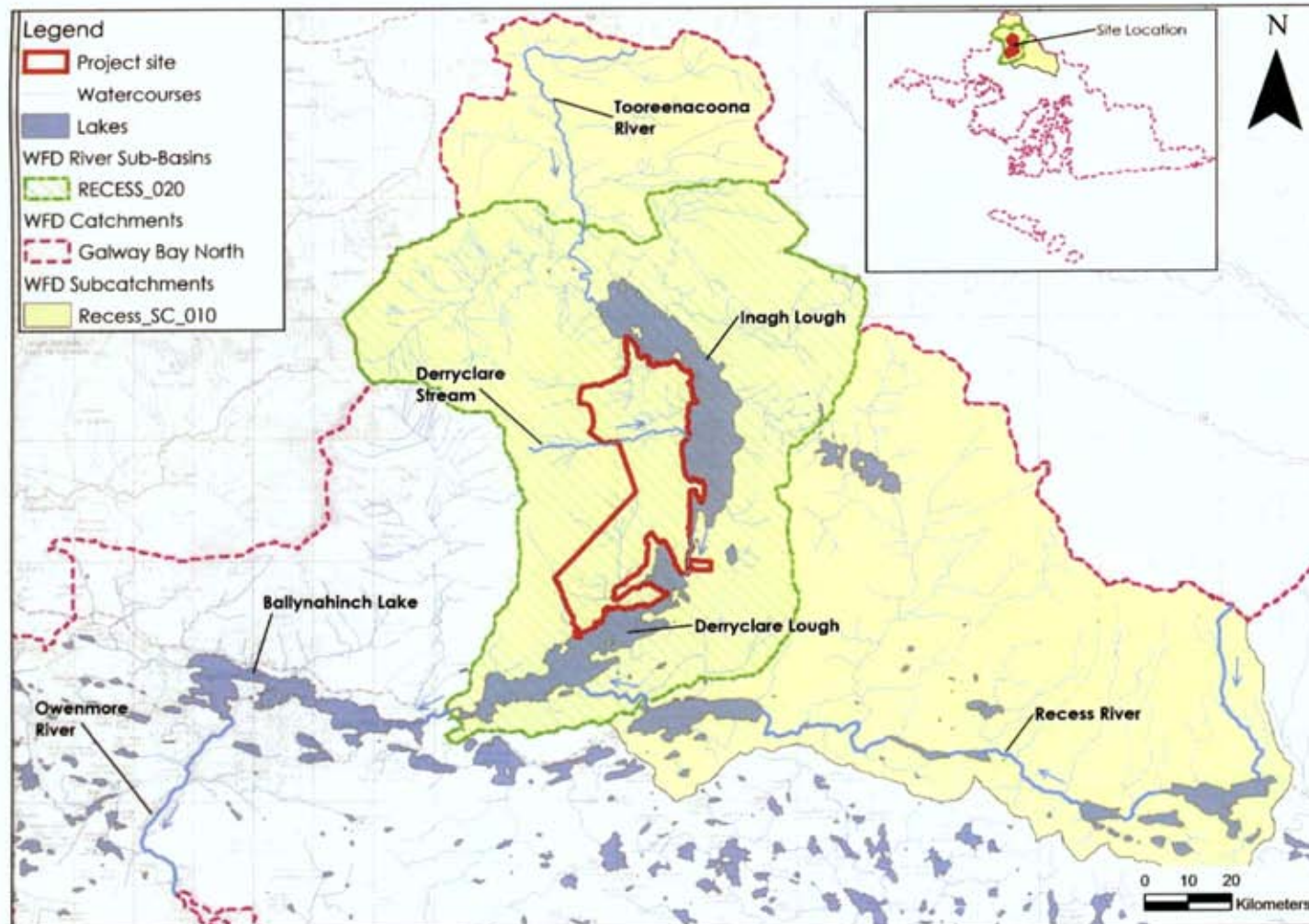


Figure 8-2: Regional Hydrology Map

Data on volumetric flow exceedance was acquired from the OPW gauging station (www.waterlevel.ie) at Derryclare. This station (Station Number: 31072) measures the outflow from Derryclare Lake to Ballynahinch Lake, with the 95%ile flow estimated to be 1.057m³/day.

The EPA's HydroTool, available on www.catchments.ie, was also consulted in order to estimate natural flow volumes in the local area. The HydroTool dataset contains estimates of naturalised river flow duration percentiles. 2 no. nodes were consulted, one located upstream of Derryclare Lough on the Tooreenacoona River (Node: 31_1601) which has a total upstream catchment of 48km². A second node is located downstream of Derryclare Lough and upstream of Ballynahinch Lough (Node: 31_697) with a total upstream catchment of 112km².

Figure 8-3 below presents the estimated flow duration curves for each of the HydroTool Nodes described above. A 95%ile flow relates to the flow which will be exceeded within the river 95% of the time. For example, the 95%ile flow at Node 09_1601 is estimated to be 0.361m³/s (361 L/s). This indicates that 95% of the time, the flow in the Tooreenacoona River at this location is estimated to be at or above 0.361m³/s. Due to the increased catchment size, the 95%ile flow at Node 09_697, downstream of Derryclare Lough, is estimated to be 0.836m³/s (836 L/s).

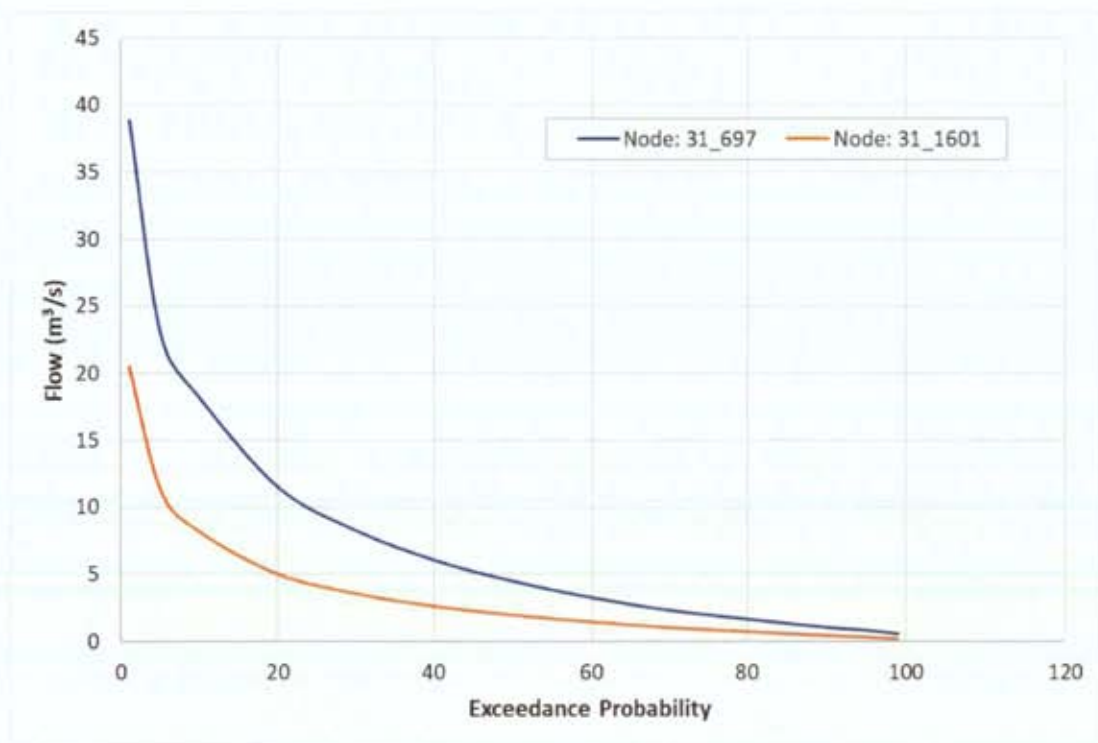
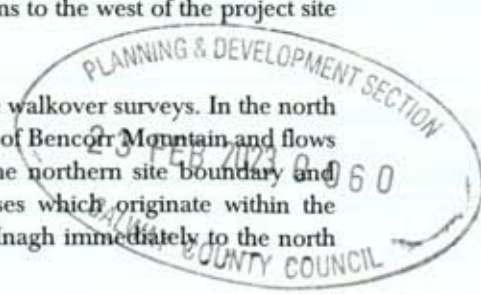


Figure 8-3: EPA HydroTool Node Flow Duration Curves

8.3.4 Project Site Drainage

The project site lies on the eastern slopes of Derryclare and Bencorr mountains and on the western shores of Lough Inagh in the north and Derryclare Lough in the south. The project site drains to these 2 no. lake waterbodies via several mountain streams which rise on the mountains to the west of the project site and flow to the east, through the project site.

The key drainage features of the project site were encountered during site walkover surveys. In the north of the project site, an unnamed mountain stream rises on the easter slopes of Bencorr Mountain and flows eastwards through the Corrabeg Valley. This watercourse runs along the northern site boundary and receives flow from several smaller unnamed EPA mapped watercourses which originate within the forestry plantation (Figure 8-4). This watercourse discharges into Lough Inagh immediately to the north



of the project site. Further south, the EPA named Derryclare River rises on the eastern slopes of Derryclare Mountain before flowing eastwards through the project site and discharging into Lough Inagh. Further south, 3 no. unnamed watercourses rise on the slopes of Derryclare Mountain and flow to the southeast, discharging into Derryclare Lough downstream of the project site. All natural watercourses encountered onsite were fast flowing, following surface topography and had incised channels into the peat deposits with some of the larger watercourses exposing bedrock outcrop.

An existing drainage map for the project site is shown within **Figure 8-5**. The drainage map was created using EPA/OSI mapped watercourses, aerial photography, field mapping and Lidar data. Lidar data allows detailed mapping on the topographic contours of the project site, thereby identifying all the linear drainage features at the project site that are greater than 150m in length. Based on this assessment the main drainage pathways at the project site are shown and the connectivity (i.e., pathways and outlet points) of these drains with the downstream EPA mapped streams/rivers can be clearly illustrated.

Surface water flow monitoring was completed at 12 no. locations within the project site. These data are presented in **Table 8-7** below. A large range of flow volumes were encountered during the walkover surveys with flows ranging from 2L/s for small drains and watercourses up to 2,000L/s for large mountain streams which drain the project site.

Within the project site there are also numerous manmade drains that are in place predominately to drain the forestry plantations. The current internal forestry drainage pattern is influenced by the topography, peat subsoils, layout of the forest plantation and by the existing road network. The forest plantations are generally drained by a network of mound drains which typically run perpendicular to the topographic contours of the project site and feed into collector drains, which discharge to interceptor drains down-gradient of the plantation.

Mound drains and ploughed ribbon drains are generally spaced approximately every 15m and 2m respectively. As illustrated in **Figure 8-6** below, interceptor drains are generally located up-gradient (cut-off drains) and down-gradient of forestry plantations. Interceptor drains are also located up-gradient of forestry access roads. Culverts are generally located at stream crossings and at low points under access roads which drain runoff onto down-gradient forest plantations. A schematic of a typical standard forestry drainage network and one which is representative of the project site drainage network is shown as **Figure 8-6**.

The forestry drains are the primary drainage routes towards the natural streams at the project site, but the flows in the higher elevated drains are generally very low or absent most of the time.

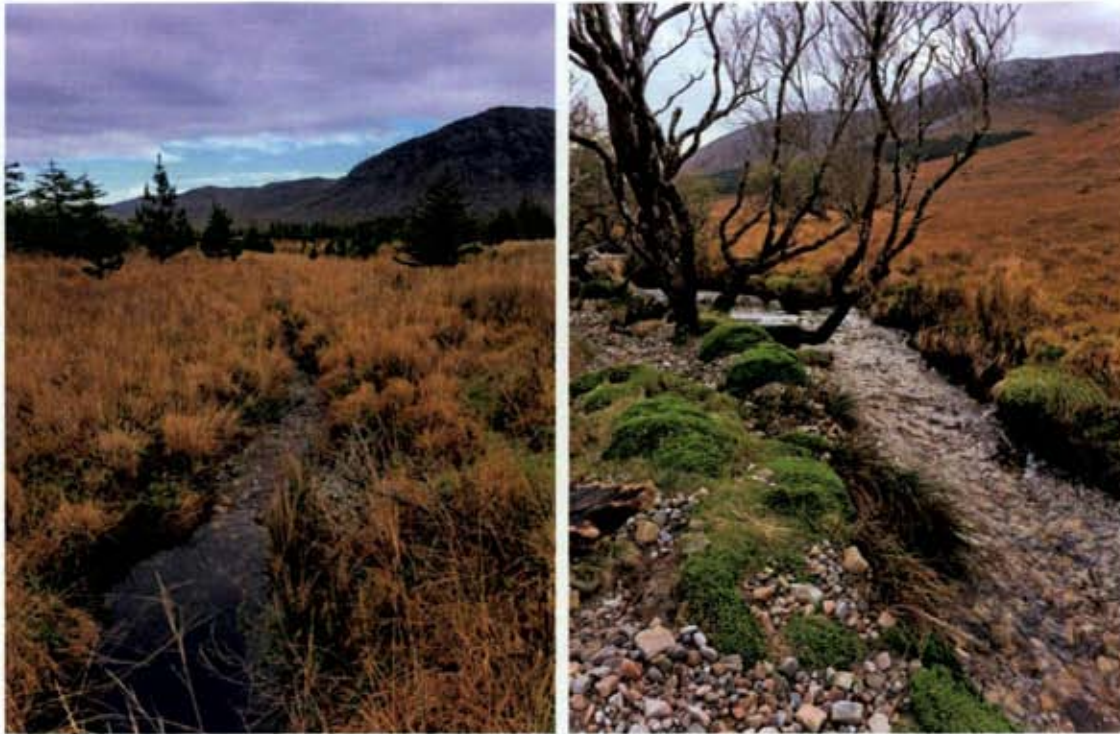


Figure 8-4: (Left) Small unnamed stream flowing through an open area. (Right) Unnamed stream immediately to the north of the project site which flows rapidly downslope and receives discharge from several watercourses which flow through the site.



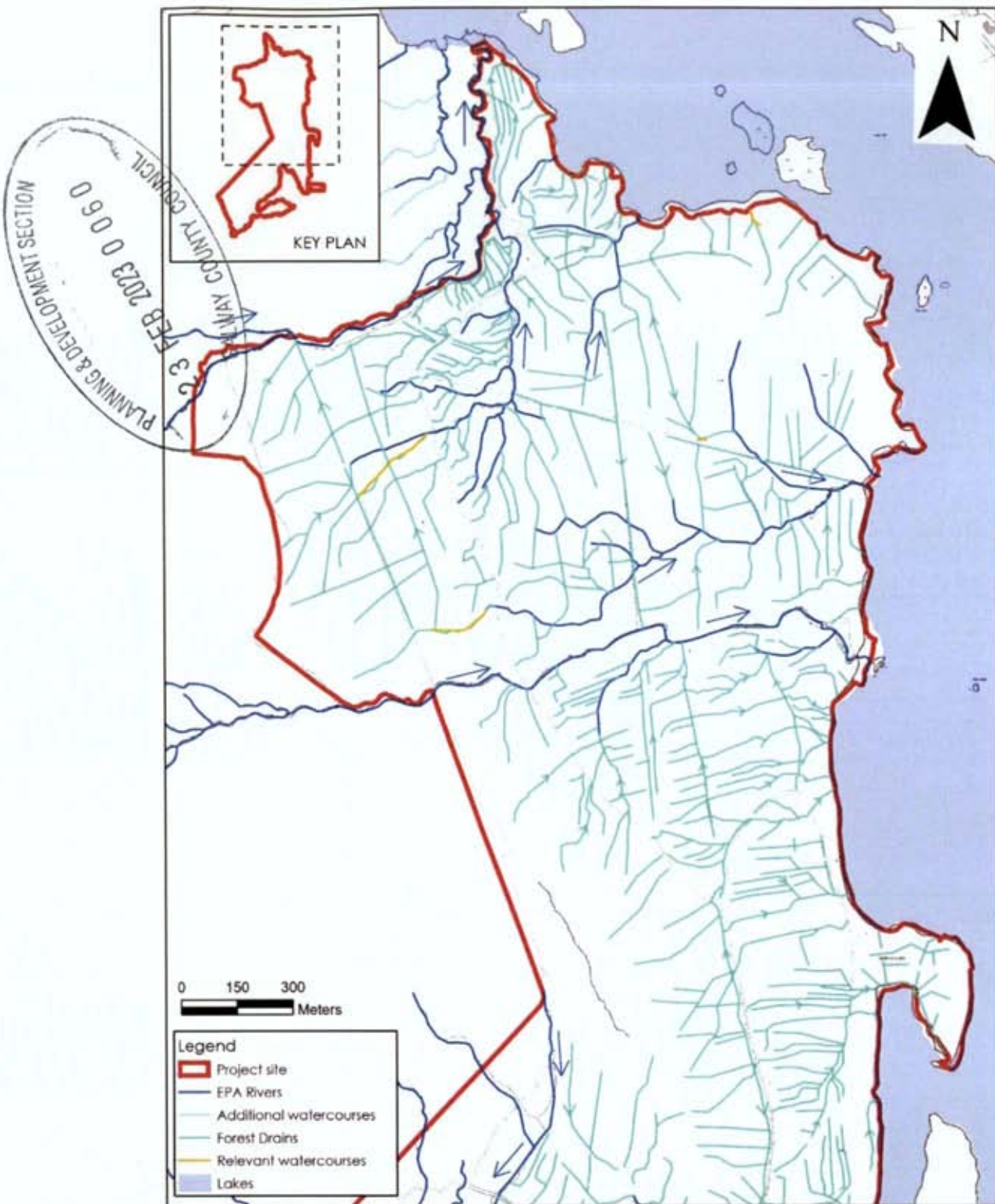


Figure 8.5a: Existing Site Drainage Map



Figure 8.5b: Existing Site Drainage Map

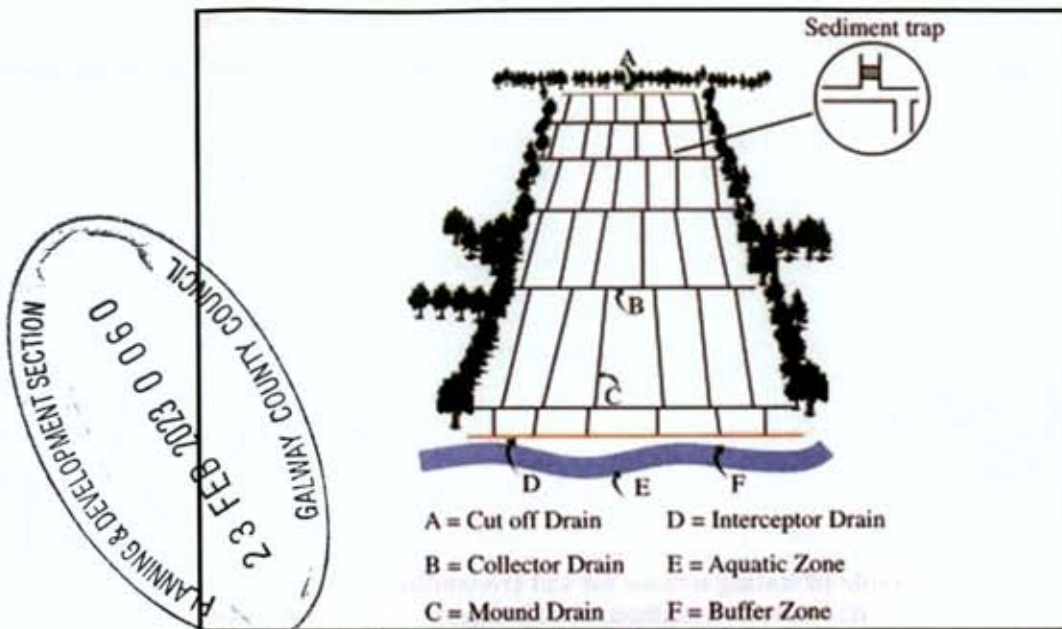


Figure 86: Process Flow Diagram for the Existing Drainage System

8.3.5 Flood Risk Assessment

A Flood Risk Assessment of the project site has been carried out by HES, the results of which are discussed below.

To identify those areas as being at risk of flooding, OPW's indicative river and coastal flood map (www.floodmaps.ie), CFRAM Flood Risk Assessment maps (www.cfram.ie), historical mapping (i.e. 6" and 25" base maps) and the GSI Groundwater Flood Maps (www.gsi.ie) were consulted.

The OPW National Flood Hazard Maps have no records of recurring or historic flood instances within the project site (Figure 8-7). Similarly, identifiable text on local available historical 6" or 25" mapping for the project site does not identify any lands that are "liable to flood".

The closest mapped recurring flood event to the project site (Flood ID: 1758) is located at Garroman, ~1.38km southeast of the project site, where an extensive low-lying area floods due to overflow of the Recess River and rising lake levels in Derryclare Lough. A recurring flood event (Flood ID: 1774) is also mapped between Derryclare and Ballynahinch Loughs.

The GSI Winter 2015/2016 Surface Water Flood Map shows surface water flood extents during the 2015/2016 flood event. This flood event is recognised as being the largest flood event on record in many areas. This flood map records surface water flooding at Lough Inagh and Derryclare Lough. However the flood extents do not significantly encroach upon the project site and are limited to the margins of the lakes.

No CFRAM mapping has been completed for the area of the project site.

The National Indicative Fluvial Flood Map for the Present Day Situation shows flooding along Lough Inagh and Derryclare Lough. However, the medium (1% AEP, 1 in 100yr) and low (0.1% AEP, 1 in 1,000yr) probability flood zones do not extend significant distances from the lakes. Flood modelling has also been completed to account for increased precipitation rates associated with climate change. The Mid-Range and High-End scenarios model potential flood zones associated with an increase in rainfall of 20% and 30% respectively. These modelled flood zones do not differ significantly from the Present Day

Scenario with flooding limited to the immediate vicinity of Lough Inagh and Derryclare Lough. No fluvial flood zones are mapped along the small mountain streams which drain the project site.

Furthermore, the project site is not mapped within any historic or modelled groundwater flood zones (www.gsi.ie).

The main risk of flooding across much of the project site is via pluvial flooding due to the low permeability peat soils and subsoils. The surface of the project site contains an extensive network of surface water drains which drain the existing forestry harvest blocks and discharge either directly into Lough Inagh or Derryclare Lough or into a nearby stream which in turn discharges into these lake waterbodies. This existing drainage network has reduced the risk of pluvial flooding across much of the project site. However, following periods of intense and prolonged rainfall events localised surface water ponding is still likely to occur in places.



PLANNING & DEVELOPMENT SECTION
 23 FEB 2023 09:00
 GALWAY COUNTY COUNCIL

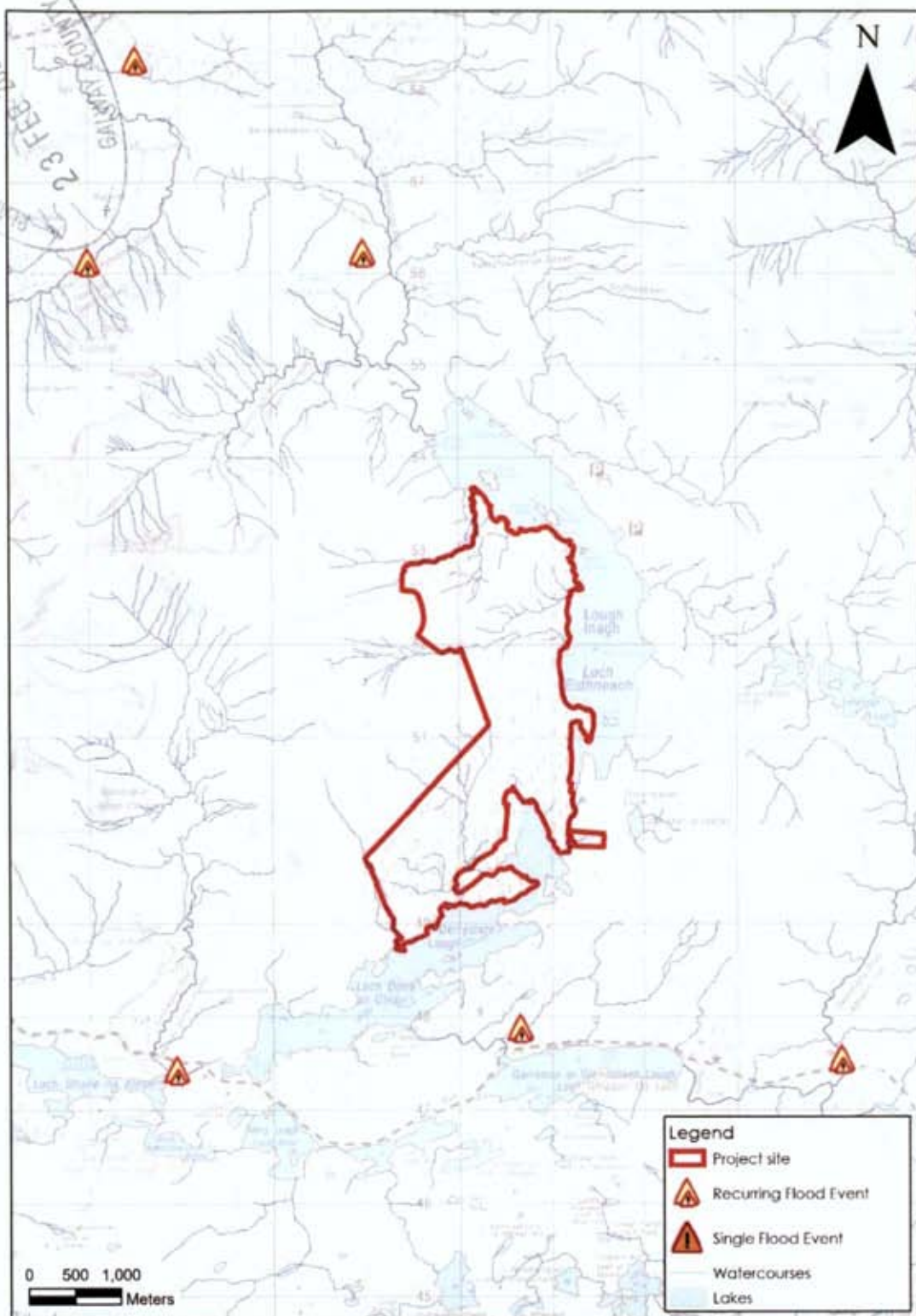


Figure 8.7: OPW National Flood Hazard Map (www.floodinfo.ie)

8.3.6

Surface Water Quality

Biological Q-rating data for EPA monitoring points downstream of the project site are shown in **Table 8-6** below. The Q-Rating is a water quality rating system based on both the habitat and the invertebrate community assessment and is divided into status categories ranging from 0-1 (Poor) to 4-5 (Good/High).

No EPA Q-rating values are available for the streams draining the project site.

Upstream of Lough Inagh and upstream of the project site, the Tooreenacoona River achieved a Q-rating of Q4 (Good status) in 2021. There is only 1 no. EPA monitoring point located downstream of the project site. This monitoring point is located downstream of Ballynahinch lake. Here the Recess River achieved a Q-rating of Q4-5 (High status) at Cloonbeg Bridge in 2021.

Table 8-6: Latest EPA Water Quality Monitoring Q-Rating Values (2020)

River	Station ID	Easting	Northing	EPA Q-Rating Status
Tooreenacoona	RS31T010200	82445.8	255514	Q4
Recess	RS31R010700	75895.45	246570.53	Q4-5

Field hydrochemistry measurements of unstable parameters, electrical conductivity ($\mu\text{S}/\text{cm}$), pH (pH units) and temperature ($^{\circ}\text{C}$) were taken at 14 no. locations during the site visit on 22nd and 23rd November 2023. The results are listed in **Table 8-7**. The monitoring locations were typically in small fast flowing mountain streams and are shown in **Figure 8-8** below.

Electrical conductivity (EC) values at the monitoring locations ranged between 64 and 117 $\mu\text{S}/\text{cm}$, with an average conductivity value of 85.7 $\mu\text{S}/\text{cm}$. Temperature ranges from 8.1 to 9.6 $^{\circ}\text{C}$ while the % of dissolved oxygen saturation was recorded between 69 and 93%. The pH values were generally acidic, ranging between 4.2 and 6.9, with an average pH of 4.7. Slightly acidic pH values of surface waters would be typical of peatland environments due to the decomposition of peat.



Table 8-7: Field Parameters - Summary of Surface Water Chemistry Measurements (22/11/2022 and 23/11/2022)

Location ID	Easting	Northing	Temp °C	DO (%)	SPC (µS/cm)	pH	Flow (L/s)
SW1	483274	753351	8.1	69.2	75.8	4.48	1.5
SW2 (Lough Inagh)	483338	753401	8.2	83.8	64	6.9	-
SW3	483137	753649	8.6	93.4	68.9	4.51	500
SW4	483036	752665	9.4	92.7	92.6	4.39	25
SW5	483166	752120	8.8	80	117.8	4.23	3
SW6	483459	752081	8.7	92.4	65	5.25	800
SW7	483908	752404	8.8	86.4	103.2	4.27	10
SW8	483584	750448	9.5	89.8	106.8	4.34	10
SW9 (Derryclare Lough)	483674	750291	8.3	78.5	85.3	4.39	-
SW10	483581	749983	9.0	83.4	100.9	6.59	10
SW11	483140	749603	8.4	92.8	70.4	4.45	2,000
SW12	482816	749658	8.8	90.8	78	4.54	6
SW13	482755	749579	9.6	92.5	87.6	4.28	6
SW14	482696	749378	8.8	91.5	84.3	4.37	8

Surface water samples were also taken at 5 no. locations for laboratory analysis on 2 no. occasions (10/08/2022 and 08/10/2022). Results of the laboratory analysis are shown alongside relevant water quality regulations in

Table 8-8 below. In addition, the European Communities Environmental Objectives (Surface Waters) Regulations (S.I. No. 272/2009) are shown in Table 8-9. The locations of these monitoring points are shown in Figure 8-8 below.

Table 8-8: Surface water quality data (10/08/2022 and 24/10/2022)

Location ID	Suspended Solids (mg/l)	Orthophosphate (mg/l)	Nitrate (mg/l N)	Ammonia (mg/l)	Total Phosphorus (mg/l)
EQS	≤25 ⁽¹⁾	≤ 0.035 to ≤0.025 ⁽²⁾	-	≤0.065 to ≤ 0.04 ⁽²⁾	-
P1	<2	<0.01 - 0.01	<0.51	0.02	<0.03
P2	<2	<0.01 - <0.01	<0.51	0.02	<0.03
P3	<2	<0.01 - 0.01	<0.51	0.03 - 0.06	<0.03
P4	<2	<0.01 - 0.01	<0.51	0.01 - 0.04	<0.03
P5	<2 - 5	<0.01 - 0.01	<0.51	0.03 - 0.04	<0.03

¹ S.I. No. 293 of 1988: European Communities (Quality of Salmonid Waters) Regulations

Suspended solid concentrations ranged from <2 to 5mg/l. All suspended solids were below the S.I. 293/1988 threshold limit of 25 mg/L. Ammonia ranged between 0.01 to 0.06 mg/l, and were often above the threshold values for High (≤ 0.04 mg/L) and Good (≤ 0.065 mg/L) quality as set out in S.I. 272/2009. In relation to ammonia 9 of the 10 no. samples were found to be of "High" status. Nitrate was below the level of detection of the laboratory (<0.51 mg/l N). For orthophosphate, all 10 no. samples were below the "High" status threshold of 0.025mg/l. Meanwhile, total phosphorus concentrations were below the level of detection of the laboratory in all 10 no. samples.

Table 8-9: Chemical Conditions Supporting Biological Elements*

Parameter	Threshold Values (mg/L)
Ammonia-N	High status ≤ 0.04 (mean)
	Good status ≤ 0.065 (mean)
Orthophosphate	High status ≤ 0.025 (mean)
	Good status ≤ 0.035 (mean)
Total Phosphorus	High status 0.01 (mean)
	Good status ≤ 0.025 (mean)

*S.I. No. 272/2009: European Communities Environmental Objectives (Surface Waters) Regulations 2009 (as amended by S.I. No. 296/2009; S.I. No. 386/2015; S.I. No. 327/2012; and S.I. No. 77/2019 and giving effect to Directive 2008/105/EC on environmental quality standards in the field of water policy and Directive 2000/60/EC establishing a framework for Community action in the field of water policy).



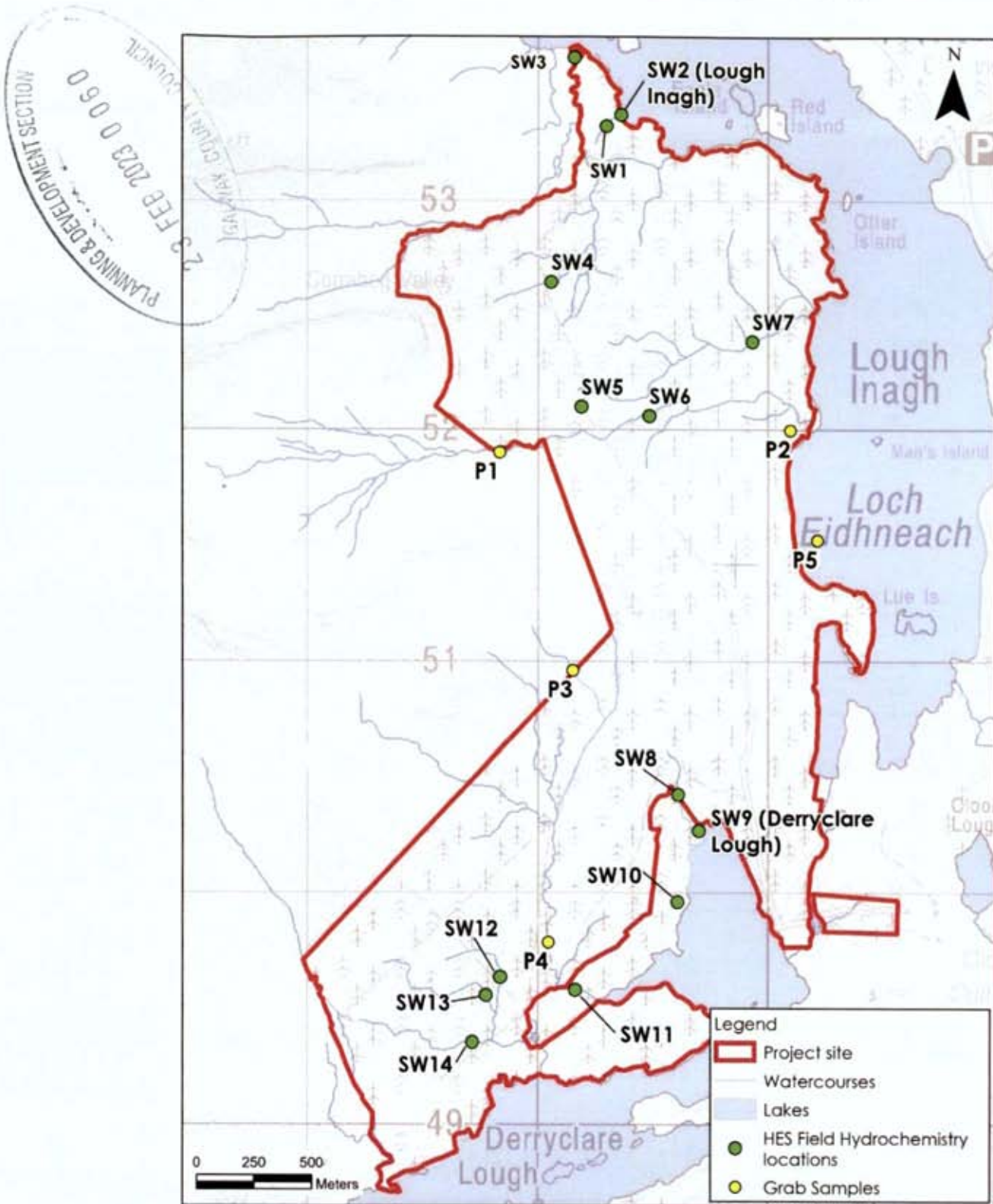


Figure 8-8: Hydrochemistry Monitoring Points (22-23/11/2022) and Grab Sample Locations

Regional Hydrogeology

The GSI map the bedrock underlying the project site to comprise predominantly of Precambrian Quartzites, Gneisses and Schists of the Streamstown Schist Formation, the Bennabeola Quartzite Formation and the Barnanoraun Schist Formation. Furthermore, Precambrian Marbles of the Lake Marbles Formation are mapped in a small area of the project site, along the western shores of Lough Inagh and again further south near Derryclare Lough. The GSI classify the bedrock geology underlying the project site as a Poor Aquifer – Bedrock which is Generally Unproductive except for Local Zones (Pl). A bedrock geology aquifer map is attached as **Figure 8-9**.

The project site is underlain largely by the Recess GWB (IE_WE_G_0011) which is characterized by poorly productive bedrock. The surface topography of this GWB is characterized by steep slopes and mountainous terrain which flattens towards the centre of the GWB. The GWB is comprised of Precambrian Quartzites, Gneisses and Schists which have undergone intense deformation, folding and faulting. These rocks are of low transmissivity, with most groundwater flow occurring in the uppermost part of the aquifer where the rocks are broken and weathered. Transmissivities may be higher in the vicinity of faults. Recharge occurs diffusely through the subsoils and rock outcrops, however recharge is limited by the presence of peat and the low permeability of the bedrock. Therefore, a high proportion of the available recharge discharges rapidly to nearby surface water streams. Flowpaths within this GWB are short (0-100m) with groundwater flows following surface topography, with the overall regional groundwater flow direction being to the south (GSI, 2004).

A small section in the northeast of the project site, along the western shores of Lough Inagh, is underlain by the Maamturks West Marbles GWB (IE_WE_G_0016) which is characterized by poorly productive bedrock. This GWB occupies a north-south trending valley between the Maamturks and the Twelve Pins, where the land surface is characterised by low-lying land and the surface water drainage pattern is towards Lough Inagh. This GWB is comprised of low transmissivity rocks, although there may be more productive zones in the vicinity of faults. Most of the groundwater flow will be concentrated in the uppermost weathered part of the aquifer. Groundwater recharge will be limited by the low permeability of subsoils and the underlying bedrock aquifer. Groundwater flowpaths will be short (~150m), with groundwater discharging to streams, springs and seeps. The overall groundwater flow direction is to the south (GSI, 2004).



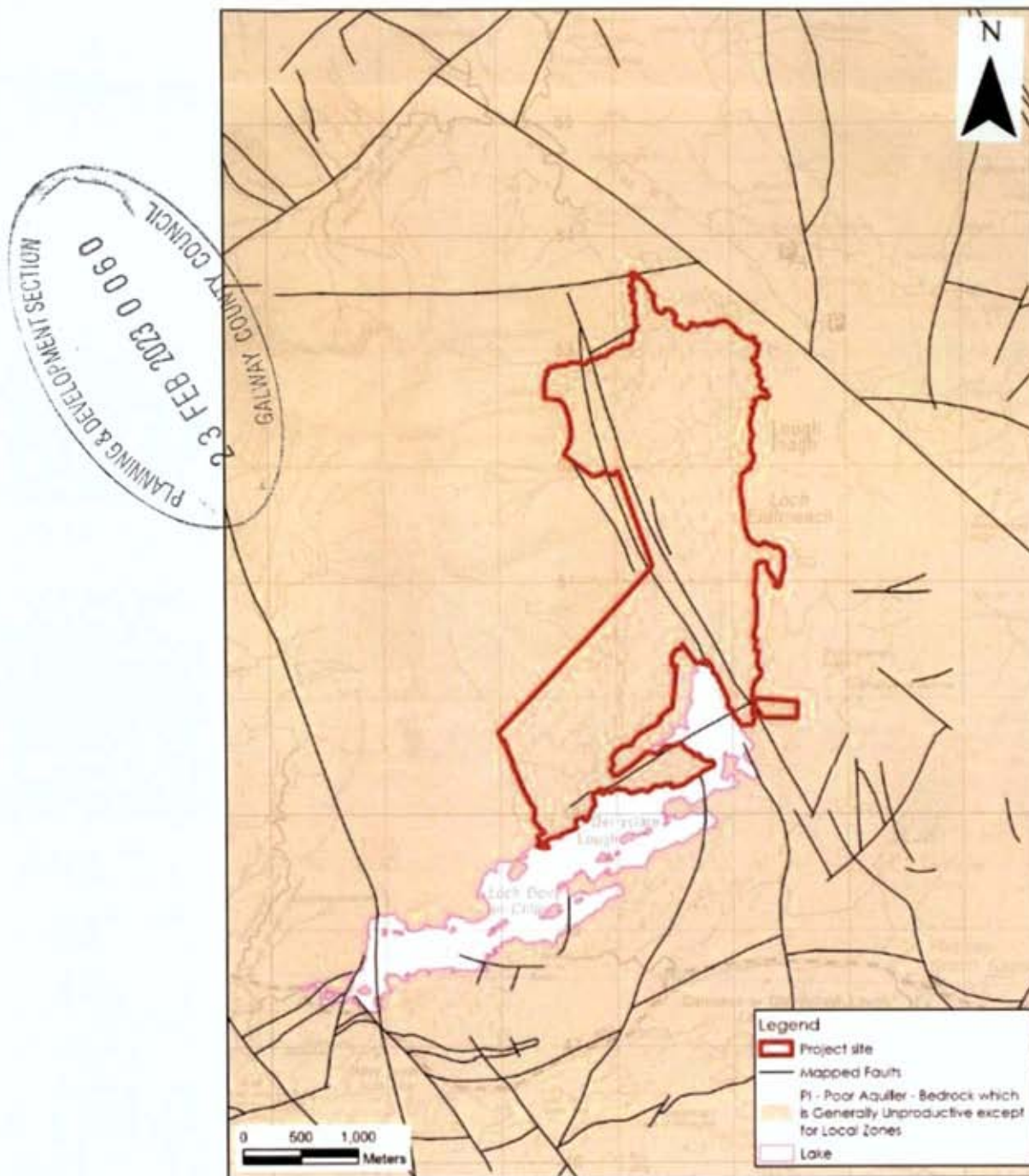


Figure 8.9: Bedrock Geology Aquifer Map

8.3.8 Project Site Hydrogeology

A shallow perched ground water table exists in the peat and is largely isolated from the underlying regional groundwater system (which occurs in the underlying bedrock).

In 2021, RPS installed a total of 43 no. shallow piezometers in the peat at Derryclare in order to record the elevation of the peat water table. These piezometers were dipped on 2 no. occasions in autumn 2021 (August and September) with the elevation of the peat water table ranging from 0 mbgl (metres below ground level) to 0.67mbgl.

Due to the extensive coverage of peat at the project site, combined with the low permeability of the bedrock aquifer and the sloping nature of the surface topography, groundwater recharge at the project site is limited and water is rapidly discharged to nearby forestry drains and natural streams.

8.3.9 Groundwater Vulnerability

The GSI Groundwater Vulnerability Map (www.gsi.ie) shows land areas where groundwater can be easily contaminated and where groundwater is well protected by the natural subsoil layers.

The groundwater vulnerability rating of the bedrock aquifer underlying project site ranges from "Moderate" to "Extreme-X". Moderate groundwater vulnerability is mapped in the northeast of the project site where blanket peat is mapped by the GSI. Here the coverage of subsoil peat protects the underlying aquifer. This means there is a low potential for groundwater dispersion and movement within the aquifer, therefore surface water bodies, such as drains and streams, are more vulnerable to pollution than groundwater.

Further south, groundwater vulnerability is mapped as "Extreme-E" where the GSI map the presence of till derived from metamorphic rocks. Meanwhile, on the elevated ground in the west of the project site, groundwater vulnerability is mapped as "Extreme-X" where rock is close to or at the surface.

8.3.10 Groundwater Hydrochemistry

The GSI Characterisation Report for the Recess GWB (GSI, 2004) states that this GWB has a calcium-magnesium-bicarbonate signature. Alkalinity is reported to range from 32-180mg/l CaCO_3 with total hardness ranging between 82-336mg/l.

Whilst no hydrochemical data is available for the Maamturks West Marbles GWB, the national classification of Precambrian Marbles is that they are calcareous with a CaHCO_3 signature. Alkalinity of Precambrian Marbles ranges from 112-428mg/l CaCO_3 with conductivity ranging from 414-814 $\mu\text{S}/\text{cm}$.

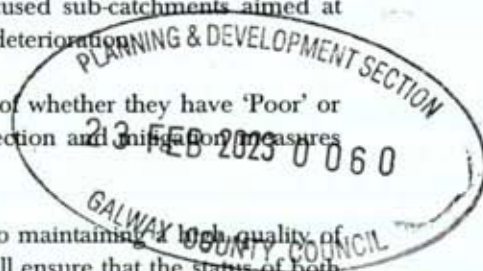
8.3.11 Water Framework Directive Water Body Status & Objectives

The River Basin Management Plan was adopted in 2018 and has amalgamated all previous river basin districts into one national river basin management district. The Third Cycle River Basin Management Plan (2022-2027) objectives include the following:

- Ensure full compliance with relevant EU legislation;
- Build on the achievements on the 2nd Cycle;
- Prevent deterioration and maintain a 'high' status where it already exists;
- Protect, enhance and restore all waters with aim to achieve at least good status by 2027;
- Ensure waters in protected areas meet requirements; and,
- Implement targeted actions and pilot schemes in focused sub-catchments aimed at restoring impacted waters and protecting waters from deterioration.

Our understanding of these objectives is that surface waters, regardless of whether they have 'Poor' or 'High' status, should be treated the same in terms of the level of protection and mitigation measures employed, i.e. there should be no negative change in status at all.

Strict mitigation measures (refer to Section 8.5.2 and 8.5.3) in relation to maintaining a high quality of surface water runoff from the project site and groundwater protection will ensure that the status of both surface water and groundwater bodies in the vicinity of the project site will be at least maintained (see below for WFD water body status and objectives) regardless of their existing status.



8.3.12 Groundwater Body Status

Local Groundwater Body (GWB) and Surface water Body (SWB) status reports are available for download from (www.wfdireland.ie).

The Recess and Maamturks West Marbles GWBs achieved “Good” status in all 3 no. WFD cycles (2010-2015, 2013-2018 and 2016-2021) which is defined based on the quantitative status and chemical status of the GWB. These GWBs has been deemed to be “Not at risk” of failing to meet their WFD objectives. No significant pressures have been identified to be impacting on these GWBs (Table 8-10).

Table 8-10: WFD Groundwater Body Status

Groundwater body	Status 2010-2015	Status 2013-2018	Status 2016-2021	Risk Status 2013-2018	WFD Pressures
Recess	Good	Good	Good	Not at risk	-
Maamturks West Marbles	Good	Good	Good	Not at risk	

8.3.13 Surface Water Body Status

A summary of the WFD status and risk result of Surface Water Bodies (SWBs) in the vicinity and downstream of the project site are shown in Table 8-11 below.

The project site is located in the Recess river sub-catchment and the Recess_020 river sub-basin. All river and stream waterbodies draining the project site form part of the WFD Recess_020 SWB which drains into Lough Inagh and Derryclare Lough.

All sections of the Recess River in the vicinity and downstream of the project site (Recess_020, Recess_030 and Recess_040) achieved “High” status in the latest WFD cycle (2016-2021). Meanwhile, Lough Inagh and Derryclare Lough immediately downstream of the project site have achieved “High” status in the last 2 no. WFD cycles. Further downstream Ballynahinch Lake achieved “High” status in all 3 no. WFD cycles.

In terms of transitional and coastal waterbodies downstream of the project site, Roundstone Bay, Bertraghboy Bay and the Aran Islands, Galway Bay and Connemara coastal waterbody all achieved “High” status in the last 2 no. WFD cycles.

No SWBs downstream of the project site have been deemed to be “at risk” of failing to meet their respective WFD objectives. A total of 7 no. SWBs are “not at risk” while the risk status for the Recess_040 river waterbody and the Aran Islands, Galway Bay and Connemara coastal waterbody is currently under review.

The 3rd Cycle Draft Galway Bay North Catchment Report states that morphological impacts remain the most prevalent issues in this catchment followed by excess nutrients and organic pollution. However, no significant pressures have been identified to be impacting on any of the SWBs in the vicinity or downstream of the project site.

It is worth noting that the Recess_040 river waterbody and Ballynahinch lake waterbody are listed as high ecological status waterbodies. Both of these SWBs achieved their target status in the latest WFD cycle.

Table 8-11: Summary WFD Information for Surface Water Bodies

SWB	Status 2010-2015	Status 2013-2018	Status 2016-2021	Risk Status 2013-2018	WFD Pressures
Recess_020	Unassigned	Good	High	Not at risk	-
Inagh	Unassigned	High	High	Not at risk	-
Derryclare	High	High	High	Not at risk	-
Recess_030	Unassigned	Good	High	Not at risk	-
Ballynahinch	High	High	High	Not at risk	-
Recess_040	High	Good	High	Under Review	-
Transitional Waterbodies					
Roundstone Bay	Unassigned	High	High	Not at risk	-
Coastal Waterbodies					
Bertraghboy Bay	Unassigned	High	High	Not at risk	-
Aran Islands, Galway Bay, Connemara	Unassigned	High	High	Under Review	-

8.3.14 Designated Sites and Habitats

Within the Republic of Ireland designated sites include Natural Heritage Areas (NHAs), Proposed Natural Heritage Areas (pNHAs), candidate Special Areas of Conservation (SAC) and Special Protection Areas (SPAs).

The project site is surrounded on all sides by the Twelve Bens/Garraun Complex SAC and pNHA (Site Code: 002031). This is an extensive site situated in north-west Connemara and is dominated by mountainous terrain. The site has been designated as an SAC due to the occurrence of several habitats listed on Annex I of the E.U. Habitats directive including but not limited to oligotrophic water containing very few minerals, alpine and subalpine heaths, blanket bog and old oak woodlands. Furthermore several species listed in Annex II have been identified within the SAC including the freshwater pearl mussel, Atlantic salmon, otter and slender naiad. The project site is hydrologically connected with the Twelve Bens/Garraun Complex SAC and pNHA as all drainage from the project site discharges into Lough Inagh and Derryclare Lough which form part of the SAC/pNHA.

The Maumturk Mountains SAC and pNHA (Site Code: 002008) lies approximately 800m to the east of the project site on the eastern shores of Lough Inagh. The Maumturk Mountains are situated east of the Twelve Bens and west of the Maumtrasnas, between the Inagh Valley and the Leenaun/Maam road in Co. Galway. The site has been designated as an SAC due to the occurrence of several habitats/species

listed on Annex I/II of the E.U. Habitats Directive including but not limited to oligotrophic waters containing very few minerals, wet heath, blanket bogs, siliceous rocky slopes, Atlantic salmon and slender naiad. The project site is not hydrologically connected to the Maumturk Mountains SAC and pNHA as Lough Inagh and Derryclare Lough act as a hydrological buffer between the project site and the SAC/pNHA.

The Connemara Bog Complex SAC and pNHA (Site Code: 002034) is located ~2.2km to the south of the project site and is a large site encompassing much of the south Connemara lowlands. The SAC/pNHA is bounded to the north by the Galway to Clifden Road and stretches as far east as the Moycullen-Spiddal road. The SAC/pNHA supports a wide range of habitats, including extensive areas western blanket bog as well as areas of heath, fen, woodlands, lakes and river and coastal habitats. The site has been designated due to the occurrence of several habitats/species listed on Annex I/II of the E.U. Habitats Directive. The project site is hydrologically linked to the Connemara Bog Complex SAC via the Recess River.

The Connemara Bog Complex SPA (Site Code: 004181) is located ~2.3km southeast of the project site. This SPA consists of 3 no. separate areas and is characterized by areas of deep peat surrounded by heath-covered rock outcrops. The site is an SPE under the E.U. Birds Directive and is of special conservation interest for Cormorant, Merlin, Golden Plover and Common Gull. The Recess River acts as a hydrological barrier between the project site and this SPA.

A map of local designated sites is attached as **Figure 8-10** below.

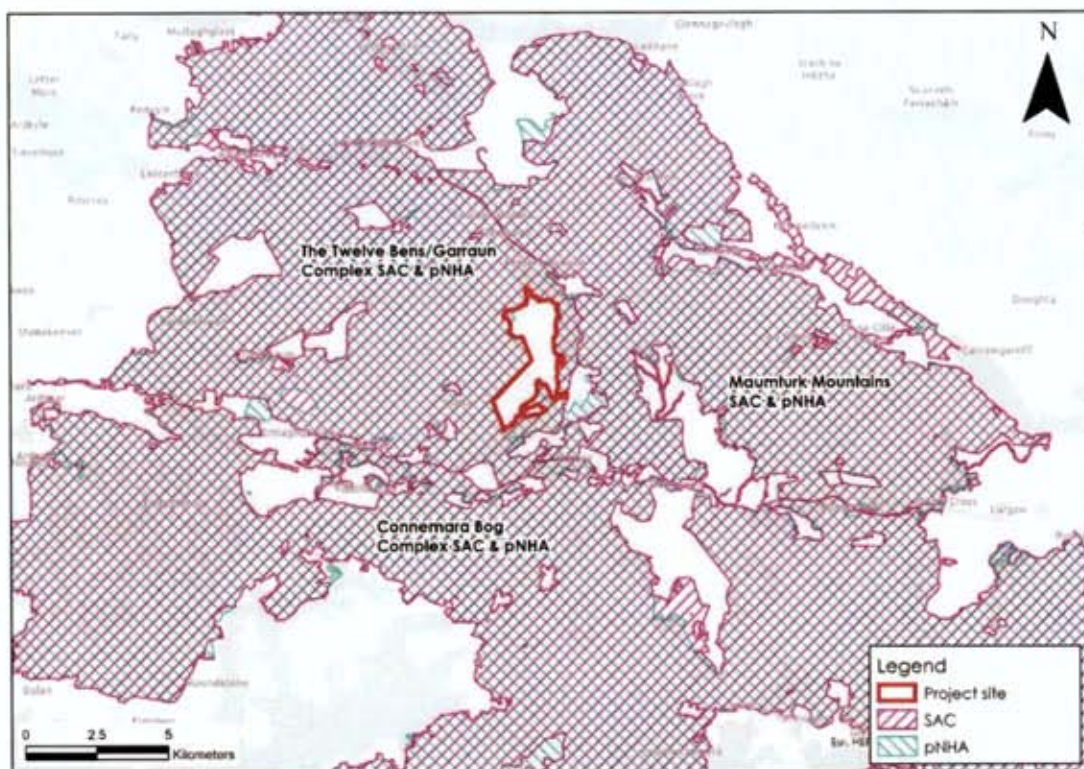


Figure 8-10: Designated Sites

8.3.15 Water Resources

There are no Group Water Schemes (GWS) or Public Water Schemes (PWS) located within the project site or in the surrounding lands.

The closest mapped water supply scheme is the Kilmain PWS located ~40km east of the project site. This PWS is located within the Cong-Robe GWB. No GWS or PWS are sourced from the Recess or Mamturks West Marbles GWBs.

A search of private well locations (wells with location accuracy of 1–100m were only sought) was undertaken using the GSI well database (www.gsi.ie). No wells are mapped within the project site or in the surrounding lands. The closest mapped well is located at Letterfrack, ~13km northwest of the project site. There are no mapped wells within the Recess or Mamturks West Marbles GWBs.

8.3.16 Receptor Sensitivity

Due to the nature of Proposed Project, being near surface construction activities (i.e., clearfelling and drain blocking), effects on groundwater are generally negligible and surface water is generally the main sensitive receptor assessed during impact assessments. The primary risks to groundwater at the project site would be from hydrocarbon spillage and leakages. These potential significant effects are assessed in Sections 8.5.2 and 8.5.3. Some of these are common potential effects on all construction and forestry sites. All potential contamination sources are to be carefully managed at the project site during the construction and operational phases of the Proposed Project and mitigation measures are proposed below to deal with these potential effects.

Based on the criteria set out in Table 8-2 above, the Poor Aquifers underlying the project site can be classed as being of Low Importance. The primary risks to groundwater during construction activities are from hydrocarbon spillage and leakages from mobile plant serving and facilitating the clearfelling and restoration activities. The vast majority of the project site is covered in cutover peat which acts as a protective cover to the underlying bedrock aquifer. Furthermore, the low permeability of the bedrock aquifers means that any contaminants which may be accidentally released on-site are more likely to travel to nearby streams within surface runoff.

Local surface waters, including all streams draining the project site can be classed as being of Extremely High Importance due to their "High" WFD status. Furthermore downstream surface waterbodies including Lough Inagh, Derryclare Lough, Ballynahinch Lough are considered as being of Extremely High Importance due to their designation as a Special Area of Conservation. The primary potential contamination of surface watercourses is via elevated concentrations of suspended solids and nutrient enrichment.

Comprehensive surface water mitigation and controls are outlined below to ensure the protection of all downstream receiving waters (Recess river, Lough Inagh, Derryclare Lough and Ballynahinch Lough). Mitigation measures will ensure that surface runoff from the project site will be of a high quality and will therefore not effect the quality of downstream surface water bodies.



Characteristics of the Proposed Project

The Proposed Project comprises:

- The felling/removal of approximately 343 hectares of conifer plantation for the purposes of peatland restoration and the establishment of native woodland. The forestry will be (felled or mulched) removed in 20 no. harvest blocks spread out over a period of 5-7 years.
- Measures to restore and rehabilitate approximately 281 hectares of Atlantic blanket bog and heathland that is currently planted with lodgepole pine and Sitka spruce forests and managed for forestry.
- Conversion of 62 hectares of conifer forestry to native woodland.
- Main peatland restoration measures will include tree removal, drain blocking (manual and mechanical) and ground reprofiling.
- The control of existing invasive species on site and continued control during the restoration works to prevent their spread.
- Drain-blocking all existing artificial drainage and artificial land drains currently existing on site in order to restore the high water table which is necessary for blanket bog growth.
- Provision of silt traps at outflows to block the pathway to the Twelve Bens/Garraun Complex SAC.
- Installation of deer fencing to protect the proposed 62 hectares of native woodland.
- Provision of a Harvest Management Phasing Plan for the Proposed Project.
- Provision of new internal access road extending to 1.58km.
- Across the project site there will be 4 no. temporary water crossings.
- Provision of informational signage.
- Resurfacing of up to 8.23km of existing forestry roads.
- Resurfacing of the existing car park.
- Installation of water monitoring stations.
- Cutting of roadside trees to improve sightline visibility at site entrance.

The main characteristics of the Proposed Project that could affect the hydrological and hydrogeological environment are:

- Clear felling of the conifer plantation. Runoff from works areas has the potential to contain elevated concentrations of suspended solids and nutrients.
- Bog restoration measures including drain blocking and ground reprofiling. Runoff from works areas has the potential to contain elevated concentrations of suspended solids and nutrients.
- Construction of the site access tracks and upgrade of existing tracks will be completed primarily using floated techniques. Construction of these access tracks has the potential to effect surface water quality.
- Application of herbicide at the project site in order to control invasive species has the potential to affect water quality.

8.4.1 Proposed Drainage

No new site drainage system is proposed as part of the Proposed Project. Existing drains will be blocked as part of the restoration measures to be implemented at the project site.

During the construction phase of the Proposed Project the drainage of the project site will require additional management.

8.4.1.1 Drainage Management During Tree Felling

The existing site drainage system will be managed during felling works so as to attenuate run-off, guard against soil erosion and safeguard downstream water quality.

The details pertaining to the drainage management are described in Chapter 4. The following provides an outline of the drainage management arrangements:

- During felling operations silt traps will be installed at all outfalls of the existing forestry drains;
- The number, design and size of the traps will vary across the project site in order to ensure sufficient protection against sediment entrainment;
- There will be no direct discharge from any drains in the work areas into any surface watercourse;
- These silt traps will provide surface water attenuation, allowing for the settlement of suspended solids and preventing the entrainment of suspended solids in downstream surface watercourses;
- Other measures to protect surface water quality during felling operations include the use of brush mats, the movement of plant solely along predetermined off-road routes and the stacking of felled timbers in designated areas alongside site access roads.

Best practice and practical experience on other similar projects suggests that in addition to the above drainage management plans there are additional site based decisions and plans that can only be made in the field through interaction between the Site Construction Manager, the Project Hydrologist and the Project Geotechnical Engineers. In relation to decisions that are made on site it is important to stress that these will be implemented in line with the associated drainage controls and mitigation measures outlined above and to ensure protection of all watercourses. These details are included in the CEMP for the project (See Appendix 4-3).

8.4.1.2 Bog Restoration Techniques

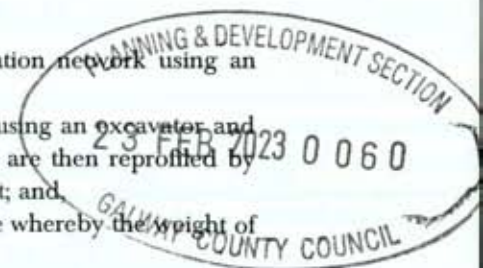
The proposed bog restoration includes drain blocking and ground re-profiling. These restoration techniques are summarised below and described in full in Chapter 4.

Drain blocking will be achieved through the use of:

- Plastic dams: To be used in areas of the project site which are inaccessible by machinery and will be installed at 10-20m intervals on flat ground, with closer spacing on sloping ground. The installation methodology involves driving piles into the ground until they are ~30cm above the bank level.
- Peat dams: Will be installed using an excavator whereby consolidated peat will be taken from an in-ditch borrow pit upstream to create a dam. Peat dams will only be installed on relatively flat ground.
- Log dams: Used to block smaller ditches and will be installed using an excavator.

Meanwhile, surface smoothing and re-profiling are bog restoration techniques designed to reverse the effect of the ridge-furrow cultivation process. The techniques include:

- Reprofiting: Levelling off of the original plough furrow afforestation network using an excavator;
- Stump flipping: The root of a stump is pried off the bog surface using an excavator and turned upside down into the adjacent furrow. The plough ridges are then reprofiled by sliding the ridge material into the furrows with an excavator bucket; and
- Cross-tracking: Involves an excavator tracking over the bog surface whereby the weight of the machine compresses the surface.



These restoration activities will disturb local peat deposits and increase the likelihood of erosion of peat and subsoils, increasing the potential for the entrainment of suspended solids in surface waters.

The main drainage management proposal during the restoration works is to first block the main collector artificial drains which are located nearest the natural watercourse followed by the strategic placement of silt traps to trap suspended solids in runoff from the work areas. The restoration works will then commence upslope at the highest point and work systematically downslope towards the natural watercourse.

Likely Significant Effects and Associated Mitigation Measures

8.5.1 Do-Nothing Scenario

If the Proposed Project were not to proceed the project site would continue to function as a coniferous forestry plantation. Currently felling operations are ongoing in some areas of the project site and, in the Do Nothing Scenario, such forestry operations would continue. The forestry operations would comprise felling and replanting of harvest blocks. We note that much of the project site is of low to moderate productivity. Nevertheless all operations at the project site would continue to conform with the current best practice Forest Service regulations, policies and guidance documents as well as Coillte and DAFM guidance documents, including replanting obligations even if commercial forestry is not continued in some harvest blocks.

If the Do Nothing Scenario was to occur the proposed restoration measures would not be implemented. In the case that the restoration plan is not implemented, it is likely that felled areas would be replanted with conifer species. If the restoration plan is not implemented the positive effects on the hydrological and hydrogeological environment at the project site would not be realised.

8.5.2 Construction Phase - Likely Significant Effects and Mitigation Measures

In relation to the Proposed Project the construction phase encompasses tree felling, habitat restoration and enhancement and all associated siteworks.

The likely significant effects of the construction phase of the Proposed Project, including construction works at the project site and mitigation measures that will be put in place to eliminate or minimise them are shown below and relate to the construction stage. It should be noted that the main potential effects on the hydrological and hydrogeological environment will occur during the construction stage.

8.5.2.1 Clear Felling of Coniferous Plantation

Tree felling is a major component of the proposed works at the project site. Initially the works will focus on harvest blocks where the existing pine and spruce have reached maturity and are starting to die off. However, over the course of 5-7 years a total of 343ha will be felled in 20 no. harvest blocks. The harvest plans and the associated drainage proposals are attached as Appendix 4-2 and provide individual plans for each of the harvest blocks to be felled at the project site. These plans are summarised in Section 8.4.1.1 above.

3 no. forms of felling will be implemented at the project site. Conventional machine felling is proposed over ~196ha, fell to waste is proposed over ~43ha while mulching is proposed over 46.14ha. Please note that ~57.41ha have already been felled under existing forestry licences.

Potential effects during tree felling occur mainly from:

- Exposure of soil and subsoils due to vehicle tracking, compaction and skidding or forwarding extraction methods resulting in a source of suspended sediment which can become entrained in surface water runoff and enter surface watercourses;
- Entrainment of suspended sediment in watercourses due to vehicle tracking through watercourses;
- Damage to roads resulting in a source of suspended sediment which can become entrained in surface water runoff and enter surface watercourses;
- Release of sediment attached to timber in stacking areas; and,
- Nutrient release.

These effects have the potential to affect the water quality and fish stocks of downstream water bodies. Potential effects on all watercourses downstream of the project site could be significant if not mitigated.

Pathways: Drainage and surface water discharge routes.

Receptors: Surface water quality in rivers and streams draining the project site and down-gradient waterbodies including Lough Inagh, Derryclare Lough, Ballynahinch Lough and the Recess River and associated dependent ecosystems.

Pre-Mitigation Potential Effect: Negative, significant, indirect, temporary, likely effect on surface water quality and dependent aquatic ecosystems.

Proposed Mitigation Measures:

Forestry operations will conform to current best practice Forest Service regulations, policies and strategic guidance documents as well as Coillte and DAFM guidance documents, including the specific guidelines listed below, to ensure that felling, planting and other forestry operations result in minimal potential negative effects to the receiving environment.

- Forestry Standards Manual (Forest Service, 2015)
- Environmental Requirements for Afforestation (Forest Service, 2016a)
- Land Types for Afforestation (Forest Service, 2016b)
- Forest Protection Guidelines (Forest Service, 2002)
- Forest Operations and Water Protection Guidelines (Coillte, 2013)
- Forestry and Water Quality Guidelines (Forest Service, 2000b)
- Forestry and the Landscape Guidelines (Forest Service, 2000c)
- Forestry and Archaeology Guidelines (Forest Service, 2000d)
- Forest Biodiversity Guidelines (Forest Service, 2000e)
- Forests and Water, Achieving Objectives under Ireland's River Basin Management Plan 2018-2021 (DAFM, 2018)
- Coillte Planting Guideline SOP
- A Guide to Forest Tree Species Selection and Silviculture in Ireland (Horgan et al., 2003)
- Management Guidelines for Ireland's Native Woodlands. Jointly published by the National Parks & Wildlife Service (Cross and Collins, 2017)
- Native Woodland Scheme Framework (Forest Service, 2018)
- Code of Best Forest Practice (Forest Service, 2000)

Mitigation by Avoidance:

There is a requirement in the Forest Service Code of Practice and in the FSC Certification Standards for the installation of buffer zones adjacent to aquatic zones at planting stage. Minimum buffer zone widths recommended in the Forest Service (2000) guidance document "Forestry and Water Quality Guidelines" are shown in Table 8-12.



With moderate slopes existing across much of the project site, a 10m setback will be established along all aquatic zones. Furthermore, a 5m setback will be established along all relevant watercourses and water hotspots. Buffer zone widths will be increased at vulnerable hotspots where deemed necessary. This will ensure water quality is protected during the felling operations.

The setback distance from sensitive hydrological features means that adequate room is maintained for the proposed mitigation measures (discussed below) to be properly installed and operate effectively. The buffer/setback zone will:

- Avoid physical damage (river/stream banks and river/stream beds) to watercourses and the associated release of sediment;
- Avoid peat/soil disturbance and compaction within close proximity to surface watercourses;
- Avoid the entry of suspended sediment from works into watercourses; and,
- Avoid the entry of suspended sediment from the drainage system into watercourses, achieved in part by ending drain discharge outside the buffer zone and allowing percolation across the vegetation of the buffer zone.

Table 8.12: Recommended minimum buffer zone width

Average slope leading to the aquatic zone		Buffer zone width on either side of the aquatic zone	Buffer zone width for highly erodible soils
Moderate	(0 – 15%)	10m	15m
Steep	(15 – 30%)	15m	20m
Very Steep	(>30%)	20m	25m

In addition to the application of buffer/setback zones, the following supplementary mitigation measures will be employed during felling works:

Mitigation by Design:

Mitigation measures which will reduce the risk of entrainment of suspended solids and nutrient release in surface watercourses comprise best practice methods which are set out as follows:

- Machine combinations will be chosen which are most suitable for ground conditions at the time of felling, and which will minimise soils disturbance. The harvester and the forwarder are designed specifically for the forest environment and are low ground pressure machines;
- All machinery will be operated by suitably qualified personnel;
- Checking and maintenance of roads and culverts will be on-going through any felling operations. No tracking of vehicle through watercourses will occur, as vehicles will use road infrastructure and existing watercourse crossing points. Where possible, existing drains will not be disturbed during felling works;
- These machines will traverse the site along specified off-road routes (referred to as racks);
- The location of racks will be chosen to avoid wet and potentially sensitive areas;
- Brash mats will be placed on the racks to support the vehicles on soft ground, reducing peat and mineral soil disturbance and erosion and avoiding the formation of rutted areas, in which surface water ponding can occur. Brash mat renewal should take place when they become heavily used and worn. Provision should be made for brash mats along all off-road routes, to protect the soil from compaction and rutting.

Where there is risk of severe erosion occurring, extraction will be suspended during periods of high rainfall;

- Silt fences will be installed at the outfalls of existing drains downstream of felling areas. No direct discharge of such drains to watercourses will occur. Sediment traps and silt fences will be installed in advance of any felling works and will provide surface water settlement for runoff from work areas and will prevent sediment from entering downstream watercourses. Accumulated sediment will be carefully disposed of at pre-selected peat disposal areas. Where possible, all new silt traps will be constructed on even ground and not on sloping ground;
- In areas particularly sensitive to erosion it will be necessary to install double or triple sediment traps and increase buffer zone width. These measures will be reviewed on site during construction;
- Double silt fencing will also be put down slope of felling areas which are located in close proximity to streams and/or relevant watercourses;
- Drains and silt traps will be maintained throughout all felling works, ensuring that they are clear of sediment build-up and are not severely eroded;
- Timber will be stacked in dry areas, and outside watercourse buffer zones. Straw bales and check dams to be emplaced on the down gradient side of timber storage/processing sites;
- Works will be carried out during periods of no, or low rainfall, in order to minimise entrainment of exposed sediment in surface water runoff;
- Refuelling or maintenance of machinery will not occur within 50m of an aquatic zone or within 20m of any other hydrological feature. Mobile bowser, drip kits, qualified personnel will be used where refuelling is required; and,
- Branches, logs or debris will not be allowed to build up in aquatic zones. All such material will be removed when harvesting operations have been completed, but care will be taken to avoid removing natural debris deflectors.

Silt Traps:

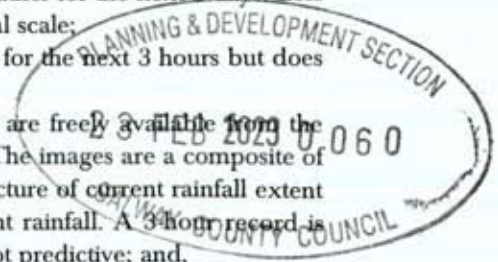
Silt traps will be strategically placed down-gradient of felling areas within forestry drains near streams. The main purpose of the silt traps and drain blocking is to slow water flow, increase residence time, and allow settling of silt in a controlled manner.

Pre-emptive Site Drainage Management :

The works programme for the felling operations will also take account of weather forecasts and predicted rainfall in particular. Operations will be suspended or scaled back if heavy rain is forecast. The extent to which works will be scaled back or suspended will relate directly to the amount of rainfall forecast.

The following forecasting systems are available and will be used on a daily/weekly basis, as required, to allow site staff to direct proposed and planned construction activities:

- General Forecasts: Available on a national, regional and county level from the Met Éireann website (www.met.ie/forecasts). These provide general information on weather patterns including rainfall, wind speed and direction but do not provide any quantitative rainfall estimates;
- MeteoAlarm: Alerts to the possible occurrence of severe weather for the next 2 days. Less useful than general forecasts as only available on a provincial scale;
- 3-hour Rainfall Maps: Forecast quantitative rainfall amounts for the next 3 hours but does not account for possible heavy localised events;
- Rainfall Radar Images: Images covering the entire country are freely available from the Met Éireann website (www.met.ie/latest/rainfall_radar.asp). The images are a composite of radar data from Shannon and Dublin airports and give a picture of current rainfall extent and intensity. Images show a quantitative measure of recent rainfall. A 3-hour record is given and is updated every 15 minutes. Radar images are not predictive; and,



- Consultancy Service: Met Éireann provide a 24-hour telephone consultancy service. The forecaster will provide an interpretation of weather data and give the best available forecast for the area of interest.

Using the safe threshold rainfall values will allow planned works to be safely executed (from a water quality perspective) in the event of forecasting of an impending high rainfall intensity event.

Works will be suspended if forecasting suggests any of the following is likely to occur:

- >10 mm/hr (i.e. high intensity local rainfall events);
- >25 mm in a 24-hour period (heavy frontal rainfall lasting most of the day); or,
- half monthly average rainfall in any 7 days.

Timing of Site Felling Works:

Felling will only be carried out during periods of low rainfall, and therefore minimum runoff rates. This will minimise the risk of entrainment of suspended sediment in surface water runoff, and transport via this pathway to surface watercourses.

Drain Inspection and Maintenance:

The following items shall be carried out during inspection pre-felling and after:

- Communication with tree felling operatives in advance to determine whether any areas have been reported where there is unusual water logging or bogging of machines;
- Inspection of all areas reported as having unusual ground conditions;
- Inspection of main drainage ditches and outfalls. During pre-felling inspections, the main drainage ditches shall be identified. Ideally the pre-felling inspection shall be carried out during rainfall;
- Following tree felling all main drains shall be inspected to ensure that they are functioning;
- Extraction tracks near drains need to be broken up and diversion channels created to ensure that water in the tracks spreads out over the adjoining ground;
- Culverts on drains exiting the site will be unblocked; and,
- All accumulated silt will be removed from drains and culverts, and silt traps, and this removed material will be deposited away from watercourses to ensure that it will not be carried back into the trap or stream during subsequent rainfall.

Surface Water Quality Monitoring:

It is proposed to complete continuous turbidity monitoring of surface watercourse downstream of the proposed work areas throughout the construction phase of the Proposed Project. This will be completed with the installation of automated water quality probes which will record turbidity and other hydrochemical parameters at regular intervals (typically every 15 minutes). These probes will be installed in natural watercourses downstream of work areas. The data will be processed and analysed at regular intervals and work will cease if elevated turbidity concentrations are recorded. In this event, all upstream silt traps and drainage routes will be inspected to identify the cause of the elevated turbidity levels. Work will not recommence until any issues have been resolved and the turbidity concentrations have returned to background concentrations.

In combination with the above, grab sampling will be completed before, during (if the operation is conducted over a protracted time) and after the felling activity. The 'before' sampling should be conducted within 4 weeks of the felling activity, preferably in medium to high water flow conditions. The 'during' sampling will be undertaken once a week or after rainfall events. The 'after' sampling will

comprise as many sampling events as necessary to demonstrate that water quality has returned to pre-activity status (*i.e.* where an effect has been shown).

Criteria for the selection of water sampling points include the following:

- Avoid man-made ditches and drains, or watercourses that do not have year round flows, *i.e.* avoid ephemeral ditches, drains or watercourses;
- Select sampling points upstream and downstream of the forestry activities;
- It is advantageous if the upstream location is outside/above the forest in order to evaluate the effect of land-uses other than forestry;
- Where possible, downstream locations should be selected: one immediately below the forestry activity, the second at exit from the forest, and the third some distance from the second (this allows demonstration of no effect through dilution effect or contamination by other land-uses where impact increases at third downstream location relative to second downstream location); and,
- The above sampling strategy will be undertaken for all on-site sub-catchments streams where tree felling is proposed.

The final details defining this monitoring will be included in the Construction Stage CEMP which will be finalised in advance of any construction works. An outline version of the CEMP is included with the EIAR.

Residual Effects: Felling operations pose a risk to surface water quality in downstream receptors due to the release of suspended sediments and nutrient enrichment. Proven and effective measures to mitigate the risk of releases of sediment have been proposed above and will break the pathway between the potential sources and the receptor. The residual effect is considered to be - Negative, imperceptible, indirect, temporary, unlikely effect on downstream water quality and aquatic habitats.

Significance of Effects: For the reasons outlined above, and with the implementation of the listed mitigation measures, no significant effects on the surface water quality will occur.

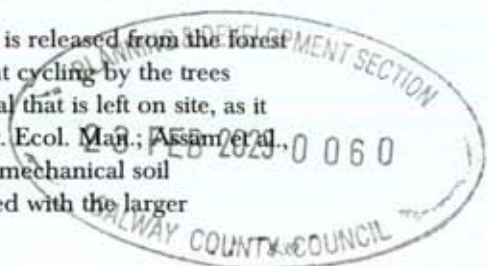
8.5.2.2 Clear Felling and Nutrient Release to Surface Waters

Tree felling is a significant component of the proposed works at the project site. Over the course of 5-7 no. years a total of 343ha will be felled across 20 no. harvest blocks.

The afforestation of the project site in the 1960s would have required an initial one off application of a phosphate based fertiliser when the trees were replanted. Phosphate application was required at the project site due to the presence of peat soils which are strongly acidic and contain low levels of available nutrients. In these acidic soils, phosphorus is one of the major limiting factors of primary productivity and phosphate, typically in the form of rock phosphate, is applied when the trees are planted to ensure that the plantations have sufficient phosphorous for sustainable growth. Typically, only one application of the phosphate is required, as once the trees are growing phosphate recycles naturally and run-off is not an issue. Total phosphorus may increase in response to fertiliser applications but such increases are temporary and have no impact on downstream river ecological status (Wasif-Shah et al., 2021).

However, felling operations disrupt the forestry nutrient cycle and there is the potential for phosphorous to be released into downstream watercourses resulting in nutrient enrichment *i.e.* eutrophication.

Following clear felling there are 2 sources of phosphorus. Firstly, phosphorus is released from the forest floor and root system, due to needle decomposition and disruption to nutrient cycling by the trees (Asam et al., 2014. Eur J. Forest. Res). The second source is the brush material that is left on site, as it degrades and leaches into adjoining watercourses (O'Driscoll et al., 2014. For. Ecol. Man.; Asam et al., 2014. Ecol. Eng). Meanwhile, phosphorus release to runoff waters due to the mechanical soil disturbance by extraction machinery has been shown to be minimal compared with the larger



contribution of the remaining clear felling residues in sites where brash mats and windrows have been applied (O'Driscoll et al. 2014. For Ecol. Man.).

Research on clear felling in upland blanket bog environments in Ireland and impacts on nearby receiving watercourses were undertaken by O'Driscoll et al. (2010). Increases in phosphorus levels in downstream nearby watercourses from baseline levels of 0.005mg/l (pre-felling) up to 0.183mg/l were noted within a couple of months after felling. The following year peak levels of 0.43mg/l were reported which is consistent with other studies (Niemenen, 2003 and Rodgers et al., 2010). The HYDROFOR project (2007) also reported that tree harvesting resulted in elevated episodic inputs of phosphorus to watercourses, typically occurring over ½ years or until the site revegetates. Once the site revegetates phosphorous is absorbed again and the leaching of phosphorus into the adjoining watercourses ceases.

The accepted critical threshold for total phosphorus is 62 µg/l (EPA, 2001). The EPA state that the "limit values of 0.2mg/l for salmonid waters, expressed as PO₄ (corresponding to 0.062mg/l as P) may be regarded as indicative in order to reduce eutrophication". This threshold will be used for surface water streams within the project site.

Therefore, the proposed felling operations have the potential to release nutrients into nearby watercourses which will have a potential negative short term impact on downstream surface water quality.

Pathways: Drainage and surface water discharge routes.

Receptors: Surface water quality in rivers and streams draining the project site and downgradient waterbodies including Lough Inagh, Derryclare Lough, Ballynahinch Lough and the Recess River and associated water dependent aquatic ecosystems.

Pre-Mitigation Potential Effect: Negative, significant, indirect, short-term, likely effect on surface water quality and dependent aquatic ecosystems.

Proposed Mitigation Measures:

The most effective way to manage tree felling and the potential risks to water quality is to implement a strict and best practice mitigation system when carrying out the felling operations.

Best practise methods provided in the EIS related to water incorporated into the forestry management and water quality protection measures were derived from:

- Forestry Commission (2003) Forests and Water Guidelines, Fourth Edition. Publ. Forestry Commission, Edinburgh;
- Coillte (2009) Forest Operations & Water Protection Guidelines;
- Coillte (2009) Methodology for Clear Felling Harvesting Operations;
- Forest Service (2000): Forestry and Water Quality Guidelines. Forest Service, DAF, Johnstown Castle Estate, Co. Wexford; and,
- Forest Service, (2000): Code of Best Forest Practice – Ireland. Forest Service, DAF, Johnstown Castle Estate, Co. Wexford.

As stated above in Section 8.5.2.1, mitigation measures from best practice Forestry Service Guidelines along with the FPM requirements will be applied and will reduce the risk of entrainment of suspended solids and nutrient release in surface watercourses. These measures are set out above. The FPM presence also requires that the project site is independently assessed prior to work commencement.

The primary mitigation measures in relation to phosphorus are the implementation of aquatic buffer zones and the avoidance of large felling coupes in excess of 25ha in the same surface water sub-catchments. For harvest blocks that are larger than 25Ha (i.e. GY27_HB0012, GY27_HB0014, and

GY27_HB0021), those will be split into smaller harvest areas below the 25Ha threshold, and felling will be sequenced in order to minimise impacts.

Phosphorus is highly mobile and studies have shown that phosphorus is absorbed quickly by riparian buffer zones which are effective in mitigating against phosphorus runoff following felling (Finnegan et al., 2012 and O'Driscoll et al. 2014). It is well established forestry best practice to implement vegetative buffer zones adjacent to watercourses, allowing the vegetation in the buffer zone to absorb the phosphorus before it enters the watercourse. The full details regarding the implementation of buffer zones at the project site are provided in Section 9.5.2.1 above. In addition, post felling, the proposed bog restoration will create one large, vegetated buffer zone. The restoration of the project site will provide adequate onsite vegetation to absorb the remaining phosphorus.

Rodgers et al. (2010) found that harvesting appropriately sized coupes in a catchment at any one time can minimise nutrient concentrations in rivers. The majority of the proposed felling coupes in Derryclare are under 25ha and are spatially distributed across the project site's surface water catchments. There are 3 no. exceptions as noted above, and those harvest blocks (i.e. GY27_HB0012, GY27_HB0014, and GY27_HB0021) will be split into smaller harvest areas below the 25Ha threshold, and felling will be sequenced in order to minimise impacts. This will ensure that the phosphorus load is evenly spread out across the entire project site.

In addition, following felling operations, it is recommended that all felled trees and where possible, brash will be removed from the project site, especially adjacent to aquatic zones. Research has shown that phosphorus loss can be reduced significantly by carrying out brash removal (O'Driscoll et al. 2011, Rodgers et al., 2010 and Yanai et al. 1988).

Surface Water Quality (Phosphorus) Monitoring:

It is proposed to complete weekly and monthly phosphorus monitoring of surface watercourse downstream of the proposed work areas throughout the construction phase of the Proposed Project. The weekly monitoring will be completed using automatic samplers for collection of composite samples. These samples will be analysed on a rolling (weekly) basis and the results will be used to direct works away from specific watercourses if total P concentrations are observed to be increasing over time. Grab sampling will also be completed on a monthly basis. The monitoring will be used to ensure that the threshold of 62 µg/l Total P (EPA, 2001) for surface waters is not being exceeded. In addition, during the construction phase of the Proposed Project monthly grab samples will be taken from Lough Inagh and Derryclare Lough to ensure there is no upward trend in total P occurring, and to demonstrate that the Site Specific Conservation Objectives (SSCOs) for nutrients are maintained (i.e. annual average total phosphorus (TP) ≤10µg/l TP, average annual total ammonia concentration should be ≤0.040mg/l N, and annual 95th percentile for total ammonia should be ≤0.090mg/l N) (NPWS, 2017).

Impact Assessment:

The mitigation measures set out above will not completely prevent the release of nutrients to downstream watercourses. The release of phosphate into the environment is an unavoidable consequence of felling.

However, the works associated with the Proposed Project will involve similar forestry felling activities to those currently and historically being undertaken at the project site. These practices are used to keep the levels of total phosphorus below the accepted critical threshold of 62 µg/l (EPA, 2001). Therefore, the existing condition of the receiving waters will provide an indication as to the potential impacts which may result from the Proposed Project.

The WFD status of the receiving waterbodies has been consulted to determine the existing baseline environment. The Recess_020 river waterbody, which includes the streams directly draining the project site, achieved "High" status in the latest WFD cycle (2016-2021). This was an improvement on the



"Good" status which this waterbody achieved in the 2nd WFD cycle (2013-2018). The receiving lake waterbodies of Lough Inagh and Derryclare Lough also achieved "High" status in the latest WFD cycle. The overall status of surface waterbodies are based on both their qualitative and quantitative characteristics.

Furthermore, these SWBs have been deemed to be "not at risk" of failing to meet their respective WFD objectives. It is noted that Derryclare Lough is a high status objective waterbody and this waterbody has been deemed to be on track to meet this target by 2027 despite the ongoing forestry operations.

It is therefore concluded, based on the overall status and the risk status of the receiving waterbodies, that the existing forestry felling and associated activities have not resulted in any deterioration in the status of any downstream receptors. As the felling works associated with the Proposed Project do not represent a significant change to the current felling practice at the project site, there is no potential for the Proposed Project to result in any deterioration in the WFD status of the receiving waterbodies.

All of the managed forestry at the project site will ultimately be felled should the Proposed Project proceed or not. As such, there is no new risk of nutrient release to the downstream catchment associated with the Proposed Project.

However, the Proposed Project involves felling each of the 20 no. harvest blocks on only 1 no. occasion. Following felling, these harvest blocks will not be replanted and therefore will not be subject to further felling in the future. The Proposed Project only has the potential to release nutrients from the project site as a result of 1 no. felling round. Meanwhile, typical forestry activities involve a continuous cycle of felling and replanting. Therefore, in the Do Nothing Scenario there are potentially many future nutrient release events as each harvest block would likely be felled and replanted several times under the existing forestry licence, i.e. cumulative impact. The Proposed Project therefore will only result in 1 no. mitigated nutrient release event which will have a short-term temporary negative impact. If the Proposed Project were to proceed this short-term negative impact would be replaced by a long-term positive effect as there will be no additional felling at the project site, i.e. removing the cumulative impact.

Residual Effects: Felling operations pose a risk to surface water quality in downstream receptors due to nutrient enrichment. Best practice measures, including the implementation of riparian buffer zones and limiting of felling coupes to 25ha (and splitting larger harvest blocks (i.e. GY27_HB0012, GY27_HB0014, and GY27_HB0021) into areas <25ha), will help protect surface water quality throughout the construction phase however nutrient release is an unavoidable consequence of felling. The short-term residual effect is considered to be - negative, indirect, slight to moderate, likely effect on downstream water quality and aquatic habitats. As stated above, the Proposed Project only proposed 1 no. round of felling in comparison to the Do Nothing Scenario in which the project site would be felled and replanted several times. Therefore, the long-term residual effect is considered to be - positive, indirect, moderate, likely effect on downstream water quality and aquatic habitats.

Significance of Effects: For the reasons outlined above, and with the implementation of the listed mitigation measures, no significant effects on the surface water quality will occur.

8.5.2.3 Sediment Entrainment in Surface Waters Due to Bog Restoration Measures

It is proposed to restore ~281ha of commercial forestry to blanket bog and wet heath habitats. Following felling, bog restoration measures will be implemented in these harvest blocks. The main restoration measures proposed include drain blocking, surface smoothing and re-profiling.

Drain blocking will be achieved through the use of plastic dams, peat dams and log dams designed to raise the groundwater level in the surrounding peat soils.

- Plastic dams will be used in areas of the project site which are inaccessible by machinery and will be installed at 10-20m intervals on flat ground, with closer spacing on sloping ground. The installation methodology involves the driving piles into the ground until they are ~30cm above the bank level.
- Peat dams will be installed using an excavator whereby consolidated peat will be taken from an in-ditch borrow pit upstream to create a dam.
- Log dams will be used to block smaller ditches and will be installed using an excavator.

These drain blocking activities will disturb local peat deposits and increase the likelihood of erosion of peat and subsoils, increasing the potential for the entrainment of suspended solids in surface waters.

Surface smoothing and re-profiling are bog restoration techniques designed to reverse the effect of the ridge-furrow cultivation process. Ideally, where suitable the site should be reprofiled as this is a more effective restoration measure than drain blocking since it elevates the water table close to the bog surface more effectively. The techniques include reprofiling, stump flipping and cross-tracking.

- Reprofiling involves the levelling off of the original plough furrow forest establishment site preparation system using an excavator;
- Stump flipping is the process whereby the root of a stump is pried off the bog surface using an excavator and turned upside down into the adjacent furrow. The plough ridges are then reprofiled by sliding the ridge material into the furrows with an excavator bucket; and,
- Cross-tracking involves an excavator tracking over the bog surface whereby the weight of the machine compresses the surface.

These surface smoothing and re-profiling activities will disturb local peat deposits and also have the potential to result in the entrainment of suspended solids in surface waters.

Pathway: drainage and surface water discharge routes

Receptor: Rivers and streams draining the project site and down-gradient waterbodies including Lough Inagh, Derryclare Lough, Ballynahinch Lough and the Recess River and associated dependent ecosystems.

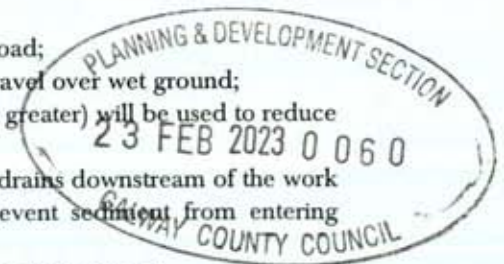
Pre-Mitigation Potential Effect: Negative, significant, indirect, short-term, likely effect.

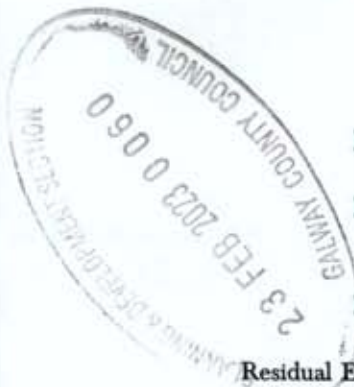
Proposed Mitigation Measures:

All proposed bog restoration works at the project site will be in accordance with the best practice Forest Service regulation, policies and strategic guidance documents as well as Coillte and DAFM guidance documents to ensure minimal potential negative effects on the local hydrological environment.

Similar mitigation measures to those outlined in Section 8.5.2.1 will be implemented during the bog restoration works in order to protect downstream surface water quality: These measures include:

- Use of aquatic buffer zones, including 10m buffer to watercourses, and 5m buffer to relevant watercourses;
- All machinery operators will be experienced;
- The project site will be walked before a machine goes off-road;
- Bog mats will be used where the excavator is required to travel over wet ground;
- A low ground pressure excavator with wide tracks (1.9m or greater) will be used to reduce compaction of the peat and subsoils;
- Silt traps will be installed at the outfalls of existing forestry drains downstream of the work areas before any works commence. These traps will prevent sediment from entering downstream watercourses;
- Silt fences will be inspected and maintained for the duration of the works;



- 
- Works will be suspended or scaled back prior to and following periods of heavy, intense and/or prolonged rainfall;
 - During drain blocking the main collector drains nearest the natural watercourse will be blocked first and silt traps will be inserted as required. Then the operators shall begin work at the highest point and work systematically downslope towards the watercourse; and,
 - All outlets of the collector and peripheral drains will be blocked.

Residual Effect Assessment: The potential for the release of suspended solids to watercourse receptors during bog restoration works is a risk to water quality and the aquatic quality of the receptor. Proven and effective measures to mitigate the risk of releases of sediment have been proposed above and will break the pathway between the potential sources and the receptor. The residual effect is considered to be - Negative, imperceptible, indirect, short-term, unlikely effect on downstream water quality and aquatic habitats.

Significance of Effects: For the reasons outlined above, and with the implementation of the listed mitigation measures, no significant effects on the surface water quality will occur.

8.5.2.4 Potential effects from Vegetation Control Measures

Vegetation control and the control of invasive species will be completed in the autumn following clear felling and for a period of at least 5-7 no. years.

Invasive species such as Rhododendron will be removed using brush-cutters, chainsaw felling, stump treatment using herbicide ecoplugs/glyphosate-based herbicides. The use of herbicides in close proximity to watercourses has the potential to effect local and downstream surface water quality.

Pathway: Site drainage and surface water discharge routes.

Receptor: Surface water quality on down gradient surface waterbodies including Lough Inagh, Derryclare Lough, Ballynahinch Lough and the Recess River and associated dependent ecosystems.

Mitigation Measures:

The following mitigation measures are proposed:

- Any spraying or stump treatment shall only take place in dry weather;
- Any work near aquatic zones will be completed by an operator who has PA6 (AW) certification;
- Any work near aquatic zones must be completed using a product designated from aquatic use such as ecoplugs or bioactive roundup; and,
- Spraying will be undertaken during dry calm weather.

Likely Residual Effects: The application of herbicide in the early stages of the restoration works will only occur over a small area of the overall project site. Strict mitigation measures have been proposed in regard to the application of herbicide to ensure surface water quality is minimised. As such, we consider the residual effects of the proposed herbicide to be an imperceptible, negative, indirect, short-term effect on downstream surface water quality.

Significance of Effects: For the reasons outlined above and with the implementation of the mitigation measures, we consider that the proposed herbicide associated with the restoration works will not have a significant effect on downstream water quality.

8.5.2.5 Effects from Proposed Roads and Road/Carparking Upgrades

The Proposed Project will utilise 8.23km of the existing forestry road network at Derryclare. While some of the existing road network will require upgrading. No road widening works are proposed.

It is proposed to construct ~1.58km of new floating forest road extensions in order to access the forestry blocks in the north and south of the project site. The proposed new road extension in the north of the project site includes a total of 11 no. temporary watercourse crossings, 3 no. of which are located over an unnamed natural watercourse and 8 no. of which are located over man-made drains. Meanwhile, proposed new road extension in the south of the project site includes a total of 10 no. temporary watercourse crossings, 1 no. of which is located over an unnamed natural watercourse, and 9 no. of which are located over man-made drains.

The existing car parking at the project site entrance off the R344 will also be upgraded to provide a level and compacted car parking surface which will be able to accommodate up to 10 vehicles.

Effects associated with these construction activities have the potential to affect the water quality and fish stocks of downstream water bodies.

Pathway: Drainage and surface water discharge routes

Receptor: Rivers and streams draining the project site and down-gradient waterbodies including Lough Inagh, Derryclare Lough, Ballynahinch Lough and the Recess River and associated dependent ecosystems.

Pre-Mitigation Potential Effect: Negative, significant, indirect, short-term, likely effect.

Proposed Mitigation Measures:

Mitigation by Avoidance:

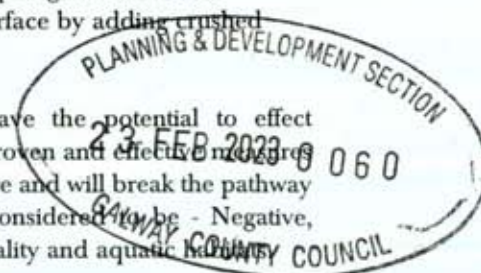
Potential water quality effects arising from proposed road construction have been minimised through the use of the existing on-site roads as part of the Proposed Project. Utilisation of the existing forestry road network reduces the amount of earthworks required for the Proposed Project and consequently minimises potential surface water quality effects.

Mitigation by Design:

Mitigation measures which will reduce the risk of entrainment of suspended solids during construction of the new floating road extensions and the upgrade of the existing site access roads are set out as follows:

- All site access roads (existing and proposed) to be used as part of the Proposed Project will be capped with clean stone to minimize the risk of sediment runoff to surface waters;
- The upgrade of the existing road network will only be completed where necessary using local stone compatible with onsite geological materials;
- The proposed new roads will be designed as “Build On-Top Embankment Roads” in accordance with the COFORD (2004) Forest road Manual – Guidelines for the Design, Construction and Management of Forest Roads.
- These new proposed floating roads will minimize effects on peat hydrology and water quality as there is no requirement for excavation and/or spoil generation. The proposed roads will be created on the existing ground surface by adding crushed stone.

Residual Effect Assessment: Road construction and road upgrades have the potential to effect downstream surface water quality and the aquatic quality of the receptor. Proven and effective measures to mitigate the risk of surface water contamination have been proposed above and will break the pathway between the potential sources and the receptor. The residual effect is considered to be - Negative, imperceptible, indirect, temporary, unlikely effect on downstream water quality and aquatic life.



Significance of Effects: For the reasons outlined above, and with the implementation of the listed mitigation measures, no significant effects on the surface water quality will occur.

Potential Release of Hydrocarbons During Construction Phase

Accidental spillage during refuelling of construction plant with petroleum hydrocarbons can cause significant pollution risk to groundwater, surface water and associated aquatic ecosystems, and to terrestrial ecology. In addition, the accumulation of small spills of fuels and lubricants during routine plant use can also be a pollution risk. Hydrocarbons have a high toxicity to humans, and all flora and fauna, including fish, and is persistent in the environment. It is also a nutrient supply for adapted micro-organisms, which can rapidly deplete dissolved oxygen in waters, resulting in the death of aquatic organisms.

Pathway: Groundwater flowpaths and site drainage network.

Receptor: Surface water quality in down-gradient waterbodies (1st and 2nd order streams draining the project site, Recess River, Lough Inagh, Derryclare Lough and Ballynahinch Lough) and groundwater quality in the peat bog.

Pre-Mitigation Potential Effect: Negative, indirect, slight, short term, likely effect on local groundwater quality in the peat bog. Indirect, negative, significant, short-term, unlikely effect to surface water quality.

Proposed Mitigation Measures:

- There will be no fuels or herbicides stored within 50m of an aquatic zone or within 20m of all other water features.
- All road-going vehicles will be refuelled off-site;
- On-site re-fuelling will be required for forestry and excavator machinery which will be based continuously at the project site;
- The on-site refuelling will be undertaken using a mobile double skinned bowser with spill kits kept on site for accidental leakages or spillages;
- The bowser will be refilled off-site and will be towed around the site by a 4x4 jeep;
- The 4x4 jeep will carry absorbent materials and pads in the event of accidental spillages;
- The fuel bowser will be parked on a level area on the construction compound when not in use;
- Only designated trained operatives will be authorised to refuel plant on-site;
- Taps, nozzles or valves associated with refuelling equipment will be fitted with a lock system;
- Fuels stored on-site will be minimised. All storage areas will be bunded appropriately for the duration of the construction phase. All bunded areas will be fitted with a storm drainage system and an appropriate oil interceptor. Ancillary equipment such as hoses, pipes will be contained within the bunded area;
- Fuel and oil stores including tanks and drums will be regularly inspected for leaks and signs of damage;
- The plant used during construction will be regularly inspected for leaks and fitness for purpose; and,
- An emergency response plan for the construction phase to deal with accidental spillages will be contained within the Construction Environmental Management Plan (which is contained in Appendix 4.3).

Residual Effect: The potential for the release of hydrocarbons to groundwater and watercourse receptors is a risk to surface water and groundwater quality, and also the aquatic quality of the surface water receptors. Proven and effective measures to mitigate the risk of releases of hydrocarbons have been proposed above and will break the pathway between the potential source and each receptor. The residual

effect is considered to be - Negative, imperceptible, indirect, temporary, unlikely effect on groundwater quality within the peat bog and surface water quality in down-gradient rivers (1st and 2nd order streams draining the project site, Recess River, Lough Inagh, Derryclare Lough and Ballynahinch Lough).

Significance of Effects: For the reasons outlined above, and with the implementation of the listed mitigation measures, no significant effects on surface water or groundwater quality will occur.

8.5.2.7 Morphological Changes to Surface Watercourses

Diversion, culverting and bridge crossing of surface watercourses can result in morphological changes, changes to drainage patterns and alteration of aquatic habitats. Construction of structures over water courses has the potential to significantly interfere with water quality and flows during the construction phase.

The proposed new floating road extension in the north of the project site includes a total of 11 no. temporary watercourse crossings, 3 no. of which are located over an unnamed natural watercourse and 8 no. of which are located over man-made drains. Meanwhile, proposed new floating road extension in the south of the project site includes a total of 10 no. temporary watercourse crossings, 1 no. of which is located over an unnamed natural watercourse, and 9 no. of which are located over man-made drains.

Pathway: Site drainage network.

Receptor: Surface water flows, stream morphology and surface water quality.

Pre-mitigation Effect: Negative, direct, slight, long-term, unlikely effect on stream flows, stream morphology and surface water quality.

Mitigation Measures:

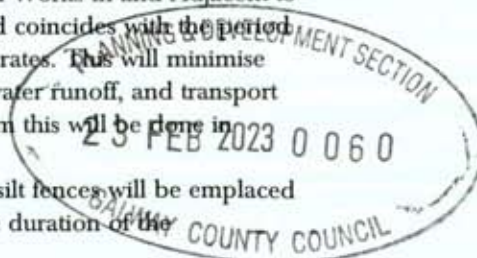
Mitigation by Avoidance:

Potential water quality effects arising from the requirement to cross the many streams and watercourse within the project site have been minimised through the use of the existing on-site roads as part of the Proposed Project. Utilisation of the existing forestry road network has significantly reduced the amount of new proposed watercourse crossings required by the Proposed Project.

Mitigation by Design:

The following mitigation measures are proposed:

- All proposed crossings will comprise of standard log-bridge crossings which are typically used in normal forestry operations;
- Any guidance / mitigation measures proposed by the OPW or the Inland Fisheries Ireland will be incorporated into the design of the proposed crossings;
- As a further precaution, near stream construction work, will only be carried out during the period permitted by Inland Fisheries Ireland for in-stream works according to the Eastern Regional Fisheries Board (2016) guidance document "Guidelines on Protection of Fisheries During Construction Works in and Adjacent to Waters", i.e., May to September inclusive. This time period coincides with the period of lowest expected rainfall, and therefore minimum runoff rates. This will minimise the risk of entrainment of suspended sediment in surface water runoff, and transport via this pathway to surface watercourses (any deviation from this will be done in discussion with the IFI);
- During the stream crossing construction work double row silt fences will be emplaced immediately down-gradient of the construction area for the duration of the



- construction of the bog-bridge crossing. There will be no batching or storage of cement allowed in the vicinity of the crossing construction areas; and,
- All new river/stream crossings will require a Section 50 application (Arterial Drainage Act, 1945). The river/stream crossings will be designed in accordance with OPW guidelines/requirements on applying for a Section 50 consent.

Residual Effects: With the application of the best practice mitigation outlined above, and through compliance with the Section 50 consenting process, we consider the residual effect to be - Negative, imperceptible, direct, long-term, unlikely effect on stream flows, stream morphology and surface water quality.

Significance of Effects: For the reasons outlined above, no significant effects on stream morphology or stream water quality will occur at crossing locations.

Effect of Bog Restoration on Bog Hydrogeological Regime

The overall aim of the Proposed Project is to rehabilitate and restore much of the project site to blanket bog and wet heath habitats.

The current drainage system was designed to lower the local peat water table in order to facilitate forestry activities. This subdued peat water table does not support bog functioning and optimum bog or wet heath ecology. The drainage regime which currently exists on-site will be altered through a series of bog restoration measures to restore pre-forestry water table conditions where possible.

Restoration can be achieved through measures such as drain blocking and surface re-profiling which will encourage natural re-vegetation of the felled areas with typical blanket bog and wet heath communities. Drain blocking will help establish a more suitable hydrological/hydrogeological regime where the water table will be much closer to the surface than it is at present. Post restoration monitoring at other sites has shown that groundwater levels in rewetted bogs can recover relatively quickly *i.e.* within 2-5 years. Maps showing the existing forestry drains to be blocked as part of this project are shown in Appendix 4-5 of this EIAR.

The magnitude of this positive effect will vary across the project site, dependent on the local intensity of the restoration measures (drain blocking, reprofiling etc).

Pathways: Water volume and peat water level rise.

Receptors: Local peat bog hydrology/hydrogeology.

Mitigation Measures:

Proposed mitigation relating to water quality protection during restoration works are detailed in Section 8.5.2.3.

No other specific mitigation measures are required in relation to the proposed alteration of the existing bog hydrogeology as the proposed measures will have a positive effect on the bog hydrogeology.

All works completed during the restoration works will be done in accordance with 'best practice' procedures and the mitigation measures in relation to the protection of surface and groundwater quality are detailed elsewhere.

Likely Residual Effects: Following the implementation of the proposed bog restoration measures, the project site will likely be wetter, will retain more water, will recolonise with vegetation, and will eventually become a naturally functioning peatland. As such, we consider the residual effects of the restoration works to be moderate, positive, direct, long-term effect on local peat bog hydrology/hydrogeology.

Significance of Effects: For the reasons outlined above, we consider that the proposed restoration works will have a significant positive effect on local bog hydrogeology.

8.5.2.9 Potential Effects on Hydrologically Connected Designated Sites

While the project site is not located within any designated conservation site, direct hydrological connections exist between the project site and the Twelve Bens/Garraun Complex SAC and pNHA (Site Code: 002031). All watercourses draining the project site flow into Lough Inagh and Derryclare Lough which both form part of the SAC/pNHA. Further downstream the project site is also hydrologically connected to the Connemara Bog Complex SAC and pNHA (Site Code: 002034) via the Recess River. No hydrological connection exists between the project site and any other designated site.

Construction phase activities at the project site, including clear felling of the coniferous plantation, the implementation of the bog restoration measures and all associated siteworks have the potential to negatively affect downstream surface water quality. The surface water connections from the project site to Lough Inagh, Derryclare Lough and the Recess River could transfer poor quality surface water that may affect the Twelve Bens/Garraun Complex SAC/pNHA and the Connemara Bog Complex SAC/pNHA.

Pathway: Surface water flowpaths.

Receptor: Down-gradient water quality Lough Inagh and Derryclare Lough (Twelve Bens/Garraun Complex SAC/pNHA) and in the Recess River (Connemara Bog Complex SAC/pNHA).

Pre-Mitigation Potential Effect: Negative, significant, indirect, short-term, likely effect on downstream designated sites (Twelve Bens/Garraun Complex SAC/pNHA) and in the Recess River (Connemara Bog Complex SAC/pNHA).

Mitigation Measures:

Detailed mitigation measures to protect surface water quality during felling operations are outlined in Section 8.5.2.1. Detailed mitigation measures to protect surface water quality during bog restoration measures are outlined in Section 8.5.2.3. Detailed mitigation measures for the control of hydrocarbons during construction works are outlined in Section 8.5.2.6. Implementation of these mitigation measures will ensure the protection of water quality in receiving waters.

Residual Effects: Construction activities at the project site pose a threat to designated sites hydrologically linked with the Proposed Project. Proven and effective measures to mitigate the risk of surface and groundwater contamination have been proposed which will break the pathway between the potential source and the downstream receptor. These mitigation measures will ensure that surface water runoff from the project site will be equivalent to baseline conditions and will therefore have no effect on the status or ecology of the protected species and habitats within the designated sites. The residual effect is considered to be Negative, imperceptible, indirect, short term, unlikely effect on downstream designated sites including the Twelve Bens/Garraun Complex SAC/pNHA and the Connemara Bog Complex SAC/pNHA.

Significance of Effects: For the reasons outlined above, no significant effects on any designated sites will occur.

8.5.2.10 Potential Effects on Surface and Groundwater WFD Status

The EU Water Framework Directive (2000/60/EC) requires that all member states protect and improve water quality in all waters, with the aim of achieving good status by 2027 at the latest. Any new development must ensure that this fundamental requirement of the Directive is not compromised.



The status of the groundwater and surface water bodies in the vicinity and downstream of the project site are described in Section 8.3.12 and 8.3.13 respectively.

In terms of surface waterbodies (SWBs), all sections of the Recess River in the vicinity and downstream of the project site (Recess_020, Recess_030 and Recess_040) achieved "High" status in the latest WFD cycle (2016-2021). Meanwhile, Lough Inagh and Derryclare Lough immediately downstream of the project site have achieved "High" status in the last 2 no. WFD cycles. Further downstream Ballynahinch Lake achieved "High" status in all 3 no. WFD cycles.

It has been determined that the Roundstone Bay transitional waterbody and the downstream coastal SWBs (Bertraghboy Bay and Aran Islands, Galway Bay and Connemara SWBs) have no potential to be affected by the Proposed Project due to their distal location from the project site, the large volume of water within these SWBs and the saline nature of the waters.

In terms of groundwater bodies (GWBs), The Recess and Maamturks West Marbles GWBs achieved "Good" status in all 3 no. WFD cycles (2010-2015, 2013-2018 and 2016-2021).

Potential effects on groundwater and surface water quality and quantity as a result of the Proposed Project has the potential to negatively affect the WFD status of ground and surface water bodies in the vicinity and downstream of the Proposed Project. The potential change in WFD status for waterbodies resulting from the Proposed Project, and in the absence of any mitigation measures, is summarised in Table 8-13 below.

Our understanding of the WFD objectives is that water bodies, regardless of whether they have 'Poor' 'Moderate' or 'High' status, should be treated the same in terms of the level of protection and mitigation measures employed in order to ensure there is no deterioration in the status of a waterbody.

Table 8-13: Summary of WFD Status Change in an Unmitigated Scenario (Construction Phase)

WFD Element	WFD Code	Current Status 2016-2021	Assessed Status - Unmitigated Scenario
Recess_020	IE_WE_31R010500	High	Good
Inagh	IE_WE_31_223	High	Good
Derryclare	IE_WE_31_227	High	Good
Recess_030	IE_WE_31R010600	High	High
Ballynahinch	IE_WE_31_228	High	High
Recess_040	IE_WE_31R010700	High	High
Recess GWB	IE_WE_G_0011	Good	Moderate
Maamturks West Marbles GWB	IE_WE_G_0016	Good	Moderate

Pathway(s): Surface water runoff and groundwater recharge.

Receptor: The following surface waterbodies have been deemed to have the potential to be affected by the Proposed Project due to their location downstream of the project site: Recess_020, Lough Inagh and Derryclare Lough.

It has been determined that the Recess_030 and _040 and Ballynahinch lake SWBs have no potential to be affected by the Proposed Project due to their location downstream of Lough Inagh and Derryclare Loughs which contain a significant volume of water and act as a hydrological buffer. Meanwhile, the Roundstone Bay transitional waterbody and the downstream coastal SWBs (Bertraghboy Bay and Aran Islands, Galway Bay and Connemara SWBs) have no potential to be affected by the Proposed Project due to their distal location from the project site, the large volume of water within these SWBs and the saline nature of the waters.

In terms of groundwater bodies, the Recess GWB and the Maamturks west Marbles GWB have the potential to be affected by the Proposed Project due to their location directly underlying the project site.

Pre-Mitigation Potential Effect: Indirect, negative, moderate, short term, likely effect on the WFD status of downstream SWBs. Indirect, negative, imperceptible, short term, unlikely effect on the WFD status of the underlying GWBs.

Impact Assessment/Mitigation Measures:

Due to the hydrogeological regime at the project site, characterised by low groundwater recharge rates and high rates of surface water runoff, the SWBs in the vicinity and downstream of the Proposed Project are the most sensitive receptors. The GWBs will be less susceptible to effects from the Proposed Project.

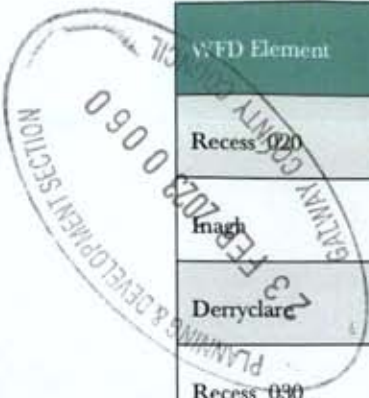
Strict mitigation measures in relation to the protection of surface and groundwaters are outlined above in Section 8.5.2.1 to 8.5.2.6. The implementation of these mitigation measures during the construction phase of the Proposed Project will ensure the qualitative and quantitative status of the receiving surface waters will not be altered by the Proposed Project.

There will be no change in GWB or SWB status in the underlying GWBs or downstream SWBs resulting from the Proposed Project (refer to **Table 8-14**). There will be no change in quantitative (volume) or qualitative (chemical) status, and the downstream SWBs and the underlying GWB are protected from any potential deterioration from chemical pollution.

As such, the Proposed Project is compliant with the requirements of the Water Framework Directive (2000/60/EC).

Table 8-14: Summary WFD Status with the implementation of Mitigation Measures (Construction Phase)





WFD Element	WFD Code	Current Status 2016-2021	Assessed Status – Unmitigated Scenario
Recess_020	IE_WE_31R010500	High	High
Inagh	IE_WE_31_223	High	High
Derryclare	IE_WE_31_227	High	High
Recess_030	IE_WE_31R010600	High	High
Ballynahinch	IE_WE_31_228	High	High
Recess_040	IE_WE_31R010700	High	High
Recess GWB	IE_WE_G_0011	Good	Good
Maamturks West Marbles GWB	IE_WE_G_0016	Good	Good

Residual Effect: Due to the local hydrogeological regime at the project site, coupled with the implementation of the proposed mitigation measures for the protection of groundwater and downstream surface waters, we consider that there will be no residual effect on the WFD status of the underlying GWBs. While SWBs are more susceptible to pollution effects from the Proposed Project, with the implementation of the proposed mitigation measures we consider that there will be no residual effect on the WFD status of the downstream SWBs.

Significance of the Effect: With the implementation of the mitigation measures outlined above there will be no change in the GWB or SWB status in the underlying GWBs or downstream SWBs resulting from the Proposed Project. The Proposed Project will not result in the deterioration in the WFD status of any surface or groundwater body nor will it jeopardise the attainment of good status in the future.

8.5.3

Operational Phase - Likely Significant Effects and Mitigation Measures

Very few potential direct effects are envisaged during the operational phase of the Proposed Project.

During the operational phase construction vehicles may be required to access the project site to allow suitably qualified personnel to complete the proposed monitoring of tree survival rates, water quality monitoring and invasive species management.

Due to the non-intrusive nature of the maintenance works during this phase of the Proposed Project, the potential effects on the hydrological and hydrogeological environment are limited to potential contamination from hydrocarbon spills and leaks as discussed in Section 8.5.3.1.

8.5.3.1

Site Vehicle/Plant Use

Plant and site vehicles used in site maintenance will be run on fuels and use hydraulic oils. Accidental spillage during refuelling of construction plant with petroleum hydrocarbons is a significant pollution risk to surface and groundwater quality and their water dependent ecosystems. The accumulation of

small spills of fuels and lubricants during routine plant use can also be a pollution risk. Hydrocarbon is highly toxic to humans, and to all flora and fauna, and is persistent in the environment.

Pathway: Groundwater flowpaths and site drainage network.

Receptor: Surface water quality in downgradient rivers and Lough Inagh and Derryclare Lough, and groundwater quality in the peat bog.

Potential Pre-Mitigation Effect: Negative, indirect, slight, short term, likely effect on local groundwater quality in the peat bog. Indirect, negative, significant, short term, unlikely effect to surface water quality.

Proposed Mitigation Measures:

- Vehicles used during the operational phase will be refuelled off site before entering the project site;
- No fuels will be stored on-site during the operational phase; and
- Spill kits will be available in all site vehicles to deal with an accidental spillage and breakdowns; and,
- An emergency plan for the operational phase to deal with accidental spillages and breakdowns will be contained in the Environmental Management Plan.

Residual Effect: The use of hydrocarbons in plant and vehicles is a standard risk associated with all sites. Proven and effective measures to mitigate the risk of spills and leaks have been proposed above and will break the pathway between the potential source and the receptor. The residual effect is considered to be - Negative, imperceptible, indirect, temporary, unlikely effect on groundwater quality within the peat bog and surface water quality in down-gradient SWBs (Recess River, Lough Inagh and Derryclare Lough).

Significance of Effects: For the reasons outlined above, no likely significant effects will occur.

8.5.3.2 Potential Effects on Surface and Groundwater WFD Status

The potential effects on groundwater and surface water during the operational phase of the Proposed Project are much reduced in comparison to the construction phase described above in Section 8.5.2.10. Therefore, the potential for the operational phase of the Proposed Project to affect the WFD status of waterbodies in the vicinity and downstream of the project site is reduced compared to the construction phase (Section 8.5.2.10).

During the operational phase of the Proposed Project, all clearfelling and the implementation of all bog restoration measures will have been completed. During the operational phase some maintenance and/or monitoring works may be completed at the project site, however these would be of a very minor scale and would be very infrequent.

During the operational phase surface and groundwater and surface water quality will be at risk from the infrequent maintenance works (hydrocarbon spillages, wastewater disposal etc) which have the potential to affect the status of SWBs and GWBs.

The potential change in WFD status for waterbodies resulting from the operational phase Proposed Project, and in the absence of any mitigation measures, is summarised in Table 8-15 below.

Table 8-15: Summary of WFD Status Change in an Unmitigated Scenario (Operational Phase).



WFD Element	WFD Code	Current Status 2016-2021	Assessed Status - Unmitigated Scenario
Recess_020	IE_WE_31R010500	High	Good
Inagh	IE_WE_31_223	High	Good
Derryclare	IE_WE_31_227	High	Good
Recess_030	IE_WE_31R010600	High	High
Ballynahinch	IE_WE_31_228	High	High
Recess_040	IE_WE_31R010700	High	High
Recess GWB	IE_WE_G_0011	Good	Moderate
Maamturks West Marbles GWB	IE_WE_G_0016	Good	Moderate

Pathway(s): Groundwater recharge and groundwater flow (downstream discharge of groundwater to surface waterbodies).

Receptor: The following surface waterbodies have been deemed to have the potential to be affected by the Proposed Project due to their location downstream of the project site: Recess_020, Lough Inagh and Derryclare Lough.

It has been determined that the Recess_030 and _040 and Ballynahinch lake SWBs have no potential to be affected by the Proposed Project due to their location downstream of Lough Inagh and Derryclare Loughs which contain a significant volume of water and acts as a hydrological buffer. Meanwhile, the Roundstone Bay transitional waterbody and the downstream coastal SWBs (Bertraghboy Bay and Aran Islands, Galway Bay and Connemara SWBs) have no potential to be impacted by the Proposed Project due to their distal location from the project site, the large volume of water within these SWBs and the saline nature of the waters.

In terms of ground waterbodies, the Recess GWB and the Maamturks west Marbles GWB have the potential to be affected by the Proposed Project due to their location directly underlying the project site.

Pre-Mitigation Potential Effect : Indirect, negative, moderate, short term, likely effect on the WFD status of downstream SWBs. Indirect, negative, imperceptible, short term, unlikely effect on the WFD status of the underlying GWBs.

Impact Assessment/Mitigation Measures:

As outlined above, the potential for effects during the operational phase of the Proposed Project is reduced in comparison to the construction phase.

During the operational phase of the Proposed Project, the only plant which will be required on site will be maintenance/inspection vehicles (jeeps/vans/quads). These will be refuelled off-site. Mitigation measures outlined for the protection of surface and groundwaters from hydrocarbon spillage will also be implemented during the operational phase. The implementation of these mitigation measures during

the operational phase will ensure the qualitative status of the receiving waters will not be altered by the Proposed Project.

There will be no change in GWB or SWB status in the underlying GWBs or downstream SWBs resulting from the Proposed Project (refer to **Table 8-16**). There will be no change in quantitative (volume) or qualitative (chemical) status, and the underlying GWBs are protected from any potential deterioration from chemical pollution.

As such, the Proposed Project is compliant with the requirements of the Water Framework Directive (2000/60/EC).

Table 8-16: Summary WFD Status with the implementation of Mitigation Measures (Operational Phase)

WFD Element	WFD Code	Current Status 2016-2021	Assessed Status – Unmitigated Scenario
Recess_020	IE_WE_31R010500	High	High
Inagh	IE_WE_31_223	High	High
Derryclare	IE_WE_31_227	High	High
Recess_030	IE_WE_31R010600	High	High
Ballynahinch	IE_WE_31_228	High	High
Recess_040	IE_WE_31R010700	High	High
Recess GWB	IE_WE_G_0011	Good	Good
Maamturks West Marbles GWB	IE_WE_G_0016	Good	Good

Residual Effect: Due to the minor and infrequent nature of works during the operational phase, coupled with the implementation of the proposed mitigation measures for the protection of groundwater and downstream surface waters, we consider that there will be no residual effect on the WFD status of SWBs downstream of the Proposed Project. Additionally, given the low rates of groundwater recharge at the project site, the minor and infrequent nature of the works during the operational phase, coupled with the proposed mitigation measures we consider that there will be no residual effect on the WFD status of the underlying GWB.

Significance of the Effect: With the implementation of the mitigation measures outlined above there will be no change in the GWB or SWB status in the underlying GWB or downstream SWBs resulting from the Proposed Project. The Proposed Project will not result in the deterioration in the WFD status of any surface or groundwater body nor will it jeopardise the attainment of good status in the future.

8.5.4

Decommissioning Phase - Likely Significant Effects and Mitigation Measures

It is not intended that the proposed peatland restoration project will be reversed or removed as permanent planning permission is being sought for the change of land use from forestry to other habitat



types. Therefore, it is intended that the Proposed Project will be retained as permanent, and will not be decommissioned.

As such, no additional effects on the hydrological and hydrogeological environment can occur.

8.5.5 Assessment of Cumulative Effects

As stated above the restoration of the project site will not be reversed and the land use change will be permanent. Any potential cumulative hydrological and hydrogeological effects will result from other activities within the Recess River surface water catchment outside the project site. However, this is a largely rural catchment and there are no active IPC or discharge licences downstream of the project site.

Forestry activities will continue is 1 no; harvest block within the project site (GY27_HB0026). Typical downstream water quality issues arising from forestry activities include elevated concentrations of suspended solids and nutrient enrichment. However, the Proposed Project involves the restoration of much of the project site resulting in improved surface water quality and attenuation in the restored areas. This will improve local surface water quality in the vicinity of the project site in comparison to the existing baseline condition where forestry operations are ongoing across the entire project site.

Human Health

Due to the nature of the Proposed Project, combined with the mitigation measures designed to protect surface water and groundwater quality, the Proposed Project will pose no risk to human health and will likely result in the long-term improvement in local surface water quality.

8.5.7 Risk of Major Accidents and Disasters

The main risk of MADs at peatland sites is related to peat stability. However, there is no record of peat instability or historic peat slides at the project site. The Proposed Project does not involve any significant excavations and will therefore not increase the risk of peat failure at the project site.

Flooding can also result in downstream MADs. However, the rehabilitation and restoration of the project site will increase surface water retention/attenuation at the site through drain blocking, re-profiling and the restoration of the bog hydrogeological regime. This will reduce the risk of flooding downstream of the project site.

8.5.8 Monitoring

As part of the operational phase of the Proposed Project a surface water quality monitoring programme will be implemented.

This will include both chemical and biological water quality monitoring. The primary objective of this water quality monitoring will be to establish a baseline and then monitor the effect of the peatland restoration on water quality discharging from the project site. The chemical parameters to be included in the monitoring programme include pH, suspended solids, total phosphorous, total ammonia, COD and DOC. Initially, monitoring should be completed bi-annually and if, after two years, the key targets are being met then the requirement for further water quality monitoring programme will be reviewed.

It is also likely that some groundwater level monitoring will continue order to evaluate the success of the restoration plans. This shall include groundwater monitoring in the installed piezometers which will allow for the measurement of the peat groundwater table and assess the effect of the proposed restoration measures, such as drain blocking and re-profiling, which are designed to raise the local peat groundwater table.

Conclusion

The project site is located in the Coillte property at Derryclare, which lies to the west of Lough Inagh and Derryclare Lough in Connemara, Co. Galway. The overall Coillte landholding at Derryclare is ~567 hectares (ha). The project site was planted with Sitka Spruce and Lodgepole Pine in the 1960s. Currently the project site is dominated by coniferous forests which are of low to moderate productivity. The project site lies on the eastern slopes of Derryclare and Bencorr mountains with topography sloping steeply to the east. The western section of the project site contains the steepest gradients while the eastern section is comparatively flatter.

It is proposed to restore and rehabilitate ~281ha of Atlantic Bog and heathland that is currently planted and managed for commercial forestry. The Proposed Project will comprise of felling of the existing forestry plantations and a series of restoration works designed to aid the restoration of the peatland at Derryclare. The Proposed Project also aims to convert ~62 ha of coniferous forestry to native scrub woodland.

On a regional scale, the project site is located within the Galway Bay North catchment and Hydrometric area 31 of the Western River Basin District. More locally, the project site is located within the Recess river sub-catchment. The project site lies immediately to the west of the of Lough Inagh and Derryclare Lough and is drained by several mountain streams which dissect the project site and discharge into these lakes.

During each phase of the Proposed Project (construction and operation) a number of activities will take place at the project site which will have the potential to affect the hydrological regime or water quality at the project site or downstream. The main potential effects on the hydrological and hydrogeological environment will occur during the construction phase while very few potential direct effects are envisaged during the operational phase of the Proposed Project. These potential effects arise from sediment input and nutrient release during felling operations and the implementation of the proposed restoration measures. Potential effects may also arise from other pollutants such as hydrocarbons which will be present at the project site. These potential effects are similar to all sites which are managed for commercial forestry.

Surface water drainage measures, pollution control measures and other preventative measures have been incorporated into the project design to minimise significant negative effects on downstream water quality. Proven and effective measures to mitigate the risk of releases of sediment and nutrients in runoff have been proposed and will ensure that no significant effects will occur. Preventative pollution measures which also include fuel management have been incorporated into the construction and Environmental Management Plan, which is presented in Appendix 4-3 of this EIAR.

Overall the Proposed Project presents no likely significant effects to surface water (quality or flows) and groundwater (quality or quantity) provided that the proposed mitigation measures are implemented.

No significant construction or operation phase cumulative effects on any surface or groundwater bodies will result from the proposed felling and restoration proposals at Derryclare.



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9.

AIR AND CLIMATE

9.1

Introduction

This chapter identifies, describes and assesses the potential significant direct and indirect effects on air quality and climate arising from the construction and operation of the Proposed Project. The full description of the Proposed Project is detailed in Chapter 4.

9.1.1

Background

The Coillte property at Derryclare (project site) lies to the west of Lough Inagh and Derryclare Lough in Connemara, Co. Galway, north of the Galway to Clifden Road (N59). The Derryclare property extends to approximately 567 Hectares (ha) on the western slopes of Derryclare and Bencorr mountains. The site is located in the townlands of Derryclare and Cloonnacartan in County Galway.

Current land-use within the project site comprises coniferous forestry with small areas of intact blanket bog. The Proposed Project involves the felling of 343 hectares of coniferous forestry in various stages of the forestry cycle. The Proposed Project will restore up to 281 hectares of peatland habitat (blanket bog and wet heath) in the felled area. Peatland restoration is one of the primary nature-based solution to the biodiversity and climate crisis in Ireland, as blanket bogs accumulate and store carbon as well as possessing unique habitats with high biodiversity value. These peatlands also store and filter water, playing a vital role in the management of water catchments. A detailed description of the project and the proposed harvesting, peatland restoration, and native woodland planting techniques are provided in Chapter 4 of this EIAR. Due to the non-industrial nature of the Proposed Project and the general character of the surrounding environment, air quality sampling was deemed to be unnecessary for this EIAR. It is expected that air quality in the existing environment is good, since there are no major sources of air pollution (e.g. heavy industry) in the vicinity of the Site.

9.1.2

Statement of Authority

This section of the EIAR has been prepared by Edward Ryan and Catherine Johnson and reviewed by Michael Watson and Thomas Blackwell, all of MKO. Edward is an Environmental Scientist with MKO with over three years of consultancy experience and has been involved the compilation of numerous EIAR chapters, including the preparation of air and climate assessments and reports, for various projects. Edward holds a BSc. in Earth Science and a MSc. in Climate Change: Integrated Environmental and Social Science Aspects. Catherine is an Environmental Scientist at MKO with expertise in international climate law and policy, earth sciences and ESG/sustainability policy. Catherine has a BSc in Earth and Ocean Science and a LLM in Global Environment and Climate Change Law. Michael Watson completed an MA in Environmental Management at NUI, Maynooth in 1999. He is a professional geologist (PGeo) and full member of IEMA (MIEMA) as well as a Chartered Environmentalist (CEnv). Michael joined McCarthy Keville O'Sullivan Ltd. in 2014 having gained over 15 years' experience in a Cork-based environmental & hydrogeological consultancy firm. Thomas Blackwell is a Senior Environmental Consultant with MKO with over 17 years of progressive experience in environmental consulting. Thomas holds a BA (Hons) in Geography from Trinity College Dublin and a M.Sc. in Environmental Resource Management from University College Dublin.



Air Quality

Air Quality Standards

In 1996, the Air Quality Framework Directive (96/62/EC) was published. This Directive was transposed into Irish law by the Environmental Protection Agency Act 1992 (Ambient Air Quality Assessment and Management) Regulations 1999. The Directive was followed by four Daughter Directives, which set out limit values for specific pollutants:

- The first Daughter Directive (1999/30/EC) addresses sulphur dioxide, oxides of nitrogen, particulate matter and lead.
- The second Daughter Directive (2000/69/EC) addresses carbon monoxide and benzene. The first two Daughter Directives were transposed into Irish law by the Air Quality Standards Regulations 2002 (SI No. 271 of 2002).
- A third Daughter Directive, Council Directive (2002/3/EC) relating to ozone was published in 2002 and was transposed into Irish law by the Ozone in Ambient Air Regulations 2004 (SI No. 53 of 2004).
- The fourth Daughter Directive, published in 2007, relates to polyaromatic hydrocarbons (PAHs), arsenic, nickel, cadmium and mercury in ambient air.

The Air Quality Framework Directive and the first three Daughter Directives have been replaced by the Clean Air for Europe (CAFE) Directive (Directive 2008/50/EC on ambient air quality), which encompasses the following elements:

- The merging of most of the existing legislation into a single Directive (except for the Fourth Daughter Directive) with no change to existing air quality objectives.
- New air quality objectives for PM_{2.5} (fine particles) including the limit value and exposure concentration reduction target.
- The possibility to discount natural sources of pollution when assessing compliance against limit values.
- The possibility for time extensions of three years (for particulate matter PM₁₀) or up to five years (nitrogen dioxide, benzene) for complying with limit values, based on conditions and the assessment by the European Commission.

Table 9-1 below sets out the limit values of the CAFE Directive, as derived from the Air Quality Framework Daughter Directives. Limit values are presented in micrograms per cubic metre ($\mu\text{g}/\text{m}^3$) and parts per billion (ppb). The notation PM₁₀ is used to describe particulate matter or particles of ten micrometres or less in aerodynamic diameter. PM_{2.5} represents particles measuring less than 2.5 micrometres in aerodynamic diameter.

The CAFE Directive was transposed into Irish legislation by the Air Quality Standards Regulations 2011 (S.I. No. 180 of 2011) as amended by the Air Quality Standards (Amendments) and Arsenic, Cadmium, Mercury, Nickel and Polycyclic Aromatic Hydrocarbons in Ambient Air Regulations, 2016 (S.I. 659 2016). These Regulations supersede the Air Quality Standards Regulations 2002 (S.I. No. 271 of 2002), the Ozone in Ambient Air Regulations 2004 (S.I. No. 53 of 2004) and the Ambient Air Quality Assessment and Management Regulations 1999 (S.I. No. 33 of 1999).

Table 9-1 Limit values of Directive 2008/50/EC, 1999/30/EC and 2000/69/EC (Source: <https://www.epa.ie/air-quality/standards/>)

Pollutant	Limit Value Objective	Averaging Period	Limit Value ($\mu\text{g}/\text{m}^3$)	Limit Value (ppb)	Basis of Application of Limit Value	Attainment Date
Sulphur dioxide (SO_2)	Protection of Human Health	1 hour	350	132	Not to be exceeded more than 24 times in a calendar year	1st Jan 2005
Sulphur dioxide (SO_2)	Protection of human health	24 hours	125	47	Not to be exceeded more than 3 times in a calendar year	1st Jan 2005
Sulphur dioxide (SO_2)	Upper assessment threshold for the protection of Human Health	24 hours	75	28	Not to be exceeded more than 3 times in a calendar year	1st Jan 2005
Sulphur dioxide (SO_2)	Lower assessment threshold for the protection of human health	24 hours	50	19	Not to be exceeded more than 3 times in a calendar year	1st Jan 2005
Sulphur dioxide (SO_2)	Protection of vegetation	Calendar year	20	7.5	Annual mean	19th Jul 2001
Sulphur dioxide (SO_2)	Protection of vegetation	1st Oct to 31st Mar	20	7.5	Winter mean	19th Jul 2001
Nitrogen dioxide (NO_2)	Protection of human health	1 hour	200	105	Not to be exceeded more than 18 times in a calendar year	1st Jan 2010
Nitrogen dioxide (NO_2)	Protection of human health	Calendar year	40	21	Annual mean	1st Jan 2010



Pollutant	Limit Value Objective	Averaging Period	Limit Value ($\mu\text{g}/\text{m}^3$)	Limit Value (ppb)	Basis of Application of Limit Value	Attainment Date
Nitrogen dioxide (NO_2)	Upper assessment threshold for the protection of human health	1 hour	140	73	Not to be exceeded more than 18 times in a calendar year	1st Jan 2010
Nitrogen dioxide (NO_2)	Lower assessment threshold for the protection of human health	1 hour	100	52	Not to be exceeded more than 18 times in a calendar year	1st Jan 2010
Nitrogen monoxide (NO) and nitrogen dioxide (NO_2)	Protection of ecosystems	Calendar year	30	16	Annual mean	19th Jul 2001
Particulate matter 10 (PM_{10})	Protection of human health	24 hours	50	-	Not to be exceeded more than 35 times in a calendar year	1st Jan 2005
Particulate matter 10 (PM_{10})	Upper assessment threshold for the protection of human health	24 hours	30	-	Not to be exceeded more than 7 times in a calendar year	Based on the indicative limit values for 1 January 2010
Particulate matter 10 (PM_{10})	Lower assessment threshold for the protection of human health	24 hours	20	-	Not to be exceeded more than 7 times in a calendar year	Based on the indicative limit values for 1 January 2010
Particulate matter 2.5 ($\text{PM}_{2.5}$)	Protection of human health	Calendar year	40	-	Annual mean	1st Jan 2005

Pollutant	Limit Value Objective	Averaging Period	Limit Value ($\mu\text{g}/\text{m}^3$)	Limit Value (ppb)	Basis of Application of Limit Value	Attainment Date
Particulate matter 2.5 ($\text{PM}_{2.5}$) Stage 1	Protection of human health	Calendar year	25	-	Annual mean	1st Jan 2015
Particulate matter 2.5 ($\text{PM}_{2.5}$) Stage 2	Protection of human health	Calendar year	20	-	Annual mean	1st Jan 2020
Lead (Pb)	Protection of human health	Calendar year	0.5	-	Annual mean	1st Jan 2005
Carbon Monoxide (CO)	Protection of human health	8 hours	10,000	8,620	-	1st Jan 2005
Benzene (C_6H_6)	Protection of human health	Calendar Year	5	1.5	-	1st Jan 2010

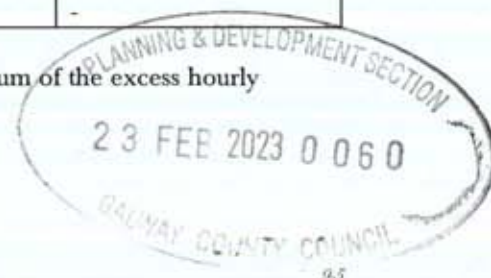
* AOT40 is a measure of the overall exposure of plants to ozone. It is the sum of the differences between hourly ozone concentration and 40 ppb for each hour when the concentration exceeds 40 ppb during a relevant growing season, e.g. for forest and crops.

The Ozone Daughter Directive 2002/3/EC is different from the other Daughter Directives in that it sets target values and long-term objectives for ozone rather than limit values. Table 9-2 presents the limit and target values for ozone.

Table 9-2 Target values for Ozone Defined in Directive 2008/50/EC

Objective	Parameter	Target Value for 2010	Target Value for 2020
Protection of human health	Maximum daily 8-hour mean	120 mg/m^3 not to be exceeded more than 25 days per calendar year averaged over 3 years	120 mg/m^3
Protection of vegetation	AOT40 calculated from 1-hour values from May to July	18,000 $\text{mg}/\text{m}^3\cdot\text{h}$ averaged over 5 years	6,000 $\text{mg}/\text{m}^3\cdot\text{h}$
Information Threshold	1-hour average	180 mg/m^3	-
Alert Threshold	1-hour average	240 mg/m^3	-

AOT₄₀ is a measure of the overall exposure of plants to ozone. It is the sum of the excess hourly concentrations greater than 80 g/m^3 and is expressed as g/m^3 hours.



Air Quality and Health

The Environmental Protection Agency (EPA) report '*Air Quality in Ireland 2021*' noted that in Ireland, the premature deaths attributable to poor air quality are estimated at 1,300 people per annum. The European Environmental Agency (EEA) Report, '*Air Quality in Europe - 2021 Report*' highlights the negative effects of air pollution on human health. The report assessed that poor air quality accounted for premature deaths of approximately 307,000 people in the 27 EU Member States in 2019, with regards to deaths relating to PM_{2.5}. The estimated impacts on the population in Europe of exposure to NO₂ and O₃ concentrations in 2019 were around 40,400 and 16,800 premature deaths per year, respectively. From this, 1,300 Irish deaths were attributable to fine particulate matter (PM_{2.5}), 30 Irish deaths were attributable to nitrogen oxides (NO₂) and 50 Irish deaths were attributable to Ozone (O₃) (Source: '*Air Quality in Europe - 2021 Report*', EEA, 2021).

These emissions, along with others including sulphur oxides, carbon monoxide, benzene and lead are produced during fossil fuel-based electricity generation and traffic in various amounts, depending on the fuel and technology used. Whilst there is the potential of such emissions to be generated from the site operations, a number of mitigation measures will be implemented at the Proposed Project site to reduce the impact from dust and vehicle emissions, which are discussed in Section 10.2.3 below.

9.2.2 Air Quality Zones

The EPA has designated four Air Quality Zones for Ireland:

- Zone A: Dublin City and environs
- Zone B: Cork City and environs
- Zone C: 16 urban areas with population greater than 15,000
- Zone D: Remainder of the country.

These zones were defined to meet the criteria for air quality monitoring, assessment and management described in the Framework Directive and Daughter Directives. The site of the Proposed Project lies within Zone D, which represents rural areas located away from large population centres.

The air quality in the vicinity of the Proposed Project site is typical of that of rural areas i of Ireland, i.e., Zone D. The EPA publishes Air Monitoring Station Reports for monitoring locations in all four Air Quality Zones. The most recent report on air quality in Ireland, '*Air Quality in Ireland 2021*' was published by the EPA in 2022. The EPA reports provide SO₂, PM₁₀, NO₂ and O₃ concentrations for areas in Zone D. Values for each of these elements recorded within the Zone D monitoring stations listed in the report, have been averaged to give representative values for Zone D. Similar measurement values for all air quality parameters would be expected for the Proposed Project site as it lies in a rural location, within Zone D.

9.2.2.1 Sulphur Dioxide (SO₂)

Sulphur dioxide data for Cork Harbour, Kilkitt, Askeaton, Edenderry and Letterkenny in 2021 is presented in Table 10-3.

Table 9-3 Average Sulphur Dioxide Data for Zone D Sites in 2021

Parameter	Measurement (ug/m ³)
Annual Mean	4.16
Hourly Values >350	0
Hourly Max	94.80

Parameter	Measurement ($\mu\text{g}/\text{m}^3$)
Daily Values >123	0
Daily Max	25.54

During the monitoring period there were no exceedances of the daily limit values for the protection of human health. As can be observed from Table 10-3 the average maximum hourly value recorded during the assessment period was $94.80 \mu\text{g}/\text{m}^3$. In addition, there were no exceedances of the annual mean limit for the protection of ecosystems. It would be expected that SO_2 values at the Proposed Project site would be similar or lower than those recorded for the Zone D sites above.

9.2.2.2 Particulate Matter (PM_{10})

Sources of particulate matter include vehicle exhaust emissions, soil and road surfaces, construction works and industrial emissions. The EPA report provides annual mean PM_{10} concentration for sixteen Zone D towns, Tipperary Town, Carrick-on-Shannon, Enniscorthy, Birr, Askeaton, Macroom, Castlebar, Cobh Carrignafof, Claremorris, Kilkitt, Cavan, Roscommon Town, Edenderry, Mallow, Longford and Cobh Cork Harbour. Particulate matter (PM_{10}) data for 2021 is presented in Table 10-4.

Table 9-4 Average Particulate Matter (PM_{10}) Data for Zone D Sites in 2021

Parameter	Measurement ($\mu\text{g}/\text{m}^3$)
Annual Mean	11.94
% Data Capture	91
Values >50 $\mu\text{g}/\text{m}^3$	Max 4
Daily Max	60.57

Note: PM_{10} daily limit for the protection of human health: No more than 35 days >50 $\mu\text{g}/\text{m}^3$

The daily limit of 50 $\mu\text{g}/\text{m}^3$ for the protection of human health was not exceeded more than 35 times during the monitoring period. It would be expected that PM_{10} values at the Proposed Project site would be similar or lower than those recorded for the Zone D sites above.

9.2.2.3 Nitrogen Dioxide (NO_2)

Nitrogen dioxide data from Emo Court, Birr, Castlebar, Carrick-on-Shannon, Kilkitt and Edenderry in 2021 is presented in Table 10-5 below.

Table 9-5 Average Nitrogen data for Zone D Sites in 2021

Parameter	Measurement ($\mu\text{g}/\text{m}^3$)
Annual Mean	7.52
NO_2 Values >200	0
Values >140 (UAT)	0
Values >100 (LAT)	0



Parameter	Measurement ($\mu\text{g}/\text{m}^3$)
Hourly Max.	63

The annual NO_2 value was below the annual mean limit value for the protection of human health of $40 \mu\text{g}/\text{m}^3$. Furthermore, the lower and upper assessment thresholds of 100 and $140 \mu\text{g}/\text{m}^3$ were not exceeded during the monitoring period. The average hourly max. NO_2 value of $63 \mu\text{g}/\text{m}^3$ measured during the monitoring period was below the hourly max threshold of $200 \mu\text{g}/\text{m}^3$. It would be expected that NO_2 values at the Proposed Project site would be similar or lower than those recorded for the Zone D sites above.

Carbon Monoxide (CO)

The EPA Report² provides rolling 8-hour carbon monoxide concentrations for Birr, a Zone D site. Carbon Monoxide data for 2021 is presented in Table 10-6 below.

Table 9-6 Carbon Monoxide Data for Birr – Zone D Site in 2021

Parameter	Measurement
Annual Mean	$0.3 \text{ mg}/\text{m}^3$
Median	$0.3 \text{ mg}/\text{m}^3$
% Data Capture	98.2%
Values > 10	0
Max	$1.2 \text{ mg}/\text{m}^3$

The average concentration of carbon monoxide was $0.3 \text{ mg}/\text{m}^3$. The carbon monoxide limit value for the protection of human health is $10,000 \mu\text{g}/\text{m}^3$ (or $10 \text{ mg}/\text{m}^3$). On no occasions were values in excess of the 10 mg limit value set out in Directives 2000/69/EC or 2008/69/EC. It would be expected that CO values at the Proposed Project site would be similar or lower than those recorded for the Zone D site above.

9.2.2.5 Ozone (O_3)

The EPA Report² provides rolling 8-hour ozone concentrations for seven Zone D sites, Emo Court, Kilkitt, Carnsore Point, Mace Head, Castlebar, Valentia and Malin Head. Ozone (O_3) data for 2021 is presented in Table 10-7. As can be observed from Table 10-7, there were no exceedances of the maximum daily eight hour mean limit of $120 \mu\text{g}/\text{m}^3$. The legislation stipulates that this limit should not be exceeded on more than 25 days. It would be expected that O_3 values at the Proposed Project site would be similar or lower than those recorded for Zone D sites below.

Table 9-7 Average Ozone Data for Zone D Sites in 2021

Parameter	Measurement
Annual Mean	$60 \mu\text{g}/\text{m}^3$
Median	$62 \mu\text{g}/\text{m}^3$
% Data Capture	89%

Parameter	Measurement
No. of days >1800	Max 8 days (Kilkitt)

9.2.2.6 Dust

There are no statutory limits for dust deposition in Ireland. However, EPA guidance suggests that a deposition of 10 mg/m²/hour can generally be considered as posing a soiling nuisance. This equates to 240 mg/m²/day. The EPA recommends a maximum daily deposition level of 350 mg/m²/day when measured according to the TA Luft Standard 2002.

The extent of dust generation at any site depends on the type of activity undertaken, the location, the nature of the dust, i.e., soil, sand, etc., and the weather. In addition, dust dispersion is influenced by external factors such as wind speed and direction and/or, periods of dry weather. Dust has the potential to be generated during the construction phase of the Proposed Project from on-site activities such as earth moving. Construction traffic movements also have the potential to generate dust as they travel along the Proposed Project site roads.

The potential dust-related effects on local air quality and the relevant associated mitigation measures are presented below.

9.2.3 Likely Significant Effects and Associated Mitigation Measures

9.2.3.1 'Do-Nothing' Effect

If the Proposed Project were not to proceed, no changes would be made to the current land-use practice of coniferous forestry. In doing so, the environmental effects in terms of emissions are likely to be neutral.

9.2.3.2 Construction Phase

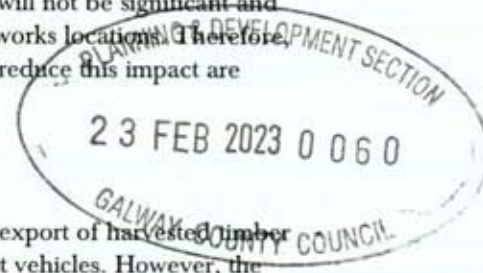
9.2.3.2.1 Exhaust Emissions

1. Restoration Work (access roads, tree harvesting, drain blocking, and all associated site restoration works)

The proposed restoration work (as outlined in Chapter 4 of this EIAR) will require the operation of construction vehicles and plant on the site. Exhaust emissions associated with vehicles and plant will arise as a result of harvesting and restoration activities. This potential effect will not be significant and will be restricted to the duration of the construction phase and localised to works locations. Therefore, this is considered a short-term slight negative effect. Mitigation measures to reduce this impact are presented below.

2. Transport to Site

The transport of logging machinery / tractors, and materials to the site, and export of harvested timber from the site, will give rise to exhaust emissions associated with the transport vehicles. However, the number of vehicles will be insignificant and will constitute an imperceptible negative impact in terms of air quality. Mitigation measures in relation to exhaust emissions are presented below.



Mitigation:

- All construction and forestry vehicles and plant will be maintained in good operational order while onsite, thereby minimising any emissions that arise.
- When stationary, delivery and on-site vehicles will be required to turn off engines.
- Users of the Site will be required to ensure that all plant and vehicles are suitably maintained to ensure that emissions of engine generated pollutants is kept to a minimum.

Residual Effect

Following implementation of the mitigation measures above, residual impacts of exhaust emissions for the construction phase of the Proposed Project will have a short-term imperceptible negative effect.

Significance of Effects

Based on the assessment above there will be no significant effects.

9.2.3.2.2 Dust Emissions

1. Restoration Work (access roads, tree harvesting, drain blocking, and all associated site restoration works)

The proposed restoration work (as outlined in Chapter 4 of this EIAR) will give rise to dust emissions during the construction phase. This potential effect will not be significant and will be restricted to the duration of the construction phase. Therefore, this is a short-term slight negative effect. Dust suppression mitigation measures to reduce this impact are presented below. The proposed felling of coniferous forestry will be carried out in accordance with Forest Service guidelines and in compliance with any Felling Licence granted by the Forest Service.

1. Transport to Site

The transport of logging machinery / tractors, and materials to the site, and export of harvested timber from the site, may also give rise to some localised dust emissions during periods of dry weather. This is a short-term slight negative effect. Mitigation measures to reduce the significance of this impact are presented below.

Mitigation

- In periods of extended dry weather, dust suppression may be necessary along haul roads and site roads to ensure dust does not cause a nuisance. If necessary, a water spreader will be used to dampen down haul roads to prevent the generation of dust where required. Water bowser movements will be carefully monitored to avoid, insofar as reasonably possible, increased runoff.
- All plant and materials vehicles shall be stored in dedicated areas (on Site).
- The agreed haul route roads adjacent to the Site will be regularly inspected for cleanliness and cleaned as necessary.
- The Site access roads will be checked weekly for damage/potholes and repaired as necessary.
- The transport of construction materials to the Site that have significant potential to cause dust, will be undertaken in tarpaulin or similar covered vehicles where necessary.

- A Construction and Environmental Management Plan (CEMP) will be in place throughout the construction phase (see Appendix 4-3). The CEMP includes dust suppression measures.

Residual Effect

Following implementation of mitigation measures as outlined above, residual effects of dust generation from the construction phase will have a Short-term Imperceptible Negative Effect.

Significance of Effects

Based on the assessment above there will be no significant effects.

9.2.3.3 Operational Phase

9.2.3.3.1 Exhaust Emissions

The assessment of baseline air quality in the region of the Proposed Project has shown that current levels of key pollutants are significantly lower than their limit values. Due to the size, nature and remote location of the Proposed Project, increased road traffic emissions resulting from the Proposed Project are expected to have an imperceptible impact on air quality.

Exhaust emissions associated with the maintenance and monitoring of the proposed project will be insignificant. This will give rise to a long-term imperceptible negative effect.

Mitigation

- Any vehicles or plant brought onsite during the operational phase will be maintained in good operational order that comply with the Road Traffic Acts 1961 as amended, thereby minimising any emissions that arise.
- When stationary, delivery and on-site vehicles will be required to turn off engines.

Residual Effects

Long-term Imperceptible Negative Effect.

Significance of Effects

Based on the assessment above there will be no significant effects.



9.3

Climate

Climate legislation and policy is outlined in detail in Chapter 2 of this EIAR. A summary of the same is provided in the following sections.

9.3.1

Climate Change and Greenhouse Gases

Although variation in climate is thought to be a natural process, the rate at which the climate is changing has been accelerated rapidly by human activities. Climate change is one of the most challenging global issues facing us today and is primarily the result of increased levels of greenhouse gases in the atmosphere. These greenhouse gases come primarily from the combustion of fossil fuels in energy use. Changing climate patterns are thought to increase the frequency of extreme weather conditions such as storms, floods and droughts. In addition, warmer weather trends can place pressure on animals and plants that cannot adapt to a rapidly changing environment. Moving away from our reliance on coal, oil and other fossil fuel-driven power plants is essential to reduce emissions of greenhouse gases and combat climate change.

9.3.1.1

Greenhouse Gas Emission Targets

Ireland is a Party to the Kyoto Protocol, which is an international agreement that sets limitations and reduction targets for greenhouse gases for developed countries. It is a protocol to the United Nations Framework for the Convention on Climate Change. The Kyoto Protocol came into effect in 2005, as a result of which, emission reduction targets agreed by developed countries, including Ireland, are now binding.

Under the Kyoto Protocol, the EU agreed to achieve a significant reduction in total greenhouse gas emissions in the period 2008 to 2012. These EU emission targets are legally binding in Ireland. Ireland's contribution to the EU commitment for the period 2008 - 2012 was to limit its greenhouse gas emissions to no more than 13% above 1990 levels.

9.3.1.1.1

Doha Amendment to the Kyoto Protocol

In Doha, Qatar, on 8th December 2012, the "Doha Amendment to the Kyoto Protocol" was adopted. The amendment includes:

- New commitments for Annex I Parties to the Kyoto Protocol who agreed to take on commitments in a second commitment period from 1 January 2013 to 31 December 2020;
- A revised list of greenhouse gases (GHG) to be reported on by Parties in the second commitment period; and
- Amendments to several articles of the Kyoto Protocol which specifically referenced issues pertaining to the first commitment period and which needed to be updated for the second commitment period.

During the first commitment period, 37 industrialised countries and the European Community committed to reduce GHG emissions to an average of 5% below 1990 levels. During the second commitment period, Parties committed to reduce GHG emissions by at least 18% below 1990 levels in the eight-year period from 2013 to 2020. The composition of Parties in the second commitment period is different from the first; however, Ireland and the EU signed up to both the first and second commitment periods.

Under the protocol, countries must meet their targets primarily through national measures, although market-based mechanisms (such as international emissions trading) can also be utilised.

9.3.1.1.2 COP21 Paris Agreement

COP21 was the 21st session of the Conference of the Parties (COP) to the United Nations Convention. Every year since 1995, the COP has gathered the 196 Parties (195 countries and the European Union) that have ratified the Convention in a different country, to evaluate its implementation and negotiate new commitments. COP21 was organised by the United Nations in Paris and held from 30th November to 12th December 2015.

COP21 closed on 12th December 2015 with the adoption of the first international climate agreement (concluded by 195 countries and applicable to all). The twelve-page text, made up of a preamble and 29 articles, provides for a limitation of the temperature rise to below 2°C above pre-industrial levels and even to tend towards 1.5°C. It is flexible and takes into account the needs and capacities of each country. It is balanced as regards adaptation and mitigation, and durable, with a periodical ratcheting-up of ambitions.

9.3.1.1.3 COP25 Climate Change Conference- Madrid

The 25th United Nations Climate Change conference COP25 was held in Madrid and ran from December 2nd to December 13th, 2019. While largely regarded as an unsuccessful conference, the European Union launched its most ambitious plan, 'The European Green New Deal' which aims to lower CO₂ emissions to zero by 2050. The deal includes proposals to reduce emissions from the transport, agriculture and energy sectors and will affect the technology chemicals, textiles, cement, and steel industries. Measures such as fines and pay-outs by member states who rely on coal power will be in place to encourage the switch to renewable clean energies such as wind. On the 4th of March 2020, the European Commission put forward the proposal for a European climate law. This aims to establish the framework for achieving EU climate neutrality. It aims to provide a direction by setting a pathway to climate neutrality and to this end, aims to set in legislation the EU's 2050 climate-neutrality objective.

9.3.1.1.4 COP27 Climate Change Conference - Sharm El-Sheikh

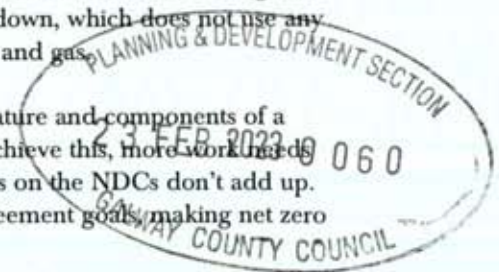
COP27 took place in Sharm el-Sheikh from the 6th of November 2022 to the 20th of November. The Conference of the Parties (COP) is a supreme decision-making body of the United Nations Framework Convention on Climate Change (UNFCCC).

The three major topics of COP27 were:

- Closing the emissions gap to keep 1.5°C alive
- Loss and damage
- Climate finance

The summit took place a year after its precedent COP26 summit in Glasgow, Scotland. In Glasgow, the final agreement was delayed due to the stance of China and India, among others, who were not comfortable with the 'phase out' of coal wording in the draft text. This led to the watering down of this commitment to a 'phase down' of coal use. The hope was that COP27 would work to include further language on coal and fossil fuel reduction efforts and be matched by increased ambition and action to meet agreed pledges. Initial texts represented more serious language than used at COP26 in Glasgow, however, the published final text retains the language of Glasgow, phase down, which does not use any binding language to reduce use and is still only applicable to coal, not oil and gas.

There has been the setting of a workplan for 2023 to help articulate the nature and components of a global collective goal on adaptation and resilience, however in order to achieve this, more work needs to be done by countries, cities and organisations as currently, the numbers on the NDCs don't add up. Currently, no country has an NDC in place that is able to meet Paris Agreement goals, making net zero by 2050 difficult to envision and 2030 commitments near impossible.



9.3.1.15 United Nations Sustainable Development Goals Report 2022

Transforming our World: the 2030 Agenda for Sustainable Development which includes 17 Sustainable Development Goals (SDGs), and 169 targets was adopted by all UN Member States at a UN summit held in New York in 2015. The agenda is universally applicable with all countries having a shared responsibility to achieve the goals and targets which came into effect on January 1st, 2016. The goals and targets are to be actions over the 15-year period, are integrated and indivisible i.e., all must be implemented together by each Member State. On 7th July 2022, The United Nations published 'The Sustainable Development Goals Report 2022' using current data, highlighting how the COVID-19 pandemic, the war in Ukraine and subsequent refugee crisis have hindered the achievements of the Sustainable Development Goals, especially in terms of climate action. The report stipulates that due to these unprecedented events, the severity and magnitude before humankind demands sweeping change not yet seen in human history.

The Sustainable Development Goals National Implementation Plan 2018-2020 was published by the Department of Communications, Climate Action & Environment in partnerships with OSI, Esri Ireland and the Central Statistics Office. The Plan sets out how Ireland will work to achieve the goals and targets of the Agenda for Sustainable Development both domestically and internationally. Relevant SDGs and how they are implemented into Irish National plans and policies can be found in Table 10-8. It should be noted that the Department (now the Department of the Environment, Climate and Communications) published the draft of the Second National Implementation Plan for the SDG Goals 2022-2024 on the 13th of May 2022. It will set out arrangements for interdepartmental coordination, stakeholder engagement and actions needed for further SDG Implementation.

Table 9-8 United Nations Sustainable Development Goals adopted in 2015. <https://sustainabledevelopment.un.org/sdgs>

SDG	Targets	International Progress/ downfalls to Date (2022)	National Relevant Policy
SDG 6: Clean Water and Sanitation: <i>Ensure availability and sustainable management of water and sanitation for all</i>	<ul style="list-style-type: none"> By 2020, protect and restore water-related ecosystems, including mountains, forests, wetlands, rivers, aquifers and lakes 	<p>Demand for water is rising owing to rapid population growth, urbanization and increasing water needs from agriculture, industry, and energy sectors. Decades of misuse, poor management, overextraction of groundwater and contamination of freshwater supplies have exacerbated water stress.</p> <p>Over the past 300 years, wetland ecosystems have experienced an 85 per cent loss in extent despite the very high value goods and services that they provide. Additionally, the extent of surface water bodies, including lakes, rivers, and reservoirs, is rapidly changing across the entire planet, with one in five river basins experiencing high - above natural - fluctuations in surface water during the last</p>	<p><i>River Basin Management Plan for Ireland (2018-2021)</i></p> <p><i>National Biodiversity Action Plan 2017-2021</i></p> <p><i>The Water Framework Directive</i></p> <p><i>Climate Action Plan 2023</i></p>

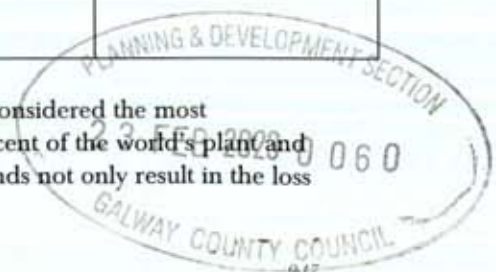
SDG	Targets	International Progress/ downfalls to Date (2022)	National Relevant Policy
		five years. Population growth, changes to land cover and land use and climate change are key drivers of these changes to freshwater ecosystems.	
SDG 12 Responsible Consumption and production: <i>Ensure sustainable consumption and production patterns</i>	<ul style="list-style-type: none"> By 2030, achieve the sustainable management and efficient use of natural resources. Promote public procurement practices that are sustainable, in accordance with national policies and priorities. Develop and implement tools to monitor sustainable development impacts for sustainable tourism that creates jobs and promotes local culture and products 	<p>Unsustainable patterns of consumption and production are the root cause of triple planetary crisis:</p> <ol style="list-style-type: none"> 1) Climate Change 2) Biodiversity Loss 3) Pollution <p>Developing countries bear a large part of the climate, biodiversity and pollution impacts of resource-intensive production processes, without reaping their benefits. This situation has been made worse by the impacts of the pandemic. As part of sustainable global pandemic recovery strategies, the implementation of sustainable consumption and production will maximize the socioeconomic benefits of resource use while minimizing the impacts.</p> <p>In 2021, 83 policy instruments supporting the shift to sustainable consumption and production were reported by 26 countries, bringing the total number of policies developed, adopted and/or implemented up to 438 (as reported by 59 countries and the European Union for 2019-2021). However, the distribution of reported sustainable consumption and production policies has so far been uneven.</p>	<p><i>Waste Action Plan for a Circular Economy</i></p> <p><i>Climate Action Plan 2023</i></p> <p><i>Tourism Action Plan</i></p>
SDG 13 Climate Action: <i>Take urgent</i>	<ul style="list-style-type: none"> Strengthen resilience and adaptive capacity to climate- 	By April 2022, 193 parties (192 countries plus the European Union) had communicated	<p><i>National Adaptation Framework</i></p>

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SDG	Targets	International Progress/ downfalls to Date (2022)	National Relevant Policy
<p><i>action to combat climate change and its impacts*</i></p> <p><i>*Acknowledging that the United Nations Framework Convention on Climate Change is the primary international, intergovernmental forum for negotiating the global response to climate change.</i></p>	<p>related hazards and natural disasters in all countries</p> <ul style="list-style-type: none"> Integrate climate change measures into national policies, strategies and planning 	<p>their first nationally determined contribution under the United Nations Framework Convention on Climate Change and 13 parties had submitted their second nationally determined contribution. The nationally determined contributions attest that countries are articulating more quantified targets and indicators for adaptation and identifying links between adaptation and the Sustainable Development Goals and other frameworks.</p> <p>In order to limit global warming to 1.5 degrees Celsius above pre-industrial levels, scientists recommend that by 2030 global emissions should be cut by 4 per cent compared with 2010 levels. According to current national commitments, however, global emissions are set to increase by almost 14 per cent during the rest of the decade.</p> <p>In 2020, Ireland's GHG emissions are estimated to be 57.72 million tonnes carbon dioxide equivalent (Mt CO₂eq), which is 3.6% lower (or 2.14 Mt CO₂ eq.) than emissions in 2019 (59.86 Mt CO₂ eq.). There was a decrease of 4.0% in emissions reported for 2019 compared to 2018. Emissions reductions have been recorded in six of the last ten years of inventory data (2010- 2020). In 2020 national total emissions decreased by 3.6%, emissions in the stationary ETS sector decreased by 6.1% and emissions under the ESD (Effort Sharing Decision) decreased by 2.8%. In May 2022, the EPA's latest projections estimated that</p>	<p><i>Building on Recovery: Infrastructure and Capital Investment 2016-2021</i></p> <p><i>National Mitigation Plan</i></p> <p><i>National Biodiversity Action Plan 2017-2021</i></p> <p><i>National Policy Position on Climate Action and Low Carbon Development</i></p> <p><i>Project 2040: National Development Plan 2021-2030</i></p> <p><i>Climate Action Plan 2023</i></p> <p><i>National Dialogue on Climate Action</i></p>

SDG	Targets	International Progress/ downfalls to Date (2022)	National Relevant Policy
		Ireland's greenhouse gas emissions had increased by 6% compared to 2020.	
SDG15 Life on Land: Protect, restore and promote sustainable use of terrestrial ecosystems, sustainably manage forests, combat desertification, and halt and reverse land degradation and halt biodiversity loss	<ul style="list-style-type: none"> By 2020 ensure the conservation, restoration and sustainable use of terrestrial and inland freshwater ecosystems and their services, in particular forests, wetlands, mountains and drylands, in line with obligations under international agreement By 2030, combat desertification, restore degraded land and soil, including land affected by desertification, drought and floods, and strive to achieve a land degradation-neutral world. Take urgent and significant action to reduce the degradation of natural habitats, halt the loss of biodiversity and, by 2020, protect and prevent the extinction of threatened species By 2020, integrate ecosystem and biodiversity values into national and local planning, development processes, poverty reduction strategies and accounts. 	<p>By February 2022, 129 countries had committed to setting their voluntary targets for achieving land degradation neutrality, and in 71 countries, Governments had already officially endorsed those targets. Overall, commitments to land restoration are estimated at 1 billion ha, out of which over 450 million ha are committed through land degradation neutrality targets.</p> <p>As of March 2022, 89 countries and territories had implemented the System of Environmental-Economic Accounting (SEEA) to make nature count in policies and build back better through accounts for natural resources and/or ecosystems. This number is unchanged from 2021. Four countries started compiling the newly adopted SEEA Ecosystem Accounting in 2021.</p>	<p><i>Climate Action Plan 2023</i></p> <p><i>Enhanced Decommissioning, Rehabilitation and Restoration Scheme (2020)</i></p> <p><i>National Biodiversity Action Plan</i></p>

The Sustainable Development Goals 2022 Report notes that wetlands are considered the most biologically diverse of all ecosystems and are breeding grounds for 40 per cent of the world's plant and animal species. Unsustainable use and inappropriate management of wetlands not only result in the loss



of ecosystem services but can also pose direct risks, including disease. Moreover, the degradation of wetlands releases stored carbon, fuelling climate change. Over the past 300 years, over 85% of the planet's wetlands have been lost, mainly through drainage and land conversion, with many remaining wetland areas degraded. Since 1970, 81% of species dependent on inland wetlands have declined faster than those relying on other biomes, and an increasing number are facing extinction. This report highlights the importance of these ecosystems and the consequences of inaction regarding restoration and rehabilitation. Note, this report only discusses wetlands as a broad category and does not discuss land use change or peatlands specifically.

Climate Change Performance Index

Established in 2005, the Climate Change Performance Index (CCPI) is an independent monitoring tool which tracks countries climate protection performance. It assesses individual countries based on climate policies, energy usage per capita, renewable energy implementation and Greenhouse Gas Emissions (GHG) and ranks their performance in each category and overall. The 2023 CCPI was published in November 2022. While the CCPI 2023 indicated signs of potential reductions in global emissions, no country achieved its Paris Climate targets and therefore the first three places of the ranking system remain unoccupied.

Ireland, ranked 46th in 2022, has climbed 9 places to 37th for 2023, however Ireland still remains as a "low" performer in international performance. Ireland still remains at "very low" on the Greenhouse Gas Emissions ratings at 47th in the world and is one of the only two EU countries, along with Poland, to receive a "very low" performance rating. However, in the Renewable Energy rating table, Ireland is placed 23rd in the rankings in the "Medium" category.

9.3.11.7 Programme for Government

The Programme for Government was published in October 2020 and last updated April 2021. In relation to climate change the programme recognises that the next ten years are a critical period in addressing the climate crisis. It is an ambition of the programme to more than halve carbon emissions over the course of the decade (2020-2030). The programme notes that the government are committed to reducing greenhouse gas emissions by an average 7% per annum over the next decade in a push to achieve a net zero emissions by the year 2050. The programme also recognises the severity of the climate challenge as it clarifies that:

"Climate change is the single greatest threat facing humanity"

9.3.11.8 Climate Action and Low Carbon Development (Amendment) Act 2021

The Climate Action and Low Carbon (Amendment) Act 2021 is a piece of legislation which commits the country to move to a climate resilient and climate neutral economy by 2050. This was passed into law in July 2021.

The Programme for Government has committed to a 7% average yearly reduction in overall greenhouse gas emissions over the next decade, and to achieve net zero emissions by 2050. This Act will manage the implementation of a suite of policies to assist in achieving this target.

The Act includes the following key elements, among others:

- Places on a statutory basis a 'national climate objective', which commits to pursue and achieve no later than 2050, the transition to a climate resilient, biodiversity-rich, environmentally sustainable and climate-neutral economy.
- Embeds the process of carbon budgeting into law, Government are required to adopt a series of economy-wide five-year carbon budgets, including sectoral targets for each relevant sector, on a rolling 15-year basis, starting in 2021.