13 MATERIAL ASSETS & OTHER ISSUES

13.1 INTRODUCTION

This chapter assesses the impacts of the Project on material assets. The Project refers to the Proposed Development the subject of this planning applications and the other works and development described in **Chapter 2: Project Description**. The assessment will consider the potential effects during the following phases of the Development:

- Construction of the Development
- Operation of the Development
- Decommissioning of the Development

Common acronyms used throughout this EIAR can be found in **Appendix 1.3.** This chapter of the EIAR is supported by:

- **Appendix 13.1 Forestry Management Plan**
- **Appendix 13.2 Telecommunications Impact Study**
- **Appendix 13.3 ASAP Aeronautical Study**

13.2 STATEMENT OF AUTHORITY

This section has been prepared by Sarah Jones and David Kiely of Jennings O'Donovan & Partners Limited. The Telecommunications Impact Survey (**Appendix 13.2**) was carried out by David McGrath and Patrick Tinney in Ai Bridges Ltd.

Sarah Jones is an Environmental Scientist and Planner and holds a first-class MSc in Environmental Sustainability from University College Dublin and a Bachelor (Hons.) Degree in Geography from Manchester Metropolitan University. Sarah has recently developed a specialist knowledge of hydrogen production and her key capabilities include Environmental Impact Assessment (EIA) screenings, Appropriate Assessment (AA) screenings, Planning and Environmental reports and Applications, Environmental Impact Assessments, Feasibility Studies, Construction Environmental Management Plans, Stakeholder Engagement, Project Management.

David Kiely is a Director of JOD who holds a BE in Civil Engineering from University College Dublin and MSc in Environmental Protection from IT Sligo. He is a Fellow of Engineers Ireland, a Chartered Member of the Institution of Civil Engineers (UK) and has over 40 years' experience. He has extensive experience in the preparation of EIARs and EISs for environmental projects including Wind Farms, Solar Farms, Wastewater Projects, and various commercial developments. David has also been involved in the construction of over 60 wind farms since 1997.

David McGrath is a Radio Planning Engineer in Ai Bridges Ltd. David has a Bachelor of Science degree in Computing and has received a Bachelor of Engineering in Electronic Engineering. David has experience in analysing Radio Frequency issues, research and development in varying wireless network projects and supervision of Dublin Institute of Technology Master's degree students.

Patrick Tinney is a Communications Engineer in Ai Bridges Ltd. with a B.Eng. in Electronics, Occupational First Aid and 3 years' experience as a Health and Safety representative. He has received a B.Eng. in Computer and IT Systems. Patrick has experience in conducting site surveys and RF. He provides on-site support for the roll-out of fixed wireless access in Ireland.

13.3 ASSESSMENT METHODOLOGY AND SIGNIFICANCE CRITERIA

Following preliminary consultations with key consultees during the scoping process, desk-based assessments, site visits and field surveys were undertaken. In line with the EIA Directive 2011/92/EU as amended by EIA Directive 2014/52/EU and current EPA Guidelines, this EIAR aims to focus the assessment solely on those elements likely to have a significant effect on the environment. Topics deemed unlikely to have a significant effect are outlined very briefly and an explanation of why they are out of scope is provided, e.g., Section 13.6 Forestry. Economic assets of natural heritage include non-renewable resources such as minerals or soils, and renewable resources such as wind and water. These assets are addressed in **Chapter 8: Soils and Geology**, **Chapter 9: Hydrology and Hydrogeology**, and **Chapter 10: Air and Climate**. Peat, spoil and waste are assessed in **Appendix 2.1: Construction Environmental Management Plan**. Amenity resources are addressed in **Chapter 4: Population and Human Health**. The cultural assets of Archaeology and Cultural Heritage are addressed in **Chapter 14: Cultural Heritage** and traffic is addressed in **Chapter 15: Traffic and Transportation**.

The material assets considered include:

- Land Use; Turbary, Forestry and Agriculture
- Telecommunications
- Electricity Networks
- Air Navigation
- Quarries
- Utilities (gas, water, waste)

13.4 LAND USE TURBARY, FORESTRY AND AGRICULTURE

13.4.1 Baseline Environment

Wind Farm Site

The Wind Farm Site as shown in **Figure 2.1,** has an area of approximately 445 hectares and is mainly cutover blanket bog with an extensive network of bog tracks, which were laid out in the 1930's to provide access to turf cutting plots. Almost the entire Wind Farm Site is subdivided into turbary plots lying primarily on a north-south axis between the east-west alignments of the road network. There are over 650 individual plots each measuring approximately 50 m x 180 m. There are a number of small gravel borrow pits on and in the immediate vicinity of the Wind Farm Site, these were used to source material for the construction of the bog roads. Continual turf extraction on the Wind Farm Site has meant that deep drains and heavily truncated areas of peat are common. No large scale or industrial scale peat cutting has taken place during the history of the site. The peat cutting has been characterised by single turbary plot cutting for residential/individual use. The Wind Farm Site is owned in part by the applicant, while the remaining is held in multiple ownerships, financially involved in the project.

The Wind Farm Site has an Existing Permission (An Bord Pleanála reference PL.16.241592, Mayo County Council Planning Reference 11/495) for the erection of 21 no. turbines with 85 m hub height and rotor blades of 35.5 m in length with a total power output capacity of 48.3 megawatts, new site roads, upgrading existing tracks, hard standing area, electrical control building, 2 no. anemometry masts, installation of underground cabling, temporary works and ancillary works. The consented layout is shown in **Figure 1.4**.

The Wind Farm Site is located within a broad area of peatland in the townland of Carrowleagh (Kilbride), Co. Mayo, within the lower north-western foothills of the Ox Mountains, adjacent to the county boundary between Mayo and Sligo. The site elevations range from 120 m O.D. in the northwest up to circa 170 m O.D. in the southeast.

Notable towns and villages in the area include Bunnyconnellan (Co. Mayo) 4 km to the southwest, Corballa 6.5 km (Co. Sligo) to the northwest, Culleens 7.5 km (Co. Sligo) to the north, Ennishcrone (Co. Sligo) 11 km to the north. The nearest large settlement is the town of Ballina (Co. Mayo.) approximately 12 km to the west.

Housing density in the surrounding area is generally very low, there are no inhabited houses on one side as the topography rises towards the Ox Mountains. Inhabited houses only start to appear lower down to the west and south of the Wind Farm Site within farmland and are

primarily farmhouses, one-off-houses and some ribbon development nearer to villages. No uninvolved houses are located within 750 metres of the Wind Farm Site. There are 18 inhabited houses within a 1.5 km radius of the turbines, comprising one off houses and farm holdings. There are 46 inhabited houses within a 2 km radius of the site (32 occupied) (**Figure 1.2**). The housing density generally increases on the approaches to settlement centres.

The principal land use in the general area is comprised of a mix of peat bogs, agricultural lands, commercial forestry and the Carrowleagh Wind Farm adjacent to the east and the Carrowleagh Wind Farm Extension which is adjacent to the north-east. The extensive Ox Mountains are the dominant feature to the east and south of the site rising to a height of 545 m at Knockalongy. The lowland landscape of the west is marginal pasture with the large fields lined by low scrubby hedgerows.

According to the CSO census of agriculture 2020[1], the total area of farmland within Study Area One (The Development and Surrounds, see **Chapter 4 Population and Human Health**) measures 13,717 hectares or 59% of land use, this is almost all 'grassland'. This includes 453 farms, and 11,294 livestock units with an average of 25 livestock units per farm. The majority of farms are family-owned and operated and small scale.

In the Mayo County Development Plan 2022-2028, this area is classed as Area H: East Mayo Uplands, described as:
"This area is primarily made up of rugged hill country, which provides for low quality pastural land uses. It progresses from low-lying lakeland drumlins around the shores of Lough Conn and Lough Cullin, to rugged hill country where it forms the foothills at the south western end of the Ox Mountains. The region is mostly occupied by peat bogs, however, agricultural lands with significant areas of natural vegetation and pasture lands are also present in the landscape. Other major land uses include small-scale conifer plantations and urban settlements."

There are a number of heritage features in the wider area and the two most significant of these are Rosserk Friary and Moyne Friary. Both are situated on the western side of the mouth of the River Moy approximately 11 km and 14 km respectively to the west of the Wind Farm Site.

[1] https://visual.cso.ie/?body=entity/ima/coa

The Wind Farm Substation is to be located within a mature commercial forest area of 5.83 ha which will be felled, to facilitate construction. This is classified as very low yield class commercial forestry, with a high percentage having very poor growth rates (yield class) and poor quality timber. A summary of the forestry is provided in **Table 13.1**

Detailed consideration of the approach to afforestation requirements associated with the Proposed Development is attached in **Appendix 13.1.**

Table 13.1: Summary of Removal of Forestry from The Development

Infrastructure	Species	Plant Year	Private Forestry Plot	Yield Class	Estimated Proposed Fell Year
Substation	Sitka spruce and Lodgepole Pine	1998	Yes	16	2040
Access Road	Sitka spruce, Lodgepole Pine, Ash and Larch	1998	Yes	18	2040

Within 1 km (an area of 311.20 ha) of the Wind Farm Substation there are approximately 135 ha of commercial forestry, largely coniferous forest (43% of land cover).

It should be noted that the clearfelling of trees in the State requires a felling licence. The associated afforestation of alternative lands equivalent in area to those lands being permanently clearfelled is also subject to licensing ('afforestation licensing'). The Forest Service of the Department of Agriculture, Food & the Marine is Ireland's national forest authority and is responsible for all forest licensing. In light of the foregoing and for the purposes of this project, the Developer commits that the location of any replanting (alternative afforestation) associated with the project will be greater than 10 km from the wind farm site and also outside any potential hydrological pathways of connectivity i.e., outside the catchment within which the proposed project is located. On this basis, it is reasonable to conclude that there will be no more than imperceptible, indirect or in-combination effects associated with the replanting. In addition, the developer commits to not commencing the project until both felling and afforestation licences are in place and this ensures the afforested lands are identified, assessed and licenced appropriately by the relevant consenting authority.

Hydrogen Plant Site

The Hydrogen Plant Site as shown in **Figure 2.2**, has an area of approximately 6.5 ha and is currently an agricultural field used for grazing horses. It is located in County Sligo in the

townland of Carraun, adjacent to the Co. Mayo border, approximately 6 km east of the Wind Farm Site and 0.6 km from the national road N59. Site elevations range from 53 m OD at the northwest corner to 45 m OD along the southern boundary. A watercourse, the Dooyeaghny River, runs approximately 70 m at the closest point along the south of the Hydrogen Plant Site which forms the Co. Sligo/Mayo County boundary and Carraun (Sligo)/Dooyeaghny (Mayo) townland boundary.

The Hydrogen Plant Site is pasture. There is an area of cutover, boggy peat adjacent to the south of the site boundary which has been avoided. There is a small area of uncut high bog in the northwest part with improved pasture on the higher ground above contour line 50 m OD. The Proposed Development includes the demolition of agricultural shed C and partial demolition of agricultural shed B in the townland of Carraun to facilitate the construction of the upgraded L-6612-1 local road and roundabout. The Project includes the demolition of an existing dwelling and agricultural sheds D and E and the demolition of the remainder of shed B and construction of a new house and shed in the townland of Carraun.

The Hydrogen Plant Site is approximately 5.3 km north-west of the village of Bunnyconnellan (Co. Mayo) and 2.9 km south of the village of Corballa (Co. Sligo). The nearest large settlement is the town of Ballina (Co. Mayo.) approximately 5.5 km to the southwest. It is accessed by the L6611 local road and newly designed roundabout and a site access road proposed to lead to the facility.

The Hydrogen Plant Site is located in a rural setting, set back from the clusters of ribbon development along the N59. Population density is 19 persons per km^2, much lower than the national average in Ireland of 72 persons per km^2. There are 22 inhabited houses within 1 km of the Hydrogen Plant Site and the closest inhabited house is 299 m to the north-east (**Figure 1.5)**.

The principal land uses in the surrounding area is agricultural lands, individual dwellings, the national primary road N59 and commercial conifer plantations. Developments in the wider surrounding area includes Ballina Beverages 4.8 km to the south-west, Ballina Engineering works 6.3 km to the southwest, construction companies and skip hire companies and numerous retail developments in Ballina and industrial development in Killala 9.7 km to the northwest including iron works manufacturing, packaging manufacturing and a power station.

In the Sligo County Development Plan 2017-2023, this area is classed as "Normal Rural Landscape", described as:

"Areas with natural features (e.g. topography, vegetation) which generally have the capacity to absorb a wide range of new development forms – these are largely farming areas and cover most of the County. At the same time, certain areas located within normal rural landscapes may have superior visual qualities, due to their specific topography, vegetation pattern, the presence of traditional farming or residential structures. These areas may have limited capacity for development or may be able to absorb new development only if it is designed to integrate seamlessly with the existing environment."

The Grid Connection Route and Interconnector Route are located largely in public roads. The design for the 110 kV Loop-In from the existing OHL will require two new interface mast structures which will be constructed under the existing Glenree - Moy 110 kV OHL. The location of these is currently an agricultural field used for pasture.

13.4.2 Assessment of Potential Effects

All 13 no. wind turbines and the associated site infrastructure are located on cutover areas of former turbary plots. The total land-take of the Wind Farm Site, including the site access roads, hardstands and turbine foundations is approximately 27.55 hectares. This area will change from cutover, former turbary plots (with permission to build a wind farm) to renewable energy. The Wind Farm Site is 445 hectares therefore the land take is 6.2% of the Wind Farm Site. Agreements are in place with plot holders for all areas impacted and communication channels are already open with plot holders and will remain open throughout the lifetime of the Proposed Development. Access to plots will be carefully managed to enable safe access throughout the construction and decommissioning phases. The construction and decommissioning phases will be timed wherever possible to avoid peak peat cutting phases over the summer months. During the operation phase turbary on plots outside the Proposed Development footprint can continue as normal. The proposed Wind Farm Site access roads and upgrades to existing roads will improve access for active turbary practices throughout the Wind Farm Site. Overall, this will have a long-term slight, negative impact on turbary use during the construction, operation and decommissioning phases.

Within 1 km of the Wind Farm Substation there are approximately 135 ha of commercial forestry, largely coniferous forest. The removal of 5.83 hectares (4.3%) of 135 hectares commercial forestry lands within the Wind Farm Site will have a permanent slight, negative impact on the existing forestry land use during the construction, operation and decommissioning of the Proposed Development.

The Grid Connection Route, Interconnector Route, Killybegs Turbine Delivery Route and Galway Turbine Delivery Route possess minor portions which traverse greenfield / green verge areas that are associated with public / private lands. Minimal land take is required for the Grid Connection Route and Interconnector considering the line will principally be buried in or directly adjacent to existing roadways and will require relatively localised excavation works and be reinstated upon installation of the cables. The tie in towers, where the Grid Connection connects to the Moy – Glenree 110 Kv overhead line, will require foundations for each leg of two towers (eight in total) circa. 3.0 m x 3.6 m giving a total land take of 86 m^2. This area is reinstated after the construction phase and normal land use can continue during operation. Upgrade works on the section of the turbine delivery route which is common to both the Killybegs Turbine Delivery Route and Galway Turbine Delivery Route to include the following to facilitate the delivery of abnormal loads and turbine component deliveries:

- Improvement of the N59 and L-2604-0 junction in the townland of Ballymoghany, County Sligo to include for the temporary widening of it. The associated accommodation works will include the installation of new drainage pipes, the construction of a 1.2 m high concrete retaining wall and the erection of timber stock proof fencing and 2 no. agricultural gates.
- Localised widening of the L-2604-0 road in the townland of Cloonkeelaun, County Sligo. The associated accommodation works will include the construction of a 1.2 m high concrete retaining wall and the erection of concrete post and timber rail stock proof fencing and 2 no. agricultural gates.
- Localised widening of the L-2604-0, L-5137-0 and L-5137-9 local roads in the townlands of Ballymoghany, Muingwore and Cloonkeelaun County Sligo and Carrowleagh County Mayo to achieve a surfaced road width of 4.5 m.
- Localised widening of the L-5137-9, L-5136-0 and L-6612 roads in the townlands of Carraun and Knockbrack County Sligo, and Carha and Carrowleagh, County Mayo to establish passing bays.
- Upgrade works on the Galway Turbine Delivery Route to include the following to facilitate the delivery of abnormal loads and turbine component deliveries:
    - Localised road widening at the N17/N5 roundabout in the townland of Ballyglass East, County Mayo.
    - Localised road widening at the road junction with the N5 in the townland of Ballyglass East, County Mayo.
    - Alterations to the embankments at the N5 junction with the L-5339 and L-1331 roads in the townland of Cloonmeen West, County Mayo.
    - Localised road widening at the junction of the L-5339 and L-1331 in the townland of Lavy More, County Mayo.

The Hydrogen Plant Site is located on lands currently used for agriculture, namely horse grazing. The Hydrogen Plant Site covers an area of 6.5 ha. The construction of the Hydrogen Plant will result in loss of 6.5 ha of agricultural horse grazing land, a permanent change of land use from agriculture to renewable energy production. The landowner has alternative areas available for horse grazing to continue elsewhere within the landholding. This will have a permanent slight, negative impact on agriculture during the construction and operation phases.

The Hydrogen Plant Site requires a water input. This has the potential to disrupt flow to local water sources. This includes agricultural soils and local wells that provide a water source for the agricultural industry.

RSK Group Limited was commissioned by the Developer to carry out a groundwater supply assessment for the water supply for the Hydrogen Plant (Report is available in **Appendix 9.8**). The report assesses the capacity of the ground water and rainwater harvesting to supply the Proposed Development with the required volume and quality of water without impacting nearby water supplies or the aquifer.

Eight boreholes were drilled on the Hydrogen Plant Site as part of the site investigations. Water strikes were noted in two boreholes (BH6 and BH7) which were subsequently selected for pump testing. A constant rate discharge pumping test commenced on the 11/07/2022 and pumping continued until the 03/08/2022 (546 hours of pumping in total). Sustainable yields of 2.25 Litres per Second (l/s) (194 cubic metres per day (m^3/d)) and 0.44 l/s (38 m^3/d) have been established for boreholes 6 and 7, respectively, with a cumulative yield of 232 m^3/d (84,680 m^3/year) which is consistent with the two boreholes being able to meet the water demand of the plant (annual average water budget of 65,021 m^3 or 178 m^3/d). A neighbouring well at an adjacent dairy farm, used for agricultural purposes was monitored for the duration of the pumping test and recovery period, results are consistent with the pumping having little discernible impact on the well.

The conclusion of the ground water supply assessment was that the two boreholes can supply the expected water demand of the Hydrogen Plant without depleting the aquifer or impacting the wells nearby.

Ongoing monitoring will be in place for the duration of the Development to ensure there are no impacts to neighbouring wells. Should readings suggest that groundwater levels are low, a backup mains supply will be utilised.

After decommissioning, the Wind Farm Site will be reinstated but Wind Farm Site access roads, the Wind Farm Substation and the Hydrogen Plant will remain.

The approach proposed for decommissioning is one of minimal intervention:

- Decommissioning works will be limited to action necessary to remove the wind farm structures, i.e., removal of turbines and monitoring mast, extraction of cables but leaving ducting in-situ.
- Roads and associated drainage systems will remain in place to serve ongoing forestry and agriculture activity.
- Hardstanding areas will be allowed to revegetate naturally.
- Turbine plinths will be removed, and the hardcore covering Turbine Foundations will be allowed to revegetate naturally.
- Soil disturbance will be avoided as much as possible.

Therefore, the effects of the decommissioning phase on agriculture and turbary will be less than those during the construction phase and not significant.

13.4.3 Mitigation Measures and Residual Effects

The following mitigation measures to minimise impacts on turbary, agricultural and forestry land use have been incorporated into the design stage:

The construction and operational footprint of the Proposed Development has been kept to the minimum necessary to avoid impact on existing land uses and existing tracks at the Wind Farm Site and the Hydrogen Plant Site have been used where possible. New Wind Farm Site access roads have been sensitively designed to minimise impact on land take. Electricity cables will be installed underground in or alongside Wind Farm Site and Hydrogen Plant Site access roads to avoid and minimise negative impact. This has allowed for the prevention of unnecessary or inappropriate ground works or land use alterations to occur and will avoid unnecessary soil compaction.

Prior to the Grid Connection and Interconnector installation works within public roads, it is proposed that all access points (domestic, business, farm) are considered when finalising the temporary road closures and diversions, to maintain local access as much as possible and avoid impacts on various land uses. **Chapter 15: Traffic and Transportation** will be referred to for all proposed works and deliveries along the turbine delivery route to avoid undue impact to adjacent land uses.

This is also considered for the decommissioning phase for which traffic will be required along the Construction Haul Routes. The Turbine Delivery Route will no longer be needed. This is further detailed in **Chapter 2: Project Description**.

The construction and decommissioning works will be planned and controlled by a Construction and Environmental Management Plan (CEMP) (**Appendix 2.1**). This provides details on day to day works and methodologies. As part of these works, the public and other stakeholders will be provided with updates on construction activities which will affect access to lands. This will be communicated to members of the public through a community liaison officer employed for the duration of the construction period.

Implementation of the measures outlined above will ensure that residual impacts on agriculture and turbary will be slight negative for the duration of the construction and operational lifespan of the Development.

The impact on land take during construction, operation and decommissioning phases is likely to have a permanent slight, negative impact on forestry, in that it alters the character of the environment, albeit in a manner consistent with existing and emerging wind farm trends in the surrounding area. Forestry will be replanted under licence from the Forest Service of the Department of Agriculture, Food & the Marine is Ireland's. Implementation of the measures outlined above will ensure that any residual impacts will be slight negative and permanent in duration. There are no worse residual impacts predicted, with respect to land use, arising from the operational phase.

13.4.4 Cumulative Effects

Due to the localised nature of the proposed construction/decommissioning works, there is no potential for significant cumulative effects in-combination with other local developments on the land use as all effects are directly within the Wind Farm Site and Hydrogen Plant Site.

Surrounding agricultural activities and peat cutting can and will continue during the construction, operational and decommissioning phases of the Proposed Development when fencing has been fully established.

All existing and approved projects in **Appendix 2.3** have been considered for potential cumulative effects. Potential projects that could introduce cumulative impacts on land use include:

- A granted permission for a forestry access road (Mayo Planning ref. 19/297) 390 m west of the Wind Farm Site, this did not require felling and has already been completed so there are no cumulative impacts.
- A granted permission for a single turbine extension to an existing wind farm (Mayo Planning ref. 21/881) approximately 3.4 km southwest of the Wind Farm Site. It is located on an area used for rough grazing, previously used for peat cutting. The land take however was relatively small at 5.27 ha.
- A granted permission for a single turbine extension to an existing wind farm (Sligo Planning ref. 22/161) x to the north of the Wind Farm Site, this 5.7 ha site is located in a wider area used for peat harvesting and commercial forestry in the surrounding lands but the site area is no longer directly used for either. The turbine is located in unforested degraded bog.
- A granted permission (Sligo Planning ref. 21/401) for change of use of a 4.3 ha agricultural field to a GAA recreational pitch, approximately 2 km north of the Hydrogen Plant Site.

Minor domestic and agricultural development will not introduce potential for cumulative effects during the construction, operational or decommissioning phases as the impacts will be localised and not significant.

The total land take of these larger scale projects in the vicinity is 15.27 ha., 9.57 ha of that is agricultural lands. In Study Area One: The Development and Environs, which includes Electoral Divisions (EDs); Kilgarvan (Co. Mayo), Castleconor East (Co. Mayo), Castleconor West (Co. Sligo), Ardnaree North (Co. Mayo), Mullagheruse (Co. Sligo) and Breencorragh (Co. Sligo), the total farmed area according to the CSO 2020[2] is 13,717.8 ha. Combined with the Proposed Development, the cumulative impact on agriculture is a loss of 15.86 ha, 0.11% of the total farmland in the area.

None of the above projects include a loss of either forestry or turbary. A review of the Department of Agriculture, Food and Marine Forestry Licence Viewer[3], in March 2023 found the following forestry licences within 1 km of the Wind Farm Substation:

- Thinning Licence for 24.17 ha granted in 2018 (licence no MO11-FL0025),
- Thinning licence for 5.03 (licence no M011-FL0025)

Thinning licences involve the felling of a proportion of the trees. No licences for afforestation or clearfelling (removal of all trees) were found within 1 km. The surrounding commercial

[2]CSO. (2020) Census of Agriculture https://visual.cso.ie/?body=entity/ima/coa
[3] Gov. of Ireland. FLV. https://forestry-maps.apps.rhos.agriculture.gov.ie/

forested area of the Wind Farm Site will continue its ongoing commercial maintenance, felling and replanting schedule throughout the operational life of the Proposed Development. As forestry activity is expected to continue on surrounding lands throughout the lifespan of this Project, no potential significant cumulative effects are considered likely.

Other projects outside the Sites do not have the potential to reduce or increase the magnitude of effects of the Proposed Development on land use within the sites. Therefore, this will not contribute to any significant cumulative effects during the construction/decommissioning or operational phases.

The construction of the Grid Connection and Interconnector will only require relatively localised excavation works within the public roads, the vicinity of the tie-in towers, the Redline Boundary of Wind Farm Site and Hydrogen Plant Site and will be reinstated upon installation of cables. Therefore, this will not contribute to any significant cumulative effects during the construction/ decommissioning or operational phases.

13.4.5 Statement of Significance

No significant impacts are predicted on turbary rights, commercial forestry or agriculture.

13.5 TELECOMMUNICATIONS

13.5.1 Baseline Environment

Microwave links need an unobstructed line of sight from end to end because blocked links will perform inadequately. It is therefore necessary to ensure tall wind turbines will not interrupt links. Impacts can include reflection, diffraction, blocking and radio frequency interference.

During operation, wind turbines have the potential to interfere with electromagnetic signals passing above the ground due to the nature and size of the wind farm. During the construction and initial decommissioning phase, signals may be passed below ground via existing infrastructure.

Ireland saw the roll out of Digital Terrestrial Television, locally known as Saorview TV, in October 2010, incorporating the switchover from analogue to digital television. According to Ofcom (a regulatory UK body) (2009), *digital television signals are much better at coping with signal reflections, and digital television pictures do not suffer from ghosting*[4]. Ghosting is the replica of a transmitted image which is offset in position and is superimposed on top of the main image.

[4] Ofcom (2009) *Tall Structures and Their Impact on Broadcast and Other Wireless Services*, OFCOM, United Kingdom. Available online at: https://www.ofcom.org.uk/__data/assets/pdf_file/0026/63494/tall_structures.pdf [Accessed 14/11/2019]

Since digital switchover, there have been very few reported cases of wind turbine interference with domestic analogue reception. Modern wind turbine blades are also typically made of synthetic materials which have a minimal impact on the transmission of electromagnetic radiation. Therefore, potential effects on television and radio signals from the Proposed Development will be negligible and are not considered further, given the advancements in technology. The consultee RTÉ (Ireland's national television and radio broadcaster) response (**Table 1.9 and 1.10 Chapter 1: Introduction**), alongside the extended distance of over 750 m to the nearest dwelling (electric fields are strongest closest to a power line and their level reduces quickly with distance) further supports this.

Potential effects generated by the Development have been assessed with reference to the following documents.

- Mayo County Development Plan 2023-2028
- Sligo County Development Plan 2017-2023
- 'Best Practice Guidelines for the Irish Wind Energy Industry', published by the Irish Wind Energy Association (2012).
- Information about Electric & Magnetic Fields and the Electricity Transmission System in Ireland, EirGrid[5]
- Wind Energy Development Guidelines: Planning Guidelines, Department of Environment, Heritage and Local Government (DHPCLG) 2006[6]

Telecommunications providers were consulted about the Development. A summary of responses is outlined in **Table 1.9 and 1.10 in Chapter 1: Introduction** and **Appendix 1.1 a and Appendix 1.1 b** outlines full consultation responses. No consultation responses raised any issues with the Proposed Development and telecommunications networks.

Following consultations between Jennings O'Donovan & Partners Ltd., and ESB Services, it was found that ESB have one UHF Point-to-Point (PMP) telemetry radio link that passes through the Wind Farm Site.

Ai Bridges Ltd. were commissioned to do a Telecommunications Impact Study of the Proposed Development to assess the potential impact on the ESB radio link and to propose possible mitigation measures. This report is attached as **Appendix 13.2**.

[5] EirGrid (2014) *Information on Electric and Magnetic Fields*. Available online at : http://www.eirgridgroup.com/site-files/library/EirGrid/Information%20on%20Electric%20and%20Magnetic%20Fields.pdf [Accessed on 18/11/2019]
[6] Department of Housing, Planning, Community and Local Government (2006) Planning Guidelines. Available online at: https://www.gov.ie/en/publication/f449e-wind-energy-development-guidelines-2006/ [Accessed 25/02/2021]

13.5.2 Assessment of Potential Effects

During the construction and decommissioning phases, there are likely to be several sources of temporary electromagnetic emissions. Chief among these will be the brief use of electrical power tools and the use of electrical generators which may be brought onsite before mains electricity is provided. These devices are required by Irish and European law to comply with the EMC Directive 2014/30/EU. Compliance with this Directive will mean that the electromagnetic emissions from these devices will not cause interference to other equipment.

The only other potential effects during the construction and decommissioning phases are likely to be as a result of tall cranes used for constructing the turbines. These cranes will be beside the proposed wind turbines. Any effects are likely to be similar to those arising during the operational phase of the Development.

It is predicted that significant effects will occur on the ESB radio link during the operational phase due to an infringement of 8.47 m into the Fresnel Zone. The Fresnel Zone is the area around the visual line of sight that radio waves spread out into after they leave the antenna. Signal strength is dependent on the maintenance of a clear line of sight. The analysis also shows that the 2nd Fresnel Zone of the radio link is already subject to terrain obstruction.

However, mitigation measures have been agreed with ESB and will be implemented such that there will either be a negligible effect, or no effect, on infrastructure as a result of the Development.

13.5.3 Mitigation Measures

All electrical elements of the proposed development are designed to ensure compliance with electro-magnetic fields (EMF) standards for human safety.

Mitigation measures were undertaken in the design phase through mitigation by avoidance i.e., the known routes of the telecommunication links were plotted and a buffer was applied to them, outside of which the proposed wind turbines were located. Compliance with the EMC Directive 2014/30/EU will mean that the electromagnetic emissions from devices used will not cause interference to other equipment.

Appendix 13.2: Telecommunications Impact Study states that during the construction phase, Turbine T2 will be in a position to impact an Interference Condition of 8.47 m to the 2nd Fresnel of an ESB radio link. Consultation with ESB Networks was carried out to

discuss the findings of the report. A number of possible mitigation measures were discussed with ESB Networks to offset the possible impact of Turbine T2 on the ESB UHF radio link. It was agreed with ESB that a relay mast site to the south of T2 would offer the most appropriate mitigation measure. The associated costs were discussed, and it was agreed that should the relay mast site be constructed, the Developer would cover the costs. ESB provided a consultation response on October 1st 2021 with confirmation that this proposed mitigation measure was acceptable.

13.5.4 Cumulative Effects

All existing and approved projects in **Appendix 2.3** have been considered for potential cumulative effects. There are eight proposed, permitted or operational wind farms within 20 km of the Development (**Appendix 2.3**). Each developer is responsible for engaging with all relevant telecommunications operators to ensure their proposals will not interfere with television or radio signals by acting as a physical barrier. Therefore, as each project is designed and built to avoid impacts arising, a cumulative impact cannot arise. There will be no cumulative impacts relating to the Development and surrounding projects in relation to telecommunications.

13.5.5 Statement of Significance

The implementation of mitigation measures will provide no interference with communication links. Therefore, no effects are predicted on telecommunications or radio reception as a result of the Development.

13.6 ELECTRICITY NETWORKS – GRID CONNECTION, INTERCONNECTOR AND GRID NETWORK

13.6.1 Baseline Environment

The nationwide electricity transmission system allows for the transport of large volumes of electricity from generation stations, including wind farms, to bulk supply points near the main population centres where it interconnects with the distribution system.

The Grid Connection will be 6.65 km in length and will be in the Wind Farm Site, along public roads and in third party lands to the existing Glenree - Moy 110 kV overhead line (OHL). There is a grid connection agreement in place with EirGrid associated with the Existing Permission. The Wind Farm Substation will connect via underground 110 kV cables with a minor section of works required in the vicinity of the Tie In towers to allow integration between the Wind Farm Site and transmission overhead line. The Wind Farm Substation will be connected to the Hydrogen Plant Substation by the Interconnector, a 110 kV

underground cable route of 8.2 km in length located in the Wind Farm Site, Hydrogen Plant Site, public roads and third party lands.

13.6.2 Assessment of Potential Effects

The are no existing public electricity network running through the Wind Farm Site or Hydrogen Production Site. All cabling on the Wind Farm Site and Hydrogen Plant site will be under ground as will the Grid Connection to the existing OHL and the Interconnector between the Wind Farm Substation and the Hydrogen Plant Substation.

During the construction phase the existing overhead line will be de-energised by ESB so work can commence on the construction of the towers. The expected duration of works is approximately four weeks, construction of foundation circa. seven days each with time allowing for curing of the concrete; erection of the interface masts circa five days; all weather dependent. The circuit will be de-energised during key phases of works. This will not impact the electricity network as EirGrid will configure the network to avoid the section during works.
The circuit will be tested in both directions before the line is re-energised.

During the operational phase, the Wind Farm will contribute directly and in the long term to the electricity network by strengthening it through additional renewable energy generation.

Dispatch-down of renewable energy refers to the amount of renewable energy that is available but cannot be used by the system due to physical shortcomings or restrictions in the electricity network in an area. This is because of broad power system limitations, known as curtailments, or local network limitations, known as constraints. In Ireland in 2021, 7.3% of wind energy was dispatched down, totalling 752 GWh[7]. This renewable energy was available but could not be used. During the operational Phase, the Hydrogen Plant will help to address the issue of dispatch-down in the North Mayo region of the national electricity network and stabilise the network through demand side response. It will alleviate constraints and curtailment by providing an equal demand load (once full installed capacity of the Hydrogen Plant is achieved) to the Firlough Wind Farm via the Interconnector. Provision of hydrogen also provides system flexibility as excess wind energy can be stored at periods of high generation and low demand.

[7] Eir Grid. (2021). Annual Renewable Constraint and Curtailment Report. https://www.eirgridgroup.com/site-files/library/EirGrid/Annual-Renewable-Constraint-and-Curtailment-Report-2021-V1.0.pdf

13.6.3 Mitigation Measures

Mitigation by design and avoidance will minimise impacts on existing electricity networks.

- The Grid Connection will be constructed to the requirements and specifications (CDS-GFS-00-001-R1) of EirGrid and in line with the grid connection offer.
- Confirmatory drawings for all existing services will be sought upon consultation with ESB Networks.
- Immediately prior to construction taking place, the area where excavation is planned will be surveyed by CAT scan (sub-surface survey technique to locate any below-ground utilities) and all existing services will be verified. Temporary warning signs will be erected.
- The as-built location of the installed ducts will be surveyed and recorded using a total station/GPS before the trench is backfilled to record the exact location of the ducts. The co-ordinates will be plotted on as-built record drawings for the grid connection cable operational phase.
- Clear and visible temporary safety signage will be erected all around the perimeter of the live work area to visibly warn members of the public of the hazards of ongoing construction works.

13.6.4 Cumulative Effects

All existing and approved projects in **Appendix 2.3** have been considered. There are ten proposed, permitted or operational wind farms within 20 km of the Wind Farm Site. There will be no cumulative impacts relating to the Proposed Development and surrounding projects in relation to electricity networks during the construction phase.

Potential negative cumulative effects on electricity networks are unlikely during the operational and decommissioning phases.

13.6.5 Statement of Significance

No significant negative impacts on the Grid Connection or grid network are anticipated. There will be a long-term slight positive residual impact on transmission infrastructure in the area (due to the installation of new infrastructure) and no impact on distribution. The Hydrogen Plant helps to address the issue of constraint in the North Mayo region of the national electricity network and stabilize the network through demand side response.

13.7 AIR NAVIGATION

13.7.1 Baseline Environment

Operating wind farms have the potential to cause a variety of adverse effects on aviation. Rotating wind turbine blades may have an impact on certain aviation operations, particularly those involving radar. The physical height of turbines can cause obstruction to aviation and the overall performance of communications, navigation and surveillance equipment. All structures over 150 m in height are required to have lighting to warn aviation traffic. The Firlough Wind Farm's ground to blade tip height of the wind turbines will range from 177 m to 185 m during operation. The tallest tip height (185 m) represents the largest obstacle of any wind turbine within the Turbine Range to air traffic (irrespective of the wind turbine selected and constructed within the Turbine Range, a wind turbine with an equal or lesser tip height will still be within that space).

The closest international airport is Ireland West knock airport which is 27.3 km to the south-east. Sligo Airport is the closest regional airport and is the helicopter search and rescue base for the north-west, it is 28.7 km to the north-east.
Airfields in the region include: Ballina Airfield is 14.3 km to the south-west, Lough Conn airfield, a grass airfield is 19.3 km south-west and Elphin Airfield; 60 km to the south-east.

Consultation with the relevant aviation organisations was initiated during the scoping process, to identify any potential aviation issues that could be affected by the Development. The findings are summarised in **Table 13.2**.

Table 13.2: Summary of Consultation Response

Consultee	Response Date	Response
Irish Aviation Authority	Response received 8/04/2022.	The development appears to be approximately 28 km Southwest of Sligo Airport. As such, it is recommended that the developer engage directly with Sligo airport to make them aware of the proposal and complete a preliminary screening assessment from an aviation safety perspective. It is likely that the following general observations would be proffered by the Authority during a formal planning process: In the event of planning consent being granted, the applicant should be conditioned to contact the Irish Aviation Authority to: (1) agree an aeronautical obstacle warning light scheme for the wind farm development, (2) provide as-constructed coordinates in WGS84 format together with ground and blade tip height elevations at each wind turbine location and (3) notify the Authority of intention to commence crane operations with at least 30 days prior notification of their erection.

Consultee	Response Date	Response
Sligo Airport		A Special aeronautical study was requested by Sligo Airport concerning the impact of the proposed Firlough wind farm on the flight procedures at Sligo airport by ASAP s.r.o. The report was commissioned by the Developer and concluded that "The Firlough wind farm will not affect the flight procedures at Sligo airport." Joe Corcoran at Sligo Airport confirmed by email 3/01/2023 that they were happy with the report.

13.7.2 Assessment of Potential Effects

Consultation with the Irish Aviation Authority and Sligo Airport found that the Proposed Development should not be likely to have any effect on the operations of Sligo or Ireland West Airports as the Proposed Development is outside the 'Outer Horizontal Surface' (over 15 km away).

The Ox Mountains at 413 m OD and 3 km west of the Wind Farm Site are a considerable and well known obstacle to aviation. The proposed wind turbines will have an elevation of approximately 340 m OD at the highest point. This elevation is lower than the mountains, thus reducing any potential interference to flights paths or radar. The Hydrogen Plant due to its height does not pose a risk to aviation. Therefore, no potential effects to air navigation were identified.

13.7.3 Mitigation Measures

Although no potential effects were identified the following mitigation measures proposed by the Irish Aviation Authority (IAA) will be implemented:

- An aeronautical lighting scheme for the Development will be agreed with the IAA and will be installed.
- As-constructed coordinates in WGS84 format together with ground and tip height elevations at each wind turbine location will be provided to the IAA.
- The IAA will be notified of intention to commence crane operations with at least 30 days prior notification of their erection.

13.7.4 Cumulative Effects

All existing and approved projects in **Appendix 2.3** have been considered. There are ten proposed, permitted or operational wind farms within 20 km of the Firlough Wind Farm. Each developer is responsible for engaging with the aviation authority to ensure the proposals will not interfere with aviation radio signals by acting as a physical barrier. Therefore, as each project is designed and built to avoid impacts arising, a cumulative

impact cannot arise. There will be no cumulative impacts relating to the Proposed Development and surrounding projects in relation to aviation during the construction phase.

Potential negative cumulative effects on aviation are unlikely during the operational and decommissioning phases.

13.7.5 Statement of Significance

No significant impacts are predicted in terms of air navigation. In adherence to IAA Safety Regulations and ICAO Annex 15, aeronautical obstacle warning light schemes will be installed as requested by IAA. Co-ordinates of ground and tip height elevations at each wind turbine location as constructed will be provided to the IAA. IAA will be notified of the provision of the intention to commence crane operations within a minimum of 30 days prior to erection.

13.8 QUARRIES

13.8.1 Baseline Environment

The base course materials, including sand and stone for construction of the Development will come from licenced quarries in the locality such as:

- Killala Rock
- Frank Harrington
- Maloney Quarries
- Molloy Concrete ltd.

These quarries will also be the source of crushed stone and concrete for widening works to the Turbine Delivery Route, Construction Haul Routes, Turbine Foundations, the Hydrogen Plant foundations, and for Grid Connection and Interconnector works. The locations of these quarries in relation to the Proposed Development can be seen in **Figure 15.5**.

13.8.2 Assessment of Potential Effects

The construction of the Proposed Development will impact on natural resources such as aggregates which will be sourced from the quarries in proximity to the Development. A total volume of crushed stone materials from quarries required for the Proposed Development is 50,277 m^3.

It is likely that a small amount of granular material may be required to maintain access roads during operation which could impact the source quarry. However, the decommissioning phase will have no impact on the source quarry.

The use of imported material will have a slight, permanent negative impact on non-renewable resources of the area. This impact is considered to be imperceptible in the long-term.

13.8.3 The 'Do-Nothing Impact'

If the Proposed Development were not to proceed, there would be no impact on quarry operations in the area and quarrying activities would continue.

13.8.4 Mitigation Measures

- Existing tracks have been used where possible and the layout was designed to minimise the length of new track required in order to reduce the requirement for such stone material.
- Local quarries have been identified to reduce impact on transportation (Please see **Chapter 15: Traffic and Transportation)**.
- The source quarry will be chosen based on stone which is chemically simar to that occurring at the Proposed Development. This will reduce hydrogeochemical impacts. (Please see **Chapter 8: Soils and Geology**)

13.8.5 Cumulative Effects

All existing and approved projects in **Appendix 2.3** have been considered.

The very nature of a quarry is that it will be subjected to cumulative effects as a it is the source of stone for almost all developments in the area.

Therefore, there will be cumulative impacts relating to the Proposed Development and surrounding projects in relation to quarries during the construction phase.

Potential negative cumulative effects on quarries are imperceptible/unlikely during the operational and decommissioning phases.

13.8.6 Statement of Significance

No significant negative impacts on local quarries are anticipated. There will be a slight, permanent negative residual impact on natural resources in the area.

This impact is considered to be imperceptible in the long-term.

13.9 UTILITIES

13.9.1 Baseline Environment

In order to assess the potential for significant effects on built services gas, water and waste in the vicinity of the Development, scoping requests were made to Uisce Éireann, Mayo County Council and Sligo County Council including Water Services and Environment Departments. Refer to **Chapter 1: Introduction** of this EIAR for details in relation to the EIA scoping exercise.

In order to assess the potential for impacts to electricity and water infrastructure and waste services, a scoping exercise was carried out to a number of key consultees, including ESB, Uisce Éireann and Local Authorities. Full details of the scoping exercise that was carried out is provided in **Chapter 1: Introduction**.

A desk study of available information from the EPA did not identify any waste facilities, illegal waste activities, chemical monitoring points or industrial EPA licensed facilities within a 2 km radius of the Wind Farm Site. The nearest waste facility to the Development is Rathroeen Landfill (W0067-1), 6.2 km north-west of the Hydrogen Plant Site and 12 km west of the Wind Farm Site. There are no gas mains located within the Wind Farm Site or Hydrogen Plant Site.

13.9.2 Assessment of Potential Effects

As there are no gas mains located within the Wind Farm Site or Hydrogen Plant Site, there is no potential for impact.

Given that no detailed information has been provided by Uisce Éireann, Mayo County Council or Sligo County Council in relation to water services within the Wind Farm Site or Hydrogen Plant Site Boundary, it has been assumed that there is the potential to encounter local water services within the Development. The Hydrogen Plant requires water for the electrolysis process during the operational phase. The Hydrogen Plant has an annual average water budget of 65,021 m^3 (or an average of 178 m^3 per day) of untreated water. Water usage patterns will be dependent on the electricity produced by the Wind Farm i.e. higher volumes of green hydrogen produced when wind speeds are higher, water requirements will therefore fluctuate throughout the year, see **Chapter 2: Project Description, Section 2.6.6.3** for details and **Chapter 9: Hydrology and Hydrogeology** for assessment of impacts. This will be obtained by groundwater abstraction, supplemented through rainwater harvesting. RSK Group Limited was commissioned by the Developer to carry out a groundwater supply assessment for the water supply for the Hydrogen Plant

(Report is available in **Appendix 9.8**). The report assesses the capacity of the ground water and rainwater harvesting to supply the Proposed Development with the required volume and quality of water without impacting nearby water supplies or the aquifer. The conclusion of the Ground Water Supply Assessment, was that the boreholes can supply the expected water demand of the Hydrogen Plant Site without depleting the aquifer or impacting the wells nearby. The groundwater will be monitored through the lifetime of the project. Underground water storage tanks provide a total of 12,816 m^3 volume of raw water which would meet the requirements of the Hydrogen Plant for between 1.5 and 4 months (depending on the month). A water connection to Uisce Éireann is proposed as a backup for the project. An application has been submitted to Uisce Éireann for this connection. It is unlikely that this will be required to supply the full demand of the electrolyser for any significant length of time. The impact of this has been assessed as being temporary and slight negative and will be assessed further in discussions with Uisce Éireann during the application process.

The construction of the Grid Connection and the Interconnector will require laying of underground cables along the road network. At the detailed design stage, roads will be surveyed in detail to ensure safe installation and avoidance of existing assets.

Potential impacts arising from the Project relating to existing water services have been assessed and are detailed in **Chapter 9: Hydrology and Hydrogeology** and referred to in **Chapter 4: Population and Human Health** with accompanying mitigation measures.

In terms of waste, during the construction, operational and decommissioning phases of the Wind Farm, there will be the typical waste generated in an office such as left-over food and sandwich wrappers. This is a non-hazardous waste. All such waste will be stored appropriately and safely from wind, rain and wild animals that often tear apart rubbish bags. The effects of this waste will be not significant. Waste generated on the Wind Farm is estimated to range between 0.005 kg and 0.189kg per person per day.[8]

The self-contained port-a-loo units at the construction/decommissioning phase which will be managed and serviced regularly (by removal of the contents by tanker to a designated sewage treatment plant such as Ballina Wastewater Treatment Plant) and removed off site on completion of construction. Toilet waste is a non-hazardous waste and effects will be

[8] Based on 1 hour a day within communal facilities. Worldwide, waste generated per person per day averages 0.74 kilogram but ranges widely, from 0.11 to 4.54 kilograms. (World Bank) Available Online: https://datatopics.worldbank.org/what-a-waste/trends_in_solid_waste_management.html [Accessed 24/08/2022]

slightly significant. The maximum wastewater production during construction is estimated to be the same as the maximum water consumption (2,000 litres per day)[9].

During the Operational phase, at the Wind Farm Site all wastewater will be tankered off-site by a licensed waste collector to the nearest wastewater treatment plant, Ballina. There will be no on-site treatment of wastewater and effects will be not significant.

During the operational phase at the Hydrogen Plant source water will be treated as part of the hydrogen production process. The wastewater arising from this process will be treated through constructed wetlands and regulated discharge rates. The wastewater generated from the water treatment process will be variable month to month depending on wind energy production, the utilisation of the energy and the utilisation capacity at the Hydrogen Plant. As a result, the Hydrogen Plant will have largest volumes of wastewater generated in February, with lowest volumes in summer months. Peak average wastewater equates to 3.04 m^3/hour or c. 0.84 l/sec (February).

During the operational phase of the Hydrogen Plant, source water will be treated as part of the hydrogen production process. Welfare waste from toilet facilities will also be produced. This wastewater will be treated by means of a septic tank (welfare waste) and series of constructed wetland and regulated discharge (combined welfare and processes wastewater).

Apart from the discharge of the trade effluent from the Hydrogen Plant and effluent from welfare facilities on site, there are additional risks to aquatic environment from the accidental spillage or release of chemicals or other pollutants. A range of chemicals will be used within the Hydrogen Plant which include:

- Potassium Hydroxide (KOH) for the electrolysis process (lye).
- Sodium bisulphite for de-chlorination of mains water, should it be used for process.
- Antiscalant used to prevent/reduce scaling of water treatment equipment (i.e. from build-up of salts and calcite).
- Glycol for coolant.
- Oils used by hydraulic systems, compressors and transformers and diesel,
- Facility cleaning chemicals.

[9]Table 3 of the EPA WW treatment Manual (Treatment systems for Small Communities, Business, Leisure Centres and Hotels), Environmental Protection Agency, 1999. Quarry (Excluding Canteen) best reflects a construction site. [Available online: https://www.epa.ie/publications/compliance--enforcement/wastewater/EPA_water_treatment_manual_-small-comm_business.pdf]

As all chemicals used in the Hydrogen Plant Site will be stored in bunded facilities in accordance with specified legislation (Safety, Health and Welfare at Work (Chemical Agents) Regulations 2001 to 2021), the risk of accidental spillage or release is considered to be unlikely.

Potassium hydroxide and glycol are used only in the closed-loop electrolysis process and will not enter the waste water stream. As the source water for the Hydrogen Plant will be groundwater or rainwater, this should be free of chemicals or dangerous substances. Sodium bisulphite will only be used if mains water is used in the process which would require de-chlorination. In large quantities Sodium bisulphite can depress pH and dissolved oxygen, causing mortality of fish (Ryon et al, 2002). However, expected levels of treatment that would be required are at most 5 mg/l (5ppm), typically 2-3 mg/l. Sodium bisulphite is regularly used in the treatment of drinking water supplies and is a non-hazardous solution commonly used as a waste water dichlorination agent. While high concentrations will contribute to elevated chemical oxygen demand in aquatic environments, but it is subject to rapid biological decomposition. Antiscalants will be used in small quantities to prevent/reduce scaling of water treatment equipment and therefore is likely to occur in the waste water stream. While the specific Antiscalant to be used has not been identified, most antiscalants are proprietary organic man-made polymers. These products are considered non-hazardous as defined by the US Occupational Safety and Health Act regulations.

The wastewater arising from the Hydrogen Plant will be treated through constructed wetlands and regulated discharge rates before being discharged to the Dooyeaghny River to the south of the Hydrogen Plant. Unmitigated discharging to surface waters will potentially impact adversely on the receiving surface water quality and potentially human health if these enter drinking water supplies.

The water treatment process, controls to avoid risks of accidental spillage or release of chemicals, controlled discharge and assimilative capacity of the receiving waters will mitigate this risk. Groundwater and surface water quality, levels and discharge rate in the receiving river will be monitored on a routine and continuous basis. A wastewater storage tank, sized c.1,500 m^3 will be constructed to achieve the ability to stop discharging to constructed wetlands or surface water completely for a minimum duration of one month. This means that should contaminants that could potentially impact human health be found in the wastewater discharge, the discharge can be halted and wastewater stored and recirculated until acceptable levels are attained or taken off site for disposal at registered waste water treatment facilities. Any particular contaminant which is observed to be

excessively high in incoming source water will be targeted with specific wastewater treatment.

Groundwater quality will be monitored on a routine / continuous basis with a view to establishing site specific baseline water quality ranges managing source water and process water chemistry. Surface water quality will be monitored on a routine / continuous basis with a view to establishing site specific Q95 and baseline water quality ranges, and managing source water and process water chemistry. Groundwater levels will be monitored continuously. Surface water levels and discharge rate in the receiving river will be monitored continuously. Continuous monitoring through the life of the project will be used to review and update methodologies wherever appropriate. If monitoring results indicate contamination is occurring, wastewater discharge can be stopped and stored on site. It can then be either circulated back through the treatment process or tinkered off site to be treated at a licenced facility. This is assessed fully in **Chapter 9; Hydrology and Hydrogeology**. No drinking water surface water bodies were identified within the Hydrogen Plant Site boundary nor downstream of the site.

Groundwater levels in terms of the proposed location of the Hydrogen Plant have been assessed fully Minerex report Ref. 3131-043 (Rev1). Bedrock groundwater aquifer water levels are in the order of 50 mbGL, however there remains the potential for perched groundwater to be intercepted during excavation and construction works. The Minerex report details results of a pumping test performed over a relatively significant time period, monitored groundwater levels, and estimated the sustainable yield and associated zone of contribution. Over pumping of the well can potentially reduce groundwater levels in excess of seasonal fluctuation, however with continuous monitoring and management, the risk of adversely impacting on groundwater levels in the locality will be easily mitigated. There are no groundwater source protection areas within the hydrogeological catchment of the proposed Development.

The demineralized water treatment system will consist of two no. 100 percent capacity RO-CEDI trains. The RO and CEDI equipment will be regularly maintained and cleaned. The RO and CEDI equipment will be regularly maintained and cleaned. Typical cleaning chemicals are citric acid or sodium hydroxide, but chemicals are tailored to what is fouling the system. Citric acid will be contained in 50 kg bags and Sodium Hydroxide in 20 litre palls. The chemical cleaning is done off-line and is expected to be needed every 3-6 months. The cleaning solution will be collected in the tank of 1500 to 2000 litres and disposed of off-site to a licenced facility. Chemical storage containers, and chemical feed

pumps will be located in concrete secondary containments built to 110% volume, sized approximately 1 m by 1 m x 0.5 m. Secondary containments will be provided with valved drains that are normally closed. The containments will be monitored for chemical spills using level indicators with alarms. If a chemical spill occurs, the operator will use mobile sump pumps to collect the spill and transport to disposal offsite.

The use of concrete (construction of Turbine Foundations, Substations etc.) on the Wind Farm Site and Hydrogen Plant Site will have slight and permanent effects. It is expected that 20 L - 30 L of concrete washout will be produced during the construction phase.

There will be no need for the use of concrete during the operational phase and effects are imperceptible.

Concrete structures will be left in place during decommissioning and allowed to naturally revegetate over time. This is the least impactful process of decommissioning. As the Sites will have already been altered, the impacts are imperceptible and permanent.

Oil waste and diesel are classified as hazardous waste/dangerous substance. There is no expected chemical/fuel/oil waste other than from rags and residual amounts in containers at the Wind Farm Site. Without mitigation, the effects would be slight and medium-term in duration. However, through the implementation of the mitigation measures, the residual effects will be not significant in the construction/decommissioning phase. The storage/use of such liquids is not seen necessary on site during the operational phase; thus, the effects are imperceptible. Refuelling has been mitigated by design, therefore the residual effects are not significant. There will be no need for refuelling during the operational phase and effects are imperceptible. The quantity of waste produced from refuelling is imperceptible.
Chemicals stored at the Hydrogen Plant Site include:

- Potassium hydroxide (KOH) for electrolysis process (lye), this is recycled through the system and is not consumed by the electrolysis process. Minor losses do occur as KOH droplets can exit the electrolyser in the hydrogen and oxygen streams. Lye/gas separators and gas scrubbers remove residual KOH, this is returned to the electrolyte storage tank, making it a closed system. Any spills will be taken offsite rather than discharged in wastewater. If there is a need to remove large volume of lye (for example if a tank is damaged or the solution is contaminated) then this can be taken off site for disposal.
- Oils used by hydraulic systems, compressors and transformers and diesel, stored in a bunded area with oil separator drainage,

- Sodium bisulphite for de-chlorination of mains water, should it be used for process. Typically provided in a 1,000 litre tote. Dosage and therefore replenishment periods will be dependent on selected vendors/equipment and therefore cannot be determined at this stage.
- Antiscalant used to prevent/reduce scaling of water treatment equipment (i.e. from build up of salts). Composition will depend on product/manufacturer selected. Typically provided in a 1,000 litre tote. Dosage and therefore replenishment periods will be dependent on selected vendors/equipment and therefore cannot be determined at this stage.
- Glycol for coolant. This is mixed with water, it is not consumed in the process but on site storage is required in case minor system losses need to be replenished Coolants
- Facility cleaning chemicals.

There is no expected fuel/oil waste other than from rags and residual amounts in containers at the Hydrogen Plant.

All chemicals will be stored in a bunded area on the Hydrogen Plant Site and will be subject to requirements of the Safety, Health and Welfare at Work (Chemical Agents) Regulations 2001 to 2021 (as amended) and compliance with the requirements of REACH, i.e., European Communities Regulation 1907/2006 for the Regulation, Evaluation, Authorisation and Restriction of Chemicals. Chemicals will be managed in accordance with European Chemicals Agency's Guidance for Downstream Users (2014). Final selection of bulk chemicals will be subject to an assessment of trace elements to ensure that they are within acceptable limits. Storage of large volumes of oils and other hazardous substances will have a secondary containment such as a bund to prevent hydrocarbon contamination to land/water. Waste oils and other chemicals, including oil rags/wipes will be disposed of as hazardous waste. Operational staff will receive training on the handling, containment, use, and disposal requirements for all potentially polluting products on the Hydrogen Plant Site.

Oxygen (O_2) is produced as a biproduct of the green hydrogen production process at a volume of 8 kg O_2 for 1 kg hydrogen. It is anticipated that the Hydrogen Plant will not be built initially with a capacity of 80 MW but is more likely to commence operation at a capacity of 10 MW and ramp-up in modules as demand increases and the hydrogen market matures. At 10 MW it is expected that the Hydrogen Plant will produce 568 tonnes of Hydrogen per year and emit 4,547 tonnes of Oxygen. At 80 MW it will produce 4,547 tonnes of green hydrogen and 36,375 of Oxygen per year. This is released to the atmosphere via a vent stack. The oxygen vent stack is separated from the hydrogen vent outlets and away from

building air takes. Sufficient ventilation will be installed inside the electrolyser building to prevent accumulation of oxygen. Oxygen could potentially be collected as a by-product however, this does not form part of the Proposed Development.

Nitrogen gas will be used at the Hydrogen Plant to purge equipment and piping for both safety and maintenance purposes. Air, oxygen and other oxidisers must be purged from a system before introducing hydrogen to avoid creating an explosive mixture. Hydrogen will also need to be purged from systems prior to maintenance. Nitrogen production equipment will be housed in the electrolyser building. This will include air separation equipment which compresses and filters atmospheric air, then binds the oxygen and allows the nitrogen to pass through. The purified nitrogen is produced on demand and is not required to be stored at the Hydrogen Plant. Nitrogen is an inert gas and so is not toxic but can pose a risk as an asphyxiant if accumulated in enclosed spaces. Appropriate venting will be installed to ensure prevent this. The engineering design of nitrogen production and handling is proven regarding safety and environmental risks.

Packaging will be brought to the Wind Farm Site and Hydrogen Plant Site during the construction, operational and decommissioning phases and can include cardboard, wood and plastics used to package turbine components. Packaging waste will be dealt with in accordance with the European Union (Packaging) Regulations 2014 (S.I. No. 282 of 2014).

'A producer who supplies to another producer packaging material, packaging or packaged products shall comply with any reasonable request from the latter producer for data on the weight of the material or packaging concerned sufficient to enable the latter producer to comply with these Regulations.'

The occurrence of 10 kg of plastic per turbine blade, between 40 and 50 pallets and 50 to 60 cable drums are expected. This will be removed from site for re-use by an authorised person(s). This waste is non-hazardous, and the effects of this waste are not significant.

During decommissioning, it is expected that 100 tonnes of steel will be removed from turbine bases and will be recycled. This waste is non-hazardous, and effects will be not significant.

Excavated materials will be required for habitat and ecological restoration, reprofiling and backfilling in accordance with the CEMP in **Appendix 2.1**. Management Plan 4; Spoil and Waste Management outlines how these will be managed. There are 3 areas designated for peat storage. During excavation works peat will be deposited in the peat storage area

closest to the works. Material excavated during the construction phase required for reinstatement, shall in the first instance be stored on site, in an environmentally safe manner that will not result in the pollution of waters, until it is required for re-use. Excavated material will not be stored adjacent to slopes (>15 degrees gradient). This will be subject to evaluation and approval by the Civil Contractors' geotechnical engineer and will accommodate the Site stockpiling requirements based on earthwork calculations. A buffer of 50 m from watercourses will be implemented for storage areas of excavated materials to be re-used for reinstatement works.

As such, excavated materials will not be classified as waste except along the Grid Connection Route and Interconnector.

An estimated 16,806 m^3 of material will be excavated along the Grid Connection Route and Interconnector and will be transported by an authorised waste permit holder to a licensed facility. The effect of this will be not significant.

13.9.3 Mitigation Measures

Mitigation measures relating to existing water services have been assessed and are detailed in **Chapter 9: Hydrology and Hydrogeology** and referred to in **Chapter 4: Population and Human Health**.

Mitigation for wastes include the following:

- ***Staff Facilities:*** Provision for separation of waste streams will be provided so that e.g., paper, and cardboard waste and bottles may be recycled.
- ***Sewage:*** It is proposed to install a rainwater harvesting system as the source of water for toilet facilities for the operational phase of the Wind Farm Site. Wastewater from the staff welfare facilities at the Wind Farm Site in the control building will be collected in a sealed storage tank, fitted with a high-level alarm. This is a device installed in a fuel storage tank that is capable of sounding an alarm, during a filling operation, when the liquid level nears the top of the tank. During the operational phase, wastewater from facilities at the Hydrogen Plant will be treated through a septic tank and constructed wetlands with regulated discharge rates, before being discharged to the Dooyeaghny River to the south of the Hydrogen Plant.
- ***Concrete***

During the construction phase:

- Precast concrete will be used wherever possible i.e., formed offsite. Elements of the Development where precast concrete will be used have been identified and are indicated

in the CEMP. Elements of the Development where the use of precast concrete will be used include structural elements of watercourse crossings (single span / closed culverts) as well as Cable Joint Bays. Elements of the development where the use of precast concrete is not possible include turbine foundations and joint bay pit excavations. Where the use of precast concrete is not possible the following mitigation measures will apply.

- The acquisition, transport and use of any cement or concrete on site will be planned fully in advance and supervised at all times.
- Vehicles transporting such material will be relatively clean upon arrival on site, that is; vehicles will be washed/rinsed removing cementitious material leaving the source location of the material. There will be no excess cementitious material on vehicles which could be deposited on trackways or anywhere else on site. To this end, vehicles will undergo a visual inspection prior to being permitted to drive onto the proposed site or progress beyond the contractor's yard. Vehicles will also be in good working order.
- Any shuttering installed to contain the concrete during pouring will be installed to a high standard with minimal potential for leaks. Additional measures will be taken to ensure this, for example the use of plastic sheeting or other sealing products at joints.
- Concrete will be poured during metrological dry periods/seasons. This will reduce the potential for surface water run off being significantly affected by freshly poured concrete. This will require limiting these works to dry meteorological conditions i.e. avoid foreseen sustained rainfall (any foreseen rainfall event longer than 4 hour duration) and/or any foreseen intense rainfall event (>3 mm/hour, yellow on Met Eireann rain forecast maps), and do not proceed during any yellow (or worse) rainfall warning issued by Met Eireann. This also will avoid such conditions while concrete is curing, in so far as practical.
- Ground crew will have a spill kit readily available, and any spillages or deposits will be cleaned/removed as soon as possible and disposed of appropriately.
- Pouring of concrete into standing water within excavations will be avoided. Excavations will be prepared before pouring of concrete by pumping standing water out of excavations to the buffered surface water discharge systems in place.
- Temporary storage of cement bound sand (if required) will be on hardstand areas only where there is no direct drainage to surface waters and where the area has been bunded e.g., using sand-bags and geotextile sheeting or silt fencing to contain any solids in run-off.
- No surplus concrete will be stored or deposited anywhere on site. Such material will be returned to the source location or disposed of off-site appropriately.

Chemicals, Fuels and Oils: All storage containers of over 200 litres will have a secondary containment of 110% capacity to ensure that any leaking oil is contained and does not

enter the aquatic environment. Avoid bringing chemicals to the Hydrogen Plant unless required.

- ***Chemical and Waste*;** An Inventory will be kept, this will include:
  - List of all substances stored on-site (volume and description)
  - Procedures and location details for storage of all materials listed
  - Waste disposal records, including copies of all Waste Transfer Notes detailing disposal routes and waste carriers used
  - Any tap or valve permanently fixed to the mobile unit through which oil can be discharged to the open or when delivered through a flexible pipe which is fitted permanently to the mobile unit, will be fitted with a lock and locked shut when not in use
  - Sight gauges will be fitted with a valve or tap, which will be shut when not in use Sight gauge tubes, if used will be well supported and fitted with a valve
  - Mobile units must have secondary containment when in use/out on site

Under the EU Directive 95/55/EC all such dangerous substances will be conveyed in a container that compiles with the ADR. As such the manufacturer of each bowser will provide certification to contractors that the following:

- A leak-proof test certificate
- A copy of the IBC approval certificate
- An identification plate attached to the container

Where mobile bowsers are used on site, guidelines will be followed so that:

- Any flexible pipe, tap or valve will be fitted with a lock where it leaves the container and be locked shut when not in use;
- Flexible delivery pipes will be fitted with manually operated pumps or a valve at the delivery end that closes automatically when not in use. Where possible, a nozzle designed to dispense oil is used;
- The pump or valve will have a lock and be locked shut when not in use.

For loads in excess of 1000 litres (220 gallons), the bowser vehicle driver will have undergone training and hold a special license.

- ***Refuelling:*** During construction/decommissioning, where possible all refuelling on site will be within the temporary compound within the re-fuelling area. Only essential refuelling (e.g., cranes) will be carried out, outside of this area, but not within 65 m of any watercourse. In such cases a non-permeable High-density Polyethylene (HDPE)

membrane will be provided beneath connection points to catch any residual oil during filling and disconnection. This membrane will be inspected and if there is any sign of oil contamination, it will be removed from site by a specialist licensed waste contractor. All vehicles will be well maintained and free from oil or hydraulic fuel leaks.

- ***Packaging:*** In accordance with the waste hierarchy, packaging will be returned to the originator ahead of re-use or recycling. Where this is not possible, waste will be separated as appropriate and safely stored on site appropriately in anticipation of recycling.

- ***Metals:*** Waste metals from concrete reinforcing during construction and removal of metals during decommissioning etc. will have commercial value and will be re-used or recycled with the appropriate licensed waste contractor.

13.9.4 Statement of Significance

There are no gas mains located within the either the Wind Farm Site or Hydrogen Plant Site. There is therefore no potential for impact.

It has been assumed that there is the potential to encounter local water services within the Proposed Development. Potential impacts arising from the Proposed Development relating to existing water services have been assessed and are detailed in **Chapter 9: Hydrology and Hydrogeology**

There are no EPA-licensed or local authority-authorised waste facilities or activities located within the EIAR Site Boundary. The closest, authorised municipal waste facility to the Development is Rathroeen Landfill (W0067-1), 6.2 km northwest of the Hydrogen Plant Site and 12 km west of the Wind Farm Site in the townland of Rathroeen.

The residual effects of waste produced as a result of the construction, operational and decommissioning phases of the Proposed Development are considered to be not significant.