Environmental Consultants

# Environmental Impact Assessment Report (EIAR)

Environmental Impact Assessment Report (EIAR) submitted as part of the planning application by P Bonar Plant Hire for quarry extraction in the townlands of Magherasolis and Craigs, Raphoe, Co. Donegal.

Greentrack Environmental Consultants

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# Non-Technical Summary

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# Non-Technical Summary

This is a non-technical summary of the Environmental Impact Assessment Report (EIAR) being submitted as part of the planning application by P Bonar Plant Hire for quarry extraction in the townlands of Magherasolis and Craigs, Raphoe, Co. Donegal. The aim of this non-technical summary is twofold:

To provide a concise and clear summary of;

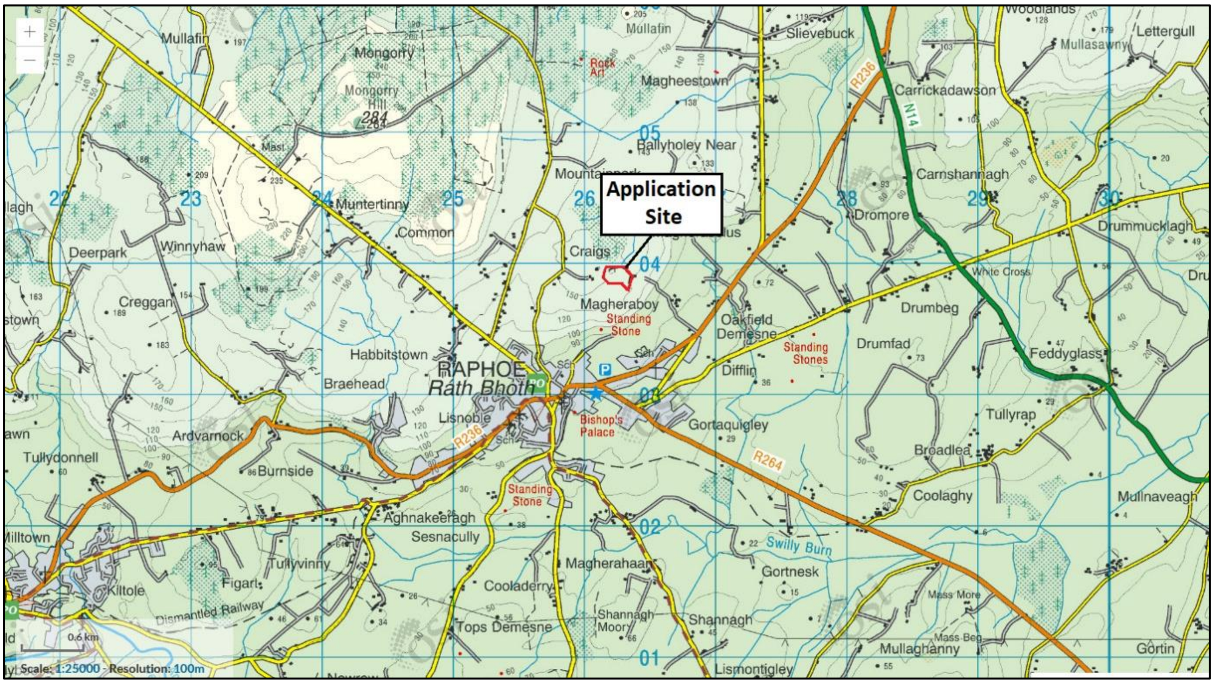
- Project description.
- Likely significant effects on the environment.
- Features of the project and/or measures envisaged in order to avoid, prevent or reduce and, if possible, offset likely significant adverse effects on the environment.

To provide an aid in explaining the content of the EIAR to the wider public and facilitating their involvement in the statutory consultation process during the consent determination stage.

# Project Description

The subject site is located to the Northeast of Raphoe Town which is designated as a Tier 2 B settlement in the Donegal County Development Plan 2018-2024. The subject site lays within the townlands of Craigs and Magherasolis. The quarry is served by the L-23749 which is a local tertiary road. This road leads directly onto the R236 regional road. Raphoe Town is located 900m Southwest of this road junction and 780m Southwest from the nearest boundary of the subject site (930m to quarry face). The site is surrounded by improved agricultural land, upland grassland and an area of commercial forestry. Map A shows the site location

**Map A: Application site in a regional context**





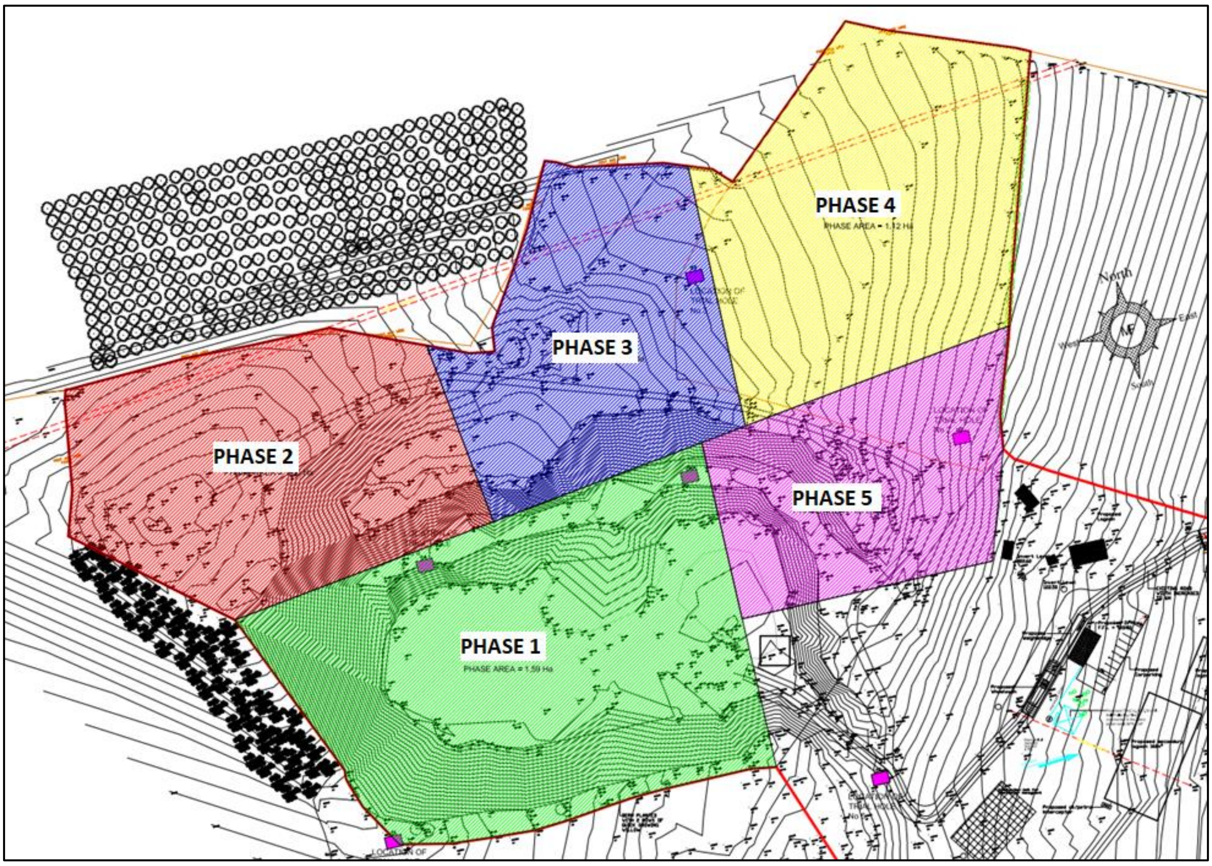

The applicant, Patrick Bonar, has over thirty years' experience in the quarry business. He has spent considerable time and resources over the last four years looking for a suitable site to facilitate planning compliant quarrying activity to service his loyal customer base and provide ongoing employment. He has looked at alternative sites, but none were feasible. Patrick settled on this site as it has previous quarry history and represents a very good resource of suitable extraction material. The stone type on this site is very suitable to produce good quality aggregate. Patrick submitted a planning application on part of this site in 2019 which was granted consent by Donegal County Council on 10/09/2020 under planning reference 19/52015. This decision to grant was subsequently appealed to An Bord Pleanála who refused the permission based on concerns that “details submitted with the planning application and the appeal has not demonstrated adequate proposal for the proper and satisfactory management of surface water at the proposed development and subsequent potential adverse effects on the integrity of River Finn Special Area of Conservation (Site Code 002301) and the River Foyle and Tributaries Special Area of Conservation (Site Code UK0030320), in view of the sites conservation objectives (ABP-308326-20)”. This EIAR is now being submitted as part of a new application process and dealt with all issues of concerns raised in the inspector’s report.

This planning application is for a period of 25 years and the proposal is to reopen the existing dormant quarry. Proposals are to extract and process rock from the original footprint of disturbed ground and to extract from an additional area of new ground immediately to the northeast of the site. The new ground is proposed to be stripped, drilled, and blasted. It is proposed to deepen existing extraction depths to approximately 10 m below the existing quarry deck level. When the material is loose from the rock face it will be moved to a primary crusher where uniform stone size will be achieved through grading. Material will be taken from the crushers and screeners and stockpiled on site to service local market demand. All material will be processed to IS EN 13242 and SR 21 standards as per the National standard for Civil Engineering products. No washing of stone is planned on this site.

The development is proposed in a phased manner with five 5-year stages proposed as shown in Map B below. The initial phase of operation will involve the construction of an office building, weighbridge, machinery shed and all site drainage including a constructed settlement tank system along with a constructed wetland area to treat all effluent and stormwater. The applicant will seek a trade discharge licence for the single outflow point from the settlement system from Donegal County Council. This means that the outflow will be constantly checked and will be monitored by Donegal County Council.

A wastewater treatment system is to be installed to treat wastewater and sewage from the office building. Noise abatement measures and dust control measures are also proposed. The office will have an electricity supply and telecommunications connection.

**Map B: Planned phases of extraction**




This Map was provided by Michael Friel Architects and Surveyors

The maximum yield of rock over the 25-year term has been estimated as shown in Table A below:

**Table A: Estimated maximum yield of rock over the 25-year term**

| Phase | Maximum Yield Potential ($m^3$) | Tonnage of rock |
|---|---|---|
| Phase 1 (year 1 to 5) | 180,000 | 486,000 |
| Phase 2 (year 6 to 10) | 310,000 | 837,000 |
| Phase 3 (year 11 to 15) | 200,000 | 540,000 |
| Phase 4 (year 16 to 20) | 220,000 | 594,000 |
| Phase 5 (year 21 to 25) | 110,000 | 297,000 |
| **Totals** | **1,020,000** | **2,754,000** |

The realistic average annual extraction amounts are expected to be in the order of 100-110,000 tonnes based on the applicants experience and projections of market requirements. This equates to 2.75m tonnes of extracted material over the 25-year life of the quarry and converts to an average daily extraction figure of 350-400 tonnes (approximately 18-20 lorry loads per day).

## Likely Significant Effects on the Environment.

This planning application is for extraction of stone from an area of 5.37 Ha within an overall site measuring 7.95 Ha. This proposed extraction area is over the threshold for compulsory Environmental Impact Assessment according to paragraph 2 of part 2 of Schedule 5, part (b) of Planning and Development Regulations 2001 (as amended). This means that an Environmental Impact Assessment

Report (EIAR) has to be produced to enable the consent authority to undertake environmental impact assessment.

The EIAR must therefore examine all likely significant effects from the proposed quarrying activities on the environment. According to Guidelines on the information to be contained in an EIAR published by the Environmental Protection Agency (EPA) in August 2017, likely significant effects must be considered in each of the following categories (relevant section of this EIAR dealing with each category is in brackets):

- Population and Human Health (Section 5)
- Biodiversity (Section 6)
- Land, Soil and Geology (Section 7)
- Water (Section 8)
- Noise & Dust, Blast & Vibration (Sections 9 and 10)
- Climate (Section 11)
- Material Assets (Section 13)
- Cultural Heritage (Section 14)
- Landscape & Restoration (Section 15)

This EIAR will examine all likely significant effects under each of these headings and will also recommend mitigation measures envisaged in order to avoid, prevent or reduce and, if possible, offset likely significant adverse effects on the environment.

Each heading will now be dealt with individually with a summary of likely significant effects and a summary of proposed mitigation measures outlined. Each section will provide much more detail with the following points being used to facilitate this non- technical summary only.

## Population and Human Health

**Significant Effects**

The proposed quarrying activities could give rise to numerous issues that have the potential to impact negatively on population and human health. Examples would include deterioration of water quality due to uncontrolled quarry discharge, noise and vibrations from quarry activities and blasting casing nuisance and stress, deterioration of air quality due to emissions from mechanical activity and dust generation. All of these potential significant negative impacts on population and health are dealt with in other sections of this EIAR, with detailed mitigation measures outlined.

It should also be noted that this proposal has the potential to provide a positive socio-economic impact on population and human health through direct and indirect employment opportunities in the local environs.

**Summary Mitigation Measures**

- Security fencing and warning signs must be erected around the boundary of the quarry.
- Noise and dust must be maintained within permitted legal limits.
- Environmental monitoring must be carried out in accordance with the requirements of the conditions attached to the grant of planning permission.

# Biodiversity

**Significant Effects**

The proposed renewal and expansion of quarry activity on this site has the potential to remove existing habitat, thus impacting negatively on wildlife and biodiversity. Dust and noise generated by the proposed extraction works will have a similar negative impact. Unregulated water discharge, containing a high loading of suspended solids, from the site could also have a negative impact on the Swilly Burn River which is an avenue of connectivity to the River Finn SAC and the River Foyle and Tributaries SAC.

**Summary Mitigation Measures**

- An Ecological Clerk of Works (ECoW's) must be appointed for the site who will advise on the appropriate implementation of the mitigation measures outlined within this EIAR and the separate NIS.
- Adequate constructed settlement tank capacity and constructed wetland system must be put in place to reduce sediment load in the effluent to acceptable levels before discharging offsite. This work must be done before any quarrying activity is undertaken
- The external site boundaries must be vegetated with a mixture of native shrubs and trees which will act an acoustic barrier for the site.
- The proposed operational works must be monitored periodically, particularly during the bird breeding season, by a qualified ecologist to ensure that the mitigation measures proposed are implemented.
- Bat and bird boxes to be erected throughout the subject site to provide roosting opportunities. Location of same to be advised by the ECoW's.
- Two inspections per annum must be undertaken for nesting birds within the site by the site manager and the appointed ECoW, one of which is during the breeding season.

# Land, Soil and Geology

**Significant Effects**

The mechanical activities associated with the proposed quarry have the potential to generate pollution from fuel spills and leakages from poorly maintained vehicles and equipment. This type of pollution can cause significant negative effects on the soil. There will also be a loss of soil and subsoil due to the extraction process along with the permanent loss of a significant amount of rock during extraction.

**Summary Mitigation Measures**

- Comprehensive fuel storage and management system to be put in place
- Instillation of two hydrocarbon interceptors. Interceptor 1 between the yard and the settlement tanks. Interceptor 2 located before final discharge point after constructed wet land system.
- Geotechnical assessments of quarry face over 20 m height, and those over 30 m height with multiple benches, must be conducted by a geotechnical specialist once the face is created and when dormant. Reports to be held by site manager for inspection upon request by the consent authority.
- A professional geologist must provide reports as required by the NSAI to ensure that the aggregate produced meets the NSAI required specification for end purpose.
- Overburden and unsuitable material must be used for the creation of screening berms around the external boundary of the application site.

- Excess overburden must be stockpiled in a suitable location for use in the restoration phase.

# Water

**Significant Effects**

The proposed quarry activities, if unregulated, could give rise to surface water quality impacts due to suspended solids, hydrocarbons and wastewater from office block. Local ground water could also be impacted if extraction were to take place below the existing water table.

**Summary Mitigation Measures**

- Adequate constructed settlement tank capacity and constructed wetland system must be put in place to reduce sediment load in the effluent to acceptable levels before discharging offsite (Section 8.6.2). This work must be done before any quarrying activity is undertaken.
- Silt fence must be installed around the perimeter of newly constructed berms and kept in place until berms have been colonised with vegetation and risk of sediment transport in runoff is negligible.
- Single discharge point to be subject to the conditions of a trade discharge licence from Donegal County Council

# Air

**Significant Effects**

The proposed quarry activities could give rise to a significant increase in day-to-day noise, including blasting, construction noise, increased traffic noise and generation of dust.

**Summary Mitigation Measures**

- Follow best practice to reduce dust
- Follow best practice to reduce noise
- Blasting can only take place between 12:00hrs and 16:00 hrs, Monday to Friday. Blasting must not be conducted on weekends or bank holidays.
- Advance warning notice of all blasts must be given to residents in the environs of the quarry at least 24hrs prior to blasting.
- Dust monitoring to be undertaken at 3 points around the quarry

# Climate

**Significant Effects**

Plant and vehicle emissions during the construction and operational stage of this proposal will have a negative effect on the climate. The loss of vegetation associated with this proposal will also reduce the ability of carbon capture in and around the site, but this will be off set with the proposed planting of the berms outlined.

The supply of aggregate to service the local marked does represent a positive resource efficiency and will avoid the importation of materials from distance. This will all help to reduce the carbon footprint associated with this material.

**Summary Mitigation Measures**

- Strict adherence to good operational practice such as switching off plant and vehicles when not in use during the construction phase

- All plant and vehicles involved in the construction phase must be regularly serviced to ensure they are running as efficiently as possible
- Energy consumption ratings must be considered when upgrading new vehicles associated with the site.
- Regular energy audits must be implemented to assess energy requirements and areas where energy usage can be reduced. This will lead to a reduction in greenhouse gas emissions.
- Landscaping plan (section 15) must be implemented to offset vegetation loss and increase net biodiversity.

# Material Assets

**Significant Effects**

It is predicted that approximately 18-20 loads of product per day will be transported off site creating approximately 40 traffic movements per day which is not significant. The 20 vehicle movements relating to workers traffic to and from the quarry is also considered as not significant. The impact on roads and traffic is therefore assessed as imperceptible.

The EIAR also finds that there will be no significant impact on other material assets such as residential buildings, public utilities and mains water supply. The office block will be supplied water from abore hole on site.

**Summary Mitigation Measures**

- There are no specific mitigation measures proposed. Monitoring is proposed in various sections of the EIAR which will identify any future needs of additional measures to be considered regarding material assets.

### Cultural Heritage

**Significant Effects**

The proposed quarry activity does not represent any significant impact on cultural heritage such folklore, tradition, religion and language.

**Summary Mitigation Measures**

- No mitigation is proposed as there are no negative impacts envisioned on local archaeology from the proposed development

# Landscape & Restoration

**Significant Effects**

The proposed quarry could create a negative impact on the visual landscape. This means that part of the quarry could be visible from certain points in and around Raphoe and environs.

**Summary Mitigation Measures**

- New berms must be created around the proposed excavation site to screen the development and to provide natural vegetation and wildlife corridors of connectivity.
- A mix of native species must be planted around the eastern and southern boundary of the new berm to support a wide range of insects and animals and contribute to the ecological value of the area.
- All planting of trees and shrubs must take place during the first dormant season, avoiding times of frost.

- Planting to be monitored by the Ecological Clerk of Works with appropriate advice and guidance given to the site manager.
- A full and comprehensive restoration plan must be submitted and agreed with the planning authority in relation to one or both of the following as they become relevant:
    - Restoration of the 5.37Ha excavation area.
    - Restoration of the entire subject site.

# CONCLUSION

The management of water run-off from the site is a key component in the design of this project. Mitigation measures have been incorporated into the design of this project by means of constructed settlement tanks and constructed wetlands. The settlement tank capacity and the capacity of the wetlands has been designed to ensure that all run off has adequate time to pass through this system to allow suspended solids to settle out of solution. This system has also been designed to allow attenuation to be provided for a 1 in a 100-year flood event. The use of two hydrocarbon interceptors is also a reflection of the “belt and braces” approach being take to water management. The implementation of a waste discharge licence and all associated requirements, including monitoring, is also an additional layer of protection to the receiving waters.

This EIAR finds that the proposed quarry activity will have no significant negative impact on the environment when all recommended mitigations are implemented.

# Section 1: INTRODUCTION

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# 1 INTRODUCTION

## 1.1 Introduction

This Environmental Impact Assessment Report (EIAR) has been prepared to accompany an application to Donegal County Council for planning permission under Section 34 of the Planning and Development Act 2000 (as amended) in respect of a quarry development located within the townlands of Craigs and Magherasolis, Raphoe Co. Donegal, (Latitude 54.88327 Longitude -7.590872).

The planning application is being submitted on behalf of Patrick Bonar and consists of the following:

*Patrick Bonar is applying to Donegal County Council for permission for development at Magherasolis & Craigs, Raphoe for a period of 25 Years. The development will consist of:*

*(1) Quarrying of 5.37 hectares which will be subject to extraction and processing of rock through drilling, blasting, crushing and screening*

*(2) Construction of settlement ponds and constructed wetland*

*(3) Construction of a Shed for the purposes of storage for the facility including the on- site machinery maintenance*

*(4) Erection of site office with Canteen, toilet & drying facilities*

*(5) Installation of a wastewater treatment system & percolation area*

*(6) Provision of a wheel wash and weighbridge*

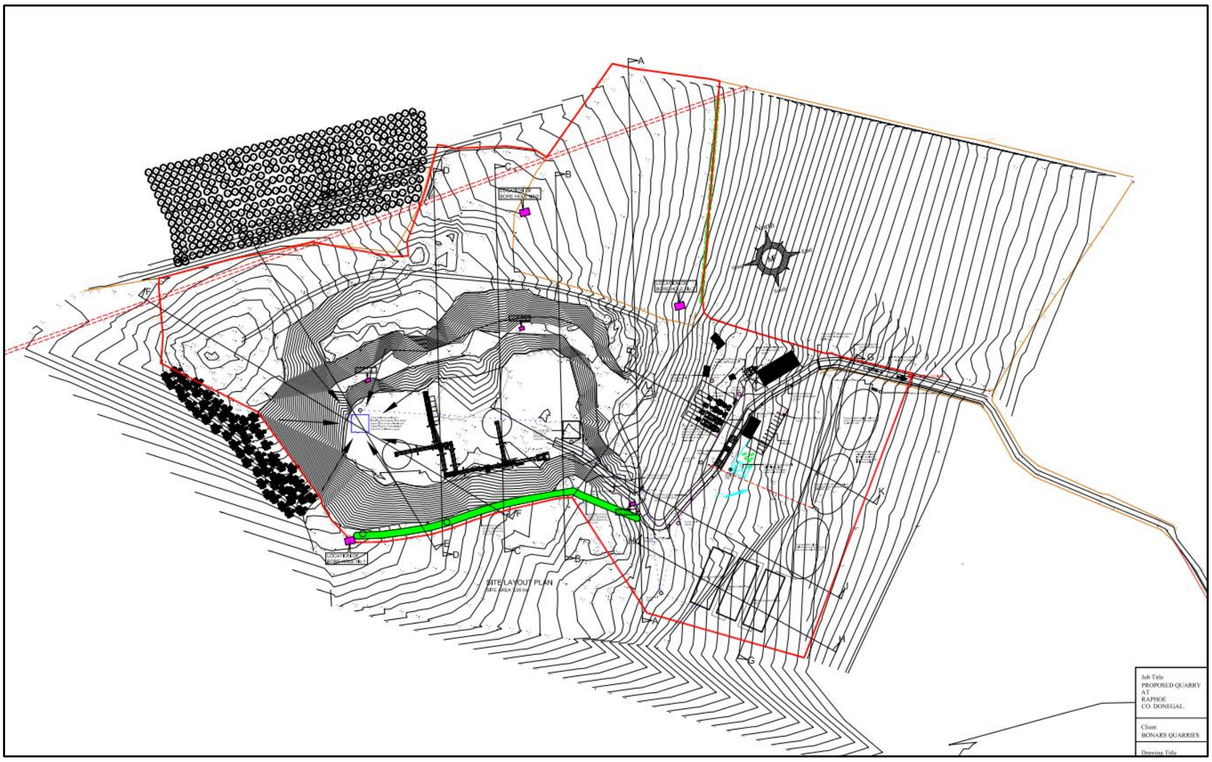
*(7) Landscaping of the Quarry during the operational phase and restoration of the quarry on completion of extraction*

*(8) All associated ancillary facilities / works over a 25-year period.*

There is an Environmental Impact Assessment Report (EIAR) and a Natura Impact Statement (NIS) accompanying this application.

For the purposes of describing areas of the quarry, the area which is subject to this planning application is referred to as the "subject site". The area of the subject site is circa 7.95ha with the extraction area being defined as 5.37ha. The location and extent of the subject site and the wider study area are illustrated in Figures 1.1 and 1.2.

**Figure 1.1: Subject Site**




This site layout map was provided my Michael Friel Architects & Surveyors (not to scale)

**Figure 1.2: The Study area**


This Map was created using QGIS.

Part of this subject site had been granted consent by Donegal County Council on 10/09/2020 under planning reference 19/52015. This decision to grant was subsequently appealed to An Bord Pleanála who refused the permission based on concerns that "details submitted with the planning application and the appeal has not demonstrated adequate proposal for the proper and satisfactory management of surface water at the proposed development and subsequent potential adverse effects on the integrity of River Finn Special Area of Conservation (Site Code 002301) and the River Foyle and Tributaries Special Area of Conservation (Site Code UK0030320), in view of the sites conservation objectives (ABP-308326-20)". This EIAR is now being submitted as part of a new application process and dealt with all issues of concerns raised in the inspector's report.

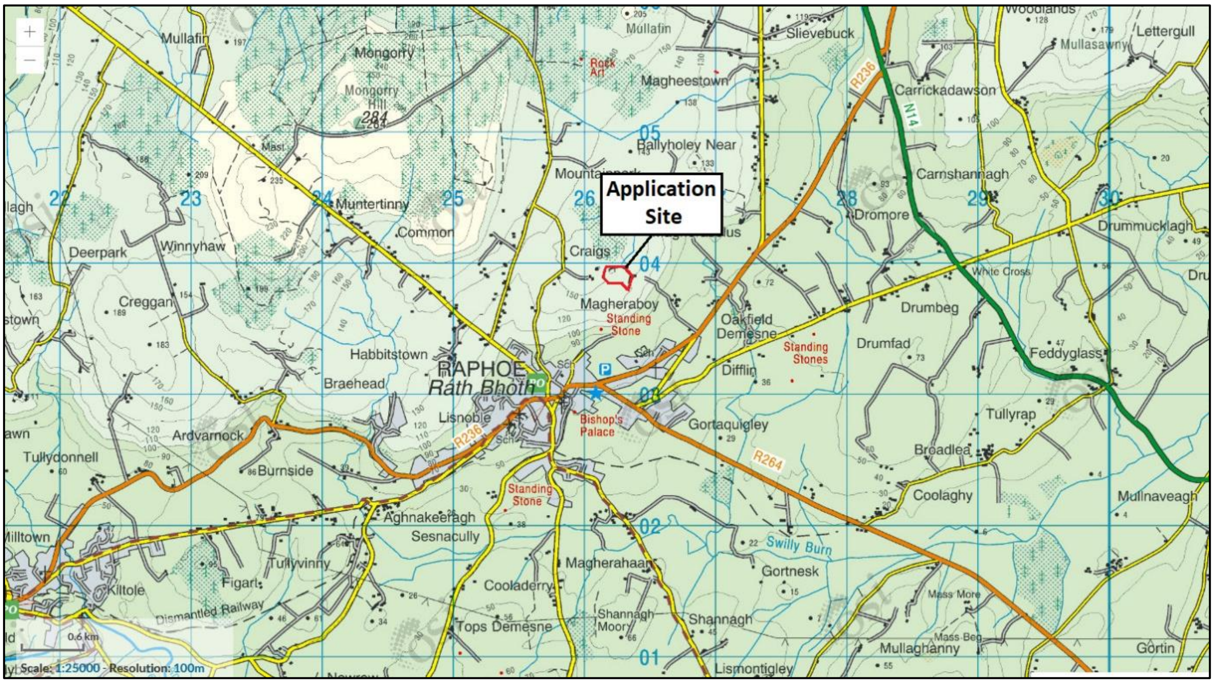
This section of the EIAR provides details in relation to the applicant and a brief history of quarry activities to date. It also outlines the structure of the EIAR.

## 1.2 Existing Site Description

### 1.2.1 Site Location

The subject site is located to the Northeast of Raphoe Town which is designated as a Tier 2 B settlement in the Donegal County Development Plan 2018-2024. The subject site lays within the townlands of Craigs and Magherasolis. The quarry is served by the L-23749 which is a local tertiary road. This road leads directly onto the R236 regional road. Raphoe town is located 900m Southwest of this road junction and 780m Southwest from the nearest boundary of the subject site (930m to quarry face). The site is surrounded by improved agricultural land, upland grassland and an area of commercial forestry. Map 1.1 shows the site location.

**Map 1.1: Application site in a regional context**






The extraction area of the subject site has been defined as 5.37ha which consists of previously blasted faces and benches as well as additional ground to the North of the site which is proposed to be stripped, drilled and blasted. The site is surrounded by improved agricultural land, upland grassland and an area of commercial forestry.

The quarry is situated in a rural area with sporadic housing and is surrounded mainly by improved agricultural land. There are also blocks of commercial forestry to the North and Northwest of the subject site. There are two dwellings located on the county road close to the quarry entrance, the closest dwelling is approximately 350m Southeast from the site boundary. There are 4 dwellings/farms sited in close proximity to the quarry site, these range from 350m to 720m from the quarry boundary. The Royal and Prior Secondary School is located 540m South, Raphoe Livestock Mart is located 710m South and Oakfield Manor House is located 800m Southeast of the subject site boundary.

#### 1.2.2 Operational History

The precise history of quarrying on site is unclear. The geology of the site is described as the presence of an intrusive body at Magherasollus which is noted in the original Memoir of the Geological Survey, Sheet 17 and SE portion of Sheet 11, G. H. Kinehan, S.B. Wilkinson, J Nolan and F.W. Egan, 1889. There is no mention of quarrying taking place on site at this time.

Quarrying was taking place on site in 1985 as it is mentioned in the publication 'Mineral Localities in the Dalradian and associated igneous rocks of County Donegal, Republic of Ireland, and of Northern Ireland', a joint publication from the Geological Survey of Ireland and the Geological Survey of Northern Ireland, dated 1985. It refers to the intrusion as follows: "Magherasollus: Metadolerite locally occurs immediately NE of Raphoe in the Termon Pelites. The locality is centred on Sheldon's Quarry, an active quarry which is extracting metadolerite and crushing it for road metal. The wall-rocks of the metadolerite are quartz rich metasediments which are discarded as waste". The quarry was operated by Donegal County Council.

Anecdotally, quarrying ceased at the site in the late 1980's. Some of the original site infrastructure remains.

#### 1.2.3 Site Layout

The historical development of quarrying at this 7.95ha site had resulted in the main production and processing areas previously being located South progressing to the North of the site. The original ground on the site slopes gently with a 1:5 to 1:20 slope. The current quarrying application is for extraction to continue Northeast and Northwest of the existing benches. The bedrock geology of the proposed site is listed as a fine grained slightly impure quartzite with beds typically c. 5cm thick and occasional pebbly beds. The quartzite lies within the Killeter Quartzite Formation. Location of the proposed office building and weigh bridge is planned to be inside the Southeast site boundary. A layout drawing of the proposed development highlights the proposed extraction areas shown in Figure 1.1.

#### 1.2.4 Site Access

The subject site is situated approximately 900m Northeast of the town of Raphoe Co. Donegal. Access to the quarry is via the country road L-23749 which is in good condition. This road leads directly onto the R236 regional road, which meets the national road the N14 2.3 Km to the NE. The N14 is the main transport link in Northeast Donegal between Letterkenny and Lifford/Strabane. There is a good network of local secondary roads in this area, which reflects the strong nature of this region.

### 1.3 The Applicant

Patrick Bonar has over 30 years' experience in the quarry industry, including extraction and batching processes. He began his career working with his father in numerous quarry sites and became proficient with operating heavy machinery at an early age. He has built up a reputation for quality customer service and loyalty from his workforce.

## 1.4 Environmental Impact Assessment Report (EIAR) Methodology

The primary objective of this EIAR is to identify baseline environmental and socio-economic conditions in the vicinity of the proposed development, predict potential beneficial and/or adverse effects of the proposed development and propose appropriate mitigation measures where necessary. The following guidelines were considered as part of this EAIR:

- Chartered Institute of Ecology and Environmental Management (CIEEM) (2019). Guidelines for Ecological Impact Assessment.
- Chartered Institute of Ecological and Environmental Management (CIEEM) (2012). Preliminary Ecological Appraisal.
- Fossitt JA (2000). A Guide to Habitats in Ireland.
- The Heritage Council (2011) Habitat Survey Guidelines: A Standard Methodology for Habitat Survey and Mapping in Ireland.
- Draft Revised guidelines on the information to be contained in Environmental Impact Statements (EPA, 2017).
- Guidelines for Planning Authorities and An Bord Pleanála on Carrying out Environmental Impact Assessment. Department of the Environment, Community and Local Government DoEHLG (2013).
- Guidelines for assessment of Ecological Impacts of National Road Schemes, (NRA, 2009). Environmental Impact Assessment of National Road Schemes – A Practical Guide (NRA, 2009).
- Environmental Assessment and Construction Guidelines (NRA, 2006).
- Advice Notes on Current Practice (in preparation of Environmental Impact Statements) (Environmental Protection Agency (EPA), 2003).
- Guidelines on the information to be contained in Environmental Impact Statements (EPA, 2002). European Commission Guidance on the preparation of the Environmental Impact Assessment Report (2017)
- Environmental Protection Agency (EPA) 'Draft Guidelines on the Information to be Contained in Environmental Impact Assessment Reports' (August 2017)

Information on the project and the receiving environment was obtained through several means including:

- Aerial photographs.
- Site visits and filed surveys.
- Site assessments (geology, water, noise, dust etc.)
- Donegal County Council.
- Review of general data for the general area in and around the subject site.
- Review of previous studies carried out at the site and locally.
- Consultation with interested parties.

## 1.5 Environmental Impact Assessment Report

This EIAR is prepared under instruction from the developer, Patrick Bonar, and is submitted to the relevant planning authority who use the information provided to assess the potential beneficial and/or adverse effects and proposed mitigation measures to determine if planning should be granted. The EIA Directive (2014/52/EU) describes information which should be included as part of an EIAR:

1. *Where an environmental impact assessment is required, the developer shall prepare and submit an environmental impact assessment report. The information to be provided by the developer shall include at least:*

**a)** *a description of the project comprising information on the site, design, size and other relevant features of the project.*
**b)** *a description of the likely significant effects of the project on the environment.*
**c)** *a description of the features of the project and/or measures envisaged in order to avoid, prevent or reduce and, if possible, offset likely significant adverse effects on the environment.*
**d)** *a description of the reasonable alternatives studied by the developer, which are relevant to the project and its specific characteristics, and an indication of the main reasons for the option chosen, taking into account the effects of the project on the environment.*
**e)** *a non-technical summary of the information referred to in points (a) to (d); and*
**f)** *any additional information specified in Annex IV relevant to the specific characteristics of a particular project or type of project and to the environmental features likely to be affected.*

*Where an opinion is issued pursuant to paragraph 2, the environmental impact assessment report shall be based on that opinion and include the information that may reasonably be required for reaching a reasoned conclusion on the significant effects of the project on the environment, taking into account current knowledge and methods of assessment. The developer shall, with a view to avoiding duplication of assessments, take into account the available results of other relevant assessments under Union or national legislation, in preparing the environmental impact assessment report.*

**2.** *Where requested by the developer, the competent authority, taking into account the information provided by the developer in particular on the specific characteristics of the project, including its location and technical capacity, and its likely impact on the environment, shall issue an opinion on the scope and level of detail of the information to be included by the developer in the environmental impact assessment report in accordance with paragraph 1 of this Article. The competent authority shall consult the authorities referred to in Article 6(1) before it gives its opinion.*

*Member States may also require the competent authorities to give an opinion as referred to in the first subparagraph, irrespective of whether the developer so requests.*

**3.** *In order to ensure the completeness and quality of the environmental impact assessment report:*
**a)** *the developer shall ensure that the environmental impact assessment report is prepared by competent experts;*
**b)** *the competent authority shall ensure that it has, or has access as necessary to, sufficient expertise to examine the environmental impact assessment report; and*
**c)** *where necessary, the competent authority shall seek from the developer supplementary information, in accordance with Annex IV, which is directly relevant to reaching the reasoned conclusion on the significant effects of the project on the environment.*

*Article 3 of the EIA Directive (2014/52/EU) states that the following factors/topics should be described and assessed:*

1. *"The environmental impact assessment shall identify, describe and assess in an appropriate manner, in the light of each individual case, the direct and indirect significant effects of a project on the following factors:*
    a) *population and human health;*
    b) *biodiversity, with particular attention to species and habitats protected under Directive 92/43/EEC and Directive 2009/147/EC.*
    c) *land, soil, water, air and climate.*
    d) *material assets, cultural heritage and the landscape.*
    e) *the interaction between the factors referred to in points (a) to (d).*

2. *The effects referred to in paragraph 1 on the factors set out there in shall include the expected effects deriving from the vulnerability of the project to risks of major accidents and/or disasters that are relevant to the project concerned."*

### 1.5.1 EIAR Format

This EIAR is presented in the "Grouped Format Structure" which gives an introduction, an overall project description, then examines each topic as a separate section. The coverage of each topic includes descriptions of the relevant characteristics of the proposed project, the existing environment, predicted impacts, mitigation measures and residual impacts.

- **Section 1** provides an introduction to the development and provides details on the project team, their relevant expertise and competencies.
- **Section 2** provides details in relation to screening, scoping and consideration of alternative design and processes,
- **Section 3** provides details relating to the proposed work methods within the development including day to day processes that will be undertaken at the proposed development.
- **Section 4** sets out planning and development context relating to the proposed development. This section reviews the national, regional and local planning policy relevant to the development.
- **Sections 5 to 15** detail information on all aspects of the existing environment including any impacts or potential impacts identified relating to the existing and proposed development. Mitigation measures are reviewed and proposed where required in order to offset potential or predicted impacts identified.
- **Section 16** addresses the cumulative impacts, indirect impacts and main interactions between different aspects of the environment likely to be significantly affected by the proposed activities at the application site. Only topics that can be logically linked to the development have been examined in detail. Accordingly, when a topic is not mentioned, it is concluded that no potential for conflict exists.
- **Section 17** provides a summary of the potential impacts identified relative to each environmental factor and the mitigation measures proposed in order to offset the potential impact. Residual impacts are also described.

The EIAR is structured under the following subject headings:

- Section 1 *Introduction*
- Section 2 *Screening , Scoping & Alternatives*
- Section 3 *Project Description*
- Section 4 *Planning & Legislative Framework*

- Section 5 *Population &Human Health*
- Section 6 *Biodiversity*
- Section 7 *Land, Soils & Geology*
- Section 8 *Water*
- Section 9 *Noise & Dust*
- Section 10 *Blast & Vibration*
- Section 11 *Climate*
- Section 12 *Material Assets – Traffic*
- Section 13 *Material Assets – Site Services*
- Section 14 *Cultural Heritage*
- Section 15 *Landscaping & Restoration*
- Section 16 *Interactions / Inter-relationships*
- Section 17 *Mitigation & Monitoring Summary*

Section 5 to 15 of the EIAR follow the same general format, as follows:

- An **Introduction** describing the purpose of the section.
- A description of the **Methodology** used in the section.
- A description of the aspect of the Existing Environment relevant to the environmental topic.
- A summary of the **Characteristics of the Development** and an **Impact Assessment** of the development on the environmental topic.
- A description of **Mitigation Measures** proposed in order to avoid, reduce or where possible remedy any adverse environmental effect identified.
- Any **Residual Impacts** after mitigation measures are proposed.

### 1.5.2 EIAR Impact Assessment

A key purpose of the Environmental Impact Assessment (EIA) is to assess the "likely significant effects". The classification of impacts associated with the proposed development follows criteria as set out in EPA Guidance Documents – *Guidelines on the Information to be contained in Environmental Impact Assessment Reports – Draft August 2017(EPA 2017).*

Each section of the EIAR describes potential impacts in terms of its quality, significance, extent, probability, duration & frequency and type, where possible. Table 1.1 outlies these characteristics with associated levels and description as used through this EIAR.

**Table 1.1: Description of Effects (Table 3.3 of the EPA Guidance Document)**

| | |
|---|---|
| **Quality of Effects** | **Positive Effects**<br>A change which improves the quality of the environment (for example, by increasing species diversity; or the improving reproductive capacity of an ecosystem, or by removing nuisances or improving amenities). |
| | **Neutral Effects**<br>No effects or effects that are imperceptible, within normal bounds of variation or within the margin of forecasting error. |
| | **Negative/adverse Effects**<br>A change which reduces the quality of the environment (for example, lessening species diversity or diminishing the reproductive capacity of an ecosystem; or damaging health or property or by causing nuisance). |
| | **Imperceptible**<br>An effect capable of measurement but without significant consequences. |
| | **Not significant**<br>An effect which causes noticeable2 changes in the character of the environment but without significant consequences. |

| | |
|---|---|
| **Describing the Significance of Effects** | **Slight Effects**<br>An effect which causes noticeable changes in the character of the environment without affecting its sensitivities. |
| | **Moderate Effects**<br>An effect that alters the character of the environment in a manner that is consistent with existing and emerging baseline trends. |
| | **Significant Effects**<br>An effect which, by its character, magnitude, duration or intensity alters a sensitive aspect of the environment. |
| | **Very Significant**<br>An effect which, by its character, magnitude, duration or intensity significantly alters most of a sensitive aspect of the environment. |
| | **Profound Effects**<br>An effect which obliterates sensitive characteristics. |
| **Describing the Extent and Context of Effects** | **Extent**<br>Describe the size of the area, the number of sites, and the proportion of a population affected by an effect. |
| | **Context**<br>Describe whether the extent, duration, or frequency will conform or contrast with established (baseline) conditions (is it the biggest, longest effect ever?) |
| **Describing the Probability of Effects** | **Likely Effects**<br>The effects that can reasonably be expected to occur because of the planned project if all mitigation measures are properly implemented. |
| | **Unlikely Effects**<br>The effects that can reasonably be expected not to occur because of the planned project if all mitigation measures are properly implemented. |
| **Describing the Duration and Frequency of Effects** | **Momentary Effects**<br>Effects lasting from seconds to minutes. |
| | **Brief Effects**<br>Effects lasting less than a day. |
| | **Temporary Effects**<br>Effects lasting less than a year. |
| | **Short-term Effects**<br>Effects lasting one to seven years. |
| | **Medium-term Effects**<br>Effects lasting seven to fifteen years. |
| | **Long-term Effects**<br>Effects lasting fifteen to sixty years. |
| | **Permanent Effects**<br>Effects lasting over sixty years. |
| | **Reversible Effects**<br>Effects that can be undone, for example through remediation or restoration. |
| | **Frequency of Effects**<br>Describe how often the effect will occur. (Once, rarely, occasionally, frequently, constantly – or hourly, daily, weekly, monthly, annually). |
| | **Indirect Effects (a.k.a. Secondary Effects)**<br>Impacts on the environment, which are not a direct result of the project, often produced away from the project site or because of a complex pathway. |
| | **Cumulative Effects**<br>The addition of many minor or significant effects, including effects of other projects, to create larger, more significant effects. |

| | |
|---|---|
| **Describing the Types of Effects** | **'Do-Nothing Effects'**<br>The environment as it would be in the future should the subject project not be carried out. |
| | **`Worst case' Effects**<br>The effects arising from a project in the case where mitigation measures substantially fail. |
| | **Indeterminable Effects**<br>When the full consequences of a change in the environment cannot be described. |
| | **Irreversible Effects**<br>When the character, distinctiveness, diversity or reproductive capacity of an environment is permanently lost. |
| | **Residual Effects**<br>The degree of environmental change that will occur after the proposed mitigation measures have taken effect. |
| | **Synergistic Effects**<br>Where the resultant effect is of greater significance than the sum of its constituents, (e.g. combination of SOx and NOx to produce smog). |

## 1.6 EIAR Study Team

The team members involved in the preparation of this EIAR are included in Table 1.2.

**Table 1.2: EIAR Study Team**

| Section | | Team Member |
|---|---|---|
| | Non-Technical Summary | **Greentrack Consultancy Limited**<br>• Denis Faulkner B.Agr.Sc<br>• Colin Farrell BSc. MSc.<br>• Shannen McEwen BSc. Env. Sc<br><br>***Noise & Vibration Consultants Limited**<br>• Brendan O'Reilly MSc (Noise & Vibration)<br><br>*** EuroGeol**<br>• John Colthurst, PhD, PGeo- Appendix 7.1<br><br>***Archaeological Impact Assessment**<br>• David Sweetman MA, MRIA, FSA - Appendix 14.1 |
| 1 | Introduction | |
| 2 | Screening, Scoping & Alternatives | |
| 3 | Project Description | |
| 4 | Planning & Legislative Framework | |
| 5 | Population & Human Health | |
| 6 | Biodiversity | |
| 7 | Land, Soils & Geology* | |
| 8 | Water | |
| 9 | Noise & Dust* | |
| 10 | Blast & Vibration* | |
| 11 | Climate | |
| 12 | Material Assets – Traffic | |
| 13 | Material Assets – Site Services | |
| 14 | Cultural Heritage* | |
| 15 | Landscaping & Restoration | |
| 16 | Interactions / Inter-Relationships | |
| 17 | Mitigation & Monitoring Summary | |

## 1.7 Technical Difficulties

Data limitations and technical difficulties associated with the compilation of the EIAR are detailed in relevant sections of the EIAR.

## 1.8 References


- European Communities (Environmental Impact Assessment) Regulations, 1989 to 1999, (S.I. No.349 of 1989)

- Local Government (Planning & Development) Regulations, 2001 (S.I. No. 600 of 2001)
- European Communities (Environmental Impact Assessment) Regulations, 1989 to 1999, Second Schedule, (S.I. No.93 of 1999)
- European Communities (Environmental Impact Assessment) Regulations, 1989 to 1999, Third Schedule, (S.I. No.93 of 1999)
- Guidelines on the Information to be Contained in Environmental Impact Statements, Environmental Protection Agency (EPA 2002)
- Advice Notes on current practice in the preparation of Environmental Impact Statements (EPA 2003)
- Environmental Management Guidelines – Environmental Management in the Extractive Industry (Non-Scheduled Minerals) prepared by the Environmental Protection Agency (2006)
- Draft Revised Guidelines on the Information to be Contained in Environmental Impact Statements, (EPA September 2015)
- Draft Advice Notes for Preparing Environmental Impact Statements (EPA September 2015)
- Guidelines on the Information to be Contained in Environmental Impact Assessment Reports Draft (EPA, August 2017)
- Donegal County Development Plan 2018-2024

# Section 2: SCREENING, SCOPING & CONSIDERATION OF ALTERNATIVES

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# 2 SCREENING, SCOPING & CONSIDERATION OF ALTERNATIVES

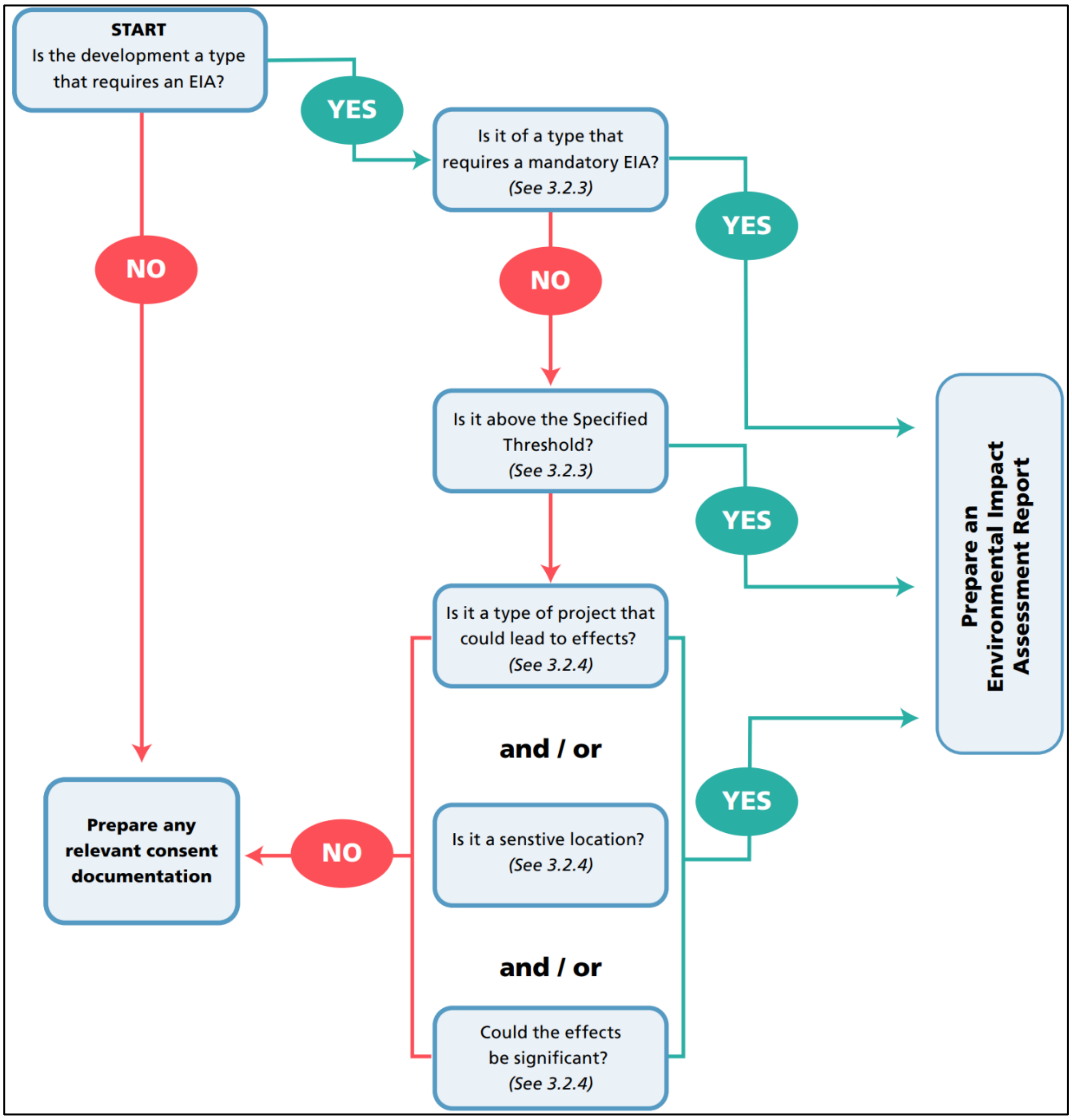
## 2.1 Introduction

This section of the EIAR details the screening and scoping exercise carried out in relation to the proposal and the alternative location, layouts and design considered as part of the process.

## 2.2 EIAR Screening

The first step of the EIA process is screening which establishes whether an EIA is required or not. The project needs to be considered in its entirety for screening purposes. This means that off site and secondary projects as well as indirect, secondary, and cumulative impacts need to be identified and assessed at an appropriate level of detail. Figure 2.1 details the steps to be followed as part of the screening exercise.

**Figure 2.1: EIA Screening Process (EPA Figure 3.2 Screening)**




Taken from EPA (August 2017) Guidelines on the information to be contained in Environmental Impact Assessment Reports
https://www.epa.ie/publications/monitoring--assessment/assessment/strategic-environmental-assessment/EPA_EIAR_Guidelines.pdf

The EIA Directive, "Council Directive 85/337/EEC of June 1985 on the assessment of the effects of certain public and private projects on the environment" as amended by Council Directive 97/11/EC, 2003/34/EC,2009/31/EC,2011/92/EC and 2014/52/EC is designed to ensure that projects likely to have significant effects on the environment are subject to a comprehensive assessment of environmental effects prior to development consent being given.

Screening involves an initial determination to establish whether the proposal is a project which is listed in one of the Annexes to the Directive 2011/92/EU (as amended by Directive 2014/52/EU). The EIA Directive lists projects for which EIA is mandatory (Annex I) and those projects for which EIA may be required (Annex II). With regard to Annex II projects, Member States can choose to apply thresholds or use case by case examination, or a combination of both, to assess whether these projects require EIA. These Annexes have been transposed into Irish law and the prescribed classes of development which require EIA are outlined in Schedule 5 of the Planning and Development Regulations 2001 (S.I. 600 of 2001) as amended. The relevant threshold for quarrying and extraction developments are detailed in Section 2.2.1.

### 2.2.1. Screening Criteria

The sections of Schedule 5 which are applicable to the proposed development are detailed below and referenced A, B and C.

***(A) Part 1, Class 19***
*Quarries and open-cast mining where the surface of the site exceeds 25 hectares.*

***(B) Part 2, Class 2 (b)***
*Extraction of stone, gravel, sand or clay, where the area of extraction would be greater than 5 hectares.*

***(C) Part 2, Class 13 (b)***
*Changes, extensions, development and testing*

***(a)*** *Any change or extension of development which would:-*

***(i)*** *result in the development being of a class listed in Part 1 or paragraphs 1 to 12 of Part 2 of this Schedule, and*

***(ii)*** *result in an increase in size greater than-*
- *25 per cent, or*
- *an amount equal to 50 per cent of the appropriate threshold, whichever is the greater.*

Where a project is of a specified type but does not meet, or exceed, the applicable threshold then the likelihood of the project having significant effects on the environment needs to be considered. Both the adverse and beneficial effects are considered. This is done by referencing the criteria specified in Annex III of the amended Directive.

***1. Characteristics of projects***
*The characteristics of project must be considered, with particular regard to;*
- ***(a)*** *the size and design of the whole project;*
- ***(b)*** *cumulation with other existing and/or approved projects;*
- ***(c)*** *the use of natural resources, in particular land, soil, water and biodiversity;*
- ***(d)*** *the production of waste;*
- ***(e)*** *pollution and nuisances;*

- ***(f)*** *the risk of major accidents and/or disasters which are relevant to the project concerned including those caused by climate change, in accordance with scientific knowledge;*
- ***(g)*** *the risks to human health (for example due to water contamination or air pollution).*

***2. Location of projects***

*The environmental sensitivity of geographical areas likely to be affected by projects must be considered, with particular regard to:*

- ***(a)*** *the existing and approved land use;*
- ***(b)*** *the relative abundance, availability, quality and regenerative capacity of natural resources (including soil, land, water, and biodiversity) in the area and its underground;*
- ***(c)*** *the absorption capacity of the natural environment, paying particular attention to the following areas:*
  - ***i.*** *wetlands, riparian areas, river mouths;*
  - ***ii.*** *coastal zones and the marine environment;*
  - ***iii.*** *mountain and forest areas;*
  - ***iv.*** *nature reserves and parks;*
  - ***v.*** *areas classified or protected under legislation ("including European sites or Areas of Special Scientific Interest" or "Natura 2000 areas designated pursuant to Directive 92/43/EEC and Directive 2009/147/EEC");*
  - ***vi.*** *areas in which there has already been a failure to meet the environmental quality standards, laid down in Union legislation and relevant to the project, or in which it is considered that there is such a failure;*
  - ***vii.*** *densely populated areas;*
  - ***viii.*** *landscapes and sites of historical, cultural or archaeological significance.*

***3. Type and characteristics of the potential impact***

*The likely significant effects of projects on the environment must be considered in relation to criteria set out in paragraphs 1 and 2 of this schedule, with regard to the impact of the project on the factors specified in Article 3(1), taking into account:*

- ***(a)*** *the magnitude and spatial extent of the impact (for example geographical area and size of the population likely to be affected);*
- ***(b)*** *the nature of the impact;*
- ***(c)*** *the transboundary nature of the impact;*
- ***(d)*** *the intensity and complexity of the impact;*
- ***(e)*** *the probability of the impact;*
- ***(f)*** *the expected onset, duration, frequency and reversibility of the impact;*
- ***(g)*** *the cumulation of the impact with the impact of other existing and/or approved projects;*
- ***(h)*** *the possibility of effectively reducing the impact."*

### 2.2.2 Determination

The proposed development (subject site) is less that the 25 Ha threshold listed under Part 1, Class 19 as the applicant site is c. 7.95 Ha.

However,

As detailed under Part 2, Class 2 (b), the proposed development consists of an extraction area greater than 5 Ha as the proposed extraction area totals 5.37 Ha therefore the proposed development should be subject to EIA.

### 2.2.3 Determination

Appropriate Assessment is required to be carried out under the Habitats Directive and specifically Article 6(3) therefore for plans or projects likely to have significant effects on Natura 2000 sites. It is most recently implemented under the European Communities (Birds and Natura Habitats) Regulations 2011. An Appropriate Assessment is required to be carried out for development on or adjacent to sites classifies by the Minister pursuant to the regulations as Special Areas of Conservation (SAC) or Special Protection Areas (SPA).

Specifically Article 42(1) of the 2011 Regulations requires public authorities to screen for Appropriate Assessment in relation to a plan or project, which is not directly connected with or necessary to the management of the site as a European Site, in view of best scientific knowledge and the conservation objectives of the site and to assess the plan or project not only individually but also in combination with other plans or projects likely to have a significant effect on the European Site.

A Stage 1 Screening Report for AA and a Natura Impact Statement (NIS) have been compiled for the proposed development and accompanies the application as a separate document. The NIS examines potential negative effects on the Natura 2000 designated SAC's and SPA's within a 15Km radius of the proposed application site. The River Foyle, Mongavlin to Carrigans pNHA site has been included in this assessment following the principles of best practice. This site is not a designated Natura 2000 site but pNHA sites are still offered protection under planning legislation which requires that planning authorities give recognition to their ecological value.

The following sites were scoped as part of the evaluation as shown in Table 2.1:

**Table 2.1:**
**Natura 2000 designated SAC's and SPA's within a 15Km radius of the proposed application site**

| Site Name | Site Code | Distance from Subject Site | Avenue of Connectivity to Subject Site | Significant Threat Possible (Y/N) |
|---|---|---|---|---|
| ***River Finn SAC*** | 002301 | 8.94km E | Through surface water run-off, potential for indirect effects. | **Y** |
| ***River Foyle and Tributaries SAC*** | UK0030320 | 8.94km E | Through surface water run-off, potential for indirect effects. | **Y** |
| ***River Foyle, Mongavlin to Carrigans pNHA*** | 002067 | 8.94km E | Through surface water run-off, potential for indirect effects. | **Y** |
| ***Feddyglass Woods pNHA*** | 001129 | 3.94 km E | No avenue for direct effects or indirect effects. | N |
| ***River Swilly Valley Woods pNHA*** | 002011 | 12.25km NE | No avenue for direct effects or indirect effects. | N |

| Site Name | Site Code | Distance from Subject Site | Avenue of Connectivity to Subject Site | Significant Threat Possible (Y/N) |
|---|---|---|---|---|
| ***Port Lough pNHA*** | 000180 | 14.42km NE | No avenue for direct effects or indirect effects. | N |
| ***Lough Swilly Including Big Isle, Blanket Nook & Inch Lake pNHA*** | 000166 | 7.55km NW | No avenue for direct effects or indirect effects. | N |
| ***Lough Swilly SAC*** | 002287 | 7.51km NW | No avenue for direct effects or indirect effects. | N |
| ***Lough Swilly SPA*** | 004075 | 7.51km NW | No avenue for direct effects or indirect effects. | N |

The following sites were included at the scoping stage:

- River Finn SAC
- River Foyle and Tributaries SAC
- River Foyle, Mongavlin to Carrigans pNHA

Consequently, likely significant effects on the qualifying interests of these Natura 2000 sites were evaluated further. The NIS concluded that in light of the conservation objectives and rationale for designation of the Natura 2000 sites, the potential for significant impacts exists as a result of aspects of the proposed development. These potentially significant impacts were evaluated, and it was concluded that

*"The proposed project as detailed will have no likely or significant negative impact on any Natura 2000 site if all mitigating measures as outlined in section 6 are implemented and carried through during construction, operation, and decommissioning. "*

## 2.3 Consultation and Scoping

This EIAR was commissioned on the foot of a decision by An Bord Pleanála to refuse permission for the previous development on hydrology grounds and to facilitate a new application to be submitted on the proposed enlarged extraction area. This EIAR addresses concerns raised within the inspector's report over hydrology and all other relevant environmental issues. This EIAR will be open for consultation and public participation in line with the Planning and Development Regs 2001-2018(as amended by the Transposing Reg.SI No 296 of 2018) by way of the EIA portal and the competent authority's web site.

## 2.4 Consideration of Alternatives

EIA guidance and legislation requires that consideration should be given to alternatives which should include, where relevant; sites, routes, alignments/layouts, processes and strategies. A number of alternatives were considered as part of the project. In terms of environmental consideration and constraints, the proposed site was considered the preferred option given it fulfilled a number of advantages over the alternatives. The alternative location and layouts which were examined as part of this project are detailed below.

### 2.4.1 Alternative Locations and Layout

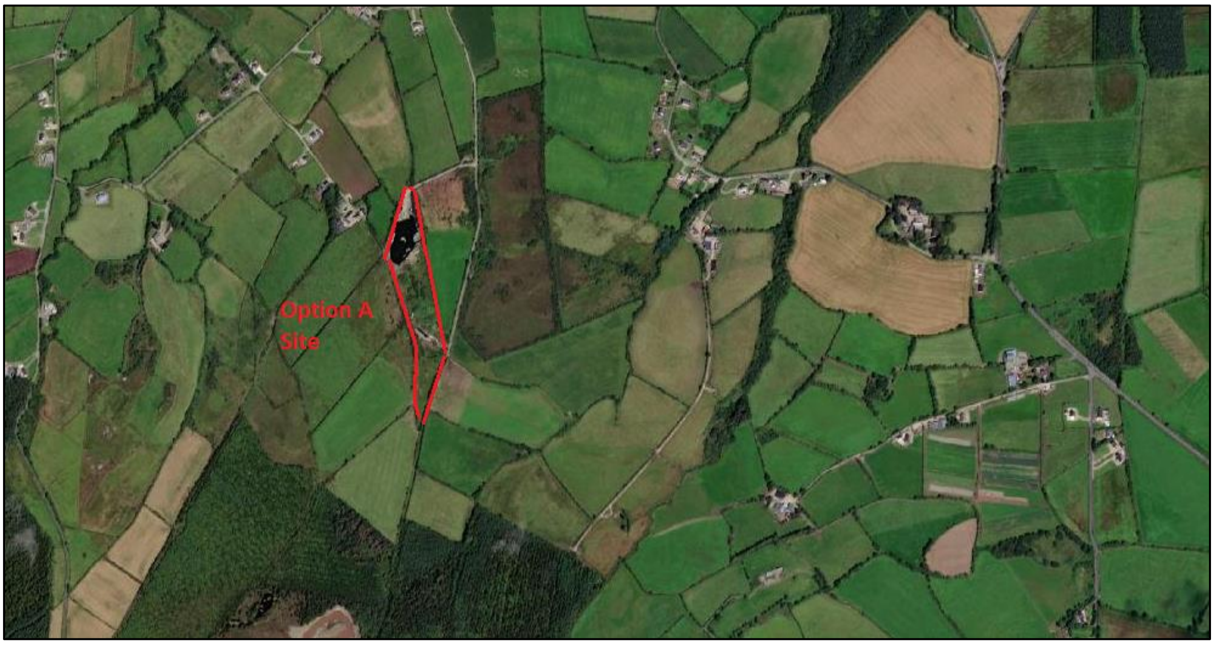
**Option A**

Option A, located in the townland of Mondooey Upper [1] , was the first option examined by the applicant back in July 2019 and is outlined in Figure 2.2. This c.3.22 Ha site contained a disused quarry which was claimed to have been in operation pre 1963 by the landowner. The applicant invested time and resources into preliminary site investigations.

This site appeared to offer quarry potential as the existing quarry void showed additional material to be available. No planning history existed on this site. Initial ecological scoping indicated that there was no priority habitat on site. Stage 1 screening for AA was required as Lough Swilly SAC Site no. 002287 was located 4.28Km to the NW and the Lough Swilly SPA Site No. 004075 was also located 4.9 Km to the NW. Initial assessment also concluded that the proposed site could be screened out for EIAR as the proposed extraction area was under 5Ha.[2]

Planning ref 15/50968 on behalf of Lettergull Energy Supply Ltd. for a new electrical overhead power line was extended in 2021 and now expires on 28th March 2026. The proposed route of this power line is across this site. The site is also located within 1km of the proposed Donegal Trans-European Transport Network (TEN-T) route between Letterkenny and Lifford. Both these issues raised concerns with the applicant. Option A was not progressed to a formal preplanning enquiry with the consent authority as it transpired that the landowner was not in a position to sell/long term lease the site to the applicant.

**Figure 2.2: Option A site location and layout**

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**Option B**

Option B was the subject site (located in the townlands of Magherasolis and Craigs) as submitted for planning in 2019 under planning ref 19/52015. This 4.81 Ha area included the current quarry void, surrounding scrubland and agricultural grassland. Twenty-five-year planning permission was granted

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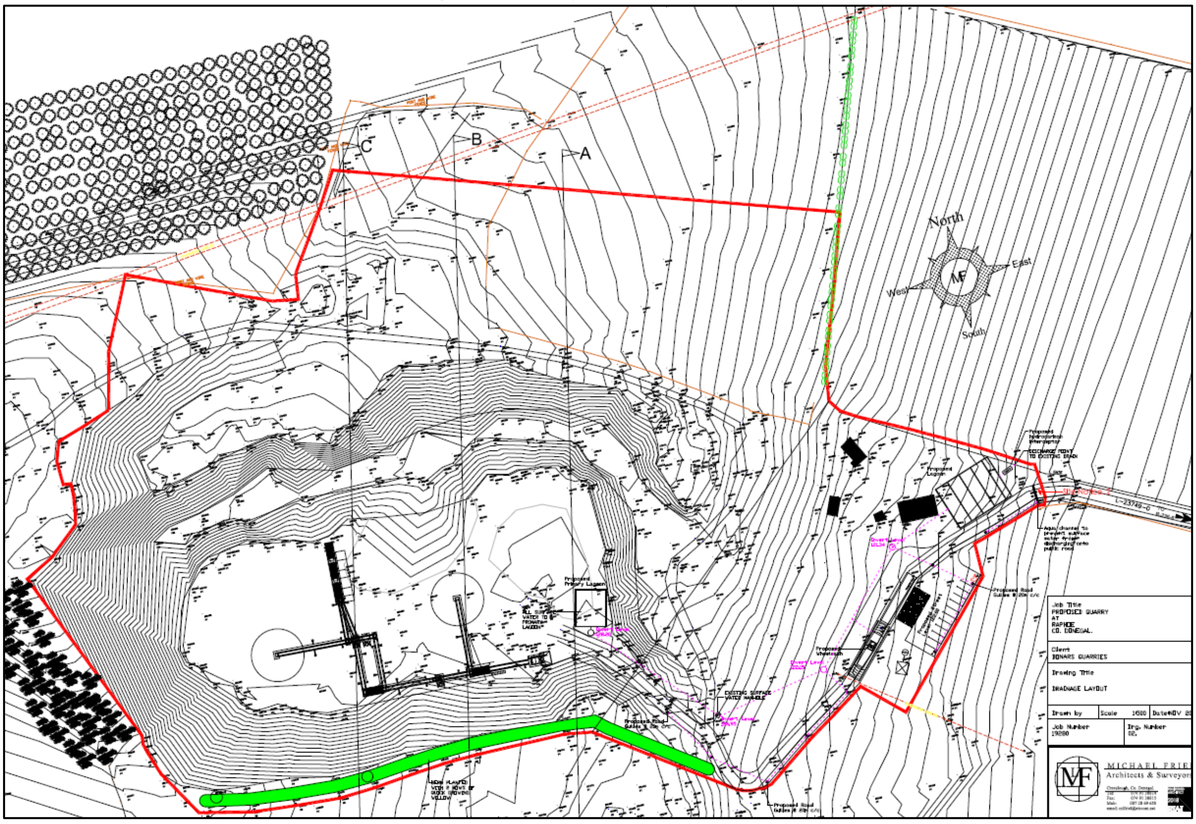
[1] site centroid Latitude 54.912750, Longitude -7.5989878 Irish Grid Reference Finder

[2] Paragraph 2 of part 2 of Schedule 5, part (b) of Planning and Development Regulations 2001 (as amended)

by Donegal County Council in September 2020 but was subsequently refused by An Bord Pleanála. Figure 2.3 shows the subject site layout for Option B.

The applicant had gone to considerable time and expense in the preparation of planning application 19/52015 which included a screening report for EIAR and a Stage 1 Screening for AA. Agreement had also been reached with the landowner to enter into a long-term lease agreement for the subject site.

**Figure 2.3: Option B site layout**



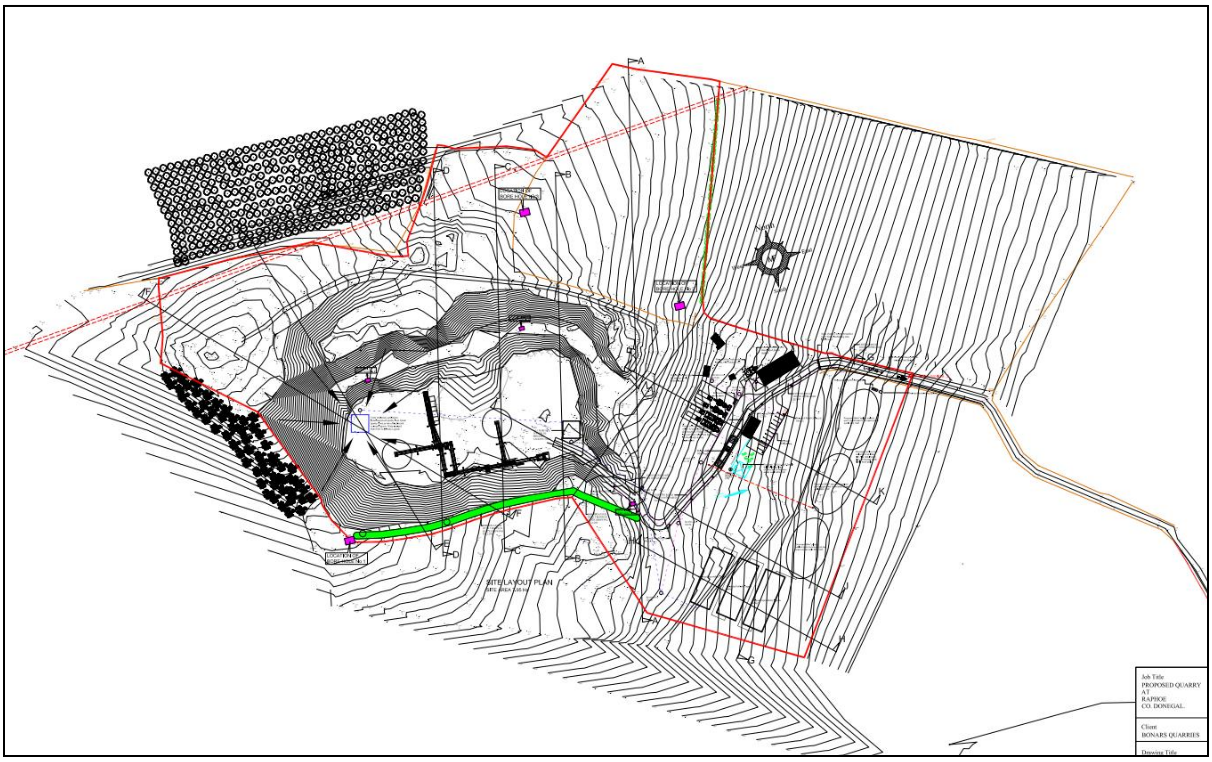

Michael Friel Architects & Surveyors (not to scale)

**<u>Option C</u>**

Option C includes the same subject site as Option B plus additional lands to the North and East to facilitate a more robust water management system to address concerns raised by the An Bord Pleanala inspector relating to planning 19/52015.

Option C subject site measures 7.95 Ha with a projected extraction area of 5.37 Ha. The site can now accommodate a comprehensive settlement pond and wetland system. The applicant has also reached agreement with the landowner on a long term lease for this subject site, subject to planning approval. Figure 2.4 shows the site layout for Option C.

**Figure 2.4: Option C site layout**



Michael Friel Architects & Surveyors (not to scale)

**Preferred Option**

Option C is the preferred option as it has a number of advantages over the other options which include:

- It includes a comprehensive water management plan to alleviate concerns raised by ABP
- The location of the extraction area is easily screened from the main road due to its current level.
- The applicant can enter into a long-term lease agreement with the landowner, subject to planning.
- This is a dormant quarry site which contains very good reserves of suitable material to service the local aggregate market

## 2.5 Rationale for the Application

The reserve of material located at Option C is estimated to supply extraction material for a 25-year duration which would service a high demand for such product in the local area, reduce the carbon footprint associated with the importation of similar material from other distant quarries, including Northern Ireland, and also provide much needed local employment. The quarry capacity in Donegal has greatly reduced over the last number of years due to economic, environmental and planning compliance concerns. This has resulted in a deficit of quality materials within the County. This application proposes to cater for local needs in a fashion that is careful and thoughtful to the environment and fully compliant in all aspects of planning regulations.

## 2.6 References


- European Communities (Environmental Impact Assessment) Regulations, 1989 to 1999, (S.I. No.349 of 1989)
- Local Government (Planning & Development) Regulations, 2001 (S.I. No. 600 of 2001)
- European Communities (Environmental Impact Assessment) Regulations, 1989 to 1999, Second Schedule, (S.I. No.93 of 1999)

- European Communities (Environmental Impact Assessment) Regulations, 1989 to 1999, Third Schedule, (S.I. No.93 of 1999)
- Guidelines on the Information to be Contained in Environmental Impact Statements, Environmental Protection Agency (EPA 2002)
- Advice Notes on current practice in the preparation of Environmental Impact Statements (EPA 2003)
- Environmental Management Guidelines – Environmental Management in the Extractive Industry (Non-Scheduled Minerals) prepared by the Environmental Protection Agency (2006)
- Guidance for Planning Authorities and An Bord Pleanála on carrying out Environmental Impact Assessment (DECLG, 2013)
- Directive 2014/52/EU European Parliament and of the Council EIA Directive (April 2014)
- Draft Revised Guidelines on the Information to be Contained in Environmental Impact Statements, (EPA September 2015)
- Draft Advice Notes for Preparing Environmental Impact Statements (EPA September 2015)
- Draft Guidelines on the Information to be Contained in Environmental Impact Assessment Reports (EIAR) (EPA, August 2017)

# Section 3: PROJECT DESCRIPTION

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# 3 DESCRIPTION OF THE PROPOSED DEVELOPMENT

## 3.1 Introduction

This section of the EIAR describes the proposed operational processes for the application site. This includes a description of the site and the proposed activities involving extraction and processing for the proposed extraction area. The full description of the proposed development submitted to the Planning Authority (Donegal County Council) is shown below:

*Patrick Bonar is applying to Donegal County Council for permission for development at Magherasolis & Craigs, Raphoe for a period of 25 Years. The development will consist of:*

*(1) Quarrying of 5.37 hectares which will be subject to extraction and processing of rock through drilling, blasting, crushing and screening*

*(2) Construction of settlement ponds and constructed wetland*

*(3) Construction of a Shed for the purposes of storage for the facility including the on- site machinery maintenance*

*(4) Erection of site office with Canteen, toilet & drying facilities*

*(5) Installation of a wastewater treatment system & percolation area*

*(6) Provision of a wheel wash and weighbridge*

*(7) Landscaping of the Quarry during the operational phase and restoration of the quarry on completion of extraction*

*(8) All associated ancillary facilities / works over a 25-year period.*

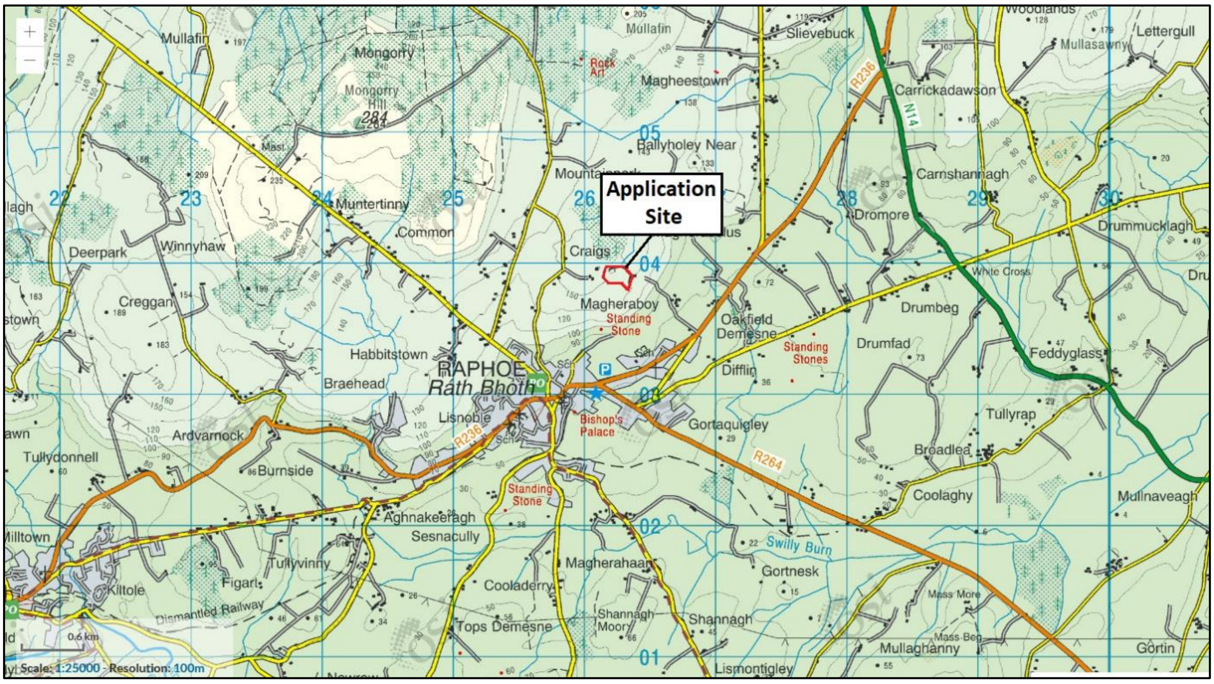
*There is an Environmental Impact Assessment Report (EIAR) and a Natura Impact Statement (NIS) accompanying this application.*

## 3.2 Existing Site Description

### 3.2.1 Site Location

The subject site is located to the Northeast of Raphoe Town which is designated as a Tier 2 B settlement in the Donegal County Development Plan 2018-2024. The subject site lays within the townlands of both Craigs and Magherasolis. The quarry is served by the L-23749 which is a local tertiary road and is in good condition. This road leads directly onto the R236 regional road. Raphoe town is located 900m Southwest of this road junction and 780m Southwest from the nearest boundary of the subject site (930m to quarry face). The site is surrounded by improved agricultural land, upland grassland and an area of commercial forestry. The subject site location is outlined in Figures 3.1 below and the site layout is detailed in Figure 3.2 below.

**Figure 3.1: Location of Subject site**

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### 3.2.2 Proposal

The site is c.7.95 hectares in size and the proposal is for permissions for development at Magherasolis & Craigs, Raphoe, Co. Donegal to quarry the site which will be subject to extraction and processing of rock by drilling, blasting, crushing and screening, landscaping of the quarry during the operational phase and restoration of the quarry on completion of extraction, the erection of site offices and canteen facilities and the installation of a wastewater treatment unit and percolation area as well as all associated ancillary facilities for a period of 25 years. The subject site measures 7.95 ha with the footprint of the extraction area approximately 5.37 ha. The proposed extraction area is over the threshold for compulsory Environmental Impact Assessment. [3]

The quarry capacity in Donegal has greatly reduced over the last number of years due to economic, environmental and planning compliance concerns. This has resulted in a deficit of quality materials within the County. This application proposes to cater for local needs in a fashion that is careful and thoughtful to the environment whilst also leaving the site in a condition which is much better than is currently the case. It is proposed that at the initial stage eight people will work in the quarry and in associated activities such as deliveries. The ongoing and final restoration of the quarry site will form an integral part of the operation.

### 3.2.3 Operational History

The precise history of quarrying on site is unclear. The geology of the site is described as the presence of an intrusive body at Magherasollus which is noted in the original Memoir of the Geological Survey, Sheet 17 and SE portion of Sheet 11, G. H. Kinehan, S.B. Wilkinson, J Nolan and F.W. Egan, 1889. There is no mention of quarrying taking place on site at this time.

Quarrying was taking place on site in 1985 as it is mentioned in the publication 'Mineral Localities in the Dalradian and associated igneous rocks of County Donegal, Republic of Ireland, and of Northern Ireland', a joint publication from the Geological Survey of Ireland and the Geological Survey of Northern Ireland, dated 1985. It refers to the intrusion as follows: Magherasollus: Metadolerite locally occurs immediately NE of Raphoe in the Termon Pelites. The locality is centred on Sheldon's Quarry, an active quarry which is extracting metadolerite and crushing it for road metal. The wall-rocks of the

[3] Paragraph 2 of part 2 of Schedule 5, part (b) of Planning and Development Regulations 2001 (as amended)

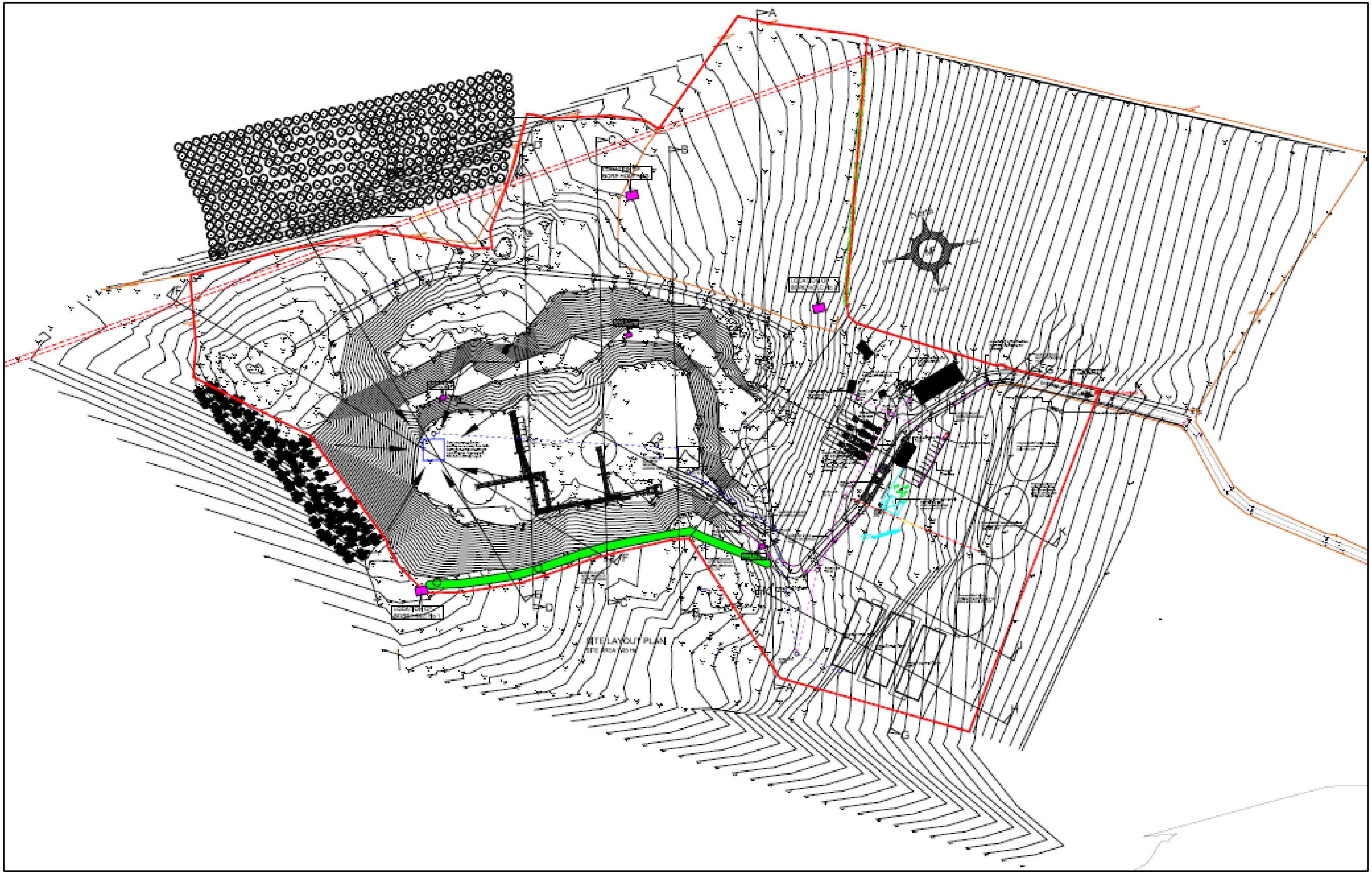
metadolerite are quartz rich metasediments which are discarded as waste. The quarry was operated by Donegal County Council.

Anecdotally, quarrying ceased at the site in the late 1980's. Some of the original site infrastructure remains.

#### 3.2.4 Site Layout

The historical development of quarrying at the site has resulted in a significant quarry void. There is a one distinct entrance into the quarry void from the lower southeastern side. The main items of site infrastructure in the proposal are the office buildings and weighbridge on approach to the quarry void entrance, crushing and processing plant on the quarry deck and series of water treatment settlement tanks in the southwest portion of the overall site. The location of this site infrastructure is shown on the main site layout drawing in Figure 3.2 below.

**Figure 3.2: Proposed Development Site Layout (not to scale)**




This was provided by Michael Friel Architects and Surveyors.

### 3.2.5 Site Infrastructure

The proposed quarry operations include the following site related infrastructure:

**Extraction Area:**

- Pegson Jaw Crusher
- 3 Cone crushers
- 4 Screeners
- 2 Excavators
- 2 Loading Shovels
- 2 Dump Trucks

### 3.2.6 Site Access

The quarry is situated approximately 1 km northeast of the village of Raphoe in East Donegal. The quarry is served by the L-23749 which is a local tertiary road and is in good condition. This road leads directly onto the R236 regional road. The R236 links with the N14 primary route approximately 2.3 km to the NE. The N14 is the main transport link between Strabane in Northern Ireland and Letterkenny in Co. Donegal.

## 3.3 Characteristics of the Proposed Development

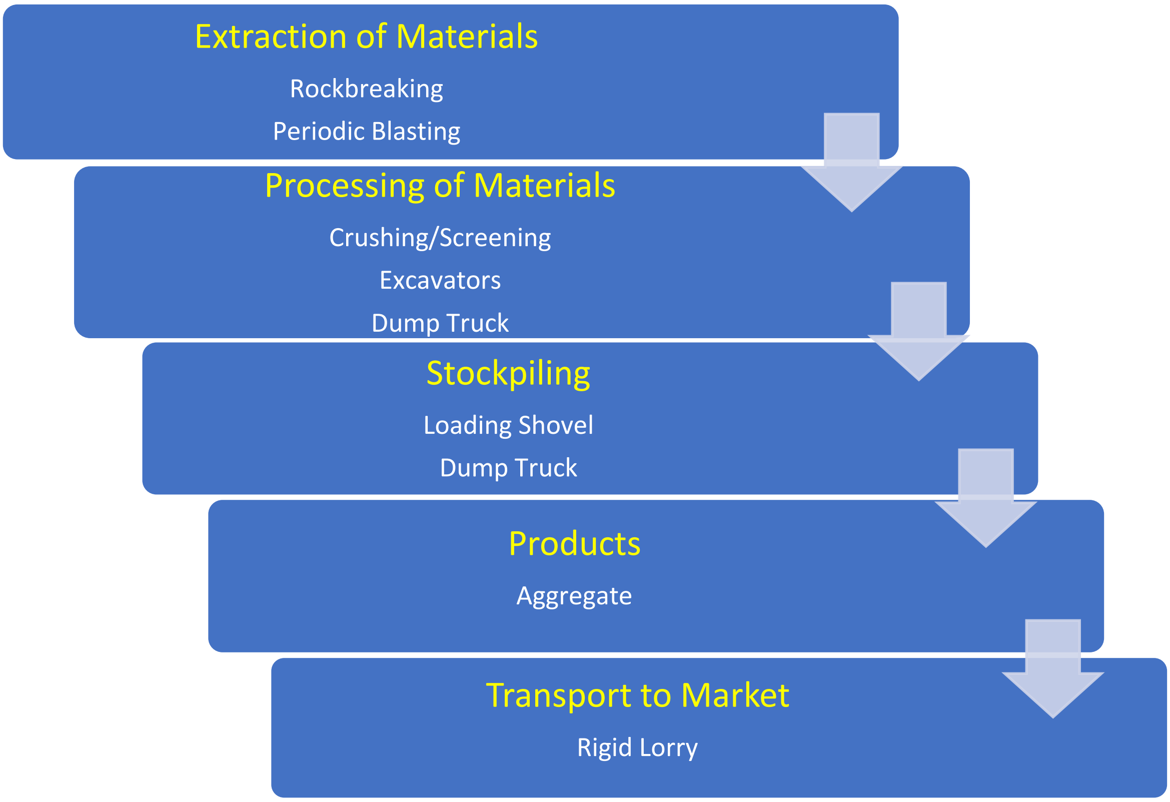
The application consists of a new extraction area of virgin ground measuring approximately 2.3 hectares, continuation of extraction along the existing benches of the current quarry void, and partially extracted areas and deepening the existing quarry void by approximately 10 m. The new areas of extraction are directly to the northeast and northwest of the previously extracted area.

Initially topsoil will be stripped off the site and utilized for screening berms. Extraction will be by both excavator and periodic blasting undertaken by a competent contractor. Extracted rock will be crushed by primary mobile crusher close to site of extraction. The extracted rock will then be transported to the fixed crusher for further processing.

Aggregate will be processed into various grades and will be stockpiled in the redundant portion of the quarry deck. Processed material will either be sold as aggregate to market or utilized in the production of ready-mix concrete or concrete blocks off site.

Figure 3.3 is a flowchart summarising the operations proposed.

**Figure 3.3: Summary of Proposed Operations**

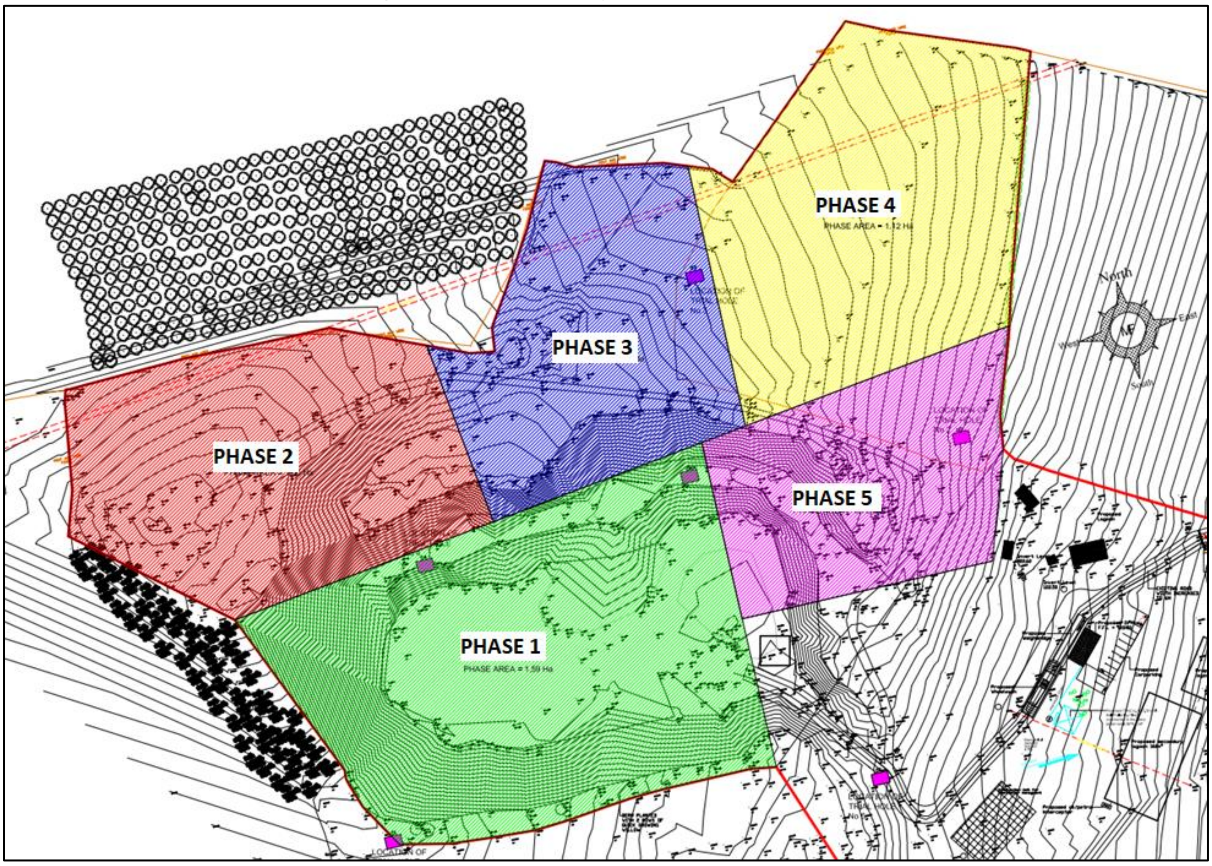


## 3.4 Activities Relating to the Development

### 3.4.1 Extraction of Material

Extraction will take place in a sequential manner. There are 5 phases of development planned over the course of the lifetime of the quarry. The phases of extraction are shown in Figure 3.4 below. Extraction of material will mostly take place using excavators. Periodic blasting will occur to fragment the parent material into manageable sizes from the quarry face.
A licenced blasting contractor will be contracted to design and carry out the blasting of bedrock on an as-needed basis. It is anticipated blasting will be required approximately 12-15 times per year. The process will follow a survey of the quarry face, design of the blast, drilling of the blast shot holes and placement of the blast. Blasts at the quarry will take place at pre-determined times with appropriate warnings and pre-blast siren. Vibration and air overpressure levels associated with this part of the operation will be routinely monitored by the blast contractor at pre-determined sensitive locations.
Extracted material will then be loaded directly into the primary crusher sited close to the active face via excavator. Some oversized material may require rock-breaking to reduce the size of material to enable it to pass through the crushing and screening plant. This will be done by excavator mounted hydraulic impact breaker.

**Figure 3.4: Planned phases of extraction**




This Map was provided by Michael Friel Architects and Surveyors.

#### *3.4.1.2 Phase 1*

Phase 1 will include the initial stripping of overburden from the extraction area and the creation of berms along the external perimeter. These berms will be 2.5 m - 3m in height.  A series of three settlement tanks is to be constructed to treat effluent together with a constructed wetland to polish the effluent before discharge off site. Phase 1 will also include the construction and placement of all site infrastructure including site drainage.
The proposed progression of extraction is to initially work out the existing quarry void and then deepen excavations by approximately 10 m beneath the current quarry deck to approximately 118 mOD. Temporary sumps will be created for the deepening excavations which will be periodically pumped out to the main quarry sump and then onwards for effluent treatment to the constructed

settlement tanks and wet land area. It is anticipated that over the lifespan of extraction in this area two benches of approximately 10 m height will be utilised for ease and safety of extraction. Phase one is shown in green on Figure 3.4.
The total extractable reserve in Phase one is calculated at 204,824$m^3$ but yield is likely to be considerably less than this due to the existing quarry faces to the south and west. Extraction is not planned in these directions. Yield is estimated at 180,000$m^3$ which equates to 486,000 tonnes of rock (using a specific gravity of 2.7 for the product).

#### ***3.4.1.3 Phase 2***

Phase two is shown in red on Figure 3.4 and is in the northwest corner of the application site. The total extractable reserve in Phase two is calculated at 324,515$m^3$ but yield is likely to be less than this when a set-back from the application boundary and bench steps to the quarry deck are taken into consideration. Yield is estimated at 310,000$m^3$ which equates to 837,000 tonnes of rock (using a specific gravity of 2.7 for the product).

#### ***3.4.1.4 Phase 3***

Phase three is shown in blue on Figure 3.4 and is in the northern portion of the application site. The total extractable reserve in Phase three is calculated at 214,025$m^3$ but yield is likely to be less than this when a set-back from the application boundary and bench steps to the quarry deck are taken into consideration. Yield is estimated at 200,000$m^3$ which equates to 540,000 tonnes of rock (using a specific gravity of 2.7 for the product).

#### ***3.4.1.5 Phase 4***

Phase four is shown in yellow on Figure 3.4 and is in the northeastern portion of the application site. This area covers most of the new extraction area where ground has been undisturbed from any previous quarrying activity. The total extractable reserve in Phase four is calculated at 237,066$m^3$ but yield is likely to be less than this when a set-back from the application boundary and bench steps to the quarry deck are taken into consideration. Yield is estimated at 220,000$m^3$ which equates to 594,000 tonnes of rock (using a specific gravity of 2.7 for the product).

#### ***3.4.1.6 Phase 5***

Phase five is shown in pink on Figure 3.4 and is in the eastern portion of the application site. This area covers some of the new extraction area where ground has been undisturbed from any previous quarrying activity and also the eastern faces of the existing quarry void. The total extractable reserve in Phase four is calculated at 123,132$m^3$ but yield is likely to be less than this when a set-back from the application boundary and bench steps to the quarry deck are taken into consideration. Yield is estimated at 110,000$m^3$ which equates to 297,000 tonnes of rock (using a specific gravity of 2.7 for the product).
Average annual extraction amounts are expected to be in the order of 100-110,000 tonnes. This converts to an average daily extraction figure of 350-400 tonnes (approximately 18-20 lorry loads per day).
The Geologists Report (which is presented as Appendix 7.1 in Section 7, Land Soils and Geology), contains an estimate of the bedrock reserve as 1,300,000 tonnes. It is noted that this estimate was based on the redline boundary of Option B as outlined in Section 2, Screening, Scoping and Alternatives. This extraction area is somewhat smaller than the chosen option C, which has the estimated reserves listed above in phases 1-5.

### **3.4.2 Processing of Materials**

Most of the material will be processed at the static and mobile crushing and screening plant. Material will be transported to the crushers either directly via excavators or via loading shovel. The primary and secondary crusher will reduce the material in size. Material will then be screened using a series of vibrating screens capable of screening the crushed material into various sized aggregate. Graded aggregate will then be directed via conveyer belt to stockpiles situated around the screener on the redundant quarry deck. No washing of product is planned.

### 3.4.3 Stockpiling of Material

Temporary stockpiles are created around the screening plant. Aggregate destined for market will be loaded directly into lorries from these stockpiles.

### 3.4.4 Products

#### *3.4.4.1 Aggregate*

The majority of aggregate will be sold as graded aggregate for fill, road surfacing or for use in Ready-Mix Concrete and Concrete Blocks off site. Aggregate will also be sold as a drainage medium to the surrounding farming community.

The suitability of the quarry product for these end uses (SR16 compliance & SR21 compliance) is demonstrated in the Geologist's report contained as Appendix 7.1 in Section 7 of this EIAR, Land, Soils and Geology.

### *3.4.5 Transport to Market*

The majority of aggregate will be sold as graded aggregate for fill, road surfacing or for use in concrete products. Aggregate from stockpiles will be loaded into open back rigid lorries by loading shovel. The truck will then be weighed at the weighbridge next to the office block and the weighbridge docket will accompany the load to its destination. Patrick Bonar lorries will generally deliver the aggregate to market but occasionally customers will collect product from the quarry.
All vehicles leaving the yard will be checked out at the office block and a record will be taken of the nature, amount and destination of each particular load.

### 3.4.6 Fuel and Chemical Storage

There will be no hazardous chemicals in use at the quarry or proposed for any of the ancillary activities. Re-fueling of site vehicles will be done from the on-site fuel tank. Vehicles for refueling will be parked on a dedicated concreted area. The tank will be situated in a bunded fuel storage area and strict adherence to pollution control protocols will be in place for re-fueling operations. Drip trays will be used, and spill kits will be available if required. Re-fueling of plant will be carried out using a mobile bowser or licenced fuel contractor with mobile tanker. The mobile bowser will be fully bunded and drip trays will be used when re-fueling and spill kits will be available if required. All re-fueling operations will be carried out with strict adherence to pollution prevention protocols.
Fuels and lubricants will be stored in a bunded area within the dedicated storage shed. All drainage from the machinery shed, lubricant storage shed and refueling area will be directed through a hydrocarbon interceptor before onwards flow to the settlement tanks and wetland for further treatment.

### 3.4.7 Surface and Groundwater Management

A number of measures will be in place for the protection of surface and groundwater on the site. Protection from accidental pollution is achieved by adhering to best practice in relation to mobile re-fueling of plant and vehicles and by robust fuel and lubricant storage measures. Further measures in place include the installation of a second hydrocarbon interceptor before final discharge of waters off site to natural waters.
Protection of the wider surface water environment is achieved by the use of constructed settlement tanks to ensure discharge to natural waters has acceptable levels of suspended sediment. The surface waters draining the extraction area will be directed to a sump within the quarry void near to the entrance. From the sump effluent flows (by gravity or in later phases pumped) to a 3-stage constructed settlement tank area where the effluent is treated by settlement. Final treatment of effluent is by flow through a constructed wetland before discharge off site through a second hydrocarbon interceptor.

Discharge of effluent off site to waters will be under strict condition of a discharge licence from Donegal County Council.

It is planned to excavate below the existing quarry deck to an approximate depth of 118 mOD. Temporary sumps will be created from which water will be pumped to the main quarry sump before onward treatment and discharge to surface waters. The metadolerite rock to be extracted has extremely low hydraulic conductivity and the volumes of groundwater expected to seep into the sumps on the working quarry deck are considered to be low.

The proposed extraction and processing of rock at the site is a dry operation. There is no washing of the crushed product planned before it leaves site for market. The only requirement for water use during the extraction and processing activities will be dust suppression in periods of dry weather. Further details on water management is contained within *Section 8 Water*, of this EIAR.

### 3.4.8 Working Hours and Employment

Normal quarrying operations are confined to the hours of 8.00 am to 5.00 pm, Monday to Saturday. The quarry is shut on Sundays and Public Holidays. It is anticipated that there will be 8-10 persons directly employed by Patrick Bonar. Additional persons such as sub-contractors for blasting, contract hauliers, maintenance contractors, material suppliers etc. will also be indirectly employed by quarrying activity.

### 3.4.9 Utilities and Services

Water use in the main office block is to be supplied from a deep drilled borehole. Water required for dust suppression measures and for the wheelwash is supplied by harvesting rainwater from the roofs of the office and workshop buildings. If needed, this supply can be augmented by pumping water from the settlement tanks.

There will be an ESB connection established to serve the office block. There will also be a telecommunications connection to the office block.

There is an ESB high voltage line traversing the northern portion of the site. The line of the pylons is shown as two parallel red dashed lines on Figure 3.4 crossing the northern parts of phases 2, 3 & 4. The applicant plans to work with the ESB to move the line before reaching phase 2 of extraction.

### 3.4.10 Facilities

A site office is planned at the entrance to the quarry at the end of the local road L-23749. Within the building there is a large open plan office with reception area, meeting rooms, canteen and toilet. A weighbridge is proposed to be located immediately outside the office block. A machinery shed is also proposed for routine maintenance of plant and site vehicles and a storage shed is proposed for maintenance oils and lubricants. Refuelling will be carried out on a sloped concrete bay outside the machinery shed with the fuel tank housed in a bunded area.

### 3.4.11 Waste Management

A wastewater treatment system has been proposed to serve the office block. A site suitability assessment has been carried out by Michael Friel Architects and found the site to be suitable.

Paper waste and other dry recyclable waste will be gathered in wheelie bins and collected by a licenced waste collector on a fortnightly basis for reuse/recycling at an authorised facility. General mixed municipal waste that cannot be recycled is gathered in wheelie bins and collected by a licenced waste collector on a fortnightly basis for disposal at an authorized facility.

Scrap machinery will be lifted off site on an annual basis by licenced contractors and taken to an authorised facility for recycling.

Waste from quarrying activity is minimal and commercial purpose has been found for all extracted material. Topsoil and overburden that have will not been used to create screening berms will be stored in preparation for re-instatement works when areas of the quarry become redundant. The fine sediment settled out of solution in the settlement ponds will be recycled for use in the creation of screening berms.

#### 3.4.12 Safety, Security and Screening

The perimeter of the site will be fenced with a stockproof fence and warning signs. Quarry faces within the site boundary will be marked with appropriate warning signage. Settlement tanks and the constructed wetlands within the site are to be fenced and warning signs erected. All access points to the quarry will be gated and locked when the quarry is not operational.

Phase 1 of extraction involves the creation of screening berms around the entire site to screen any open quarry faces, quarry activity and help with noise abatement. These berms will be planted before the end of the first winter post construction to allow that they blend into the landscape and provide additional biodiversity cover. The settlement tank system will also be screened with berms. Once the berms are in place and colonised with vegetation the extraction area and quarry activity will be well screened from the regional road R-236.

Further details on screening mitigation measures proposed for the new extraction area are given in Section 15, Landscaping & Restoration, of this EIAR.

#### 3.4.13 Dust Generation and Control

The extraction, processing and transport of aggregate has potential to generate wind-blown dust if not managed effectively. In periods of prolonged dry weather sprinklers will be employed to dampen down haul roads, plant and stockpiles to minimize dust blow. Further details on dust generation and control are given in Section 9, Air, of this EIAR.

#### 3.4.14 Noise Generation and Control

Noise will be generated as a result of the activities being undertaken at the application site. All necessary precautions will be put in place to ensure that operations associated with the quarry do not impact significantly on the local environment. Noise generation and control is dealt with in Section 10, Noise and Vibration, of this EIAR.

#### 3.4.15 Landscaping, Restoration, Decommissioning and Aftercare

When the appropriate planning period has expired at the application site and no further planning permission has been obtained, the applicant will be required to implement a restoration and decommissioning plan. The excavation of rock will result in the creation of a quarry void. It is important to implement a restoration plan so that the site is safe and returned to some beneficial use. This will include rounding off the top of the face, re-grading the quarry face on each redundant bench and re-distributing the stockpiled soil/overburden on these slopes to allow natural re-colonisation of vegetation.

Details of the site restoration plan are laid out in Section 15, Landscaping & Restoration, of this EIAR. Planting activity in the redundant extraction areas will increase biodiversity and provide additional cover, foraging and nesting habitat for local wildlife. The planting of native species in this area will also retain water, bind soil, reduce erosion and increase fungal activity as well as supporting soil biodiversity. Planted vegetation will prevent invasive species from encroaching on the unoccupied soils and will provide valuable ecological services while allowing the natural seed bank in the soil to regenerate.

### 3.5 Technical Difficulties

No technical difficulties were encountered.

### 3.6 References

Donegal County Council Planning Portal:
http://donegal.maps.arcgis.com/apps/webappviewer/index.html?id=8be91e332a8f47bfbbe83add1550c666

# Section 4: PLANNING & LEGISLATIVE FRAMEWORK

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# 4 PLANNING & LEGISLATIVE FRAMEWORK

## 4.1 Introduction

This section of the EIAR sets out the planning and development context relating to the quarry development. This section reviews the national, regional and local planning policy relevant to the development. Under Irish legislation, the type of development for which an EIAR is required is prescribed by Part X of the 2000 Planning and Development Act and Part 10 of, and Schedule 5 (Development for the Purposes of Part 10), Schedule 6 (Information to be contained in an EIS), and Schedule 7 (Criteria for determining Whether a Development would or would not be likely to have Significant Effects on the Environment) to the 2001 Planning and Development Regulations, as amended.

## 4.2 Government Policy

In recent years, there has been a conscious move in Ireland towards strategic planning with various policy documents and plans introduced over the years to support strategic planning and development. Policies and objectives of the Government are contained in documents such as Sustainable Development: a Strategy for Ireland (1997), National Spatial Strategy 2002 - 2020 and more recently Project Ireland 2040. These in turn have derived their authority from higher order World and European Union (EU) agreed agendas and directives. Policy support filters down from national and regional levels through to specific County Development Plans and Local Area Plans (LAPs). The following documents are relevant to the assessment of the development:

### 4.2.1 The National Spatial Strategy 2002 – 2020 and Project Ireland 2040

In early 2000 work began on the National Spatial Strategy which ended with its publication in November 2002. The National Spatial Strategy (NSS) was a 20-year strategy designed to enable every place in the Country to reach its potential, no matter what its size or location. It recognised that the various regions of the Country have different roles and it sought to organise and co-ordinate these roles to benefit the regions. It aimed to achieve a better balance of social, economic, physical development and population growth between regions and focused on people, places and on building communities.

In order to drive development in the regions, the NSS required that areas of sufficient scale and critical mass be built up through a network of gateways and hubs. While the National Development Plan 2000-2006 identified Dublin, Cork, Limerick/Shannon, Galway and Waterford as existing gateways, the NSS designated four new national level gateways - the towns of Dundalk and Sligo and the linked gateways of Letterkenny/(Derry) and the Midland towns of Athlone/ Tullamore/Mullingar.

This Strategy proposed to address the contrast between rapid development in the east of the Country and slower rates of development in other regions. To redress this imbalance, the Strategy identifies gateways and hubs that would have the capacity to support the stronger urban-rural structure needed to drive the development of these other regions.

A review of the NSS was announced by Government on 2nd February 2017, the Government published a strategic issues paper for citizens, stakeholder organisations, public bodies, indeed anyone with an interest in the country's future and willing to share their ideas, to inform and engage in creating a new Framework Plan. The Government prepared a radical plan for Ireland for action and delivery between now and 2040 called "Project Ireland 2040 - Our Plan". Project Ireland 2040 is the Government's policy initiative which aims to provide balanced regional development and to improve the State's infrastructure. It consists of two plans. The National Planning Framework (NPF) which aims to achieve balanced regional development. This plan prioritises growth in the major cities of Dublin, Cork, Galway, Limerick and Waterford and is the Government’s response to changes coming down the tracks, including:

- Around 1 million extra people, almost a quarter of whom will be over 65 by 2040;
- More than 500,000 additional people at work, many of whom will be in high skilled jobs in and around cities;
- At least 500,000 extra homes needing to be close to services and amenities; and
- Major environmental challenges such as protecting air, water quality, biodiversity and climate change, transforming our energy and transport systems to move away from a dependency on fossil fuels towards green energy

The second strand is the National Development Plan (NDP) 2018 — 2027. The ten year plan demonstrates the Government's commitment to meeting Ireland's infrastructure and investment needs. The NDP sets out the significant level of investment, almost €116 billion, which will underpin the National Planning Framework and drive its implementation over the ten year period. The Government is committed to the delivery of the NPF as a blueprint for spatial planning in Ireland to 2040. In setting out a strategic framework for public capital investment, the National Development Plan will support its delivery over the next ten years. Ten National Strategic Outcomes (NSOs) are outlined in the NPF along with corresponding Strategic Investment Priorities.

In March 2017, the Irish Concrete Federation (ICF) made a submission to Government on the draft National Planning Framework. The submission highlighted that aggregates must be recognised as a strategic national resource, essential for the future development of Ireland and that access to aggregates must be safeguarded to facilitate the creation of the places, infrastructure and environment required to meet the economic, environmental and societal needs of Ireland for the coming two decades and beyond. Recognising this fact, Project Ireland 2040 states the following in relation to aggregates:

> *"Aggregates and Minerals Extractive industries are important for the supply of aggregates and construction materials and minerals to a variety of sectors, for both domestic requirements and for export. The planning process will play a key role in realising the potential of the extractive industries sector by identifying and protecting important reserves of aggregates and minerals from development that might prejudice their utilisation. Aggregates and minerals extraction will continue to be enabled where this is compatible with the protection of the environment in terms of air and water quality, natural and cultural heritage, the quality of life of residents in the vicinity, and provides for appropriate site rehabilitation".*

The Department of Housing Planning and Local Government, on behalf of the Government published the finalised plan in February 2018.

#### 4.2.2 Regional Planning Guidelines

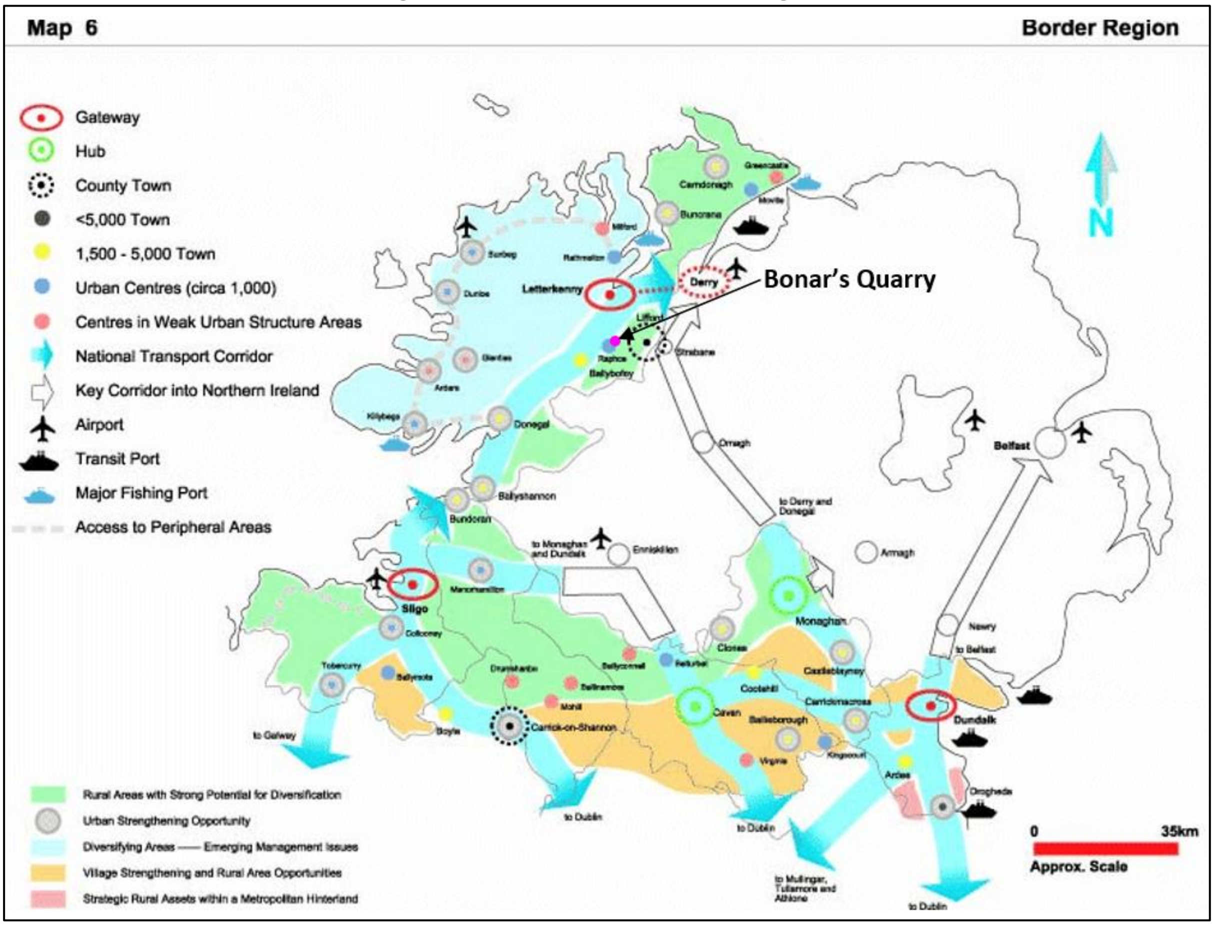
The Planning and Development Act, 2000 called for the drawing up of Regional Planning Guidelines (RPGs) which were first adopted in March 2004 as a key implementation mechanism of the Government’s overall framework for achieving more balanced regional development and more strategic physical and spatial planning. The principal function for RPGs was to link national strategic spatial planning policies to the planning process at City and County Council level by co-ordinating the Development Plans of the local authorities through the Regional Planning Guidelines.

The Border Region derives its name from its location relative to Northern Ireland. It comprises the six Counties of Donegal, Sligo, Leitrim, Cavan, Monaghan and Louth. The Planning and Development Act, 2000 (as amended) requires Regional Authorities to provide a long-term strategic planning framework for the sustainable development of the Region for a 12-year period up to 2022.

The RPG's recognised the important role quarrying plays in the Irish Economy stating that *"The extractive industry is significantly important to the construction sector and currently provides a large number of jobs. The industry is now developing its practices in a more sustainable and environmentally friendly manner and provides opportunities for new and alternative employment within the industry".* As part of the on-going programme of public service reform, the eight Regional Authorities were dissolved on the 1st June 2014 and the functions, staff, assets and liabilities of the former Border Regional Authority, Midland Regional Authority and West Regional Authority were transferred on a transitional basis to the Border, Midland and Western Regional Assembly.

Patrick Bonar's proposed quarry is located in the Border Region which is illustrated in Figure 4.1 below for reference. There are a number of towns and villages located in the vicinity of the quarry site with the closest gateway being Letterkenny located c.12km Northwest. The quarry will be a significant employer in the area and will supply a range of quarry related products to the local construction sector for the development of both public and private sector developments which contribute to growth and development of areas in the vicinity.

**Figure 4.1: Hubs in the Border Region**




Map 1.1 from the Regional Panning Guidelines (2010-2022)[4]

[4] https://www.nwra.ie/wp-content/uploads/Planning-Guidelines-for-the-Border-Region.pdf

### 4.2.3 Northern & Western Regional Assembly

Three new Regional Assemblies came into being on 1st January 2015, namely the Northern & Western, the Midland & Eastern and the Southern Regional Assemblies. The Northern & Western Regional Assembly comprises of 25 elected Members nominated by the 9 local authorities within the region. The main roles of the Northern & Western Regional Assembly are to:

- Manage the BMW Regional Operational Programmes;
- Monitor the general impact of all EU and Irish exchequer-funded programmes in the Northern and Western region;
- Promote the co-ordination of the provision of Public Services in the region; and
- Ensure that national policies take regional issues into account.

The Headquarters of the Northern and Western Regional Assembly is located in Ballaghaderreen, Co. Roscommon.

### 4.2.4 Donegal County Development Plan 2018 – 2024

The County Development Plan is a spatial planning framework that gives effect to the delivery of sustainable and planned economic and social development in a manner consistent with higher levels plans and strategies such as the National Spatial Strategy and the Regional Planning Guidelines. The current County Development Plan in place is for the period of 2018 to 2014. Donegal Co. Co. recognises the importance of the extractive industry and that aggregates are a significant and necessary natural resource for the continued economic development of Donegal, therefore there is a need to facilitate the sustainable extraction of appropriate materials such as clays, gravels, sands and aggregates. At the same time the Local Authority also accepts the need to minimise any adverse impacts upon the natural environment, landscape, road network, heritage and communities. Impacts which must be taken into consideration include the following; noise, vibration, dust, water quality, lowering of the water table, natural and cultural heritage, landscape traffic and waste materials. The following objectives and policies relate to the extractive/ natural resources industry.

**Objectives**

**EX-O-1:** To conserve and protect the environment, including in particular, the archaeological and natural heritage and conservation and protection of European designated sites and any other sites, which are prescribed.

**EX-O-2:** To preserve the character of the landscape where and to the extent that, the proper planning and sustainable development of the area requires it, including the preservation of identified views and prospects, cultural features and the amenities of places and features of natural beauty or interest.

**EX-O-3:** To protect and preserve the quality of the environment so as to ensure no significant adverse effects including the prevention, limitation, elimination, abatement or reduction of environmental pollution and the protection of waters, groundwater, the seashore and the atmosphere.

**Policies**

**EX-P-1:** It is a policy of the Council to require that development proposals for extractive industry are in accordance with DEHLG Quarries and Ancillary Activities Guidelines for Planning Authorities 2004 and the EPA Environmental Management Guidelines – Environmental Management in the Extractive Industry (Non-scheduled minerals) 2006.

**EX-P-2:** It is a policy of the Council not to permit new extractive industry proposals in areas of Especially High Scenic Amenity or in areas of High Scenic Amenity. Furthermore, such proposals will not normally be permitted where they would adversely impact upon any Natura 2000 site, Natural Heritage Area, Nature Reserve, Groundwater Protection Area (Aquifer), Freshwater Pearl Mussel Catchment or other areas of importance for the protection of flora and fauna, or areas of significant archaeological potential, unless it can be clearly demonstrated that such extractive industries would not have significant adverse impacts on amenities or the environment, and comply with Article 6 of the Habitats Directive. All extractive industry proposals in designated Freshwater Pearl Mussel Catchments will be subject to a Habitats Directive Assessment and will comply with the objectives and practices set out in Freshwater Pearl Mussel Sub-basin Plan, and any relevant codes of practice.

**EX-P-3:** It is a policy of the Council not to permit development proposals for quarry and ancillary facilities unless it has been evidenced that the development shall not result in a significant threat of pollution to the environment including, siltation and sedimentation of receiving downstream surface waters, having regard to the vulnerabilities identified within the River Basin Management Plan, and any relevant Fresh Water Pearl Mussel Sub-basin Plan and to ensure that extractive industry proposals do not result in significant adverse impact upon the environment, including surface water and groundwater (aquifers) quality and quantity, river corridors, associated wetlands and River Basin Management Districts.

**EX-P-4:** It is a policy of the Council to require all applications for extractive industry proposals to be accompanied by an integrated phased development and restoration plan for aftercare/re-use of the site. Any restoration plan must comply with Article 6 of the Habitats Directive and have regard to the relevant conservation objectives, qualifying interests and threats to the integrity of a Natura 2000 site. Restoration plans should comply with the following policies EX-P-1 and EX-P-2 and objectives EX-O-1, EX-O-2 and EX-O-3.

**EX-P-5:** It is a policy of the Council to require that, where an extractive industry development is proposed within 300m of a recorded monument/archaeological site or is likely to have a material impact on the visual amenities of the monument/site, the applicants/operators shall engage the services of an archaeologist or suitably qualified person to undertake archaeological assessment of the site. This assessment to be submitted in full with the planning application for the development.

**EX-P-6:** It is a policy of the Council to require that development proposals for extractive industries are accompanied by evidence of the suitability of the road network in terms of width, alignment and carrying capacity and to require that any identified deficiencies can be addressed at the applicant's expense. Where mitigating works are required to upgrade or realign roads infrastructure, they must comply with Article 6 of the Habitats Directive and have regard to the relevant conservation objectives, qualifying interests and threats to the integrity of a Natura 2000 site, and will comply with the objectives and practices set in any relevant Freshwater Pearl Mussel Subbasin Plan, and any relevant codes of practice, insofar as reasonably possible taking into consideration the safety of the future road users.

### 4.2.5 Compliance with County Development Plan

The subject site is located to the Northeast of Raphoe Town which is designated as a Tier 2 B settlement in the Donegal County Development Plan 2018-2024. The subject site lays within the townlands of both Craigs and Magherasolis. The quarry is served by the L-23749 which is a country road and is in good condition. This road leads directly onto the R236 regional road. Raphoe town is located 900m SW of this road junction and 780m SW from the nearest boundary of the subject site (930m to quarry face). The site is surrounded by improved agricultural land, upland grassland and an area of commercial forestry. The location of any quarry is dictated by the availability of resources at a particular location. Similarly, the extent of operations on any site is dictated by the extent of those resources. In this case the existing quarry is located in this particular area due to the presence of available materials, and the proposed development is directly influenced by the availability of further resources on the site.

The quarry is not in an Area of Especially High Scenic Amenity (EHSA). The closest EHSA is 17.1km Southwest of the quarry. The current County Development Plan lists a number of views and prospects for the County which are illustrated on Map 7.1.1 of the County Development Plan. The closest is located c.11.8km NW of the quarry in the townland of Listack (the quarry is not visible from this point).

Quarrying was taking place on site in 1985 as it is mentioned in the publication 'Mineral Localities in the Dalradian and associated igneous rocks of County Donegal, Republic of Ireland, and of Northern Ireland', a joint publication from the Geological Survey of Ireland and the Geological Survey of Northern Ireland, dated 1985. It is thought quarrying on site ceased in the late 1980's. As quarrying has historically taken place on site, there are some redundant pieces of site infrastructure remaining on site. The proposed development is compatible with the policies set out in the CDP with respect to landscape characterisation and protection.

#### 4.2.6 Essential Aggregates Providing for Ireland's Needs To 2040

On Wednesday, 23rd October 2019, Minister of State for Natural Resources Sean Canney TD launched Irish Concrete Federation's Publication -"Essential Aggregates: Providing for Ireland's needs to 2040".

The Irish Concrete Federation (ICE) is the national representative body for the Irish aggregates and concrete products industry. ICF members comprise almost 100 companies employing over 5,000 people throughout Ireland. ICF members are involved in the extraction, processing and delivery of the essential aggregate and concrete materials used in the construction of Ireland's built environment. The members of the ICI account for approximately 80% of total industry output in terms of volume and value.

The document is an industry led call for Government to ensure that Ireland's future supply of aggregates (crushed rock, sand and gravel) is planned, monitored and managed in a sustainable manner, to provide for Ireland's future infrastructure development. The report identifies that demand for aggregates in Ireland at 12 tonnes per capita is twice the current EU 28 average, due to Ireland's infrastructural deficit, dispersed pattern of settlement and resulting large road network. The Federation warns that scarcities of some aggregates are now emerging in the Eastern and Midland regions, due to natural shortages, a lack of forward planning and delays and other shortcomings in the planning process.

The report estimates that Ireland will need to produce an estimated 1.5 billion tonnes of aggregates to meet housing and infrastructure targets set down under the Government's Project Ireland 2040 plan, according to the Irish Concrete Federation (ICE) at the launch of a major new publication.

ICF recommends as part of the document that a number of proactive steps are taken by Government and other stakeholder organisations to ensure that future demand for aggregates can be supplied sustainably to ensure the achievement of Government's objectives.

#### 4.2.7 Planning History of Site

There is only one planning application relating to the site. This concerned the (1) Quarrying of 4.81 hectares which will be subject to extraction and processing of rock by drilling, blasting, crushing and screening (2) Landscaping of the quarry during the operational phase and restoration of the quarry on completion of extraction (3) Erection of site office with canteen facilities (4) Installation of wastewater treatment unit & percolation area (5) All associated ancillary facilities / works over a 25-year period under Reg. Ref. 19/52015. Donegal County Council granted planning permission for the quarry in September 2020 which was appealed to An Bord Pleanála. ABP subsequently refused permission for the quarry.

**Table 4.1: Planning Permissions Attached to the Quarry**

| Ref. No. | Brief Description | Decision Date |
|---|---|---|
| 19/52015 | (1) Quarrying of 4.81 hectares which will be subject to extraction and processing of rock by drilling, blasting, crushing and screening (2) Landscaping of the quarry during the operational phase and restoration of the quarry on completion of extraction (3) Erection of site office with canteen facilities (4) Installation of wastewater treatment unit & percolation area (5) All associated ancillary facilities / works over a 25-year period | 20/12/2019 |

## 4.3 References

Local Government (Planning & Development) Regulations, 2001 (S.I. No. 600 of 2001)

National Spatial Strategy for Ireland 2002 – 2020 (Department of Environment, Heritage and Local Government, 2002)

Environmental Management Guidelines – Environmental Management in the Extractive Industry (Non – Scheduled Minerals) (EPA, 2006)

Regional Planning Guidelines for the Border Region 2010 – 2022 (The Border Regional Authority, 2010)

Donegal County Development Plan 2018 – 2024 (Donegal County Council, May 2017)

European Union (Environmental Impact Assessment and Habitats) Regulations 2015, S.I. No 301 of 2015

Planning and Development (Amendment) No. 2 Regulations 2015, S.I. No. 310 of 2015, Circular Letter PL 3/15 (Department of Environment, Community and Local Government, 21 July 2015)

National Planning Framework under Project Ireland 2040 (Department of Housing Planning and Local Government, February 2018)

Ireland 2040 Our Plan – www.npf.ie

Irish Concrete Federation - http://www.irishconcrete.ie

Donegal County Council - www.donegalcoco.ie

# Section 5: POPULATION & HUMAN HEALTH

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# 5 POPULATION & HUMAN HEALTH

## 5.1 Introduction

This section of the Environmental Impact Assessment Report (EIAR) assesses the existing environment in addition to the potential effects on population and human health arising from the proposed development.

Section 5.2 focuses on Population including potential direct and indirect effects of the proposed development with regard to principal socio-economic indicators, including population, land use, employment, tourism and residential amenity. Section 5.7 assesses the potential effects on human health associated with the development.

A human health risk assessment is the process of assessing the nature and probability of adverse health effects on human beings as a result of a development. Mitigation measures are discussed where required to mitigate any potential effects arising from the proposed development.

Other aspects of potential direct and indirect effects on human beings are also considered in the other Sections of this EIAR which include the following:

- Section 8 - *Water*
- Section 9 - *Noise & Dust*
- Section 10 - *Blast & Vibration*
- Section 12 - *Material Assets -Traffic*
- Section 15 - *Landscaping & Restoration*

## 5.2 Population

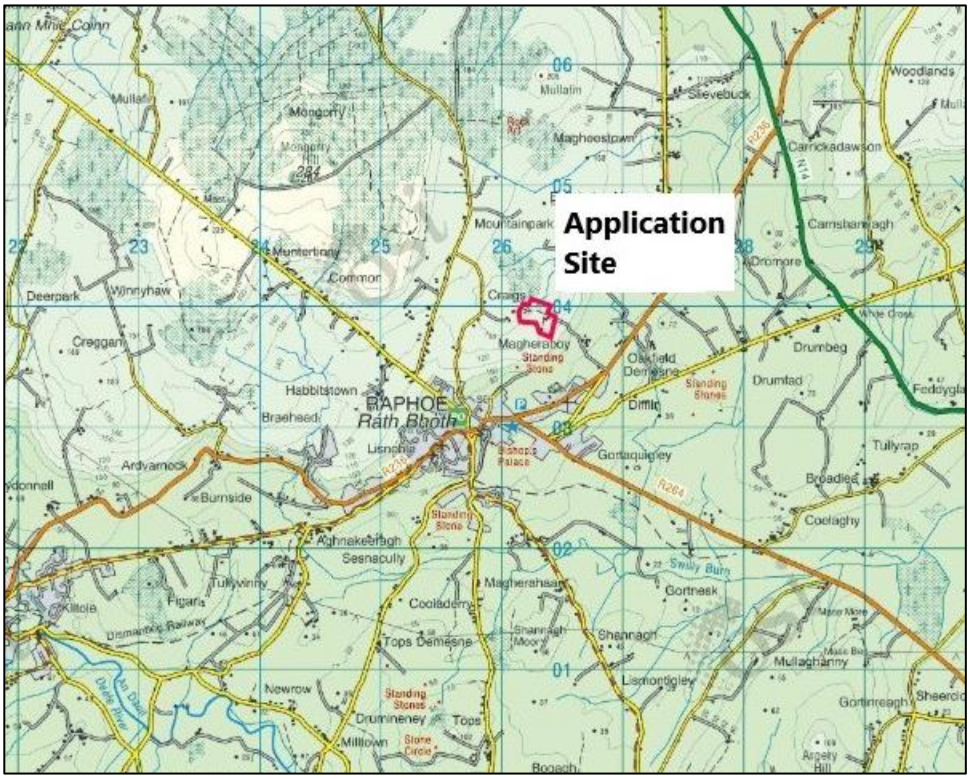
### <u>5.2.1 Methodology</u>

The assessment of impacts on human beings entails the identification of key populations that are most likely to be impacted by the proposed development. Key populations that have, and had, the potential to be impacted have been identified as persons residing and engaging in activities in close proximity to the subject site, persons with a stake in the general economy of the local and regional area and persons enjoying the recreational and cultural amenities of the area. The principal sources of information is from the Central Statistics Office (CSO). A number of other sources of information and guidance documents were referred to as part of the compilation of this section which are listed in References.

### <u>5.2.2 The Existing Environment</u>

The subject site is located within the townlands of both Craigs and Magherasolis, Raphoe, County Donegal. The quarry is served by the L-23749 which is a local tertiary road and is in good condition. This road leads directly onto the R236 regional road. Raphoe town is located 900m Southwest of this road junction and 780m Southwest from the nearest boundary of the subject site (930m to quarry face). The site is surrounded by improved agricultural land, upland grassland and an area of commercial forestry. Map 5.1 shows the subject site in a regional context.

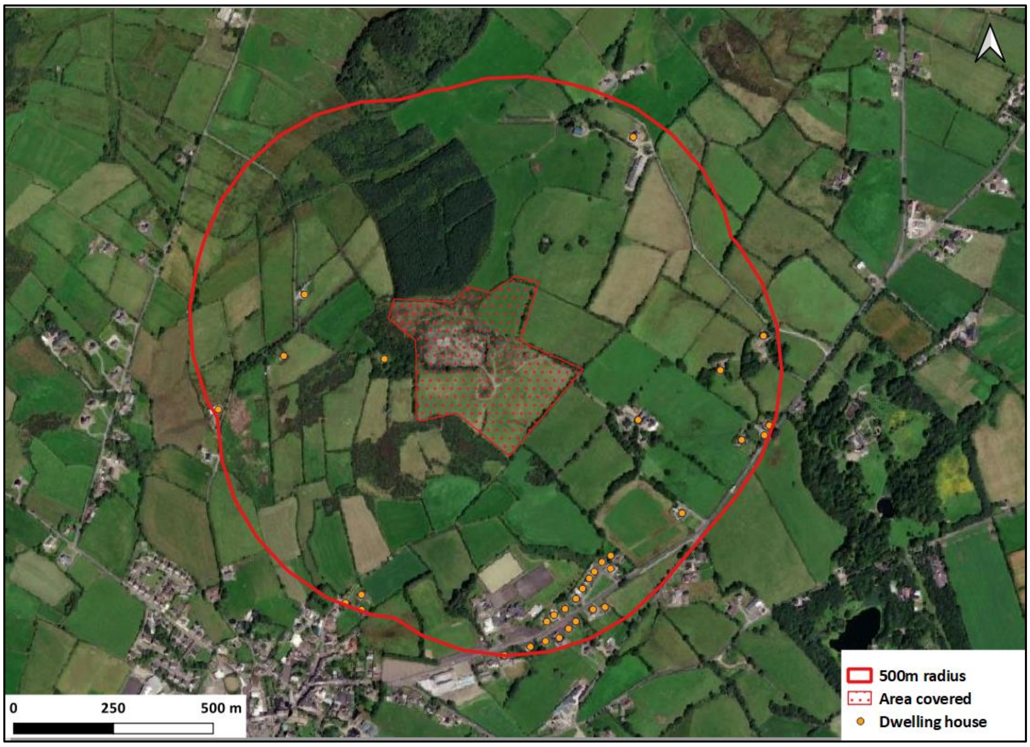
**Map 5.1: Subject site in a regional context**




**CYAL50244901** © Ordnance Survey Ireland/Government of Ireland.

In describing the receiving environment in relation to human beings, this section provides an overview of the local area, including settlement patterns, age structure, population change, social indicators including employment, education, and social class, and economic activity. Figure 5.1 illustrates the habitable residences within proximity of the park.

**Figure 5.1:**
**Site Location in Relation to Local Dwellings within 500m of the subject site**




**CYAL50244901** © Ordnance Survey Ireland/Government of Ireland.

***5.2.2.1 Land Use***

As described in *Section 3 Project Description*, the subject site is an existing dormant quarry which is located on 7.95ha site with the proposed extraction area being defined as 5.37ha. The site is surrounded by improved agricultural land with an area of forestry to the Northwest. The surrounding fields are bordered by hedgerows and treelines. The closest dwelling is located 270m west of the nearest subject site boundary and 370m from the quarry face. The landowners house and farmyard are located 350m Southeast from the nearest site boundary and 500m from the quarry face.

### 5.2.3 Population & Age Profile

The Central Statistics Office (CSO) is the Government agency responsible for the collection and publication of most Irish official statistics. The CSO disseminates the results of its statistical enquiries through a number of different statistical publications. In this assessment, the following CSO based releases and publications were consulted to get both a historic and up to date picture of the current population of Ireland, Donegal and the Craigs and Magherasolis, Raphoe, area:

1. Census of Population 2002, 2006, 2011 and 2016.
2. Small Area Population Statistics 2011 and 2016 (SAPS).

The townlands of Craigs and Magherasolis are located within the Lifford-Stranorlar Electoral Division in the Local Electoral Area (LEA) 6 and both are located within the Small Area Population (SAP) 057067004. The population of this SAP was 210 in the 2016 census. The population for Raphoe Town in 2011 was 1157 falling to 1089 in 2016, a decrease of 6.24%. The population for the county of Donegal was 161,137 in 2011, falling to 159,192 in 2016, a fall of 1.2%. According to the 2016 Census the Lifford-Stranorlar Electoral District covers 705.30km$^2$ and has a population density of 36.7 persons/km$^2$.

### 5.2.4 Employment and Unemployment

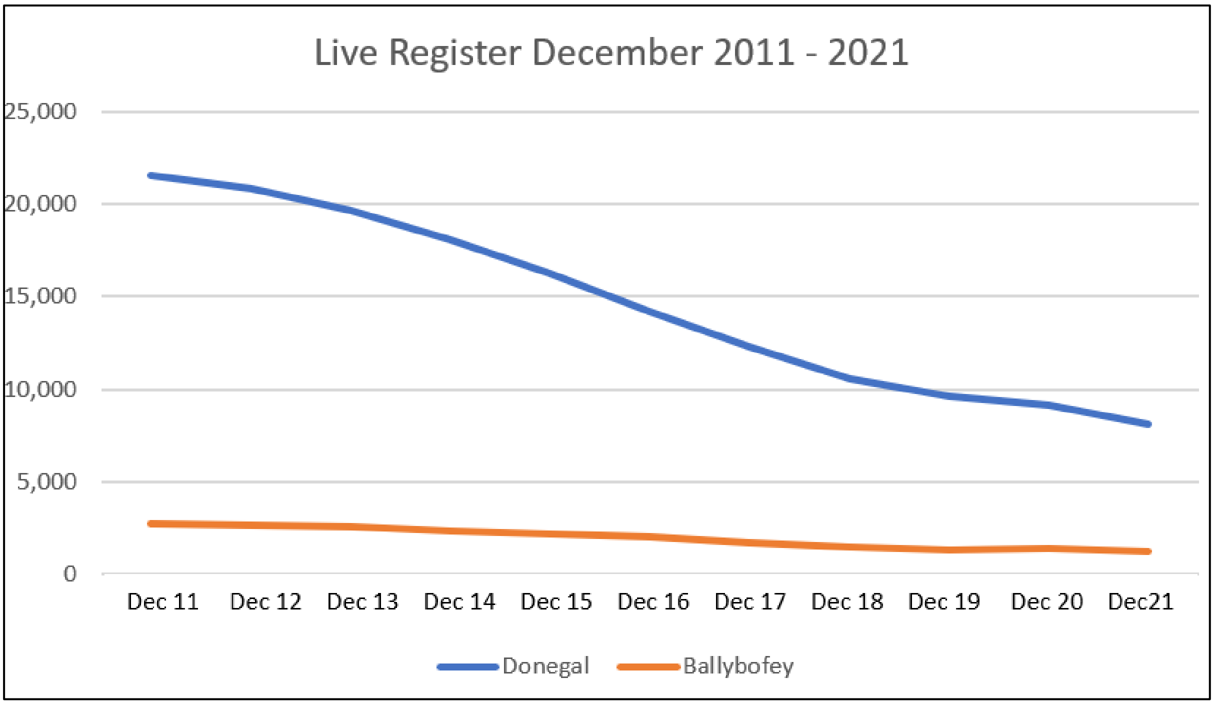
There was no available Live Register data for Raphoe town, so the closet town of similar size was Ballybofey with a distance of 22km. The lowest level of unemployment in the last 10 years reached in the Ballybofey (closest available area to the subject site) was in December 2021 when 1,182 people signed on the live register, while the peak was in July 2011 when 2,884 persons were recorded. This is in-line with the County Donegal live register which peaked at 23,223 in July 2011 but has since reached a 11 year low in December 2021 of 8,079.

Table 5.1 Provides details of unemployment levels at the local Social Welfare Office in Ballybofey for the last 11 years and illustrated in Graph 5.1.

**Table 5.1: Live Register Numbers in County Donegal and Raphoe 2011-2021.**

| Month / Year | County Donegal Live Register | Ballybofey Area Live Register |
|---|---|---|
| December 2021 | 8,079 | 1,182 |
| December 2020 | 9,151 | 1,375 |
| December 2019 | 9,584 | 1,298 |
| December 2018 | 10,540 | 1,479 |
| December 2017 | 12,309 | 1,707 |
| December 2016 | 14,205 | 2,006 |
| December 2015 | 16,231 | 2,165 |
| December 2014 | 18,105 | 2,339 |
| December 2013 | 19,656 | 2,550 |
| December 2012 | 20,890 | 2,657 |
| December 2011 | 21,596 | 2,683 |

**Graph 5.1: Live Register Numbers in County Donegal and Ballybofey 2011-2021.**




The 2016 Census of Population provides a detailed breakdown of the industries in which person from the Small Area Population (SAP) 057067004 and the Lifford- Stranorlar Local Electoral Area (LEA) 6 Table 5.2 provides details of the findings.

**Table 5.2:**
**Persons at work by industry from the SAP 057067004 and Lifford - Stranorlar LEA in April 2016**

| Industry | SAP No. of persons at work | LEA No. of persons at work |
|---|---|---|
| Agriculture, forestry and fishing | 14 | 821 |
| Building and construction | 10 | 539 |
| Manufacturing industries | 6 | 804 |
| Commerce and trade | 16 | 1868 |
| Transport and communications | 10 | 599 |
| Public administration | 3 | 634 |
| Professional services | 22 | 2271 |
| Other | 6 | 1588 |
| **Total Persons at work** | **87** | **9124** |

The total population of the Lifford-Stranorlar Local Electoral Area (LEA) aged 15 or over, working in April 2016, stood at 9,124 (35.2%) of the total population of 25,889, whilst 69.6% (87) of the residents of 'Small Area' 057067004 were in employment. Within 'Small Area' 057067004, 53 persons (25.2%) are under 18 years of age while 32 (15.2%) are over 65 years of age.

These figures would indicate that as much as 30.4% of the working age population were unemployed in Small Area 057067004 on Census 2016. The quarry would initially provide a further 8-10 new jobs for people within the local area which could further rise depending on demand for supply. The quarry would also help with indirect employment associated with the construction and agricultural activities associated with the extracted material.

### 5.2.5 Settlement Patterns

The previous sections have addressed the population and employment statistics for the area. This section will address the local settlement pattern, which consists entirely of one off-housing.

The 2016 Census Small Area Population Statistics (SAPS) indicated that 73 (94.8%) out of 77 houses, within Small Area 057067004, were occupied houses on Census night 2016. 4 out of the 77 houses were classed as 'other vacant dwellings. This level of vacancy (5.2%) suggests that the Small Area has a higher rate of residential homes, compared to the LEA and County Donegal as a whole.

**Table 5.3: Dwellings Occupancy / Vacancy rate on Census Night – April 2016**

| Area | Total Housing | Occupied | Unoccupied Holiday Homes | Vacant | Temporarily Absent |
|---|---|---|---|---|---|
| **Donegal** | **83,931** | 58,964 (70.25%) | 11,288 (13.45%) | 11,704 (13.95%) | 1,975 (2.35%) |
| **Lifford-Stranorlar Local Electoral Area** | **11,202** | 9,329 (83.3%) | 152 (1.4%) | 1,466 (13.1%) | 255 (2.3%) |
| **Small Area 057131008** | **77** | 73 (94.8%) | 0 (0%) | 4 (5.2%) | 0 (0%) |

Statistics from the 2016 Census show the vacancy rate within the Small Area is significantly lower than the LEA and the county as a whole. The housing stock of 'Small Area' 057067004 represents just 0.09% of the total housing stock of the county, it contains 0.13% of the population of the County. The LEA has an occupancy level of 2.8 persons per occupied unit and 2.46 within the 'Small Area' (excluding unoccupied holiday houses) compared to 2.79 per unit in the County.

In 2016 the county of Donegal had the second highest Vacancy Rate, as a % of total housing stock, at 28%, the Small Area 057067004 had a Vacancy Rate of 5.2% which is well below the state average of 12.8%.

### 5.2.6 Housing Demand

Data from the 2016 Census outlines the average household size, as shown in Table 5.4 the Small Area average household size is 2.46 which is below the country, LEA and county averages.

**Table 5.4: Private Households by Number of Persons and Average Household Size.**

| Area | Number of Households | Number of Persons in Households | Average Household Size |
|---|---|---|---|
| **Ireland** | 1,702,289 | 4,676,648 | 2.75 |
| **Donegal** | 58,505 | 157,276 | 2.69 |
| **Lifford- Stranorlar LEA** | 9,303 | 25,684 | 2.76 |
| **Small Area 057067004** | 72 | 101 | 2.46 |

Table 5.5 outlines the percentage of households built, per 10-year period, from 1919 to the Census of 2016. The data shows 31.9% % of the houses in Small Area 057067004 have been built since 2001-2010 which is in line with the LEA and county rate.

**Table 5.5: Private Households and Period Built**

| AREA | Pre 1919 | 1919 to 1945 | 1946 to 1960 | 1961 to 1970 | 1971 to 1980 | 1981 to 1990 | 1991 to 2000 | 2001 to 2010 | 2011 or later | Not Stated |
|---|---|---|---|---|---|---|---|---|---|---|
| **Small Area 057067004** | 8.3% | 5.6% | 6.9% | 0% | 16.7% | 8.3% | 8.1% | 31.9% | 4.2% | 0% |
| **LEA** | 8.3% | 4.7% | 5.3% | 6.2% | 11.7% | 11.3% | 15.9% | 30.1% | 2.2% | 4% |
| **County** | 8.1% | 4.4% | 4.6% | 5.1% | 12.0% | 12.4% | 16.1% | 30.7% | 2.1% | 4.5% |
| **Ireland** | 8.3% | 6.5% | 7.4% | 6.8% | 12.6% | 10.1% | 14.2% | 25.4% | 2.0% | 6.7% |

### 5.2.7 Travel Patterns

Data from the 2016 Census details the travel times for the population, aged 5 years and older, by Journey Time to Work, School or College. The findings are shown in Table 5.6. Due to the distance from the Small Area to local centres of employment and education the percentage of people travelling less than 15minutes was at 51%, compared to the LEA of 39.8% and 44.1% for the County. The percentage of people travelling between 30 and 45 minutes is 10.7% for the Small Area, significantly less than that of the LEA and county, again as this is due to the distance from the Small Area to the destination.

**Table 5.6: Population, aged 5 years and older, by Journey Time to Work, School or College**

| Area | Under 15 Minutes | 15 to 30 Minutes | 30 to 45 Minutes | 45 to 60 Minutes | 60 to 90 Minutes | Over 90 Minutes | Not Stated | Total |
|---|---|---|---|---|---|---|---|---|
| **Donegal** | 40,177 (44.1%) | 24,408 (26.8%) | 11,281 (12.4%) | 3,556 (3.9%) | 2,974 (3.4%) | 1,488 (1.6%) | 7,128 (7.8%) | **91,012** |
| **Lifford-Stranorlar LEA** | 5,806 (39.8%) | 4,218 (28.9%) | 2,208 (15.1%) | 537 (3.7%) | 453 (3.1%) | 202 (1.39%) | 1,157 (7.9%) | **14,581** |
| **Small Area 057067004** | 62 (51.2%) | 26 (21.5%) | 13 (10.7%) | 7 (5.8%) | 2 (1.7%) | 3 (2.5%) | 8 (6.6%) | **121** |

More than half of the population of the SAP travel less than 15 mins to work or school. The quarry would add to this number through the creation of new employment opportunities for local people. This quarry will also bring a boost for the local economy by providing locally sourced stone and aggregate products for construction, agricultural and other uses, in turn having a positive effect on these sectors. A shorter journey to work for locals would also greatly reduce their carbon footprint, in turn having a more positive impact on the environment.

## 5.3 Tourism & Recreation

Tourism is regarded as one of the greatest sources of potential employment nationally and also has the potential to benefit the community in an environmentally sustainable way. The following is a summary of key statistics taken from the Fáilte Ireland research report Tourism Facts 2018:

- Expenditure by tourists visiting Ireland (excluding receipts paid to Irish carriers by foreign visitors) was estimated to be worth €5.6 billion in 2018, this represents growth of 6% on 2017. Combining spending by international tourists with the money spent by Irish residents taking trips here and receipts paid to Irish carriers by foreign visitors, total tourism expenditure in 2018 was estimated to be €9.4 billion.
- Overseas tourists to Ireland in 2018 grew by 6.5% to 9.6 million. Overseas tourists from Britain grew by 1% while our other markets continue to grow at a stronger rate. Mainland Europe recorded growth of 7.8%. North America also performed very strongly, increasing by 14.5%. The long-haul markets have also increased by 7.8% in 2018.

Some of the tourist attractions located in the local area include:

- Oakfield Park, Oakfield Demense, Raphoe, Co. Donegal. 100 acres of gardens, parkland, woodland, streams and lakes, railway and a restaurant.
- Raphoe Castle also known as Bishop's Palace a ruined 17$^{th}$ century castle on the edge of Raphoe, Co. Donegal.
- Beltany Stone Circle a Bronze Age stone circle south of Raphoe town, Co. Donegal.

According to the 2018 Fáilte Ireland report of the total 10,947,000 'out-of-state' tourists, who visited Ireland in 2018, 29% engaged in Hiking / Cross Country Walking and Cycling activities. Raphoe has the potential for further developing its tourism facilities. It is proposed that the when the quarry is decommissioned that the subject site could be used as a recreational outdoors amenity for activities such as rock climbing and water sports.

## 5.4 Human Health

A human health risk assessment is the process to estimate the nature and probability of adverse health effects in humans as a result of a development. The assessment has had regard to the findings of other sections of the EIAR, in particular to:

1. Section 5.2 *Population & Human Health*
2. Section 8 *Water*
3. Section 10 *Noise*
4. Section 12 *Material Assets – Traffic*
5. Section 15 *Landscaping & Restoration*

## 5.5 Methodology

### <u>5.5.1 Health Based Standards</u>

Health based standards by their nature are set to protect against human health effects. The Irish EPA Guidance favours the Health Based Standards approach. In its publication: EPA Revised Draft Guidelines on the Information to be contained in Environmental Impact Assessment Reports (August 2017), it states:

> *'The evaluation of effects on these pathways is carried out by reference to accepted standards (usually international) of safety in dose, exposure or risk. These standards are in turn based upon medical and scientific investigation of the direct effects on health of the individual substance, effect or risk. This practice of reliance upon limits, doses and*

*thresholds for environmental pathways, such as air, water or soil, provides robust and reliable health protectors [protection criteria] for analysis relating to the environment.'*

***5.5.1.1 Significance of Health Effects***

There is a difficulty in assigning levels of significance to Human Health effects. In medicine, as in all science, the concept of statistical significance is used i.e., putting a value on percentage levels of our confidence in the data (confidence measures of 95% or even 99%) to measure our levels of certainty that any changes are not due to chance alone. This is a valid approach for the study of the effects on a population or in large studies but is not possible in the assessment of a significant effect on human health in smaller scale projects as it does not absolutely exclude a response in an individual. Low levels of noise emissions from a process undertaken at the development may be such that the vast majority of the population do not notice it. However, an individual located within proximity, may find them annoying even when other people in same location do not. The significance criteria used in the assessment as adapted from the Irish EPA Guidelines, are set out in Table 5.7 below.

## 5.6 Characteristics of the Proposed Development

A full description of the proposed development is outlined in Section 3 *Description of the Proposed Development*. The application is for permissions for development to the existing dormant quarry site which will be subject to extraction and processing of rock by drilling, blasting, crushing and screening, landscaping of the quarry during the operational phase and restoration of the quarry on completion of extraction, the erection of site offices and canteen facilities and the installation of a wastewater treatment unit and percolation area as well as all associated ancillary facilities for a period of 25 years. The subject site measures 7.95ha with the extraction area being defined as 5.37ha which is above the sub threshold determination level for EIA.

The subject site is made up of previously blasted faces and benches as well as additional ground to the North of the site which is proposed to be stripped, drilled and blasted. As the rock face is established and intact it is proposed to blast once or twice a month. This process will involve the drilling of the rock from above and a controlled blast being carried out by a competent, licensed, independent team. When the material is loose from the rock face it will be moved to a primary crusher where uniform stone size will be achieved through grading. Most of the material will be sent directly to the primary crushing unit by an excavator working on the rock face. Material will be taken from the crushers and screeners and stockpiled on site for use throughout Donegal. All of the material will be processed to IS EN 13242 and SR 21 standards as per the National standard for Civil Engineering products. No washing of stone is planned on this site.

The planning application is for a period of 25 years and the proposal is to reopen an existing dormant quarry. The application also includes restoration proposals to ensure that the quarry site can return to use as a natural habitat once production ceases.

## 5.7 Impact Assessment

The significance criteria used in the assessment as adapted from the Irish EPA Guidelines, are set out in Table 5.7.

**Table 5.7: Criteria Used in the Assessment of Human Health Effects**

| Effect Level | Significance Criteria |
|---|---|
| **Imperceptible** | No significant human health impacts are apparent. An example is no measurable effect attributable to the proposed development. |
| **Slight** | A small impact on individual reported symptoms but no change in health status can be attributed to the proposed development. An example is a temporary increase in symptoms in an individual but no change in the severity of the underlying condition or treatment required. |
| **Moderate** | A small impact on health status of individuals but no change in morbidity or mortality can be attributed to the proposed development. An example is an individual increasing their use of a treatment attributable to the development but no change in underlying condition. |
| **Significant** | A proposed development has the potential to impact on individual health status. An example is an individual's condition becoming measurably more severe as a result of the proposed development. |
| **Very Significant** | A proposed development has the potential to impact on the health status of groups. An example is a group of individuals' conditions becoming measurably more severe as a result of the proposed development. |
| **Profound** | A proposed development has the potential to impact on the health status of communities. An example is a measurable increase in the incidence or severity of a condition in a community. |

### 5.7.1 Population Impact Assessment

The existing quarry is located in an area of one-off houses situated along local roads in the vicinity of the subject site. This is typical of rural and semi-rural areas. Quarries can deter people from living in the proximity of such developments due to the noise and traffic associated with the development during operation times. The generation of noise and vibrations during the active quarry phase will have the potential to influence human health. Noise and water monitoring will be carried out during the construction stages of the to ensure emission levels are within recommended guideline values (see Section 10 of this EIAR for full detail).

#### *5.7.1.1 Economic Activity*

The proposed development will result in an increase in employment levels in the area through the development of the existing site. The quarry capacity in Donegal has greatly reduced over the last number of years due to economic, environmental and planning compliance concerns. This has resulted in a deficit of quality materials within the County. This application proposes to cater for local needs in a fashion that is careful and thoughtful to the environment whilst also leaving the site in a condition which is much better than is currently the case. It is proposed that at the initial stage eight to ten people will work in the quarry and in associated activities such as deliveries.

#### *5.7.1.2 Land-Use and Housing*

The existing dormant quarry area is dominated by low intensity agriculture. The planning application for the development of this existing dormant quarry will not adversely affect the agricultural land use or availability. The aspects of the proposal that can result in landscape and visual impacts during the operational phase are:

1. **Creation of additional berms** – the berm on the southwestern side of the quarry will be visible but it will be planted with native species to form a wildlife corridor and screening.
2. Traffic movement – the volume of lorry traffic to and from the quarry is projected at 18 to 20 lorry journeys per day which is not deemed to be excessive.
3. Site office and carpark - the location of the lorry park will keep all site vehicles completely shielded from public view thus further reducing any negative visual impact from the site.
4. Office and car park lighting – Normal exterior lighting will be used in and around the office and car parks. No flood lighting will be used in areas of the quarry that are visible from the R236.

i.

The re-instatement phase will result in short term visual impacts in the form of machinery creating additional berms and movement of spoil but this would be short term and not considered significant. The quarry is 11.8 Km from the nearest scenic viewing point therefore it will have no effect on this feature. In summary, no significant effect to landscape and visual character of the area will occur as a result of this proposal (see Section 15 for full detail on visual impacts from the proposed development).

***5.7.1.3 Social Infrastructure***

The Royal and Prior Comprehensive School lands are located 325m south of the nearest boundary of the subject site. This school has extensive playing fields that are available to the local community and local clubs. The playing fields are located 415m south of the nearest boundary of the subject site and 575m from the quarry face.

Sensitive receptors for human beings to environmental effects, such as noise, air quality, vibrations and increased traffic are outlined below and are in line with the "Draft Advice Notes for Preparing Environmental Impact Statements issued by the EPA" (EPA 2017):

- Homes
- Hospitals
- Hotels and holiday accommodation
- Schools and rehabilitation workshops

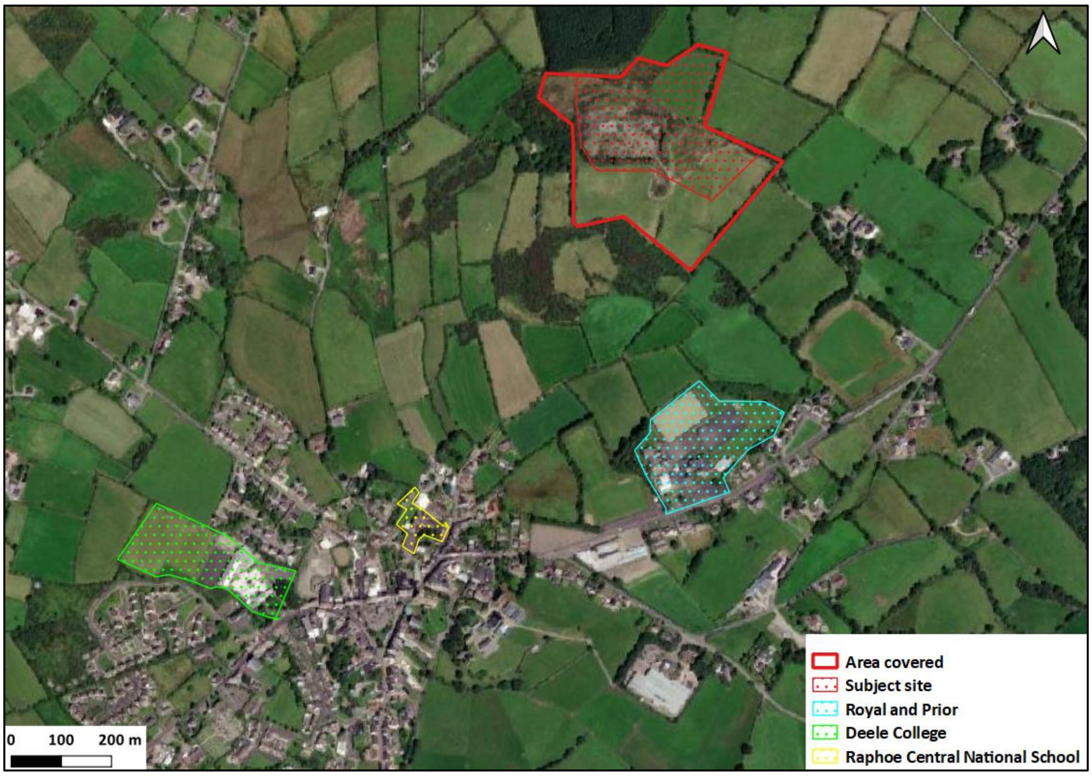
ii.

The principal sensitive receptors within the environs of the subject site include residential properties to the west and east, schools to the south and Oakfield Manor House to the east. The Royal and Prior Comprehensive School is located 540m south of the subject site and 690m from the quarry face as detailed in Figure 5.2 below. Lands as detailed in folio numbers DL41896, DL41937 and DL80000F are registered to the Minister for Education and Science. The majority of school buildings are located in Folio DL41896 which is located on the western edge of the school site and furthest away from the subject site. Playing fields are located in Folio DL41937 with the closest edge of the playing surface located 415m south of the nearest boundary of the subject site and 575m south from the quarry face. The main school buildings are located 690m from the quarry face.

Raphoe Central National School is located 745m SW from the nearest subject site boundary and 850m from the quarry face. Deele College Vocational School is located 1.03km SW from the closest border of the subject site and 1.14Km from the quarry face. Section 5.7.7.2 below highlights the predicted noise and vibration levels. The predicted noise levels are well within the levels recommended by the EPA Environmental Management Guidelines-Environmental Management in Extractive Industry (Non-Scheduled Minerals). Ground vibration and air-overpressure will be kept below the guidelines recommended and below the regulatory limits. Given the distance from the site to the nearest receptor, the proposed quarry activities will not have any effects on the local schools (see Sections 9-10 of this EIAR for full detail).

Figure 5.2 below outlines the relative location of the local schools to the quarry.

**Figure 5.2: Relative location of the local schools to the quarry**




**CYAL50244901** © Ordnance Survey Ireland/Government of Ireland.

### *5.7.1.4 Site Safety*

There are no adverse effects associated with the new proposal and health and safety as all legal and best practice standards in relation to the operating of the quarry will apply at the site.

### *5.7.1.5 Traffic*

It is predicted that approximately 18-20 loads of product per day will be transported off site, which equates to 4-5 loads per lorry creating approximately 40 traffic movements. This equates to a mean flow of 4.5 vehicle movements/hour. It is a possibility that demand could increase over a time period which would result in an increase in machinery operating and delivering lorries on the road. Three traffic surveys were undertaken as part of this assessment (Section 12 of this EIAR fully details the impact from proposed quarry traffic). The surveys show that an average of 400 vehicles per hour travel along the main road to the east of the quarry. The projected vehicle movement of 4.5 per hour from the quarry would not have any significant effect on traffic levels.

### *5.7.1.6 Unplanned Events*

Emergency response plans and procedures in place will be implemented should an unplanned event occur.

### 5.7.2 Human Health Impact Assessment

The key elements of the proposed development which have potential to impact on human health are detailed below. Each element has been assessed under specific sections of this EIAR, for example, noise is assessed under Section 10 "*Blast & Vibration*".

***5.7.2.1 Assessment of Impacts Associated with Emissions to Water***

The potential impacts of the existing and proposed development on the water environment have been assessed in Section 8 "*Water"* of this EIAR and mitigation measures are proposed in order to safeguard the water environment. The assessments concluded that, if the proposed mitigation measures are practiced, there will be no significant impact on surface water or groundwater.

***Assessment of Effect***

Given that there will be no effect on water quality standards, the effects on human health from water are assessed as Imperceptible.

***5.7.2.2 Assessment of Impacts Associated with Noise and Vibration***

Noise levels for the proposal have been predicted and include the cumulative effects of activity. Predictions have been made of maximum hourly noise levels with no allowance made for ground absorption or air attenuation. The predicted noise levels are well within the levels recommended by the EPA Environmental Management Guidelines-Environmental Management in Extractive Industry (Non-Scheduled Minerals). Ground vibration and air-overpressure will be kept below the guidelines recommended and below the regulatory limits. Controls specified to limit ground vibration and air-overpressure will be in place as a component of good management procedures. To ensure compliance with regulatory limits, monitoring of all blast vibration will be carried out at a location to be agreed with Local Authority. Keeping within the statutory limits will ensure that blast vibration or air overpressure will ensure that the likelihood of damage (or superficial damage) to all receptor structures and humans approaches zero - see Section 10 of this EIAR for full detail on noise and vibration.

***Assessment of Effect***

The effects on human health for all receptors arising from noise and vibration are assessed as being Imperceptible.

***5.7.2.3 Assessment of Impacts Associated with Traffic***

The proposed development will not result in a significant increase in traffic on the public road infrastructure. It is predicted that there would be approximately 18-20 loads per day transported off site, which equates to 4-5 loads per lorry creating approximately 40 traffic movements (approx. 400T per day will be transported from the quarry to market). Due to the low traffic density and good quality of the Regional Road the impact of the additional traffic generated by the proposed development is not considered to put extra undue pressure on either the road network or the traffic. The impact on roads and traffic is assessed as imperceptible.

***5.7.2.4 Unplanned Events***

Should an unplanned event occur, emergency response plans and procedures in place will be implemented. Unplanned events are discussed in detail in other sections of this EIAR.

**5.7.3 Cumulative Impacts**

Impacts which could affect human beings principally relate to noise and impacts on water quality as a result of the development. These topics are dealt with under the various sections of this EIAR. Compliance with the mitigation measures in the relevant sections of this EIAR: *8 Water, 10 Blast & Vibration, 12 Material Assets Traffic, Material Assets Site Services*, will ensure that the proposed development's effect on the receiving environment will be minimised.

Table 5.8 below shows the determination of environmental impact significance post mitigation

**Table 5.8: Determination of environmental impact significance post mitigation**

| Impact | Nature of residual impact | Receptor | **Significance** Imperceptible to Profound |
|---|---|---|---|
| **Employment** | Direct and indirect employment opportunities for local people during the construction and operational phase of the development | Local community | Significant positive |
| **Traffic** | Transport of aggregate to market causing an increase in traffic volumes | Local transport network | Imperceptible |
| **Tourism** | Impact on local tourism facilities and amenities/visual impact on landscape | Local community | Imperceptible |
| **Noise & vibration** | Generation of noise/vibration from quarrying activities | Local community | Imperceptible |
| **Air quality and climate** | Generation of dust from quarrying activities | Local community | Imperceptible |

## 5.8 Technical Difficulties

No technical difficulties were encountered.

## 5.9 References


Central Statistics Office – Results of the 2011 and 2016 Census – www.cso.ie

Discover Ireland - https://www.discoverireland.ie/donegal/muckish-lub-loch-achair

Fáilte Ireland - https://www.failteireland.ie/Research-and-Insights.aspx

Donegal County Council - https://www.donegalcoco.ie//media/donegalcountyc/planning/pdfs/viewdevelopmentplans/countydonegaldevelopmentplan2018-2024/partaandb/Document.pdf

# Section 6: BIODIVERSITY

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# 6 BIODIVERSITY

## 6.1 Introduction

This Section assesses the likely significant effects (both alone and cumulatively with other projects) that the proposed development may have on Biodiversity, Flora and Fauna and sets out the mitigation measures proposed to avoid, reduce, or offset any potential significant effects that are identified. The residual impacts on biodiversity are then assessed. Particular attention has been paid to species and habitats of ecological importance. These include species and habitats with national and international protection under the Wildlife Acts 1976 to 2018 (as Amended), EU Habitats Directive 92/43/EEC and EU Birds Directive 2009/147/EC.

The full description of the proposed development is provided in Section 3 of this EIAR.

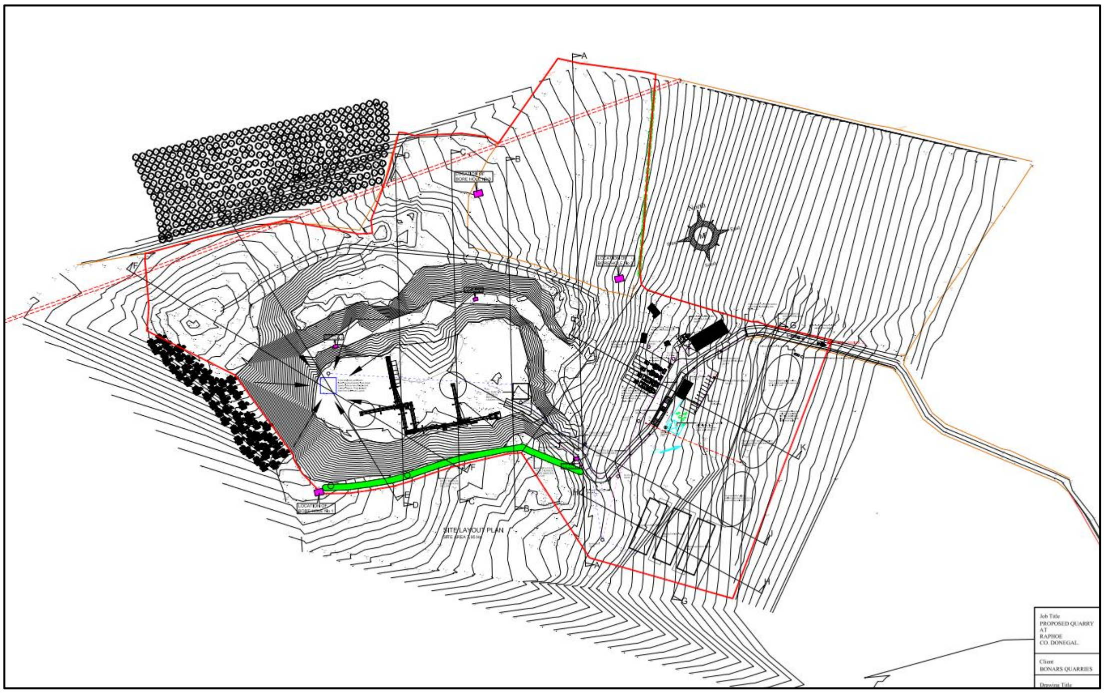
The Section is structured as follows:

- The Introduction provides a description of the legislation, guidance, and policy context applicable to Biodiversity, Flora and Fauna.
- This is followed by a comprehensive description of the ecological survey and impact assessment methodologies that were followed to inform the robust assessment of likely significant effects on ecological receptors.
- A description of the Baseline Ecological Conditions and Receptor Evaluation is then provided.
- This is followed by an Assessment of Effects which are described regarding each phase of the development: construction phase, operational phase, and decommissioning phase. Potential Cumulative effects in combination with other projects are also fully assessed.
- Proposed mitigation and best practice measures to avoid, reduce or offset the identified effects are described and discussed. This is followed by an assessment of residual effects taking into consideration the effect of the proposed mitigation and best practice measures.
- The conclusion provides a summary statement on the overall significance of predicted effects on Biodiversity, Flora and Fauna.

The following defines terms utilised in this Section:

- For the purposes of this EIAR, the red line site as submitted for planning is referred to as the subject site (Figure 6.1).
- For the purpose of this EIAR, the term ‘Study Area Boundary’ refers to the wider site which includes the surrounding agricultural fields (Figure 6.2).
- “Key Ecological Receptor” (KER) is defined as a species or habitat occurring within the zone of influence of the development upon which likely significant effects are anticipated.
- “Zones of Influence” (ZOI) for individual ecological receptors refers to the zone within which potential effects are anticipated. ZOI’s differ depending on the sensitivities of habitats and species and were assigned in accordance with best available guidance and through adoption of a precautionary approach.

**Figure 6.1: Subject Site layout**



Michael Friel Architects & Surveyors (not to scale)

**Figure 6.2: Subject site boundary and EIAR study area**


**CYAL50244901** © Ordnance Survey Ireland/Government of Ireland

## 6.2 Requirements for Ecological Impact Assessment

National and European legislation and Policy set out the requirement for the ecological impact assessment of development.

### 6.2.1 National Legislation

The Wildlife Acts (1976/2000) provides legal protection to various species from anthropogenic interference with licensing providing the only derogation. The 2000 amendment set out the designation of NHAs and pNHAs. This designation is to provide protection to species and habitats found therein. pNHAs were proposed in 1995 but have yet to be statutorily approved. However, the NPWS considers pNHAs of significant value for flora and fauna. NHAs, pNHAs and the species therein are considered Key Ecological Receptors in this assessment.

Rare plant species are afforded protection from cutting, picking and damage and their habitats are protected from alteration, interference, and damage under The Flora Protection Order 1999. Any rare plant species listed are considered Key Ecological Receptors in this assessment.

### 6.2.2 National Policy

The United Nations Convention on Biological Diversity (CBD) places an obligation on U.N member states to develop national strategies and action plans for the conservation and sustainable use of biodiversity. Out of this requirement the Irish National Biodiversity Action Plan was formed. The Current National Biodiversity Action Plan 2017-2021 expands on the targets set out in the previous iteration. The principle aim of this plan is to conserve biological diversity in Ireland. The plan highlights the following measures as significant in the context of the principal objective of mainstreaming biodiversity in decision making across all sectors of the economy:

- “Incorporate into legislation the requirement for consideration of impacts on biodiversity to ensure that conservation and sustainable use of biodiversity are taken into account in all relevant plans and programs and relevant new legislation.
- Public and Private Sector relevant policies will use best practice in SEA, AA and other assessment tools to ensure proper consideration of biodiversity in policies and plans; All Public Authorities and private sector bodies move towards no net loss of biodiversity through strategies, planning, mitigation measures, appropriate offsetting and/or investment in Blue-Green infrastructure.
- Strengthen ecological expertise in local authorities and relevant Government Departments and agencies.
- Local Authorities will review and update their Biodiversity and Heritage Action Plans.
- Local Authorities will review and update their Development Plans and policies to include policies and objectives for the protection and restoration of biodiversity.
- Develop a Green Infrastructure at local, regional, and national levels and promote the use of nature-based solutions for the delivery of a coherent and integrated network.
- Continue to produce guidance on the protection of biodiversity in designated areas, marine and the wider countryside for Local Authorities and relevant sectors.
- Integrate Natura 2000 and Biodiversity financial expenditure tracking into Government Programmes internal paying agency management procedures including linkage to the Prioritised Action Framework and this NBAP.
- Develop a Natural Capital Asset Register and national natural capital accounts by 2020, and integrate these accounts into economic policy and decision-making.
- Initiate natural capital accounting through sectoral and small-scale pilot studies, including the integration of environmental and economic statistics using the framework of the UN System of Experimental-Ecosystem Accounting (SEEA).

- Establish a national Business and Biodiversity Platform under the CBD's Global Business Partnership; Ensure Origin Green produces tangible benefits for biodiversity with increased emphasis on conservation and restoration of biodiversity.
- Implement actions from Ireland's Biodiversity Climate Change Sectoral Adaptation Plan.
- Identify and take measures to minimise the impact of incentives and subsidies on biodiversity loss, and develop positive incentive measures, where necessary, to assist the conservation of biodiversity.
- Establish and implement mechanisms for the payments of ecosystem services including carbon stocks, to generate increased revenue for biodiversity conservation and restoration.
- Develop and implement a National Biodiversity Finance Plan to set out in detail how the actions and targets of this NBAP will be delivered from 2017 and beyond; and monitor the implementation of the Plan.

These measures and the content of the National Biodiversity Action plan 2017-2021 are considered throughout this assessment.

### 6.2.3 European Legislation

The Habitats Directive (Council Directive 92/43/EEC on the Conservation of Natural Habitats and Wild Fauna) formed a basis for the designation of Special Areas of Conservation (SAC's). Similarly, Special Protection Areas are legislated for under the Birds Directive (Council Directive 79/409/EEC on the Conservation of Wild Birds). Collectively, SACs and SPAs are referred to as Natura 2000 sites. In general terms, they are of exceptional importance in terms of rare, endangered or vulnerable habitats and species within the European Community. Under Article 6(3) of the Habitats Directive an Appropriate Assessment must be undertaken for any plan or project that is likely to have a significant effect on the conservation objectives of a Natura 2000 site. An Appropriate Assessment is an evaluation of the potential impacts of a plan or project on the conservation objectives of a Natura 2000 site, and the development, where necessary, of mitigation or avoidance measures to preclude negatives effects. The main aim of the EU Habitats Directive is to "contribute towards ensuring biodiversity through the conservation of natural habitats of wild fauna and flora in the European territory of the Member States to which the treaty applies". The Directive was originally transposed into Irish law by the European Communities (Natural Habitat) Regulations, S1 94/1997. However, two judgments of the Court of Justice of the EU (CJEU) – notably cases C-418/04 and C-183/05 - found that Ireland had not adequately transposed the two Directives. Therefore, Part 6 of the European Communities (Birds and Natural Habitats) Regulations 2011-2015 is now the relevant part dealing with the protection of flora and fauna since the revoke of the European habitats Regulations of 1997. This consolidates the European Communities (Natural Habitats) Regulations 1997 to 2005 and the European Communities (Birds and Natural Habitats) (Control of Recreational Activities) Regulations 2010, as well as addressing transposition failures identified in CJEU judgments.

Article 6 (3) of the Habitats Directive states that:

"*Any plan or project not directly connected with or necessary to the management of the site but likely to have a significant effect thereon, either individually or in combination with other plans or projects, shall be subject to appropriate assessment of its implications for the site in view of the site's conservation objectives. In the light of the conclusions of the assessment of the implications for the site and subject to the provisions of paragraph 4, the competent national authorities shall agree to the plan or project only after having ascertained that it will not adversely affect the integrity of the site concerned and, if appropriate, after having obtained the opinion of the general public*".

As such any project likely to have a significant effect, either individually or in combination with other plans or projects, upon the conservation objectives of a Natura 2000 site must undergo an assessment of its implications on relevant Natura 2000 sites.

A separate NIS has been prepared to examine the potential effects of this development on the Natura 2000 network and to inform appropriate assessment by the consent authority. Furthermore, the species and habitat protected under European legislation are considered key ecological receptors in this assessment.

The EIA Directive (85/337/EEC) is in force since 1985 and applies to a wide range of defined public and private projects, which are defined in Annexes I and II:

- Mandatory EIA: all projects listed in Annex I are considered as having significant effects on the environment and require an EIA (e.g. long-distance railway lines, motorways and express roads, airports with a basic runway length ≥ 2100 m, installations for the disposal of hazardous waste, installations for the disposal of non-hazardous waste > 100 tonnes/day, waste water treatment plants > 150.000 p.e.).
- Discretion of Member States (screening): for projects listed in Annex II, the national authorities have to decide whether an EIA is needed. This is done by the "screening procedure", which determines the effects of projects on the basis of thresholds/criteria or a case-by-case examination. However, the national authorities must take into account the criteria laid down in Annex III. The projects listed in Annex II are in general those not included in Annex I (railways, roads waste disposal installations, wastewater treatment plants), but also other types such as urban development projects, flood-relief works, changes of Annex I and II existing projects)

The EIA Directive of 1985 has been amended three times, in 1997, in 2003 and in 2009:

- Directive 97/11/EC brought the Directive in line with the UN ECE Espoo Convention on EIA in a Transboundary Context. The Directive of 1997 widened the scope of the EIA Directive by increasing the types of projects covered, and the number of projects requiring mandatory environmental impact assessment (Annex I). It also provided for new screening arrangements, including new screening criteria (at Annex III) for Annex II projects, and established minimum information requirements.
- Directive 2003/35/EC was seeking to align the provisions on public participation with the Aarhus Convention on public participation in decision-making and access to justice in environmental matters.
- Directive 2009/31/EC amended the Annexes I and II of the EIA Directive, by adding projects related to the transport, capture and storage of carbon dioxide (CO2).

The initial Directive of 1985 and its three amendments have been codified by DIRECTIVE 2011/92/EU of 13 December 2011. Directive 2011/92/EU has been amended in 2014 by DIRECTIVE 2014/52/EU.

## 6.3 Guidance Documents

Guidance from the National Roads Authority forms the basis of both survey techniques and assessment methodology. The documents 'NRA Guidelines for Assessment of Ecological Impacts of National Road Schemes Rev 2' (NRA, 2009) and 'NRA Guidelines on Ecological Surveying Techniques for Protected Flora and Fauna on National Road Schemes (NRA, 2009)' were initially designed in the context of assessing the development of roads. However, the guidelines follow standardised techniques and are considered good practice in terms of ecological assessment.

Guidance documents that informed this assessment include:

- Chartered Institute of Ecology and Environmental Management (CIEEM) (2019). Guidelines for Ecological Impact Assessment.
- Chartered Institute of Ecological and Environmental Management (CIEEM) (2012). Preliminary Ecological Appraisal.
- Fossitt JA (2000). A Guide to Habitats in Ireland.
- The Heritage Council (2011) Habitat Survey Guidelines: A Standard Methodology for Habitat Survey and Mapping in Ireland.
- Draft Revised guidelines on the information to be contained in Environmental Impact Statements (EPA, 2017).
- Guidelines for Planning Authorities and An Bord Pleanála on Carrying out Environmental Impact Assessment. Department of the Environment, Community and Local Government DoEHLG (2013).
- Guidelines for assessment of Ecological Impacts of National Road Schemes, (NRA, 2009). Environmental Impact Assessment of National Road Schemes – A Practical Guide (NRA, 2009).
- Environmental Assessment and Construction Guidelines (NRA, 2006).
- Advice Notes on Current Practice (in preparation of Environmental Impact Statements) (Environmental Protection Agency (EPA), 2003).
- Guidelines on the information to be contained in Environmental Impact Statements (EPA, 2002).
- European Commission Guidance on the preparation of the Environmental Impact Assessment Report (2017)
- Environmental Protection Agency (EPA) 'Draft Guidelines on the Information to be Contained in Environmental Impact Assessment Reports' (August 2017).

## 6.4 Statement of Authority

This section of the EIAR has been compiled by Shannen McEwen, Ecologist with Greentrack. Shannen holds a B.Sc. (Hons) Environmental Science with a Diploma in Professional Practice from the University of Ulster. She has been involved in all aspects of Environmental Impact Assessment, Appropriate Assessment and Ecological Impact Assessment since 2017. Shannen is an Associate Member of the Institution of Environmental Sciences.

## 6.5 Methodology

Prior to assessing the ecological impact of a development, the environmental baseline must first be described. Baseline ecological conditions were assessed in line with CIEEM (2018) 'Guidelines for Ecological Impact Assessment in the UK and Ireland: Terrestrial, Freshwater, Coastal and Marine '. The baseline was assessed through desk and field survey methodology which are described in the following sections.

### 6.5.1 Desk Study

The desk study was informed by the following resources

- EPA Map Viewer
- Donegal County Council Map Viewer
- NPWS Map Viewer
- NPWS records
- Inland Fisheries Reports
- National Biodiversity Data Centre records and map viewer
- Geohive.ie

### 6.5.2 Scoping

This EIAR was commissioned by the applicant to facilitate a new planning application to be submitted to the Consent Authority on this subject site. This EIAR addresses all concerns raised by the ABP inspectors report relating to the refusal to grant planning permission subject to 19/52015. This EIAR will be open for comment by any concerned party throughout the statutory consultation determination stage.

### 6.5.3 Field Study

Multiple field surveys were carried out as part of this assessment from October 2021-February 2022. The following section describes the surveys carried out, the timing of the surveys and the guidance followed.

#### *6.5.3.1 Site walkover*

A multidisciplinary site walkover was carried out on multiple site visits spanning a six-month period from October 2021-Februray 2022. The purpose of this exercise was to understand the context of the site and act as a 'ground-truthing exercise' to confirm any insights inferred from desk study as to the nature of the site.

Annotations were marked on a sample map indicating the approximate location of any significant features noted such as important habitat, plant species or signs of important fauna. Incidental sightings of birds and invasive species were also noted, as relevant. Information collected during site walkovers informed the preceding survey work.

#### 6.5.3.2 Habitat Survey and Botanical Survey

Following the multidisciplinary site walkovers, a more in-depth Phase 1 habitat survey was conducted on 18/01/2022. All habitats were classified according to Fossitt (2000)[5]. A botanical survey was conducted during the site visit and quadrats were placed at various locations throughout the quarry site. The botanical survey was conducted adhering to NRA (2009) guidelines for ecological surveys[6]. The habitat and botanical studies were conducted in tandem to provide an understanding of the ecological baseline of the quarry site. Data gathered from habitat and botanical surveys was used to produce a thematic map illustrating the relative position and scale of habitats in the quarry site and surrounding environs. Guidelines from the Heritage Council were followed, and classification were designated according to Fossitt's. However, position and scale of habitats shown are approximate and should be considered only as a broad representation of the study area. Figure 6.5 in Section 6.6.2 shows the habitats within the site boundary.

#### 6.5.3.3 Mammal Surveys

The information gathered from desk study methods in addition to ecological surveys informed the focus of targeted terrestrial fauna surveys. Relevant surveys as detailed below were conducted within the footprint of the development.

##### *6.5.3.3.1 Badger Survey*

A dedicated badger survey was undertaken on 25/02/2022. The survey covered the entire footprint of the development. The survey intended to identify any potential signs of badger such as setts/tracks/latrines. The survey was conducted with respect to NRA guidelines (2009). Results can be found in Section 6.6.2.2.1.

[5] J. Fossitt. (2000) A Guide to Habitats in Ireland. The Heritage Council, Dublin

[6] National Roads Authority - Guidelines for Assessment of Ecological Impacts of National Roads Schemes https://www.tii.ie/technical-services/environment/planning/Guidelines-for-Assessment-of-Ecological-Impacts-of-National-Road-Schemes.pdf

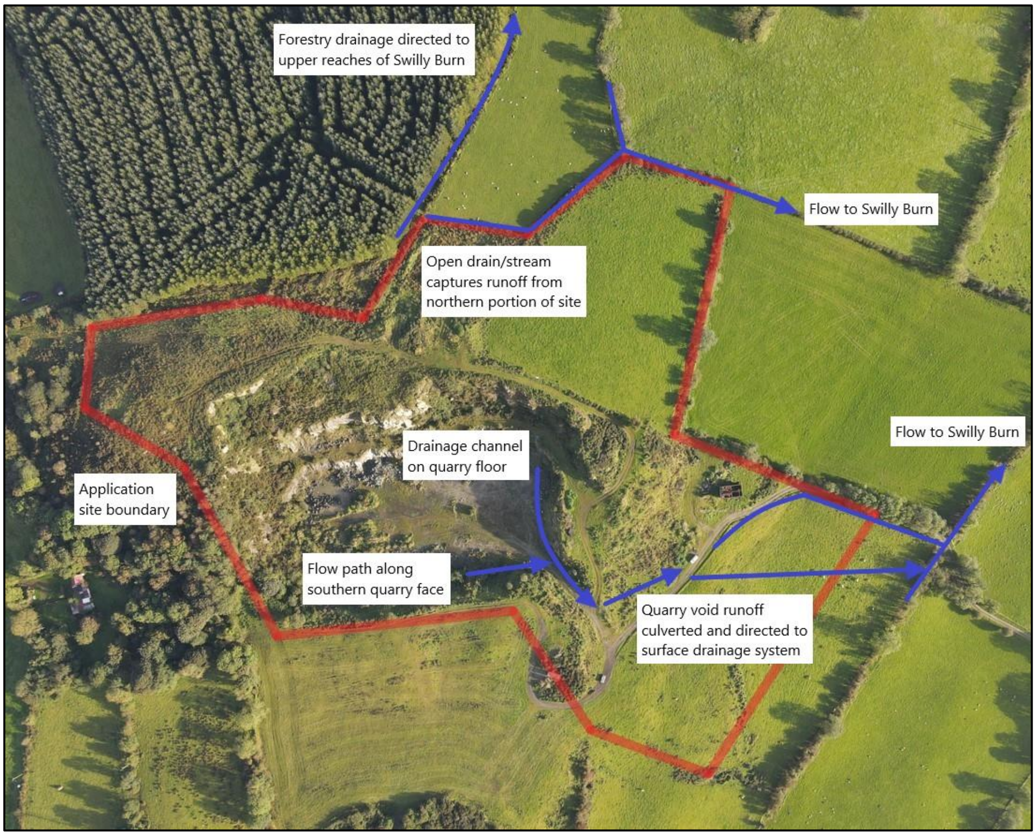
### *6.5.3.3.2 Otter Survey*

An otter survey for the site was deemed to be unnecessary after conducting a thorough site walkover due to the lack of supporting habitat onsite. There is a culverted outflow of water from the quarry void to a surface water ditch flowing east from the site. Surface water flowing from the northern portion of the site flows into a small agricultural ditch flowing east from the north of the site. These are the only two defined water channels on the site. Both channels are too narrow and shallow to support the needs of otter. Water flow on the site differs to that as shown in the EPA maps (Figure 6.3) which is incorrect. Figure 6.4 below shows the existing site drainage channels and flow direction as confirmed through multiple site walkovers.

**Figure 6.3: Site drainage and flow direction as per EPA website**


EPA.ie

**Figure 6.4: Actual site drainage and flow direction**




QGIS Software

***6.5.3.3.3 Other mammals***

Any evidence of mammals that were not the subject of dedicated surveys was noted during site walkovers.

***6.5.3.3.4 Bat Survey***

Bat conservation trust and CIEEM bat survey good practice guidelines[7] were followed throughout site investigation for bats. A tree survey was conducted on 25/02/2022 to identify any potential roosting features. Binoculars were used to inspect trees from the ground to the canopy for any signs of bat activity including natural holes, cracks/splits in major limbs, loose bark, hollows/cavities, dense epicormic growth and bird and bat boxes. Results can be found in section 6.6.2.2.3. Further rationale behind field survey methodology is provided in Section 6.6.2.

***6.5.3.4 Bird Survey***

A series of dedicated bird observation reports was conducted between December 2021-February 2022 throughout the entire footprint of the proposed development. Lands within, and adjacent to, the proposed development boundary were slowly walked in a manner allowing the surveyor to come within 50m of all habitat features. Birds were identified by sight and sound, and general location was recorded. Physical parameters such as weather conditions and the presence of any disturbance factors were also noted. Guidelines from the following were considered:

- CIEEM Bird census and survey techniques, Gregory RD, Gibbons DW and Donald PF (2004)
- CIEEM Guidance for bird surveys in relation to development, Good practice guidance for birds, Keith Ross and James Latham
- Common bird census (CBC) methodology
- British Trust for Ornithology's (BTO's) Survey (WeBS) methodology
- Birdwatch Ireland Countryside Bird Survey manual

Results can be found in Section 6.6.2.2.4

***6.5.3.5 Amphibian and Reptile Survey***

No dedicated amphibian or reptile surveys were carried out for this assessment due to the time of year (Dec-Feb) as most are within hibernation and are not active during these months. Any Incidental sightings of amphibians during site walkovers were noted. This is not significant as a dedicated survey will be undertaken before any site stripping works commence should planning be granted.

***6.5.3.6 Invasive Species Surveys***

Throughout the multidisciplinary site walkover, no signs of invasive species were noted. Focus was placed on any third schedule species listed in the European Communities Birds and Natural Habitats Regulations 2011.

***6.5.3.7 Field Survey Limitations***

There were no limitations/technical difficulties experienced during the survey work undertaken as the whole site was accessible which allowed the site to be thoroughly surveyed during the multiple walkovers conducted.

### 6.5.4 Impact and Effect Assessment Methodology

This sub section will describe the methodology followed to identify key ecological receptors (KER) and their significance before describing the methodology followed to characterise impacts and effects on identified KERs.

[7] Collins, J. (2016) Bat Surveys for Professional Ecologists: Good Practice Guidelines. 3rd edition. Bat Conservation Trust, London.

***6.5.4.1 Identification of Key Receptors***

The culmination of desk/field survey and consultation with relevant bodies informed the identification of Key Ecological Receptors. Target receptors that were found to likely occur with the zone of impact of 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)/ Special Protection Areas (SPA) within the likely zone of impact
- Species protected under the Wildlife Acts 1976-2019
- Species protected under the Flora Protection Order 2015

***6.5.4.2 Assessing the Importance of Receptors***

Ecological evaluation and impact assessment methodologies in the following sections have implemented guidance from the NRA. An outline for this methodology is provided in 'Guidelines for Assessment of Ecological Impacts of National Road Schemes (NRA, 2009)'. This methodology follows the same modality as the assessment criteria described by CIEEM (2018).

This guidance provides a scale of importance for features in a geographical context. Importance ranges from:

- International/European
- National
- Regional (County)
- Local (High Value)
- Local (Low Value)

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.

Ecological receptors considered to be of International, National, Regional or Local (Higher Value) are to be considered KERs provided a pathway for significant effects exist thereon. Ecological receptors of Local importance (Lower Value) are not considered KERs.

***6.5.4.3 Characterising impacts and effects on Key Ecological Receptors***

Once the Baseline has been established, impact on KERs can be assessed and mitigation/compensation or enhancement measures can be put in place to negate any negative effect. Impacts will be characterised according to CIEEM guidance (2019) in addition to EPA guidance (2017) draft document 'Guidelines on the information to be contained in environmental impact assessment reports. The following criteria was used to characterise impacts:

- **Magnitude** relates to the quantum of effect, for example the number of individuals affected by an activity. Described in Table 6.1
- **Extent** should also be predicted in a quantified manner and relates to the area over which the effect occurs.

- **Duration** is intended to refer to the time during which the effect is predicted to continue, until recovery or re-instatement.
- **Reversibility** should be addressed by identifying whether an effect is ecologically reversible either spontaneously or through specific action; and,
- **Timing/frequency** of effects in relation to important seasonal and/or life-cycle constraints should be evaluated. Similarly, the frequency with which activities (and associated effects) would take place can be an important determinant of the effect on receptors.

***6.5.4.4 Assessing the significance of effect***

The ecological significance of effects is described using guidance provided in section 5 of CIEEM guidelines (2019). When assessing ecological impacts, a 'significant effect' can be described as an effect that supports or undermines biodiversity conservation objectives for important ecological features. Effects can be considered significant at a variety of geographic scales from international to local.

Any assessment of effect should take account of:

- construction and operational phases.
- direct, indirect, and synergistic effects.
- and those that are temporary, reversible, and irreversible.

The EPA provides the following terminology to describe duration of effects:

- Momentary effects - Effects lasting from seconds to minutes
- Brief effects - Effects lasting less than a day
- Temporary effects - Effects lasting less than a year
- Short-term – 1 to 7 years
- Medium term – 7 to 15 years
- Long term – 15 to 60 years
- Permanent – over 60 years
- Reversible effects - Effects that can be undone, for example through remediation or restoration.

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 language suggested by the EPA (2017) to describe the magnitude of effects is outlined in Table 6.1.

**Table 6.1 Magnitude of Impacts**

| Magnitude | Description |
|---|---|
| ***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. |

| Magnitude | Description |
|---|---|
| ***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 effect*** | 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 |

Effects on Key ecological receptors can be of varying quality as described by the EPA (2017) they can be one of the following:

- **Negative** - A change which reduces the quality of the environment (for example, lessening species diversity or diminishing the reproductive capacity of an ecosystem; or damaging health or property or by causing nuisance).
- **Neutral** - No effects or effects that are imperceptible, within normal bounds of variation or within the margin of forecasting error
- **Positive** - A change which improves the quality of the environment (for example, by increasing species diversity; or the improving reproductive capacity of an ecosystem, or by removing nuisances or improving amenities).

The following are key considerations when determining significance:

- Integrity
- Conservation Status

**Integrity** refers to the essential unity of a site in terms of its ecological structure and function. NRA (2009) describes integrity as "the coherence of 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. Impacts resulting in adverse changes to those ecological structures and functions would be significant."

**Conservation Status**
An impact on the conservation status of a habitat or species is considered 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 methodologies, 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).

#### ***6.5.4.5 Incorporating Mitigation***

Section 6.6 of this EIAR assesses the potential effects of the proposed development 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. The primary mitigation employed should be mitigation by avoidance.

## 6.6 Establishing the Baseline

The following sections provide the results from desk and field studies and describe the baseline ecological conditions at the quarry site.

### **6.6.1 Desk Study**

This section describes the results of review of available public information including:

- EPA Map Viewer
- Donegal County Council Map Viewer
- NPWS Map Viewer
- NPWS records
- Inland Fisheries Reports
- National Biodiversity Data Centre records and map viewer
- Geohive.ie
- A collection of relevant reports and records

#### ***6.6.1.1 Designated Sites***

The impacts of the proposed development on European sites are examined in the accompanying Natura Impact Statement. As per EPA guidance (2017) this biodiversity section will not repeat the information provided in the NIS but instead will incorporate the key findings provided in the NIS.

The NIS identified the following Natura 2000 sites as susceptible to threat from the proposed development in the absence of mitigation:

- **River Finn SAC**
- **River Foyle and Tributaries SAC**

Several nationally designated sites occur within 15km of the proposed development. These include Proposed Natural Heritage Areas (pNHAs). No designated Natural Heritage Areas (NHAs) were noted within the 15km radius. Table 6.2 provides proximal Nationally Designated Sites and a preliminary impact determination for each.

**Table 6.2 Impact Determination for Nationally Designated Sites.**

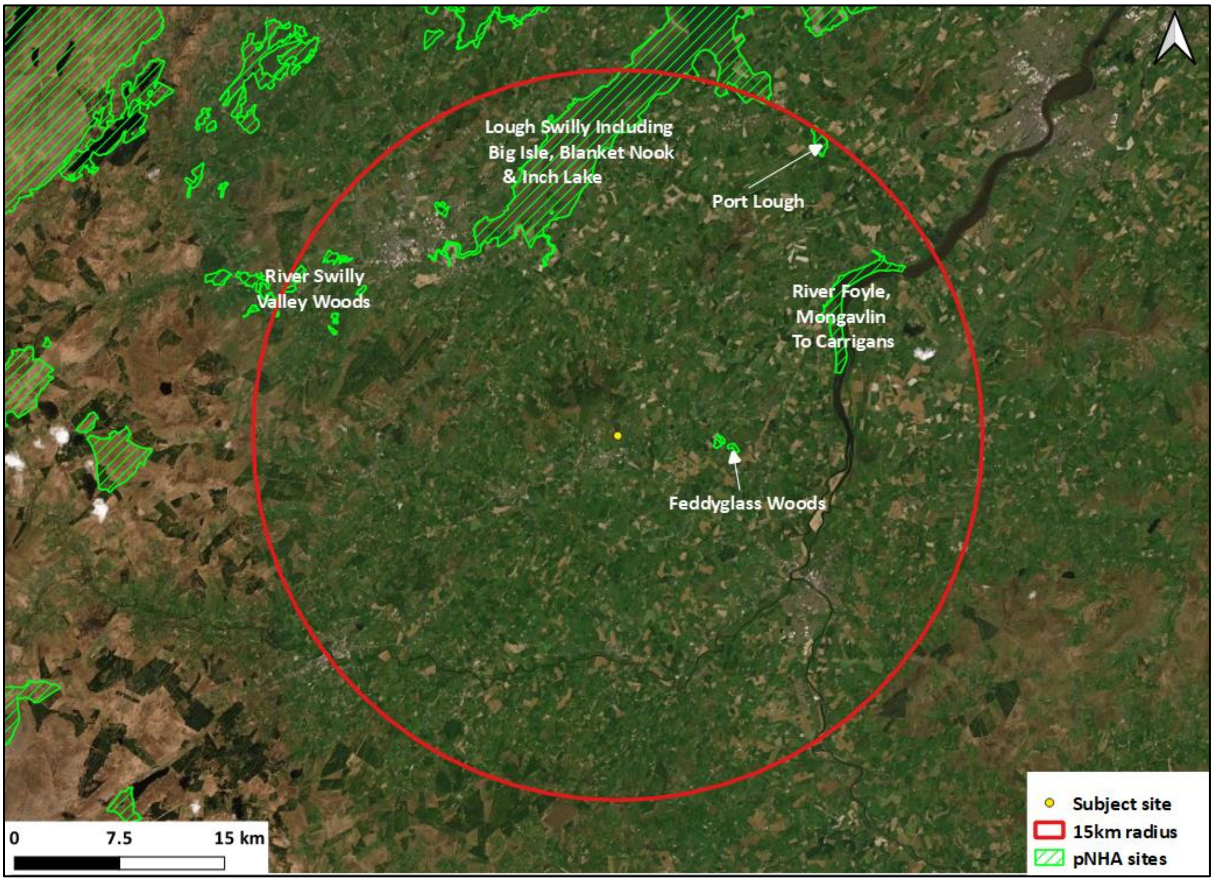
| Designated Site | Minimum Distance from Proposed Development | Impact Determination |
|---|---|---|
| | ***pNHAs*** | |
| ***Feddyglass Woods*** | 3.94 km E | No direct avenue of connectivity exists to these nationally designated sites.<br>Therefore, no avenue for impacts on these receptors exists and **no further assessment is required** |
| ***River Foyle, Mongavlin to Carrigans*** | 9.34km NE | A source-pathway-receptor link to this pNHA exists through runoff from the quarry site entering the Swilly Burn and flowing on to the River Foyle. In the absence of mitigation, the proposed development has the potential to cause deterioration in surface water quality during the construction, operational and decommissioning phases, potentially affecting downstream aquatic receptors. **This pNHA is therefore within the likely zone of impact, and further assessment was deemed to be required and has been carried out as part of the accompanying NIS.** |
| ***River Swilly Valley Woods*** | 12.25km NE | No direct avenue of connectivity exists to these nationally designated sites.<br>Therefore, no avenue for impacts on these receptors exists and **no further assessment is required.** |
| ***Port Lough*** | 14.42km NE | |
| ***Lough Swilly Including Big Isle, Blanket Nook & Inch Lake*** | 7.55km NW | |

The following nationally designated sites have been identified as potentially susceptible to impact from the proposed development:

- River Foyle, Mongavlin to Carrigans pNHA

As this site forms part of a designated Natura 2000 site (River Finn SAC), impacts from the proposed development were jointly assessed in the accompanying NIS. Figure 6.5 below shows the subject site in relation to pNHA sites within a 15km radius.

**Figure 6.5: Nationally Designated Sites Proximal to The Proposed Development**




**CYAL50244901** © Ordnance Survey Ireland/Government of Ireland

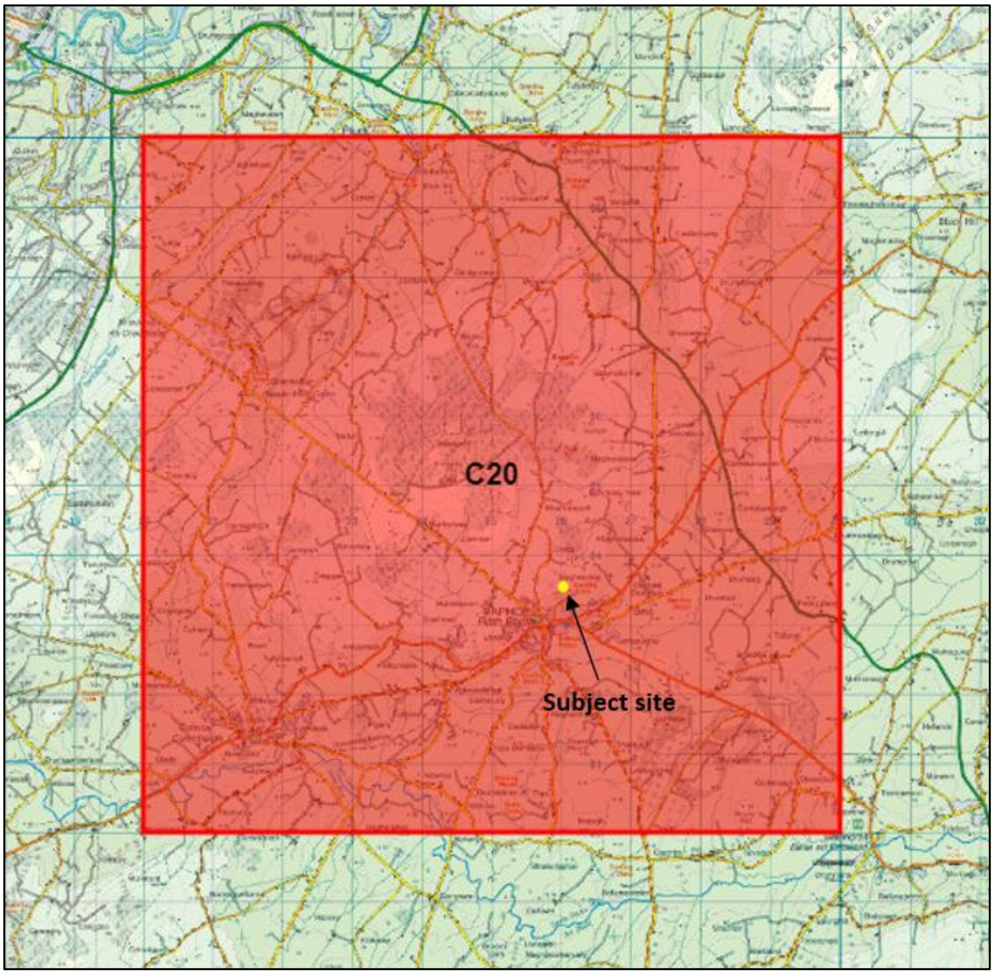
### *6.6.1.2 Flora and Fauna records and Implications for Field Study*

#### *6.6.1.2.1 Mammals*

Mammal observation records from Hectad C20[8] (site of proposed development) and adjacent Hectads of C30 and H29 (each hectad covers a 10km area) were searched to establish a more comprehensive picture of the landscape and supporting habitat for mammal species (excluding bats). Map 6.1 shows the location of subject site within Hectad C20.

[8] National Biodiversity Data Centre - https://maps.biodiversityireland.ie/Map

**Map 6.1: Location of subject site within Hectad C20**




**CYAL50244901** © Ordnance Survey Ireland/Government of Ireland

Mammals are important members of food chains and food webs, as grazers and as predators. Mammals are typically important for maintaining services and functions associated with sustaining a balanced ecosystem including engineering aspects of their environment, seed dispersal, and maintaining balance in their communities.

Table 6.3 provides details of mammal records proximal to the quarry site. Data was accessed through the National Biodiversity Data Centre[9]. The dataset accessed was the Atlas of Mammals in Ireland 2010-2015 and Mammals of Ireland 2016-2025.

**Table 6.3: Mammal Records**

| Species Name | Legislative Status | Record Count | Date of Last Record |
|---|---|---|---|
| **Hectad C20** | | | |
| ***Eurasian badger*** *(Meles meles)* | Wildlife Acts | 35 | 31/12/2013 |
| ***Otter*** *(Lutra lutra)* | Annex II Habitats Directive, Wildlife acts | 2 | 12/01/2010 |
| ***Irish hare*** *(Lepus timidus hibernicus)* | | 1 | 24/03/2001 |
| ***Irish stoat*** *(Mustela erminea Hibernica)* | | 2 | 08/07/2003 |
| ***Red deer*** *(Cervus elaphus)* | Wildlife Acts | 1 | 22/06/2016 |
| ***Sika Deer*** *(Cervus nippon)* | | 1 | 31/12/2008 |
| ***Red fox*** *(Vulpes vulpes)* | | 1 | 28/05/1990 |

[9]National Biodiversity Data Centre - https://maps.biodiversityireland.ie/Dataset

| Species Name | Legislative Status | Record Count | Date of Last Record |
|---|---|---|---|
| ***West European hedgehog*** *(Erinaceus europaeus)* | Wildlife acts | 2 | 30/03/2017 |
| ***Eurasian pygmy shrew*** *(Sorex minutis)* | Wildlife Acts | 2 | 07/07/2013 |
| ***American mink*** *(Mustela vison)* | | 2 | 01/04/2006 |
| ***Grey squirrel*** *(Sciurus carolinensis)* | | 5 | 27/03/219 |
| ***European Rabbit*** *(Oryctolagus cuniculus)* | | 6 | 11/10/2014 |
| ***Red Squirrel*** *(Sciurus vulgaris)* | Wildlife Acts | 3 | 18/08/2017 |
| ***Common Seal*** *(Phoca vitulina)* | Annex II and V Habitats Directive, Wildlife acts | 1 | 22/03/1994 |
| **Hectad C30** | | | |
| ***American mink*** *(Mustela vison)* | | 3 | 16/06/2012 |
| ***Grey squirrel*** *(Sciurus carolinensis)* | | 4 | 13/01/2015 |
| ***Eurasian badger*** *(Meles meles)* | Wildlife Acts | 38 | 31/12/2015 |
| ***Red Squirrel*** *(Sciurus vulgaris)* | Wildlife Acts | 3 | 31/12/2012 |
| ***Otter*** *(Lutra lutra)* | Annex II Habitats Directive, Wildlife acts | 4 | 02/02/2012 |
| ***European Rabbit*** *(Oryctolagus cuniculus)* | | 19 | 09/03/2007 |
| ***Irish hare*** *(Lepus timidus hibernicus)* | | 7 | 20/05/2009 |
| ***Irish stoat*** *(Mustela erminea Hibernica)* | | 2 | 03/03/2000 |
| ***Red fox*** *(Vulpes vulpes)* | | 6 | 31/12/2008 |
| ***Sika Deer*** *(Cervus nippon)* | | 1 | 31/12/2008 |
| ***West European hedgehog*** *(Erinaceus europaeus)* | Wildlife acts | 1 | 11/10/2014 |
| **Hectad H29** | | | |
| ***American mink*** *(Mustela vison)* | | 9 | 22/03/2012 |
| ***Brown Hare*** *(Lepus europaeus)* | | 7 | 07/06/2007 |
| ***Grey squirrel*** *(Sciurus carolinensis)* | | 7 | 31/12/2012 |
| ***Eurasian badger*** *(Meles meles)* | Wildlife Acts | 109 | 31/12/2013 |
| ***Eurasian pygmy shrew*** *(Sorex minutis)* | Wildlife Acts | 1 | 22/061995 |
| ***Otter*** *(Lutra lutra)* | Annex II Habitats Directive, Wildlife acts | 12 | 12/08/2011 |
| ***European Rabbit*** *(Oryctolagus cuniculus)* | | 3 | 26/10/2009 |
| ***Irish hare*** *(Lepus timidus hibernicus)* | | 28 | 09/02/2010 |
| ***Irish stoat*** *(Mustela erminea Hibernica)* | | 5 | 11/08/2014 |
| ***Pine Marten*** *(Martes martes)* | Annex V Habitats Directive, Wildlife acts | 2 | 06/05/2016 |
| ***Red deer*** *(Cervus elaphus)* | Wildlife Acts | 1 | 31/12/2008 |
| ***Red fox*** *(Vulpes vulpes)* | | 60 | 07/06/2012 |
| ***Sika Deer*** *(Cervus nippon)* | | 1 | 31/12/2008 |
| ***West European hedgehog*** *(Erinaceus europaeus)* | Wildlife acts | 15 | 11/10/2014 |
| ***Wood Mouse*** *(Apodemus sylvaticus)* | | 7 | 01/07/2000 |

Desk research indicated historical mammal activity in the hectad of the quarry site. Moreover, desk research informed that further investigation of mammal activity within the quarry site was required.

#### *6.6.1.2.2 Bats*

Records from Hectad C20 (site of proposed development) and the adjacent hectads of C30 and H29 were searched to establish a more comprehensive picture of the landscape and supporting habitat for bat species. Table 6.4 presents data of bat records in proximal hectads. Figure 6.4 shows the location of Hectads C30 and H29 in relation to the subject site and also illustrates the location of the quarry site in relation to these and gives the Bat suitability index for each area.

**Table 6.4: Bat Records**

| Species Name | Count | Date of Last Record |
|---|---|---|
| **Hectad C20** | | |
| **Daubertons bat** (*Myotis daubentonii)* | 23 | 19/08/2008 |
| **Lesser noctule** (*Nyctalus leislerlei)* | 2 | 26/06/2009 |
| **Soprano pipistrelle** (*Pipistrellus pygmaeusl)* | 5 | 10/08/2014 |
| **Brown long eared bat** (*Plecotus auratus*) | 1 | 26/06/2009 |
| **Pipistrelle bat** (*Pipistrellus pipistrellus*) | 1 | 26/06/2009 |
| **Hectad C30** | | |
| **Common Pipistrelle** *(Pipistrellus pipistrellus sensu stricto)* | 1 | 03/10/1996 |
| **Daubertons bat** (*Myotis daubentonii)* | 1 | 17/09/2009 |
| **Lesser noctule** (*Nyctalus leislerlei)* | 2 | 17/09/2009 |
| **Soprano pipistrelle** (*Pipistrellus pygmaeusl)* | 5 | 27/09/2009 |
| **Hectad H29** | | |
| **Common Pipistrelle** *(Pipistrellus pipistrellus sensu stricto)* | 1 | 11/08/2014 |
| **Daubertons bat** (*Myotis daubentonii)* | 20 | 24/08/2014 |
| **Lesser noctule** (*Nyctalus leislerlei)* | 3 | 11/08/2014 |
| **Pipistrelle** (*Pipistrellus pipistrellus sensu lato*) | 1 | 17/09/2009 |
| **Soprano pipistrelle** (*Pipistrellus pygmaeusl)* | 3 | 11/08/2014 |

The data presented in Table 6.4 is not definitive. A dedicated survey has not been carried out in recent years. Hectad C20 (Quarry Site) has an all-Bat Suitability index of 20.48. This index was accessed through the National Biodiversity Data Centre and is calculated based on research by Lundy et al. (2011)[10]. The index ranges on a scale from 0 to 59 depending on the suitability of the habitats and resources available. Figure 6.6 illustrates the total bat suitability index for all bat species. A more detailed breakdown per species is presented in Table 6.5.

[10] Lundy, M.G., Aughney, T., Montgomery, W.I., & Roche, N., (2011) Landscape conservation for Irish bats & species specific roosting characteristics. Bat Conservation Ireland.

**Figure 6.6: Bat Suitability Index for Relevant Hectads**


National Biodiversity Data Centre

**Table 6.5: Breakdown of All Bats Suitability Index by Species**

| | C20 | C30 | H29 |
|---|---|---|---|
| ***All Bats*** | 20.78 | 23.33 | 21.89 |
| ***Soprano pipistrelle*** | 20.78 | 17.89 | 24.78 |
| ***Brown long-eared bat*** | 20.11 | 26.56 | 21.89 |
| ***Common pipistrelle*** | 20.78 | 23.33 | 21.89 |
| ***Lesser horseshoe*** | 20.78 | 28.11 | 24.78 |
| ***Leislers bat*** | 20.78 | 28.11 | 24.78 |
| ***Whiskered bat*** | 20.78 | 28.11 | 21.89 |
| ***Daubertons bat*** | 20.78 | 26.56 | 21.89 |
| ***Nathusius pipistrelle*** | 20.78 | 28.11 | 21.78 |
| ***Natters bat*** | 20.78 | 28.11 | 21.78 |

This table has been created using data sourced from the National bat database of Ireland and Irelands BioBlitz by the National Biodiversity data centre.

Based on consideration of historical records of bats in hectad C20, C30 and H29 and the characteristics of bat species recorded it was deemed necessary to conduct a tree survey for potential bat roosting features. Greentrack conducted a tree survey to identify potential roosting on 25/02/2022. Binoculars were used to inspect trees from the ground to the canopy for any signs of bat activity including natural holes, cracks/splits in major limbs, loose bark, hollows/cavities, dense epicormic growth and bird and bat boxes. Results can be found in Section 6.6.2.2.3

***6.6.1.2.4 Birds***

There are no SPA's within the vicinity of the quarry (the nearest is Lough Swilly SPA which is located c. 7.51km SW from the subject site). A search for avian records in Hectad C20 was conducted using a combination of data from the National Biodiversity Data Centre and the Bird Atlas of Ireland 2007-2011. The Bird Atlas of Ireland 2007-2011 collates data from the survey of bird distribution, in summer and winter, over the four-year period between 2007 and 2011. The survey work was carried out by Bird Watch Ireland. A total of 115 avian species have been recorded in this area. The activity of bird species in the area of the proposed development suggested a dedicated bird survey was required to determine avian activity throughout the footprint of the proposed development. Records of bird species in Hectad C20 are provided in Table 6.6 below.

**Table 6.6: National Biodiversity Data Centre and Bird Atlas of Ireland records in Hectad C20**

| Species Name | Scientific Name |
|---|---|
| **Barn Owl** | *Tyto alba* |
| **Barn Swallow** | *Hirundo rustica* |
| **Black-billed Magpie** | *Pica pica* |
| **Blackcap** | *Sylvia atricapilla* |
| **Black-headed Gull** | *Larus ridibundus* |
| **Blue Tit** | *Cyanistes caeruleus* |
| **Brambling** | *Fringilla montifringilla* |
| **Chaffinch** | *Fringilla coelebs* |
| **Coal Tit** | *Periparus ater* |
| **Common Blackbird** | *Turdus merula* |
| **Common Bullfinch** | *Pyrrhula pyrrhula* |
| **Common Buzzard** | *Buteo buteo* |
| **Common Chiffchaff** | *Phylloscopus collybita* |
| **Common Crossbill** | *Loxia curvirostra* |
| **Common Cuckoo** | *Cuculus canorus* |
| **Common Grasshopper Warbler** | *Locustella naevia* |
| **Common Kestrel** | *Falco tinnunculus* |
| **Common Kingfisher** | *Alcedo atthis* |
| **Common Linnet** | *Carduelis cannabina* |
| **Common Moorhen** | *Gallinula chloropus* |
| **Common Pheasant** | *Phasianus colchicus* |
| **Common Raven** | *Corvus corax* |
| **Common Snipe** | *Gallinago gallinago* |
| **Common Starling** | *Sturnus vulgaris* |
| **Common Swift** | *Apus apus* |
| **Common Whitethroat** | *Sylvia communis* |
| **Common Wood Pigeon** | *Columba palumbus* |
| **Corncrake** | *Crex crex* |
| **Eurasian Collared Dove** | *Streptopelia decaocto* |
| **Eurasian Curlew** | *Numenius arquata* |
| **Eurasian Jackdaw** | *Corvus monedula* |
| **Eurasian Jay** | *Garrulus glandarius* |
| **Eurasian Siskin** | *Carduelis spinus* |
| **Eurasian Sparrowhawk** | *Accipiter nisus* |
| **Eurasian Tree Sparrow** | *Passer montanus* |
| **Eurasian Treecreeper** | *Certhia familiaris* |
| **Eurasian Woodcock** | *Scolopax rusticola* |
| **European Goldfinch** | *Carduelis carduelis* |
| **European Greenfinch** | *Carduelis chloris* |
| **European Robin** | *Erithacus rubecula* |

| Species Name | Scientific Name |
|---|---|
| **Fieldfare** | *Turdus pilaris* |
| **Goldcrest** | *Regulus regulus* |
| **Great Black-backed Gull** | *Larus marinus* |
| **Great Tit** | *Parus major* |
| **Grey Heron** | *Ardea cinerea* |
| **Grey Wagtail** | *Motacilla cinerea* |
| **Gyr Falcon** | *Falco rusticolus* |
| **Hedge Accentor** | *Prunella modularis* |
| **Herring Gull** | *Larus argentatus* |
| **Hooded Crow** | *Corvus cornix* |
| **House Martin** | *Delichon urbicum* |
| **House Sparrow** | *Passer domesticus* |
| **Lesser Redpoll** | *Carduelis cabaret* |
| **Long-eared Owl** | *Asio otus* |
| **Long-tailed Tit** | *Aegithalos caudatus* |
| **Loxia** | *Loxia curvirostra* |
| **Mallard** | *Anas platyrhynchos* |
| **Meadow Pipit** | *Anthus pratensis* |
| **Merlin** | *Falco columbarius* |
| **Mistle Thrush** | *Turdus viscivorus* |
| **Northern Lapwing** | Vanellus vanellus |
| **Northern Wheatear** | *Oenanthe oenanthe* |
| **Pied Wagtail** | *Motacilla alba subsp. yarrellii* |
| **Red Grouse** | *Lagopus lagopus* |
| **Redwing** | *Turdus iliacus* |
| **Reed Bunting** | *Emberiza schoeniclus* |
| **Rock Pigeon** | *Columba livia* |
| **Rook** | *Corvus frugilegus* |
| **Sand Martin** | *Riparia riparia* |
| **Sedge Warbler** | *Acrocephalus schoenobaenus* |
| **Sky Lark** | *Alauda arvensis* |
| **Song Thrush** | *Turdus philomelos* |
| **Spotted Flycatcher** | *Muscicapa striata* |
| **Stonechat** | *Saxicola torquata* |
| **Tundra Swan** | *Cygnus columbianus* |
| **White Wagtail** | *Motacilla alba* |
| **White-throated Dipper** | *Cinclus cinclus* |
| **Whooper Swan** | *Cygnus cygnus* |
| **Willow Warbler** | *Phylloscopus trochilus* |
| **Winter Wren** | *Troglodytes troglodytes* |
| **Yellowhammer** | *Emberiza citrinella* |

***6.6.1.2.4 Amphibians and Reptiles***

Table 6.7 provides records for amphibians and reptiles that have been recorded within Hectad C20. Data was accessed through the National Biodiversity Data Centre.

**Table 6.7: Amphibians and Reptiles**

| Species Name | Scientific Name |
|---|---|
| **Common Frog** | *Rana temporaria* |

### *6.6.1.2.5 Rare and Protected Plant Species*

There are no rare or protected species recorded within the hectad according to data supplied by the National Biodiversity Data Centre. Any incidental sightings during field survey were to be recorded.

### *6.6.1.2.6 Invasive Species*

Invasive species recorded in Hectad C20 are presented in Table 6.8. Data was accessed through the National Biodiversity Data Centre. Only species recorded in the last 20 years are shown.

**Table 6.8 Invasive Species in Hectad C20**

| Species Name | Scientific Name |
|---|---|
| **Vertebrates** | |
| **American Mink** | *Mustela vison* |
| **European Rabbit** | *Oryctolagus cuniculus* |
| **Grey Squirrel** | *Sciurus carolinensis* |
| **Sika Deer** | *Cervus nippon* |
| **Invertebrates** | |
| **Flatworm (Turbellaria)** | *Arthurdendyus triangulatus* |
| **Flora** | |
| **Barberry** | *Berberis vulgaris* |
| **Black currant** | *Ribes nigrum* |
| **Butterfly-bush** | *Buddleja davidii* |
| **Evergreen Oak** | *Quercus ilex* |
| **Giant Hogweed** | *Heracleum mantegazzianum* |
| **Himalayan Honeysuckle** | *Leycesteria formosa* |
| **Himalayan Knotweed** | *Persicaria wallichii* |
| **Indian Balsam** | *Impatiens glandulifera* |
| **Japanese Knotweed** | *Fallopia japonica* |
| **Japanese Rose** | *Rosa rugosa* |
| **Red Oak** | *Quercus rubra* |
| **Rhododendron** | *Rhododendron ponticum* |
| **Salmonberry** | *Rubus spectabilis* |
| **Spanish Bluebell** | *Hyacinthoides hispanica* |
| **Sycamore** | *Acre pseudoplantus* |
| **Three-cornered Garlic** | *Allium triquetrum* |
| **Thunberg's Barberry** | *Berberis thunbergii* |
| **Wall Cotoneaster** | *Cotoneaster horizontalis* |
| **Winter Heliotrope** | *Petasites fragrans* |

### ***6.6.1.3 Baseline Hydrology***

A hydrological walkover survey, including detailed mapping and baseline monitoring/sampling, was undertaken by Colin Farrell of Greentrack on various dates between September 2021 and March 2022. The field assessments included a detailed site walkover survey, water features survey, and an inspection of all relevant hydrological features, such as existing drainage ditches, groundwater contributions and inflows/outflows from the site.

The subject site is located within the Northwestern River Basin District, hydrometric area 01 – Foyle (BGNIIENW) and Johnston Stream sub catchment area (JohnstonStream_SC_010), and Swilly Burn

River Sub Basin (Swilly Burn_020). Site drainage, surface water runoff and water management within the current site are schematically represented in Figure 8.4 within Section 8 of this EIAR. Dominant flow direction in the region is east towards the River Finn. There are no EPA monitoring points on the tributary of the Swilly Burn directly linked to the subject site. There are 5 EPA monitoring points along the main reach of the Swilly Burn. The latest Q values for all of these monitoring stations indicate a value of 3, poor ecological status.

Greentrack conducted an ecological assessment on the tributary of the Swilly extending from the application site in October 2021 with a follow up conducted in April 2022. Benthic macroinvertebrates were used as bioindicators as they provide a realistic record of the prevailing water quality conditions. The sample point of both ecological assessments and the latest EPA Q values along the Swilly Burn are shown in Figure 8.26 in Section 8 of this EIAR (see Section 8: *Water* for full detail on site hydrology).

A 3-minute kick sampling search was carried out at both points during the two visits using a standard hand net (250mm width, mesh size 500 micron) whilst adhering to ISO 10870:2012 standard procedures[11]. No taxa were recorded during either assessment as point 1. The condition of the stream during each assessment was very poor with signs of acidification from the forestry to the North of the site giving site 1 a Q value of 1 (Bad ecological status)[12]. Class C, D & E invertebrates dominated both samples taken at point 2 with no EPA class A or B clean water invertebrates present in the either sample collected. Both samples collected from point 2 contained class C (moderately pollution tolerant) invertebrate species crustacean Gammarus duebeni and were dominated by (class D) (pollution tolerant) crustacean Asellus aquaticus and class E (very tolerant) Tubificid sp. worms and Chironomus riparius. The dominance in the samples of pollution tolerant invertebrates accounted for a Q rating of 2-3 (i.e. poor status), in line with the EPA score of 2-3.

#### ***6.6.1.4 Conclusions from Desk Study***

This desk study exercise provided information about the existing environment in Hectad C20 of the proposed development in addition to adjoining hectads C30 and H29. The desk study identified the following designated sites as susceptible to impact from the proposed development:

- **River Finn SAC**
- **River Foyle and Tributaries SAC**
- **River Foyle, Mongavlin to Carrigans pNHA**

Moreover, the desk study found that a variety of flora, fauna and ecological receptors required further investigation. Protected faunal species including Badger, Bat and Bird Species occur in the vicinity of the proposed development and were deemed to require further investigation. Invasive species were also recorded within Hectad C20. No invasive species were observed during site investigations in and around the subject site. However best practice must be followed in all aspects of construction and operation of the proposed development as the introduction of invasive species on site could negatively affect local biodiversity.

Desk research identified a variety of avian species recorded in the vicinity of the proposed development. Further investigation of avian species was deemed necessary.

Desk research identified the subject site falls within the North-western River Basin District, Water Framework Directive (WFD) Catchment 01 Foyle and falls within WFD sub-catchments JohnstonStream_SC_010. Further assessment is required to ensure no deterioration in water resource quality occurs as a result of the proposed development.

[11] ISO 10870:2012 Water quality — Guidelines for the selection of sampling methods and devices for benthic macroinvertebrates in fresh waters https://www.iso.org/standard/46251.html
[12] EPA RIVER QUALITY SURVEYS: BIOLOGICAL - https://epawebapp.epa.ie/qvalue/webusers/

## 6.6.2 Field Study

### *6.6.2.1 Habitat Survey and Botanical Survey*

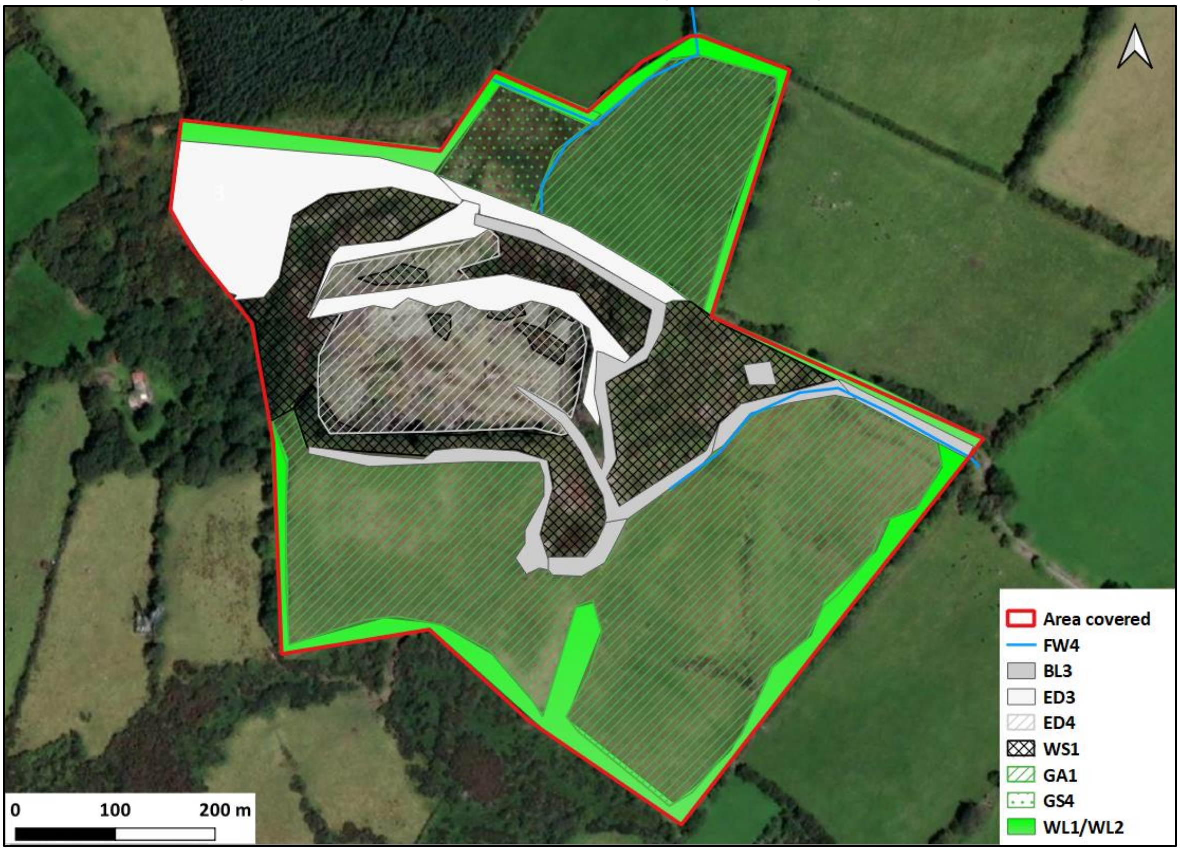
The following habitats listed in Table 6.9 were recorded within the quarry site during a Phase 1 habitat survey and classified according to Fossitt (2000). Habitat classification was informed by results from the dedicated botanical survey. Full details of the botanical survey are provided in Appendix 6.1.

**Table 6.9: Habitats on Site and surrounding environs**

| Habitat Type | |
|---|---|
| **GA1** | Improved agricultural grassland |
| **ED4** | Active quarries and mines |
| **WL2** | Treelines |
| **GS4** | Wet grassland |
| **WL1** | Hedgerows |
| **ED3** | Recolonising bare ground |
| **WS1** | Scrub |
| **FW4** | Drainage ditches |

The habitats recorded are illustrated in Figure 6.7 with a legend of habitat details. A brief outline of the characteristics of habitats on site is provided in the remainder of this section. However, position and scale of habitats shown are approximate only and should be considered only as a broad representation of the study area.

**Figure 6.7: Habitats within the Quarry Site and adjacent lands**




This map was created on QGIS software using data collected during site visits according to Fossitts guide to habitats in Ireland

#### *6.6.2.1.1 Habitats*

**ED4 Active quarry**

Active Quarry is the dominant habitat type within the subject site and can be broadly described as exposed rock faces, minimal stockpiles and bare ground sparsely recolonising with ruderal species. The quarry void also contains standing water. Occasional clumps of rushes (*Juncus effuses)* and creeping bent (*Agrostis stolonifera*) were noted within the void. Around the edges of the quarry void species such as gorse (*Ulex europaeus)* and bramble (*Rubus fruticosus agg*) are encroaching and re-establishing on areas which were previously worked. With the exception of the exposed rock face as a nesting area for breeding birds, the subject site does not offer suitable opportunities for fauna. No evidence of bird nesting on the rock face was noted during any of the site visits undertaken between October 2021-February 2022.

**Photograph 6.1: Current quarry void**

**WS1 Scrub**

Some sections of hedgerow along the site perimeter have gone unmanaged and have widened out into areas of scrub dominated by gorse. This habitat was observed dispersed over the site, with areas dominant around the current quarry face and ledges and the quarry surrounds. Scrub onsite predominantly consists of gorse and bramble which are of poor ecological value. The scrub area on the western perimeter of the site will be left in situ and will form part of the re-instatement phase of the quarry. The scrub located in and around the quarry face will be removed to allow extraction work to commence.

**Photograph 6.2: Scrub habitat**

**WL1 and WL2 – Hedgerows and Treelines**

The majority of the site boundaries consist of hedgerows and treelines. Combined, these have an approximate length of 1.4km. These borders are very overgrown and have become dominated heavily by gorse and bramble. Other species present include Goat willow (*Salix caprea*), Mountain ash (*Sorbus aucuparia*), and Common Hawthorn (*Crataegus monogyna)* which is being overcome with Ivy (*Hedera*). The species present within these hedgerows and treelines are commonly occurring and widespread throughout the surrounding areas. A section of hedgerow around the NW/NE boundary may be removed under phase 3 and 4 to accommodate the proposal but the majority of all hedgerows/treelines will be retained by the applicant.

**Photograph 6.3: Treeline spanning part of the NE site boundary**

**FW4 Drainage Ditch**

Two separate drainage ditches are currently located within the quarry site as per Figure 6.3. These are the only two defined water channels on the site. Both these channels discharge into the Swilly Burn and flow onwards into the Foyle system.

**Photograph 6.4: Drainage Ditch along the North-eastern boundary**

**GA1 Improved agricultural grassland**

Improved agricultural grassland makes up the majority of the quarry site and surrounding environs. This habitat is species poor and is dominated by rye grasses with occasional areas of rushes and clover. Improved agricultural grasslands are dominant in the wider environment as the quarry site is located in an area of intensive farming. GA1 habitat within quarry site covers an area of approx. 59,000m². During the operational phase, an area of approx. 11,000$m^2$ of GA1 habitat will be lost around the NE corner under phase 4. During phase 4 approx. 200,000$m^3$ (540,000 T) of rock will be extracted. A further c. 4575m² of GA1 habitat will be lost within the site to accommodate the new settlement pond and wetland system. The loss of habitat will not be significant as it is not rich in biodiversity and is very common within the surrounding environs. Measures to offset the effects of the removal of this habitat have been incorporated into this EIAR to ensure that there will be no negative effects after mitigation.

**Photograph 6.5: GA1 Improved grassland**

**GS4 Wet grassland**

A small area of wet grassland was noted along the NW site boundary, adjacent to the conifer plantation. This habitat covers an area of approximately 3,650m² and is dominated by rushes. Other species noted include sedges *(Carex* spp.), yorkshire fog *(Holcus lanatus)*, bents (*Agrotis* spp.), marsh foxtail *(Alopecurus geniculatus)*, meadow grass *(Poa* spp.*)*, and creeping buttercup *(Ranunculus repens)*. During the operational phase, this area is included in the extraction area proposed under phase 3 in which approx. 170,000$m^3$ of rock which equates to 459,000 T will be extracted. The loss of habitat will not be significant as it is very common within the surrounding environs. Measures to offset the effects of the removal of this habitat have been incorporated into this EIAR to ensure that there will be no negative effects after mitigation.

Dumping of slurry within this area was noted during the site visits undertaken in 2019 under the original planning application (19/52095) which subsequently had a detrimental effect on the water quality in the area as evident by the elevated BOD within the sample. No dumping of slurry or any other farmyard matter was noted within the area during any of the site visits undertaken for the current application.

**Photograph 6.6: GS4 habitat along the NW boundary**

**ED3 Recolonising Bare Ground**

Along the northern area of the site there are multiple areas of recolonising bare ground which consists of rock debris, exposed soil, grasses, sedges, rushes and juvenile gorse. These areas are of no significant ecological value and will eventually be encroached by scrub, if left undisturbed. These areas form part of the proposed extraction area under phase 2 during which approx. 280,000m³ (756,000 T) of rock will be extracted.

**Photograph 6.7: Area of recolonised bare ground along the quarry ledge**

**Habitats within the surrounding environs**

The habitats located within the quarry site, Figure 6.8, are also common within the surrounding environs. The majority of the surrounding habitat consists of (GA1) Improved agricultural grassland as farming is the main land use within the area. Sheep and cattle graze the lands immediately surrounding the existing quarry void. Several conifer plantations (WD4) are also noted within the vicinity of the quarry site. The hedgerows and treelines within the site provide avenues of connectivity to the surrounding environs.

**Figure 6.8: Habitats in the surrounding environs**


This map was created on QGIS software using data collected during site visits according to Fossitts guide to habitats in Ireland

***6.6.2.2 Mammal Survey***

Dedicated and incidental mammal surveys were carried out with particular focus on hotspots of mammal activity identified during the initial multidisciplinary site walkover.

***6.6.2.2.1 Badger***

There were no badger setts observed in the quarry site. There was no evidence of badger feeding, tracks or other signs onsite.

***6.6.2.2.2 Other Mammal Evidence/Activity***

Red deer tracks were observed during multiple site visits. The tracks were noted around the SW boundary through an area of scrub. Grey squirrels were also observed during two sites visits within the tree cover around the western boundary. Both of these areas are outside the proposed extraction area. The tree cover will be retained under the proposal. No other mammal presence was noted during any of the site visits. Figure 6.9 shows the locations of the grey squirrels and red deer tracks observed within the site.

**Table 6.10: Mammal activity noted within the site**

| 18/01/22 | |
|---|---|
| **Species noted** | **Type of sign observed** |
| Grey squirrel | Two live animals observed |
| Red deer | Hoof marks observed |
| **25/02/22** | |
| **Species noted** | **Type of sign observed** |
| Grey squirrel | One live animal observed |
| Red deer | Hoof marks observed |

**Figure 6.9: Location of mammal activity noted within the site**


**CYAL50244901** © Ordnance Survey Ireland/Government of Ireland

***6.6.2.2.3 Bat***

Tree inspections throughout the quarry site did not reveal any signs of bats but several contain suitable roosting potential for bats. All trees around the site boundaries are to be avoided by design as part of the proposed development which may increase potential bat habitat in the receiving environment. The disused quarry may also begin to provide suitable as it reclaimed by nature once operation has ceased.

***6.6.2.4 Bird Survey***

Multiple bird observation reports were conducted over 3 months (Dec 21-Feb 22) encompassing the entire footprint of the quarry site. The site boundaries recorded the most bird activity. The site boundaries of mature vegetation provide good cover, foraging and habitat connectivity. Several species of bird were recorded during the survey including:

- Jackdaw
- Crow
- Rook
- Robin
- Blackbird
- Song thrush
- Mistle thrush
- Wren

- Blue tit
- Great tit
- Goldcrest
- Long tailed tit
- Dunnock
- Goldfinch
- Meadow pipit
- Collared dove
- Pied wagtail
- Siskin
- Stonechat

No protected bird species were noted during any of the site visits undertaken. A small section of hedgerows/treelines will be removed around the NW/NE boundaries to accommodate the proposed development. Mitigation measures to offset any negative impacts on nesting birds from quarrying activities have been incorporated into the EIAR (see Section 6.7.4).

### 6.6.3 Identification of Key Ecological Receptors

Table 6.11 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 that are Key Ecological Receptors. These ecological receptors are considered in Section 6.7 of this report and mitigation/ measures will be incorporated into the proposed development where required, to avoid potential significant impacts on the features.

**Table 6.11: Identification of KERs**

| Ecological Feature / Species | Reason for Consideration as KER | KER Yes/No |
|---|---|---|
| **Designated Sites** | **Nationally Designated Sites**<br>The following nationally designated sites have been identified as requiring further assessment.<br>• River Foyle, Mongavlin to Carrigans pNHA<br>This site is of **National Importance.** | **Yes** |
| | **International/European Sites**<br>The following nationally designated sites have been identified as requiring further assessment:<br>• River Finn SAC<br>• River Foyle and Tributaries SAC<br>These sites are of **International Importance.** | **Yes** |
| **Aquatic Habitats and Species** | **Streams**<br>The Swilly Burn which drains the site and the aquatic species therein are assigned **local importance (Higher value).** The Swilly Burn flows into the Foyle system which is designated under the River Finn SAC and the River Foyle and Tributaries SAC which are both of **International Importance.** | **Yes** |
| | **Drainage ditches**<br>This habitat has been assigned **local importance (lower value)** | No |
| **Grassland Habitat** | The grassland habitat within the site has been assigned as **local importance (lower value).** During the operational phase, C. 14,650m² will be lost under phases 3 and 4 with a further 4575m² of GA1 habitat lost to accommodate the new settlement pond and wetland system. This habitat is not rich in biodiversity and common within the | **Yes** |

| Ecological Feature / Species | Reason for Consideration as KER | KER Yes/No |
|---|---|---|
| | surrounding environs. Removal of the grassland habitat could have a wider impact on the hydrology of the surrounding area and has been designated as a KER for this reason. | |
| **Woodland Habitat** | **Treelines and Hedgerow**<br>This habitat has been assigned **local importance (higher value)** due to avenues of connectivity it provides to local wildlife and the bird activity within this habitat. Hedgerow are included as KERs due to the potential for direct impact from disturbance to species this habitat supports. | **Yes** |
| **Built/Man Made Habitats** | **Active quarries and mines**<br>This habitat has been assigned **local importance (lower value)** | No |
| | **Recolonising bare ground.**<br>This habitat has been assigned **local importance (lower value)** | No |
| | **Buildings and artificial surfaces**<br>This habitat has been assigned **local importance (lower value)** | No |
| **Scrub** | This habitat has been assigned **local importance (lower value)** | No |
| **Badger** | Badger presence was not identified during survey and site investigation.<br>This species is not a KER as its presence was not observed during site investigation and there is no evidence of badgers within the site | No |
| **Bat** | Bat presence was not identified during survey and site investigation.<br>This species is not a KER as its presence was not observed during site investigation. Some trees around the site boundaries contain suitable roosting features which are to be retained by the applicant | No |
| **Otter** | Otter presence was not identified on site. Both drainage ditches occurring within the site are too narrow and shallow to support the needs of otters | No |
| **Deer/Squirrel/Other Mammals** | Evidence of these mammal species was observed on site.<br>Collectively these species are assigned **local (higher value)** and are assessed as a KER under other mammals | **Yes** |
| **Birds and bird habitat** | Bird species occurring on site and the habitats including the hedgerows and treelines that span the site boundaries at the are assigned **Local Importance (Higher Value)**, these are considered a KER. | **Yes** |
| **Amphibians/Reptiles** | Amphibian and reptile presence was not identified on site and therefore not considered a KER. | No |

## 6.7 Ecological Impact Assessment

### 6.7.1 Do Nothing Scenario

If the proposed development were not to occur the subject site would remain in its current condition.

### 6.7.2 Effects on Designated Sites

None of the elements of the proposed development are located within the boundaries of any National or European designated sites. There will be no direct effects on any designated site as a result of the construction, operation and decommissioning of the project including blasting and extracting rock in the extraction area or any other ancillary activities.

One nationally designated site was identified as being within the zone of influence and as KERs, River Foyle, Mongavlin to Carrigans pNHA. This pNHA is designated as a European Site under the River Finn SAC. In relation to European sites, an Appropriate Assessment Screening Report and Natura Impact Statement (NIS) have been prepared to provide the competent authorities with the information necessary to complete an Appropriate Assessment for the Proposed development in compliance with Article 6(3) of the Habitats Directive. The AA will address all concerns as the pNHA is covered under the River Finn SAC.

As per the EPA draft Guidance (201716), "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". This section provides a summary of the key assessment findings regarding Special Areas of Conservation (SACs) and Special Protection Areas (SPAs).

The NIS concluded:

*"The proposed project as detailed, either individually or in combination with other plans or projects, will have no significant adverse effects on the integrity of any European sites if all mitigating measures as outlined in Section 6 are implemented. The proposed development as described will not alter the structure or function of any Natura 2000 site or negatively impact the conservation of any qualifying interest/ special conservation interest therein".*

Based on the findings of the accompanying NIS it concluded that the proposed development would have no significant negative effects on the integrity of the following sites if all mitigation measures outlined within this EIAR and NIS are implemented in full:

- River Finn SAC
- River Foyle and Tributaries
- River Foyle, Mongavlin to Carrigans pNHA

### 6.7.3 Potential Invasive Species Threat

No invasive species were observed during site investigations. However, best practice[13] should be followed in all aspects of construction and operation of the proposed development as the introduction of invasive species on site could negatively affect local biodiversity. Therefore, it is recommended as a means of Invasive species mitigation that the following measures are implemented:

- Good construction site hygiene will be employed to prevent the spread of these species with vehicles thoroughly cleaned down prior to leaving any site with the potential to have supported invasive species.
- All plant and equipment employed on the construction site must be thoroughly cleaned down on site to prevent the spread of invasive plant. All clean down must be undertaken in areas with no potential to result in the spread of invasive species.

[13] http://invasivespeciesireland.com/invasive-plant-management/setting-your-priorities/

- Any material that is imported onto any site will be verified by the ECoW to be free from any invasive species listed on the 'Third Schedule' of Regulations 49 & 50 of Regulations 49 and 50 of the European Communities (Birds and Natural Habitats) Regulations 2011 (S.I. 477 of 2011). This will be carried out by searching for rhizomes and plant material.

The 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)

**6.7.4 Likely Significant Effects During Construction Stage**

This section examines the likely significant effects on KERs from the proposed development during the site clearance works and entire construction stage. Where likely significant effects are predicted appropriate mitigation will be suggested to avoid/reduce the significance of the effect on KERs.

**Table 6.12: Assessment of Potential Effects on Rivers/Streams and Sensitive Aquatic Faunal Species**

| | |
|---|---|
| **Description of effect** | This assessment considers the Swilly Burn which drains the site.<br>Soil/overburden removal, rock extraction, rock crushing and screening, and stockpiling of aggregate all have the potential to generate suspended sediment within the surface water runoff leaving the site. Any change in water quality could deleteriously affect sensitive aquatic faunal species.<br>Section 8: *Water*, outlines a series of measures to mitigate the probability of runoff of hydrocarbons which should be read in conjunction with this Section |
| **Characterisation of unmitigated effect** | Effects during construction are characterised as short-term negative on this KER |
| **Assessment of significance prior to mitigation** | Due to the proximity of the site to this receptor and the indirect discharge which occurs this effect prior to mitigation is deemed moderately adverse. |
| **Mitigation** | • An Ecological Clerk of Works (ECoW's) must be appointed for the site who will advise on the appropriate implementation of the mitigation measures outlined within the EIAR and the separate NIS.<br>• Prior to the commencement of any extraction and major clearance works, an extensive water management system must be implemented as detailed in section 8 of this report<br>• Areas proposed for soil stripping must be assessed by the ECoW prior to work commencing, during works and on completion of works. ECoW to liaise with site manager in relation to any issues that need to be addressed.<br>• Removal of overburden for berm construction must be in accordance with demand and must be controlled to reduce the risk of runoff containing silt.<br>• Any precipitation that falls on stripping or berm construction areas must be directed to the new primary settlement pond.<br>• A silt fence must be erected along the outside of the berms to stop runoff flowing offsite<br>• Excavated material must be loaded onto dump trucks and hauled via designated routes to the location for berm construction along the site boundaries as per figure 15.6<br>• Should any haul routes cross the drainage system throughout the site, a culvert must be constructed. |

| | |
|---|---|
| | • Any excess overburden remaining after the creation of the berms must be removed off site to an approved waste facility or a site which is planning compliant.<br>• Drains and silt traps must be maintained throughout all excavation and works, ensuring that they are clear of sediment build-up and are not severely eroded.<br>• Clearance works must cease in periods of heavy rainfall denoted by a Met Eireann status orange warning.<br>• Strict control of the site boundaries must be enforced by the Site Manager, including minimal land clearance and restrictions on the use of machinery near waterbodies. |
| **Residual effect** | No residual effect on this KER exists after mitigation during the construction stage |

**Table 6.13: Assessment of Potential Effects on Hedgerows and Treelines**

| | |
|---|---|
| **Description of effect** | The majority of the hedgerows/treelines which bound the site are to be retained by the applicant and will not be subjected to clearance work. |
| **Characterisation of unmitigated effect** | This effect is characterised as short-term negative |
| **Assessment of significance prior to mitigation** | This effect is assessed as imperceptible, as there will be no intentional clearance of the hedgerows/treelines with the only threat coming from accidental damage due to improper construction activity. |
| **Mitigation** | Mitigation by design:<br>• The project has been designed to avoid these habitats as far as practicable.<br>• Drawings and planned routes must be adhered to, thus ensuring the correct route corridor is followed.<br>• Prior to clearance during the construction stage the ECoW is to be consulted. Sensitive areas that are to remain untouched from clearance must be highlighted.<br>Other mitigation<br>• Once the construction works are complete, the site boundaries will be interplanted with a mix of native trees and shrubbery. The existing boundaries must be strengthened with the planting of additional trees. |
| **Residual effect** | There will be no residual effects on the integrity of KER hedgerow/treeline habitat after mitigation has been implemented. |

***Assessment of Potential Effects on Grassland***

The assessment of potential effects on grassland (both GA1 and GS4) during construction stage will be jointly assessed with the potential effects during operational stage. This will allow for a more precise assessment on the entire impact on this receptor.

**Assessment of Potential Effects on Birds and other fauna**

The table below mainly focuses on the potential impacts from noise from the construction works which could cause a disturbance to any birds/mammals which may be nesting/foraging within site.

**Table 6.14: Assessment of Potential Effects on Birds and other fauna**

| | |
|---|---|
| **Description of effects** | Phased removal of habitat and associated construction works could cause a disturbance to any birds/mammals which may be nesting/foraging within the proposed target area for clearance (phase 1-5). |
| **Characterisation of unmitigated effect** | The effect is characterised as short-term negative. |
| **Assessment of significance prior to mitigation** | Prior to mitigation this effect is considered not significant |
| **Mitigation** | • Each area (phase 1-5) must be examined by the ECoW prior to works commencing. If birds are observed breeding within the area (phase 1-5) then works must be delayed until chicks have fledged (as confirmed by the ECoW.<br>• Invasive activities are to be avoided during the primary breeding periods of wildlife, including removal of vegetation. The cutting of hedgerows is illegal from March 1st to August 31st, as per the Wildlife Act 1976 as amended 2000.<br>• All construction activity must be undertaken in line with BS 5228 - 1:2009+A1 2014 which includes guidance on several aspects of construction site practices such as: (a) Selection of quiet plant, (b) Control of noise sources, (c) Screening, (d) Hours of work.<br>• Plant used at the site must have noise emission levels that comply with the limiting levels defined in EC Directive 86/662/EEC and any subsequent amendments. Any plant that is used intermittently must be shut down when not in use to minimise noise levels.<br>• The best means practical, including proper maintenance of plant, must be employed to minimise the noise produced by on-site operations.<br>• All vehicles and mechanical plant must be fitted with effective exhaust silencers and maintained in good working order for the duration of the contract.<br>• Compressors must be of the “sound reduced” models fitted with properly lined and sealed acoustic covers which must be kept closed whenever the machines are in use and all ancillary pneumatic tools must be fitted with suitable silencers.<br>• All outdoor lighting (outside of the yard area) is to be hooded and limited to 10 watts maximum. Outdoor lighting should face downwards and be minimised at night and utilise motion sensors to reduce interference to nocturnal species.<br>• The external site boundaries must be vegetated with a mixture of native shrubs and trees which will act an acoustic barrier for the site. |
| **Residual effect** | No residual effects are envisaged after the implementation of mitigation on this KER |

### 6.7.5 Likely Significant Effects During Operational Stage

This section examines the likely significant effects on KERs from the proposed development during the operational stage. For the purposes of this assessment the operational stage comprises the proposed 25-year extraction and blasting of rock in the proposed 5.37ha area for extraction and all ancillary activities including processing of materials; stockpiling of materials; the manufacture of product; Transport to market; and operation of on-site facilities including office building and waste management.

Where likely significant effects are predicted appropriate mitigation will be suggested to avoid/reduce the significance of the effect on KERs.

**Table 6.15: Assessment of Potential Effects on Rivers/Streams and Sensitive Aquatic Faunal Species**

| | |
|---|---|
| **Description of effect** | (This assessment considers Swilly Burn Stream)<br>Insufficient water management would result in water of poor quality being discharged to the Swilly Burn. This could arise from a variety of operational processes. |
| **Characterisation of unmitigated effect** | The characterisation of effects on this KER is assessed as long-term negative in the absence of mitigation |
| **Assessment of significance prior to mitigation** | The assessment of this effect is moderate adverse due to the indirect discharge that will occur to the Swilly Burn. |
| **Mitigation** | • The quarry must adhere to the terms and condition of the new water discharge licence once issued.<br>• The water management system as detailed in Section 8 of this EIAR must be fully implemented before any extraction commences.<br>• All fuel and other chemicals must be stored within a fully bunded area within the machinery shed. The area must contain appropriate drip trays and spill kits available, for vehicle refuelling operations.<br>• The concrete bunded area adjacent to the fuel storage area must be used for vehicle refuelling operations.<br>• All drainage from the proposed machinery shed, refuelling area and lubricant storage shed must be directed through a hydrocarbon interceptor before flowing through the settlement treatment system.<br>• Maintain the hydrocarbon interceptor installed into the drainage system immediately before discharge of surface waters off site.<br>• Regular inspections and maintenance scheduling must be undertaken for all plant and vehicle to minimise the potential for malfunction or leak.<br>• An emergency spill kit with oil boom, absorbers etc. must be kept on site for use in the event of an accidental spillage/leak.<br>• Regular visual monitoring of all surface waters onsite for any surface sheen or sign of potential hydrocarbon pollution must be undertaken.<br>• Regular maintenance of settlement tanks must be undertaken to ensure efficiency and appropriate disposal of material removed.<br>• Suspension of extraction and material handling activities for the duration of a red level rainfall warning issued by Met Eireann must be adhered to.<br>• The site must maintain and continually update the environmental monitoring programme and monitor water, noise, dust, and blasting on a regular basis to demonstrate that the development is not having an adverse impact on the surrounding environment. |
| **Residual effect** | No residual effect is envisaged on this KER |

**Table 6.16: Assessment of Potential Effects on Grassland**

| | |
|---|---|
| **Description of effects** | Over the 25-year period of the proposed development, phased extraction will occur in the area for extraction as detailed in section 3. The proposed phasing of the extraction areas will result in the loss of c. 20,000m² of grassland habitat. This will involve the gradual stripping of vegetation, extraction of top layer of rock by mechanical means, blasting of rock and extraction. Removal of the grassland habitat could have a wider impact on the hydrology of the surrounding area |
| **Characterisation of unmitigated effect** | The removal of the both the improved agricultural grassland and wet grassland represents the removal of an ecological receptor of local importance (lower level). The characterisation of effects on this KER is assessed as long-term permanent negative in the absence of mitigation and compensation. |
| **Assessment of significance prior to mitigation** | Prior to implementing mitigation by design in addition to other mitigation measures this effect is assessed as significant. |
| **Mitigation** | • The area for extension was chosen as it is situated near the existing infrastructure such as roads. The area is adjacent to the existing dormant quarry and is the natural direction for further extraction based on site geology. Figure 6.5 illustrates the habitats that are found within the subject site. The majority of the habitat to be removed is improved agricultural grassland with a small amount of wet grassland. Both habitats are common in the surrounding environs. The removal of c.20,000m² of grassland represents a small percentage of grassland in the wider receiving environment.<br><br>Mitigation/ compensation:<br>• Overburden won from site clearance must be used to create berms around the site boundaries as per figure 15.6.<br>• Planting of the berms will improve the overall biodiversity within the subject site and will create wildlife corridors.<br>• Landscaping must use a mix of native species which will help support a wide range of insects and animals and will contribute to the ecological value of the area. Details of landscaping are laid out in Section 15 of this EIAR.<br>• Additionally, section 15 details a full restoration plan which must be implemented once quarrying activities have ceased which will allow the quarry void to be reclaimed by nature over time. |
| **Residual effect** | C. 2 Ha of grassland will be lost within the extraction site over a 25-year period. The loss of this habitat represents a slight adverse effect at a site level after mitigation. Additionally, the attenuation and wetland system for this site has been specifically sized to deal with the additional runoff generated from site stripping so there is no risk of flooding occurring within the site nor in the surrounding environs due to the removal of the grassland habitat.<br>After the operational period has ceased the potential exists for restoration of the quarry void as detailed in Section 15. |

**Table 6.17: Assessment of Potential Effects on Birds and other fauna**

| | |
|---|---|
| **Description of effects** | Operation of the quarry including blasting as well as noise/vibration, dust and excessive outdoor lighting could disrupt local wildlife |
| **Characterisation of unmitigated effect** | This effect is characterised as long term in the absence of mitigation. The magnitude is determined to be moderate. |
| **Assessment of significance prior to mitigation** | Prior to mitigation this effect is considered moderately adverse |
| **Mitigation** | • Bat and bird boxes to be erected throughout the subject site to provide roosting opportunities. Location of same to be advised by the ECoW's.<br>• Two inspections per annum must be undertaken for nesting birds within the site by the site manager and the appointed ECoW, one of which is during the breeding season.<br>• All mitigation prescribed in section 10 noise and vibration and section 9 Air, and in the accompanying NIS must be adhered to. This must be implemented by the site manager and ECoW.<br>• Prior notification of blasting (24 hours) to the NPWS by email or telephone and adhere to any additional mitigation measures as may be suggested. This will allow local ranger to take seasonal and localised factor relating to other fauna into consideration. |
| **Residual effect** | No residual effect is envisaged on this KER |

### 6.7.6 Likely Significant Effects During Decommissioning Stage

No likely significant effects are envisaged during the decommissioning of the proposed development. There will be no additional habitat loss during decommissioning. The quarry void will be allowed to rewild, and enhancement measures will be implemented as appropriate. Section 15 details a restoration plan to be implemented in the case of decommissioning of the entire quarry and/or the proposed extraction area.

## 6.8 Cumulative Impact Assessment

The Proposed Development 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 6.6.5 of this report. Records from Donegal County Council planning registry were considered to identify projects that had potential to generate cumulative impacts on KERS. There were no plans recorded within the vicinity of the quarry site that can be considered under cumulative impacts.

The main areas that give rise to cumulative impacts in relation to this proposal area as follows:

### 6.8.1 Operation of the new extraction area

The following were considered in this assessment of cumulative impacts on KERs:

- Loss of habitat – this is represented by the proposed new extraction area of 5.37Ha within the site. As discussed above, this habitat loss represents a slight negative effect at a site level after mitigation.
- Section 15 of the EIAR outlines landscaping and restoration plans which add to the habitat cover and biodiversity of the subject site which act as a positive in combination impact of KER's.
- The water management system outlined in Section 8 will also act as a positive in combination impact on KER's

**6.8.2 Existing Habitats and surrounding land uses**

This proposal will have no significant in combination effect with current land use and habitats within the wider area in which the subject site is located. The site is located in a rural area with sporadic on-off houses and farmsteads. The surrounding land use is predominantly agriculture with some isolated blocks of commercial forestry. More extensive forestry is more prevalent in higher ground several kilometres north of the site.

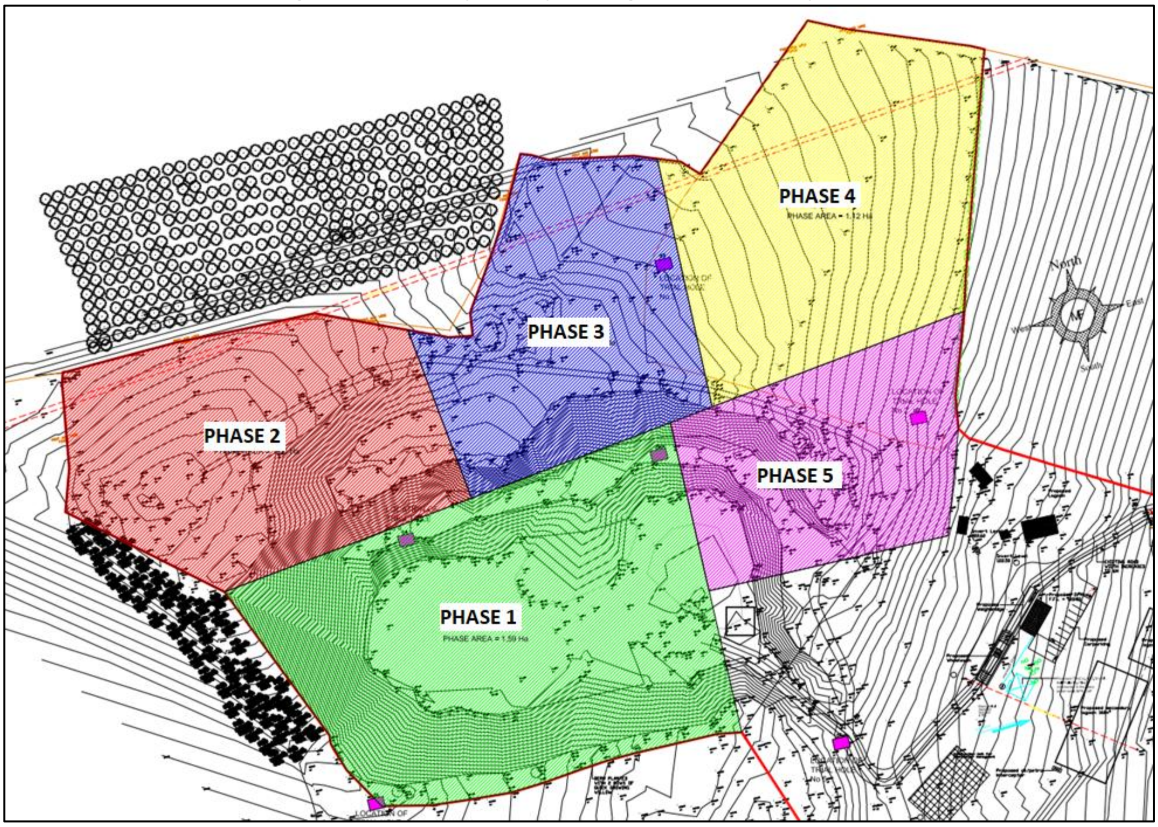
The quarry was an established use of land in the area during its initial period of operation and had resulted in the associated activities, services and employment becoming an integral part of this rural environment and rural economy. The proposed development and the associated effects on the wider area will not adversely affect the agricultural land use or availability. There are no other developments in the vicinity of the application site which would result in a significant cumulative impact. A search of the planning portal of the Donegal County Council website revealed no planned development which may result in significant cumulative impact in the vicinity of the application site

Direct and indirect socio-economic impacts will arise from the economic activity and employment from the proposed development. Sections 7-12 of this EIAR assesses the cumulative effects of the subject site in relation to land soils & geology, water, air, noise, climate and traffic. Mitigation Measures are detailed in the relevant sections of this EIAR to ameliorate cumulative impacts from the proposed development on the above listed respectively.

**6.8.4 Assessment of Cumulative Effects**

The combined development of the current application and the additional phases is considered together. The additional phases are similar in nature and scale to the current application and are shown below in Figure 6.10. The proposed phasing of the development is discussed in full detail within Section 3 of this EIAR.

**Figure 6.10: Proposed phasing of the development**




This Map was provided by Michael Friel Architects and Surveyors.

If the additional phases went ahead, there would be a moderate adverse cumulative impact to biodiversity before mitigation on the site with a further loss of habitat. Habitat within the location for the additional developments (improved agricultural grassland, wet grassland, recolonising bare ground and scrub) are of little ecological value as detailed above. C. 37,000m² of GA1, GS4, ED3 and WS1 habitat would potentially be lost over the span of 25 years taking into consideration all 5 phases of development. As discussed above, this habitat loss would represent a slight adverse effect after mitigation (the same mitigation measures as applied to phase one will apply to the future phases should the development go ahead).

A landscaping and restoration plan has been prepared for the quarry to offset the impact that quarrying activity will have on habitat within the extraction area which is discussed in full detail in section 15 of this EIAR. The losses of existing vegetation as a result of removal of overburden to allow extraction of rock from the will be offset by the creation and maintenance of berms and the covering of same by translocated vegetation and judicious planting on the eastern and southern berm sides. The new berms will serve to reduce the long-term visual impact of the new extraction area.

The greatest potential for increased biodiversity in relation to the subject site is after the operation has ceased. The aim of any natural restoration plan is to restore ecological balance and to produce self-sustaining plant and wildlife communities and habitats. The proposed restoration of the extraction site will allow for the creation of new habitats and the rewilding of this area for reclamation by nature which will have an overall positive effect on the biodiversity within the site.

## 6.9 Determination of Environmental Impact Significance Pre-mitigation

| **Impact** | **Receptor** | **Description of Impact (Character/Magnitude/ Duration/Probability/ Consequences)** Negligible to High | **Existing Environment (Significance/ Sensitivity)** Negligible to High | **Significance** Imperceptible to Profound |
|---|---|---|---|---|
| Loss of habitat from stripping from quarrying activities | Wildlife within the surrounding environs | Medium | Medium | Moderate |
| Dust from the construction works causing disturbance to any birds/mammals which may be nesting/foraging within site | Wildlife within the surrounding environs | Medium | Medium | Moderate |
| Noise from the construction works causing disturbance to any birds/mammals which may be nesting/foraging within site | Wildlife within the surrounding environs | Medium | Medium | Moderate |
| Surface Water Quality Impacts from Suspended Sediment Load | Swilly Burn River, River Finn SAC, River Foyle and Tributaries SAC | Medium | Medium | Moderate |

### 6.9.1 Summary of Mitigation Measures Proposed

| Summary of Mitigation Measures proposed to protect aquatic environment – should be read in conjunction with Section 8 of this EIAR |
|---|
| • An Ecological Clerk of Works (ECoW's) must be appointed for the site who will advise on the appropriate implementation of the mitigation measures outlined within the EIAR and the separate NIS.<br>• Prior to the commencement of any extraction and major clearance works, an extensive water management system must be implemented as detailed in section 8 of this report<br>• Areas proposed for soil stripping must be assessed by the ECoW prior to work commencing, during works and on completion of works. ECoW to liaise with site manager in relation to any issues that need to be addressed.<br>• Removal of overburden for berm construction must be in accordance with demand and must be controlled to reduce the risk of runoff containing silt.<br>• Any precipitation that falls on stripping or berm construction areas must be directed to the new primary settlement pond.<br>• A silt fence must be erected along the outside of the berms to stop runoff flowing offsite<br>• Should any haul routes cross the drainage system throughout the site, a culvert must be constructed.<br>• Any excess overburden remaining after the creation of the berms must be removed off site to an approved waste facility or a site which is planning compliant.<br>• Drains and silt traps must be maintained throughout all excavation and works, ensuring that they are clear of sediment build-up and are not severely eroded.<br>• Clearance works must cease in periods of heavy rainfall denoted by a Met Eireann status orange warning.<br>• Strict control of the site boundaries must be enforced by the Site Manager, including minimal land clearance and restrictions on the use of machinery near waterbodies.<br>• The quarry must adhere to the terms and condition of the new water discharge licence once issued.<br>• The water management system as detailed in Section 8 of this EIAR must be fully implemented before any extraction commences.<br>• All fuel and other chemicals must be stored within a fully bunded area within the machinery shed. The area must contain appropriate drip trays and spill kits available, for vehicle refuelling operations.<br>• The concrete bunded area adjacent to the fuel storage area must be used for vehicle refuelling operations.<br>• All drainage from the proposed machinery shed, refuelling area and lubricant storage shed must be directed through a hydrocarbon interceptor before flowing through the settlement treatment system.<br>• Maintain the hydrocarbon interceptor installed into the drainage system immediately before discharge of surface waters off site.<br>• Regular inspections and maintenance scheduling must be undertaken for all plant and vehicle to minimise the potential for malfunction or leak.<br>• Regular visual monitoring of all surface waters onsite for any surface sheen or sign of potential hydrocarbon pollution must be undertaken.<br>• Regular maintenance of settlement tanks must be undertaken to ensure efficiency and appropriate disposal of material removed.<br>• An emergency spill kit with oil boom, absorbers etc. must be kept on site for use in the event of an accidental spillage/leak.<br>• Suspension of extraction and material handling activities for the duration of a red level rainfall warning issued by Met Eireann must be adhered to. |

| |
|---|
| • The site must maintain and continually update the environmental monitoring programme and monitor water, noise, dust, and blasting on a regular basis to demonstrate that the development is not having an adverse impact on the surrounding environment. |
| **Summary of Mitigation Measures proposed to protect Hedgerows and Treelines** |
| • Drawings and planned routes must be adhered to, thus ensuring the correct route corridor is followed.<br>• Prior to clearance during the construction stage the ECoW is to be consulted. Sensitive areas that are to remain untouched from clearance must be highlighted.<br>• Once the construction works are complete, the site boundaries will be interplanted with a mix of native trees and shrubbery. The existing boundaries must be strengthened with the planting of additional trees. |
| **Summary of Mitigation Measures for protection of birds and other wildlife** |
| • The site of the proposed works must be thoroughly walked by the ECoW's and examined prior to works occurring to confirm that there are no birds nesting within the area and to give any resting animals warning and opportunity to escape safely.<br>• If birds are observed breeding within the extraction area, then works must immediately cease until chicks have fledged and the birds have all moved on.<br>• Invasive activities are to be avoided during the primary breeding periods of wildlife, including removal of vegetation. The cutting of hedgerows is illegal from March 1st to August 31st, as per the Wildlife Act 1976 as amended 2000.<br>• All construction activity must be undertaken in line with BS 5228 -1:2009+A1 2014 which includes guidance on several aspects of construction site practices such as: (a) Selection of quiet plant, (b) Control of noise sources, (c) Screening, (d) Hours of work.<br>• Plant used at the site must have noise emission levels that comply with the limiting levels defined in EC Directive 86/662/EEC and any subsequent amendments. Any plant that is used intermittently must be shut down when not in use to minimise noise levels.<br>• The best means practical, including proper maintenance of plant, must be employed to minimise the noise produced by on-site operations.<br>• All vehicles and mechanical plant must be fitted with effective exhaust silencers and maintained in good working order for the duration of the contract.<br>• Compressors must be of the "sound reduced" models fitted with properly lined and sealed acoustic covers which must be kept closed whenever the machines are in use and all ancillary pneumatic tools must be fitted with suitable silencers.<br>• All outdoor lighting (outside of the yard area) is to be hooded and limited to 10 watts maximum. Outdoor lighting should face downwards and be minimised at night and utilise motion sensors to reduce interference to nocturnal species.<br>• The external site boundaries must be vegetated with a mixture of native shrubs and trees which will act an acoustic barrier for the site.<br>• The proposed operational works must be monitored periodically, particularly during the bird breeding season, by a qualified ecologist to ensure that the mitigation measures proposed are implemented.<br>• Bat and bird boxes to be erected throughout the subject site to provide roosting opportunities. Location of same to be advised by the ECoW's.<br>• Two inspections per annum must be undertaken for nesting birds within the site by the site manager and the appointed ECoW, one of which is during the breeding season.<br>• All mitigation prescribed in section 10 noise and vibration and section 9 Air, and in the accompanying NIS must be adhered to. All such mitigation measures must be implemented by the site manager and ECoW.<br>• Prior notification of blasting (24 hours) to the NPWS by email or telephone and adhere to any additional mitigation measures as may be suggested. This will allow local ranger to take seasonal and localised factor relating to other fauna into consideration, if relevant. |

| Summary of Mitigation Measures for removal of grassland/scrub habitat |
|---|
| • Overburden won from site clearance must be used to create berms as per figure 15.6<br>• Landscaping must use a mix of native species which will help support a wide range of insects and animals and will contribute to the ecological value of the area. Details of landscaping are laid out in Section 15 of this EIAR.<br>• Additionally, section 15 details a full restoration plan which must be implemented once quarrying activities have ceased which will allow the quarry void to be reclaimed by nature over time.<br>• The attenuation and wetland system must be specifically sized to deal with the additional runoff generated from site stripping so there is no risk of flooding occurring within the site nor in the surrounding environs due to the removal of the grassland habitat. |

### 6.9.2 Determination of Environmental Impact Significance Post mitigation

| **Impact** | **Receptor** | **Description of Impact (Character/Magnitude/ Duration/Probability/ Consequences)** Negligible to High | **Existing Environment (Significance/ Sensitivity)** Negligible to High | **Significance** Imperceptible to Profound |
|---|---|---|---|---|
| Loss of habitat from stripping and construction works | Wildlife within the surrounding environs | Low | Medium | Imperceptible |
| Dust from the construction works causing disturbance to any birds/mammals which may be nesting/foraging within site | Wildlife within the surrounding environs | Negligible | Low | Imperceptible |
| Noise from the construction works causing disturbance to any birds/mammals which may be nesting/foraging within site | Wildlife within the surrounding environs | Negligible | Low | Imperceptible |
| Surface Water Quality Impacts from Suspended Sediment Load | Swilly Burn River, River Finn SAC, River Foyle and Tributaries SAC | Medium | Medium | Imperceptible |

### 6.9.3 Transboundary Effects

The study area associated with the proposed development is within the Foyle Catchment. The Foyle catchment is a cross border catchment and therefore the hydrological link extends to areas beyond the international border in the River Foyle. The project is hydrologically linked to both the River Finn SAC in the Republic of Ireland and the River Foyle and Tributaries SAC in Northern Ireland. However, the residual impact after the implementation of the mitigation measures is assessed as imperceptible. This means that there is no potential for significant transboundary effects on water quality as a result of the proposed development, particularly given the distance from the development site to these features.

## 6.10 Conclusion

This ecological impact assessment of the proposed application concludes that continuation and expansion of quarry activities within the subject site will have no significant residual effects assuming the mitigation measures outlined in the section on Biodiversity are strictly adhered to.

It is recommended that the proposed operational works are monitored periodically, particularly during the bird breeding season by a qualified ecologist to ensure that the mitigation measures are implemented. Ongoing monitoring of water quality will continue to be undertaken during the operation of the quarry to ensure that all mitigation measures as set within the EIAR and NIS are being implemented. Water quality monitoring will be in line with conditions that will be set within the discharge licence which will be applied for should planning be granted. This role will be taken on by the nominated ECoW who will be responsible for all ongoing monitoring required (including monitoring requirements as set within the possible future discharge licence) throughout the operational lifetime of the quarry. Reports on findings should be submitted to the competent authority, Donegal County Council, as required.

# APPENDIX I: Botanical Survey Data Sheet

**Botanical survey**

**Applicant**: Patrick Bonar

**Surveyor**: Shannen McEwen

**Site Location:** Magherasolis & Craigs, Raphoe, Co. Donegal

**Size of site:** c. 7.58ha

**Date of survey:** 18/01/2022

**Soil Type:**

| Mineral | Peat | Sandy |
|---|---|---|
| | X | |

**Figure 6.11: Location of quadrats**

| Ground Cover of vegetation: *Estimate % cover*<br>D=Dominant >50% A=Abundant 25-50% F=Frequent 5-25% O=Occasional <5% | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Sample No.** | **Name of plant species** | **Numbers of individuals in Section and %** | | | | | | | | | | **No of areas species present** | **Frequency (%)** | **Abundance (%)** |
| | | **1** | **2** | **3** | **4** | **5** | **6** | **7** | **8** | **9** | **10** | | | |
| **1** | **Bent grass** | F | F | O | O | O | O | O | F | F | F | **10** | **100** | **3 – 15** |
| **2** | **Birds-foot-trefoil** | | O | | | | | | | | | **1** | **10** | **0.1-0.5** |
| **3** | **Bracken** | | O | O | F | F | A | | | | F | **6** | **60** | **4.2- 13.5** |
| **4** | **Bramble** | | F | F | F | F | F | | | | A | **6** | **60** | **5– 17.5** |
| **5** | **Brome** | | | O | | | O | | | | O | **3** | **30** | **0.3-1.5** |
| **6** | **Bushvetch** | | | | | | | | | | O | **1** | **10** | **0.1 – 0.5** |
| **7** | **Celandine** | | O | | | | O | | | | O | **3** | **30** | **0.3-1.5** |
| **8** | **Chickweed** | | | O | O | | | | | | | **2** | **20** | **0.2 – 1** |
| **9** | **Clover** | O | | | | | | O | O | O | | **4** | **40** | **0.4 – 2** |
| **10** | **Creeping buttercup** | O | | | | | | O | O | O | O | **5** | **50** | **0.5 – 2.5** |
| **11** | **Dandelion** | O | | | | | | O | O | O | | **4** | **40** | **0.4 – 2** |
| **12** | **Dock** | O | | | | | | O | O | O | | **4** | **40** | **0.4 – 2** |
| **13** | **Fescues** | | O | | | | | | O | | | **2** | **20** | **0.2 – 1** |
| **14** | **Gorse** | | F | O | D | O | D | | | | D | **6** | **60** | **15.7 – 33.5** |
| **15** | **Groundsel** | | | O | O | | O | | | | O | **4** | **40** | **0.4 – 2** |
| **16** | **Ivy** | | | | O | | | | | | | **1** | **10** | **0.1 – 0.5** |
| **17** | **Marsh foxtail** | | O | | | | | | | | | **1** | **10** | **0.1 – 0.5** |
| **18** | **Marsh Thistle** | | O | | | | | | | | | **1** | **10** | **0.1 – 0.5** |
| **19** | **Meadow-grass** | O | F | O | O | | O | O | O | O | O | **9** | **90** | **1.3-6.5** |
| **20** | **Nettle** | O | | | O | | O | | | O | F | **5** | **50** | **0.9-4.5** |
| **21** | **Ragwort** | | | O | O | | O | | | O | O | **5** | **50** | **0.5 – 2.5** |
| **22** | **Rush** | O | D | O | O | | | O | O | O | | **7** | **70** | **5.6 – 13** |
| **23** | **Rye grasses** | D | | | | | | D | D | D | | **4** | **40** | **20 – 40** |
| **24** | **Sedges** | | | | | | | O | O | O | | **3** | **30** | **0.3-1.5** |
| **25** | **Silverweed** | | O | | | | | | | | | **1** | **10** | **0.1-0.5** |
| **26** | **Sphagnum** | | | O | A | | | | | | | **2** | **20** | **2.6-5.5** |
| **27** | **Thistle** | O | O | | | | | O | | O | | **4** | **40** | **0.4-2** |
| **31** | **Timothy** | | | | | | | O | O | O | | **3** | **30** | **0.3-1.5** |
| **32** | **Tormentil** | | | | | | O | | | O | | **2** | **20** | **0.2 – 1** |
| **33** | **Yorkshire fog** | O | O | O | | | | O | O | O | | **6** | **60** | **0.6 – 3** |

# APPENDIX II: Bird Survey

**Bird Survey**

A series of bird observation report over a period of 8 weeks within the quarry site. The results of this are attached below.

| | |
|---|---|
| **Site Name:** | Patrick Bonar |
| **Date:**<br>**Start time:**<br>**End time:** | 17/12/2021<br>09.30<br>13.30 |
| **Counter:**<br><br>**Weather:**<br><br>**Activity:** | Shannen McEwen (B.Sc. Hons Environmental Science with a Diploma in Professional Practice, University of Ulster)<br><br>Cloud clover: 33-66%, Rain: 2, Wind: 2, Visibility: 1.<br><br>No other activity onsite. |

| | By sight | | | |
|---|---|---|---|---|
| **Species** | **In flight** | **Foraging** | **Roosting** | **By sound** |
| **Blackbird** | | | | **2** |
| **Blue tit** | | | **1** | |
| **Coal tit** | **1** | | | |
| **Wood pigeon** | **4** | | | |
| **Dunnock** | | | **2** | |
| **Goldfinch** | | | **1** | **1** |
| **Great tit** | **1** | | | |
| **Hooded crow** | **1** | **2** | | |
| **Jackdaw** | | | **1** | **2** |
| **Long tailed tit** | | | **1** | |
| **Meadow pipit** | | | **1** | **3** |
| **Collared dove** | **2** | | | |
| **Pied wagtail** | **1** | | **2** | **2** |
| **Robin** | | | **1** | **3** |
| **Siskin** | | | **1** | |
| **Song thrush** | **1** | | | **2** |
| **Stonechat** | | | **2** | |
| **Wren** | | | | **8** |

| | |
|---|---|
| **Site Name:** | Patrick Bonar |
| **Date:**<br>**Start time:**<br>**End time:** | 18/01/2022<br>10.00<br>14.00 |
| **Counter:**<br><br>**Weather:**<br><br>**Activity:** | Shannen McEwen (B.Sc. Hons Environmental Science with a Diploma in Professional Practice, University of Ulster)<br><br>Cloud clover: 66-100%, Rain: 3, Wind: 2, Visibility: 2. Very cold and wet.<br><br>No other activity onsite. |

| | By sight | | | |
|---|---|---|---|---|
| **Species** | **In flight** | **Foraging** | **Roosting** | **By sound** |
| **Blackbird** | **1** | | | **2** |
| **Blue tit** | | | | **1** |
| **Crow** | **3** | | | **4** |
| **Goldcrest** | | | | **2** |
| **Gold finch** | | | | **1** |
| **Great tit** | | | | **1** |
| **Hooded crow** | **4** | | | |
| **Jackdaw** | **32** | | **20** | |
| **Long tailed tit** | | | | **1** |
| **Mistle thrush** | | | | **3** |
| **Robin** | **1** | | | **2** |
| **Rook** | **4** | | | **2** |
| **Song thrush** | **1** | | | **1** |
| **Wren** | | | | **3** |

| | |
|---|---|
| **Site Name:** | Patrick Bonar |
| **Date:**<br>**Start time:**<br>**End time:** | 25/02/2022<br>12.00<br>16.00 |
| **Counter:**<br><br>**Weather:**<br><br>**Activity:** | Shannen McEwen (B.Sc. Hons Environmental Science with a Diploma in Professional Practice, University of Ulster)<br><br>Cloud clover: 33-66%, Rain: 1, Wind: 1, Visibility: 1.<br><br>No other activity onsite. |

| | By sight | | | |
|---|---|---|---|---|
| **Species** | **In flight** | **Foraging** | **Roosting** | **By sound** |
| **Blackbird** | **10** | | | **2** |
| **Blue tit** | **1** | | | **2** |
| **Crow** | **5** | | **2** | **2** |
| **Dunnock** | **1** | | | **2** |
| **Goldcrest** | | | | **1** |
| **Great tit** | **5** | | | **1** |
| **Jackdaw** | **20** | | **15** | |
| **Long tailed tit** | | | | **4** |
| **Mistle thrush** | **1** | | | **2** |
| **Pied wagtail** | **1** | | | **1** |
| **Robin** | | | **1** | **2** |
| **Rook** | **2** | | **1** | **2** |
| **Song thrush** | | | | **2** |
| **Wren** | | | | **6** |

# References:


Chartered Institute of Ecology and Environmental Management (CIEEM) (2019). Guidelines for Ecological Impact Assessment.

Chartered Institute of Ecological and Environmental Management (CIEEM) (2012). Preliminary Ecological Appraisal.

Fossitt JA (2000). A Guide to Habitats in Ireland.

The Heritage Council (2011) Habitat Survey Guidelines: A Standard Methodology for Habitat Survey and Mapping in Ireland.

Draft Revised guidelines on the information to be contained in Environmental Impact Statements (EPA, 2017).

Guidelines for Planning Authorities and An Bord Pleanála on Carrying out Environmental Impact Assessment. Department of the Environment, Community and Local Government DoEHLG (2013).

Guidelines for assessment of Ecological Impacts of National Road Schemes, (NRA, 2009). Environmental Impact Assessment of National Road Schemes – A Practical Guide (NRA, 2009).

Environmental Assessment and Construction Guidelines (NRA, 2006).

Advice Notes on Current Practice (in preparation of Environmental Impact Statements) (Environmental Protection Agency (EPA), 2003).

Guidelines on the information to be contained in Environmental Impact Statements (EPA, 2002).

European Commission Guidance on the preparation of the Environmental Impact Assessment Report (2017).

Environmental Protection Agency (EPA) 'Draft Guidelines on the Information to be Contained in Environmental Impact Assessment Reports' (August 2017).

# Section 7: LAND, SOILS & GEOLOGY

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# 7 LAND, SOILS AND GEOLOGY

## 7.1 Introduction

This section of the EIAR describes the natural characteristics of the site and surrounding area in terms of land, soils and geology. An assessment is made of the potential impacts associated with the proposed development and the activities that will be undertaken. Existing mitigating measures are reviewed, and further measures proposed where required, to remove or reduce any potential impacts identified.

## 7.2 Methodology

The assessment is focussed on formations and features associated with the soils and geological succession within the study area. The assessment of the potential impact of the development was carried out according to the methodology specified by the Environmental Protection Agency (EPA) and the Institute of Geologists of Ireland guidelines for Geology in Environmental Impact Statements. All available mapping data from the Geological Survey of Ireland (GSI) and EPA was consulted.

The assessment involved;

- Site walkovers and the examination of soil trial pits and geological material on site
- Desktop reviews on all available literature available regarding the soils and geology of the site and surrounding area.

## 7.3 Impact Assessment Methodology

The nature of the potential environmental impacts on the land, soil and geology is based on the matrix presented in Table 7.1 below. This table is derived from the EPA Guidelines on information to be included in Environmental Impact assessment Reports (Draft 2017).

**Table 7.1: Description of Potential Environmental Impacts**

| | |
|---|---|
| ***Quality of Effects*** | **Positive Effects**<br>A change which improves the quality of the environment (for example, by increasing species diversity; or the improving reproductive capacity of an ecosystem, or by removing nuisances or improving amenities). |
| | **Neutral Effects**<br>No effects or effects that are imperceptible, within normal bounds of variation or within the margin of forecasting error. |
| | **Negative/adverse Effects**<br>A change which reduces the quality of the environment (for example, lessening species diversity or diminishing the reproductive capacity of an ecosystem; or damaging health or property or by causing nuisance). |
| ***Describing the Significance of Effects*** | **Imperceptible**<br>An effect capable of measurement but without significant consequences. |
| | **Not significant**<br>An effect which causes noticeable2 changes in the character of the environment but without significant consequences. |
| | **Slight Effects**<br>An effect which causes noticeable changes in the character of the environment without affecting its sensitivities. |
| | **Moderate Effects**<br>An effect that alters the character of the environment in a manner that is consistent with existing and emerging baseline trends |
| | **Significant Effects** |

| | |
|---|---|
| | An effect which, by its character, magnitude, duration or intensity alters a sensitive aspect of the environment. |
| | **Very Significant**<br>An effect which, by its character, magnitude, duration or intensity significantly alters most of a sensitive aspect of the environment. |
| | **Profound Effects**<br>An effect which obliterates sensitive characteristics |
| ***Describing the Extent and Context of Effects*** | **Extent**<br>Describe the size of the area, the number of sites, and the proportion of a population affected by an effect. |
| | **Context**<br>Describe whether the extent, duration, or frequency will conform or contrast with established (baseline) conditions (is it the biggest, longest effect ever?) |
| ***Describing the Probability of Effects*** | **Likely Effects**<br>The effects that can reasonably be expected to occur because of the planned project if all mitigation measures are properly implemented. |
| | **Unlikely Effects**<br>The effects that can reasonably be expected not to occur because of the planned project if all mitigation measures are properly implemented. |
| ***Describing the Duration and Frequency of Events*** | **Momentary Effects**<br>Effects lasting from seconds to minutes |
| | **Brief Effects**<br>Effects lasting less than a day |
| | **Temporary Effects**<br>Effects lasting less than a year |
| | **Short-term Effects**<br>Effects lasting one to seven years. |
| | **Medium-term Effects**<br>Effects lasting seven to fifteen years. |
| | **Long-term Effects**<br>Effects lasting fifteen to sixty years. |
| | **Permanent Effects**<br>Effects lasting over sixty years |
| | **Reversible Effects**<br>Effects that can be undone, for example through remediation or restoration |
| | **Frequency of Effects**<br>Describe how often the effect will occur. (once, rarely, occasionally, frequently, constantly – or hourly, daily, weekly, monthly, annually) |
| ***Describing the Types of Effects*** | **Indirect Effects (a.k.a. Secondary Effects)**<br>Impacts on the environment, which are not a direct result of the project, often produced away from the project site or because of a complex pathway. |
| | **Cumulative Effects**<br>The addition of many minor or significant effects, including effects of other projects, to create larger, more significant effects. |
| | **'Do-Nothing Effects'**<br>The environment as it would be in the future should the subject project not be carried out. |
| | **'Worst case' Effects** |

| | |
|---|---|
| | The effects arising from a project in the case where mitigation measures substantially fail. |
| | **Indeterminable Effects**<br>When the full consequences of a change in the environment cannot be described. |
| | **Irreversible Effects**<br>When the character, distinctiveness, diversity or reproductive capacity of an environment is permanently lost. |
| | **Residual Effects**<br>The degree of environmental change that will occur after the proposed mitigation measures have taken effect. |
| | **Synergistic Effects**<br>the resultant effect is of greater significance than the sum of its constituents, (e.g. combination of SOx and NOx to produce smog). |

## 7.4 Existing Environment

### 7.4.1 Site Description

The application site is c. 7.95 hectares in size and was previously in use as a quarry, extracting and processing material. Historical activity has led to the creation of a quarry void with redundant quarry faces and abandoned working quarry benches.

This EIAR will accompany a new planning application for permission to extract and process material. The extraction area includes the existing quarry footprint of disturbed ground and also a new area of virgin ground immediately to the northeast of the existing quarry. The planning application also includes the use of the existing quarry deck as a processing and stockpile storage area.

### 7.4.2 Topography and Drainage

The application site and existing quarry is situated on the uppermost south-eastern slopes of a small hill approximately 165 m OD. Topography on the application site varies from 170 m OD in the northwest corner, 128 m OD on the existing quarry deck and approximately 107 m OD along the eastern site boundary. Drainage is to the southeast from the site and to the Swilly Burn stream flowing through Oakfield Park Estate and onwards emptying into the Foyle system.

### 7.4.3 Land Use

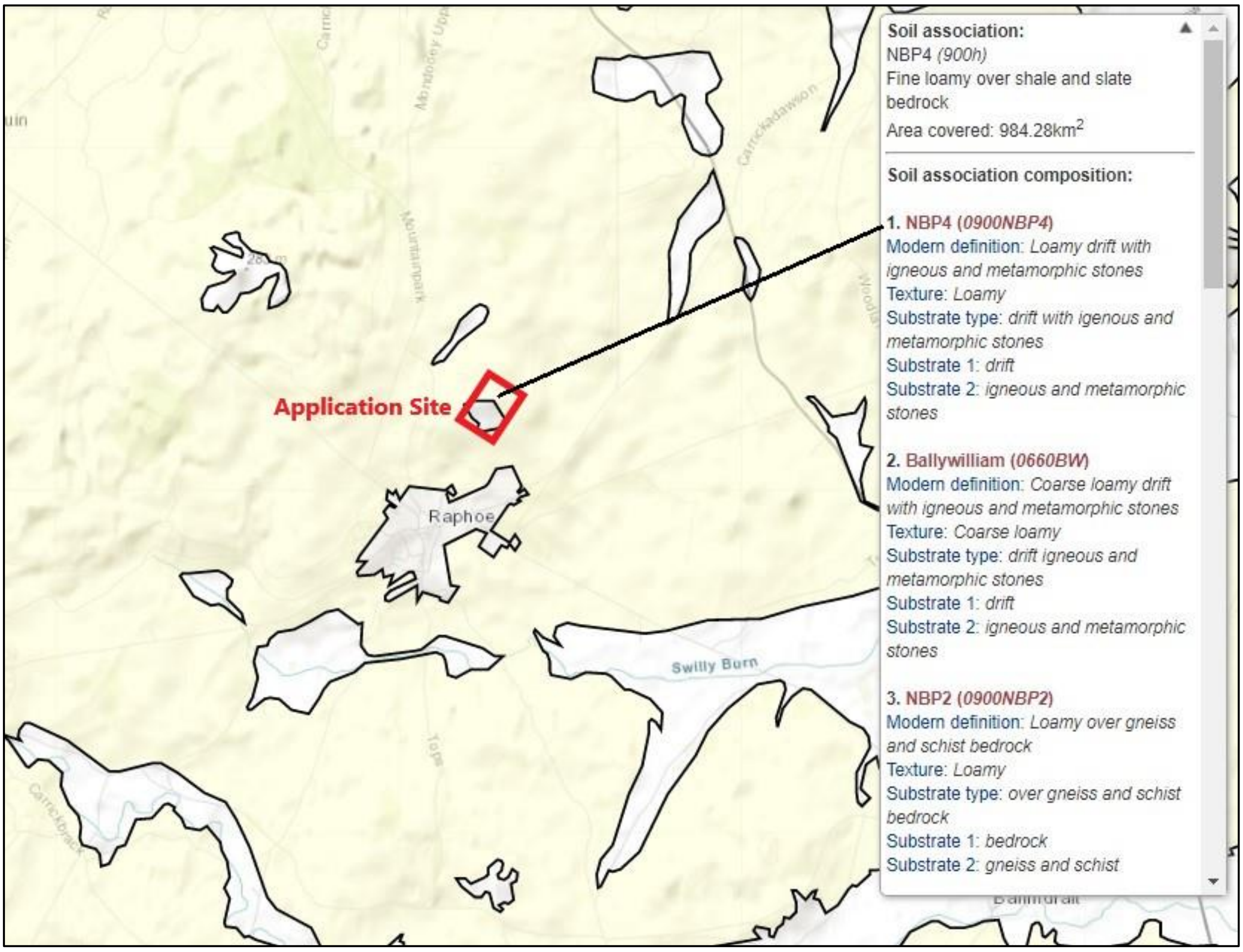
The site is located in a rural area with sporadic on-off houses and farmsteads. The surrounding countryside is undulating, and land use is predominantly agriculture with some isolated blocks of commercial forestry. More extensive forestry is more prevalent in higher ground several kilometres north of the site.

### 7.4.4 Soils

The Teagasc soil mapping webviewer was used to identify the broad grouping of soils of the application site. Figure 7.1 shows the soils on the new extraction area to be loamy drift. The area of the remainder of the site is recorded as rock on the Teagasc viewer due to the historical quarrying on site. Some of this area recorded as rock is in fact made ground as it was formed from the overburden stripped from the site when quarrying was taking place in the 1980’s.

A review of the EPA/Teagasc Soil map of Ireland shows the subject site as listed as Rock with the surrounding land classified as NBP4 ‘*Loamy drift with igneous and metamorphic stones’*. This is classified as a highly productive soil type and facilitates the intensive agricultural production in and around the Raphoe area which is known as the “*Lagan Valley*”.

**Figure 7.1: Teagasc Soil**




(Teagasc webviewer)

As part of the investigation into groundwater levels, 3 groundwater monitoring boreholes were installed (See Figure 3.2 in Section 3- Site Description). Drill logs from the drilling operator confirms depth of soil and subsoil to vary between 3 - 5m. Borehole 3 in the northernmost part of the application site was seen to be in made ground. This is most likely overburden from historic quarrying activity. The borehole logs are presented in Appendix 8.5 of *Section 8 Water*, of this EIAR.

On a site walkover during 8th December 2021 several trial pits were dug to assess the soils over the proposed extraction area. All the trial pits were very similar in composition. Loamy drift was confirmed to be present in all the trail pits. No defined soil profile was observed and the field into which the new extraction area is planned may well have been raised in level in the past. This could possibly be related to historic quarrying activity where the topsoil has been used to raise the field levels.

On the eastern boundary of the new extraction area the ground levels appear raised in comparison with the adjacent field to the east. A typical soil profile encountered is shown in Photograph 7.1 below. The profile is seen as homogenous mid brown loamy soil. Drainage will be reasonable in this type of soil.

Towards the west of the site near the topographic high of the site and surrounding area the soil is seen to be considerably thinner. Photograph 7.2 shows a typical profile from this area.

**Photograph 7.1: Typical Soil Profile from eastern side of site**

**Photograph 7.2: Typical soil profile in northwest portion of site**

**7.4.5 Bedrock Geology**

Details of the bedrock geology have been compiled from a geological report completed by John Colthurst (EuroGeol) in January 2022 and information obtained from GSI mapping and independent reports as required by I.S.E.N 932-3:1997. The geologist's report is attached as Appendix 7.1.

The area is underlain by meta-sedimentary rocks which are assigned to the Ballybofey Succession of the Dalradian. Most of the rocks in the Ballybofey Succession belong to the Argyll Group and the Southern Highland Group of Middle to Upper Dalradian age, and the rocks were originally deposited about 600 to 700 million years ago.

The most recent geological map of the area is Geology of South Donegal, 1:100,000 scale, published by the Geological Survey of Ireland, in 1999. Figure 2. Geology of the area around Raphoe, County Donegal. Extracted from Geology of South Donegal, 1:100,000 scale, published by the Geological Survey of Ireland, in 1999. The quarry site is within the Killeter Quartzite Formation which overlies the Termon Formation.

The application site itself is however in a volcanic intrusive and is not within the sediments of the Killeter Quartzite Formation. Photograph 7.3 below shows the volcanic intrusive on the left of the picture overlying the banded quartzite metasediments. The blue line on the photograph represents the geological contact between the rock types.

**Photograph 7.3: Metadolerite overlying the Killeter Quartzite Formation**

This intrusive is not shown on the 1:100,000 scale map but can clearly be seen to overlie hornfelsed banded quartzites along the southern edge of the quarry. Geology of South Donegal, 1:100,000 scale describes the metadolerites as follows:

*"Broadly concordant intrusive sills of metadolerite (epidiorite of the older literature) ranging to more than 200m thick are widespread in County Donegal. The thicker sills have coarse grained gabbroic interiors. Chilled margins to the sills are often apparent and intrusive contacts are sharp, though mobilization of contact hornfelses may locally tend to obscure this. Sill distribution is chiefly concentrated with the Termon and Lower and Upper Crana Quartzite Formations. At least some of the sills probably relate to later volcanism during Tayvallich or Southern Highland Group times. Prior to metamorphism, the metadolerite sills were originally quartz bearing basaltic, doleritic and gabbroic tholeiites showing signs of insitu igneous differentiation. Regional metamorphism has variably replaced the original calcic plagioclase (labradorite*

*or andesine) with a more sodic plagioclase (albite) that has been saussuritised: igneous pigeonitic augite has been replaced by green and blue-green amphibole (hornblende of ferro-actinolite) and later actinolite occurs in felted acicular patches; epidote and chlorite are also present".*

The presence of an intrusive body at Magherasollus is noted in the original Memoir of the Geological Survey, Sheet 17 and SE portion of Sheet 11, G. H. Kinehan, S.B. Wilkinson, J Nolan and F.W. Egan, 1889. They describe the Intrusive as follows:
*"A large irregular mass of highly schistose diorite occurs on the hill north of Raphoe. It is of a dull greenish grey colour, becoming lighter by weathering, and consists of felspar intimately intermixed with a large amount of hornblende. This mineral crystallizes out indistinctly and occasionally appears in large broken crystals an inch or more in length, which often project and give a rough aspect to the weathered surfaces. This mass of trap, which is clearly intrusive into the quartzite and mica schist probably forms one of the principal volcanic necks".*

Mineral Localities in the Dalradian and associated igneous rocks of County Donegal, Republic of Ireland, and of Northern Ireland, a joint publication from the Geological Survey of Ireland and the Geological Survey of Northern Ireland, dated 1985, also refers to the intrusion as follows: "*Magherasollus: Metadolerite locally occurs immediately NE of Raphoe in the Termon Pelites. The locality is centred on Sheldon's Quarry, an active quarry which is extracting metadolerite and crushing it for road metal. The wall-rocks of the metadolerite are quartz rich metasediments which are discarded as waste. The quarry is operated by Donegal County Council"*

The stratigraphy of the Ballybofey area is shown in Table 7.2 below.

**Table 7.2: Stratigraphy of the area**

| Geological Unit | Age | Lithology |
|---|---|---|
| Lithology Lough Foyle | Southern Highland Group Dalradian | Psammites, pebbly grits, limestones |
| Aghyaran and Killygordon Limestone Formation | Tayvallich Dalradian | Dark grey calcitic and dolomitic marbles associated with quartzite and psammite |
| Killeter Quartzite Formation | Crinan Dalradian | Fine grained slightly impure quartzite with beds typically 5cms thick and occasional graded pebble beds |
| Termon Formation | Easdale Dalradian | Banded semi-pelitic and psammitic schist |

Geology of South Donegal, 1:100,000 scale shows the quarry as being within the Killeter Quartzite Formation rather than the Termon Pelite Formation. Metasediments are exposed on the east side of the entrance to the quarry floor and along the south wall of the quarry. These metasediments are hornfelsed laminated or banded quartzites and most likely belong to the Killeter Quartzite Formation. Where the metadolerite is seen in contact with these metasediments it has a very fine-grained texture typical of a chilled margin. The metasediments are hornfelsed (baked), extremely hard and lacking in a regional cleavage.

All the benches are developed in well jointed but otherwise massive metadolerite. The metadolerite is fine grained along the south side of the quarry where it is exposed close to the entrance and this area is interpreted as a chilled margin. The metadolerite exposed in the benches is much coarser grained and weathered blocks have a rough surface. The metadolerite is well jointed and many of the joint planes dip at $40^0$ to $50^0$ to the south. These joints are probably orthogonal to the contacts of the intrusion. There are a number of quartz segregations within the metadolerite no mineralisation was seen apart from very rare crystals of fresh brassy pyrite. There is no evidence of iron oxide staining, after pyrite, on the quarry faces.

### 7.4.6 Economic Geology and Aggregate Potential

The GSI provide a dataset of Aggregate Potential Mapping of identified sand, gravel and rock resources that are considered useful in the construction industry. The application site is listed in an area that is mapped as having very high potential for the supply of crushed rock aggregate. A search of the register of quarries held by Donegal County Council revealed 11 registered quarries within a 15 km radius of the application site. These are listed in Table 7.3 below. Many of the listed quarries are redundant and not expected to be operational in the near future.

**Table 7.3: Registered quarries within 15 km of application site**

| Location | Quarry Registration No. | Approximate Distance from Application Site |
|---|---|---|
| Glentown, St Johnston | EUQY42 | 7 km |
| Islandmore, Clonleigh, Lifford | EUQY43 | 9 km |
| Trentamucklagh, St Johnston | EUQY44 | 7 km |
| Porthall, Lifford | EUQY45 | 8 km |
| Calhame, Letterkenny | EUQY46 | 14 km |
| Calhame, Letterkenny | EUQY47 | 14 km |
| Porthall, Lifford | EUQY132 | 8 km |
| Meentycat, Drumkeen | EUQY134 | 11 km |
| Fearn, Castlefinn | EUQY137 | 9 km |
| Fearn, Castlefinn | EUQY138 | 9 km |
| Dooballagh, Letterkenny | EUQY164 | 8 km |

### 7.4.7 Geological Heritage

Geology is recognised as a fundamental component of natural heritage. In 1998, the Geological Survey of Ireland (GSI) established the Irish Geological Heritage (IGH) Programme, which is a partnership between the GSI and the National Parks and Wildlife Service. Under the IGH Programme, important geological sites to be conserved as Natural Heritage Areas (NHA) are identified. Those not selected for NHA designation are being promoted as County Geological Sites (CGS). There are approximately 114 Irish Geological Heritage (IGH) sites in County Donegal.

There are no County Geological Sites near the application site. The nearest County Geological Site is Lough Swilly (IGH site code ND015) located approximately 10 km to the north of the application site. The geological features of interest of Lough Swilly are the long wide fjord bordered by high bold cliffs in the north, passing to gentler coastal slopes and shallow flats in its southern reaches.

### 7.4.8 Historic quarrying activity.

The GSI have produced a map of all known mineral extraction and quarrying activity. Part of the application site is listed in this reicter and is detailed as having been in operation from 1975-1995 working out metadolerite for road metal. Figure 7.2 shows the extract from the GSI mapviewer.

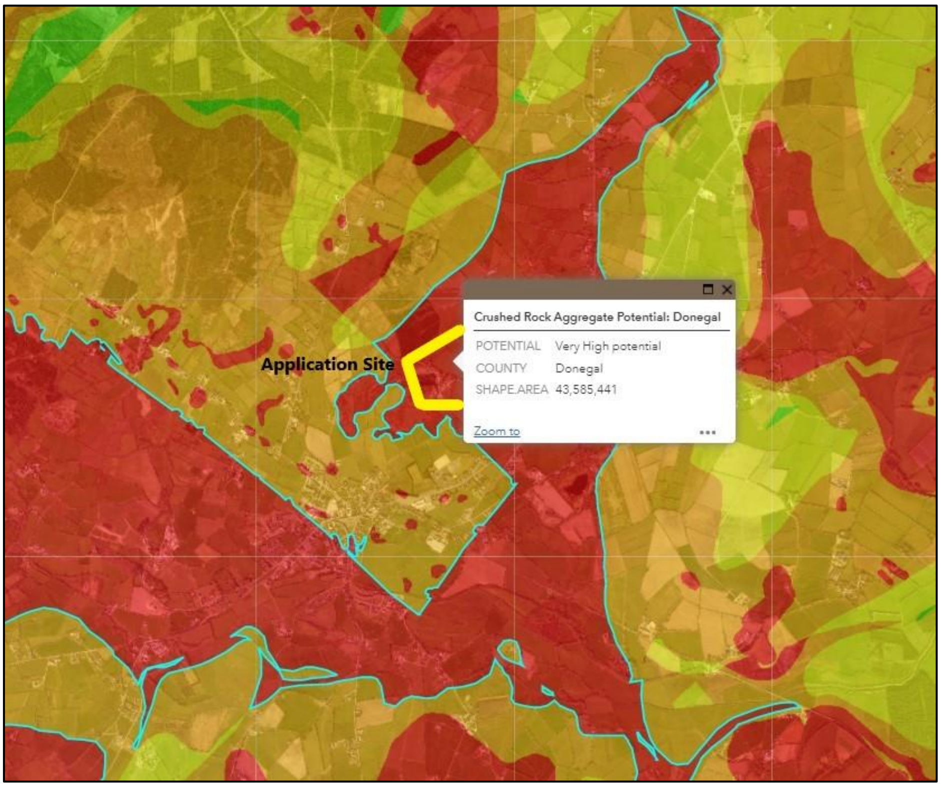
**Figure 7.2: Historic Pits and Quarry Locations**


GSI mapviewer

## 7.4.9 Crushed Rock Aggregate Potential

The GSI have mapped the country in terms of crushed rock aggregate potential. The application site and surrounding area are listed as areas of 'very high potential' in relation to Crushed Rock Aggregate Potential. Figure 7.3 below shows an extract from the GSI mapviewer.

**Figure 7.3: Crushed Rock Aggregate Potential**




GSI mapviewer

## 7.5 Characteristics of the Development

The planning application is for a period of 25 years and the proposal is to reopen an existing quarry on the application site. Proposals are to extract and process rock from the original footprint of disturbed ground and also to extract from an additional area of new ground immediately to the northeast of the site. The new ground is proposed to be stripped, drilled and blasted. It is proposed to deepen existing extraction depths to approximately 10 m below the existing quarry deck level. When the material is loose from the rock face it will be moved to a primary crusher where uniform stone size will be achieved through grading. Material will be taken from the crushers and screeners and stockpiled on site for use throughout Donegal. All of the material will be processed to IS EN 13242 and SR 21 standards as per the National standard for Civil Engineering products. No washing of stone is planned on this site.

The development is proposed in a phased manner with 5, 5-year stages proposed. The initial phase of operation will involve the construction of an office building, weighbridge, machinery shed and all site drainage including a settlement tank system with constructed wetland proposed to treat all effluent and stormwater. The applicant will seek a trade discharge licence for the outflow from the settlement system from Donegal County Council. A wastewater treatment system is to be installed to treat wastewater and sewage from the office building. Noise abatement measures and dust control measures are proposed. The office will have an electricity supply and telecommunications connection.

Landscaped berms surrounding the site are proposed to screen workings. It is anticipated that initially the quarry will employ 8 to 10 people directly with more employed indirectly. The application also includes restoration proposals which will form an integral part of the operation to ensure that the quarry site can return to use as a natural habitat once production ceases.
Further details on the characteristics of development are provided in *Section 3*, *Project Description*, of this EIAR.

## 7.6 Impact Assessment

There will be a defined construction phase associated with the proposed development as the site infrastructure needs to be put in place before any extraction and processing activities can take place. The construction of berms for screening purposes are also considered in the construction phase.

### 7.6.1 Construction Impacts

#### *7.6.1.1 Loss of Land*

Construction will involve a certain amount of site clearance of topsoil and bedrock to create the correct levels for the development of site infrastructure, settlement tank area and drainage area. Most of the bedrock, sub-soils and soils will be re-used within the site for the creation of screening berms along the boundaries of the proposal. These berms will be planted with native species to integrate the new development into the landscape.
There is potential for damage or contamination to soils and geology with spillage of hydrocarbon-based materials from construction vehicles and activity. These could be oils or fuels. Mitigation measures are proposed to minimise these potential risks.

#### *7.6.1.2 Accidental Spillages/Leaks*

There is potential for accidental spillages or leaks occurring from vehicles on the application site. The risk of a potential spillage is very low. A pollution spill kit will be available to deal with any potential spillages/leaks arising. Refuelling of on-site vehicles will be carried out in a dedicated re-fuelling area where appropriate spill kits are available. Refuelling of static plant will be carried out by a licenced fuel contractor or by mobile bunded bowser adhering to pollution prevention protocols and using drip trays. There will be no storage of any fuel/lubricants on site during construction.

## 7.6.2 Operational Impacts

### *7.6.2.1 Loss of Land*

The proposed development will result in the extraction of bedrock material and the altering of the topography of an area of approx. 7.95 hectares. Historical quarrying activity has altered the topography of the application site and adjoining lands.

The loss of overburden and rock in the extraction areas will lead to the inevitable loss of some habitat. Improved grassland and made ground are the predominant component of the proposed new extraction areas. *Section 6, Biodiversity*, assesses the impact of habitat loss for the proposal.

The proposed landscaping and restoration of the site, once redundant, will offset the impact to a certain extent with the creation of new habitats. This will increase the biodiversity of the wider area in the longer term. The positive impact of increased biodiversity is discussed in Section 6, Biodiversity, and proposals for re-instatement are discussed in *Section 15, Landscape and Restoration*.

The aggregate production will help meet the local and regional demand for construction materials which is seen as a positive effect.

### *7.6.2.2 Stability of Quarry Faces*

Rock will be extracted in line with the Guidelines to the Safety, Health and Welfare at Work (Quarries) Regulations 2008 (S.I. No. 28 of 2008). A buffer strip will be left around the external part of the proposed extraction area which will ensure the stability of the external quarry faces. The minimum buffer strip left will be 5m between the boundary and the edge of a quarry face and overall face angle will not be greater than $45^0$. Benches will be left to aid slope stability.

### *7.6.2.3 Waste Generation*

Stripping of overburden will be the first thing done on the extraction area. This overburden will be used to create screening berms along the external boundaries of the application area. The screening berms will help with the visual screening of the proposed activities and also will help attenuate noise associated with the proposed activities. Scrap metal from redundant machinery will be collected from the site by a licenced waste collector on an annual basis.

There is not likely to be any general waste on the extraction area. The office building will have appropriate facilities for the collection of recyclable and mixed municipal waste. Recyclable and mixed municipal waste is collected from the office on an alternate weekly basis by a licenced waste collector.

A wastewater treatment system is planned to treat foul water from the office block. Effluent is to be treated by a sand polishing filter and discharged to ground. The proposed location for the wastewater treatment has been shown to be suitable for percolation treatment.

### *7.6.2.4 Accidental Spillages/Leaks*

There is potential for accidental spillages or leaks occurring from plant and vehicles operating within the application site. A pollution spill kit will be available to deal with any potential spillages/leaks arising. Regular plant/machinery inspections are carried out to ensure all plant/vehicles are properly maintained recuing the risk of an accidental leak/malfunction.

Refuelling of vehicles will be carried out in the concrete apron next to the fuel tank where appropriate spill kits are available. Refuelling of static plant is carried out using a mobile bunded bowser and drip tray with appropriate spill kits available. The storage of any fuel/lubricants on site is within securely bunded areas. Maintenance is carried out in a concreted maintenance bay to ensure any potential leak/spoilage cannot escape to ground.

### *7.6.1.5 Geological Heritage Sites*

The activities proposed at the application site will have no impact on the geological features of the nearest geological heritage site of Lough Swilly approximately 10 km north.

## 7.6.3 Cumulative Impacts

The application site must also be considered in association with other developments located within or close to the application site.

### *7.6.3.1 Other Developments*

There are no other developments in the vicinity of the application site which would result in a significant cumulative impact. A search of the planning portal of the Donegal County Council website revealed no planned development which may result in significant cumulative impact in the vicinity of the application site. The application site is situated in a rural environment where the two main land uses are low intensity livestock farming and private commercial forestry.

#### 7.6.4 Do Nothing Option

If the proposed development to extract rock and process aggregate is not granted planning permission then local construction end users will be forced to continue to source quarry product and aggregate from further afield. This will result in a higher carbon footprint for these products. The planned provision of 8-10 local jobs and the secondary benefits that this may bring to the local community will not happen if the project does not achieve planning permission.

## 7.7 Mitigation Measures

The following mitigation measures are proposed to minimise the impacts of quarrying activity on the land, soils and geology of the application site;

- Fuel storage beside the machinery shed is in a fully bunded area
- A concrete bunded area adjacent to the fuel storage area with appropriate drip trays and spill kits available is used for vehicle refuelling operations.
- A hydrocarbon interceptor is installed into the drainage system downstream of the area containing the machinery shed, lubricant storage shed and vehicle refuelling bay.
- A second hydrocarbon interceptor is installed into the drainage system downstream of the constructed wetlands before final discharge of effluent off site.
- Oils and lubricants are stored in a bunded area in the machinery shed.
- A dedicated bay with a concrete apron next to the machinery shed is used for vehicles undergoing routine maintenance, washing etc.
- Refuelling of static plant on site is carried out using a fully bunded bowser or by licenced fuel contractor with mobile tanker.
- Drip trays to be used for all refuelling operations. Best practice for refuelling is incorporated into the Environmental Management System for the site.
- Regular inspections and maintenance scheduling will take place for all plant and vehicle to minimise the potential for malfunction or leak.
- An emergency spill kit with oil boom, absorbers etc. will be kept on site for use in the event of an accidental spillage/leak.
- Regular visual monitoring of all surface waters onsite (including settlement tanks) for any surface sheen or sign of potential hydrocarbon pollution.
- Geotechnical assessments of quarry faces over 20 m height, and those over 30 m height with multiple benches must be conducted by a geotechnical specialist.
- A professional geologist must provide a reports when required by the NSAI to ensure that the aggregate produced meets the NSAI required specification for end purpose.
- Overburden and unsuitable material must be used for the creation of screening berms around the external boundary of the application site.
- Excess overburden must be stockpiled in a suitable location for use in the restoration phase.
- To ensure minimal deterioration in quality of the topsoil in keeping with good practice any stockpile must be placed at a safe angle of repose, and re-handling of topsoil will be minimised to preserve the integrity of the soil.
- A landscaping and restoration plan, (Section 15, Landscaping and Restoration) must be implemented when activities on site have ceased.

## 7.8 Monitoring

An inspection of the geological environment and determination of quality of product must be undertaken by a competent Geologist when required by the NSAI. If face heights exceed 20m, or exceeds 30m for those with multiple benches, then a geotechnical assessment must be carried out by a competent geotechnical specialist.

## 7.9 Decommissioning / Re-instatement

The proposed landscaping and restoration plan must be implemented when activities have ceased on site. Details on the landscaping and restoration are given in Section 15, Landscaping and Restoration.

## 7.10 Residual Impacts

Residual impacts are those that remain after the implementation of the mitigation measures. By its nature quarrying activity will have a permanent negative effect on the bedrock removed from the site. The removal of the resource is difficult to mitigate against.

The provision of quarry product to the local and regional markets and the creation of new diverse habitats on the restoration of the site will go some way to mitigating the loss of the resource in the longer term.

## 7.11 Technical Difficulties

There were no technical difficulties encountered.

## 7.12 Determination of Significance of Impact Pre-mitigation

| **Impact** | **Receptor** | **Description of Impact (Character/Magnitude/ Duration/Probability/ Consequences)** Negligible - High | **Existing Environment (Significance / Sensitivity)** Negligible -High | **Significance** Imperceptible - Profound |
|---|---|---|---|---|
| Hydrocarbon contamination through accidental spillages/leaks | Local bedrock geology & soils/subsoils | Low-Medium | Low | Slight |
| Loss of soils/subsoils due to extraction | Soils/ subsoils | High | Low | Moderate |
| Loss of bedrock geology as extracted product | Bedrock geology | High | Low | Moderate |

## 7.13 Summary of Mitigation Measures

| **Summary of Mitigation Measures Proposed** |
|---|
| Fuel storage beside the machinery shed must be in a fully bunded area |
| A concrete bunded area adjacent to the fuel storage area with appropriate drip trays and spill kits must be used for vehicle refuelling operations. |
| A hydrocarbon interceptor must be installed into the drainage system downstream of the area containing the machinery shed, lubricant storage shed and vehicle refuelling bay. |
| A second hydrocarbon interceptor must be installed into the drainage system downstream of the constructed wetlands before final discharge of effluent off site. |
| Oils and lubricants must be stored in a bunded area in the machinery shed. |
| A dedicated bay with a concrete apron next to the machinery shed must be used for vehicles undergoing routine maintenance, washing etc. |
| Refuelling of static plant on site must be carried out using a fully bunded bowser or by licenced fuel contractor with mobile tanker. |
| Drip trays must be used for all refuelling operations. Best practice for refuelling is incorporated into the Environmental Management System for the site. |
| Regular inspections and maintenance scheduling must take place for all plant and vehicle to minimise the potential for malfunction or leak. |
| An emergency spill kit with oil boom, absorbers etc. must be kept on site for use in the event of an accidental spillage/leak. |

| |
|---|
| Regular visual monitoring of all surface waters onsite (including settlement tanks) must be undertaken for any surface sheen or sign of potential hydrocarbon pollution. |
| Geotechnical assessments of quarry face over 20 m height, and those over 30 m height with multiple benches, must be conducted by a geotechnical specialist once the face is created and when dormant. Reports to be held by site manager for inspection upon request by the consent authority. |
| A professional geologist must provide reports as required by the NSAI to ensure that the aggregate produced meets the NSAI required specification for end purpose. |
| Overburden and unsuitable material must be used for the creation of screening berms around the external boundary of the application site. |
| Excess overburden must be stockpiled in a suitable location for use in the restoration phase. |

## 7.14 Determination of Significance of Impact Following Mitigation

| **Impact** | **Receptor** | **Description of Impact (Character/Magnitude/ Duration/Probability/ Consequences)** Negligible - High | **Existing Environment (Significance / Sensitivity)** Negligible -High | **Significance** Imperceptible - Profound |
|---|---|---|---|---|
| Hydrocarbon contamination through accidental spillages/leaks | Local bedrock geology & soils/subsoils | Low-Medium | Low | Imperceptible |
| Loss of soils/subsoils due to extraction | Soils/ subsoils | Medium | Low | Slight |
| Loss of bedrock geology as extracted product | Bedrock geology | High | Low | Moderate |

## 7.15 Impact Assessment Conclusion

There will be an inevitable moderate permanent negative impact due to the extraction of bedrock geology. The impact of the loss of soils is assessed as slight due to the mitigation measures in place. The other activities associated with the project have no negative effects on the land, soils and geology.

# Appendix 7.1: Geological Report

# Raphoe Quarry,
# Magherasollus and Craigs Townlands,
# Raphoe,
# County Donegal

Report for Bonar's Quarries,

Letterkenny, County Donegal

11th January 2022

**Prepared by:**

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**Registration Number 008**

# Introduction

This report describes the geology of a proposed quarry site in the townlands of Magherasollus and Craigs, north of Raphoe town, County Donegal.

There is a disused quarry, formerly operated by Donegal County Council, on the site. This quarry was closed about 20 years ago, but Bonar's Quarries wish to re-open it by expanding the existing quarry northwards and perhaps by deepening it below the current floor level.

The quarry is in the Dalradian sequence and the lithology which is targeted is a hornblende metadolerite which is intruded into a Dalradian sequence dominated by thinly bedded meta-quartzites.

This report has been compiled by EurGeol John Colthurst, PhD, P Geo, who is a qualified Professional Geologist.

# Location

The currently disused quarry is in the adjoining townlands of Magherasollus and Craigs, with the eastern half of the quarry in Magherasollus and the western half in Craigs. The quarry is located 1 kilometre north of Raphoe Town and is accessed from a minor road and a laneway leading from the R236, the main Raphoe to Saint Johnstone Road.

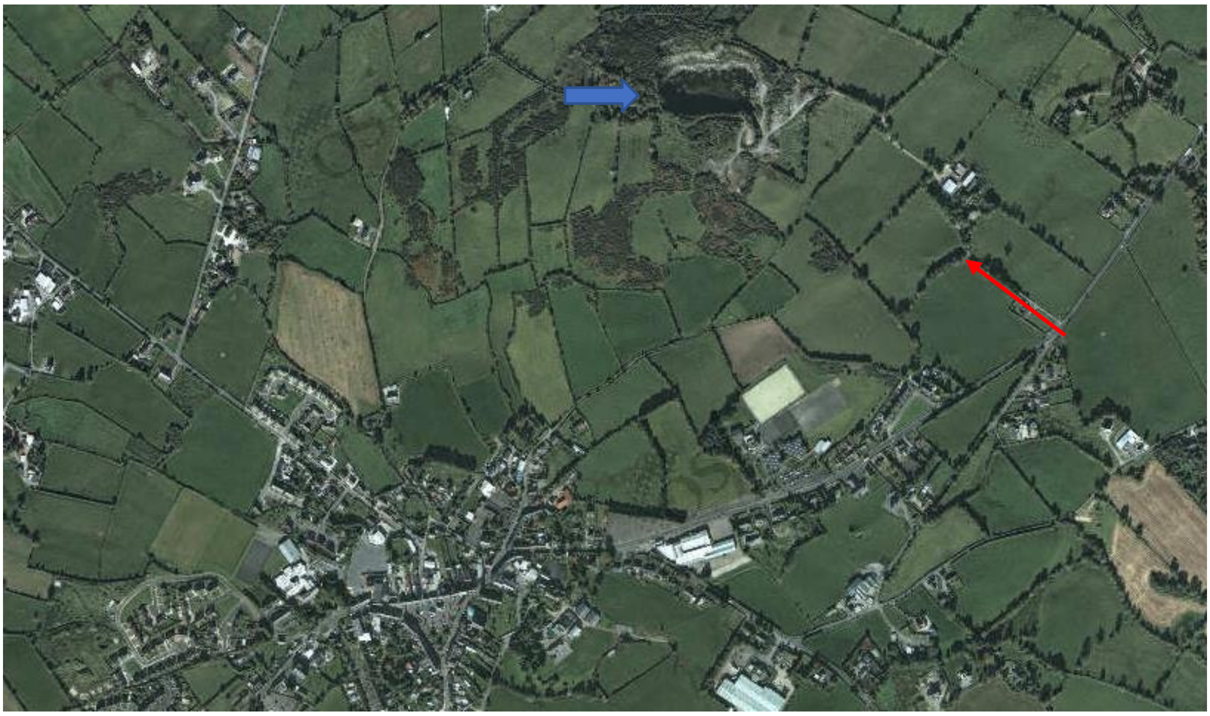

*Figure 1. Location Of Quarry. Access point indicated by the red arrow.*

The quarry is surrounded by rough scrubby ground and is at an elevation of approximately 160m. There are areas of forestry to the northwest of the site and good quality farmland to the east and northeast.

The Quarry was originally operated by Donegal County Council. It was active in 1985 but was closed about 20 years ago.

## Geology

The area is underlain by meta-sedimentary rocks which are assigned to the Ballybofey Succession of the Dalradian. Most of the rocks in the Ballybofey Succession belong to the Argyll Group and the Southern Highland Group of Middle to Upper Dalradian age, and the rocks were originally deposited about 600 to 700 million years ago.

The most recent geological map of the area is **Geology of South Donegal, 1:100,000 scale, published by the Geological Survey of Ireland, in 1999.**

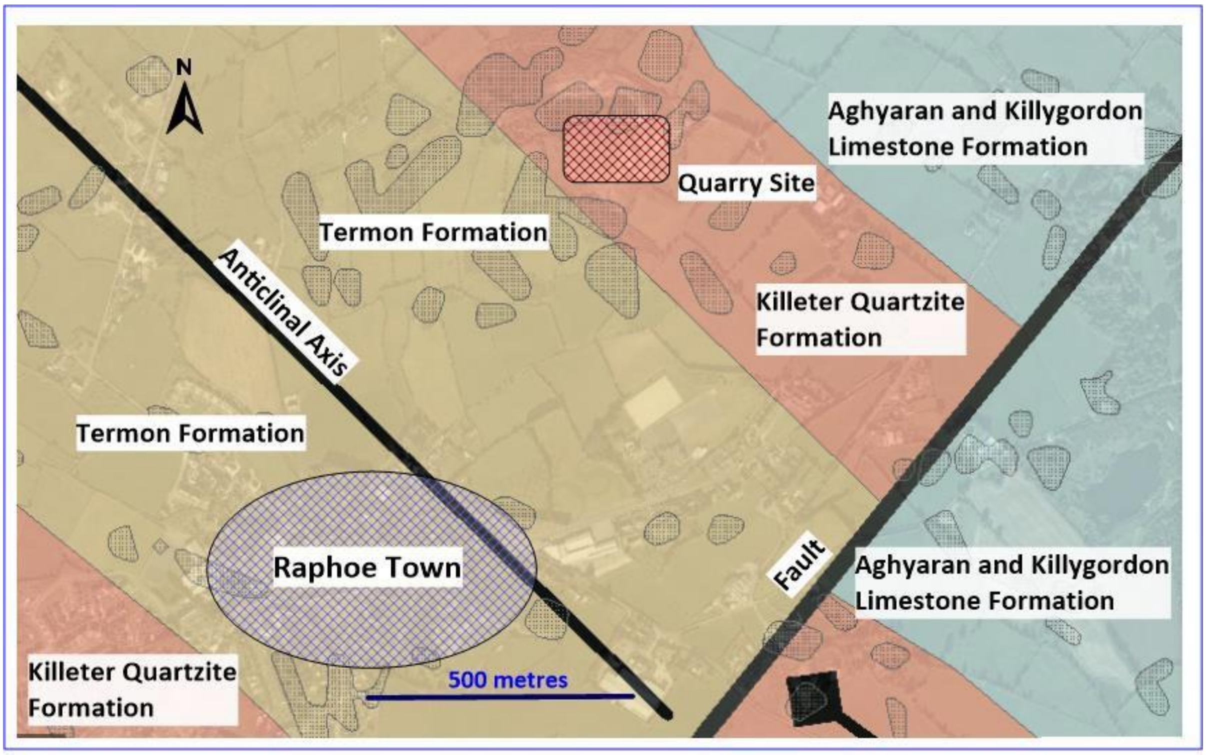


*Figure 2. Geology of the area around Raphoe , County Donegal. Extracted from* ***Geology of South Donegal, 1:100,000 scale, published by the Geological Survey of Ireland, in 1999.***

The quarry site is within the Killeter Quartzite Formation which overlies the Termon Formation.

The quarry itself is however in a volcanic intrusive and is not within the sediments of the Killeter Quartzite Formation. This intrusive is not shown on the 1:100,000 scale map but can clearly be seento overlie hornfelsed banded quartzites along the southern edge of the quarry.

**Geology of South Donegal, 1:100,000 scale** describes the metadolerites as follows:

*Broadly concordant intrusive sills of metadolerite (epidiorite of the older literature) ranging to more than 200m thick are widespread in County Donegal. The thicker sills have coarse grained gabbroic interiors. Chilled margins to the sills are often apparent and intrusive contacts are sharp, though mobilization of contact hornfelses may locally tend to obscure this. Sill distribution is chiefly concentrated with the Termon and Lower and Upper Crana Quartzite Formations.*

*At least some of the sills probably relate to later volcanism during Tayvallich or Southern Highland Group times.*

*Prior to metamorphism, the metadolerite sills were originally quartz bearing basaltic, doleritic and gabbroic tholeiites showing signs of insitu igneous differentiation. Regional metamorphism has variably replaced the original calcic plagioclase (labradorite or andesine) with a more sodic plagioclase (albite) that has been saussuritised: igneous pigeonitic augite has been replaced by greenand blue-green amphibole (hornblende of ferro-actinolite) and later actinolite occurs in felted acicular patches; epidote and chlorite are also present.*

The presence of an intrusive body at Magherasollus is noted in the original **Memoir of the Geological Survey, Sheet 17 and SE portion of Sheet 11**, G. H. Kinehan, S.B. Wilkinson, J Nolan and F.W. Egan, 1889.

They describe the Intrusive as follows:

*A large irregular mass of highly schistose diorite occurs on the hill north of Raphoe. It is of a dull greenish grey colour, becoming lighter by weathering, and consists of felspar intimately intermixed with a large amount of hornblende. This mineral crystallizes out indistinctly and occasionally appearsin large broken crystals an inch or more in length, which often project and give a rough aspect to the weathered surfaces. This mass of trap, which is clearly intrusive into the quartzite and mica schist probably forms one of the principal volcanic necks …*

**Mineral Localities in the Dalradian and associated igneous rocks of County Donegal, Republic of Ireland, and of Northern Ireland,** a joint publication from the Geological Survey of Ireland and the Geological Survey of Northern Ireland, dated 1985, also refers to the intrusion as follows:

*Magherasollus: Metadolerite locally occurs immediately NE of Raphoe in the Termon Pelites. The locality is centred on Sheldon's Quarry, an active quarry which is extracting metadolerite and crushing it for road metal. The wall-rocks of the metadolerite are quartz rich metasediments whichare discarded as waste. The quarry is operated by Donegal County Council*

The stratigraphy of the Ballybofey area is tabulated below:

| Geological Unit | Age | Lithology |
|---|---|---|
| Lough Foyle Succession | Southern Highland Group Dalradian | Psammites, pebbly grits, limestones |
| Aghyaran and Killygordon Limestone Formation | Tayvallich Dalradian | Dark grey calcitic and dolomitic marbles associated with quartzite and psammite |
| Killeter Quartzite Fm | Crinan Dalradian | Fine grained slightly impure quartzite with beds typically 5cms thick and occasional graded pebble beds |
| Termon Formation | Easdale Dalradian | Banded semi-pelitic and psammitic schist |

**Geology of South Donegal, 1:100,000 scale** shows the quarry as being within the Killeter Quartzite Formation rather than the Termon Pelite Formation. Metasediments are exposed on the east side of the entrance to the quarry floor (Figure 4) and along the south wall of the quarry (Figure 5). These metasediments are hornfelsed laminated or banded quartzites (Figure 6) and most likely belong to the Killeter Quartzite Formation. Where the metadolerite is seen in contact with these metasediments it has a very fine-grained texture typical of a chilled margin. The metasediments are hornfelsed (baked), extremely hard and lacking in a regional cleavage.

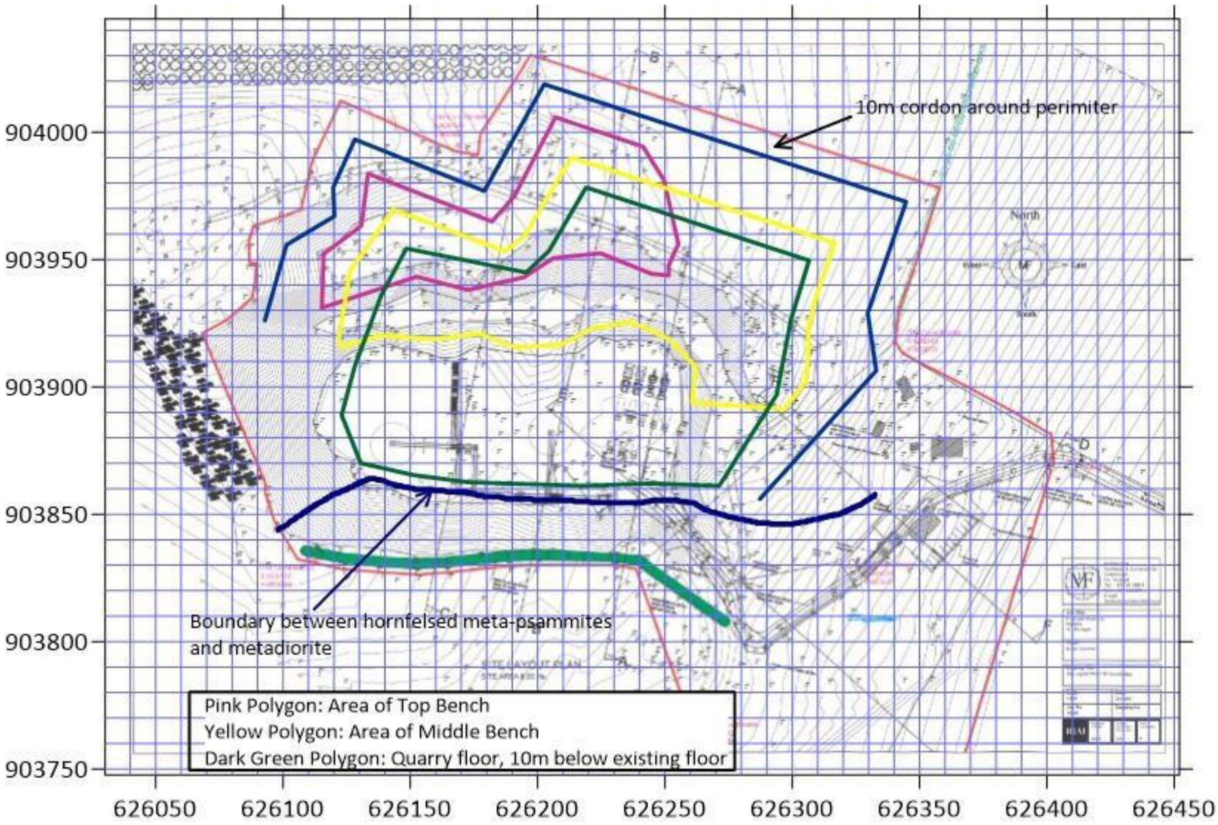


*Figure 3. Quarry plan, based on original drawing by Michael Friel Architects, planned benches have been added.*

*Figure 4. Eastern side of quarry entrance. Hornfelsed thinly bedded quartzites on the right, overlain by massive or unbedded metadolerite to the left. The position of the contact is indicated by the blue line.*

*Figure 5. Looking westwards along the southern wall of the quarry. The quarry wall is the contact between the hornfels and the metadolerite. Loose blocks of banded hornfels in the foreground.*

*Figure 6. Blocks of laminated flaggy bedded hornfels*

The contact between the metasedimenmts and the metadolerite strikes east west, along the southern side of the quarry. The metasediments dip northwards at angles between 40 and 60° with the steepest dips at the eastern end of the quarry. The contact between the metasediments and the metadolerite is largely obscured by debris and scrub but it is almost certainly concordant.

*Figure 7. View from the quarry entrance looking north northwest.*

*Figure 8. View taken from the quarry floor looking north and showing both main benches.*

The existing quarry floor is at a level of 129m and is flat except where small piles of waste rock and debris have been dumped. The area of the quarry floor is approximately 7,600 square metres. There are two main benches on the south side of the quarry. The lower bench is 9 to 10 metres high and the upper bench averages 12m. There is a third partially developed bench at the north-western corner of the quarry.

All the benches are developed in well jointed but otherwise massive metadolerite. The metadolerite is fine grained along the south side of the quarry where it is exposed close to the entrance and this area is interpreted as a chilled margin. The metadolerite exposed in the benches is much coarser grained and weathered blocks have a rough surface (Figures 9 and 10).

*Figure 9. Loose blocks of coarse grained metadolerite.*

*Figure 10. Block of coarse grained, slightly weathered metadolerite.*

The metadolerite is well jointed and many of the joint planes dip at 40 to 50° to the south. These joints are probably orthogonal to the contacts of the intrusion.

There are a number of quartz segregations within the metadolerite (Figure 11) but no mineralisation was seen apart from very rare crystals of fresh brassy pyrite.

There is no evidence of iron oxide staining, after pyrite, on the quarry faces.

*Figure 11. Quartz vein within the metadolerite.*

## Resource

The topographic plan provided by Michael Friel Architects and Surveyors Ltd was used tocalculate the resource (Figure 12).

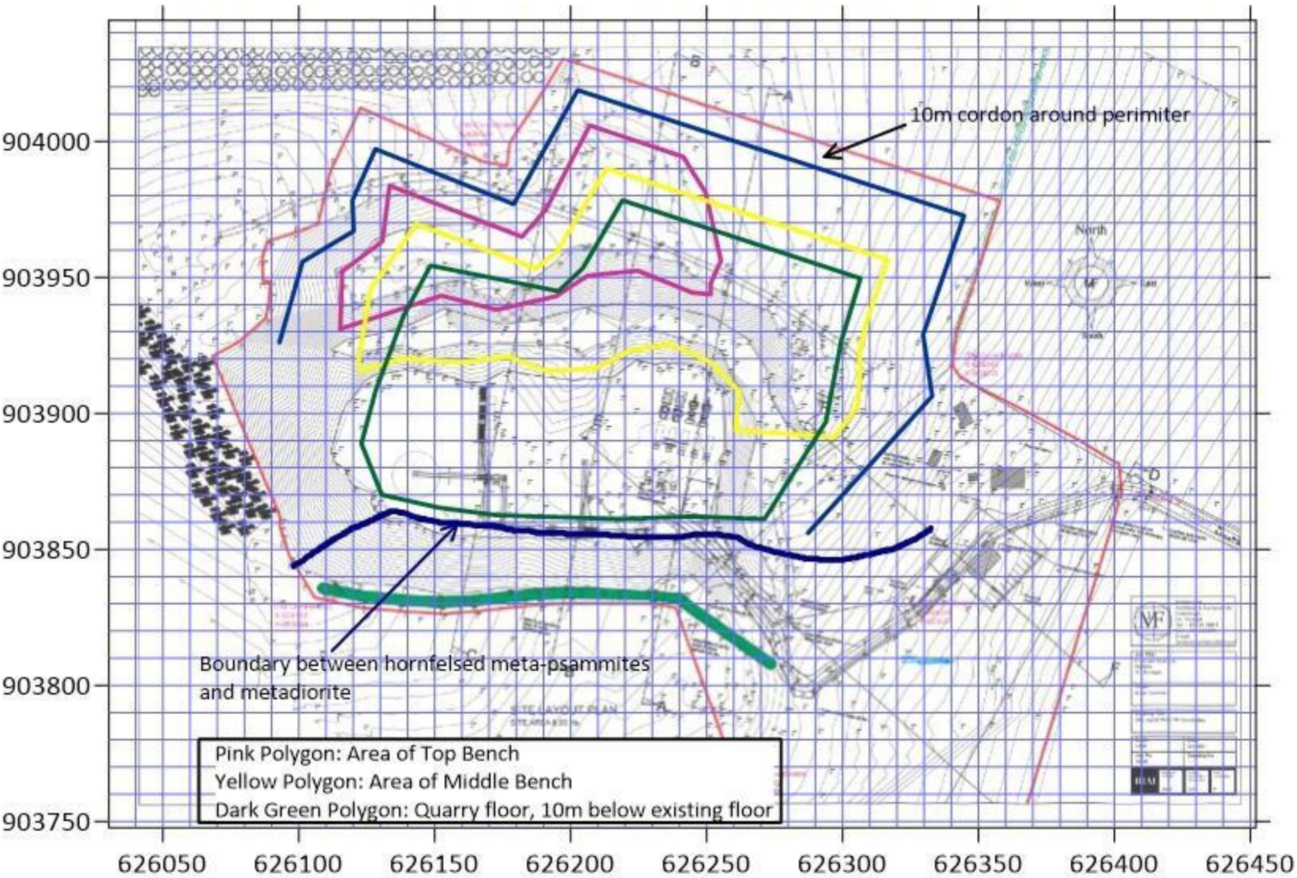


*Figure 12. Topographic plan, with proposed benches added.*

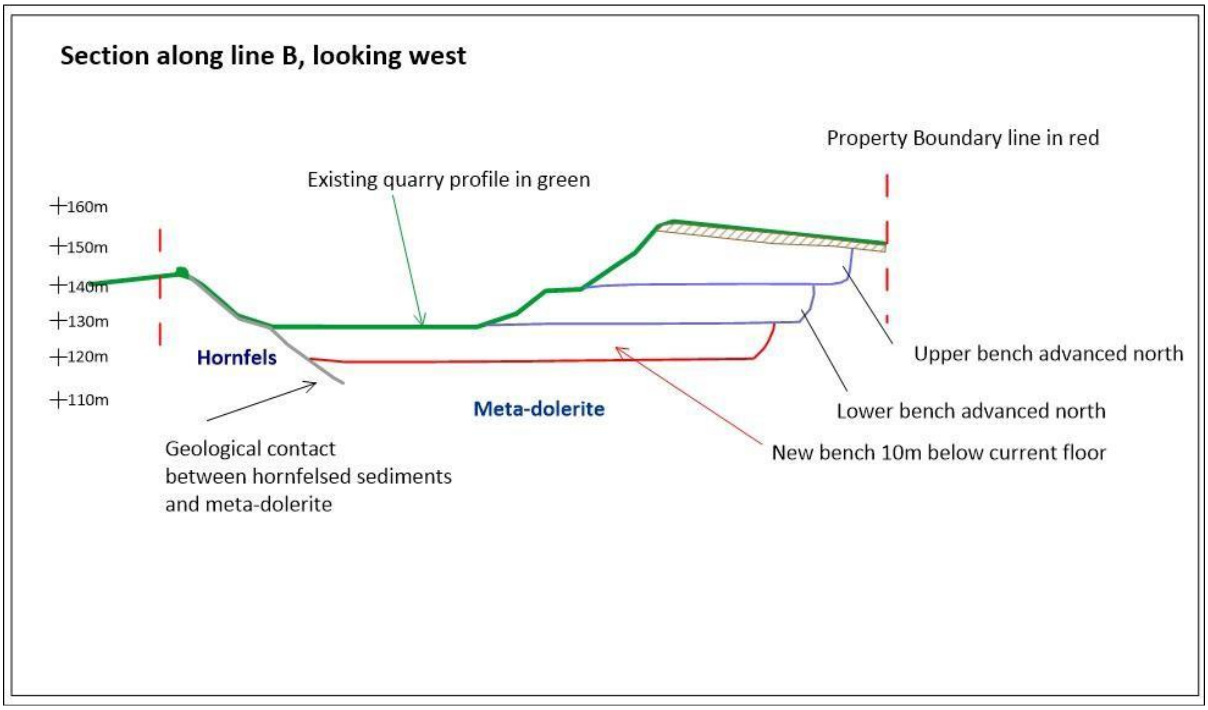


*Figure 13. Cross-section, looking west*

The following criteria were used:

- A 10m perimeter was left unquarried along the property boundary.
- The existing benches were progressed northwards.
- A 10m bench width was allowed for.
- No allowance for overburden until further detailed information.

| | | | |
|---|---|---|---|
| **Yellow Polygon,** Figure 12 | 10,396 sq metres | height 9m | 93,564 Cubic metres |
| **Pink Polygon** | 5,378 sq metres | height 13m | 69,914Cubic Metres |
| **Total** | | | 163,478 Cubic Metres |
| 163,478 Cubic Metres, Specific Gravity of 2.7 | | | 441,390 tonnes |

If Quarry is deepened by 10 metres:

| | | | |
|---|---|---|---|
| **Green Polygon** | 15,432 sq metres | height 10m | 154,320 Cubic metres |
| 317,798 Cubic Metres, Specific Gravity of 2.7 | | | 858,054 tonnes |
| **Total: Yellow, Pink and Green Polygons** | | | **1.299,444 tonnes** |

## Testing

The quarry is not currently in production but Bonnars collected rock and crushed it toproduce a 10/14mm aggregate which was tested by Construction Testing Services.

| Test | Testing Company | Material tested | Date | Result | SR16 Compliance | SR21 Compliance |
|---|---|---|---|---|---|---|
| Water Absorption Coarse aggregate App Particle Density Coarse aggregate Los Angeles Coefficient | CTS | 10/14mm | 7/12/2021 | 0.6% | To be declared | Yes, must be ≤2% |
| | CTS | 10/14mm | 7/12/2021 | 2.93 | To be declared | Not Specified |
| | CTS | 10/14mm | 7/12/2021 | 17 | Must be ≤40, for high strength ≤25 | Yes, must be ≤30 |
| Total Sulphur Content Acid soluble Sulphate as $SO_4$ | CTS | 10/14mm | 9/11/2021 | 0.03% | Yes, must be ≤1% | Yes, must be ≤1% |
| | CTS | 10/14mm | 9/11/2021 | 0.04% | Yes, must be ≤0.2% | Yes, must be ≤0.2% |
| Magnesium Sulphate soundness | CTS | 10/14mm | 7/12/2021 | 1% | To be declared, $MS_{25}$ if subject to freeze/thaw | Yes, must be ≤25% |

The limited testing done to date suggests that the aggregate will be suitable to produce S.R.21 compliant material and for Clause 804 material. Chippings should also be S.R.16 compliant. Further testing will be required when a when fresh aggregate is produced and processed.

## Conclusions

1. The existing quarry extracted Dalradian aged metadolerite or metadiorite.
2. The footwall to the metadolerite is a hornfelsed silty quartzite exposed along thesouth side of the quarry.
3. The metadolerite appears to be a conformable body dipping between 40 and 60°to the north.
4. The metadolerite is fine grained when in close contact with the hornfelsed sediments. This is a chilled margin and the metadolerite is coarse grained awayfrom the contact.
5. The top contact of the metadolerite sill is not exposed in the existing quarriedarea.
6. A detailed quarry design is necessary before and exact estimate of the availablereserves can be made but an estimate of the resource has been made as outlined.
7. If the quarry is deepened by 10m the resource is approximately 1.299 milliontonnes.
8. Based on the limited testing completed to date the aggregate is suitable toproduce S.R.21, S.R.16 and Clause 804 materials.

# SECTION 8 WATER
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# 8 WATER

## 8.1 Introduction

This section of the EIAR assesses the impact on the hydrological and hydrogeological environment of the proposed development. The subject site lies within the catchment of the Swilly Burn stream which flows into the Foyle system north of Lifford. Where confluence of the Swilly Burn meets the Foyle is part of the River Finn Special Area of Conservation (SAC code 002301) and River Foyle and Tributaries SAC (SAC code UK0030320).

### 8.1.1 Objectives

The objectives of the assessment are to:

- Produce a baseline study of the existing water environment (surface water and groundwater) in the area of the proposal;
- identify likely significant effects of the proposed development on surface water and groundwater during the construction phase, operational phase and decommissioning phase of each aspect of the development;
- identify mitigation measures to avoid, remediate or reduce significant negative effects and,
- assess significant residual effects and cumulative effects of each aspect of the proposed development in combination with other local developments.

## 8.2 Methodology

The overall study components comprised of a desk study reviewing all the available relevant information on the site followed by site assessments involving inspection of site features and chemical analysis of waters. Assessment of potential impacts on sensitive receptors by the proposed development was carried out. The methodology employed was 3-stage:

- Desk study
- Site assessment and analysis
- Impact assessment

### 8.2.1 Desk Study

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

- Environmental Protection Agency database (www.epa.ie);
- Geological Survey of Ireland - National Draft Bedrock Aquifer map;
- 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 Map Viewer (www.catchments.ie);
- Bedrock Geology 1:100,000 Scale Map Series, Geology of North Donegal (Long and McConnell) Geological Survey of Ireland;
- 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 Site Investigations**

A hydrological walkover survey, including detailed mapping and baseline monitoring/sampling, was undertaken by Colin Farrell of Greentrack on various dates between September 2021 and March 2022. The field assessments included a detailed site walkover survey, water features survey, and an inspection of all relevant hydrological features, such as existing drainage ditches, groundwater contributions and inflows/outflows from the site. In summary, assessments to address the water, hydrology and hydrogeology section of the EIAR included the following:

- Walkover surveys and hydrological mapping of the existing quarry site, proposed new extraction area and the surrounding area were undertaken whereby water flow directions and drainage patterns were recorded
- A sampling and analysis of program was carried out from September 2021 to March 2022 to monitor the flow and quality of surface water in and around the site.
- Monitoring boreholes were installed on the site and groundwater levels were monitored weekly over the course of three months. Groundwater quality was assessed.
- A rudimentary assessment of the transmissivity of the aquifer underlying the site was carried out

**8.2.3 Impact Assessment Methodology**

Section 8.2 of this EIAR refers to the impact assessment methodology employed. In addition, 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 are then used to assess the potential effects that the proposal may have on the local baseline water environment (i.e. water receptors).

**Table 8.1: Receptor Sensitivity Criteria** (Adapted from www.sepa.org.uk)

| Sensitivity of Receptor | Description |
|---|---|
| ***Not Sensitive*** | Receptor is of low environmental importance (e.g. surface water quality classified by EPA as A3 waters or seriously polluted), fish sporadically present or restricted). Heavily engineered or artificially modified and may dry up during summer months. Environmental equilibrium is stable and is resilient to changes which are considerably greater than natural fluctuations, without detriment to its present character. No abstractions for public or private water supplies. GSI groundwater vulnerability “Low” – “Medium” classification and “Poor” aquifer importance. |
| ***Sensitive*** | Sensitive Receptor is of medium environmental importance or of regional value. Surface water quality classified by EPA as A2. Salmonid species may be present and may be locally important for fisheries. Abstractions for private water supplies. Environmental equilibrium copes well with all natural fluctuations but cannot absorb some changes greater than this without altering part of its present character. GSI groundwater vulnerability “High” classification and “Locally” important aquifer. |
| ***Very Sensitive*** | Very sensitive Receptor is of high environmental importance or of national or international value i.e. NHA or SAC. Surface water quality classified by EPA as A1 and salmonid spawning grounds present. Abstractions for public drinking water supply. GSI groundwater vulnerability “Extreme” classification and “Regionally” important. |

**8.2.3 Relevant Guidance**

The hydrological and hydrogeological descriptions and assessments in this EIAR are carried out in line with guidance contained in the following:

- Guidance on the preparation of the EIA Report (Directive 2011/92/EU as amended by 2014/52/EU);
- Environmental Protection Agency (August 2017) Draft - Guidelines on the Information to be Contained in Environmental Impact Assessment Reports;
- Environmental Protection Agency (September 2015): Draft - Advice Notes on Current Practice (in the preparation on Environmental Impact Statements);
- Environmental Protection Agency (September 2015): Draft – Revised Guidelines on the Information to be Contained in Environmental Impact Statements;
- Environmental Protection Agency (2003): Advice Notes on Current Practice (in the preparation on Environmental Impact Statements);
- Environmental Protection Agency (2002): Guidelines on the Information to be Contained in Environmental Impact Statements;
- Institute of Geologists Ireland (2013): Guidelines for Preparation of Soils, Geology & Hydrogeology Chapters in Environmental Impact Statements;
- National Roads Authority (2009): Guidelines on Procedures for Assessment and Treatment of Geology, Hydrology and Hydrogeology for National Road Schemes;
- Eastern Regional Fisheries Board (2016): Guidelines on Protection of Fisheries during Construction Works in and Adjacent to Waters;
- PPG1 - General Guide to Prevention of Pollution (UK Guidance Note);
- PPG5 – Works or Maintenance in or Near Watercourses (UK Guidance Note);
- CIRIA (Construction Industry Research and Information Association) 2006: Guidance on 'Control of Water Pollution from Linear Construction Projects' (CIRIA Report No. C648, 2006);
- CIRIA 2006: Control of Water Pollution from Construction Sites - Guidance for Consultants and Contractors. CIRIA C532. London, 2006.

## 8.3 Proposed Development

The proposal is for permissions for development at Magherasolis & Craigs, Raphoe, Co. Donegal consisting of twenty-five-year permission to extract & blast rock and all other associated works as detailed in the application.

The application site consists of an approximate 1.2-hectare area of proposed new extraction area and also extraction within the existing footprint of quarried and disturbed ground. Total area of the application site is 7.95 hectares with proposed extraction area running to approximately 5.37 Ha. Proposals are to extract to approximately 10 m beneath existing quarry deck levels. A site layout drawing is provided in Figure 8.1 below.

Quarrying has historically taken place on site in the 1980's by Donegal County Council for roadstone and there are some redundant pieces of site infrastructure remaining on site.

The application site is made up of previously blasted faces and benches as well as additional ground to the northeast of the site which is proposed to be stripped, drilled and blasted. As the rock face is established and intact it is proposed to blast once or twice a month. This process will involve the drilling of the rock from above and a controlled blast being carried out by a competent, licensed, independent team. It is proposed to deepen existing extraction depths to approximately 10 m below the existing quarry deck level. When the material is loose from the rock face it will be moved to a primary crusher where uniform stone size will be achieved through grading. Most of the material will be sent directly to the primary crushing unit by an excavator working on the rock face. Material will be taken from the crushers and screeners and stockpiled on site for use throughout Donegal. All of the material will be processed to IS EN 13242 and SR 21 standards as per the National standard for Civil Engineering products.

The planning application is for a period of twenty five years and the development is proposed in a phased manner with five x five year stages proposed. The application also includes restoration proposals to ensure that the quarry site can return to use as a natural habitat once production ceases.

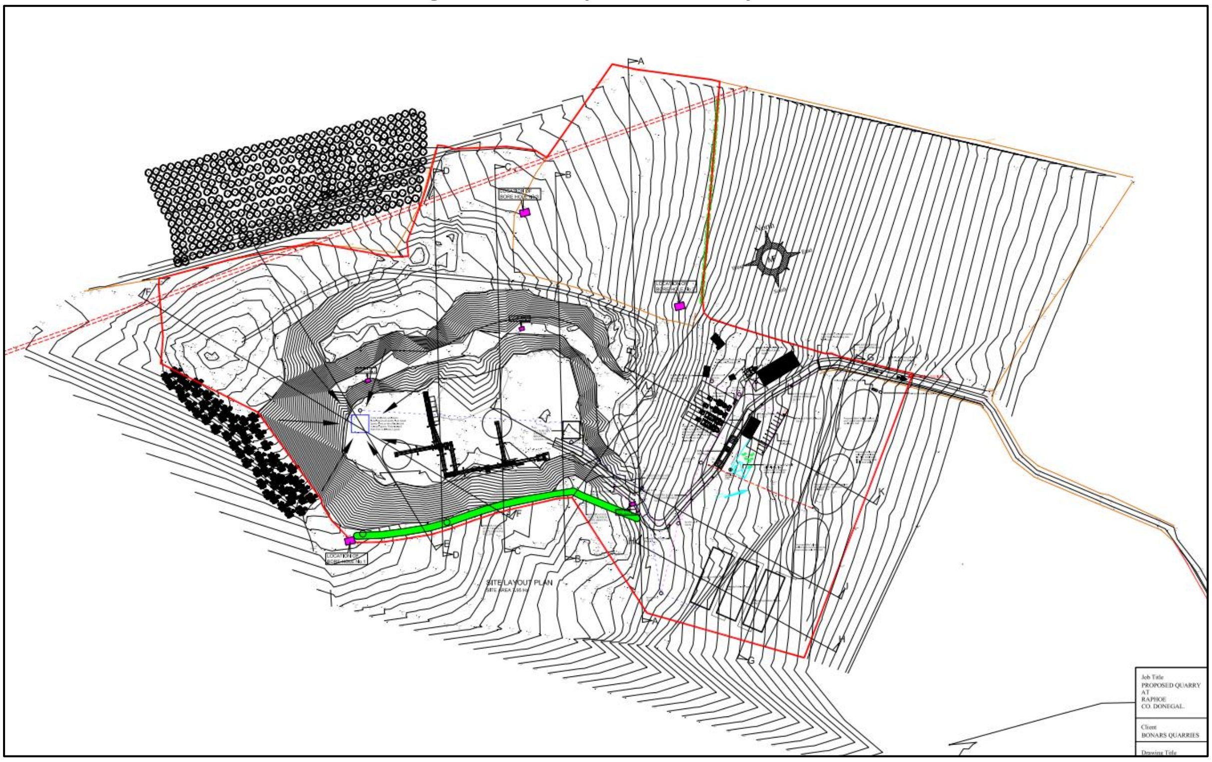
A number of measures will be put in place for the protection of surface and groundwater on the site. Protection from accidental pollution will be achieved by adhering to best practice in relation to mobile re-fueling of plant and vehicles and by robust fuel and lubricant storage measures. Further measures to be put in place include the installation of a hydrocarbon interceptor in the refueling bay/machinery shed area and a second interceptor before final discharge of effluent off site to natural waters.

Protection of the wider surface water environment will be achieved by the use of constructed settlement tanks to ensure discharge to natural waters has acceptable levels of suspended sediment. The surface waters draining the extraction area will be directed to a sump within the quarry void near to the entrance. From the sump, effluent flows (by gravity or in later phases pumped) to a 3-stage constructed settlement tank area where the effluent is treated by settlement. Final treatment of effluent is by gravity flow through a 3-stage constructed wetland before discharge off site through a second hydrocarbon interceptor. Discharge of effluent off site to waters will be under strict condition of a discharge licence from Donegal County Council to be applied for, subject to planning approval.

As the phases of extraction proceed, the existing quarry deck will deepen to an approximate depth of 118 mOD. This will require a minor amount of pumping of any groundwater and surface water ingress to the main sump before onward treatment and discharge to surface waters. The metadolerite rock to be extracted is expected to have low hydraulic conductivity and consequently the volumes of groundwater ingress likely are considered to be low. The main sump on the quarry deck will have to be lowered as extraction progresses.

The proposed extraction and processing of rock at the site is a dry operation. There is no washing of the crushed product planned before it leaves site for market. The only requirement for water usage during the extraction and processing activities will be dust suppression in periods of dry weather.

**Figure 8.1: Proposed Site Layout**




This site layout map was provided my Michael Friel Architects & Surveyors (not to scale)

See Figure 3.2, Section 3, for larger scale site layout.

## 8.4 Site Description

### 8.4.1 Site Location

The subject site is located to the Northeast of Raphoe Town which is designated as a Tier 2 B settlement in the Donegal County Development Plan 2018-2024. The subject site lays within the townlands of both Craigs and Magherasolis. The quarry is served by the L-23749 which is a country road and is in good condition. This road leads directly onto the R236 regional road. Raphoe town is located 900m SW of this road junction and 780m SW from the nearest boundary of the subject site (930m to quarry face). The site is surrounded by improved agricultural land, upland grassland and an area of commercial forestry.

### 8.4.2 Site Services in Water & Wastewater

There are toilet facilities proposed within the office block. A wastewater treatment system has been proposed to serve the office block. A site suitability assessment has been carried out by Michael Friel Architects and found the site to be suitable. Potable water is to be sourced from a borehole located upgradient of the wastewater treatment system. This borehole will source groundwater from deep groundwater strikes at approximately 100-150 mbgl.

### 8.4.3 Current Land Use

Current land use for the application site is as part of the surrounding agricultural land. Sheep and cattle graze the lands immediately surrounding the existing quarry void. Most of the footprint of previous extraction and areas of disturbed ground have recolonised with poor quality vegetation such as gorse and rushes.

### 8.4.4 Historical Land Use

The Ordnance Survey of Ireland historical map series was examined for land use on the application site. In the series mapped between 1829-1841 the site is seen as marshy ground with rocky outcrops with unknown land-use. Quarrying activity on the site started sometime in the mid 1970’s when Donegal County Council owned and operated the site for roadstone. It is thought quarrying on site ceased in the late 1980’s.

### 8.4.5 Topography

The application site and existing quarry is situated on the uppermost south-eastern slopes of a small hill approximately 165 m OD. Topography on the application site varies from 170 m OD at the northeast corner to 128 m OD on the existing quarry deck.

The proposal for extraction involves deepening the existing quarry void by approximately 10 m and eventually extending this deck depth across the new extraction area. The propose finished quarry deck level is approximately 118 mOD

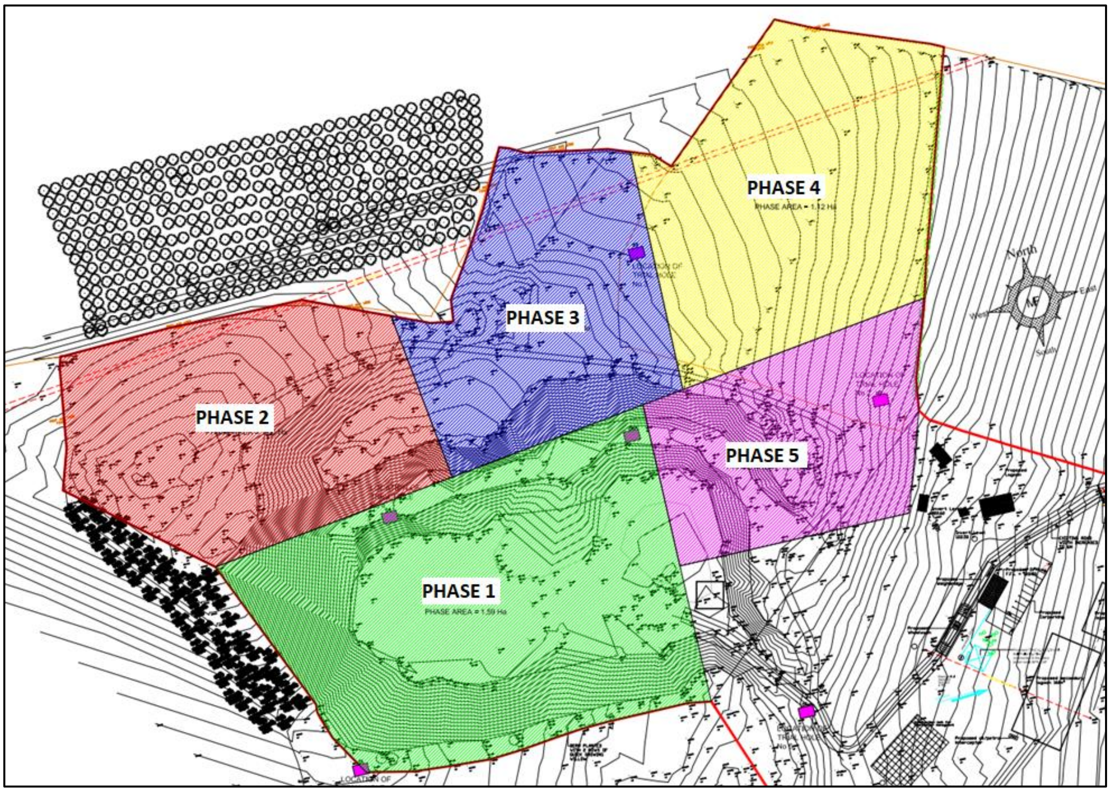
### 8.4.6 Site Layout

The proposed site layout is shown in Figure 8.1. The main items of site infrastructure such as the office block, machinery shed and weighbridge are in the eastern part of the site outside the entrance to the quarry void. Settlement tanks and constructed wetlands for effluent treatment are situated in the south-eastern part of the site. Extraction is proposed from the existing quarry void in a general north easterly direction, and vertically to approximately 118 mOD. Effluent will be directed to a sump on the quarry floor before flow (or pumping if required) to the settlement system for treatment. Processing of rock won and stockpiling of product is to take place on the redundant quarry floor.

### 8.4.7 Phases of Extraction

There are 5 phases of extraction planned over the project lifetime. These phases are depicted in Figure 8.2 below.

**Figure 8.2: Phased development of the Project**




Phase Plan supplied by Michael Friel Architects (not to scale)

#### ***8.4.7.1 Phase 1 (Figure 8.2 Green)***

Phase 1 will include the initial stripping of overburden from the extraction area and the creation of berms along the external perimeter. These berms will be 2.5 m - 3m in height. A series of settlement tanks is to be constructed to treat effluent and a constructed wetland to polish the effluent before discharge off site. Phase 1 will also include the construction and placement of all site infrastructure including site drainage.

The proposed progression of extraction is to initially work out the existing quarry void and then deepen excavations by approximately 10 m beneath the current quarry deck to approximately 118 mOD. Temporary sumps will be created for the deepening excavations which will be periodically pumped out to the main quarry sump and then onwards for effluent treatment. The total extractable reserve in Phase one is calculated at 204,824m$^3$.

#### ***8.4.7.2 Phase 2 (Figure 8.2 Red)***

Phase two is in the northwest corner of the application site and includes partially excavated areas and areas of new excavation. The total extractable reserve in Phase two is calculated at 324,515m$^3$.

#### ***8.4.7.3 Phase 3 (Figure 8.2 Blue)***

Phase three is in the northern portion of the application site and includes partially excavated areas and areas of new excavation. The total extractable reserve in Phase three is calculated at 214,025m$^3$.

#### ***8.4.7.4 Phase 4 (Figure 8.2 Yellow)***

Phase four is in the northeastern portion of the application site. This area covers most of the new extraction area where ground has been undisturbed from any previous quarrying activity. The total extractable reserve in Phase four is calculated at 237,066m$^3$.

#### ***8.4.7.5 Phase 5 (Figure 8.2 Pink)***

Phase five is in the eastern portion of the application site. This area covers some of the new extraction area where ground has been undisturbed from any previous quarrying activity and also the eastern faces of the existing quarry void. The total extractable reserve in Phase four is calculated at 123,132m$^3$.

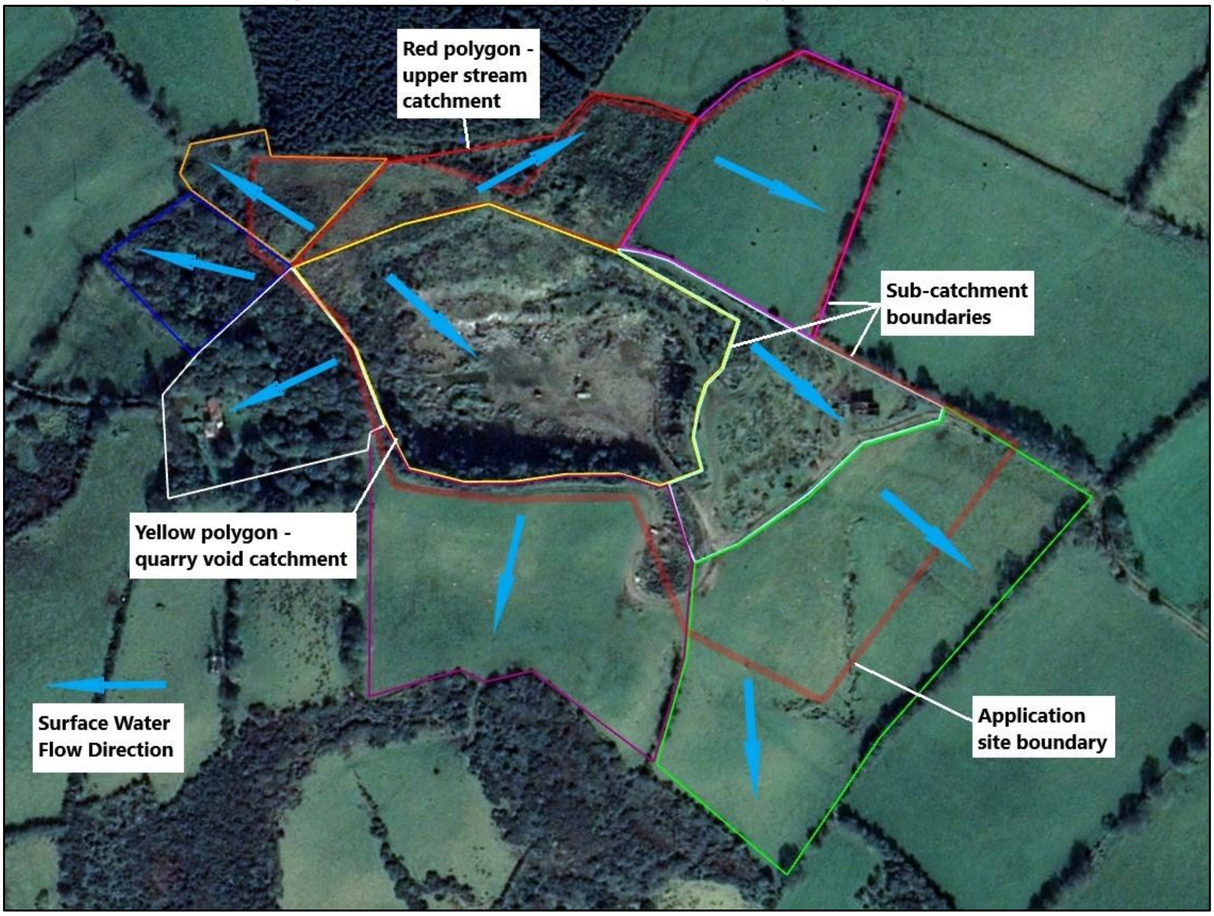
## 8.4.8 Water Requirements

Water requirements for the office block, canteen and toilet facilities are supplied by a borehole upgradient of the wastewater treatment system. Monitoring boreholes have been installed as part of the groundwater assessment of the site. Groundwater yield in the underlying bedrock has been shown to be low. The borehole for potable water will be required to be drilled deep at approximately 100-150 mbgl to achieve a water strike within the deep groundwater resource. There is no washing of quarry product planned. Water will also be required for dust suppression in periods of prolonged dry weather and for the proposed wheel wash. It is proposed to source this water from rainwater harvested from the roofs of the office block and machinery shed. A supplementary water supply from the settlement tanks can be accessed if required.

## 8.4.9 Site Drainage & Surface Water Runoff on Site

The current drainage flow directions for the site and surrounding areas were examined and 9 sub-catchments identified surrounding the site. The sub-catchments are indicated on Figure 8.3 below. As is seen in Figure 8.3, because the site is located at the top of a hill there is very little runoff directed into the site from outside the red-line boundary.

**Figure 8.3: Sub-catchments around the application site**



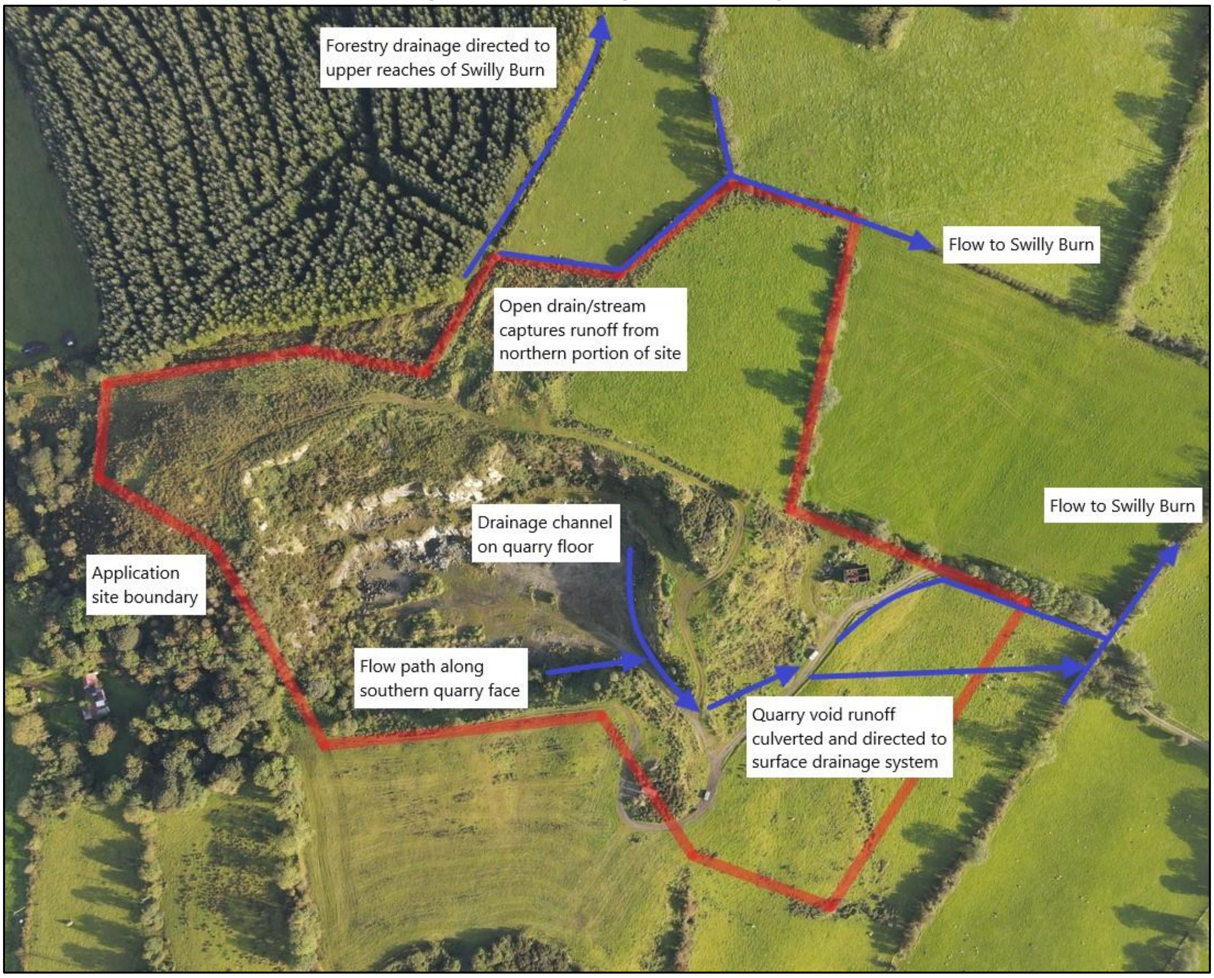

Base Image supplied by Google Earth Pro ™

Site drainage, surface water runoff and water management within the current site are schematically represented in Figure 8.4. There is a culverted outflow of water from the quarry void to a surface water ditch flowing east from the site. Surface water flowing from the northern portion of the site flows into a small agricultural ditch flowing east from the north of the site. These are the only two defined water channels on the site. Both these channels flow into the Swilly Burn stream and eventually into the Foyle system. At various points after leaving the application site, both these channels are culverted through sections of agricultural land before entering the main channel of the Swilly Burn.

Flow outside the quarry void into either of these two channels is via unregulated surface flow or throughflow. The flow regime inside the quarry void is more complex as there is interaction between surface and groundwater. Incident rainfall is captured within the quarry void. The quarry void also captures rainfall from the high ground immediately to the northwest (see Figure 8.3, Quarry void catchment shown as a yellow polygon). Within the quarry void there are several pools of water near the quarry faces which appear to be of static water. It is likely that these pools are a mixture of groundwater and surface water. Conductivity testing of these water samples in Section 8.4.14 is consistent with this view.

A wide channel conducts flow out of the quarry void through a culvert and onwards to the surface drain and subsequently downstream to the Swilly Burn. Field observation of this channel on numerous occasions has shown flow in this channel to be static until almost at the entrance to the quarry void. At this point a distinct flow enters the channel from under the quarry entrance road and from the direction of the southern quarry face. This appears to be water flowing in a preferential flow path along the boundary between the two distinct rock groups on site, the meta-sediments and the meta-dolerite. This is likely to be a mixture of surface water and groundwater flowing along this boundary. Conductivity testing of these water samples in Section 8.4.14.1 is consistent with this view. The geology report in Appendix 7.1, *Section 7 Land, Soils & Geology*, describes this geological contact comprehensively.

**Figure 8.4: Existing Site Drainage**

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## 8.4.10 Existing Water Balance Estimations

Extensive flow rate measurements have been taken from both outflows from the site to assess water balance for the area. The flow rate was estimated in the upper agricultural drain/stream at regular intervals over the study period. This is a small stream/ditch with a highly irregularly shaped channel of silt and clay. A 100 mm diameter half-pipe was installed to crudely estimate flow using the velocity area method.

The flow rate leaving the quarry void was measured at regular intervals over the study period. The culverted pipe leaving the quarry floor is accessible outside a small building remaining as part of the original site infrastructure. Measurements were taken with a 15L bucket and stopwatch.

The points for flow rate measurement were also used for water quality sampling and are shown in Figure 8.5 below. Point 1 is the flow leaving the quarry void. Point 2 is the upper drainage channel.

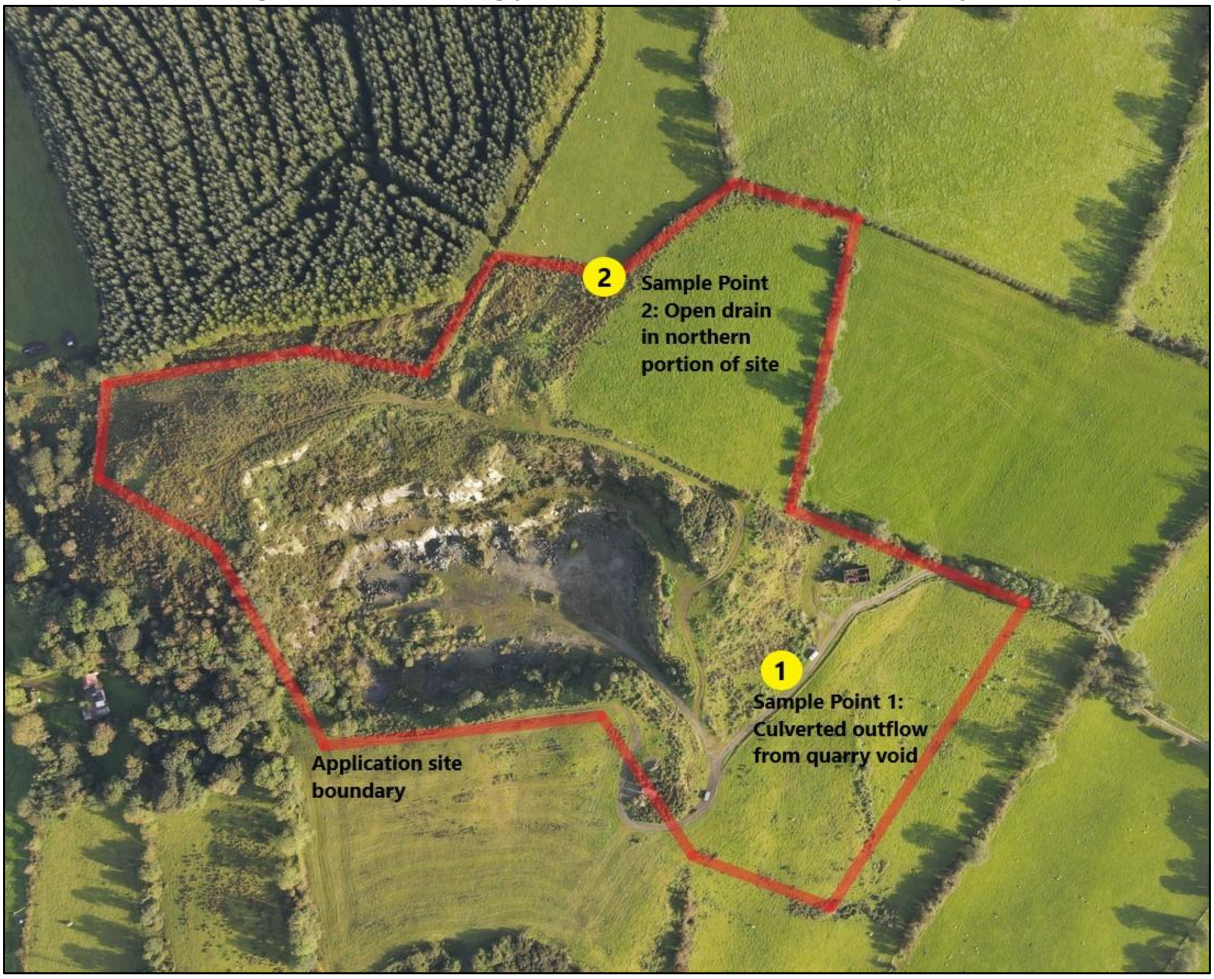
Measurements for both outflows are presented in Appendix 8.2. The study period was from October 2021 to March 2022 and therefore generally represents the wettest period of the year.

Average flow rate for the upper stream was 0.25 L/s. This catchment area is represented by the red polygon in Figure 8.3 and measures approximately 8,637m$^2$.

Average flow rate for the quarry floor was 1.72 L/s. This catchment area is represented by the yellow polygon in Figure 8.3 and measures approximately 25,418m$^2$.

Both flow rates were directly proportional to the amount of incident rainfall received on site of the preceding 3 days prior to measurement.

**Figure 8.5: Monitoring points for flow rate and water quality**

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To calculate average runoff rates the annual effective rainfall is assessed against the amount of rainfall that will percolate into the groundwater system. Effective rainfall (ER) is the average amount of incident rainfall minus the amount of Actual Evapotranspiration (AE). AE is usually calculated as 82% of Potential Evapotranspiration (PE). (The 82% figure has been used in recent studies and will calculate a higher ER rate than the customary 95% calculation rate which has been traditionally used). PE figures are available from Met Eireann for Malin Head. Malin Head is the nearest Met Eireann synoptic recording station located approximately 59 km to the north of the application site. Annual mean PE is 527.3mm.

***AE = PE * 82%*** ***AE = 432.4mm***

Average annual rainfall (AAR) can be taken from long term data sets produced by Met Eireann (1981-2010). The figure from Malin Head is 1,076mm. A more representative average annual rainfall figure is obtained from the Met Eireann Letterkenny, Dromore metrological station, 10 km northwest of the application site. The average annual rainfall for the last available 5 years (2020 – 2016 inclusive) is 1,196mm.

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

**Effective rainfall = AAR – AE**
**ER = 1196mm - 432.4mm**
**ER = 763.6mm**

The calculated figure for ER compares favourably with the Geological Society of Ireland's (GSI) estimated figure for the site of 717.10 mm for the site (Figure 8.22).

In relation to the site, the upper area draining to the upper stream will receive approximately 6,595m$^3$ effective rainfall annually, approximated as 18 m$^3$ daily. This daily figure will vary seasonally. To account for seasonality the last 5 years data for the months October to February from the meteorological station at Dromore, Letterkenny, were examined and the average daily figure for rainfall was calculated as 3.1 mm.

Annual AE is calculated as 432.4 mm which averages out at 1.18 mm per day. However, AE will be less over the winter period due to the colder temperatures. A conservative assumption of 0.5 mm per day AE is made for this winter period between October and February. Assuming an average daily figure of 0.5 mm AE, effective rainfall for the site is a daily average of 2.6 mm over the winter period. The average daily winter incident effective rainfall for the area draining to the upper stream (8,637 m$^2$) is calculated at 22.5 m$^3$.

The crude approximation of average flow rate over the study period for the upper stream was 0.25 L/s. Average daily flow rate discharged through the steam in this small catchment is measured at 21.6 m$^3$ for the study period (Oct-Feb). The expected input (22.5 m$^3$) and measured output (21.6 m$^3$) figures for this sub-catchment are similar. These figures broadly reflect what might be expected where a high proportion of incident rainfall forms surface water runoff and a small percentage forms throughflow or contributes to groundwater recharge. Figure 8.7 below shows the strong relationship between incident rainfall and flow rate measured in the upper stream.

In relation to the quarry void catchment, the annual effective rainfall received will be 19,409m$^3$, approximated at 53m$^3$ daily. This daily figure will vary seasonally. To account for seasonality the last 5 years data for the months October to February from the meteorological station at Dromore, Letterkenny, were examined and the average daily figure for rainfall was calculated as 3.1 mm. As in the above calculations involving the upper stream catchment the daily AE is assumed to be 0.5 mm. The effective rainfall for the site is a daily average of 2.6 mm over the winter period. For the area draining to the quarry void (25,418 $m^2$) this average daily winter incident effective rainfall was calculated at 66 $m^3$. Average daily flow rate discharged through the culvert in the quarry catchment is 149 $m^3$ for the study period (Oct-Feb).

The observed quarry void outflow rate is higher than the expected incident effective rainfall and reflects the flow contribution from along the southern quarry face. This flow has potential to have a zone of contribution extending beyond the quarry void catchment to the north and west of the site. The flow rate along this preferential flow path is directly related to incident rainfall on the site. Conductivity measurements indicate that there also may be a significant groundwater contribution to this flow (Section 8.4.14.1).

Figure 8.6 below shows the strong relationship between incident rainfall and the outflow from the quarry void. When flow rate measurements were taken, the sample date and the preceding two days rainfall figures were averaged to achieve an average daily incident rainfall figure for the preceding three days. Meteorological data from both Finner Camp and Malin Head synoptic stations were used as the application site is almost equidistant between the two (Malin Head 59 km to NW and Finner Camp 61 km to SE). A similar relationship exists between the data for the preceding 3 days rainfall and the flow rate observed in the upper stream. Figure 8.7 shows this correlation.

**Figure 8.6: Quarry outflow and incident rainfall**

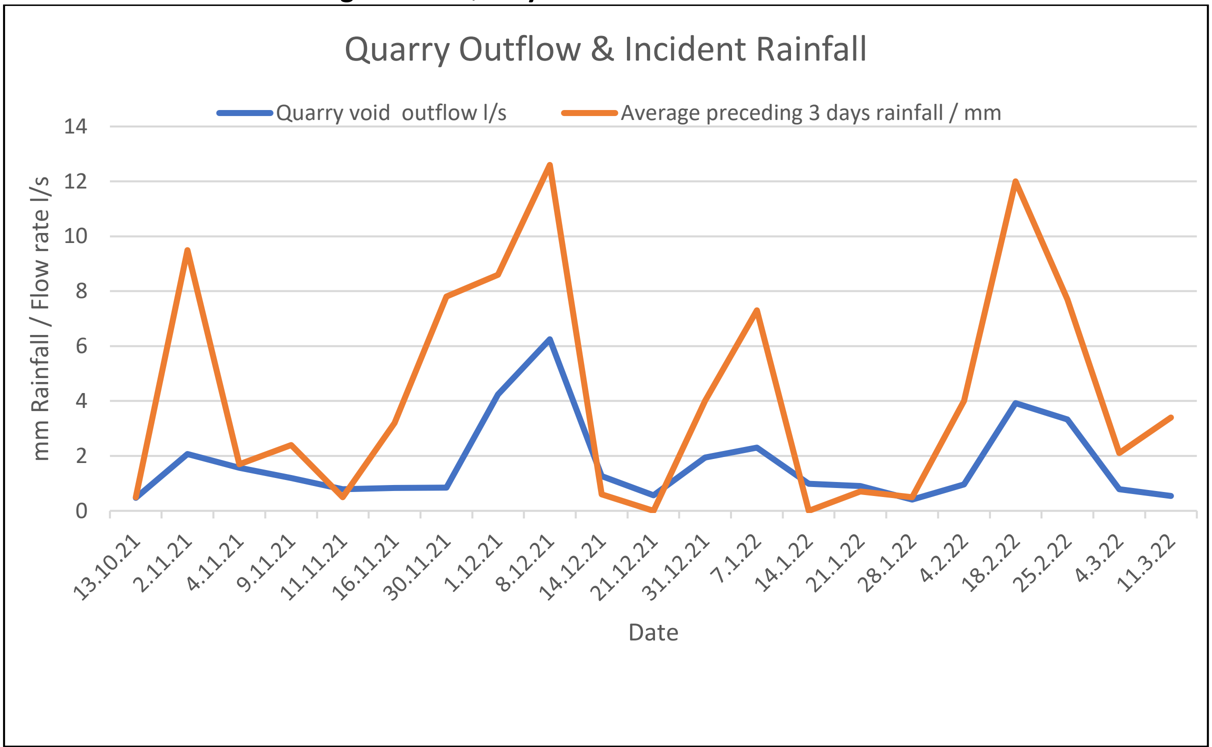
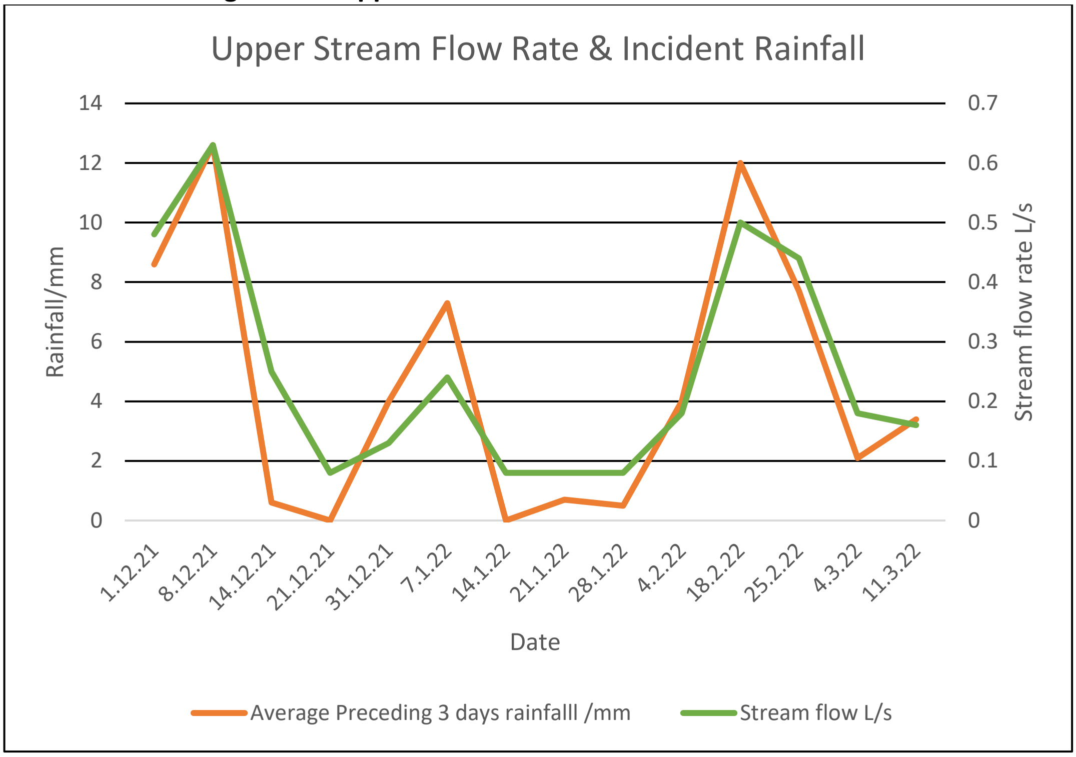


**Figure 8.7: Upper stream flow rate and incident rainfall**




## 8.4.11 Existing Surface Water Quality

The outflows from the site have been sampled and analysed for surface water quality periodically over the study period. The flow was sampled leaving the quarry void at sample point 1 and the flow in the upper drainage channel was sampled at point 2. Both these locations are shown in Figure 8.5 above. The results of the chemical analysis are presented in Table 8.2 below. The certificates of analysis are presented in Appendix 8.1.

**Table 8.2: Surface Water Quality Analysis**

| Sampling Date | Sample Point | Parameter | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | pH | SS mg/L | COD mg/L | Conductivity µS/cm | Ammonia mg/L | Total N mg/L | Sulphate mg/L | BOD mg/L |
| 17.10.2021 | **1** | 7.54 | <5 | | 464 | | | | |
| 22.11.2021 | **1** | 7.57 | <5 | | | | | | |
| | **2** | 7.52 | 11 | | | | | | |
| 07.12.2021 | **1** | 7.57 | <5 | <16 | 379 | 0.05 | 3.89 | 68.37 | 1.2 |
| | **2** | 7.53 | 5 | <16 | 205 | 0.08 | 4.11 | 12.86 | 2.04 |
| 04.01.2022 | **1** | 7.88 | <5 | | | | | | |
| | **2** | 7.98 | 10 | | | | | | |

An examination of these results shows that the both the outflows from the site are of high quality. BOD and Ammonia values for both outflows are in the category of 'high' ecological status as defined in the Environmental Objectives Surface Water Regulations values (S.I. 272 of 2009). The values for pH are with the accepted range of 6-9, and suspended sediment values are lower than the 25 mg/L threshold specified in the Freshwater Fish Directive (2006/44/EC).

Conductivity results confirm the likelihood of a strong groundwater influence from the quarry void outflow (Section 8.4.14.1).

***8.4.11.1 Ecological Assessment of Upper Drainage Channel***

A kick sample was taken in the open drain/stream which runs along the northern boundary of the application site. The kick sample was taken immediately upstream of sample point 2 shown in Figure 8.5. A photograph of the sampling location is shown below in Photograph 8.1. The photograph was taken looking east.

**Photograph 8.1: Kick sample location on northern boundary of site**

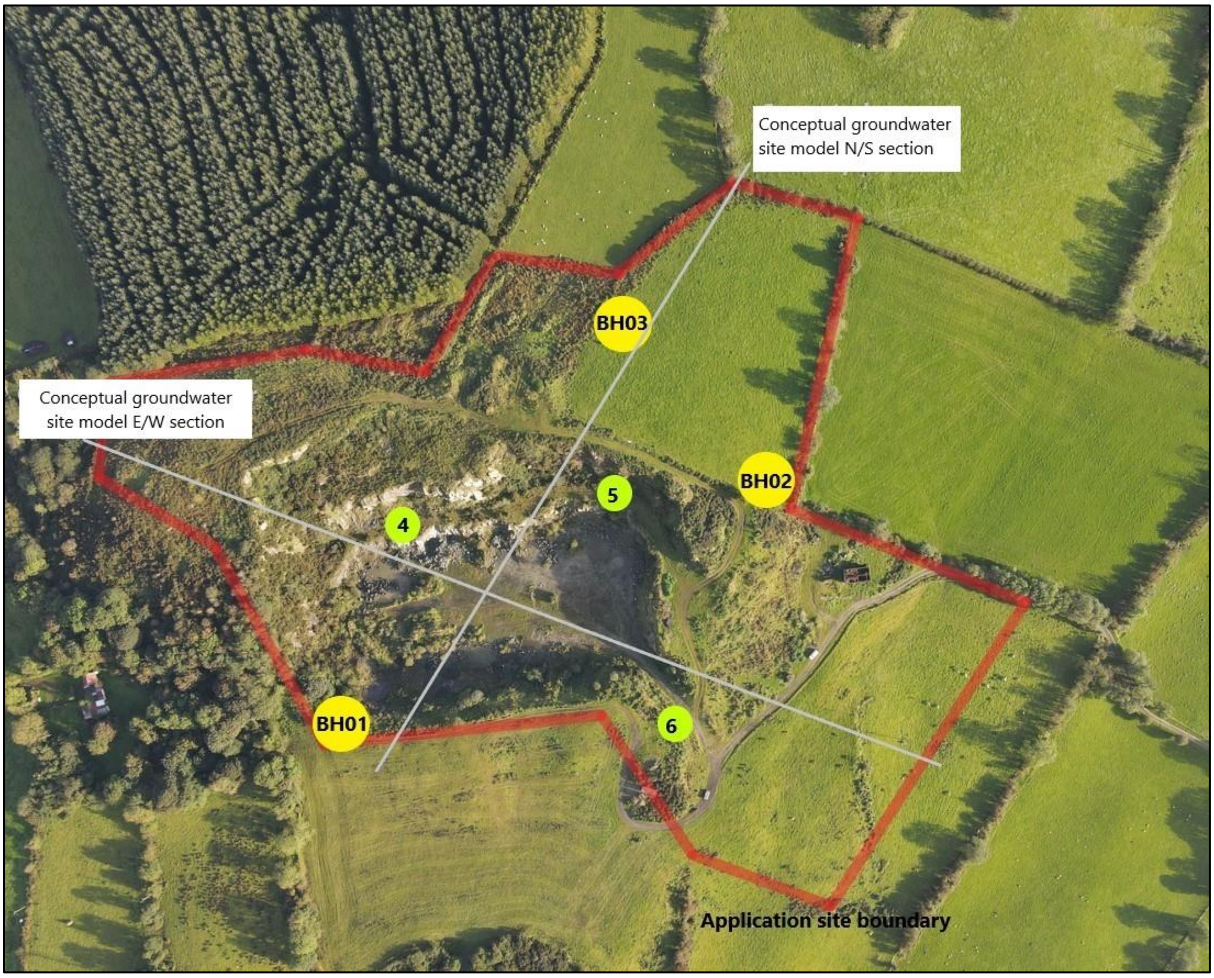
The condition of the stream was poor with dark black/grey mud as the main substrate. The sample was found to have poor/low ecological value. The drain/stream at this point has little ecological value. The details of the ecological assessment are presented in Appendix 8.7. A large part of the catchment of this drain will be removed on extraction and water will be directed through the quarry settlement system. The assessment is simply to show that the removal of the majority of the water source from this drain won't have a hugely significant impact on the ecology within the drain.

**8.4.12 Hydrogeology, Groundwater Levels and Gradient**

To assess the current hydrological regime on site, three monitoring boreholes were drilled and installed in November 2021. The position of the three wells (BH01, BH02 & BH03) is shown in Figure 8.8 below.

The boreholes were 100 mm in diameter drilled to 100 mbgl, 50 mm diameter standpipe installed, gravel packed, bentonite sealed and capped. The drilling crew reported no water strikes encountered in any of the three monitoring boreholes and that drilling dust remained dry throughout the drilling process. The borehole logs completed by the drilling crew are presented in Appendix 8.3.

**Figure 8.8: Position of monitoring boreholes, BH01, BH02 & BH03.**

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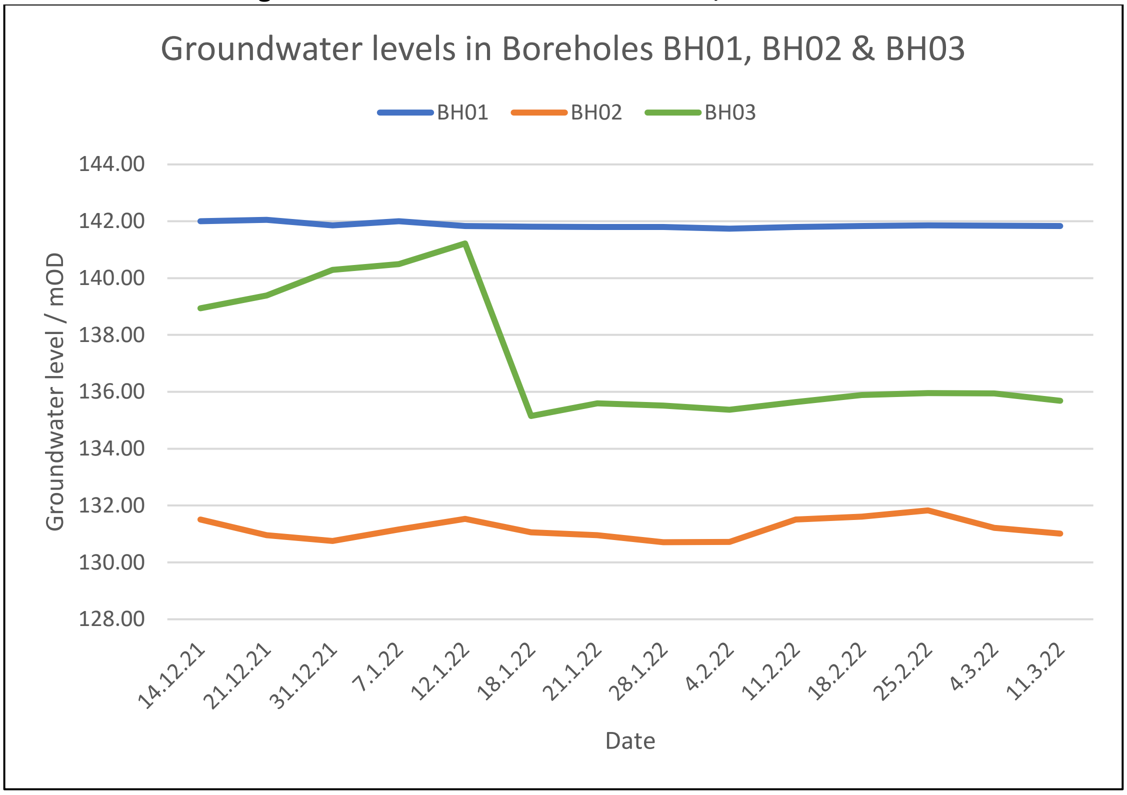
BH01 is located on the southeast corner of the application site in the quartzite metasediment. BH02 and BH03 are located in the northern portion of the site in the area of proposed new extraction and are in the metadolerite bedrock.

***8.4.12.1 Groundwater Levels***

Groundwater levels were recorded with an electronic dip meter weekly at each of the boreholes over the course of a 3-month study period. It is noted that the monitoring period occurred when groundwater levels are likely to be at their highest. Plots of the groundwater level variation over time are given below for the three monitoring boreholes in Figure 8.9 below. The groundwater level readings are presented in Appendix 8.4.

**Figure 8.9: Groundwater levels at BH01, BH02 & BH03**



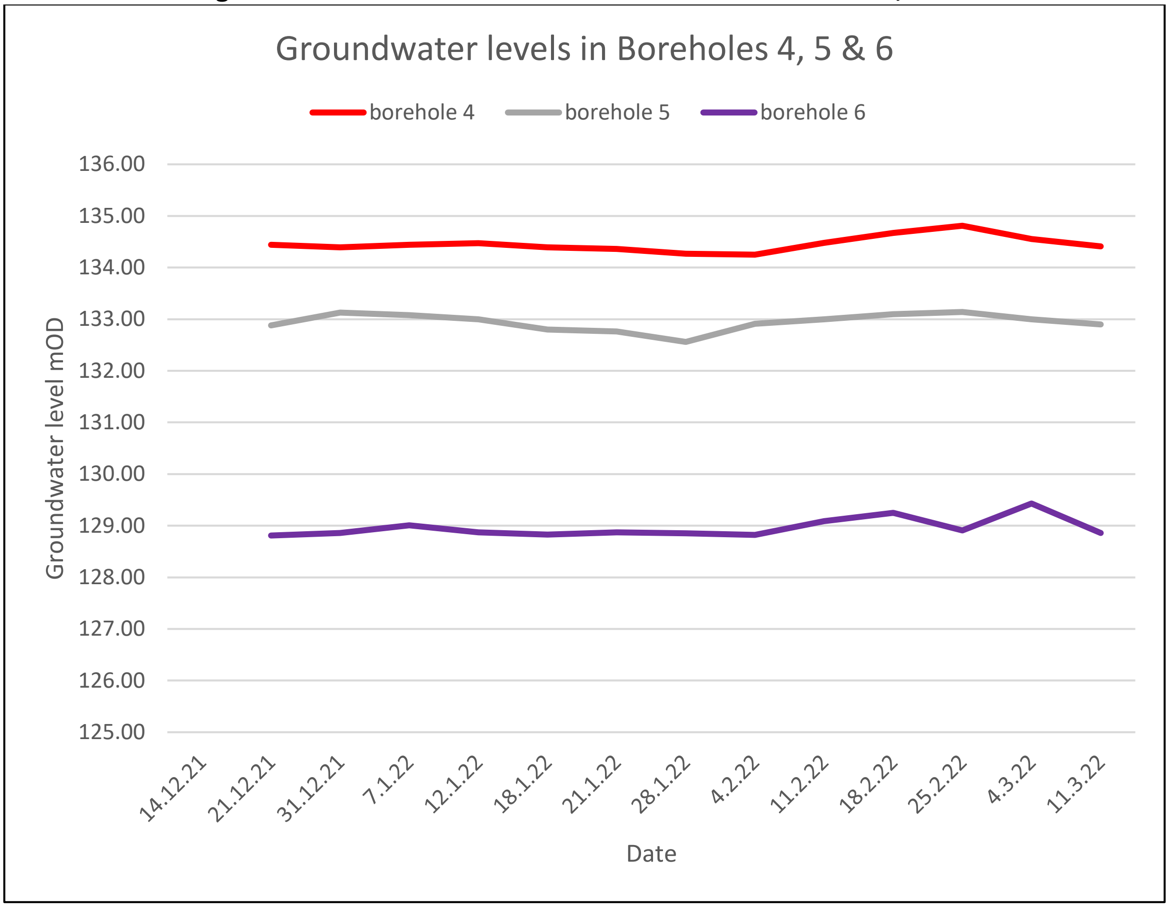

The groundwater levels at BH01 remained reasonably constant at approximately 142 mOD.

Groundwater levels at BH02 were initially high, around 140 mOD, but decreased to between 135 mOD and 136 mOD following a mini-pump and recovery test on 12.1.22. It is thought that the original readings may have been artificially high due to the ingress of surface water during installation. Groundwater levels at BH03 were consistently around 131 mOD.

In addition to the monitoring boreholes installed in November 2021, measurement of static groundwater levels was taken from three previously drilled boreholes on site. These boreholes were drilled in 2019 to a depth of 24 mbgl and were unlined. The positions of these boreholes are shown as 4, 5 & 6 on Figure 8.8. Groundwater level readings from these unlined boreholes are viewed with caution as the boreholes are not constructed to monitoring specification. However, measurements are seen to be consistent with other groundwater level observations and as such help inform the overall groundwater regime.

Plots of the groundwater level variation over time are given below for the three additional boreholes (4, 5 & 6) in Figure 8.10 below. The groundwater level readings are presented in Appendix 8.4.

**Figure 8.10: Groundwater levels at additional boreholes 4, 5 & 6**




- Borehole 4 has groundwater levels of around 134 mOD.
- Borehole 5 has groundwater levels of around 133 mOD.
- Borehole 4 has groundwater levels of around 129 mOD.

Inferred hydraulic gradients can be estimated from this limited data.

***<u>8.4.12.2 Groundwater Gradient</u>***

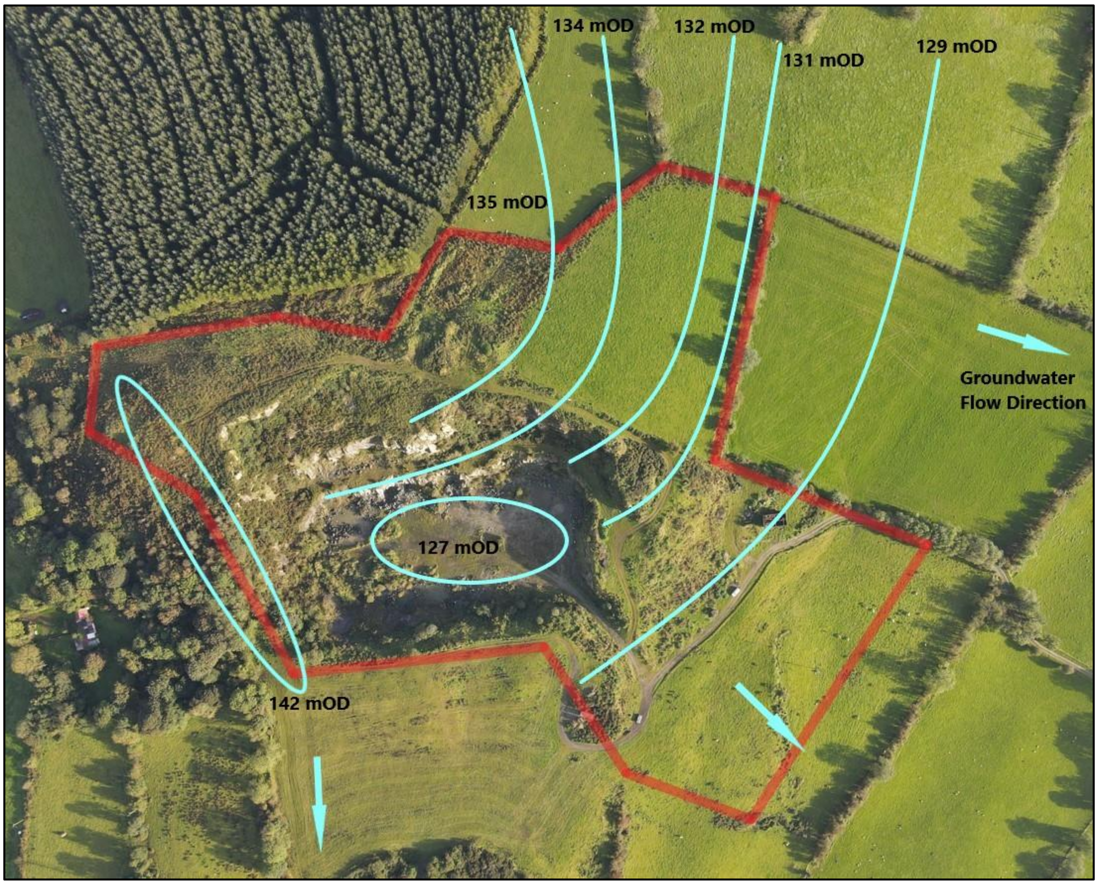
The difference in hydraulic head between BH03 and BH02 averages 4.46 m (once a correction has been made for the initial artificially high levels in BH03). The groundwater flow direction is to the east and the difference in distance east to west between BH02 and BH03 is approximately 96 m. The hydraulic gradient is estimated at 0.046 or 4.6% flowing to the east.

The difference in hydraulic head between borehole 4 and 5 averages 1.52 m. The groundwater flow direction is to the east and the difference in distance east to west between BH02 and BH03 is approximately 76 m. The hydraulic gradient is estimated at 0.02 or 2% flowing to the east.

***<u>8.4.12.3 Groundwater Contours</u>***

Using these observed groundwater levels it is possible to plot limited inferred groundwater contours for the site to demonstrate the groundwater gradient. The groundwater contours are shown schematically in Figure 8.11. From Figure 8.11 it is seen that the groundwater gradient for the site is to the east. Groundwater flow will be directed east and southeast in line with the topography of the area and the regional groundwater gradient.

**Figure 8.11: Inferred Groundwater Contours**

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### *8.4.12.4 Aquifer properties*

Hydraulic conductivity (K) defines the rate of movement through the aquifers on site and can be expressed in units of metres per day (m/day) or metres per second (m/s). Table 8.2 below gives a description of typical Hydraulic conductivity rates and expected ranges for a number of different rock types.

Measurement of hydraulic conductivity is problematic on site due to the likely transport mechanism within the rock types. Groundwater movement through both the metasediments and the metadolerite is likely to be confined to fracture flow within small cracks and joints as both lithologies are massively bedded. There is not expected to be any intergranular flow on site. There is likely to be a high degree of variability through the site with the amount and orientation of the cracks and fractures dictating the flow regime. Hydraulic conductivity is expected to decrease with increasing depth due to the decreasing number of cracks and fractures at depth.

**Table 8.3: Hydraulic Conductivity Rates**

| Description | Hydraulic conductivity (m/d) | Rock Type | Range of Hydraulic conductivity (m/d) |
|---|---|---|---|
| **Extremely slow** | 0.000001 | Slate | $10^{-8}$-$10^{-5}$ |
| **Very slow** | 0.0001 | Granite | 0.0003-0.03 |
| | | Basalt | 0.0003-3 |
| **Slow** | 0.01 | Sandstone | $10^{-3}$-1 |
| **Moderate** | 1 | Fine grade unconsolidated sand | 1-5 |
| **Fast** | 10 | Medium grade unconsolidated Sand | 5-20 |
| **Very Fast** | 100 | Gravel | 100-1000 |

From Table 8.3 it can be seen that hydraulic conductivity can vary greatly between and within rock types. The metadolerite to be quarried on site resembles the characteristics of the basalt rock type in the table. The metadolerite would be assumed to have K values which are variable due to the fracture density present but generally of low hydraulic conductivity.

Within the quarry void there appears to be a preferential flow path following the contact between the quartzite metasediment and the metadolerite along the base of the southern quarry face (Section 8.4.9). Apart from this flow path there were no other significant groundwater seeps in any part of the existing quarry faces observed under a range of weather conditions. It is assumed that the transmissivity of the metadolerite is low. It is seen to be massively bedded with weathering cracks and joints the only possible route for slow groundwater migration. Photograph 8.2 below shows the typical metadolerite encountered within the quarry void on bench 1. Typically, the amounts of fractures and cracks will decrease with increasing depth below ground level and consequently the transmissivity is expected to decrease with depth.

**Photograph 8.2: Massively bedded metadolerite with weathering cracks and fractures.**

To further assess the aquifer property mini-pump and recovery tests were carried out at each of the monitoring boreholes BH01, BH02 & BH03. Each borehole was emptied to varying degrees with a submersible pump. The rate of pumping was noted and when pumping ceased the recharge to the borehole was monitored with a dip meter until full recharge was reached. Further details on the mini-pump tests are presented in Appendix 8.5.

The results of the mini-pump tests confirm that recharge and hence hydraulic conductivity of both the quartzite metasediment and the metadolerite are very low. The recharge curves for BH01, BH02 and

BH03 are shown below in Figures 8.12, 8.13 & 8.14 respectively. BH01 was pumped to a depth of approximately 40m and 87 Litres abstracted at an average rate of 0.11 L/s. Recharge for BH01 took approximately 15 hours. BH02 was pumped to a depth of 40.1m and 478 Litres abstracted at an average rate of 0.09 L/s. Recharge for BH02 took approximately 9 hours. BH03 was pumped to a depth of approximately 38m and 338 Litres abstracted at an average rate of 0.07 L/s. Recharge for was incomplete and after 24 hours the groundwater level returned to 14.96 mbgl. The initial groundwater level before pumping started was 8.94 mbgl. Eight weeks after the pump test groundwater levels at BH03 remained at approximately 14 mbgl. It is thought that the initial standing groundwater levels were artificially high. This may have been related to the construction of the boreholes taking place during a wet period and ingress from surface water.

**Figure 8.12: Mini-pump test recharge for BH01**

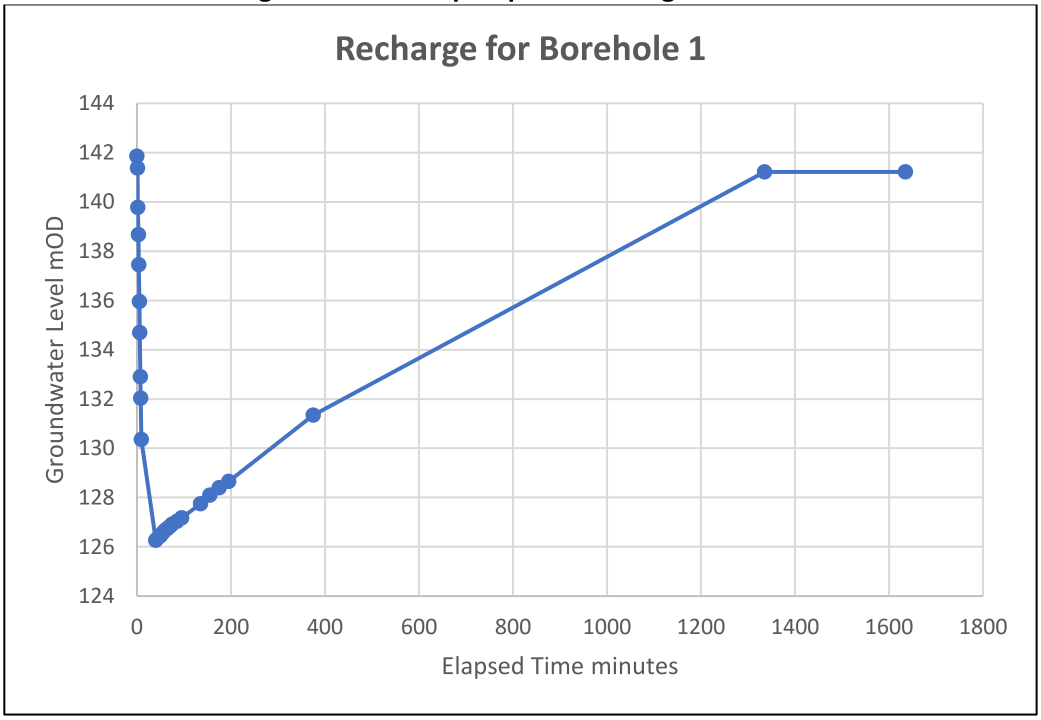



**Figure 8.13: Mini-pump test recharge for BH02**

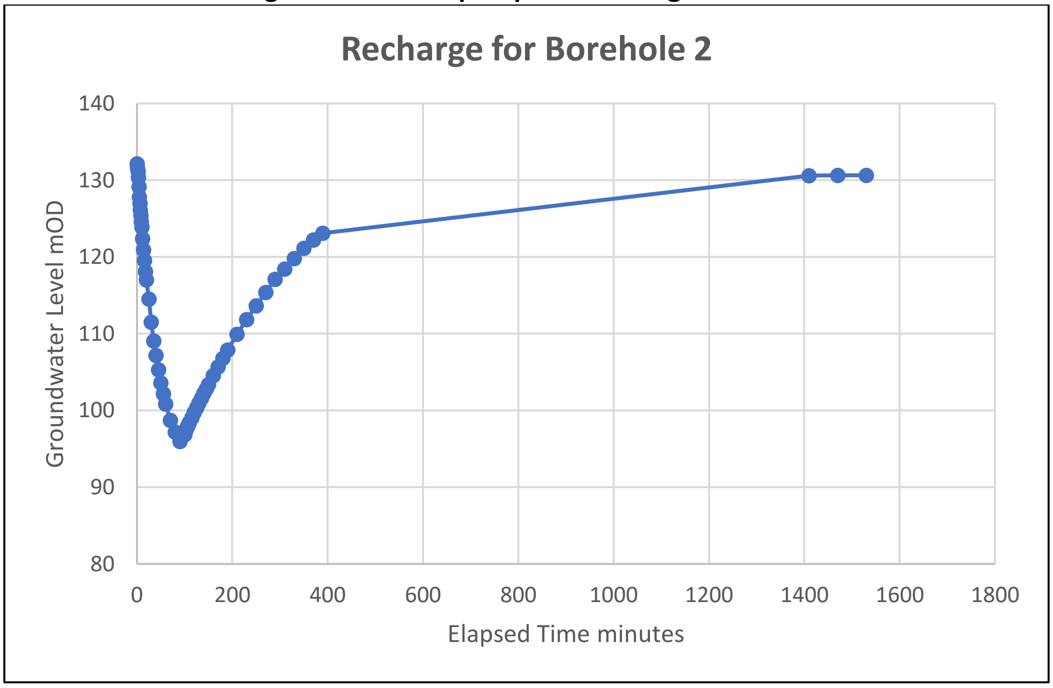
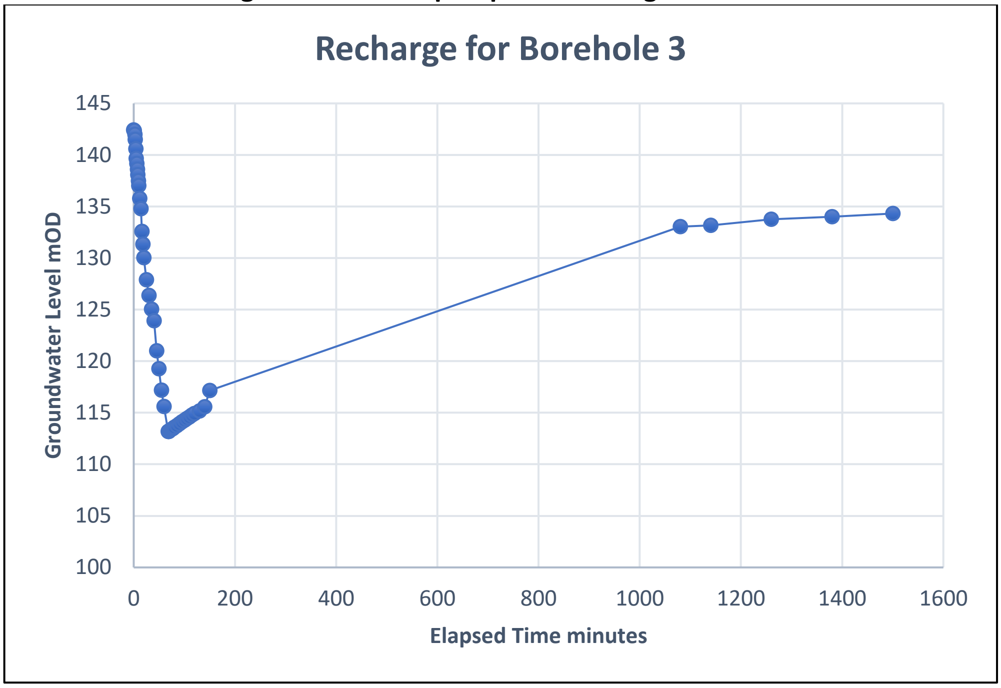


**Figure 8.14: Mini-pump test recharge for BH03**




Although these tests were limited in nature, a similar recharge response is demonstrated in boreholes 1 & 3. The aquifer in BH01 is the quartzite metasediment and in BH03 is the metadolerite. Both boreholes are located close to the highest point in the surrounding area and will be close to the top of the groundwater resource. Borehole 2 is approximately 100m downgradient of groundwater at BH01 & BH03 and the increased hydraulic gradient may explain the faster recharge time noted.

***8.4.12.5 Transmissivity Calculations***

Using the limited data from the mini-pump tests on each of the boreholes a crude estimate of transmissivity was made. The recharge data following pump shut off was examined and calculations based on Theis's recovery method used to estimate KD (transmissivity $m^2$/day) on the site. The data and calculations are presented in Appendix 8.6.

The results are treated with caution as the pump test was of short duration and many assumptions have been made regarding the aquifer properties. Irish aquifers tend to be generally heterogeneous, anisotropic and not aerially infinite so there is likely to be a high degree of error associated with these calculations. However, the results obtained are broadly in line with what is expected:

- **BH01 (metasediment): KD = 19.9 $m^2$/day**
- **BH02 (metadolerite): KD = 5.5 $m^2$/day**
- **BH03 (metadolerite): KD = 2.3 $m^2$/day**

It is seen that the metadolerite has variable and low transmissivity. This is evident in the lack of seeps and groundwater flows through the existing quarry faces and the relatively long recharge response times to the mini-pump tests. The GSI list poorly productive aquifers (Pl, Pu & Ll) as having transmissivity values of less than 10 $m^2$/day.

***8.4.12.6 Conceptual Hydrogeology***

A conceptual site model has also been generated for the hydrogeology of the site and is shown in Figures 8.15 & 8.16. Figure 8.15 is a cross sectional conceptual model showing the existing quarry and the new extraction area across a north-south axis. Figure 8.16 is a cross sectional conceptual model showing the new extraction area across an east-west axis. The cross-section lines are depicted on Figure 8.8.

**Figure 8.15: Conceptual Hydrogeological model across north south axis**

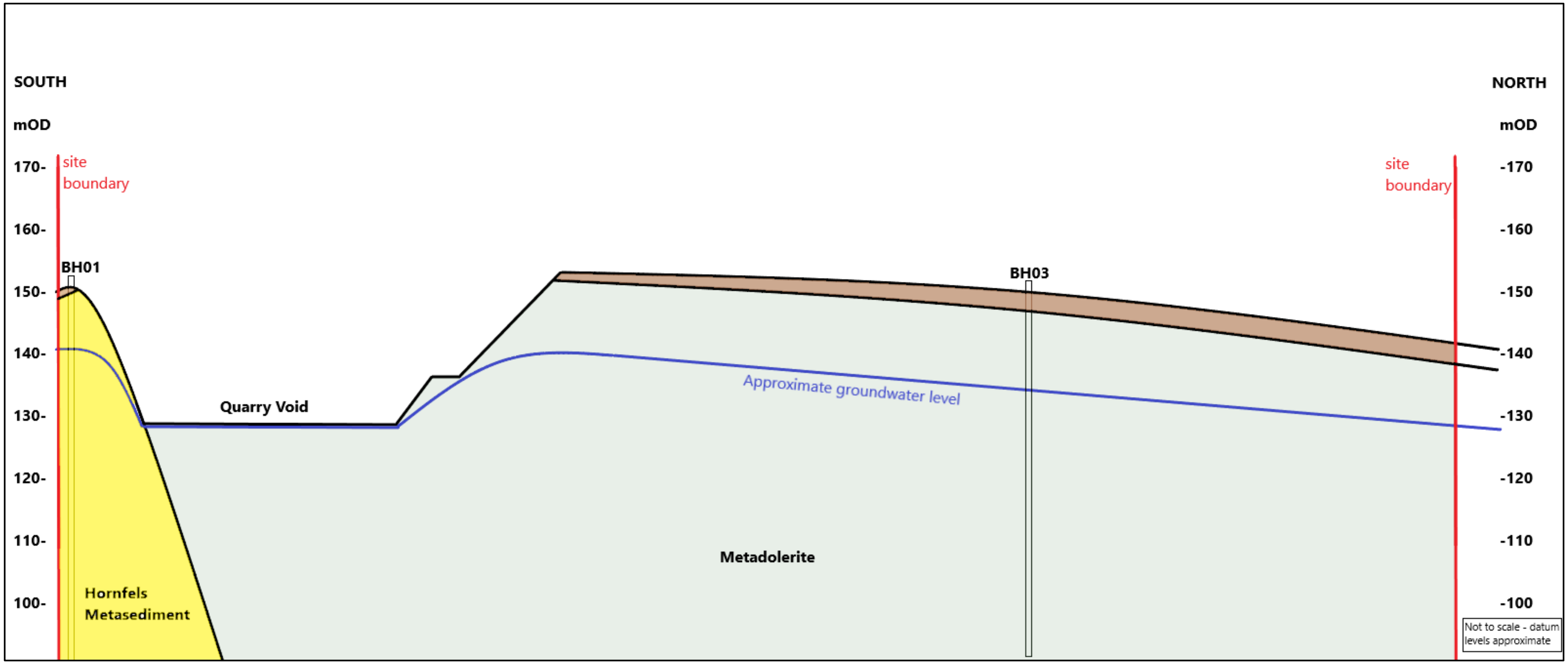
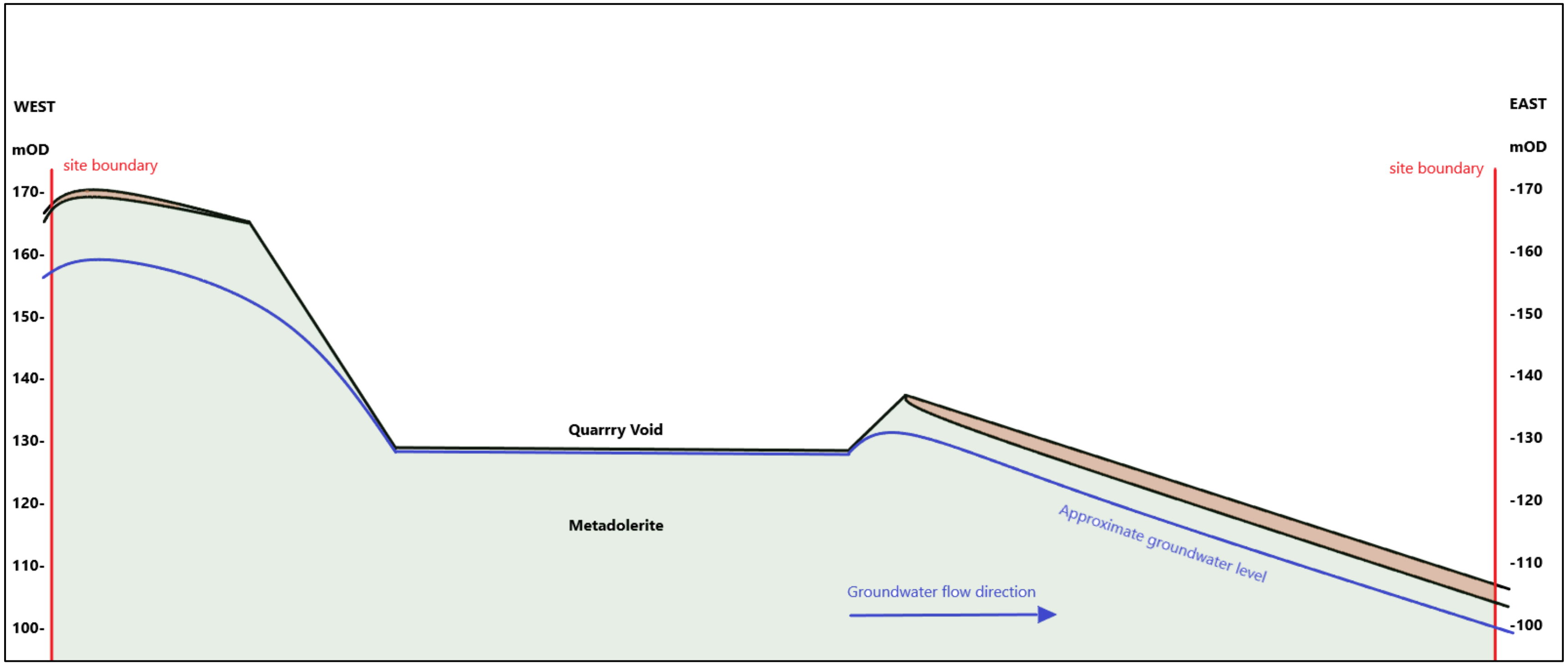


**Figure 8.16: Conceptual Hydrogeological model across east west axis**




In the conceptual site model, the cone of depression created by the existing quarry void is seen to be steep and does not appear to extend for any significant distance beyond the edge of the quarry faces. This is likely to be due to the low transmissivity properties of the aquifers concerned.

**8.4.13 Existing Groundwater Quality**

After installation of boreholes, BH01, BH02 & BH03, groundwater was allowed to settle for several weeks. The boreholes were purged and samples taken with a manual bailer on 19th January 2022. A fresh bailer was used for each borehole sample. The samples were analysed for a range of parameters and a summary of the analysis provided in Table 8.3 below. Certificates of analysis are presented in Appendix 8.1.

**Table 8.3: Groundwater chemical analysis**

| Sample | Date | Parameter | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | pH | SS mg/L | DO % | Conductivity µS/cm | Ammonia mg/L | Total N mg/L | Sulphate mg/L | Orthophosphate mg/L |
| BH01 | 18.01.22 | 7.35 | 29 | 43.3 | 602 | <0.01 | 1.4 | 41.80 | 0.01 |
| | 25.02.22 | 8.09 | 9 | | 656 | | | | |
| BH02 | 18.01.22 | 7.92 | 60 | 45.2 | 624 | 0.03 | 1.4 | 13.22 | <0.01 |
| | 25.02.22 | 7.12 | 12 | | 633 | | | | |
| BH03 | 18.01.22 | 7.61 | 13 | 35.6 | 613 | 0.03 | 1.4 | 20.51 | <0.01 |
| | 25.02.22 | 7.79 | 10 | | 588 | | | | |

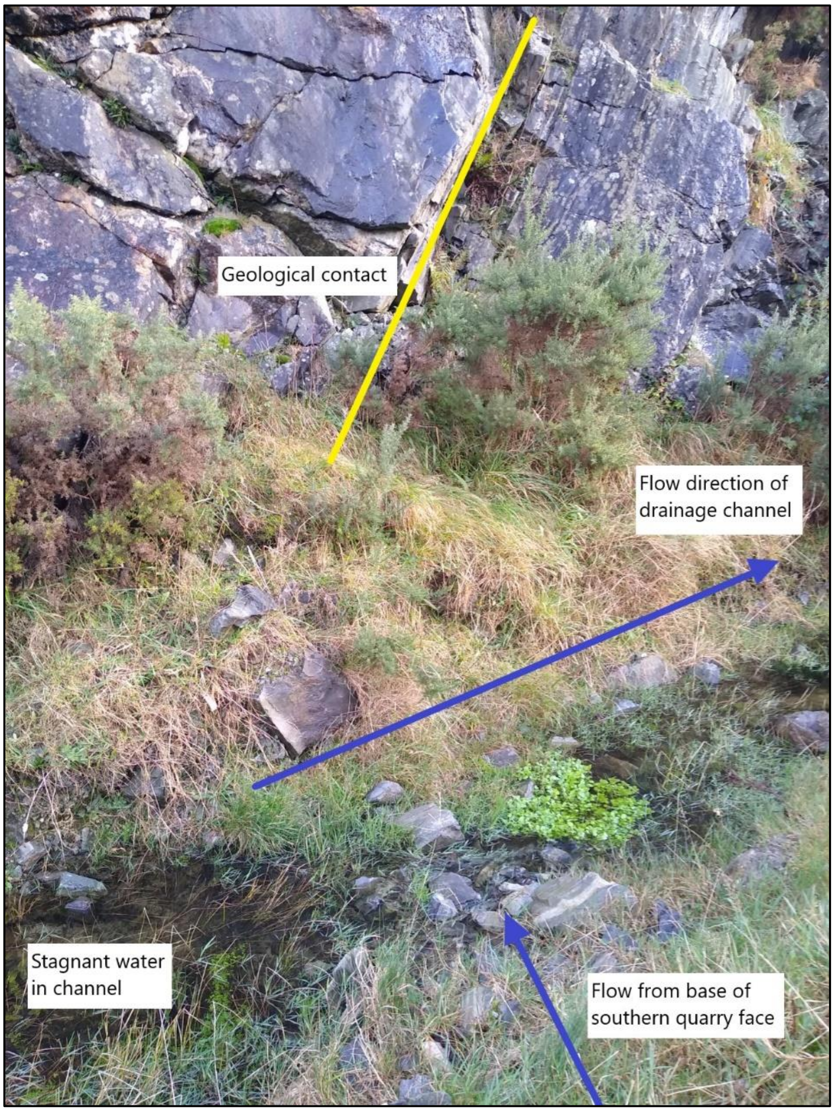
Overall, groundwater quality in all three monitoring boreholes is very good. There were no exceedances of any of the Environmental Quality Standards set in the Drinking Water Regulations (S.I. 122 of 2014) or of the Groundwater Regulations (S.I. 9 of 2010), or no exceedances of any of the EPA's Interim Guideline Values set in the Interim Report of 2003 – 'Towards setting guideline value for the protection of groundwater in Ireland.'

**8.4.14 Surface Water-Groundwater Interactions**

Due to the previous quarrying activity that has taken place on site a significant quarry void has been created. The quarry void has an approximate datum level of 128 mOD. There is a drainage channel along the eastern wall of the void (Figure 8.4). There are also numerous ponds within the void most of which are located near the base of the various quarry faces. There was no lateral water movement observed in any of these ponds. The level of water in the ponds was seen to rise in periods of wet climactic conditions. The water level rise is likely to come from surface water runoff captured with the quarry void and seasonal variations in the underlying water table.

The water within the drainage channel did not appear to be flowing until approximately 10 m from the culvert at the quarry void entrance. At this point the water is augmented by a flow from the west which appears to flow along the base of the southern quarry face. This is the geological contact between the quartzite metasediments and the metadolerite sill. The strength of this flow is observed to be directly related to the recent levels of incident rainfall. The flow is observed coming through the fractured wall of the drainage channel. Photograph 8.3 shows this flow. The drainage channel directs water out of the quarry void through a culvert.

**Photograph 8.3: Water flow along geological contact**

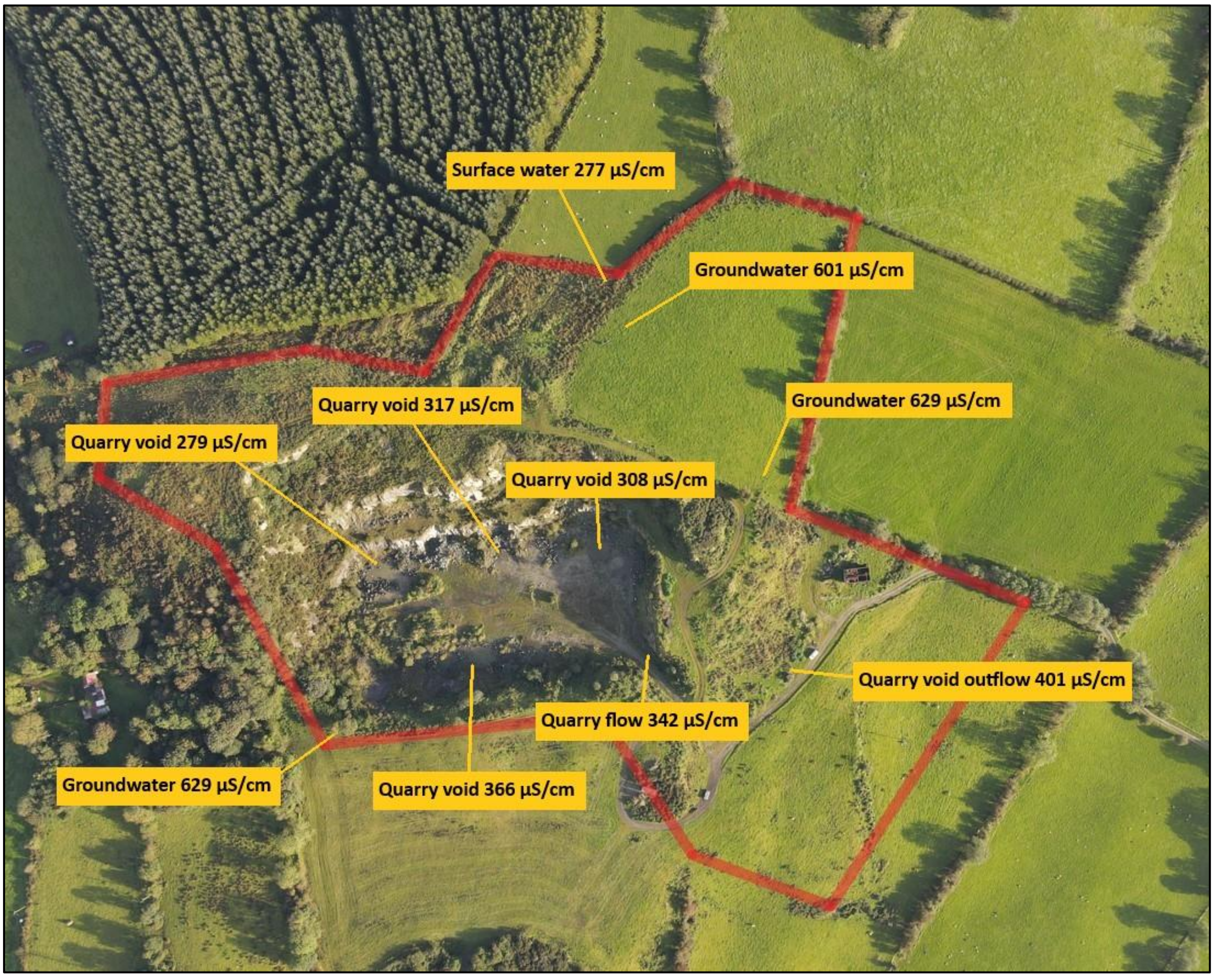



***8.4.14.1 Conductivity***

To assess the surface water and groundwater contributions to the standing and flowing water on site, a series of conductivity measurements were taken. The measurements were taken from the two surface water outflows from the site as described in Figure 8.5, the three monitoring boreholes on site, BH01-03 (Figure 8.6), and various ponds/sumps/flows within the quarry void (Figure 8.17). The samples were sent to Aqualab for conductivity analysis and the results are summarised below in Figure 8.17. Where more than one measurement of conductivity was taken for the same sample point over two or more dates, the average figure is presented. Certificates of analysis are presented in Appendix 8.1.

Groundwater on site is seen to have conductivity values consistently over 600 µS/cm. The surface water drain along the northern portion of the site has an average value of 277 µS/cm. The outflow from the quarry void has an average conductivity value of 401 µS/cm. It is likely that the quarry void outflow is surface water with a considerable groundwater influence. Water in the quarry void also appears to be a mixture of surface water and groundwater with the groundwater influence strongest in the southern portion of the quarry void.

**Figure 8.17: Conductivity values for water sources through site**






## 8.5 Receiving Environment

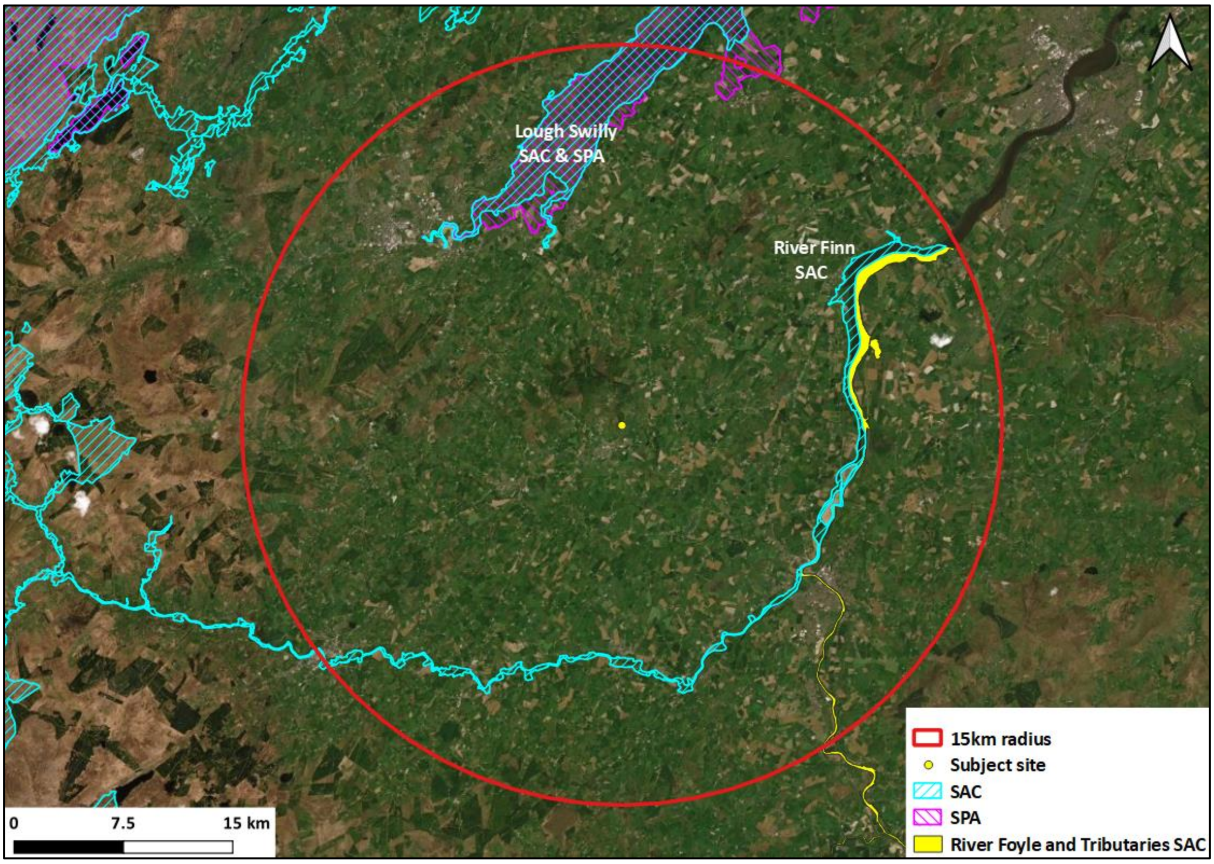
### 8.5.1 Designated Areas

Figure 8.20 shows the closest designated sites to the application site. The River Finn SAC is located 8.9 km east of the site (site code 002301). Lough Swilly SPA is located 8.2 km north of the site (site code 004075). Lough Swilly SAC is located 7.6 km north of the site. The River Foyle and Tributaries SAC is located in Northern Ireland and since 1 January 2021, nature conservation areas in the UK (including Northern Ireland) are no longer considered to be a part of the Natura 2000 network[14]. Under best practice, Greentrack have screened in this SAC as An Bord Pleanála were concerned that details submitted with the previous planning application and the appeal had not demonstrated adequate proposal for the proper and satisfactory management of surface water at the proposed development that could have subsequent potential adverse effects on the integrity of River Finn Special Area of Conservation (Site Code 002301) and the River Foyle and Tributaries Special Area of Conservation (Site Code UK0030320), in view of the sites conservation objectives (ABP-308326-20). The River Foyle and Tributaries SAC is located 8.9km East of the site.

From a hydrological perspective the designated sites that are connected by a surface or groundwater link is the River Finn SAC and River Foyle and Tributaries SAC. Water flowing off the site flows in to the Swilly Burn which in turn flows into the Foyle system. The River Finn SAC and River Foyle and Tributaries SAC form part of the Foyle system.

[14]Office of the Planning Regulator - https://www.opr.ie/wp-content/uploads/2021/03/9729-Office-of-the-Planning-Regulator-Appropriate-Assessment-Screening-booklet-15.pdf

**Figure 8.18: Designated Areas**

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The qualifying interest of the River Finn SAC are:

- Oligotrophic waters containing very few minerals of sandy plains (Littorelletalia uniflorae) [3110]
- Northern Atlantic wet heaths with Erica tetralix [4010]
- Blanket bogs (* if active bog) [7130]
- Transition mires and quaking bogs [7140]
- Salmo salar (Salmon) [1106]
- Lutra lutra (Otter) [1355]

The qualifying interest of the River Foyle and Tributaries SAC are:

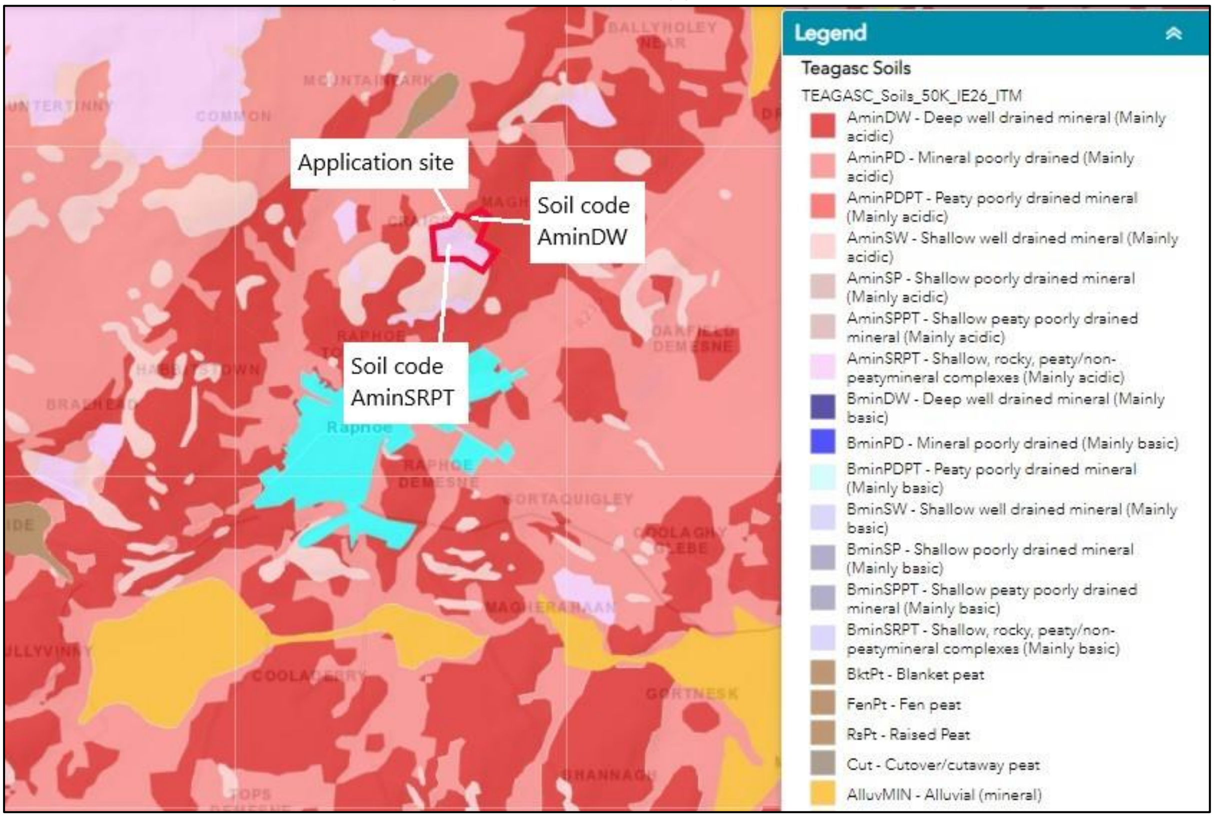
- Atlantic Salmon *(Salmo salar)*
- Otter (*Lutra lutra)*
- Water courses of plain to montane levels with the Ranunculus fluitans and Callitricho-Batrachion vegetation
- Sea Lamprey
- River Lamprey
- Brook Lamprey
- Freshwater Peral Mussel

Any potential impact on hydrology due to proposed activities connected (directly or indirectly) with the subject site may have potential impact on these habitats/conservation interests. This issue is dealt with in detail in the NIS which will also accompany the planning application.

**8.5.2 Soil**

There are two classifications of soils for the application site available from the GSI website. Most of the site is classified as AminSRPT which is shallow rocky, peaty/non peaty mineral complexes (mainly acidic). The remainder of the site is classified as AminDW, and these are deep, well drained mineral soils (mainly acidic). The deep soils are in the area in the northern part of the site which will form the new area of extraction. The other parts of the site with the shallow soil have had most of the soil removed to facilitate previous quarrying activity. Figure 8.19 shows an extract from the GSI webviewer depicting the soils on the application site. The soils of the site are discussed in more detail in *Section 7 Land, Soils and Geology*.

**Figure 8.19: Soil on the application site**




(from GSI webviewer)

## 8.5.3 Bedrock Geology

The area is underlain by meta-sedimentary rocks which are assigned to the Ballybofey Succession of the Dalradian. Most of the rocks in the Ballybofey Succession belong to the Argyll Group and the Southern Highland Group of Middle to Upper Dalradian age, and the rocks were originally deposited about 600 to 700 million years ago. The application site is listed within the Killeter Quartzite Formation which overlies the Termon Formation.

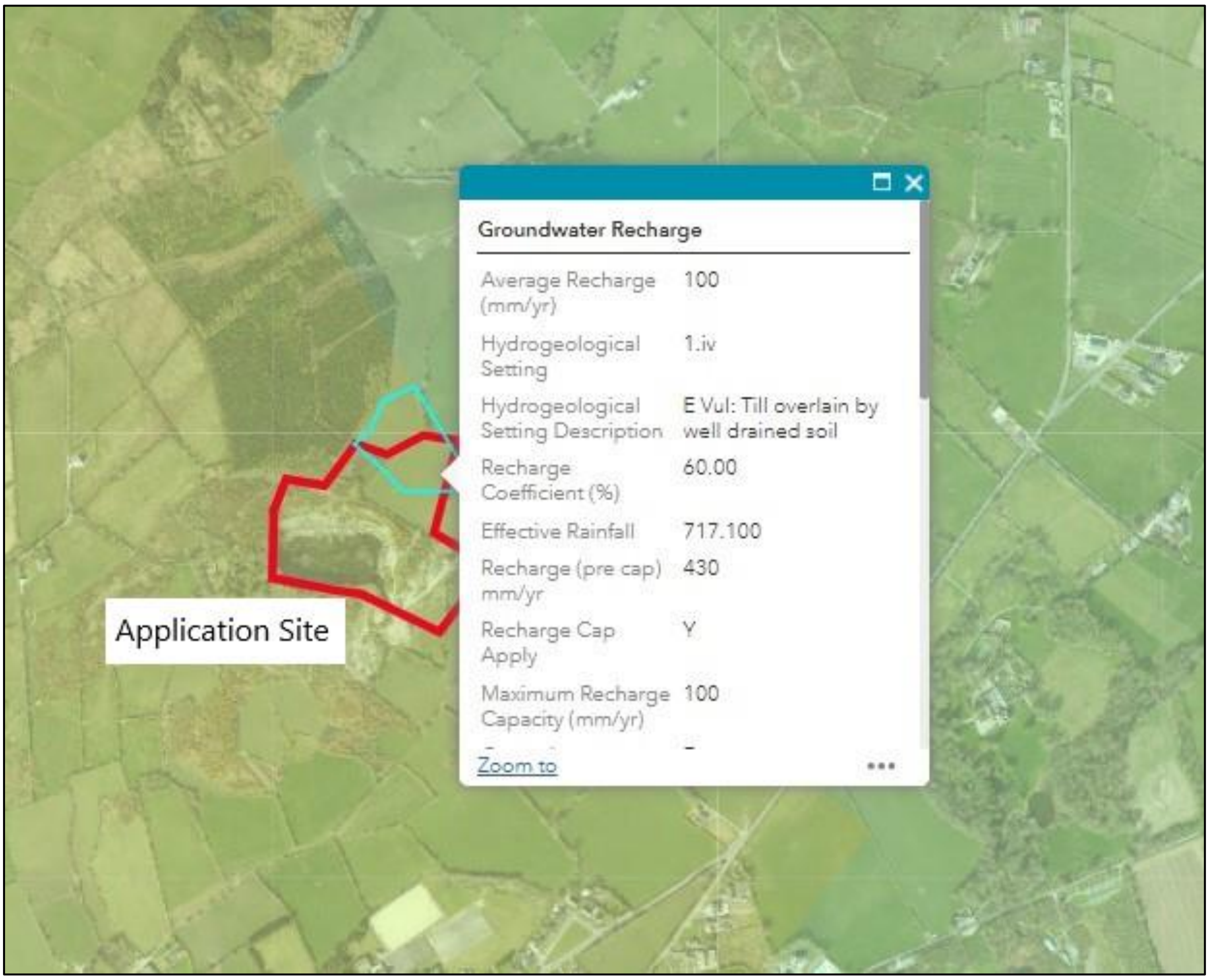
The application site itself is however in a volcanic intrusive and is not within the sediments of the Killeter Quartzite Formation. The intrusive is a metadolerite sill. This intrusive is not shown on the 1:100,000 scale Geological map but can clearly be seen to overlie hornfelsed banded quartzites along the southern edge of the quarry. A full description of the geology of the site is given in Section 7, Land, Soils and Geology, and in Appendix 7.1, Geological Report.

## 8.5.4 Aquifer Classification and Potential Recharge

The Killeter Quartzite Formation is listed as the bedrock underlying the site. These rocks are classified by the Geological Survey of Ireland (GSI) as being a poor aquifer with only locally productive zones. Aquifer recharge occurs diffusely through the subsoil and outcrops and is limited by the low permeability of the bedrock. Groundwater recharge is limited due to the general impermeability of the underlying bedrock and is capped at 100 mm/year by GSI estimates.

In reality a volcanic intrusive, the metadolerite sill, is the geology of the application site. This will have similar, if not lower hydraulic conductivity, than the quartzite. So is likely to have limited recharge to the aquifer. Most of the effective rainfall is not likely to recharge the aquifer but to flow into the surface water system. This is evidenced by the high density of surface watercourses in the surrounding area. Figure 8.20 from the GSI shows the application site in relation to groundwater recharge.

**Figure 8.20: Groundwater recharge at the application site**



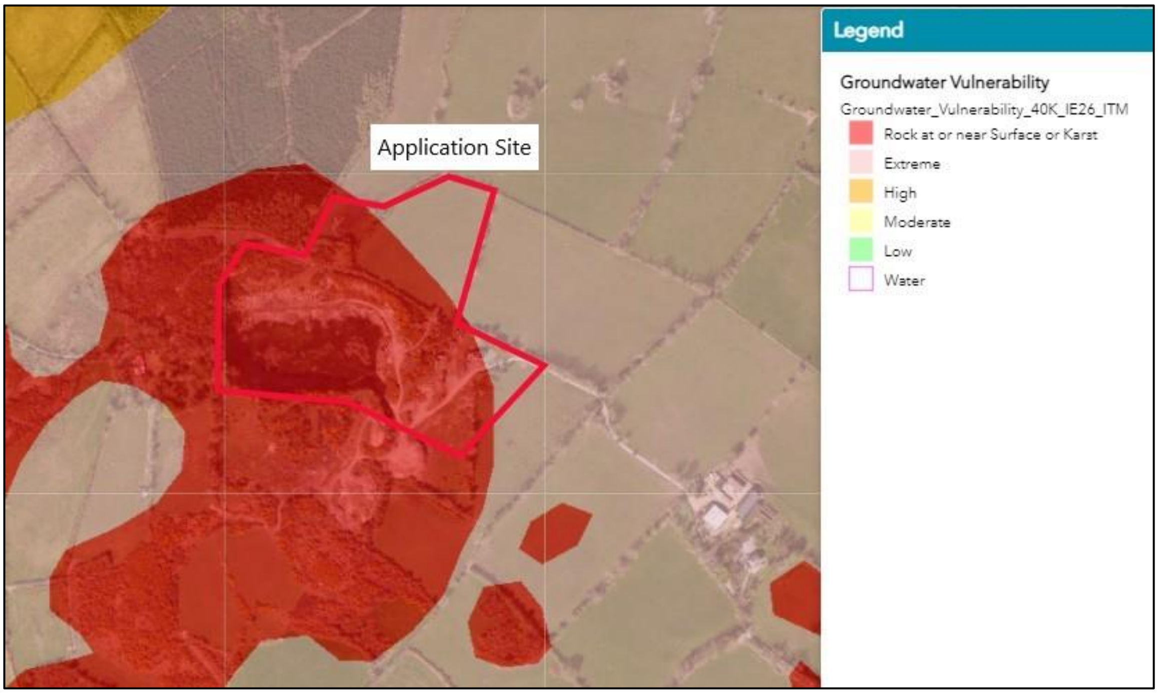

(from GSI Webviewer)

Section 8.4.12.3 above describes the aquifer properties in more detail and makes comment on the hydraulic conductivity of the aquifers on site through field observations and mini-pump tests.

## 8.5.5 Aquifer Vulnerability

A search of the GSI database on aquifer vulnerability revealed that most of the site has exposed rock, or rock near to the surface and the remainder of the site has the aquifer vulnerability classed as extreme. This is due to the relatively thin soils on site which are often less than 3m thick. Figure 8.21 below shows the classification of aquifer vulnerability on site.

**Figure 8.21: Aquifer vulnerability classification**

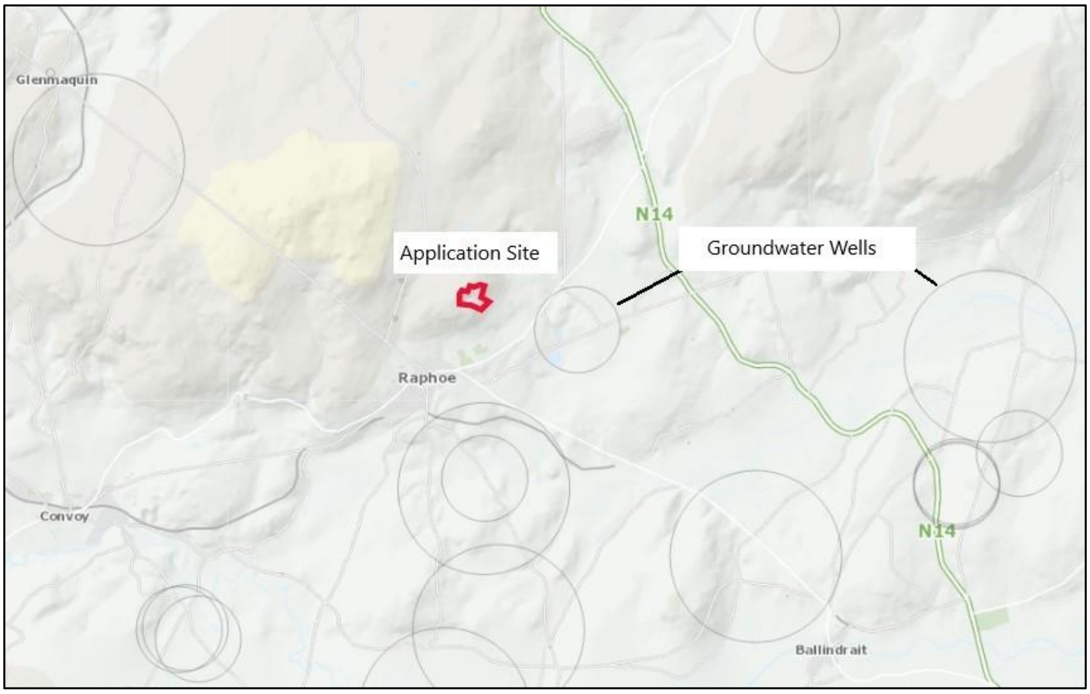



(from GSI Webviewer)

**8.5.6 Source Protection Areas and Groundwater Wells**

A search for the nearest EPA source protection area to the site found that there are no source protection areas within 5km of the site. The nearest Source protection Area is 5.5km north in a separate hydrological catchment area in the townlands of Magherabeg/Veagh. There are approximately 8 recorded groundwater wells within 5 km of the application site. None of these wells are within the zone of influence of the site. The nearest well to the site is located in Oakfield Demense 1.1 km southeast of the application site. The depth of the well is recorded at 4.6m with depth to bedrock 1.8m. The GSI yield class is 'Poor' for the well and yield is stated at 19.6m$^3$/day. Figure 8.22 below shows the groundwater wells in the vicinity of the site. On the historic 6'' map series a 'Holy Well' is mapped approximately 290m southwest of the application site. There is no evidence that this well/spring is still active.

**Figure 8.22: Groundwater Wells**




(from GSI mapviewer)

## 8.5.7 Regional Hydrology

### *8.5.7.1 Surface Water*

The subject site is located within the Northwestern River Basin District, hydrometric area 01 – Foyle (BGNIIENW) and Johnston Stream sub catchment area (JohnstonStream_SC_010), and Swilly Burn River Sub Basin (Swilly Burn_020). Figure 8.23 shows the regional network of watercourses flowing east towards the Foyle.

**Figure 8.23: Watercourses**


(from EPA mapviewer)

### *8.5.7.2 Surface Water Quality*

There are no EPA monitoring points on the tributary of the Swilly Burn directly linked to the application site. There are 5 EPA monitoring points along the main reach of the Swilly Burn. The latest Q values for all of these monitoring stations indicate a value of 3, poor ecological status.

Greentrack conducted an ecological assessment using a kick sample on the tributary of the Swilly extending from the application site in October 2021 with a follow up conducted in April 2022. The sample point of the ecological assessment and latest EPA Q values along the Swilly Burn are shown in Figure 8.24 below. In addition to the ecological assessment the stream was sampled and analysed for pH and suspended solids. The results of the chemical analysis are shown in Table 8.4 below. The certificates of analysis are presented in Appendix 8.1.

**Table 8.4: Swilly Burn tributary**

| pH | Suspended Sediment mg/L |
|---|---|
| 8.02 | <5 |

The results of the ecological assessment are given in Table 8.5 below.

**Table 8.5: Ecological Assessment of Swilly Burn tributary**

| | |
|---|---|
| **Water Beetles** | Present |
| **Oligochaeta (Red worms)** | Present |
| **Water Slaters** | Present |
| **Leeches** | Present |
| **Chironomus** | Present |
| **Chironomids** | Present |
| **Tipula** | Present |

The assemblage of organisms present, and general observations lead to the assessment of a Q value of 2-3 which indicates that the watercourse is slightly polluted. More detail on the ecological assessment is given in Appendix 8.7.

**Figure 8.24: Q values for the Swilly Burn**


(from EPA mapviewer)

**8.5.8 Regional Hydrogeology**

For the purposes of WFD water management, groundwater in Ireland is assigned, assessed and managed within 514 groundwater bodies, which range in size from < $1km^2$ to $1,887km^2$. The application site lies within the Northwest Donegal Groundwater Basin and the Raphoe Groundwater Body draining into the Foyle and Lough Swilly. The following is an extract from the description for the Raphoe Groundwater Body by the GSI:

*"In the absence of inter-granular permeability, groundwater flow is expected to be concentrated in upper fractured and weathered zones and in the vicinity of fault zones, which may have some degree of karstification. Available groundwater levels are mainly 0-5 m below ground level. Unconfined flow paths are likely to be short (30- 300 m), with groundwater discharging rapidly to nearby streams and small springs. Water strikes deeper than the estimated interconnected fissure zone suggest a*

*component of deep groundwater flow, however shallow groundwater flow is dominant. Groundwater flow directions are expected to follow topography i.e. generally to the east to discharge into R. Foyle. Groundwater will discharge locally to streams and rivers crossing the aquifer and also to small springs and seeps. Owing to the poor productivity of the aquifers in this body it is unlikely that any major groundwater - surface water interactions occur. Baseflow to rivers and streams is relatively low".*

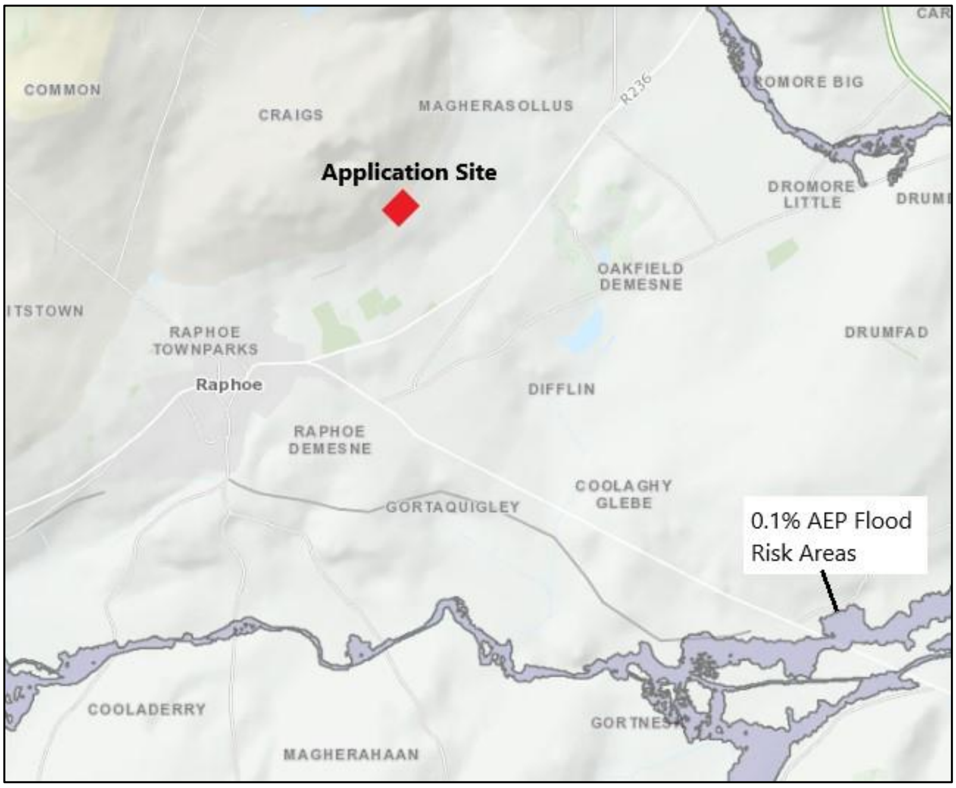
***8.5.8.1 Groundwater WFD Status***

Article 8 of the Water Framework Directive requires the establishment of programmes of monitoring for groundwater. The groundwater monitoring programmes by the EPA primarily focus on providing information that can be used to assess the environmental status of groundwater bodies. Groundwater in the region for the monitoring period 2013-2018 achieved 'good' quality status. The Raphoe Groundwater Body is considered 'not at risk' by the EPA.

### 8.5.9 Flood Risk

An appraisal of the available flood maps was made to determine if there was any flood risk at the site or if any of the proposed activities were likely to increase the risk of flooding either at the site or elsewhere. An examination of the flood maps (floodinfo.ie) for the area show the application site and surrounding area to be at low risk of river flooding events. The flood risk map in relation to the application site is shown below in Figure 8.25. The layers active are the low probability of flooding, 0.1% AEP (1 in a 1000 chance of occurring) and the high-end future scenario is also modelled. This takes in the potential effects of climate change modelling an increase in rainfall of 30% and sea level rise of 1,000mm.

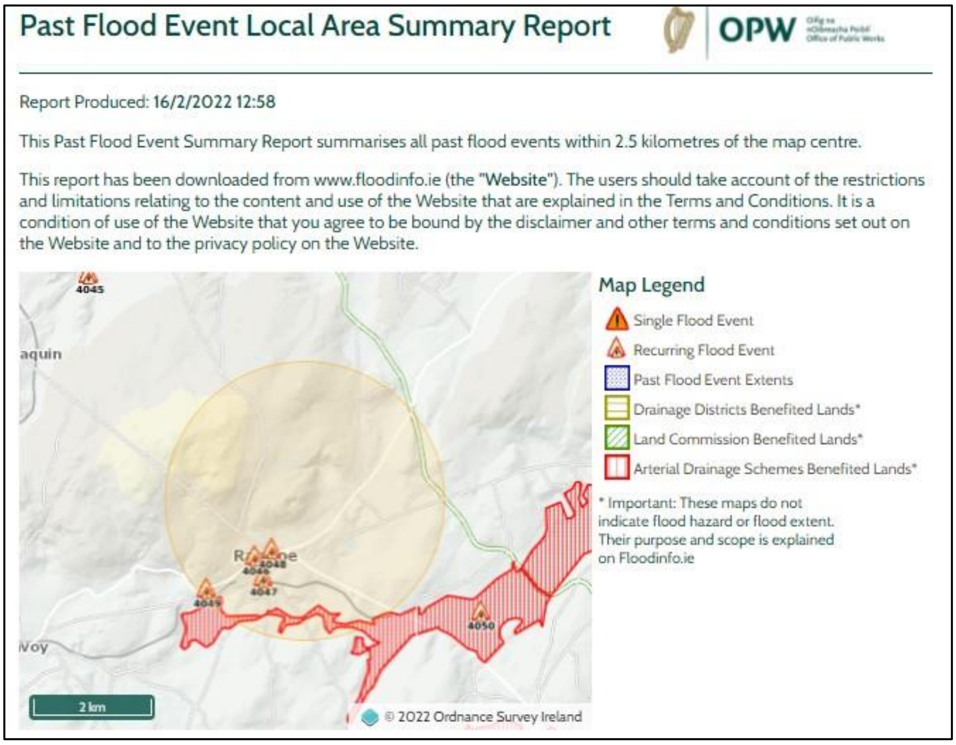
**Figure 8.25: Flood Risk in the area around the application site**




(Image from floodmaps.ie)

The closest recorded flood events area shown in Figure 8.26 below. The 2.5 km radius is centred on the application site. The flood events within 2.5 km of the site are all recorded upstream of any potential site influence.

**Figure 8.26: Past Flood Events**




(Image from floodmaps.ie)

The proposed extraction areas will remove topsoil from approximately 2 hectares of previously undisturbed land. Much of the rest of the extraction areas are in already previously disturbed ground. Due to the topsoil removal, the increase in response times from incident rainfall for surface water is likely to increase marginally. This increase in response times is offset by the attenuation provided by the water management proposals (Section 8.6).

There is a comprehensive set of water management proposals including temporary sumps on the quarry deck, a main sump, a 3-stage settlement tank system and a 3-stage constructed wetland. It is proposed to fit the outflows of each of the wetland ponds with a flow restricting device. The wetlands ponds will provide attenuation for extreme rainfall events. The wetland ponds will provide an additional 1,131 m$^3$ temporary storage capacity when they are allowed to fill to 1m depth. Runoff attenuation for the overall application site is expected to be improved following development due to the creation of the sump, settlement tanks and wetlands.

## 8.6 Water Management Proposals

Mechanisms and infrastructure are proposed to ensure that effluent leaving the site is treated to the highest standard and will not negatively affect surface or groundwaters. The greatest threat to water quality leaving the site is from untreated or poorly treated effluent. The main source of effluent will be incident rainfall on extraction and working areas of the proposal leading to contaminated runoff. Two hydrocarbon interceptors, quarry void sump, 3-stage constructed settlement tanks and a 3-stage wetland are proposed to treat effluent on site.

### 8.6.1 Proposed Drainage

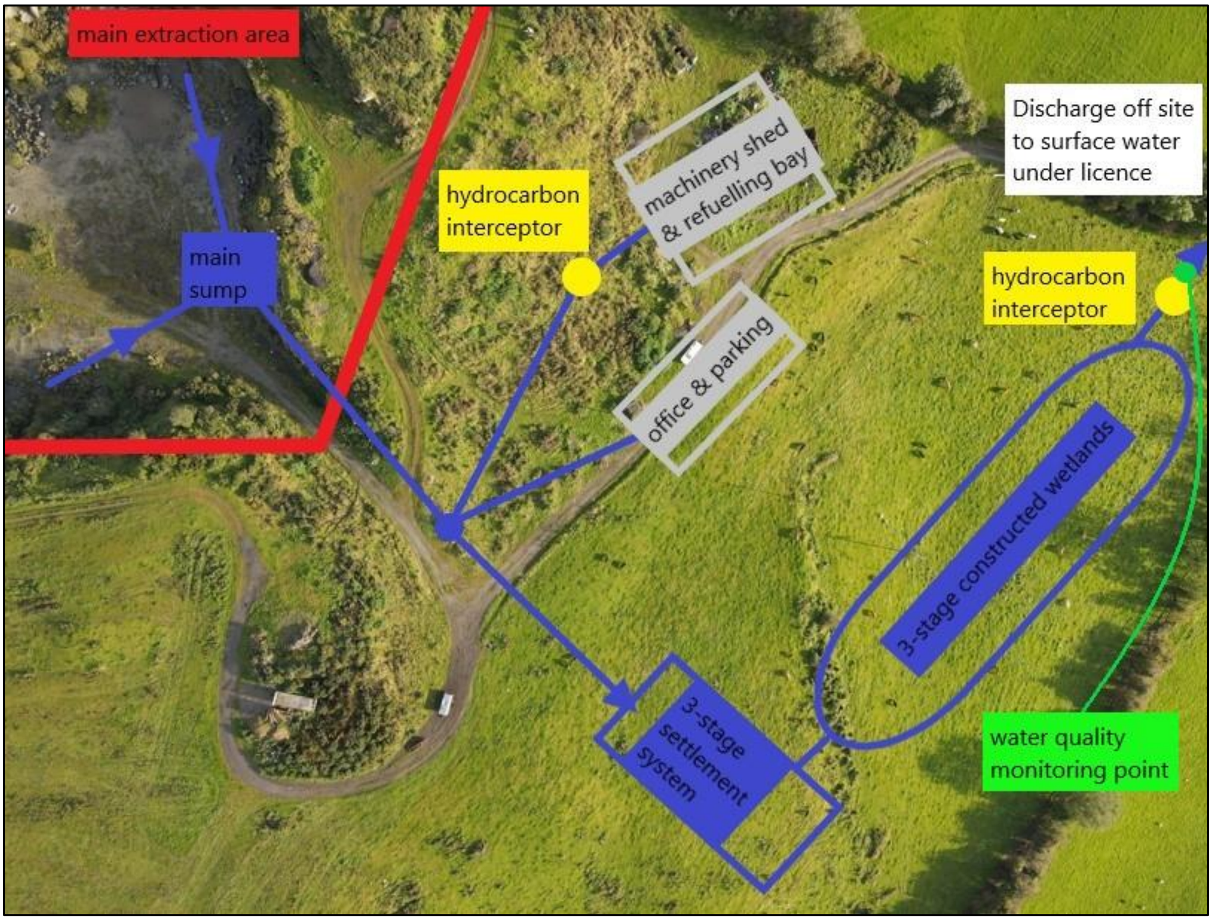
It is proposed to drain all workings around the excavation areas into a sump located on the quarry floor near the entrance. The existing quarry floor will be re-graded with capture drains installed servicing the main sump. The existing quarry floor will be filled and levelled in some areas to achieve this.

The main sump will flow by gravity to the three-stage constructed settlement tank system. From the settlement tank outflow treated effluent will then flow through the constructed wetlands and through the hydrocarbon interceptor before discharge off site to the surface water drain.

Further stages of extraction will involve deepening the quarry void. The amount of groundwater inflow from northwards and vertical extraction is expected to be low due to the low permeability of the metadolerite bedrock. A pump will be installed to remove any groundwater and captured surface water to the main sump from the deepened quarry floor. From the main sump, water will flow through the treatment system before discharge off site through a hydrocarbon interceptor.

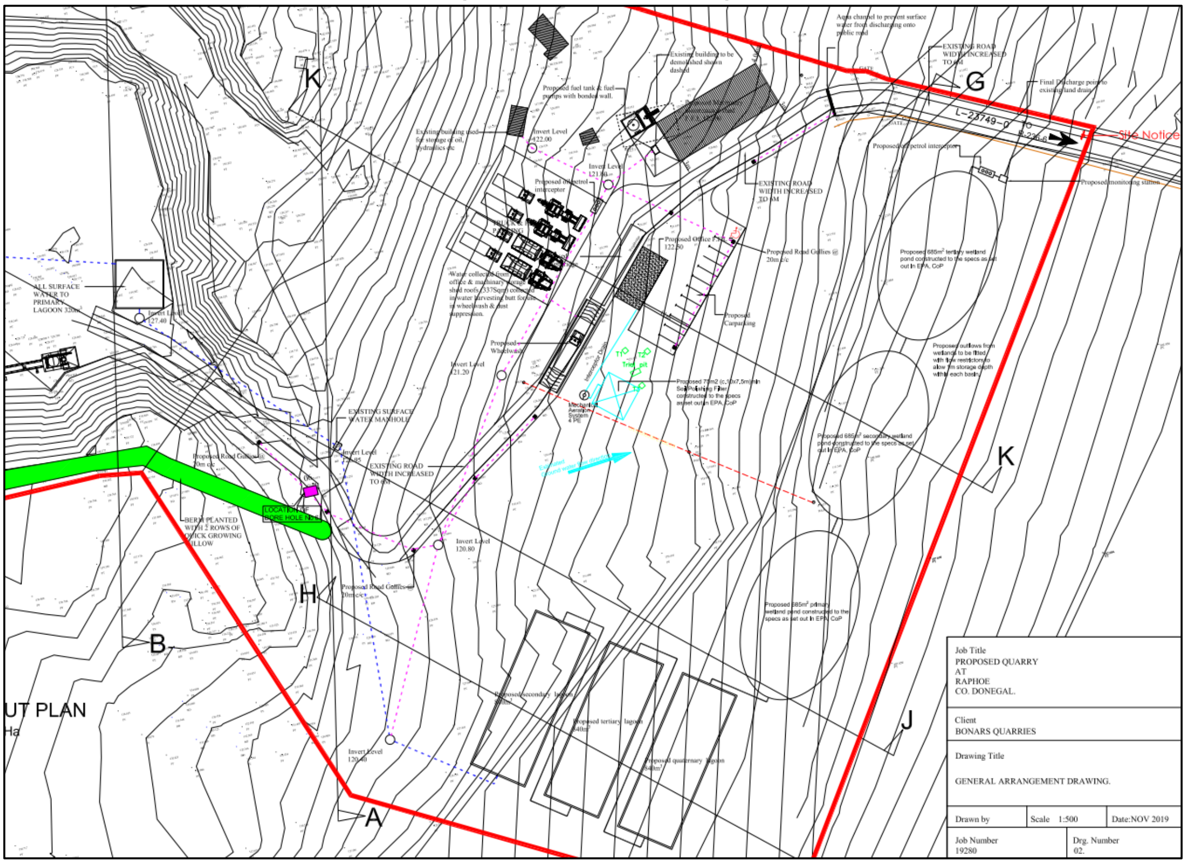
Drainage from the proposed machinery shed, refuelling area and lubricant storage shed will be directed through a hydrocarbon interceptor before flowing through the settlement treatment system. Drainage from the office block, weighbridge and car parking areas are also directed into the settlement treatment system. The drainage routes are shown schematically below in Figure 8.27 and also in Figure 8.28 (an extract from the site layout drawing).

**Figure 8.27: Schematic Site Drainage and Effluent Treatment**




**CYAL50244901** © Ordnance Survey Ireland/Government of Ireland

**Figure 8.28: Site Drainage**




## 8.6.2 Effluent Treatment

It is likely that the main contaminant arising from activities will be suspended sediment contained within runoff. It is proposed to treat effluent from the extraction and processing areas by settlement. A main sump is proposed for the duration of the project. This will be situated on the quarry floor near the entrance haul road (Figure 8.1). All drainage from the quarry floor will be directed into the sump and water from temporary sumps at deeper excavation levels will be pumped into it. The sump is proposed to be 12m x 12m x 3m deep. The sump will have the approximate capacity of 432 $m^3$.

Three large constructed settlement tanks are proposed in the south-eastern portion of the application site. These are to work in series receiving inflow from the main quarry sump to Tank 1 under gravity. Flow will be sequentially through Tanks 2 & 3 with outflow by gravity to the constructed wetlands. The inflow and outflow of each settlement tank will be set at the maximum distance from each other. Each tank will be constructed from concrete and there will be 840 $m^3$ capacity in each tank. The three settlement tanks provide total settlement capacity of 2,520 $m^3$.

The constructed wetlands will provide further effluent treatment. In addition to settlement, there are a variety of complex bio-geochemical processes occurring within wetlands especially at the root zone of the planting which treats effluent very effectively. The proposed constructed wetlands are to have a minimum footprint of 1616 $m^2$ and standard operating depth of 300-600 mm. Assuming the wetlands are operating at minimum depth (300 mm), additional settlement capacity of approximately 485 $m^3$ will be provided. The wetland ponds will also have a flood attenuation function. It is proposed to create three wetland ponds in series with the outlet of each fitted with a flow restriction device to allow water to accumulate to the required storage depth of approximately 1 m for storm events. Outflow from the wetlands will then be directed through the hydrocarbon interceptor. The bypass separator will trap any oils/hydrocarbons present in the effluent before the treated effluent is discharged off site to the surface water drain.

Immediately before final discharge off site to the surface water drain it is proposed to install a monitoring point. A robust water quality monitoring regime will be put in place for the lifetime of the project, monitoring the quality of site discharge and the quality of the receiving waters. A trade discharge licence will be sought from Donegal County Council for the final discharge and all licence conditions will be adhered to. The indicative position of the main sump, settlement tanks, constructed wetland, hydrocarbon interceptor, monitoring station and point of final discharge are all shown in Figure 8.29 above.

***8.6.2.1 Area generating effluent***

With regard to effluent treatment, the calculations below relate to the extraction and working area of the proposal and take into account the catchment of the quarry void when the footprint of extraction is at its maximum (Figure 8.3). The total catchment at its maximum is estimated at 51,400 $m^2$. The area estimation was made with the aid of online mapping tools, topographical maps for the site and on the ground verification of flow directions and catchment areas. The catchment includes the small area to the northwest outside the redline boundary of the application site adjacent to the forestry plantation.

The catchment for effluent treatment also includes the area around the office building, machinery shed, weighbridge, wheelwash and roadways on approach to the quarry void. This area is serviced by roadside gulleys and a separate stormwater drainage system. This area is estimated at 1,650 $m^2$ and excludes the roofed areas because incident rainfall on the roofs is captured by a rainwater harvesting tank for use in the wheelwash. The total drainage area requiring effluent treatment is taken as 53,050 $m^2$.

***8.6.2.2 Effluent Volumes***

To calculate sufficient settlement capacity the average runoff rates for the site are used with the settlement capacity to estimate residence time in the treatment system. To calculate average runoff rates the annual effective rainfall is assessed against the amount of rainfall that will percolate into the groundwater system. Effective rainfall (ER) is the average amount of incident rainfall minus the amount of Actual Evapotranspiration (AE). AE is usually calculated as 82% of Potential Evapotranspiration (PE). (The 82% figure has been used in recent studies and will calculate a higher ER rate than the customary 95% calculation rate which has been traditionally used). PE figures are available from Met Eireann for Malin Head. Malin Head is the nearest Met Eireann synoptic recording station located approximately 59 km to the north of the application site. Annual mean PE is 527.3mm.

***AE = PE * 82 %*** ***AE = 432.4 mm***

However, the AE figure for the application site when the extraction footprint is at its maximum will be considerably less due to the lack of vegetation. A figure of 100 mm AE is estimated for the site when extraction is at its peak.

Average annual rainfall (AAR) can be taken from long term data sets produced by Met Eireann (1981-2010). The figure from Malin Head is 1,076mm. A more representative average annual rainfall figure is obtained from the Met Eireann Letterkenny, Dromore metrological station, 10 km northwest of the application site. The average annual rainfall for the last available 5 years data (2020 – 2016 inclusive) is 1,196mm.

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

- **Effective rainfall = AAR – AE**
- **ER = 1196 mm - 100 mm**
- **ER = 1096 mm**

A proportion of runoff will percolate into the ground and become groundwater. The calculations for this site are based on most of the site being stripped of topsoil and effectively bare rock. Bare rock runoff co-efficients vary between 0.82 and 0.94. The figure of 0.94 is used because of the observations regarding the low transmissivity of the metadolerite bedrock. This means that of the 1,096 mm effective rainfall approximately 1,030 mm will generate runoff. This figure equates to an annual runoff figure for the site of 54,641 $m^3$ for the drainage area. This approximates to a daily runoff figure of 150 $m^3$ from incident rainfall. requiring effective treatment before discharge off site.

There is an additional consideration of the flow along the geological contact within the quarry. From the flow rate measurements (Appendix 8.2) it is seen that the base flow rate appears to average approximately 0.4 L/s from this source. This flow of water, although appearing clear and low in suspended sediment concentration, will add to the volume of effluent requiring treatment. The base flow of this mixture of surface water and groundwater contribution is estimated at 35 $m^3$ per day.

A total daily average effluent volume of 185 m3 will require effective treatment before discharge off site.

#### ***8.6.2.3 Treatment Capacity and Residence Time***

Settlement tanks are designed so that under ideal conditions all particles having an equivalent spherical diameter of d (typically 0.006mm) or greater are removed. Ideally the settlement tank will have parallel sides and a smooth floor to induce horizontal linear flow within the pond. To prevent re-suspension of sediment in a settlement tank a depth of at least 1m should be maintained. The minimum residence time for settlement of sediment varies from quarry to quarry dependent on a number of variables. In ideal conditions a settlement tank should have a retention time of greater than 11 hours to settle out particles with a diameter greater than 0.006mm. (A retention time of 24 hours is recommended for particles with a diameter greater than 0.004mm (fine silt)). This allows most of the suspended sediment to settle out of solution.

The total available settlement capacity is provided by the main sump on the quarry floor (432 $m^3$), the three settlement tanks (2,520 $m^3$) and the three wetlands ponds (485 $m^3$). The total settlement capacity provided is 3,437 $m^3$. Additional settlement capacity may be provided by temporary sumps/voids at deepening quarry extraction levels but these are not taken into consideration for these calculations.

The residence time for the average daily runoff amount of 185 $m^3$ will be over 18 days. This is more than adequate time to settle sediment out of solution.

#### ***8.6.2.4 Climate change allowance***

The calculations above for average settlement time were repeated with the recommended 30% additional precipitation to account for possible climate change scenarios. Effective Rainfall becomes 1,455 mm. With run-off coefficient 0.94, annual runoff volume for the site 77,177 $m^3$. With the baseflow of 35 $m^3$ also increased by 30%, the average daily runoff figure is now estimated at 257 $m^3$. Allowing for a 30 % increase in precipitation, the residence time for the average daily runoff amount of 257 $m^3$ will be over 13 days. This is more than adequate time to settle sediment out of solution.

#### ***8.6.2.5 Treatment Capacity for Extreme Weather Events***

Calculations shown in Section 8.6.2.3 have shown the settlement capacity to be more than adequate under average conditions. However, in reality, incident rainfall will not be consistent throughout the year. To ensure the settlement capacity on site is robust under all conditions, calculations are made of the expected residence time of effluent on site in response to an extreme weather event. The one in a 100-year 6-hour storm event is widely used as suitably extreme weather event. Rainfall returns from Met Eireann indicate that 51.8mm of rainfall would be associated with the 1 in 100-year 6-hour storm event at the application site.

The maximum area serviced by the settlement system is approximately 53,050 $m^2$ (at maximum extraction). Assuming a worst-case scenario whereby all incident rainfall on the site generated runoff (no percolation to ground or evapotranspiration taken into consideration).

In this worst-case scenario, 2,748 $m^3$ of runoff would be generated. The baseflow contribution of groundwater to the surface water system over the course of the storm event is estimated at almost 9 $m^3$. The total volume of runoff from the site requiring treatment before discharge is calculated as 2,757 $m^3$. The available settlement capacity 3,437 $m^3$.

For a 1 in 100-year 6-hour storm event the expected residence time for effluent for treatment is calculated at 29.9 hours. This is adequate time to settle out fine silt particles from the effluent before discharge off site. Further settlement and treatment will be provided by the three constructed wetlands ponds with outlets fitted with flow restriction devices. The flow restriction devices allow effluent to be temporarily stored in each of the wetland ponds to a depth of 1m. This provides an additional temporary 1,131 $m^3$ storage capacity . The proposed effluent treatment system is shown to be robust under extreme conditions.

#### ***8.6.2.6 Final polishing treatment by wetlands***

There is a proposed constructed wetland planned to be installed as a polishing element to the effluent treatment system. The constructed wetland is to be installed downstream of the settlement tanks. The location of the wetland is indicated in Figure 8.28.

The wetland has a minimum footprint of 1,616 $m^2$ and an operation depth of 300 mm - 600 mm. The wetlands will provide a minimum 485 $m^3$ settlement capacity and are designed to reduce any potential remaining suspended sediment load in the effluent down to imperceptible levels. The design for the wetland is to reduce a potential suspended sediment load of 25 mg/L down to below 15 mg/L. The design specification for the wetlands are provided in Appendix 8.8. In reality, the settlement tank system is likely to reduce effluent suspended sediment content to below acceptable levels and the wetlands will provide an extra polishing buffer. The wetlands will also add to the biodiversity of the quarry site. Key design points that are to be included in the wetlands design:

- Ponds to be integrated into the existing landscape contours where possible to give a natural finish
- 300 mm fall between ponds
- Shallow open swales the final stage for additional filtration, habitat and aesthetics
- Pond outlets to be fitted with flow restriction devices to allow water to accumulate to the required storage depth (1 m) within each basin, drawing down in drier weather to standard operating depth (300 mm)
- Perimeter of ponds to be planted with a selection of the following tall species:
  - Bullrush (*Typha latifolia*)
  - Branched Burr Reed (*Sparganiium erectum*)
  - Greater Pond Sedge (*Carex riparia*)
  - Yellow Flag (*Iris pseudocorus*)
- Pond plants in deeper water to include:
  - White water lily (*Nymphaea alba*)
  - Ppondweed (*Potamogeton spp*.)
  - Water startwort (*Callitriche spp*.)
- Lower growing species to be interplanted through the taller species to include:
  - Water mint (*Mentha aquatica*)
  - Water cress (*Nasturtium officinale*)
  - Fools crest *(Apium nodiflorum*)
  - Brookliime (*Veronica beccabunga*)

During extreme weather events the wetlands will also provide flood attenuation benefit with the flow restriction devices allowing depths to increase to 1m and providing an additional 1,131 $m^3$ temporary storage capacity and temporary settlement function.

#### *8.6.2.7 Settlement Test*

The settlement times outlined in section 8.6.2.3 above are taken from the guidance document produced by the EPA *'Environmental Management in the Extractive Industry (Non-Scheduled Minerals) 2006'.* Quarries and quarry product can often have varying settlement times. To ensure the quarry product at the application site was within normal parameters for settlement time a simple settlement test was conducted.

A sample of mud and fines was taken from the quarry void and mixed with water in a clear plastic jar. A large black cross was marked on the reverse side of the jar and the sample agitated to suspend the contents in the water. The sample was sat on a desk with white background and a photograph was taken of the sample jar every hour for 4 hours and then again at 8 hours, 12 hours and 24 hours. A simple report on the settlement test with associated photographs is presented in Appendix 8.9. The sample was seen to completely settle with clarity in the water sometime between 8 and 12 hours. This would be considered within the normal parameters for settlement for the majority of quarries.

### 8.6.3 Additional mitigation for extreme weather events

As an additional mitigation measure, it is proposed to cease extraction and material handling activities for the duration of a red level weather warning for rainfall issued by Met Eireann. The criteria for red level rainfall warnings are:

- 70mm rainfall or greater in a 24-hour period
- 50mm rainfall or greater in a 12-hour period
- 40mm rainfall or greater in a 6-hour period

### 8.6.4 Monitoring Point

A water quality monitoring point is proposed to be installed immediately before treated effluent is discharged off site. Figures 8.29 & 8.30 indicate the position of this point. This will allow access for monitoring of water quality as part of licence conditions and also for general environmental management of the site.

## 8.7 Groundwater Impact

Rock extraction has the potential to affect the water table by creating a cone of depression within the extraction void and can affect water supplies dependant on the groundwater resource in certain situations.

Within the application site the water table in the bedrock has been shown to be at relatively shallow levels (5-10 mbgl) outside the quarry void created by previous activity. No significant ingress of groundwater to the quarry void was observed through any of the exposed quarry faces and some crude testing of the underlying aquifer properties showed it to be of low transmissivity (2-6 $m^2$/day) consistent with GSI categorisation. Examination of the site following previous extraction activity gives a good indication of how the site will be impacted upon further extraction. The quarrying activity proposal will deepen the quarry void and extend into areas of the existing water table. This is not expected to have a significant impact outside the extraction areas as groundwater levels are shown to be at expected levels within relatively short distances from the edge of extraction areas. The cone of depression formed by previous extraction is steep and the cone of depression formed when extraction is complete for this proposal is similarly expected to be steep. It is not anticipated that there will be any significant change in groundwater levels outside the site boundaries on completion of the project. No groundwater supplies will be impacted by the proposed activity.

Figures 8.29 & 8.30 are schematic representations of what the groundwater levels were likely to have been before any quarry activity took place on site, what they are likely to be currently and what they are likely to be once extraction in this current application has been completed. Figure 8.29 is a schematic cross-section along a north-south axis and Figure 8.32 is a schematic cross-section along an east-west axis. Figure 8.8 shows the approximate lines of cross-section.

**Figure 8.29: Groundwater levels in original site, pre-development site and post development site (Cross-section on a north-south axis)**

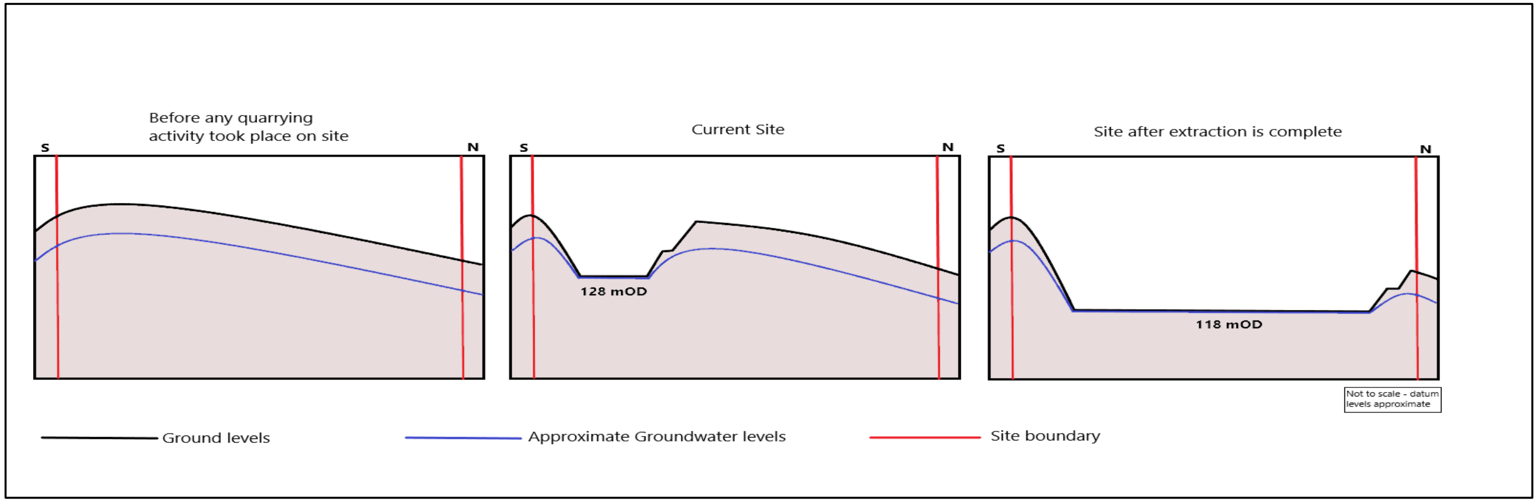
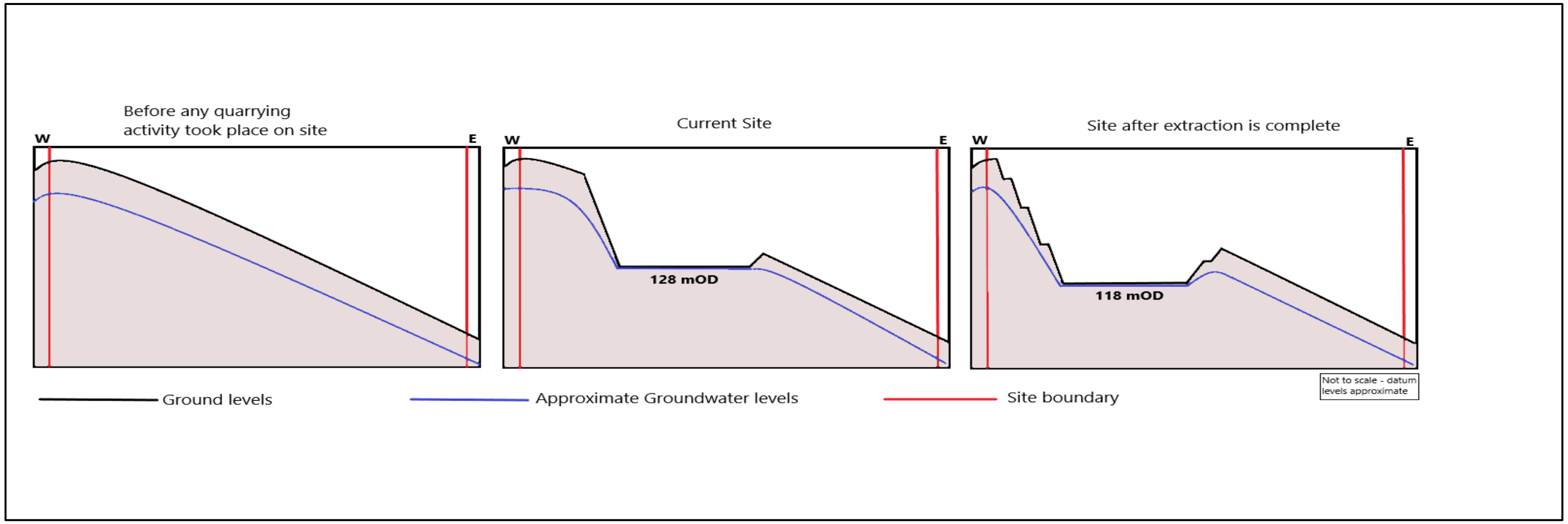



**Figure 8.30: Groundwater levels in original site, pre-development site and post development site (Cross-section on an east-west axis)**



## 8.8 Impact Assessment

Soil/overburden removal, rock extraction, rock crushing and screening, and stockpiling of aggregate and concrete product all have the potential to generate suspended sediment within the surface water runoff leaving the site. The use of hydrocarbon fuels and lubricants on site in vehicles and plant carries the potential for contamination of surface waters and groundwaters through leaks and accidental spillage. The quarrying of rock beneath the water table and the removal or alterations of catchments can have potential impacts on the surface and groundwater regimes. The potential impacts to surface waters and groundwaters are assessed, and existing and proposed mitigation measures are outlined.

### 8.8.1 Surface Water Quality Impacts from Suspended Sediment Load during construction phase involving earth movement and berm construction

The construction of berms and earth movement to facilitate construction activity may lead to discharge of suspended sediment load in runoff which may be directed to surface watercourses leading to the Swilly Burn River and ultimately to the River Finn SAC and River Foyle and Tributaries SAC.

- **Receptor(s):** Swilly Burn River, River Finn SAC, River Foyle and Tributaries SAC
- **Pathway(s):** Surface discharge to river system
- **Pre-mitigation Impact:** Moderate short-term negative effect on a sensitive receptor

The mitigation measures that are in place and proposed are listed below;

- Temporary silt traps to be created near construction areas where direction of runoff to settlement system is not practical
- Silt fence to be installed around the perimeter of newly constructed berms and kept in place until berms have been colonised with vegetation and risk of sediment transport in runoff is negligible
- Temporary silt traps and channels to be used to direct runoff to settlement system where practical.

**Residual Effect:** Short-term imperceptible negative effect on surface water quality
**Significance of Effects:** No significant effects on surface water quality are expected

### 8.8.2 Surface Water Quality Impacts from Suspended Sediment Load during operational phase

The development proposes to discharge effluent off site directly to a surface watercourse leading to the Swilly Burn River and ultimately to the River Finn SAC and River Foyle and Tributaries SAC.

- **Receptor(s):** Swilly Burn River, River Finn SAC, River Foyle and Tributaries SAC
- **Pathway(s):** Surface discharge to river system
- **Pre-mitigation Impact:** Moderate short-term negative effect on a sensitive receptor

The mitigation measures that are in place and proposed are listed below;

- Adequate settlement tank capacity to reduce sediment load in the effluent to acceptable levels before discharge offsite (Section 8.6.2).
- Suitable drainage system in place to direct effluent and runoff that may become contaminated with suspended sediment to the settlement tank and wetland system.
- Regular maintenance of settlement tanks (and drainage system) to ensure efficiency and appropriate disposal of material removed.
- Suspension of extraction and material handling activities for the duration of a red level rainfall warning issued by Met Eireann.
- Regular monitoring of the discharge point.

- Single discharge point to be subject to the conditions of a trade discharge licence from Donegal County Council.

**Residual Effect:** Short-term imperceptible negative effect on surface water quality
**Significance of Effects:** No significant effects on surface water quality are expected

### 8.8.3 Surface Water and Groundwater Quality Impacts from Hydrocarbon Contamination

The development proposes to discharge effluent off site directly to a surface watercourse leading to the Swilly Burn River and ultimately to the River Finn SAC and River Foyle and Tributaries SAC.

- **Receptor(s):** Swilly Burn River, River Finn SAC, River Foyle and Tributaries SAC, Local Groundwater Body
- **Pathway(s):** Surface discharge to river, discharge directly to groundwaters
- **Pre-mitigation Impact:** Moderate short-term negative effect on a sensitive receptor

The mitigation measures that are in place and proposed are listed below

- The concrete bunded area adjacent to the fuel storage area with appropriate drip trays and spill kits available is to be used for vehicle refuelling operations.
- Fuels and lubricants continue to be stored in a bunded area in the machinery shed.
- The hydrocarbon interceptor is maintained within the drainage system downstream of the machinery shed before discharge to the settlement tank system.
- Maintain the second hydrocarbon interceptor installed into the drainage system immediately before final discharge of surface waters off site.
- Refuelling of static plant on site to be carried out using a fully bunded bowser/mobile fuel truck.
- Drip trays continue to be used for all re-fuelling operations. Best practice for re-fuelling to be incorporated into the Environmental Management System for the subject site.
- Regular inspections and maintenance scheduling to take place for all plant and vehicle to minimise the potential for malfunction or leak.
- Emergency spill kit with oil boom, absorbers etc. to be kept on site for use in the event of an accidental spillage/leak.
- Regular visual monitoring of all surface waters onsite to take place for any surface sheen or sign of potential hydrocarbon pollution.

**Residual Effect:** Short-term imperceptible negative effect on surface water quality
**Significance of Effects:** No significant effects on surface water quality or groundwater quality are expected

### 8.8.4 Surface Water and Groundwater Quality Impacts from wastewater discharged from office block

The development will discharge wastewater effluent by percolation to ground. Effluent treatment system discharges directly to a surface watercourse leading to the Swilly Burn River and ultimately to the River Finn SAC and River Foyle and Tributaries SAC.

- **Receptor(s):** Swilly Burn River, River Finn SAC and River Foyle and Tributaries SAC, Local Groundwater Body
- **Pathway(s):** Percolation to surface water drainage system, percolation to groundwater
- **Pre-mitigation Impact:** Imperceptible short-term negative effect on a sensitive receptor.

The mitigation measures that are in place and proposed are listed below

- The settlement tanks will be constructed of concrete and will not leak or permit effluent to enter other than through the dedicated inflow.
- The wetland base will be formed of an impermeable liner which will not allow effluent to enter other than through the dedicated inflow.

**Residual Effect:** Short-term imperceptible negative effect on surface water quality and groundwater
**Significance of Effects:** No significant effects on surface water quality and groundwater quality are expected

**8.8.5 Groundwater impacts due to extraction below water table**

The development proposes to extract bedrock some of which may be below the water table.

- **Receptor(s):** Local Groundwater Body
- **Pathway(s):** Direct due to removal of bedrock
- **Pre-mitigation Impact:** Imperceptible permanent negative effect on a low sensitivity receptor

There are no mitigation measures proposed as volumes of groundwater contained in the bedrock are low and transmissivity through the rock is shown to be very low. Small amounts of water that would have percolated to groundwater will now flow directly to the surface water system.

**Residual Effect:** Imperceptible permanent negative effect on groundwater.
**Significance of Effects:** No significant effects on groundwater supply are expected

**8.8.6 Surface Water ecology losses and reduction in stream base flow due to removal of catchment areas**

The development proposes to extract bedrock from areas that currently supplies surface water to a drainage ditch which may affect the ecology and base flow of the watercourse.

- **Receptor(s):** Drainage Ditch on northern site boundary, Swilly Burn River, River Finn SAC and River Foyle and Tributaries SAC
- **Pathway(s):** Direct due to partial removal of watercourse catchment
- **Pre-mitigation Impact:** Slight permanent negative effect on a low sensitivity receptor

There are no mitigation measures proposed as volumes of surface water supplied to the ditch along the northern boundary of the site is re-directed through the effluent treatment system for the site and flows into the same tributary of the Swilly Burn River approximately 380 m downstream of the point where the catchment has been affected by quarrying activity. The direct impact to the ecology of the drain is assessed as negligible as it has been shown to be of low/poor ecological value.

**Residual Effect:** Imperceptible negative effect on drainage ditch. No negative effects on Swilly Burn River, River Finn SAC and River Foyle and Tributaries SAC.
**Significance of Effects:** Neutral effects on Swilly Burn River, River Finn SAC and River Foyle and Tributaries SAC are expected.

### 8.8.7 Determination of Environmental Impact Significance Pre-mitigation

| Impact | Receptor | **Description of Impact (Character/Magnitude/Duration /Probability/Consequences)** Negligible - High | **Existing Environment (Significance/Sensitivity)** Negligible -High | **Significance** Imperceptible - Profound |
|---|---|---|---|---|
| Surface Water Quality Impacts from Suspended Sediment Load during construction phase involving earth movement and berm construction | Swilly Burn River, River Finn SAC, River Foyle and Tributaries SAC | Medium | Medium | Moderate |
| Surface Water Quality Impacts from Suspended Sediment Load during operational phase | Swilly Burn River, River Finn SAC, River Foyle and Tributaries SAC | Medium | Medium | Moderate |
| Surface Water and Groundwater Quality Impacts from Hydrocarbon Contamination | Swilly Burn River, River Finn SAC, River Foyle and Tributaries SAC, Local Groundwater Body | Low-Medium | Medium | Slight |
| Surface Water and Groundwater Quality Impacts from wastewater discharged from office block | Swilly Burn River, River Finn SAC, River Foyle and Tributaries SAC, Local Groundwater Body | Low-Negligible | Medium | Not significant |
| Groundwater Impacts due to extraction below water table | Local Groundwater Body | Low-Negligible | Low | Not significant |
| Surface Water Ecology Losses and reduction in stream baseflow due to removal of catchment areas | Drainage Ditch on northern site boundary | Low | Low | Slight |
| | Swilly Burn River, River Finn SAC and River Foyle and Tributaries SAC | Negligible | Medium | Not significant |

### 8.8.8 Summary of Mitigation Measures Proposed

| Summary of Mitigation Measures Proposed |
| --- |
| • Silt fence must be installed around the perimeter of newly constructed berms and kept in place until berms have been colonised with vegetation and risk of sediment transport in runoff is negligible |
| • Temporary silt traps and channels to be used to direct runoff to settlement system where practical. |
| • Adequate constructed settlement tank capacity and constructed wetland system must be put in place to reduce sediment load in the effluent to acceptable levels before discharging offsite (Section 8.6.2). This work must be done before any quarrying activity is undertaken. |
| • Suitable drainage system must be put in place to direct effluent and runoff that may become contaminated with suspended sediment to the settlement tank and wetland system. |
| • Regular maintenance of settlement tanks (and drainage system) must be undertaken to ensure efficiency and appropriate disposal of material removed. |
| • Suspension of extraction and material handling activities for the duration of a red level rainfall warning issued by Met Eireann must be implemented. |
| • Regular monitoring of the discharge point must be undertaken. |
| • Single discharge point to be subject to the conditions of a trade discharge licence from Donegal County Council. |
| • The concrete bunded area adjacent to the fuel storage area with appropriate drip trays and spill kits available must be used for vehicle refuelling operations. |
| • Fuels and lubricants must be stored in a bunded area in the machinery shed. |
| • Maintain both hydrocarbon interceptors. |
| • Refuelling of static plant on site must be carried out using a fully bunded bowser/mobile fuel truck. |
| • Drip trays must be used for all re-fuelling operations. Best practice for re-fuelling to be incorporated into the Environmental Management System for the subject site. |
| • Regular inspections and maintenance scheduling to take place for all plant and vehicle to minimise the potential for malfunction or leak. |
| • Emergency spill kit with oil boom, absorbers etc. to be kept on site for use in the event of an accidental spillage/leak. |
| • Regular visual monitoring of all surface waters onsite to take place for any surface sheen or sign of potential hydrocarbon pollution. |

### 8.8.9 Determination of Environmental Impact Significance Following Mitigation

| Impact | Receptor | Description of Impact (Character/Magnitude/Duration /Probability/Consequences) Negligible - High | Existing Environment (Significance/Sensitivity) Negligible -High | Significance of Impact Imperceptible - Profound |
|---|---|---|---|---|
| Surface Water Quality Impacts from Suspended Sediment Load during construction phase involving earth movement and berm construction | Swilly Burn River, River Finn SAC, River Foyle and Tributaries SAC | Medium | Medium | Imperceptible |
| Surface Water Quality Impacts from Suspended Sediment Load during operational phase | Swilly Burn River, River Finn SAC, River Foyle and Tributaries SAC | Medium | Medium | Imperceptible |
| Surface Water and Groundwater Quality Impacts from Hydrocarbon Contamination | Swilly Burn River, River Finn SAC, River Foyle and Tributaries SAC, Local Groundwater Body | Low-Medium | Medium | Imperceptible |
| Surface Water and Groundwater Quality Impacts from wastewater discharged from office block | Swilly Burn River, River Finn SAC, River Foyle and Tributaries SAC, Local Groundwater Body | Low-Negligible | Medium | Imperceptible |
| Groundwater Impacts due to extraction below water table | Local Groundwater Body | Low-Negligible | Low | Not significant |
| Surface Water Ecology Losses and reduction in stream base flow due to removal of catchment areas | Drainage Ditch on northern site boundary | Low | Low | Imperceptible |
| | Swilly Burn River, River Finn SAC and River Foyle and Tributaries SAC | Negligible | Medium | Not significant |

### 8.8.10 Conclusion

With the implementation of the mitigation measures listed, the implementation of the project as outlined will not cause a significant negative effect on the surface water or groundwater environments.

# APPENDIX 8.1: Certificates of Analysis

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## CERTIFICATE OF ANALYSIS

Page 1 of 1

**Customer:** **Greentrack**
**4 Roe House,**
**Dry Arch Business Park ,**
**Dromore ,**
**Letterkenny ,**

| | |
|---|---|
| **Report no.:** | **21-06855** |
| **No. of samples:** | 2 |
| **Acceptance date:** | 19/10/2021 |
| **Analysis date:** | 19/10/2021 |
| **Date of issue:** | 20/10/2021 |
| **Contact:** | Denis Faulkner |

**Comments**
2 x samples ex PJ Bonner

| Sample ID | Sample type | Client reference | Test method | Test description | Result / Units |
|---|---|---|---|---|---|
| 21-06855-(01) | Water | Stream | E-105 | pH | 8.02 @ 18.2°C |
| | | | E-103 | Suspended Solids | <5 mg/l |
| 21-06855-(02) | Effluent | Quarry discharge | E-105 | pH | 7.54 @ 17.3°C |
| | | | E-103 | Suspended Solids | <5 mg/l |
| | | | E-113 | #Conductivity | 464 µS/cm @ 20°C |

The results in this electronically produced test report have been checked and approved. The test report meets the requirements of IS EN ISO/IEC 17025:2017 and is also valid without signature.

**Report authorised by:** J Cassidy
**Julie Cassidy**
Senior Technician

In Test Method - 'Subcontracted A' tests are accredited; 'Subcontracted U' tests are unaccredited.
Tests are unaccredited if prefixed by # or if INAB logo is not visible on the report.
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| | |
|---|---|
| **Report no.:** | **21-07771** |
| **No. of samples:** | 2 |
| **Acceptance date:** | 24/11/2021 |
| **Analysis date:** | 24/11/2021 |
| **Date of issue:** | 07/12/2021 |
| **Contact:** | Denis Faulkner |

**Comments**
2 x samples ex PJ Bonner

| Sample ID | Sample type | Client reference | Test method | Test description | Result / Units |
|---|---|---|---|---|---|
| 21-07771-(01) | Effluent | discharge (S) | E-105 | pH | 7.57 @ 16.4°C |
| | | | E-103 | Suspended Solids | <5 mg/l |
| 21-07771-(02) | Water | stream(N) | E-105 | pH | 7.52 @ 16.5°C |
| | | | E-103 | Suspended Solids | 11 mg/l |

The results in this electronically produced test report have been checked and approved. The test report meets the requirements of IS EN ISO/IEC 17025:2017 and is also valid without signature.

**Report authorised by:**

J Cassidy

**Julie Cassidy**
Senior Technician

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| **Customer:** | **Greentrack**<br>**4 Roe House,**<br>**Dry Arch Business Park ,**<br>**Dromore ,**<br>**Letterkenny ,** | **Report no.:** | **22-00053** |
| | | **No. of samples:** | 2 |
| | | **Acceptance date:** | 05/01/2022 |
| | | **Analysis date:** | 05/01/2022 |
| | | **Date of issue:** | 06/01/2022 |
| | | **Contact:** | Denis Faulkner |

**Comments**
2 x samples ex PJ Bonner

| Sample ID | Sample type | Client reference | Test method | Test description | Result / Units |
|---|---|---|---|---|---|
| 22-00053-(01) | Water | site discharge(N) | E-105 | pH | 7.98 @ 15.7°C |
| | | | E-103 | Suspended Solids | 10 mg/l |
| 22-00053-(02) | Effluent | site discharge(S) | E-105 | pH | 7.88 @ 16.8°C |
| | | | E-103 | Suspended Solids | <5 mg/l |

The results in this electronically produced test report have been checked and approved. The test report meets the requirements of IS EN ISO/IEC 17025:2017 and is also valid without signature.

**Report authorised by:**

J Cassidy

**Julie Cassidy**
Senior Technician

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**Report no.:** **22-00427**
**No. of samples:** 3
**Acceptance date:** 20/01/2022
**Analysis date:** 20/01/2022
**Date of issue:** 26/01/2022
**Contact:** Denis Faulkner

**Comments**
3 x samples groundwater ex PJ Bonner

| Sample ID | Sample type | Client reference | Test method | Test description | Result / Units |
|---|---|---|---|---|---|
| 22-00427-(01) | Water | borehole 1 | E-105 | pH | 7.35 @ 15.2°C |
| | | | E-103 | Suspended Solids | 29 mg/l |
| | | | E-113 | #Conductivity | 602 µS/cm @ 20°C |
| | | | E-142 | #Dissolved Oxygen | 43.3 % |
| | | | E-124 | Ammonia (as NH3-N) | <0.01 mg/l |
| | | | E-129 | #Total Nitrogen | 1.4 mg/l |
| | | | E-134 | #Sulphate | 41.80 mg/l |
| | | | E-108 | Nitrate (as N) | <0.1 mg/l |
| | | | E-109 | Orthophosphate (as P) | 0.01 mg/l |
| 22-00427-(02) | Water | borehole 2 | E-105 | pH | 7.92 @ 18.3°C |
| | | | E-103 | Suspended Solids | 60 mg/l |
| | | | E-113 | #Conductivity | 624 µS/cm @ 20°C |
| | | | E-142 | #Dissolved Oxygen | 45.2 % |
| | | | E-124 | Ammonia (as NH3-N) | 0.03 mg/l |
| | | | E-129 | #Total Nitrogen | 1.4 mg/l |
| | | | E-134 | #Sulphate | 13.22 mg/l |
| | | | E-108 | Nitrate (as N) | <0.1 mg/l |
| | | | E-109 | Orthophosphate (as P) | <0.01 mg/l |
| 22-00427-(03) | Water | borehole 3 | E-105 | pH | 7.61 @ 15.2°C |
| | | | E-103 | Suspended Solids | 13 mg/l |

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**Dromore ,**
**Letterkenny ,**

| | |
|---|---|
| **Report no.:** | **22-00427** |
| **No. of samples:** | 3 |
| **Acceptance date:** | 20/01/2022 |
| **Analysis date:** | 20/01/2022 |
| **Date of issue:** | 26/01/2022 |
| **Contact:** | Denis Faulkner |

**Comments**
3 x samples groundwater ex PJ Bonner

| Sample ID | Sample type | Client reference | Test method | Test description | Result / Units |
|---|---|---|---|---|---|
| 22-00427-(03) | Water | borehole 3 | E-113 | #Conductivity | 613 µS/cm @ 20°C |
| | | | E-142 | #Dissolved Oxygen | 35.6 % |
| | | | E-124 | Ammonia (as NH3-N) | 0.03 mg/l |
| | | | E-129 | #Total Nitrogen | 1.4 mg/l |
| | | | E-134 | #Sulphate | 20.51 mg/l |
| | | | E-108 | Nitrate (as N) | <0.1 mg/l |
| | | | E-109 | Orthophosphate (as P) | <0.01 mg/l |

The results in this electronically produced test report have been checked and approved. The test report meets the requirements of IS EN ISO/IEC 17025:2017 and is also valid without signature.

**Report authorised by:** J Cassidy

**Julie Cassidy**
Senior Technician

In Test Method - 'Subcontracted A' tests are accredited; 'Subcontracted U' tests are unaccredited.
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## CERTIFICATE OF ANALYSIS

Page 1 of 1

**Customer:** **Greentrack**
**4 Roe House,**
**Dry Arch Business Park ,**
**Dromore ,**
**Letterkenny ,**

| | |
|---|---|
| **Report no.:** | **21-08232** |
| **No. of samples:** | 2 |
| **Acceptance date:** | 09/12/2021 |
| **Analysis date:** | 09/12/2021 |
| **Date of issue:** | 14/12/2021 |
| **Contact:** | Denis Faulkner |

**Comments**
2 x samples ex PJ Bonner

| Sample ID | Sample type | Client reference | Test method | Test description | Result / Units |
|---|---|---|---|---|---|
| 21-08232-(01) | Water | site discharge(N) | E-105 | pH | 7.53 @ 16.2°C |
| | | | E-103 | Suspended Solids | 5 mg/l |
| | | | E-102 | COD | <16 mg/l |
| | | | E-113 | #Conductivity | 205 µS/cm @20°C |
| | | | E-124 | Ammonia (as NH3-N) | 0.08 mg/l |
| | | | E-129 | #Total Nitrogen | 4.11 mg/l |
| | | | E-134 | #Sulphate | 12.86 mg/l |
| | | | E-101 | BOD | 2.04 mg/l |
| 21-08232-(02) | Effluent | site discharge(S) | E-105 | pH | 7.57 @ 15.8°C |
| | | | E-103 | Suspended Solids | <5 mg/l |
| | | | E-102 | COD | <16 mg/l |
| | | | E-113 | #Conductivity | 379 µS/cm @20°C |
| | | | E-124 | Ammonia (as NH3-N) | 0.05 mg/l |
| | | | E-129 | #Total Nitrogen | 3.89 mg/l |
| | | | E-134 | #Sulphate | 68.37 mg/l |
| | | | E-101 | BOD | 1.20 mg/l |

The results in this electronically produced test report have been checked and approved. The test report meets the requirements of IS EN ISO/IEC 17025:2017 and is also valid without signature.

**Report authorised by:** J Cassidy

**Julie Cassidy**
Senior Technician

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## CERTIFICATE OF ANALYSIS

Page 1 of 1

**Customer:** **Greentrack**
**4 Roe House,**
**Dry Arch Business Park ,**
**Dromore ,**
**Letterkenny ,**

**Report no.:** **22-01403**
**No. of samples:** 3
**Acceptance date:** 01/03/2022
**Analysis date:** 01/03/2022
**Date of issue:** 02/03/2022
**Contact:** Denis Faulkner

**Comments**
3 x samples groundwater ex PJ Bonner

| Sample ID | Sample type | Client reference | Test method | Test description | Result / Units |
|---|---|---|---|---|---|
| 22-01403-(01) | Water | borehole 1 | E-105 | pH | 8.09 @ 17.8°C |
| | | | E-103 | Suspended Solids | 9 mg/l |
| | | | E-113 | #Conductivity | 656 µS/cm @ 20°C |
| 22-01403-(02) | Water | borehole 2 | E-105 | pH | 7.12 @ 16.1°C |
| | | | E-103 | Suspended Solids | 12 mg/l |
| | | | E-113 | #Conductivity | 633 µS/cm @ 20°C |
| 22-01403-(03) | Water | borehole 3 | E-105 | pH | 7.79 @ 17.0°C |
| | | | E-103 | Suspended Solids | 10 mg/l |
| | | | E-113 | #Conductivity | 588 µS/cm @ 20°C |

The results in this electronically produced test report have been checked and approved. The test report meets the requirements of IS EN ISO/IEC 17025:2017 and is also valid without signature.

**Report authorised by:** J Cassidy

**Julie Cassidy**
Senior Technician

In Test Method - 'Subcontracted A' tests are accredited; 'Subcontracted U' tests are unaccredited.
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## CERTIFICATE OF ANALYSIS

Page 1 of 1

**Customer:** **Greentrack**
**4 Roe House,**
**Dry Arch Business Park ,**
**Dromore ,**
**Letterkenny ,**

| | |
|---|---|
| **Report no.:** | **22-01404** |
| **No. of samples:** | 7 |
| **Acceptance date:** | 01/03/2022 |
| **Analysis date:** | 01/03/2022 |
| **Date of issue:** | 02/03/2022 |
| **Contact:** | Denis Faulkner |

**Comments**
7 x samples water ex PJ Bonner

| Sample ID | Sample type | Client reference | Test method | Test description | Result / Units |
|---|---|---|---|---|---|
| 22-01404-(01) | Water | SW1 | E-113 | Conductivity | 349 µS/cm @ 20°C |
| 22-01404-(02) | Water | SW2 | E-113 | Conductivity | 279 µS/cm @ 20°C |
| 22-01404-(03) | Water | SW3 | E-113 | Conductivity | 317 µS/cm @ 20°C |
| 22-01404-(04) | Water | SW4 | E-113 | Conductivity | 366 µS/cm @ 20°C |
| 22-01404-(05) | Water | SW5 | E-113 | Conductivity | 308 µS/cm @ 20°C |
| 22-01404-(06) | Water | SW6 | E-113 | Conductivity | 342 µS/cm @ 20°C |
| 22-01404-(07) | Water | SW7 | E-113 | Conductivity | 359 µS/cm @ 20°C |

The results in this electronically produced test report have been checked and approved. The test report meets the requirements of IS EN ISO/IEC 17025:2017 and is also valid without signature.

J Cassidy

**Report authorised by:**
**Julie Cassidy**
Senior Technician



Revision: 13

# APPENDIX 8.2: Flow Rates from existing Outflows

| Flow | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **Date** | **Litres** | **seconds** | **Discharge rate** | **Average L/s** | | **13.10.21** | **12.10.21** | **11.10.21** | **Average daily over 3 days** | | |
| 13.10.21 | 13 | 28.12 | 0.46 | | | 0 | 2 | 0.1 | | | |
| | 15 | 30.5 | 0.49 | | | 0 | 0.7 | 0.2 | 0.5 | | |
| | 12 | 27.12 | 0.44 | 0.47 | | | | | | | |
| **Date** | **Litres** | **seconds** | **Discharge rate** | **Average L/s** | | **2.11.21** | **31.10.21** | **1.11.21** | | | |
| 2.11.21 | 15 | 7.12 | 2.11 | | | 3.6 | 19 | 8.6 | | | |
| | 14 | 6.59 | 2.12 | | | 2.5 | 15 | 8.2 | 9.5 | | |
| | 14 | 7.04 | 1.99 | 2.07 | | | | | | | |
| **Date** | **Litres** | **seconds** | **Discharge rate** | **Average L/s** | | **4.11.21** | **3.11.21** | **2.11.21** | | | |
| 4.11.21 | 13 | 8.4 | 1.55 | | | 1.2 | 2.1 | 3.6 | | | |
| | 14.5 | 8.94 | 1.62 | | | 0.6 | 0.1 | 2.5 | 1.7 | | |
| | 12.5 | 8.08 | 1.55 | 1.57 | | | | | | | |
| **Date** | **Litres** | **seconds** | **Discharge rate** | **Average L/s** | | **9.11.21** | **8.11.21** | **7.11.21** | | | |
| 9.11.21 | 12.5 | 10.57 | 1.18 | | | 0 | 6.2 | 0.1 | | | |
| | 14 | 12.1 | 1.16 | | | 0 | 7.8 | 0 | 2.4 | | |
| | 15 | 12.26 | 1.22 | 1.19 | | | | | | | |
| **Date** | **Litres** | **seconds** | **Discharge rate** | **Average L/s** | | **11.11.21** | **10.11.21** | **9.11.21** | | | |
| 11.11.21 | 12 | 15.9 | 0.75 | | | 0.7 | 0 | 0 | | | |
| | 13 | 16.25 | 0.80 | | | 2.4 | 0 | 0 | 0.5 | | |
| | 12.5 | 15.6 | 0.80 | 0.79 | | | | | | | |
| **Date** | **Litres** | **seconds** | **Discharge rate** | **Average L/s** | | **16.11.21** | **15.11.21** | **14.11.21** | | | |
| 16.11.21 | 14 | 16.42 | 0.85 | | | 4.6 | 2.1 | 6.7 | | | |
| | 13.5 | 16.68 | 0.81 | | | 2.8 | 0.8 | 2.1 | 3.2 | | |
| | 14.5 | 17.24 | 0.84 | 0.83 | | | | | | | |
| **Date** | **Litres** | **seconds** | **Discharge rate** | **Average L/s** | | **30.11.21** | **29.11.21** | **28.11.21** | | | |
| 30.11.21 | 12.5 | 15.93 | 0.78 | | | 24.3 | 1.6 | 2.3 | | | |
| | 14.8 | 16.77 | 0.88 | | | 16.1 | 1.6 | 0.9 | 7.8 | | |
| | 15.2 | 17.35 | 0.88 | 0.85 | | | | | | | |
| **Date** | **Litres** | **seconds** | **Discharge rate** | **Average L/s** | | **1.12.21** | **30.11.21** | **29.11.21** | | | |
| 1.12.21 | 16.5 | 4.05 | 4.07 | | upper stream: 0.63 L/s | 4.4 | 24.3 | 1.6 | | | |
| | 15.2 | 3.37 | 4.51 | | | 3.6 | 16.1 | 1.6 | 8.6 | | |
| | 15 | 3.64 | 4.12 | 4.24 | | | | | | | |
| **Date** | **Litres** | **seconds** | **Discharge rate** | **Average L/s** | | **8.12.21** | **7.12.21** | **6.12.21** | | | |
| 8.12.21 | 16.5 | 2.97 | 5.56 | | upper stream: 0.63 L/s | 5 | 15.1 | 9.3 | | | |
| | 15.2 | 2.22 | 6.85 | | | 21.2 | 14.2 | 10.8 | 12.6 | | |
| | 15.5 | 2.44 | 6.35 | 6.25 | | | | | | | |
| **Date** | **Litres** | **seconds** | **Discharge rate** | **Average L/s** | | **14.12.21** | **13.12.21** | **12.12.21** | | | |
| 14.12.21 | 15.2 | 11.62 | 1.31 | | upper stream: 0.25 L/s | 0 | 0.8 | 1 | | | |

| | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | 13 | 10.81 | 1.20 | | | 0 | 0 | 1.6 | 0.6 | | |
| | 15 | 11.71 | 1.28 | 1.26 | | | | | | | |
| **Date** | **Litres** | **seconds** | **Discharge rate** | **Average L/s** | | **21.12.21** | **20.12.21** | **19.12.21** | | | |
| 21.12.21 | 12.5 | 22.29 | 0.56 | | upper stream: 0.08 L/s | 0 | 0 | 0.2 | | | |
| | 13 | 22.93 | 0.57 | | | 0 | 0 | 0 | 0.0 | | |
| | 15 | 25.71 | 0.58 | 0.57 | | | | | | | |
| **Date** | **Litres** | **seconds** | **Discharge rate** | **Average L/s** | | **31.12.21** | **30.12.21** | **29.12.21** | | | |
| 31.12.21 | 16.5 | 8.5 | 1.94 | | upper stream: 0.13 L/s | 5.1 | 0.2 | 7.2 | | | |
| | 15.5 | 7.95 | 1.95 | | | 5.3 | 1.6 | 4.6 | 4.0 | | |
| | 15.2 | 7.82 | 1.94 | 1.94 | | | | | | | |
| **Date** | **Litres** | **seconds** | **Discharge rate** | **Average L/s** | | **7.1.21** | **6.1.22** | **5.1.22** | | | |
| 7.1.22 | 11 | 4.97 | 2.21 | | upper stream: 0.24 L/s | 6.5 | 13.7 | 0.9 | | | |
| | 10.5 | 4.45 | 2.36 | | | 7.6 | 15.1 | 0 | 7.3 | | |
| | 10.7 | 4.6 | 2.33 | 2.30 | | | | | | | |
| **Date** | **Litres** | **seconds** | **Discharge rate** | **Average L/s** | | **14.1.21** | **13.1.22** | **12.1.22** | | | |
| 14.1.22 | 15 | 15.68 | 0.96 | | upper stream: 0.15 L/s | 0 | 0 | 0 | | | |
| | 14 | 13.78 | 1.02 | | | 0 | 0 | 0 | 0.0 | | |
| | 14.2 | 14.1 | 1.01 | 0.99 | | | | | | | |
| **Date** | **Litres** | **seconds** | **Discharge rate** | **Average L/s** | | **21.1.21** | **20.1.22** | **19.1.22** | | | |
| 21.1.22 | 15 | 16.68 | 0.90 | | upper stream: 0.14 L/s | 0.3 | 0.2 | 2.4 | | | |
| | 14 | 15.3 | 0.92 | | | 0.2 | 0 | 0.9 | 0.7 | | |
| | 14.2 | 15.95 | 0.89 | 0.90 | | | | | | | |
| **Date** | **Litres** | **seconds** | **Discharge rate** | **Average L/s** | | **28.1.22** | **27.1.22** | **26.1.22** | | | |
| 28.1.22 | 13 | 30 | 0.43 | | upper stream: 0.08 L/s | 0 | 0.7 | 0.6 | | | |
| | 13.5 | 34 | 0.40 | | | 0.3 | 0.3 | 1.3 | 0.5 | | |
| | 14.5 | 36 | 0.40 | 0.41 | | | | | | | |
| **Date** | **Litres** | **seconds** | **Discharge rate** | **Average L/s** | | **4.2.22** | **3.2.22** | **2.2.22** | | | |
| 4.2.22 | 15 | 16.08 | 0.93 | | upper stream: 0.18 L/s | 4.3 | 6.1 | 1.6 | | | |
| | 14.8 | 15.65 | 0.95 | | | 4.2 | 7.3 | 0.6 | 4.0 | | |
| | 14.70 | 14.74 | 1.00 | 0.96 | | | | | | | |
| **Date** | **Litres** | **seconds** | **Discharge rate** | **Average L/s** | | **11.2.22** | **10.2.22** | **9.2.22** | | | |
| 11.2.22 | | | | | upper stream: | 0.4 | 2.9 | 4 | | | |
| | | | | | | 3.1 | 4.2 | 7.2 | 3.6 | | |
| | | | | 0.00 | | | | | | | |

| Date | Litres | seconds | Discharge rate | Average L/s | | 18.2.22 | 17.2.22 | 16.2.22 | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 18.2.22 | 12 | 3.34 | 3.59 | | upper stream: 0.5 L/s | 26.9 | 6.5 | 13 | | | |
| | 15 | 3.56 | 4.21 | | | 17 | 2.5 | 6 | 12.0 | | |
| | 16.50 | 4.16 | 3.97 | 3.92 | | | | | | | |
| **Date** | **Litres** | **seconds** | **Discharge rate** | **Average L/s** | | **25.2.22** | **24.2.22** | **23.2.22** | | | |
| 25.2.22 | 15.8 | 4.6 | 3.43 | | upper stream: 0.34 L/s | 0.2 | 14.2 | 10.6 | | | |
| | 15.3 | 4.52 | 3.38 | | | 0.7 | 9.8 | 10.9 | 7.7 | | |
| | 14.80 | 4.69 | 3.16 | 3.33 | | | | | | | |
| **Date** | **Litres** | **seconds** | **Discharge rate** | **Average L/s** | | **4.3.22** | **3.3.22** | **2.3.22** | | | |
| 4.3.22 | 15 | 19.28 | 0.78 | | upper stream: 0.21 L/s | 0.7 | 3.5 | 0.7 | | | |
| | 14.8 | 18.9 | 0.78 | | | 0.1 | 6.2 | 1.5 | 2.1 | | |
| | 14.90 | 18.66 | 0.80 | 0.79 | | | | | | | |
| **Date** | **Litres** | **seconds** | **Discharge rate** | **Average L/s** | | **11.3.22** | **10.3.22** | **9.3.22** | | | |
| 11.3.22 | 14.8 | 27.31 | 0.54 | | upper stream: 0.16 L/s | 3.9 | 0 | 4.9 | | | |
| | 15.1 | 28.32 | 0.53 | | | 1.3 | 0 | 10.5 | 3.4 | | |
| | 15.10 | 27.39 | 0.55 | 0.54 | | | | | | | |

# APPENDIX 8.3: Borehole Drilling Log

CAUSEWAY GEOTECH

| Project No. | Project Name: Raphoe Quarry, Co Derry | Borehole ID |
|---|---|---|
| W21-20H | Client: PJ Bonar | BH01 |
| | Client's Rep: | |

| Method | Plant Used | Top (m) | Base (m) | Coordinates | | | | Sheet 1 of 3 |
|---|---|---|---|---|---|---|---|---|
| Rotary Drilling | Comacchio 405 | 0.00 | 100.00 | E | Final Depth: 100.00 m | Start Date: 04/11/2021 | Driller: JC | Scale: 1:200 |
| | | | | N | Elevation: mOD | End Date: 04/11/2021 | Logger: IR | DRAFT |

| Depth (m) | Sample / Tests | Field Records | Casing Depth (m) | Water Depth (m) | Level mOD | Depth (m) | Legend | Description | Water | Backfill |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | TOPSOIL and CLAY | | |
| | | | | | | 1.00 | | Weathered Dolerite (Fine Grained Igneous) | | |
| | | | | | | 3.50 | | DOLERITE | | |

| Water Strikes | | | |
|---|---|---|---|
| Struck at (m) | Casing to (m) | Time (min) | Rose to (m) |
| | | | |

**Remarks**

No water strikes encountered other than overnight seepage
Gravel filter installed from the bottom of the standpipe to 5.0m BGL
Bentonite pellet seal from 0.5-5.00m BGL
Vandal-proof cover installed with concrete surround
All strata descriptions are Drillers Description

| Casing Details | | Water Added | |
|---|---|---|---|
| To (m) | Diam (mm) | From (m) | To (m) |
| | | | |

| Core Barrel | Flush Type | Termination Reason | Last Updated |
|---|---|---|---|
| | | | 15/12/2021 |

AGS

CAUSEWAY GEOTECH

| Project No. | Project Name: Raphoe Quarry, Co Derry | Borehole ID |
|---|---|---|
| W21-20H | Client: Pl Bonar | BH01 |
| | Client's Rep: | |

| Method | Plant Used | Top (m) | Base (m) | Coordinates | | | |
|---|---|---|---|---|---|---|---|
| Rotary Drilling | Comacchio 405 | 0.00 | 100.00 | E | Final Depth: 100.00 m | Start Date: 04/11/2021 | Driller: JC |
| | | | | N | Elevation: mOD | End Date: 04/11/2021 | Logger: IR |

Sheet 2 of 3
Scale: 1:200
DRAFT

| Depth (m) | Sample / Tests | Field Records | Casing Depth (m) | Water Depth (m) | Level mOD | Depth (m) | Legend | Description | Water | Backfill |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | DOLERITE | | |

| Water Strikes | | | | Remarks |
|---|---|---|---|---|
| Struck at (m) | Casing to (m) | Time (min) | Rose to (m) | No water strikes encountered other than overnight seepage<br>Gravel filter installed from the bottom of the standpipe to 5.0m BGL<br>Bentonite pellet seal from 0.5-5.00m BGL<br>Vandal-proof cover installed with concrete surround<br>All strata descriptions are Drillers Description |

| Casing Details | | Water Added | |
|---|---|---|---|
| To (m) | Diam (mm) | From (m) | To (m) |

| Core Barrel | Flush Type | Termination Reason | Last Updated |
|---|---|---|---|
| | | | 15/12/2021 |

AGS

| CAUSEWAY GEOTECH | Project No. W21-20H | Project Name: Raphoe Quarry, Co Derry | Borehole ID BH01 |
|---|---|---|---|
| | | Client: PJ Bonar | |
| | | Client's Rep: | |

| Method | Plant Used | Top (m) | Base (m) | Coordinates | Final Depth: 100.00 m | Start Date: 04/11/2021 | Driller: JC | Sheet 3 of 3 Scale: 1:200 |
|---|---|---|---|---|---|---|---|---|
| Rotary Drilling | Comacchio 405 | 0.00 | 100.00 | E | | | | |
| | | | | N | Elevation: mOD | End Date: 04/11/2021 | Logger: IR | DRAFT |

| Depth (m) | Sample / Tests | Field Records | Casing Depth (m) | Water Depth (m) | Level mOD | Depth (m) | Legend | Description | Water | Backfill |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | DOLERITE | | |
| | | | | | | 100.00 | | End of Borehole at 100.00m | | |

**Water Strikes**

| Struck at (m) | Casing to (m) | Time (min) | Rose to (m) |
|---|---|---|---|
| | | | |

**Remarks**

No water strikes encountered other than overnight seepage
Gravel filter installed from the bottom of the standpipe to 5.0m BGL.
Bentonite pellet seal from 0.5-5.00m BGL
Vandal-proof cover installed with concrete surround
All strata descriptions are Drillers Description

| Casing Details | | Water Added | |
|---|---|---|---|
| To (m) | Diam (mm) | From (m) | To (m) |
| | | | |

| Core Barrel | Flush Type | Termination Reason | Last Updated |
|---|---|---|---|
| | | | 15/12/2021 |

AGS

CAUSEWAY GEOTECH

| Project No. | Project Name: Raphoe Quarry, Co Derry | Borehole ID |
|---|---|---|
| W21-20H | Client: PJ Bonar | BH02 |
| | Client's Rep: | |

| Method | Plant Used | Top (m) | Base (m) | Coordinates | | | | Sheet 1 of 3 |
|---|---|---|---|---|---|---|---|---|
| Rotary Drilling | Comacchio 405 | 0.00 | 100.00 | E | Final Depth: 100.00 m | Start Date: 01/12/2021 | Driller: PD | Scale: 1:200 |
| | | | | N | Elevation: mOD | End Date: 01/12/2021 | Logger: IR | DRAFT |

| Depth (m) | Sample / Tests | Field Records | Casing Depth (m) | Water Depth (m) | Level mOD | Depth (m) | Legend | Description | Water | Backfill |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | MADE GROUND: Grey slightly sandy angular to subangular fine to coarse GRAVEL with low cobble content. Sand is fine to coarse. Cobbles are angular. | | |
| | | | | | | 7.00 | | DOLERITE | | |

| Water Strikes | | | | Remarks |
|---|---|---|---|---|
| Struck at (m) | Casing to (m) | Time (min) | Rose to (m) | No water strikes encountered<br>Gravel filter installed from the bottom of the standpipe to 5.0m BGL.<br>Bentonite pellet seal from 0.5-5.00m BGL<br>Vandal-proof cover installed with concrete surround<br>All strata descriptions are Drillers Description |

| Casing Details | | Water Added | |
|---|---|---|---|
| To (m) | Diam (mm) | From (m) | To (m) |

| Core Barrel | Flush Type | Termination Reason | Last Updated |
|---|---|---|---|
| | | | 15/12/2021 |

AGS

| CAUSEWAY GEOTECH | Project No. W21-20H | Project Name: Raphoe Quarry, Co Derry<br>Client: PJ Bonar<br>Client's Rep: | Borehole ID BH02 |
|---|---|---|---|

| Method | Plant Used | Top (m) | Base (m) | Coordinates | Final Depth: 100.00 m | Start Date: 01/12/2021 | Driller: PD | Sheet 2 of 3<br>Scale: 1:200 |
|---|---|---|---|---|---|---|---|---|
| Rotary Drilling | Comacchio 405 | 0.00 | 100.00 | E<br>N | Elevation: mOD | End Date: 01/12/2021 | Logger: IR | DRAFT |

| Depth (m) | Sample / Tests | Field Records | Casing Depth (m) | Water Depth (m) | Level mOD | Depth (m) | Legend | Description | Water | Backfill |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | DOLERITE | | |

| Water Strikes | | | | Remarks |
|---|---|---|---|---|
| Struck at (m) | Casing to (m) | Time (min) | Rose to (m) | No water strikes encountered<br>Gravel filter installed from the bottom of the standpipe to 5.0m BGL<br>Bentonite pellet seal from 0.5-5.00m BGL<br>Vandal-proof cover installed with concrete surround<br>All strata descriptions are Drillers Description |

| Casing Details | | Water Added | |
|---|---|---|---|
| To (m) | Diam (mm) | From (m) | To (m) |

| Core Barrel | Flush Type | Termination Reason | Last Updated | AGS |
|---|---|---|---|---|
| | | | 15/12/2021 | |

CAUSEWAY GEOTECH

| Project No. | Project Name: Raphoe Quarry, Co Derry | Borehole ID |
|---|---|---|
| W21-20H | Client: PJ Bonar<br>Client's Rep: | BH02 |

| Method | Plant Used | Top (m) | Base (m) | Coordinates | Final Depth: 100.00 m | Start Date: 01/12/2021 | Driller: PD | Sheet 3 of 3<br>Scale: 1:200 |
|---|---|---|---|---|---|---|---|---|
| Rotary Drilling | Comacchio 405 | 0.00 | 100.00 | E<br>N | Elevation: mOD | End Date: 01/12/2021 | Logger: IR | DRAFT |

| Depth (m) | Sample / Tests | Field Records | Casing Depth (m) | Water Depth (m) | Level mOD | Depth (m) | Legend | Description | Water | Backfill |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | DOLERITE | | |
| | | | | | | 100.00 | | End of Borehole at 100.00m | | |

| Water Strikes | | | |
|---|---|---|---|
| Struck at (m) | Casing to (m) | Time (min) | Rose to (m) |

| Casing Details | | Water Added | |
|---|---|---|---|
| To (m) | Diam (mm) | From (m) | To (m) |

**Remarks**

No water strikes encountered
Gravel filter installed from the bottom of the standpipe to 5.0m BGL
Bentonite pellet seal from 0.5-5.00m BGL
Vandal-proof cover installed with concrete surround
All strata descriptions are Drillers Description

| Core Barrel | Flush Type | Termination Reason | Last Updated |
|---|---|---|---|
| | | | 15/12/2021 |

AGS

| CAUSEWAY GEOTECH | Project No. W21-20H | Project Name: Raphoe Quarry, Co Derry<br>Client: PJ Bonar<br>Client's Rep: | Borehole ID BH03 |
|---|---|---|---|

| Method | Plant Used | Top (m) | Base (m) | Coordinates | | | | Sheet 1 of 3 |
|---|---|---|---|---|---|---|---|---|
| Rotary Drilling | Comacchio 405 | 0.00 | 100.00 | E | Final Depth: 100.00 m | Start Date: 06/12/2021 | Driller: JC | Scale: 1:200 |
| | | | | N | Elevation: mOD | End Date: 06/12/2021 | Logger: IR | DRAFT |

| Depth (m) | Sample / Tests | Field Records | Casing Depth (m) | Water Depth (m) | Level mOD | Depth (m) | Legend | Description | Water | Backfill |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | Weathered Dolerite | | |
| | | | | | | 6.00 | | DOLERITE | | |

| Water Strikes | | | | Remarks |
|---|---|---|---|---|
| Struck at (m) | Casing to (m) | Time (min) | Rose to (m) | Small amount of water in top 6 meters- no other strikes<br>Gravel filter installed from the bottom of the standpipe to 5.0m BGL<br>Bentonite pellet seal from 0.5-5.00m BGL<br>Vandal-proof cover installed with concrete surround<br>All strata descriptions are Drillers Description |

| Casing Details | | Water Added | |
|---|---|---|---|
| To (m) | Diam (mm) | From (m) | To (m) |

| Core Barrel | Flush Type | Termination Reason | Last Updated |
|---|---|---|---|
| | | | 15/12/2021 |

AGS

| CAUSEWAY GEOTECH | Project No. W21-20H | Project Name: Raphoe Quarry, Co Derry<br>Client: PJ Bonar<br>Client's Rep: | Borehole ID BH03 |
|---|---|---|---|

| Method | Plant Used | Top (m) | Base (m) | Coordinates | | |
|---|---|---|---|---|---|---|
| Rotary Drilling | Comacchio 405 | 0.00 | 100.00 | E<br>N | Final Depth: 100.00 m<br>Elevation: mOD | Sheet 2 of 3 |
| | | | | | Start Date: 06/12/2021<br>End Date: 06/12/2021 | Scale: 1:200 |
| | | | | | Driller: JC<br>Logger: IR | DRAFT |

| Depth (m) | Sample / Tests | Field Records | Casing Depth (m) | Water Depth (m) | Level mOD | Depth (m) | Legend | Description | Water | Backfill |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | DOLERITE | | |

| Water Strikes | | | | Remarks |
|---|---|---|---|---|
| Struck at (m) | Casing to (m) | Time (min) | Rose to (m) | Small amount of water in top 6 meters- no other strikes<br>Gravel filter installed from the bottom of the standpipe to 5.0m BGL<br>Bentonite pellet seal from 0.5-5.00m BGL<br>Vandal-proof cover installed with concrete surround<br>All strata descriptions are Drillers Description |

| Casing Details | | Water Added | |
|---|---|---|---|
| To (m) | Diam (mm) | From (m) | To (m) |

| Core Barrel | Flush Type | Termination Reason | Last Updated |
|---|---|---|---|
| | | | 15/12/2021 |

AGS

CAUSEWAY GEOTECH

| Project No. | Project Name: Raphoe Quarry, Co Derry | Borehole ID |
|---|---|---|
| W21-20H | Client: PJ Bonar | BH03 |
| | Client's Rep: | |

| Method | Plant Used | Top (m) | Base (m) | Coordinates | | | | Sheet 3 of 3 |
|---|---|---|---|---|---|---|---|---|
| Rotary Drilling | Comacchio 405 | 0.00 | 100.00 | E | Final Depth: 100.00 m | Start Date: 06/12/2021 | Driller: JC | Scale: 1:200 |
| | | | | N | Elevation: mOD | End Date: 06/12/2021 | Logger: IR | DRAFT |

| Depth (m) | Sample / Tests | Field Records | Casing Depth (m) | Water Depth (m) | Level mOD | Depth (m) | Legend | Description | Water | Backfill |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | DOLERITE | | |
| | | | | | | 100.00 | | End of Borehole at 100.00m | | |

**Water Strikes**

| Struck at (m) | Casing to (m) | Time (min) | Rose to (m) |
|---|---|---|---|
| | | | |

**Remarks**

Small amount of water in top 6 meters- no other strikes
Gravel filter installed from the bottom of the standpipe to 5.0m BGL
Bentonite pellet seal from 0.5-5.00m BGL
Vandal-proof cover installed with concrete surround
All strata descriptions are Drillers Description

**Casing Details**

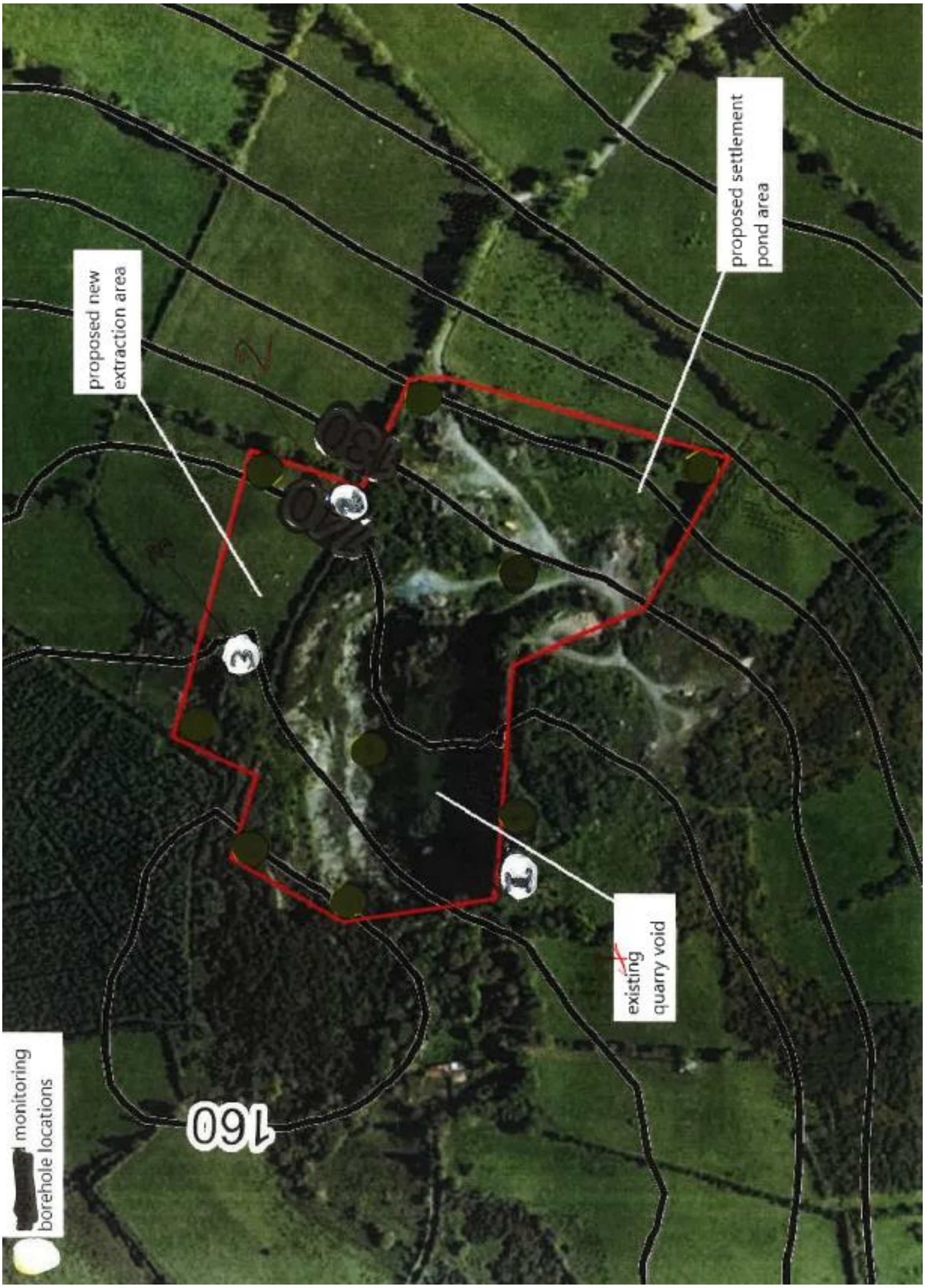
| To (m) | Diam (mm) |
|---|---|
| | |

**Water Added**

| From (m) | To (m) |
|---|---|
| | |

| Core Barrel | Flush Type | Termination Reason | Last Updated |
|---|---|---|---|
| | | | 15/12/2021 |

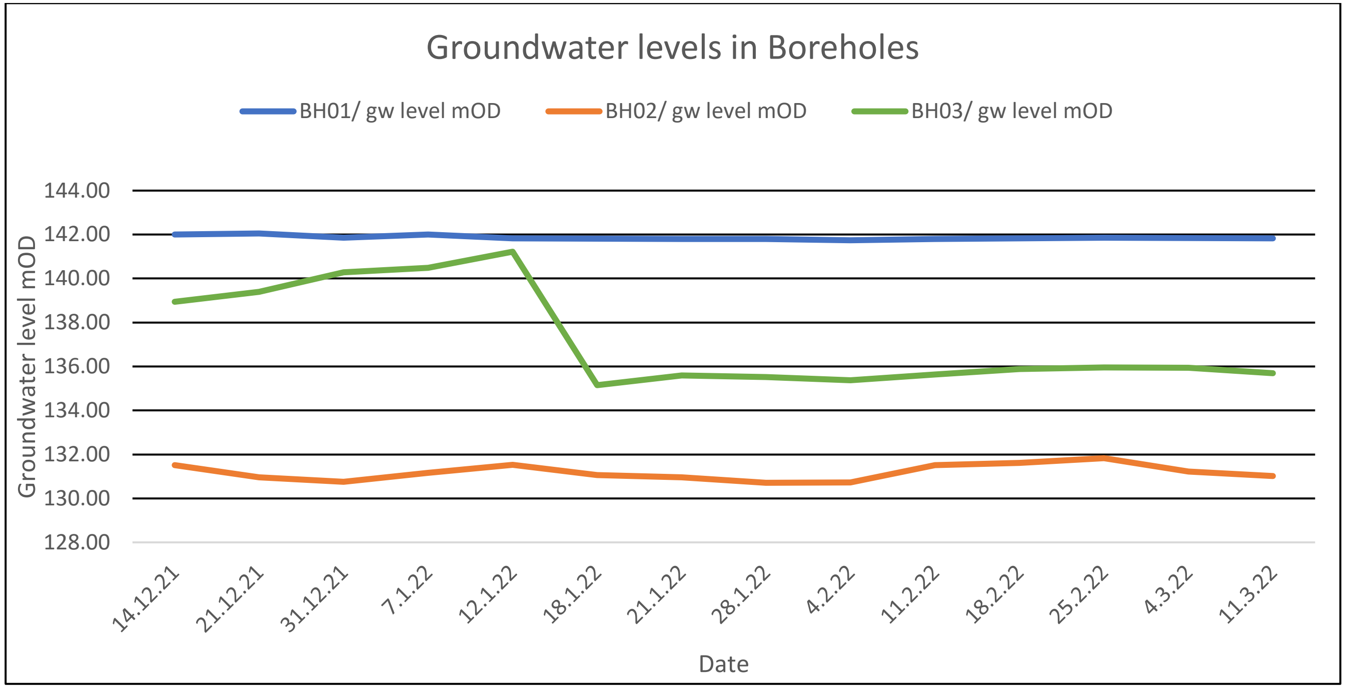
AGS


proposed new extraction area
proposed settlement pond area
existing quarry void
monitoring borehole locations
130
140
160
1
2
3

# APPENDIX 8.4: Borehole Dip Meter Readings

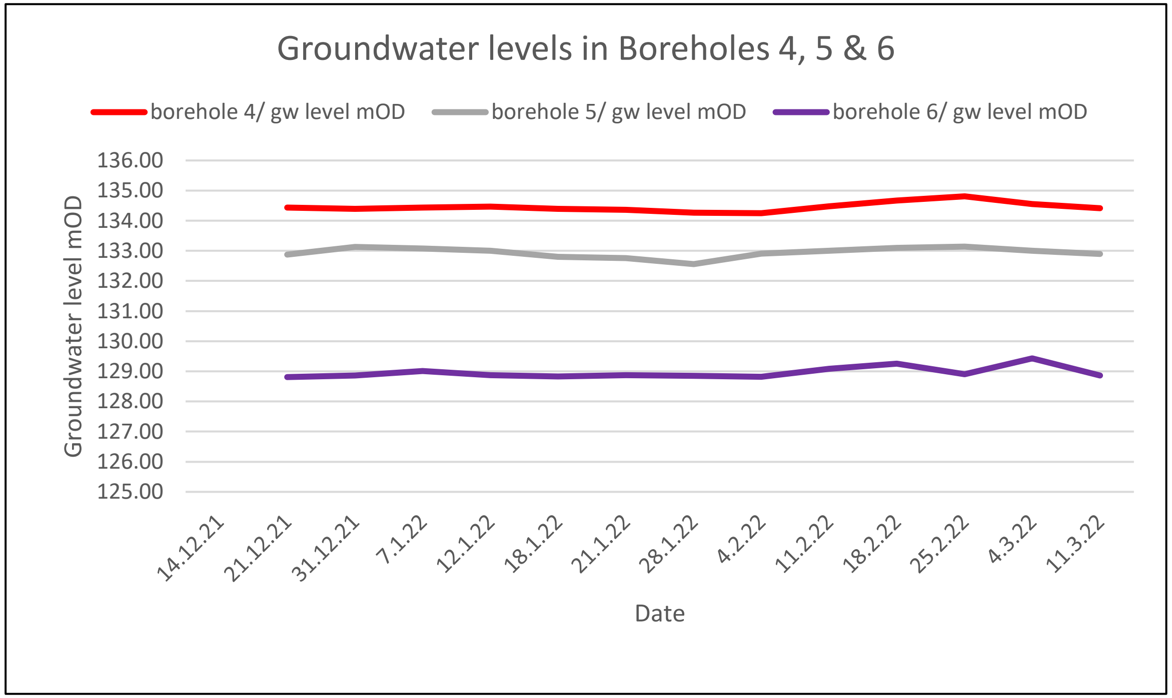
**Borehole Dip Readings**

| Date | | Borehole 1: SW in Quartzite/ mbgl | | Borehole 2: E in Dolerite/ mbgl | | Borehole 3: N in Dolerite/ mbgl |
|---|---|---|---|---|---|---|
| 14.12.21 | | 8.75 | | 4.55 | | 10.85 |
| 21.12.21 | | 8.70 | | 5.10 | | 10.40 |
| 31.12.21 | | 8.90 | | 5.30 | | 9.50 |
| 07.01.22 | | 8.75 | | 4.90 | | 9.30 |
| 12.01.22 | | 8.92 | | 4.53 | | 8.57 |
| 18.01.22 | | 8.94 | | 5.00 | | 14.64 |
| 21.01.22 | | 8.95 | | 5.10 | | 14.20 |
| 28.01.22 | | 8.95 | | 5.35 | | 14.27 |
| 04.02.22 | | 9.01 | | 5.34 | | 14.42 |
| 11.02.22 | | 8.95 | | 4.55 | | 14.15 |
| 18.02.22 | | 8.92 | | 4.45 | | 13.90 |
| 25.02.22 | | 8.90 | | 4.23 | | 13.83 |
| 04.03.22 | | 8.91 | | 4.84 | | 13.85 |
| 11.03.22 | | 8.92 | | 5.05 | | 14.10 |
| | | **150.75** | | **136.06** | | **149.79** |
| **Date** | **ground level/ mOD** | **BH01/ gw level mOD** | **ground level/mOD** | **BH02/ gw level mOD** | **ground level/ mOD** | **BH03/ gw level mOD** |
| 14.12.21 | 150.75 | 142.00 | 136.06 | 131.51 | 149.79 | 138.94 |
| 21.12.21 | 150.75 | 142.05 | 136.06 | 130.96 | 149.79 | 139.39 |
| 31.12.21 | 150.75 | 141.85 | 136.06 | 130.76 | 149.79 | 140.29 |
| 07.01.22 | 150.75 | 142.00 | 136.06 | 131.16 | 149.79 | 140.49 |
| 12.01.22 | 150.75 | 141.83 | 136.06 | 131.53 | 149.79 | 141.22 |
| 18.01.22 | 150.75 | 141.81 | 136.06 | 131.06 | 149.79 | 135.15 |
| 21.01.22 | 150.75 | 141.80 | 136.06 | 130.96 | 149.79 | 135.59 |
| 28.01.22 | 150.75 | 141.80 | 136.06 | 130.71 | 149.79 | 135.52 |
| 04.02.22 | 150.75 | 141.74 | 136.06 | 130.72 | 149.79 | 135.37 |
| 11.02.22 | 150.75 | 141.80 | 136.06 | 131.51 | 149.79 | 135.64 |
| 18.02.22 | 150.75 | 141.83 | 136.06 | 131.61 | 149.79 | 135.89 |
| 25.02.22 | 150.75 | 141.85 | 136.06 | 131.83 | 149.79 | 135.96 |
| 04.03.22 | 150.75 | 141.84 | 136.06 | 131.22 | 149.79 | 135.94 |
| 11.03.22 | 150.75 | 141.83 | 136.06 | 131.01 | 149.79 | 135.69 |
| | | **141.86** | | **131.18** | | **135.64** |




| Date | | Unlined BH 4: NW/ mbgl | | Unlined BH 5:E/ mbgl | | Unlined BH 6:S/ mbgl |
|---|---|---|---|---|---|---|
| 21.12.21 | | 3.75 | | 3.90 | | 2.70 |
| 31.12.21 | | 3.80 | | 3.65 | | 2.65 |
| 07.01.22 | | 3.75 | | 3.70 | | 2.50 |
| 12.01.22 | | 3.72 | | 3.78 | | 2.64 |
| 18.01.22 | | 3.80 | | 3.98 | | 2.68 |
| 21.01.22 | | 3.83 | | 4.02 | | 2.64 |
| 28.01.22 | | 3.92 | | 4.22 | | 2.66 |
| 04.02.22 | | 3.94 | | 3.87 | | 2.69 |
| 11.02.22 | | 3.71 | | 3.78 | | 2.42 |
| 18.02.22 | | 3.52 | | 3.68 | | 2.26 |
| 25.02.22 | | 3.38 | | 3.64 | | 2.60 |
| 04.03.22 | | 3.64 | | 3.78 | | 2.08 |
| 11.03.22 | | 3.78 | | 3.88 | | 2.65 |
| | | **138.19** | | **136.78** | | **131.51** |

| Date | ground level/ mOD | borehole 4/ gw level mOD | ground level/ mOD | borehole 5/ gw level mOD | ground level/ mOD | borehole 6/ gw level mOD |
|---|---|---|---|---|---|---|
| 21.12.21 | 138.19 | 134.44 | 136.78 | 132.88 | 131.51 | 128.81 |
| 31.12.21 | 138.19 | 134.39 | 136.78 | 133.13 | 131.51 | 128.86 |
| 07.01.22 | 138.19 | 134.44 | 136.78 | 133.08 | 131.51 | 129.01 |
| 12.01.22 | 138.19 | 134.47 | 136.78 | 133.00 | 131.51 | 128.87 |
| 18.01.22 | 138.19 | 134.39 | 136.78 | 132.80 | 131.51 | 128.83 |
| 21.01.22 | 138.19 | 134.36 | 136.78 | 132.76 | 131.51 | 128.87 |
| 28.01.22 | 138.19 | 134.27 | 136.78 | 132.56 | 131.51 | 128.85 |
| 04.02.22 | 138.19 | 134.25 | 136.78 | 132.91 | 131.51 | 128.82 |
| 11.02.22 | 138.19 | 134.48 | 136.78 | 133.00 | 131.51 | 129.09 |
| 18.02.22 | 138.19 | 134.67 | 136.78 | 133.10 | 131.51 | 129.25 |
| 25.02.22 | 138.19 | 134.81 | 136.78 | 133.14 | 131.51 | 128.91 |
| 04.03.22 | 138.19 | 134.55 | 136.78 | 133.00 | 131.51 | 129.43 |
| 11.03.22 | 138.19 | 134.41 | 136.78 | 132.90 | 131.51 | 128.86 |
| | | **134.46** | | **132.94** | | |

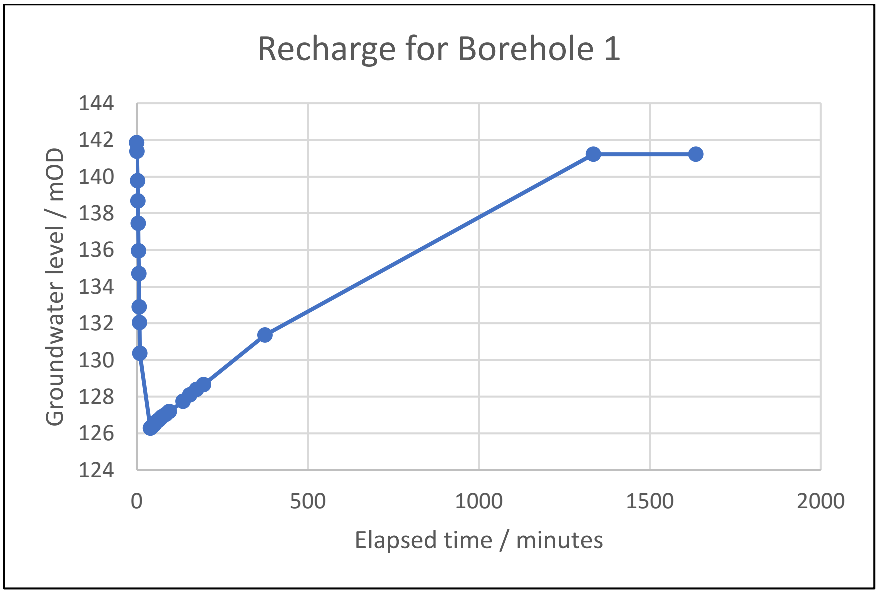


# APPENDIX 8.5: Mini-Pump Test Details

**Mini Pump-Test Summary**

**BH01**

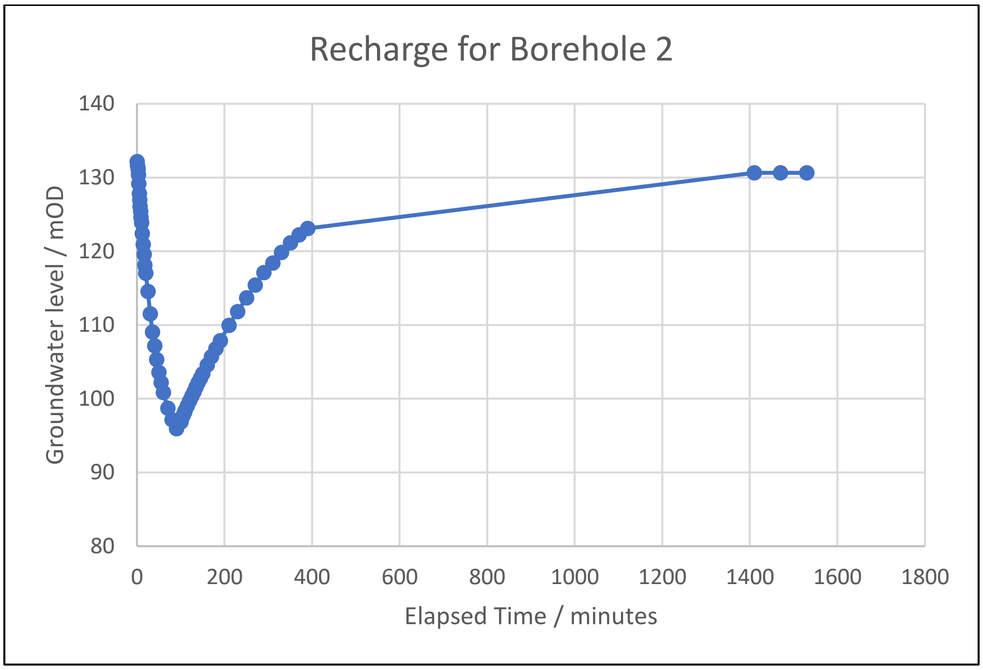
| Elapsed time/ min | Gw level/mbgl | Gw level/ mOD |
|---|---|---|
| 0 | 8.9 | 141.85 |
| 1 | 9.38 | 141.37 |
| 2 | 10.98 | 139.77 |
| 3 | 12.08 | 138.67 |
| 4 | 13.3 | 137.45 |
| 5 | 14.8 | 135.95 |
| 6 | 16.05 | 134.7 |
| 7 | 17.85 | 132.9 |
| 8 | 18.72 | 132.03 |
| 9 | 20.39 | 130.36 |
| 40 | 24.48 | 126.27 |
| 45 | 24.38 | 126.37 |
| 50 | 24.30 | 126.45 |
| 55 | 24.18 | 126.57 |
| 60 | 24.08 | 126.67 |
| 65 | 24.01 | 126.74 |
| 70 | 23.93 | 126.82 |
| 75 | 23.84 | 126.91 |
| 85 | 23.72 | 127.03 |
| 95 | 23.57 | 127.18 |
| 135 | 23.00 | 127.75 |
| 155 | 22.65 | 128.1 |
| 175 | 22.36 | 128.39 |
| 195 | 22.10 | 128.65 |
| 375 | 19.40 | 131.35 |
| 1335 | 9.53 | 141.22 |
| 1635 | 9.53 | 141.22 |



**BH02**

| Elapsed time/ min | Gw level/mbgl | Gw level/ mOD |
|---|---|---|
| 0 | 3.9 | 132.16 |
| 1 | 4.43 | 131.63 |
| 2 | 4.89 | 131.17 |
| 3 | 5.7 | 130.36 |
| 4 | 6.9 | 129.16 |
| 5 | 8.25 | 127.81 |
| 6 | 9.1 | 126.96 |
| 7 | 9.97 | 126.09 |
| 8 | 10.66 | 125.4 |
| 9 | 11.45 | 124.61 |
| 10 | 12.18 | 123.88 |
| 12 | 13.68 | 122.38 |
| 14 | 15.14 | 120.92 |
| 16 | 16.5 | 119.56 |
| 18 | 17.94 | 118.12 |
| 20 | 19.04 | 117.02 |
| 25 | 21.53 | 114.53 |
| 30 | 24.55 | 111.51 |
| 35 | 27.01 | 109.05 |
| 40 | 28.87 | 107.19 |
| 45 | 30.76 | 105.3 |
| 50 | 32.48 | 103.58 |
| 55 | 33.89 | 102.17 |
| 60 | 35.22 | 100.84 |
| 70 | 37.34 | 98.72 |
| 80 | 38.89 | 97.17 |
| 90 | 40.1 | 95.96 |
| 100 | 39.21 | 96.85 |
| 102 | 38.68 | 97.38 |
| 104 | 38.48 | 97.58 |
| 106 | 38.19 | 97.87 |
| 108 | 37.92 | 98.14 |
| 110 | 37.65 | 98.41 |
| 115 | 37.00 | 99.06 |
| 120 | 36.35 | 99.71 |
| 125 | 35.70 | 100.36 |
| 130 | 35.08 | 100.98 |
| 135 | 34.46 | 101.6 |
| 140 | 33.85 | 102.21 |
| 145 | 33.27 | 102.79 |
| 150 | 32.66 | 103.4 |
| 160 | 31.50 | 104.56 |
| 170 | 30.37 | 105.69 |
| 180 | 29.26 | 106.8 |
| 190 | 28.19 | 107.87 |
| 210 | 26.13 | 109.93 |
| 230 | 24.23 | 111.83 |
| 250 | 22.40 | 113.66 |

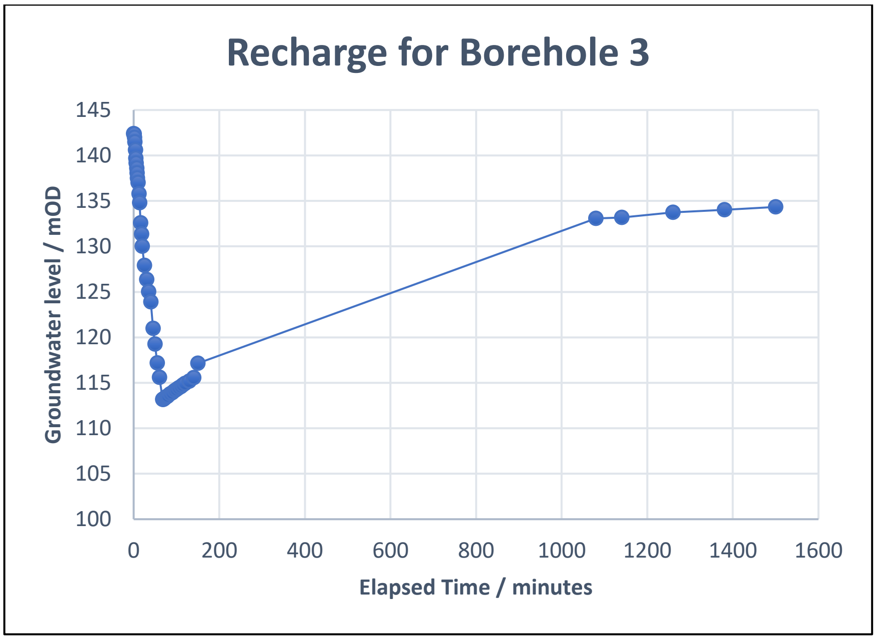
| | | |
|---|---|---|
| 270 | 20.66 | 115.4 |
| 290 | 18.95 | 117.11 |
| 310 | 17.63 | 118.43 |
| 330 | 16.24 | 119.82 |
| 350 | 14.92 | 121.14 |
| 370 | 13.84 | 122.22 |
| 390 | 12.96 | 123.1 |
| 1410 | 5.44 | 130.62 |
| 1470 | 5.43 | 130.63 |
| 1530 | 5.43 | 130.63 |




**BH03**

| Elapsed time/ min | Gw level/mbgl | Gw level/ mOD |
|---|---|---|
| 0 | 7.38 | 142.41 |
| 1 | 7.43 | 142.36 |
| 2 | 7.8 | 141.99 |
| 3 | 8.3 | 141.49 |
| 4 | 9.2 | 140.59 |
| 5 | 10.12 | 139.67 |
| 6 | 10.64 | 139.15 |
| 7 | 11.18 | 138.61 |
| 8 | 11.73 | 138.06 |
| 9 | 12.3 | 137.49 |
| 10 | 12.78 | 137.01 |
| 12 | 14 | 135.79 |
| 14 | 15 | 134.79 |
| 16 | 17.2 | 132.59 |
| 18 | 18.45 | 131.34 |
| 20 | 19.76 | 130.03 |
| 25 | 21.9 | 127.89 |
| 30 | 23.43 | 126.36 |

| | | |
|---|---|---|
| 35 | 24.76 | 125.03 |
| 40 | 25.88 | 123.91 |
| 45 | 28.8 | 120.99 |
| 50 | 30.54 | 119.25 |
| 55 | 32.6 | 117.19 |
| 60 | 34.2 | 115.59 |
| 68 | 36.62 | 113.17 |
| 68.5 | 36.62 | 113.17 |
| 69 | 36.62 | 113.17 |
| 69.5 | 36.58 | 113.21 |
| 70 | 36.57 | 113.22 |
| 72 | 36.50 | 113.29 |
| 74 | 36.42 | 113.37 |
| 76 | 36.35 | 113.44 |
| 78 | 36.29 | 113.5 |
| 80 | 36.22 | 113.57 |
| 85 | 36.04 | 113.75 |
| 90 | 35.87 | 113.92 |
| 95 | 35.68 | 114.11 |
| 100 | 35.52 | 114.27 |
| 105 | 35.36 | 114.43 |
| 110 | 35.20 | 114.59 |
| 115 | 35.04 | 114.75 |
| 120 | 34.87 | 114.92 |
| 130 | 34.61 | 115.18 |
| 140 | 34.22 | 115.57 |
| 150 | 32.63 | 117.16 |
| 1080 | 16.73 | 133.06 |
| 1140 | 16.62 | 133.17 |
| 1260 | 16.03 | 133.76 |
| 1380 | 15.78 | 134.01 |
| 1500 | 15.46 | 134.33 |



# APPENDIX 8.6: Aquifer Characteristics Calculations

**Transmissivity**

The recovery recharge of the aquifers following the mini-pump tests were used to calculate transmissivity. Caution is advised due to the short duration of the mini-pump tests and the number of assumptions that had to be made.

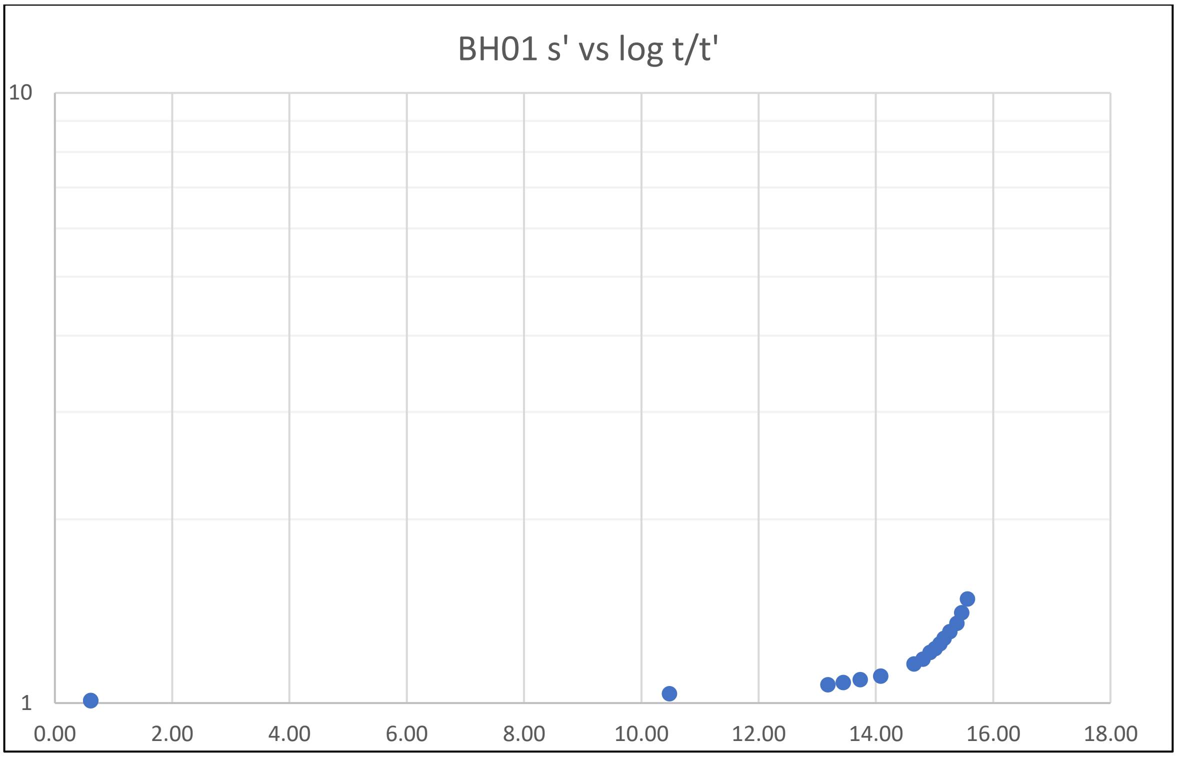
Calculations are based on Theis's recovery method: s'= [(2.30 X Q)/(4π x KD)] x log(t/t') where:

s' = residual drawdown/m
t = time in days since start of pumping
t' = time in days since cessation of pumping
Q = average rate of discharge $m^3/d$
KD = transmissivity of aquifer in $m^2/d$

The aquifers are assumed to be unconfined and the slope of the plot of t/t' on semi-log paper for was used to estimate KD.

**BHO1**

| t | t/days | t' | t'/days | s' | log (t/t') | t/t' |
|---|---|---|---|---|---|---|
| 0 | 0 | | | | | |
| 1 | 0.000694 | | | | | |
| 2 | 0.001389 | | | | | |
| 3 | 0.002083 | | | | | |
| 4 | 0.002778 | | | | | |
| 5 | 0.003472 | | | | | |
| 6 | 0.004167 | | | | | |
| 7 | 0.004861 | | | | | |
| 8 | 0.005556 | | | | | |
| 9 | 0.00625 | | | | | |
| 40 | 0.027778 | 27 | 0.01875 | 15.56 | 0.170696 | 1.481481 |
| 45 | 0.03125 | 32 | 0.022222 | 15.46 | 0.148063 | 1.40625 |
| 50 | 0.034722 | 37 | 0.025694 | 15.38 | 0.130768 | 1.351351 |
| 55 | 0.038194 | 42 | 0.029167 | 15.26 | 0.117113 | 1.309524 |
| 60 | 0.041667 | 47 | 0.032639 | 15.16 | 0.106053 | 1.276596 |
| 65 | 0.045139 | 52 | 0.036111 | 15.09 | 0.09691 | 1.25 |
| 70 | 0.048611 | 57 | 0.039583 | 15.01 | 0.089223 | 1.22807 |
| 75 | 0.052083 | 62 | 0.043056 | 14.92 | 0.08267 | 1.209677 |
| 85 | 0.059028 | 72 | 0.05 | 14.80 | 0.072086 | 1.180556 |
| 95 | 0.065972 | 82 | 0.056944 | 14.65 | 0.06391 | 1.158537 |
| 135 | 0.09375 | 122 | 0.084722 | 14.08 | 0.043974 | 1.106557 |
| 155 | 0.107639 | 142 | 0.098611 | 13.73 | 0.038043 | 1.091549 |
| 175 | 0.121528 | 162 | 0.1125 | 13.44 | 0.033523 | 1.080247 |
| 195 | 0.135417 | 182 | 0.126389 | 13.18 | 0.029963 | 1.071429 |
| 375 | 0.260417 | 362 | 0.251389 | 10.48 | 0.015323 | 1.035912 |
| 1335 | 0.927083 | 1322 | 0.918056 | 0.61 | 0.00425 | 1.009834 |
| 1635 | 1.135417 | 1622 | 1.126389 | 0.61 | 0.003467 | 1.008015 |

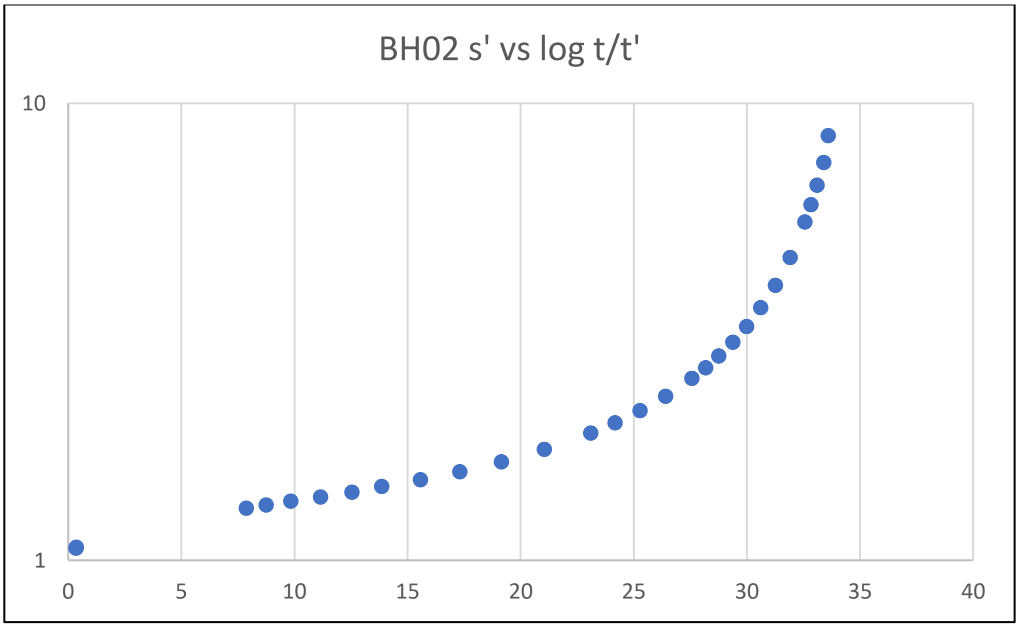



**For BH01 KD is estimated at 19.9 m²/d**

**BH02**

| t | t/days | t' | t'/days | s' | log (t/t') | t/t' |
|---|---|---|---|---|---|---|
| 0 | 0 | | | | | |
| 1 | 0.000694 | | | | | |
| 2 | 0.001389 | | | | | |
| 3 | 0.002083 | | | | | |
| 4 | 0.002778 | | | | | |
| 5 | 0.003472 | | | | | |
| 6 | 0.004167 | | | | | |
| 7 | 0.004861 | | | | | |
| 8 | 0.005556 | | | | | |
| 9 | 0.00625 | | | | | |
| 10 | 0.006944 | | | | | |
| 12 | 0.008333 | | | | | |
| 14 | 0.009722 | | | | | |
| 16 | 0.011111 | | | | | |
| 18 | 0.0125 | | | | | |
| 20 | 0.013889 | | | | | |
| 25 | 0.017361 | | | | | |
| 30 | 0.020833 | | | | | |
| 35 | 0.024306 | | | | | |
| 40 | 0.027778 | | | | | |
| 45 | 0.03125 | | | | | |
| 50 | 0.034722 | | | | | |
| 55 | 0.038194 | | | | | |
| 60 | 0.041667 | | | | | |
| 70 | 0.048611 | | | | | |
| 80 | 0.055556 | | | | | |
| 90 | 0.0625 | 0 | 0 | 35.01 | | |

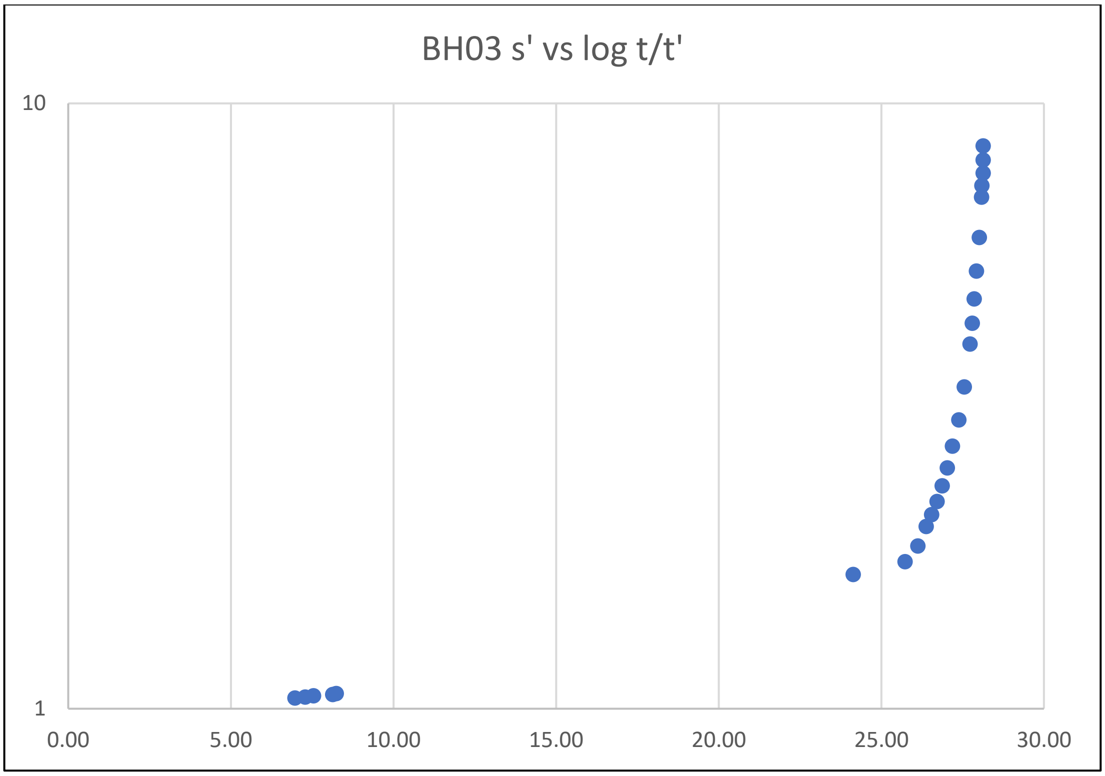
| t | t/days | t' | t'/days | s' | log (t/t') | t/t' |
|---|---|---|---|---|---|---|
| 100 | 0.069444 | 10 | 0.006944 | 34.12 | 1 | |
| 102 | 0.070833 | 12 | 0.008333 | 33.59 | 0.929419 | 8.5 |
| 104 | 0.072222 | 14 | 0.009722 | 33.39 | 0.870905 | 7.428571 |
| 106 | 0.073611 | 16 | 0.011111 | 33.1 | 0.821186 | 6.625 |
| 108 | 0.075 | 18 | 0.0125 | 32.83 | 0.778151 | 6 |
| 110 | 0.076389 | 20 | 0.013889 | 32.56 | 0.740363 | 5.5 |
| 115 | 0.079861 | 25 | 0.017361 | 31.91 | 0.662758 | 4.6 |
| 120 | 0.083333 | 30 | 0.020833 | 31.26 | 0.60206 | 4 |
| 125 | 0.086806 | 35 | 0.024306 | 30.61 | 0.552842 | 3.571429 |
| 130 | 0.090278 | 40 | 0.027778 | 29.99 | 0.511883 | 3.25 |
| 135 | 0.09375 | 45 | 0.03125 | 29.37 | 0.477121 | 3 |
| 140 | 0.097222 | 50 | 0.034722 | 28.76 | 0.447158 | 2.8 |
| 145 | 0.100694 | 55 | 0.038194 | 28.18 | 0.421005 | 2.636364 |
| 150 | 0.104167 | 60 | 0.041667 | 27.57 | 0.39794 | 2.5 |
| 160 | 0.111111 | 70 | 0.048611 | 26.41 | 0.359022 | 2.285714 |
| 170 | 0.118056 | 80 | 0.055556 | 25.28 | 0.327359 | 2.125 |
| 180 | 0.125 | 90 | 0.0625 | 24.17 | 0.30103 | 2 |
| 190 | 0.131944 | 100 | 0.069444 | 23.1 | 0.278754 | 1.9 |
| 210 | 0.145833 | 120 | 0.083333 | 21.04 | 0.243038 | 1.75 |
| 230 | 0.159722 | 140 | 0.097222 | 19.14 | 0.2156 | 1.642857 |
| 250 | 0.173611 | 160 | 0.111111 | 17.31 | 0.19382 | 1.5625 |
| 270 | 0.1875 | 180 | 0.125 | 15.57 | 0.176091 | 1.5 |
| 290 | 0.201389 | 200 | 0.138889 | 13.86 | 0.161368 | 1.45 |
| 310 | 0.215278 | 220 | 0.152778 | 12.54 | 0.148939 | 1.409091 |
| 330 | 0.229167 | 240 | 0.166667 | 11.15 | 0.138303 | 1.375 |
| 350 | 0.243056 | 260 | 0.180556 | 9.83 | 0.129095 | 1.346154 |
| 370 | 0.256944 | 280 | 0.194444 | 8.75 | 0.121044 | 1.321429 |
| 390 | 0.270833 | 300 | 0.208333 | 7.87 | 0.113943 | 1.3 |
| 1410 | 0.979167 | 1320 | 0.916667 | 0.35 | 0.028645 | 1.068182 |
| 1470 | 1.020833 | 1380 | 0.958333 | 0.34 | 0.027438 | 1.065217 |
| 1530 | 1.0625 | 1440 | 1 | 0.34 | 0.026329 | 1.0625 |




**For BH02 KD is estimated at 5.5 m²/d**

**BH03**

| t | t/days | t' | t'/days | s' | log (t/t') | t/t' |
|---|---|---|---|---|---|---|
| 0 | 0 | | | | | |
| 1 | 0.000694 | | | | | |
| 2 | 0.001389 | | | | | |
| 3 | 0.002083 | | | | | |
| 4 | 0.002778 | | | | | |
| 5 | 0.003472 | | | | | |
| 6 | 0.004167 | | | | | |
| 7 | 0.004861 | | | | | |
| 8 | 0.005556 | | | | | |
| 9 | 0.00625 | | | | | |
| 10 | 0.006944 | | | | | |
| 12 | 0.008333 | | | | | |
| 14 | 0.009722 | | | | | |
| 16 | 0.011111 | | | | | |
| 18 | 0.0125 | | | | | |
| 20 | 0.013889 | | | | | |
| 25 | 0.017361 | | | | | |
| 30 | 0.020833 | | | | | |
| 35 | 0.024306 | | | | | |
| 40 | 0.027778 | | | | | |
| 45 | 0.03125 | | | | | |
| 50 | 0.034722 | | | | | |
| 55 | 0.038194 | | | | | |
| 60 | 0.041667 | 0 | 0 | 28.26 | | |
| 68 | 0.047222 | 8 | 0.005556 | 28.13 | 0.929419 | 8.5 |
| 68.5 | 0.047569 | 8.5 | 0.005903 | 28.13 | 0.906272 | 8.058824 |
| 69 | 0.047917 | 9 | 0.00625 | 28.13 | 0.884607 | 7.666667 |
| 69.5 | 0.048264 | 9.5 | 0.006597 | 28.09 | 0.864261 | 7.315789 |
| 70 | 0.048611 | 10 | 0.006944 | 28.08 | 0.845098 | 7 |
| 72 | 0.05 | 12 | 0.008333 | 28.01 | 0.778151 | 6 |
| 74 | 0.051389 | 14 | 0.009722 | 27.93 | 0.723104 | 5.285714 |
| 76 | 0.052778 | 16 | 0.011111 | 27.86 | 0.676694 | 4.75 |
| 78 | 0.054167 | 18 | 0.0125 | 27.80 | 0.636822 | 4.333333 |
| 80 | 0.055556 | 20 | 0.013889 | 27.73 | 0.60206 | 4 |
| 85 | 0.059028 | 25 | 0.017361 | 27.55 | 0.531479 | 3.4 |
| 90 | 0.0625 | 30 | 0.020833 | 27.38 | 0.477121 | 3 |
| 95 | 0.065972 | 35 | 0.024306 | 27.19 | 0.433656 | 2.714286 |
| 100 | 0.069444 | 40 | 0.027778 | 27.03 | 0.39794 | 2.5 |
| 105 | 0.072917 | 45 | 0.03125 | 26.87 | 0.367977 | 2.333333 |
| 110 | 0.076389 | 50 | 0.034722 | 26.71 | 0.342423 | 2.2 |
| 115 | 0.079861 | 55 | 0.038194 | 26.55 | 0.320335 | 2.090909 |
| 120 | 0.083333 | 60 | 0.041667 | 26.38 | 0.30103 | 2 |
| 130 | 0.090278 | 70 | 0.048611 | 26.12 | 0.268845 | 1.857143 |
| 140 | 0.097222 | 80 | 0.055556 | 25.73 | 0.243038 | 1.75 |
| 150 | 0.104167 | 90 | 0.0625 | 24.14 | 0.221849 | 1.666667 |
| 1080 | 0.75 | 1020 | 0.708333 | 8.24 | 0.024824 | 1.058824 |
| 1140 | 0.791667 | 1080 | 0.75 | 8.13 | 0.023481 | 1.055556 |
| 1260 | 0.875 | 1200 | 0.833333 | 7.54 | 0.021189 | 1.05 |
| 1380 | 0.958333 | 1320 | 0.916667 | 7.29 | 0.019305 | 1.045455 |
| 1500 | 1.041667 | 1440 | 1 | 6.97 | 0.017729 | 1.041667 |




**For BH03 KD is estimated at 2.3 m$^2$/d**

# APPENDIX 8.7: Ecological Assessment

# 1 INTRODUCTION

Greentrack undertook an initial biological survey on the tributary of the Swilly Burn extending from the application site at the two points as shown in Figure 1.1 in October 2021. A follow up survey was undertaken on 14th April 2022. These surveys will establish baseline biological water quality for this site which can be used to assess against future water quality targets. Future values should not deteriorate as a result of works associated with the project. According to the Water Framework Directive (2000/60/EEC) target 'good status' i.e. Q4 is required in all Irish Rivers.

**Figure 1.1: Sample locations**


Sample point 1 is located north of the extraction area on the boundary the quarry. Dark, muddy water was noted during both surveys. Signs of acidification from the forestry to the North of the site was also noted during both visits. Sample point 2 is located downstream in receiving waters south of the subject site under the bridge at the Oakfield Park boundary. The water in the receiving burn was a greyish colour and had a slight odour. There was areas of fine sediment and gravel on the riverbed. Larger rocks along the riverbed had significant algal growth.

## 1.1 Background

The subject site is located within the Northwestern River Basin District, hydrometric area 01 – Foyle (BGNIIENW) and Johnston Stream sub catchment area (JohnstonStream_SC_010), and Swilly Burn River Sub Basin (Swilly Burn_020).

## 1.2 Statement of Authority

This report has been compiled by Shannen McEwen, Ecologist with Greentrack. Shannen holds a B.Sc. (Hons) Environmental Science with a Diploma in Professional Practice from the University of Ulster. She has been involved in all aspects of Environmental Impact Assessment, Appropriate Assessment and Ecological Impact Assessment since 2017. Shannen is an Associate Member of the Institution of Environmental Sciences.

# 2 METHODOLOGY

The biological survey was undertaken using the benthic macroinvertebrates as bioindicators as they provide a realistic record of the prevailing water quality conditions. Macroinvertebrates are the most widely utilised organisms for biological assessment within freshwater systems as they are found in virtually all freshwater systems, they do not migrate far and due to a relatively long life-cycle they respond to changes in water quality such as inputs of organic pollution, as well as changes in the physical habitat. Research has shown that macroinvertebrate diversity declines in the presence of pollution and that sensitive species are progressively replaced by more tolerant forms as pollution increases.

A 3-minute kick sampling and 1- minute hand search sampling of macroinvertebrates was carried out at point 1 (upstream of quarry site) and point 2 (downstream of quarry site) using a standard hand net (250 mm width, mesh size 500 micron) whilst adhering to ISO 10870:2012 standard procedures. The kick sample was taken moving across the river channel to ensure a full representation of the species composition from the site. Collected samples were preserved in 70% ethanol and were sorted in an illuminated tray with all macroinvertebrates identified to the appropriate taxonomic resolution using FBA taxonomic keys.

The macroinvertebrate data was used to derive a Q value using the EPA methodology (McGarrigle *et al.*, 2002). In Ireland, the 'Q Value' procedure has been used to monitor the ecological quality of streams and rivers since 1971. The Q-value system is a five point scale based on the proportions of five groups of macroinvertebrates with different pollution tolerances. Q1 indicates severely polluted waters and Q5 indicates pristine conditions as indicated in figure 2.1.

**Figure 2.1: Q values and water quality**

| Q Value | WFD Status | Pollution Status | Condition* | EPA Quality Class |
|---|---|---|---|---|
| Q5, Q4-5 | High | Unpolluted | Satisfactory | Class A |
| Q4 | Good | Unpolluted | Satisfactory | Class A |
| Q3-4 | Moderate | Slightly polluted | Unsatisfactory | Class B |
| Q3, Q2-3 | Poor | Moderately polluted | Unsatisfactory | Class C |
| Q2, Q1-2, Q1 | Bad | Seriously polluted | Unsatisfactory | Class D |

*'Condition' refers to the likelihood of interference with beneficial or potential beneficial use.

# 3 RESULTS

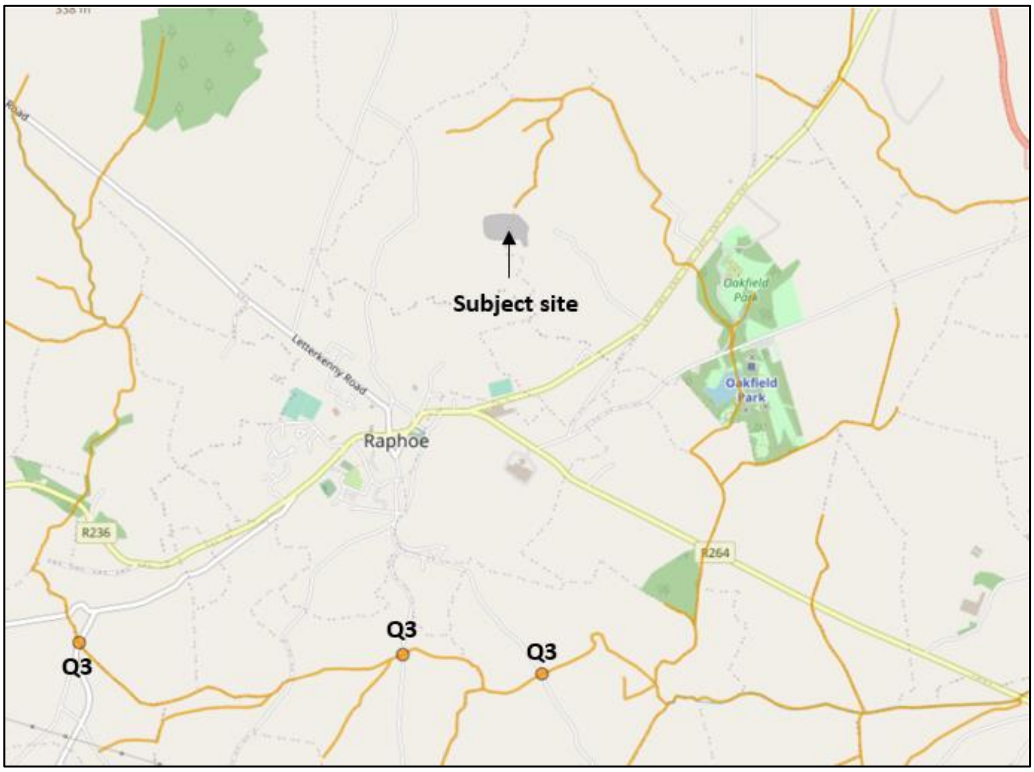
## 3.1 Existing Water Quality Records

The overall ecological status of the Swilly Burn is classified by the EPA as having 'Poor' ecological status. There are no EPA monitoring points on the tributary of the Swilly Burn directly linked to the application site. There are 5 EPA monitoring points along the main reach of the Swilly Burn. The Swilly Burn was last surveyed in June 2019 by the EPA with their assessment concluding as follows:

"*The Swilly Burn remains in poor condition throughout its reaches in 2019. Pollution tolerant taxa were found at all sites and excessive simuliidae at station 0150* (1.91km SW of the subject site) *suggested additional impacts above the STW. Extensive growth of Vauchera and Cladophora were found at the lower site indicating nutrient enrichment*"

The latest Q values for all of these monitoring stations indicate a value of 3, poor ecological status. The latest Q value results are shown in Figure 3.1.

**Figure 3.1: Latest Q values for the Swilly Burn**




## 3.2 Current Water Quality

Biological water quality data as prescribed by the Environmental Protection Agency (EPA; Toner et al. 2005), groups invertebrates into classes according to pollution sensitivity. For the purposes of the EPA 'Q Value' assessment procedure, benthic macro invertebrates have been divided into five 'Indicator Groups' as follows (see appendix I):

- Group A, species most sensitive to pollution
- Group B, species less sensitive
- Group C, species more tolerant to pollution
- Group D, species very tolerant, and;
- Group E, the most tolerant species

The presence or absence of these groups and their relative abundances facilitates an assessment of biological river health.

## 3.3 Taxa Recorded

No taxa were recorded during either assessment at point 1. The condition of the stream during each assessment was very poor with signs of acidification from the forestry to the North of the site giving site 1 a Q value of 1 (Bad ecological status)[15].

Class C, D & E invertebrates dominated both samples taken at point 2 with no EPA class A or B clean water invertebrates present in the either sample collected. Both samples collected from point 2 contained class C (moderately pollution tolerant) invertebrate species crustacean *Gammarus duebeni* and were dominated by *(*class D) (pollution tolerant) crustacean *Asellus aquaticus* and class E (very tolerant) *Tubificid* sp. worms and *Chironomus riparius*. The dominance in the samples of pollution tolerant invertebrates accounted for a Q rating of 2-3 (i.e. poor status), in line with the EPA score of 2-3.

[15] EPA RIVER QUALITY SURVEYS: BIOLOGICAL - https://epawebapp.epa.ie/qvalue/webusers/

# APPENDIX 8.8: Constructed Wetland Design Specification

Alvin Morrow
Reed Bed and Wetland
wastewater treatment systems
design, supply, installation and maintenance
Est.2003

***Reed bed and Wetland design for a proposed Quarry at Raphoe, Co. Donegal for Bonars Quarries***

Alvin Morrow B.Sc. (Env). Reed bed and Constructed Wetland tel: 087 9440370
Design, Installation and Maintenance

*21/03/2022*

## *WETLAND DESIGN FOR A QUARRY AT RAPHOE, CO. DONEGAL FOR BONARS QUARRY*

*To whom it may concern,*

*The following is a design proposal for a free water surface (FWS) flow horizontal wetland system. It is proposed that the system will be designed to provide a final polish of pre treated waters which are collected from a quarry floor.*

*The total site is 7.95 ha of which approximately 5.3 ha will be utilised for extraction/processing and drained towards the treatment system. A sump on the quarry floor will send the wastewater to 3-4 suitably sized settlement tanks, followed by a wetland. A hydrocarbon interceptor will then follow prior to discharge off site to an agricultural drain which eventually forms part of the Swilly Burn river system.*

*The total settlement capacity of the tanks is 2792m3. It is expected that the tanks will reduce the suspended solids (SS) down to below 25mg/l under all weather conditions. A discharge licence will be required and a limit for SS has been assumed at 15-20mg/l.*

*Suspended Solids that are not removed in pre treatment are effectively removed by filtration and settlement (Cooper et al., 1996; Vymazal et al., 1998b). Most of the suspended solids are filtered out and settled within the first few meters beyond the inlet zone. Using reed bed/wetland design principles, (kickuth equation) and using a k value of 1000m/year for SS surface flow design as suggested by kadlec (kSS 2.74) the following calculations have been conducted.*

*When assuming average daily flows of 200,000 litres/day a wetland sized at 38m2 would be sufficient, when reducing SS to <15mg/litre. Similarly if reducing to <5mg/litre an area of 117m2 would be required.*

*However, assuming a 1 in 100, 6 hr storm flow figure of 2750,000 litres per day and using the same reed bed/wetland design principles, a minimum 513m2 is required to reduce SS to <15mg/litre, while an area of 1616m2 is required to bring SS down to <5mg/litre.*

*It has therefore been suggested that for suitable long term management the 1616m2 design be followed.*

*The wetland system would act on gravity as site topography allows following pumping from the settlement tanks prior to entry into the wetland. The wetland shall be lined using an impervious geotextile clay liner as protection to groundwater etc. 1m of soil shall be laid on the liner as rooting material and protection to the liner to prevent damage. The plants (phragmites australis) root network within the wetland, will oxygenate the rooting/protection layer to a depth of ~0.5m below the wetland base. This would provide further aerobic and anaerobic treatment conditions for the discharged effluent. It is expected to use either one cell 23m x 70.3 or alternatively 2 cells, each (16 x 50.5).*

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Design, Installation and Maintenance

Alvin Morrow
Reed Bed and Wetland
wastewater treatment systems
design, supply, installation and maintenance
Est.2003

## *WETLAND DESIGN FOR A QUARRY AT RAPHOE, CO. DONEGAL FOR BONARS QUARRY*

- *Depending on best landscape fit, the wetland will be sized at one cell 23m x 70.3 or 2 x (16m x 50.5m) beds/cells, plus additional allowance for embankments etc., meaning a total constructed wetland design of ~ 27m x 75m or (20m x 105m). (Drawings will follow in due course following further assessments of the site)*
- *The wetland will be designed to have, as near to a 3:1 length to width ratio, as possible when treating effluent for discharge to surface water.*

***RETENTION TIMES:***

*Assuming the average flow of 200m3/day and considering the capacity of the wetland area is 1616m2 with a depth between 0.15m and 0.2m (242.4m3/day and 323.2m3/day respectively) a retention time of 1day 10hrs - 1 day 14 hrs could be expected. Therefore it can be assumed that the wetland could easily cope with the flows envisaged in a 24 hr period.*

*(N.B. REED BED SURFACE FLOW CONSTRUCTED WETLAND PRINCIPLE:*

*A short retention time of 16-24 hrs is sufficient to achieve high performance secondary and tertiary treatment standards i.e. <5/5 BOD5/SS).*

***Wetland design rationale and Construction methods***

*These shall be developed followed further site assessment and included in subsequent submissions.*

***Supervision of installation:***

*The full construction process is to be supervised to ensure the correct processes are followed. It is envisaged the wetland will reach full maturity within 1-2 years, whereby full efficiency will be achieved. The wetland only will be subject to a-three year maintenance and guarantee contract from the date of completion of installation. After 3 years elapses this can be extended if requested.*

***Maintenance for the efficient function of the reed bed and wetland.***

*These shall be included in subsequent submissions.*

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Design, Installation and Maintenance

# APPENDIX 8.9: Settlement Test

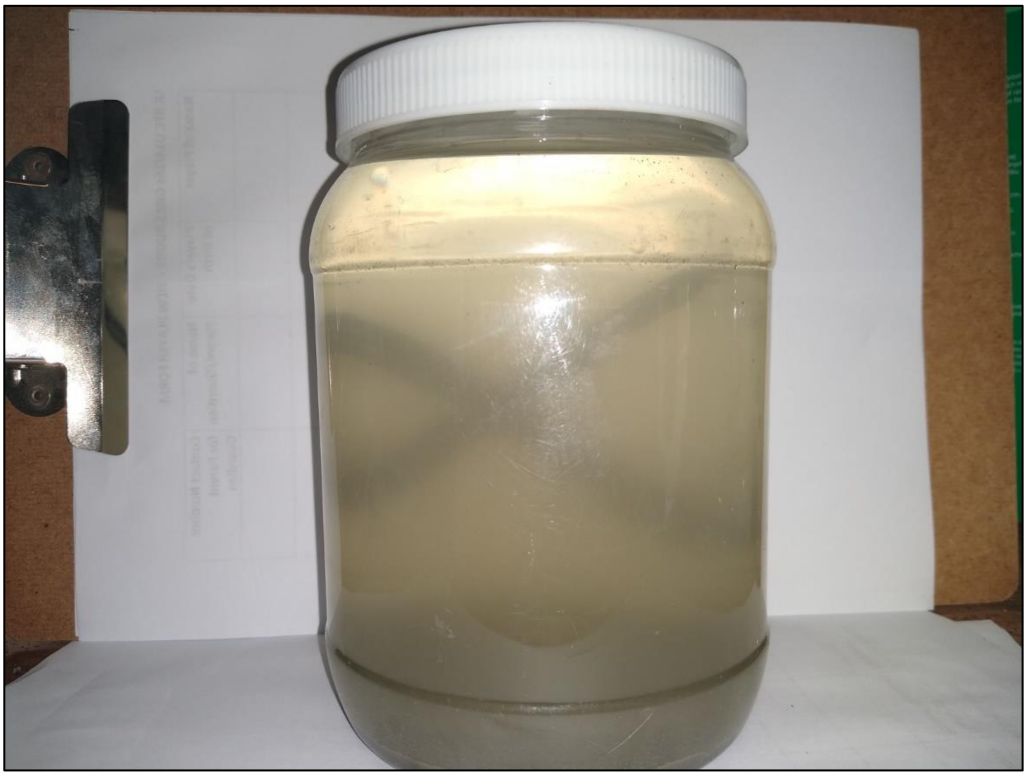
**Settlement Assessment**

A sample of mud and fines was taken from the quarry void and mixed with water in a clear plastic jar. A large black cross was marked on the back of the jar to help identify when the effluent had started to clear. The sample was agitated by shaking for one minute and then left undisturbed on a white surface with a white background behind.

A photograph was taken immediately and is shown below as Photograph 1. Photographs were taken at various times over the course of the next eight hours to show the settlement progress of the effluent samples.

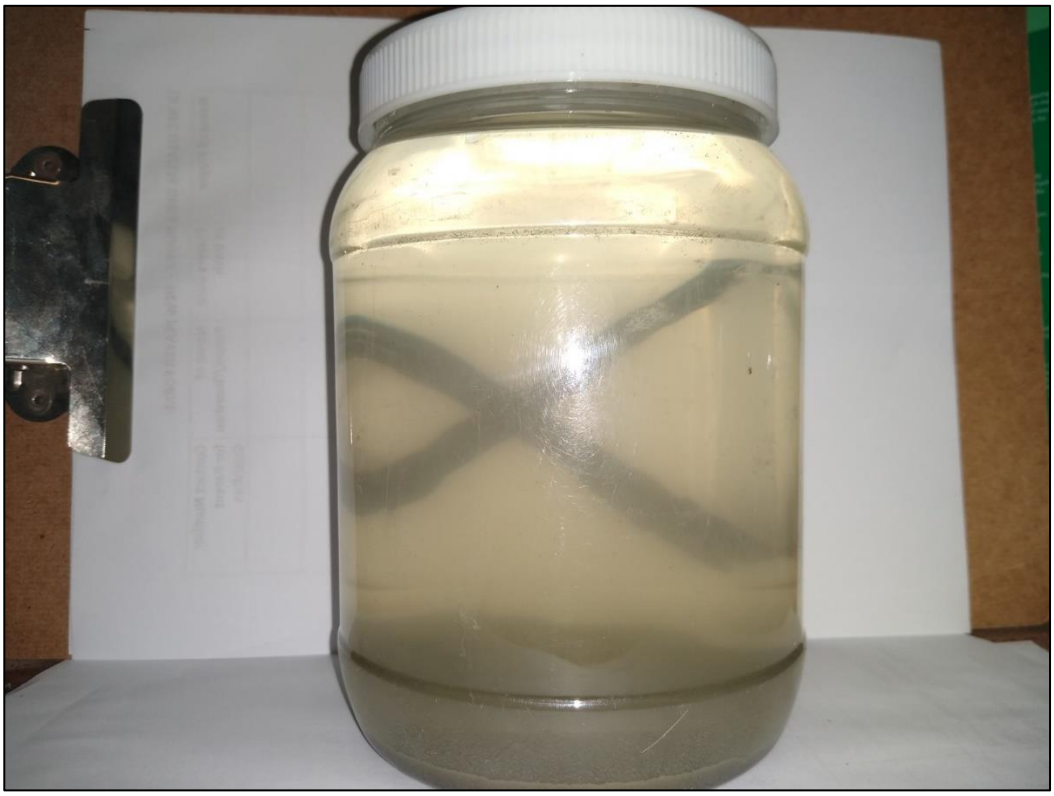
**Photograph 1: Recently agitated effluent**

**Photograph 2: Effluent after 1 hour settlement time**

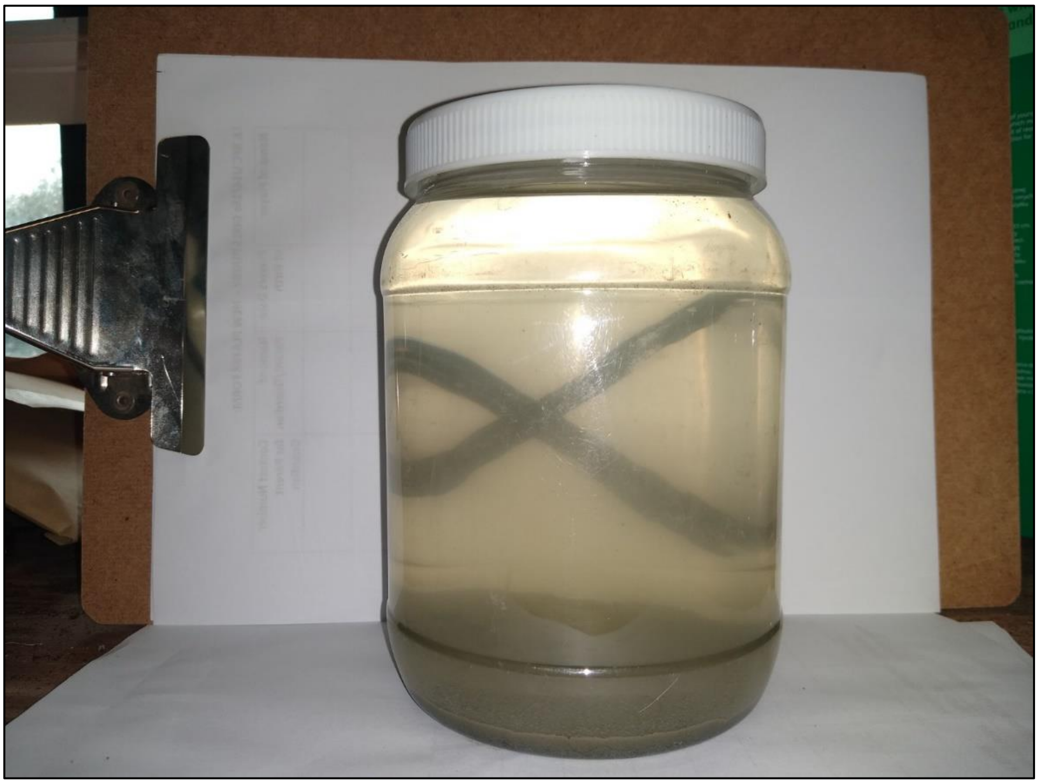


**Photograph 3: Effluent after 2 hours settlement time**

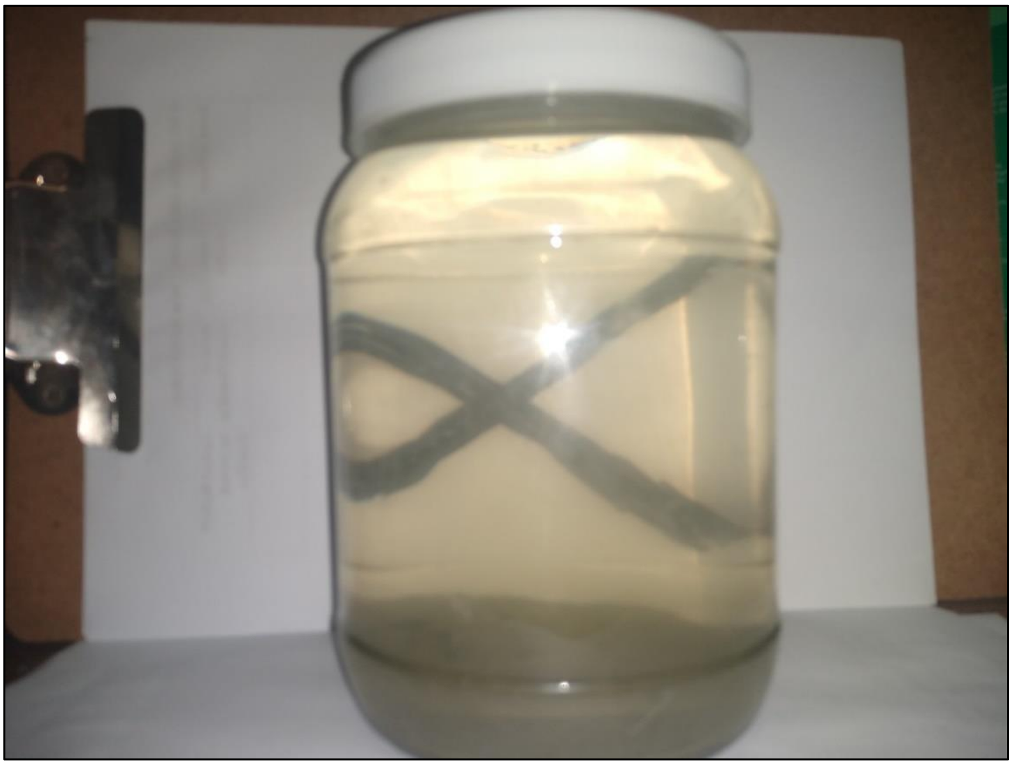
**Photograph 4: Effluent after 3 hours settlement time**



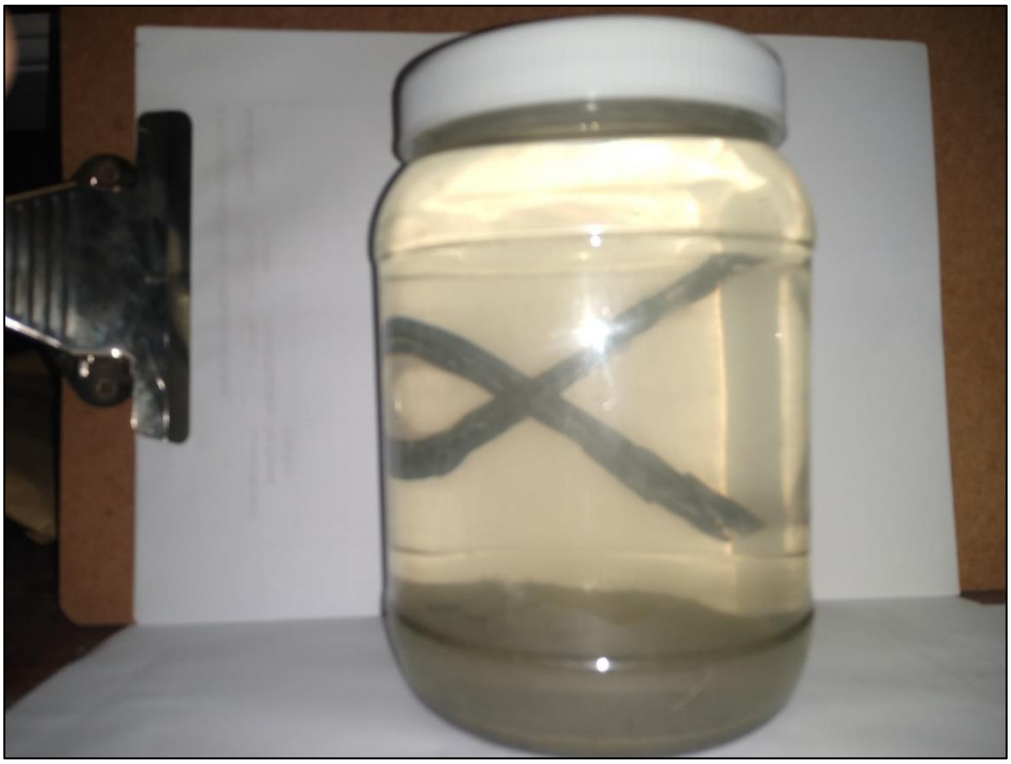
**Photograph 5: Effluent after 4 hours settlement time**



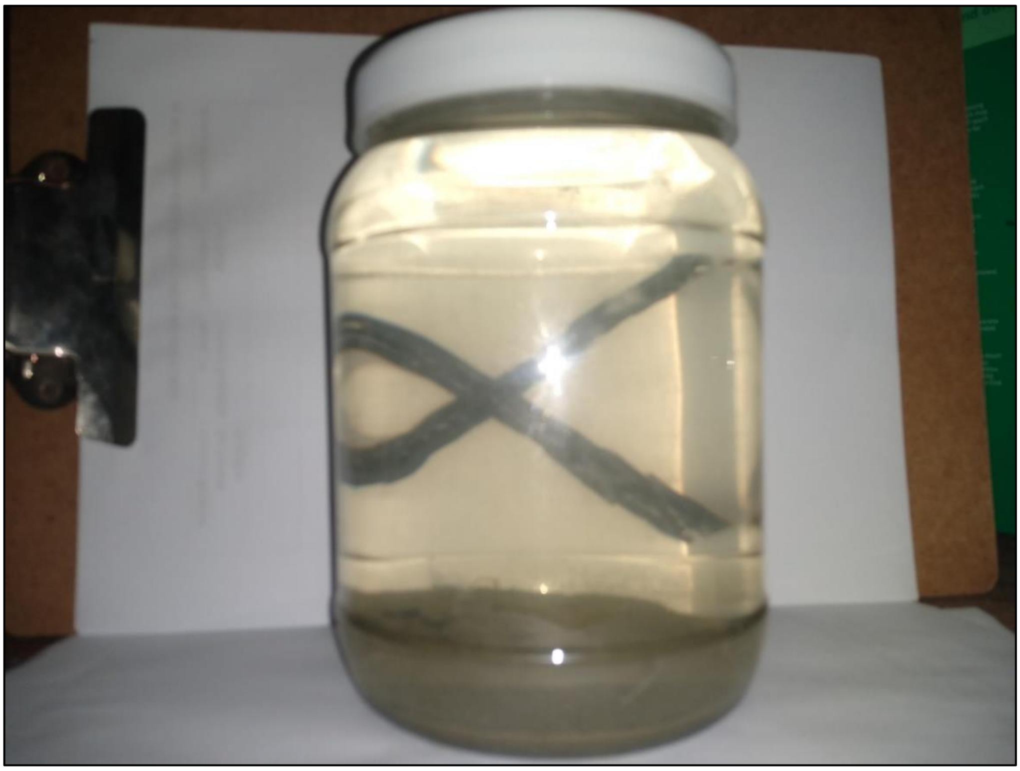
**Photograph 6: Effluent after 8 hours settlement time**



**Photograph 7: Effluent after 12 hours settlement time**



**Photograph 8: Effluent after 24 hours settlement time**



**Results**

As can be seen from the photographs above, between 8-hours and 12-hours settlement time appears to settle out the fine fraction from the site effluent. Settlement appears complete after 12 hours as can be seen in Photograph 7.

# Section 9: NOISE & DUST

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Reg No: IE 8298170M
*Principal: Brendan O'Reilly MPhil (Noise & Vibration) ISEE SFA EAA*

## Noise and Dust Report

## Raphoe Quarry Development

Report Prepared by: Brendan O'Reilly (April 2022)

# 9 NOISE & DUST

## 9.1 Introduction

Noise and Vibration Consultants were commissioned by Patrick Bonar to assess the potential noise impacts of a proposed development at an existing quarry site located at Magherasolis & Craigs, Raphoe, Lifford, Co. Donegal. The quarry which has been idle over a number of years is located approximately 0.6km south of Raphoe. The subject site measures 7.95ha and the footprint of the extraction area approximately 5.37 ha.

## 9.2 Statement of Authority

This section of the EIAR has been prepared by Mr. Brendan O'Reilly of Noise and Vibration Consultants Ltd. Brendan has a master's degree in noise and vibration from Liverpool University and has over 40 years' experience in noise and vibration control (and many years' experience in preparation of noise impact statements) was a member of a number of professional organisations. Brendan was head of Environment for over 10 years of Europe's largest Zn/Pb mine and was a co-author and project partner (as a senior noise consultant) in 'Environmental Quality Objectives Noise in Quiet Areas'.

Noise and Vibration Consultants have considerable experience in the assessment of noise impact and have compiled EIA studies ranging from quarries, mines, retail development, wastewater treatment plants, housing developments and wind farms.

## 9.3 Site Location and Setting

The exit from the existing quarry is via the L-23749 onto the R236 regional road. Raphoe town is located 900m SW of this road junction and 780m SW from the nearest boundary of the subject site (930m to quarry face). The site is surrounded by improved agricultural land, wet upland grassland, heath and an area of commercial forestry.

### 9.3.1 Description of Proposed Activity

The proposed activity will include construction of fixed plant on the quarry floor, removal of overburden to build berms on the site boundary or into storage for restoration of quarry and the subsequent operation of the quarry. The operation of the quarry will be in 5 phases (refer to Section 3 of this EIAR).

The quarry operation will include extraction of rock by drilling blasting. The blasted rock will be loaded by an excavator on the quarry floor on to a dump truck and transferred to the processing plant. The processing plant will consist of a primary jaw crusher, three cone crushers and 4 screeners in an integrated system with conveyors. The screening systems will be housed inside a structure with concrete walls and a roof of Kingspan cladding, or equivalent. The cone crushers grind the material into different sizes and shapes with resultant material divided into stockpiles of varying sizes and shapes. A loading shovel will operate in this area for truck loading and managing stockpiles. The loaded processed material is then trucked off site using road lorries. The planned output of the quarry is approximately 400 tonnes per day which results in 18-20 lorry loads per day resulting in a daily total of 36 HCV's movements to and from the site.

## 9.4 Methodology

To assess the potential noise emissions from the proposed development, the following relevant guidance and legislation were consulted:

- Guidance Note for Noise: Licence Applications, Surveys and Assessments in Relation to Scheduled Activities (NG4) (Jan 2016).
- Integrated Pollution Control Licensing – Guidance Note for Noise in Relation to Scheduled Activities, EPA 1995.

- ISO 9613-2, First Edition 1996-12-15. Acoustics-Attenuation of sound during propagation outdoors-Part 2: General method of calculations
- Draft Guidelines for the Treatment of Noise and Vibration in National Road Schemes
- BS5228, 2009 Code of Practice for Noise Control on Construction and Open Sites: Part 1: Noise.
- EPA, 2006, Environmental Management Guidelines-Environmental Management in Extractive Industry (Non Scheduled Minerals).
- EPA, 2003,Environmental Quality Objectives-Noise in Quiet Areas
- HMSO, Welsh Office, 1988. Calculation of Road Traffic Noise

### 9.4.1 Acoustic Terminology

Sound is simply the pressure oscillations that reach our ears. These are characterised by their amplitude, measured in decibels ("dB"), and their frequency, measured in Hertz ("Hz"). Noise is unwanted or undesirable sound, it does not accumulate in the environment, is transitory, fluctuates, and is normally localised. Environmental noise is normally assessed in terms of A-weighted decibels, dB (A), when the 'A weighted' filter in the measuring device elicits a response which provides a good correlation with the human ear. The criteria for environmental noise control are of annoyance or nuisance rather than damage. In general, a noise level is liable to provoke a complaint whenever its level exceeds by a certain margin, the pre-existing noise level or when it attains an absolute level. A change in noise level of 3 dB (A) is 'barely perceptible'; while an increase in noise level of 10 dB (A) is perceived as a twofold increase in loudness. A noise level in excess of 85 dB (A) gives a significant risk of hearing damage. Construction and industrial noise sources are normally assessed and expressed using equivalent continuous levels, LAeq[16].

## 9.5 Relevant Guidance and Legislation

### 9.5.1 Operation of quarry

The EPA has produced Environmental Management Guidelines 2006[2]. This document references 'A Guidance Note for Noise in Relation to Scheduled Activities (EPA, 1996[1])'. It deals with the approach to be taken in the measurement and control of noise, and provided advice in relation to the setting of emission limits values and compliance monitoring.

In relation to quarry developments and ancillary activities, it recommended that noise from the activities on site shall not exceed the following noise limits at the nearest noise-sensitive receptor:

| | | |
|---|---|---|
| **Daytime** | 08.00-20.00 hrs | LAeq (1h) = 55dBA |
| **Night-time** | 20.00-08.00 hrs | LAeq (1h) = 45dBA |

95% of all noise levels shall comply with the specified limits values(s). No noise level shall exceed the limit value by more than 2dBA.

The guidelines also recommend that where existing background noise levels are very low, lower noise levels ELV's may be appropriate. It is also appropriate to permit higher ELV's for short term temporary

[16] $L_{Aeq}$ is defined as being the A-weighted equivalent continuous steady sound level that has the same sound energy as the real fluctuating sound during the sample period and effectively represents a type of average value.

[2] 'Environmental Management in the Extractive Industry (Non-Scheduled Minerals),2006

[1] Ref. EPA's Guidance Note For Noise In Relation to Scheduled Activities, 1996

activities such as construction of screening bunds etc. where such activities will result in considerable environmental benefit.

Very low background noise environment is well defined and referenced in the EPA's NG4 (Jan'16). Quiet areas are referenced in NG4 and refer to in Environmental Quality Objectives-Noise in Quiet Areas. To qualify the first stage involves screening and a number of criteria needs to be satisfied, one which involves being more than 3km from urban areas with a population >1,000 people, or at least 3 km from any local industry. The town of Raphoe had a population in the 2016 census of over 1000 people and the area would not be considered as a 'Quiet Area'.

The proposed times of operation are between 0800 hours and 1800 hours Monday to Friday and 0800 to 1300 hours on Saturdays with no work on Sundays. The pit will not operate outside these hours or on Sundays or Public Holidays. The pit will provide employment for approximately 8-10 persons.

## 9.5.2 Construction

Relevant Guidance

There is no published national guidance relating to the maximum permissible noise level that may be generated during the construction phase of a project. However, the National Roads Authority ("NRA") give limit values which are acceptable ("the NRA Guidelines")[17]. Guidance to predict and control noise is also given in BS 5228:2009, *Code of Practice for Noise and Vibration Control on Construction and Open Sites* (two parts) where Part 1 deal with Noise. The NRA guidelines for construction noise which are considered typically acceptable are given in Table 9.1.

**Table 9.1: Noise levels that are typically acceptable**

| Day / Times | Guideline Limits |
|---|---|
| **Monday to Friday** | |
| 07:00 – 19:00hrs | 70dB LAeq, (1h) and LAmax 80dB |
| 19:00 – 22:00hrs | *60dB LAeq, (1h) and LAmax 65dB* |
| **Saturday** | |
| 08:00 – 16:30hrs | 65dB LAeq,1h and LAmax75dB |
| **Sunday and Bank Holidays** | |
| 08:00 – 16:00hrs | *60dB LAeq,1h and LAmax 65dB* |

*Construction outside of these times, other than required by an emergency works, will normally require explicit permission from the relevant local authority

Part 1 of BS 5228 provides several example criteria for the assessment of the significance of noise effects from construction activities. Noise levels generated by construction activities are considered significant if:

- The LAeq, period level of construction noise exceeds lower threshold values of 65dB during daytime, 55dB during evenings and weekends or 45dB at night, and;
- The total noise level (pre-construction ambient noise plus construction noise) exceeds the pre-construction noise level by 5dB or more for a period of one month or more.

[17] National Roads Authority, *Guidelines for Noise and Vibration in National Road Schemes.*

## 9.6 Noise Impacts

The development proposal is fully described in Section 3. which includes construction and operation of the development.

### 9.6.1 Construction

Construction activity includes removal of overburden to provide berms/screening and storage stockpiles to be used in the restoration of the quarry. Other construction includes settlement tanks and a constructed wetland to treat the effluent before discharge off site. Locating fixed plant on the quarry floor is not considered as a main noise source as this activity in not intense and the existing quarry face berm effect provides significant acoustic barrier attenuation effect well in excess of 20dBA.

Phase 1 will include all overburden removal, placement of all site infrastructure on the quarry floor and development of settlement tanks, wetlands ponds and drainage infrastructure.

The main noise sources for construction activity are in Table 9.2. The sources operate to remove overburden into stockpiles, build screens/berms and to construct the water treatment infrastructure. The boundary is used as the nearest location of potential activity where acoustic screening / berms could be located. The prediction is based at a dumper and excavator operating together at the boundary – nearest distance /point to the receptor.

**Table 9.2: Main construction noise sources**

| Noise Source | Noise level @ 10m Leq dBA* | Comments |
|---|---|---|
| Komatsu 400 dump truck-40 tonne | 84 | Load being carried on low level slope |
| Hitachi 350 excavator (35tonne) | 83.5 | Operating filling truck |

N.B: Noise levels obtained from measurements from active quarries

The two pieces of plant in Table 9.1 operating together equates to a Leq 1hr of 86.7dBA at 10m.

#### *9.6.1.1 Predicted construction noise levels*

The predicted noise levels are made for construction development surrounding the boundary of the site when maximum levels are envisaged. The predicted noise levels assume that both pieces of plant are operating together. Table 9.3 gives the distance of the nearest of some of the nearest receptors to the boundary of the site and predicted construction noise levels. The noise prediction locations are shown in Figure 9.1. NSL1 is a receptor who owns the lands under consideration, NSL2 is a local receptor. NSL 3 is Oakfield Manor a protected structure, NSL4 is a local school, Location 5 is the road entrance to the Regional Road where noise monitoring was carried out and location 6 is a derelict building. Approximate extraction area is marked in purple and water treatment plant marked in blue.

**Figure 9.1: Noise prediction locations (NSL 1-NSL4)**


The difference between noise levels at two different locations can be modelled as follows:

$$L_{p2} - L_{p1} = 10 \log (R_2 / R_1)^2 - (A_{atm} + A_{gr} + A_{br} + A_{mis})$$

$$= 20 \log (R_2 / R_1) - (A_{atm} + A_{gr} + A_{br} + A_{mis})$$

Where;

$L_{p1}$ = sound pressure level at location 1

$L_{p2}$ = sound pressure level at location 2

$R_1$ = distance from source to location 1

$R_2$ = distance from source to location 2, and where

$A_{atm}$ = Attenuation due to air absorption

$A_{gr}$ = Attenuation due to ground absorption

$A_{br}$ = Attenuation provided by a berm/barrier

$A_{mis}$ = Attenuation provided by miscellaneous other effects

Attenuation by miscellaneous effects is assumed as zero in all the predictions. Attenuation by air absorption and ground absorption combined is conservatively assumed as 3dBA.

**Table 9.3: Distance of the nearest receptors to the boundary of the site and predicted construction noise levels.**

| House id | Nearest to site boundary (m) | Geometric spreading | Ground absorption + Air attenuation | Source noise@ 10m | Leq 1hr dBA |
|---|---|---|---|---|---|
| NSL1 | 230 | 21.2 | 3 | 86.7 | 56.5 |
| NSL2 | 280 | 28.9 | 3 | 86.7 | 54.8 |
| NSL3 | 780 | 37.8 | 3 | 86.7 | 45.9 |
| NSL4 | 450 | 33.0 | 3 | 86.7 | 50.7 |

NB: Noise levels obtained from similar plant

#### ***9.6.1.2 Assessment***

Noise levels have been predicted at receptor locations based on activity /works located at the perimeter of the site. Maximum noise levels at receptors west of the site will be from construction of a barrier / berm on the boundary of the site while maximum levels for receptors east and south of the site will from the development of the water treatment infrastructure. The aforementioned activity will generate maximum levels no more than 1 week equivalent (40 hrs) at any receptor. The predicted construction noise levels are well within the guidelines recommended by the NRA and by those given in Part 1 of BS 5228. Construction works are temporary activity.

### 9.6.2 Operational noise

The operational noise can be categorised as workings in two zones, Zone 1 and Zone 2. classified in zones as follows:

Zone 1: Operation of the fixed processing plant located on the quarry floor

Zone 2: Activity close to the active quarry face operating at varying elevations well below the surface.

Table 9.4 gives a list of the plant and noise level in Zone1 and Zone 2 upon which the predictions are based with the assumption that all this plant is operating 100% of time.

The topography of the quarry setting provides significant acoustic screening / barrier effects which is provided by the height differential between the quarry floor, the height of the quarry boundary and the lower elevation of all receptors (lower than the quarry floor and significantly lower than the quarry boundary). The topographical setting provides acoustic screening similar to having a hill between the noise source and receptor. The current quarry floor base at mOD of 128.6, but is proposed to be lowered by 10m resulting in effective barrier/screening height ranging from a minimum to 15 to above 40m (15m being the bench height). A similar topographical setting has been measured recently where the screening /berm on the perimeter of a quarry site provided values ranging between 34 and 38dBA. In the calculations /prediction a more conservative allowance of 25dBA is made for plant operating below the surface.

**Table 9.4: Main noise sources and associated noise levels**

| Noise Source | Noise level @ 20m Leq dBA* | Comments |
|---|---|---|
| **Zone 1** | | |
| 3 X Cone crushers, conveyors and screeners (screeners housed) | 78 | Crushing and screening system |
| Hitachi 350 excavator-35 tonne | 77.5 | Operating filling truck |
| Loading shovel | 77.0 | Operating servicing stockpiles |
| Komatsu HM 400 dump truck-40 tonne | 78 | Travelling past |
| **Zone 2** | | |
| Pegsan Jaw Primary Crusher with two screeners rated at 250 tonnes/hr | 75 | Operating at normal operation |
| Hitachi 310 ZW loading shovel-7 tonne | 78.5 | Loaded passing by |
| New Holland 385 -40 tonne excavator | 78.0 | Periodic rock breaking |
| Shot hole drill | 63 @ 40m | drilling |

*Noise levels obtained from measurements from active quarries.

#### ***9.6.2.1 Predicted operational noise***

**Zone 1 Activity**

The location of Zone 1 activity will not vary over the life of the quarry as all plant is fixed in location. The fixed noise sources in Zone 1 are the processing plant which includes primary crushing, cone crushing screening. A dump truck will operate on the quarry floor operating between Zone 1 and 2 and this source is included in the calculations as located at Zone 1. The front end loader is included in this zone operating stock piles and filling road lorries.

Zone 1 activity combined equates to an Leq 1hr of 83.7dBA (78+77.5+77+78)dBA at 20m.

**Zone 2 Activity**

The location of Zone 2 activity will vary during the life of the quarry as the active quarry face will move with extraction. Included in this activity is loading shovel, drilling shot holes and excavator filling a dump truck which is idling. The prediction for the drill rig is based on measurements taken on a number of sites which gave mean Leq levels of 63dBA at 40m. Drilling shot holes on surface (top bench to be blasted) will occur at a frequency of no more than 2 to 3 days per blast with blasts number predicted to be no more than 12 to 15 blasts per year.

Zone 2 activity combined equates to an Leq 1hr of 82.2dBA (75+78.5+78)dBA at 20m)

Table 9.5 gives the predicted noise levels as Leq dBA for all plant operating.

**Table 9.5: Distance of the nearest receptors to the boundary of the site and predicted noise levels.**

| House id | Nearest to site boundary (m) | Source noise @ 20m dBA | Screening / Berm effect | Geometric spreading | Leq 1hr dBA |
|---|---|---|---|---|---|
| **Zone 1** | | | | | |
| NSL1 | 515 | 83.7 | 25 | 21.2 | 30.0 |
| NSL2 | 650 | 83.7 | 25 | 22.7 | 28.5 |
| NSL3 | 395 | 83.7 | 25 | 31.8 | 32.8 |
| NSL4 | 1020 | 83.7 | 25 | 27.0 | 29.0 |
| **Zone 2** | | | | | |
| NSL1 | 230 | 82.2<br>63@40m | 25<br>0 | 21.2<br>21.2 | 36.0 Total<br>47.8 = **<u>48.1</u>** |
| NSL2 | 280 | 82.2<br>63@40m | 25<br>0 | 22.9<br>22.9 | 34.3 Total<br>46.1= **<u>46.4</u>** |
| NSL3 | 780 | 82.2<br>63@40m | 25<br>0 | 31.8<br>31.8 | 25.4 Total<br>37.2= <u>37.5</u> |
| NSL4 | 450 | 82.2<br>63@40m | 25<br>0 | 27.0<br>27.0 | 30.2 Total<br>42.0 = **<u>42.3</u>** |

Table 9.6 gives the cumulative noise levels (Zone 1 + Zone 2) fixed and mobile plant working together (including shot drilling).

**Table 9.6: Predicted Noise levels from quarry with all plant in operation**

| House id | Zone 1 | Zone 2 | Cumulative Zone 1 + Zone 2 Leq 1hr dBA |
|---|---|---|---|
| NSL1 | 30 | 48.1 | **48.2** |
| NSL2 | 28.5 | 46.4 | **46.5** |
| NSL3 | 32.8 | 37.5 | **38.8** |
| NSL4 | 29.0 | 42.3 | **42.5** |

#### ***9.6.2.2 Noise assessment***

The maximum noise levels are predominately based on the contribution made by shot hole drilling close to the boundary on surface. The higher levels at NSL1 will be from the Phase 2 development, while the higher levels at NSL2 will be from the Phase 5 development. The highest levels at NLS4 will be from the Phase 1 development. The Phase 1 development will include all construction aspects of the development which is temporary works.

Noise levels have been predicted at receptor locations assuming that all plant fixed and mobile is in operation. By the very nature of quarrying all plant will normally not be in operation at the same time as two days crushing may be sufficient for a weekly demand. Mitigating measures have been recommended where deemed necessary. The predicted noise levels are maximum levels and include the cumulative effects of all activity. The predicted noise levels are below the levels recommended by the EPA Environmental Management Guidelines for Quarries.

## 9.7 Ameliorative Measures Proposed

- Acoustic berms of 2.5 to 3m height will be constructed along the extraction boundary of the site where possible.
- The processing plant (crushing and screening) will be located in the quarry floor area thereby giving maximum barrier attenuation effect
- The screener systems will be in a housing envelope
- All motors and pulleys will be maintained to a high standard with regular maintenance so as to avoid any tonal or impulsive components in the emission.
- All mobile plant on site will have well maintained silencers.
- Machinery will be throttled down or turned off when not in use.
- A noise buying standard will be put in place where any replacement of mobile or fixed plant where noise characteristics will be considered.

## 9.8 Road Traffic Noise Impacts

A noise survey was carried out at location 5 close to the R231 Regional Road at the exit from the development site over a period of 1.5 hours including a traffic count on 10th November 2021 Measurements were taken at 7m from the road-side. Table 9.7 gives a summary of the noise level and traffic survey results of the survey, a photograph of the monitor in situ is shown in Photograph 9.1 below.

**Photograph 9.1: Noise Monitor in Situ**


Table 9.7 gives a summary of the noise level and traffic survey results of the survey.

**Table 9.7: Summary of the noise level and traffic survey results of the survey**

| Time | Leq dBA | L10 dBA | L50 dBA | L90 dBA | Traffic count |
|---|---|---|---|---|---|
| 11.05 | 70.6 | 73.8 | 52.1 | 41.2 | 92 |
| 11.38 | 71.0 | 74.6 | 53.7 | 43.6 | 82 |
| 12.09 | 71.4 | 75.3 | 53.6 | 42.4 | 104 |

The planned output of the quarry is 480 tonnes per day which results in 18 lorry loads per day resulting in a daily total of 36 HCV's movements to and from the site. This equates to a mean flow of 4.5 HCV's movements/hour. The daily road traffic flow from 2017 on the R231 is 4,800 with HCV's not classified. Assuming a 10% HCV flow results in a daily flow of 480 movements. Over 10 hours this equates to a mean flow of 48 movements. Typically, 2 light vehicles can equate to 2 HCV's in noise emission terms.

The recorded traffic flow approximates to a flow of 185veh /hr. There is a logarithmic relationship between traffic flow and noise levels and typically doubling the road traffic flow will increase the noise levels by 3dBA. The increase in road traffic will be negligible at all receptors.

## 9.8.1 Ground Vibration from HCV's

The level of ground vibration at 10m from a loaded truck will be below the human threshold at less than PPV of 0.2mm/sec[18]

## 9.9 Do-nothing Scenario

If the proposed development were not to proceed, the operator would continue to operate in the area with existing planning permission until resource material in that area expired. Work would then be suspended.

[18] Wiss, J. F., and Parmelee, R. A.. (1974) Human Perception of Transient Vibrations, "*Journal of Structural Division"*, ASCE, Vol 100, No. S74, PP. 773-787

### 9.10 Decommissioning

Noise effects during decommissioning are likely to be of a similar nature to that during construction. It is likely that the duration of decommissioning will be shorter than that during construction. Any legislation, guidance or best practice relevant at the time of decommissioning would be complied with.

### 9.11 Noise Monitoring

It is proposed to carry out noise monitoring at two locations biannually (NSL1 and NSL2). If compliance is met at these two nearest locations then it will be met at locations further away from the site.

### 9.12 Residual Impacts

It is not anticipated that there will be an adverse impact on noise quality in the vicinity of the application site provided that mitigation measures and best practice is applied.

### 9.13 Technical Difficulties

There were no technical difficulties encountered during the study / assessment.

### 9.14 Conclusion Noise

Noise levels for the proposal have been predicted and include the cumulative effects of activity. Predictions have been made of maximum hourly noise levels with no allowance made for ground absorption or air attenuation. The predicted noise levels are well within the levels recommended by the EPA Environmental Management Guidelines-Environmental Management in Extractive Industry (Non-Scheduled Minerals).

### 9.15 Dust Deposition

Quarrying activity has the potential to generated dust with the main sources being vibrating screeners, traffic on the quarry roads during dry periods, stockpiles of fine material and drilling.

#### 9.15.1 Ameliorative measures proposed include:

- housing all screening plant
- use of a tractor bowser in dry weather condition to spray the roads
- filter bag on drill rig
- in dry windy weather water spray stock piles
- a wheel wash will operate at exit from quarry

#### 9.15.2 Methods of measuring dust deposition

There a number of methods for measuring dust deposition ranging from Directional Dust gauges to Fressibie gauges which use different methods and different limits, however the Standard Method being used for over 20 years is German Standard Method VDI 2119 (Measurement of Dustfall, Determination of Dustfall using Bergerhoff Instrument (Standard Method) German Engineering Institute.

This method unlike other methods measures the total of suspended and dissolved solids fraction that is present in the collected sample jar, so it is important that the Standard Limit is used. Local Authorities and the EPA specify the German Standard.

#### 9.15.3 Dust deposition limits

The EPA's Environmental Management Guidelines states: '*There are a number of methods to measure dust deposition but only the German TA Luft Air Quality Standards (TA Luft 1986) specify a method of measuring dust deposition- The Bergerhoff Method (German VDI 2119, 1972)- with dust nuisance. It is the only enforceable method available. On this basis, it is recommended that the following TA Luft* *dust deposition limit value be adopted at site boundaries associated with quarry developments= total dust deposit deposition (soluble and insoluble): 350mg/m2/day (when averaged over a 30-day period)'.*

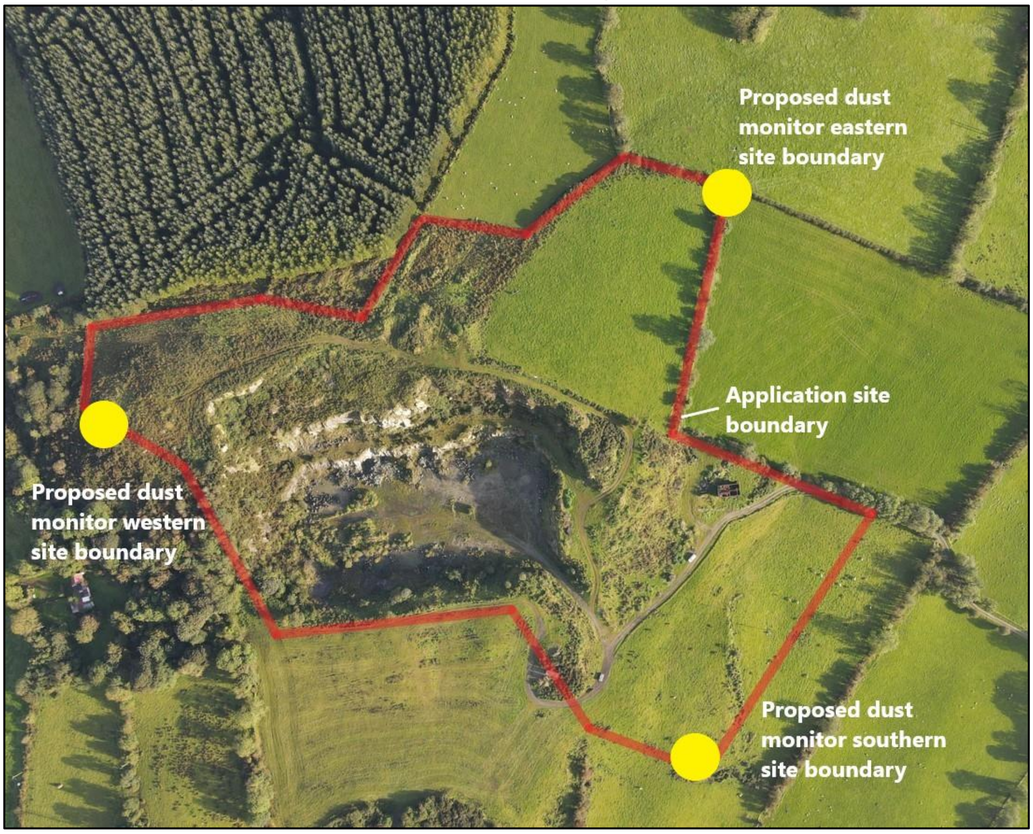
A more recent version VDI4320-:2012 gives advice on storage of sample prior to analysis to prevent sample being contaminated by say algae growth. It does not change the specification of the collecting jar.

**The total dust deposit deposition (soluble and insoluble): 350mg/m$^2$/day (when averaged over a 30-day period) is recommended as the total dust deposition limit.**

### 9.15.4 Monitoring

It is recommended that 3 Bergerhoff Standard Gauges be set up at locations close to the boundary of the site one being west of site, one being south of site and one being east of site as detailed in Figure 9.2 below. In practice monitoring is reported monthly (average 28-32days as 350mg/m$^2$/day).

**Figure 9.2: Proposed location of Bergerhoff Dust Monitors**




### 9.16.1 Determination of Significance of Impact Pre-Mitigation

| Impact | Receptor | Description of Impact (Character / Magnitude / Duration / Probability / Consequences) Negligible - High | Existing Environment (Significance / Sensitivity) Negligible -High | Significance Imperceptible - Profound |
|---|---|---|---|---|
| Operational noise of day-to-day quarrying activity from the | Noise sensitive receptors near the site | Low | Medium | Slight |

| | | | | |
|---|---|---|---|---|
| site including blasting | | | | |
| Construction noise from the site | Noise sensitive receptors near the site | Low | Medium | Slight |
| Increased traffic noise | Noise sensitive receptors near the site | Low-Negligible | Low-Medium | Not significant |
| Dust Deposition from quarry activity and transporting product to market | Nearby dwellings & road network | Low-Negligible | Low-Medium | Not Significant |

### 9.16.2 Summary of Mitigation Measures

| **Summary of Mitigation Measures Proposed** |
|---|
| Acoustic berms of 2.5 to 3m height must be constructed along the extraction boundary of the site where possible. |
| The processing plant (crushing and screening) must be located in the quarry floor area thereby giving maximum barrier attenuation effect |
| The screener systems must be in a housing envelope |
| All motors and pulleys must be maintained to a high standard with regular maintenance so as to avoid any tonal or impulsive components in the emission. |
| All mobile plant on site must have well maintained silencers. |
| Machinery must be throttled down or turned off when not in use. |
| A noise buying standard must be put in place where any replacement of mobile or fixed plant is considered. |
| A tractor bowser must be used during weather condition to spray the roads |
| Filter bag must be in place on drill rig |
| In dry windy weather stockpiles and haul roads must be dampened down with water |
| A wheel wash must operate at exit from quarry |

### 9.16.3 Determination of Significance of Impact Following Mitigation

| **Impact** | **Receptor** | **Description of Impact (Character / Magnitude / Duration / Probability / Consequences)** Negligible - High | **Existing Environment (Significance / Sensitivity)** Negligible -High | **Significance** Imperceptible - Profound |
|---|---|---|---|---|
| Operational noise of day-to-day quarrying activity from the site including blasting | Noise sensitive receptors near the site | Low | Medium | Not significant |
| Construction noise from the site | Noise sensitive receptors | Low | Medium | Not significant |

| | | | | |
|---|---|---|---|---|
| | near the site | | | |
| Increased traffic noise | Noise sensitive receptors near the site | Low-Negligible | Low-Medium | Not significant |
| Dust Deposition from quarry activity and transporting product to market | Nearby dwellings & road network | Low-Negligible | Low-Medium | Imperceptible |

### 9.16.4 Impact Assessment Conclusion

There will be no significant negative impact from noise or dust deposition following the implementation of the recommended mitigation measures.

## 9.17 References

Department of Communities and Local Government (1993) Minerals Planning Guidance 11 – The Control of Noise at Surface Mineral Workings (MPG-11)

Department of the Environment, Heritage and Local Government (2004) Quarries and Ancillary Activities: Guidelines for Planning Authorities

DEFRA (2005) Update of Noise Database for Prediction of Noise on Construction and Open Sites

EPA (2006) Environmental Management Guidelines Environmental Management in the Extractive Industry (Non-Scheduled Minerals)

EPA (2012) Guidance Note for Noise: Licence Applications, Surveys and Assessments in Relation to Scheduled Activities (NG4)

EPA (2016) Guidance Note for Noise: Licence Applications, Surveys and Assessments in Relation to Scheduled Activities (NG4)

BS5228 (2009) Code of Practice for Noise Control on Construction and Open Sites. Part 1: Noise

Safety Health and Welfare at Work (Control of Noise at Work) Regulations 2006 (S.I. No. 371 of 2006)

# Section 10: BLAST VIBRATION

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# Blast Vibration Report

## Raphoe Quarry Development

Report Prepared by: Brendan O'Reilly (April 2022)

# 10 BLAST VIBRATION

## 10.1 Introduction

Noise and Vibration Consultants were commissioned by Patrick Bonar to assess the potential blasting vibration impacts of a proposed development at an existing quarry site located at Magherasolis & Craigs, Raphoe, Lifford, Co. Donegal. The quarry which has been idle over a number of years is located approximately 0.6km south of Raphoe.

## 10.2 Statement of Authority

This section of the EIAR has been prepared by Mr. Brendan O'Reilly of Noise and Vibration Consultants Ltd. Mr. O'Reilly has a Master's degree in noise and vibration from Liverpool University and over 35 years' experience in noise and vibration control (and many years' experience in preparation of noise impact statements) and is a member of a number of professional organisations. Brendan was a co-author and project partner (as a senior noise consultant) in 'Environmental Quality Objectives Noise in Quiet Areas' administered by the Environmental Protection Agency. Noise & Vibration Consultants have considerable experience in the assessment of noise impact and have compiled EIA studies ranging from quarries, mines, retail development, wastewater treatment plants, housing developments and wind farms. Local experience included monitoring and assessment of rock breaking at 1.5m from a row of houses in Main Street Glenties and rock breaking in Donegal Town during the laying of a pipeline on the base of River Eske close to houses.

## 10.3 Description of Proposed Activity

Preliminary work includes the removal of overburden and vegetation where present in phases prior to blasting the underlying bedrock. Overburden material will be stored in berms at the boundary of the greenfield area to provide screening or stored for restoration of the quarry. The removal of the overburden allows the blasting engineer to assess the area to plan the blast and to allow the blast hole drilling rig to access and drill holes at the area proposed for extraction

The proposal involves extraction of rock by blasting to 10m below the existing quarry floor level (average floor level 128.6 m OD). The development will be in a north to north-east direction away from the village of Raphoe. The lowering of the quarry will have an insignificant vibration impact at all receptors. It is envisaged that the maximum number of blasts will range up to 15 per year with maximum bench heights ranging between 10 and 15m. A typical blast will be of duration of less than 1 second. All blasting at the quarry will be undertaken in accordance with all applicable legislation including the Safety, Health and Welfare at Work Act 2005, and the Safety, Health and Welfare at Work (Quarries) Regulations, 2008, and best practice within industry.

## 10.4 Blast Vibration Criteria, Guidelines/Recommendations/Standards

<u>Ground Vibration</u>

The measurement of peak particle velocity (PPV) is internationally recognised as the best single descriptor to use when assessing potential ground vibration damage to structures/buildings. More recently velocity-frequency control bounds are used as damage control criteria.

There are many different standards and recommendations being used internationally, some like the German DIN 4150[1] that lacks data for its foundation. However, most of these standards and recommendations are derived from the considerable work carried by the U. S Bureau of Mines

[1] German Standard, DIN 4150; Part 3: 1986, Vibration in buildings; effects on structures

(USBM). The USBM Report of Investigation 8507[2] gives practical safe criteria for blasts that generate low frequency ground vibrations (<40Hz). These are 19 mm/sec for modern houses and 12.7 mm/sec for older houses. It is normal when measuring PPV that the vibration levels are measured in three orthogonal directions (horizontal longitudinal, vertical, horizontal transverse (often termed x, y, z vector components, or L, V, T).

There are no Irish standards for ground vibration, however there are limits recommended in the EPA's Guidance Note on Noise in Relation to Scheduled Activities. These limits are also recommended in the Guidelines for Planning Authorities for *Quarries and Ancillary Activities* issues in April 2004 by the Department of the Environment, Heritage and Local Government. The EPA has also published "Environmental Management Guidelines" Environmental Management in the Extractive Industry (Non Schedule Minerals), 2006. For ground vibration the recommended limits is 12mm/s, measured in any of the three mutually orthogonal directions at the receiving location (for vibration with a frequency of less than 40Hz) and normal hours of blasting should be defined with quarry operators providing advance notification of blasting to nearby residents.

For this development a ground vibration limit of 10 mm/sec is proposed with a limit of 6 mm/s for the protected structure Oakfield Manor (location 10) could apply.

**Air Overpressure (Air Blasts)**

Air blasts are characterised by containing a larger proportion of its energy in the sub-audible spectrum, below 20 Hz. Because the waves associated with air blasts are essentially outside the audible spectrum (below 20 Hz), a separate unit of measure, pressure is reported.

The pressure is recorded using an air-blast transducer and the linear device must measure accurately in the structurally critical range of 2 to 20 Hz. Air blast (sound waves) can be reported in two distinct units of measurements, pressure (psi) or decibels (dB), however it is normal to report air-overpressure in dB with a microphone that is Linear down to 2Hz. EPA guidance recommends limit of 128 dB (linear maximum peak value), with a 95% confidence level.

## 10.5 Ground Vibration

Ground vibration can be defined as regularly repeated movement of a physical object about a fixed point. Ground-borne vibration can be generated by a number of sources, including road and railways, construction activities such as piling, blasting and tunnelling.

Table 10.1 below details a list of common tasks and the level of vibration they produce. This table was extracted from the Environmental Management Guidelines Environmental Management in the Extractive Industry (Non-Scheduled Minerals) which was published by the EPA in 2006.

[2] Siskind, D. E, Stagg, M. S., Kopp, and Dowding, C. H. (1980) '*Structure Response and Damage Produced by Ground Vibration From Surface Mine Blasting*' U .S Bureau of Mines RI 8507

**Table 10.1: Typical vibration levels generated by everyday activities**

| Vibration level | Description of activity |
|---|---|
| 1.0–2.5 mm/s | Walking measured on a wooden floor |
| 2.0–5.0 mm/s | Door slam, measured on a wooden floor |
| 12–35 mm/s | Door slam, measured over doorway |
| 5–50 mm/s | Footstamp, measured on wooden floor |
| 30–70 mm/s | Daily changes in temperature and humidity |
| 120 dB | Constant wind of 5 m/s: Beaufort Scale 3, Gentle Breeze |
| 130 dB | Constant wind of 8 m/s: Beaufort Scale 4, Moderate Breeze |

**Ground Vibration from Blasting**

When an explosive detonates within a borehole it causes the rock in the immediate vicinity to break or distort. Outside this immediate vicinity of the blast site permanent deformation does not occur.

Ground vibration is caused by the imperfect utilisation of the explosive energy released during fragmentation of rock in blasting operations. The energy that is unused in the fragmentation of rock propagates as an elastic disturbance away from the shot area as seismic waves. These waves, which radiate in a complex manner, diminish in strength with distance from the source. The theory relative to this motion is based on an idealised (sinusoidal) vibratory motion. When these waves come into contact with a free face, physical motion results, as the energy induces oscillation in the ground surface. Blasting vibration is a surface wave type, which incorporates components of both body and surface motion.

Ground vibration itself is in-audible, however air vibrations (Air overpressure) both audible and sub-audible usually accompany it. The resulting impacts of blasting vibration are often characterised as being impulsive and of short duration, usually less than 3 seconds. It is difficult for the average lay person to differentiate between the various types of vibrations (ground vibration and air overpressure), humans commonly associate the level of vibration with the 'loudness' of a blast.

**10.5.1 Ground Vibration Control**

Ground vibration from blasting at any receptor point is influenced in the main by:

- the maximum instantaneous charge of explosives usually referred to as MIC.
- the medium between blast source and receptor point and.
- the distance between the receptor point and the blast source.

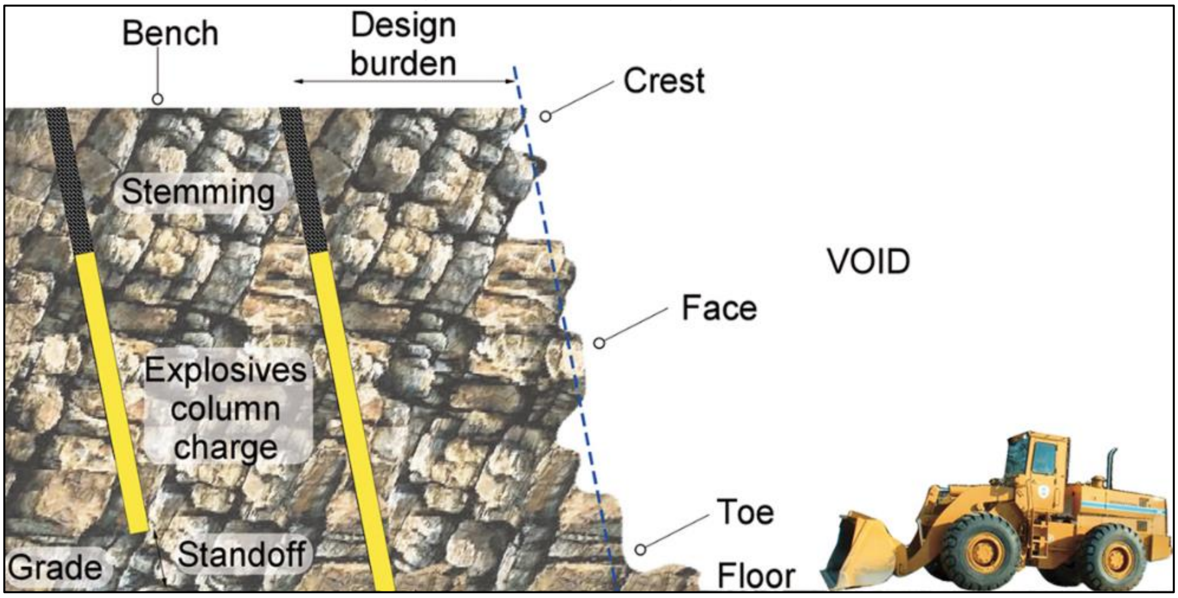
The level of ground vibration control is based on reducing and controlling the weight of explosives detonated per delay. In any given situation large amounts of explosives can be detonated using time delay intervals (greater than 8millie-second) between specific charges within the overall blast. The level of ground vibration is directly related to the maximum charge weight per delay and numerous studies have shown that peak particle velocity (PPV) is directly related to the maximum charge weight per delay. In terms of predicting ground vibration each quarry location is 'site specific'. Typically, a 'scaled distance' regression line can be established using monitored vibration data, MIC and distance, or in this instance a conservative regression line can be used for a first blast. Continuous vibration monitoring will ensure that blast vibration limits are being complied with and it also allows the development and adjustments to the 'scale distance' regression line for the proposed site. The Raphoe quarry may require a number of small blasts to align the benches and these small blasts can be used to form a site-specific 'scale distance' regression line.

In practice the distance and medium to a receptor will determine the MIC to be used for a blast. As blasting operations move in a north to north-east direction blast vibration levels can be altered by making changes to the MIC. Lowering the MIC can be obtained by a number of means including any combination of the following:

- reducing the shot hole diameter for given bench height.
- reducing the bench height, thereby reducing the shot hole.
- decking charges-dividing the charge within the shot hole by using a minimum of 1.5m of stemming.

The bench height proposed is in the range of 10 to 15 metres which is not considered excessive and allows for low Mic's to be used as standard. The most up to date technology in blasting operation will be used by a competent blasting contractor. To this end face profiling will be carried for each blast so that accurate geometry of the free face can be established, thereby enabling the optimum burden and spacing to be applied for each blast. Ground vibration and air overpressure will be recorded for each blast at monitoring locations with state-of-the-art seismographs. Monitoring can demonstrate that compliance with blast vibration limits is being met. Figure 10.1 below details a blast design profile for a quarry which shows a section through the quarry face and drill holes (not to scale).

**Figure 10.1: Blast design profile**




## 10.6 Air Blast (Air-Overpressure) Noise

A blast causes a diverging shock-wave front that quickly reduces to the speed of sound, and an air blast is then propagated through the atmosphere as sound waves. Air blast or air overpressure is the term used to describe the low frequency, high energy air vibrations generated by blasting detonation. Air blasts are characterised by containing a larger proportion of its energy in the sub-audible spectrum, below 20 Hz. Because the waves associated with air blasts are essentially outside the audible spectrum (below 20 Hz), a separate unit of measure, pressure is reported.

The pressure is recorded using an air-blast transducer and the linear device must measure accurately in the structurally critical range, 2 to 20 Hz. Air blast (sound waves) can be reported in two distinct units of measurements, pressure (psi) or decibels (dB). It is standard t6o report in decibels

Sound waves in the form of the sub-audible sound waves (air overpressure/air blast waves), and noise (the audible waves) are sometimes linked inextricable. It is difficult sometimes for humans to differentiate between the characteristics of air blasts and noise.

In general the sub-audible waves are of greatest concern. The sub-audible sound waves, if high enough can excite structures to produce audible rattle inside structures and may, in the extreme, break glass and crack wall coverings. However, there are no known cases of foundation cracks from air blasts at values anywhere near the glass breakage threshold of 140 dB[4]. The cracking of glass (the weakest component of a structure) is likely to be probabilistic in nature. In other words, not all windows will crack at 140 dB.

A wind speed of 9 m/s produces a pressure equal to 133.7 dB (0.014 psi). Although such wind is comparable in amplitude to a strong air-blast, its effects are not as noticeable because of the relatively slow rate of wind change and the corresponding minor or non-existent rattling, compared with the rapid rise time (impulsive) of an air blast transient.

Air blast waves are attenuated over distance in much the same way as sound waves; however, there are some differences due to the lower frequency of the sub-audible air blast waves. Lower frequency waves are attenuated at a lower rate by air absorption over distance than the higher frequency audible waves. Air blasts, being very high pulses of energy in the form of low frequency waves can travel great distances. The effects of temperature inversions are negligible close to a blast, but may exceed 10 dB at 800m or greater. However, lack of focusing at short distances is important, since only at short distances are pressures large enough to produce cracking. The effects of ambient temperature and relative humidity are considered negligible, at less than 1 dB at 1Km[5]. Prediction and control of air blasts can be more difficult than that of ground vibration due to the influences of weather conditions on the air blast propagation.

**10.6.1 Control of Air Blasts**

The principal factors governing air blasts are:

(a) the type and quantity of explosives

(b) the degree and type of confinement (stemming)

(c) the method of initiation (not-use of exposed detonating Cord etc.)

(d) local geology, topography and distance

(e) atmospheric conditions

Factors (a), (b) and (c) are variables within the control of the quarry operator whereas (d) and (e) are essentially uncontrollable at any particular site. However, by varying the timing of a blast (avoid early morning or late evening), by controlling the degree of confinement and by using non-electric or electronic detonators as the method of initiation (non –use of detonating Cord on surface) the quarry operator, in effect, achieves control over the influence of atmospheric conditions and hence over the blast emissions. It is important to note that atmospheric conditions (including temperature inversions) will have little effects at distances within 300m.

It is proposed to limit the air blast to an air overpressure level of 125 dB (Lin peak) with a 95% confidence limit when measured with instrumentation that has a linear response down to 2 Hz. as is

[4] Siskind, D. E., Crum, S. V., and Plis, N. M. (1993). '*Blast Vibrations and Other Potential Causes of Damage in Homes Near a Large Surface Coal Mine in Indiana'*, USBM, RI 9455

[5] Aimone-Martin, C., and Martin, R. S. (2000). *Effects of Temperature and Humidity on Airblast Sound Pressure Levels*. Journal of the International Society of Explosive Engineers

given in condition 4 of the existing permission. This proposed limit is well below the safe level of 133.7 dB for air blasts given by Siskind *et al.*, 1980[6] and is also within the limit recommended by the EPA.

### 10.6.2 Flyrock

Flyrock can occur due to incorrect design and poor management of blasting rounds where there is inadequate stemming or inadequate burden (overcharging the holes with explosives). Overcharging can be avoided by following proper management procedures). Considerations for the bench height, bench face profile, face condition, local geology, rock properties, burden and spacing of the drilling pattern and in particular to the first row of boreholes when calculating charge weight per hole will ultimately define the optimum powder and energy factors for a safe and productive blast. The measures taken to control ground vibration and air-overpressure will also control and counteract the possibility of flyrock.

### 10.6.3 Mitigating Impacts for Ground Vibration, Air-Overpressure Noise and Flyrock Control

The following controls will be put in place so that ground vibration, air overpressure and noise is minimised and kept within the regulatory limits. Specific mitigations measures are listed as follows;

- Blasting can only be done between 12:00 hrs and 16:00 hrs, Monday to Friday. No blast will be conducted on weekends or bank holidays.
- Prior to drilling of any blast, a face profiling or a trigonometric bench height measurement will be carried out for all blasts.
- Prior to drilling the blasting pattern, the quarry foreman will mark the position of the boreholes and the blast number on the ground as per the agreed blasting plan approved and signed by the Drilling and Blasting Manager.
- A blasting plan will be issue by the blaster in charge for agreement to the Drilling and Blasting Manager prior the drilling of any blast.
- Only personnel with appropriated Certification in drilling and blasting will be allowed to operate the blasting programs.
- A driller's log must be in place at all times.
- A site-specific scale distance regression for the proposed development site will be developed (or equivalent) as blasting continues over the life of the quarry.
- Monitoring locations for ground vibration and air overpressure will be agreed prior to blasting. Monitoring data will be used to allow for future adjustments to the maximum instantaneous charge of the blast if required.
- All seismographs will have a certificate of calibration from the manufacturer and all certificates and serial numbers of each seismograph to be use for the monitoring of the blast will be kept on file for future reference for Donegal Co. Co as required. All seismometers will have blast wave frequency analysis facility.
- Advance warning notice of all blasts will be given to residents in the local environs of the quarry at least 24hrs prior to blasting.
- Ensure that the optimum blast ratio is maintained and ensure that the maximum amount of explosive on any one delay, the maximum instantaneous charge (MIC) is optimised so that the ground vibration levels are kept below the regulatory limits.
- Explosive charges will be properly and adequately confined by a sufficient amount of quality of stemming by using angular chippings and/or a combination of angular chippings and plug.

[6] Siskind, D. E., Stachura, V.J., Stagg, M. S., and Kopp, J. W. (1980). *Structural Response and Damage Produced by Air Blast from Surface Mining*, USBM, RI 8485

- The adequate confinement of all charges by means of accurate face survey and the subsequent judicious placement of explosives by certified personnel.
- Overcharging will be avoided by considering depth, burden and spacing when calculating charge weight per hole.
- There will be no exposed detonating cord used in surface.
- The initiation sequence in the blast will be set in a way that it progresses away from the nearest sensitive locations or structure to be protected, were practical.
- An adequate powder factor and energy factor will be chosen for each blast by considering safety, confinement and productivity.
- Borehole deviation studies will be conducted in order to have a better control in potential borehole deviation.
- Only the necessary sub drilling to achieve good breakage will be use (Normally 1 to 1.5 m), excessive sub-drilling will be avoided at all times.
- Use of decked charges if required in order to reduce the Maximum Instantaneous Charge (MIC).
- Pre-splitting technique will be use for the final slope stability.

#### 10.6.4 Assessment of Ground vibration and Air Overpressure Impacts

Keeping within the recommended ground vibration and air over pressure limits will ensure that there will be no damage (including superficial damage) to any property. Furthermore, local infrastructure such as overhead cables should not be negatively affected by air overpressure as the levels produced would be substantially lower than high level gusts of wind. The level of air overpressure tends to be lower at 90 degrees to the bench face.

## 10.7 Do-nothing Scenario

If the proposed development were not to proceed, the quarry would remain in current status with no restoration carried out and the quarry owner may run out of rock.

## 10.8 Unplanned Events

In the event of an emergency such as a fire to plant or equipment, the emergency response plan will be implemented, and the relative emergency services will be contacted. An assessment in relation to the cause of the emissions will be undertaken and the activity will not recommence until the problem has been rectified.

## 10.9 Decommissioning

Blast vibration effects during decommissioning will stop and no impacts will exist. Any legislation, guidance or best practice relevant at the time of decommissioning would be complied with.

## 10.10 Blast Vibration Monitoring

Blast vibration monitoring should be carried out for each blast at a minimum of two locations with locations varying throughout the life of quarry. Where practical one monitor should be placed at a receptor location away from active face (i.e no void between blast source and receptor).

## 10.11 Residual Impacts of Development

It is not anticipated that there will be an adverse impact on the vibration quality in the vicinity of the application site provided that mitigation measures and best practice is applied.

## 10.12 Summary of Significant Effects

The operation of quarry blasting will be designed and planned with mitigation measures to keep well within the statutory limits.

## 10.13 Statement of significance

This Section has assessed the significance of the potential effects of quarry blasting during operation and decommissioning. The control measures put in place along with the mitigation measures and only personnel with appropriated Certification in drilling and blasting will be allowed to operate the blasting programs will ensure that statutory limits are complied with.

## 10.14 Technical Difficulties

There were no technical difficulties encountered during the study / assessment.

## 10.15 Conclusion – Blast Vibration

Ground vibration and air-overpressure will be kept below the guidelines recommended and below the regulatory limits. Controls specified to limit ground vibration and air-overpressure will be in place as a component of good management procedures. To ensure compliance with regulatory limits, monitoring of all blast vibration will be carried out at a location to be agreed with Local Authority. Keeping within the statutory limits will ensure that blast vibration or air overpressure will ensure that the likelihood of damage (or superficial damage) to all receptor structures and humans approaches zero.

## 10.16 Determination of Significance of Impact Pre-Mitigation

| **Impact** | **Receptor** | **Description of Impact (Character / Magnitude/ Duration / Probability / Consequences)** Negligible - High | **Existing Environment (Significance / Sensitivity)** Negligible - High | **Significance** Imperceptible - Profound |
|---|---|---|---|---|
| Blast Vibrations | Buildings surrounding the application site | Low-Medium | Medium | Slight |

## 10.17 Summary of Mitigation Measures

| **Summary of Mitigation Measures Proposed** |
|---|
| Considerable care must be taken to conduct the blast only between 12:00 hrs and 16:00 hrs, Monday to Friday. No blast can be conducted on weekends or bank holidays. |
| Prior to drilling of any blast, a face profiling or a trigonometric bench height measurement must be carried out. |
| Prior to drilling the blasting pattern, the quarry foreman must mark the position of the boreholes and the blast number on the ground as per the agreed blasting plan approved and signed by the Drilling and Blasting Manager. |

| |
|---|
| A blasting plan must be issue by the blaster in charge for agreement to the Drilling and Blasting Manager prior the drilling of any blast. |
| Only personnel with appropriated Certification in drilling and blasting can operate the blasting programs. |
| A driller's log must be in place at all times. |
| A site-specific scale distance regression for the proposed development site must be developed (or equivalent) as blasting continues over the life of the quarry. |
| Monitoring locations for ground vibration and air overpressure must be agreed prior to blasting. Monitoring data must be used to allow for future adjustments to the maximum instantaneous charge of the blast, if required. |
| All seismographs must have a certificate of calibration from the manufacturer and all certificates and serial numbers of each seismograph to be use for the monitoring of the blast must be kept on file for future reference for Donegal Co. Co., as required. All seismometers must have blast wave frequency analysis facility. |
| Advance warning notice of all blasts must be given to residents in the local environs of the quarry at least 24hrs prior to blasting. |
| Ensure that the optimum blast ratio is maintained. Ensure that the maximum amount of explosive on any one delay, the maximum instantaneous charge (MIC), is optimised so that the ground vibration levels are kept below the regulatory limits. |
| Explosive charges must be properly and adequately confined by a sufficient amount of quality of stemming by using angular chippings and/or a combination of angular chippings and plug. |
| Overcharging must be avoided by considering depth, burden and spacing when calculating charge weight per hole. |
| The initiation sequence in the blast must be set in a way that it progresses away from the nearest sensitive locations or structure to be protected, were practical. |
| An adequate powder factor and energy factor must be chosen for each blast by considering safety, confinement and productivity. |
| Borehole deviation studies must be conducted in order to have a better control in potential borehole deviation. |
| Only the necessary sub drilling to achieve good breakage must be use (Normally 1 to 1.5 m), excessive sub-drilling must be avoided at all times. |
| Use decked charges, if required, in order to reduce the Maximum Instantaneous Charge (MIC). |
| Pre-splitting technique must be use for the final slope stability. |

## 10.18 Determination of Significance of Impact Following Mitigation

| **Impact** | **Receptor** | **Description of Impact (Character / Magnitude/ Duration / Probability / Consequences)** Negligible - High | **Existing Environment (Significance / Sensitivity)** Negligible - High | **Significance** Imperceptible - Profound |
|---|---|---|---|---|
| Blast Vibrations | Buildings surrounding the application site | Low-Medium | Medium | Not significant |

## 10.19 Impact Assessment Conclusion

There will be no significant negative impact from blast vibration following the implementation of the recommended mitigation measures.

## 10.20 Glossary of Technical Terms

*Peak Particle Velocity* (PPV) – the maximum rate of change of particle displacement, measured in millimetres per second (mm/sec).

*Frequency* (Hz) – the number of cycles per second of vibration usually expressed in Hertz (Hz).

*dB* – Decibel, a unit of measure on a logarithmic scale used to quantify pressure fluctuations such as those associated with air overpressure (concussion wave).

*dB(A)* – Decibel measured within an A weighted frequency curve that differentiates between sounds of different frequency in a similar way to the human ear.

*Maximum Instantaneous Charge Weight* – The maximum amount of explosives detonated at any one precise instance in time.

*Scaled Distance* – The blast/receiver separation distance divided by the square root of the maximum instantaneous charge weight.

*Blast Ratio* – The amount of work per unit of explosive measured in tonnes of rock per kilogram of explosives detonated.

*Delay Interval* – The time between successive detonations of detonators.

*Sequential Detonation* – The method of control of time intervals between explosions of individual charges.

*Stemming* – The term given to the inert material, typically stone chippings that is placed into the top of a borehole which has already been filled with explosives. The length of stemming should equal the distance between the hole and its associated free face.

*Burden* – The distance measured at right angles between a row of holes and the free face, or between rows of holes.

*Shot* – is a borehole complete with primed charge and stemming.

*Bench blasting* - method of blasting in quarries and opencast sites by means of steps or benches with holes positioned parallel to the bench face.

*Flyrock* - The projection of material from the blast site to any area beyond the designated danger zone.

*Free face* - A rock surface bounded by air.

## 10.21 Vibration Terminology

*Particle Velocity (V)* - the particle velocity is defined as the rate of change of amplitude or, for sinusoidal motion this may be mathematically expressed as;

$V=2\pi fa$

Where, 'V' represents PPV (mm/sec.), 'f' is the frequency (Hz) and 'a' is the peak particle displacement or amplitude (mm). Particle velocity as the term suggests is the movement of particles within a body or medium.

Vibration is usually measured in three orthogonal directions: the vertical, horizontal transverse and the horizontal longitudinal (often termed the x, y, z vector components). Vibration waves can be divided into P (primary) waves which are compression wave, S (secondary) waves which are shear waves, Rayleigh waves, Love waves, Stonely waves etc. However, in practice it is very difficult (and not very important) to distinguish between these waves. In most cases the vertical component is the *body wave* while the *surface waves* are the longitudinal and transverse waves.

Peak Particle Velocity (PPV)- the peak particle velocity is the maximum peak level of the 3 vectors (x, y, z), often referred as the real-time resultant. As all three vectors have different travel times the PPV of the three vectors will not arrive at the same time at a monitoring location.

*Peak Vector Sum (PVS)* - the peak vector sum is often referred to as the RPPV (resultant peak particle velocity) and can be mathematically expressed as;

$$PVS = \sqrt{X^2 + Y^2 + Z^2}$$

and this is the pseudo resultant (not the real time resultant). You will usually find that in practice the average difference in the peak vector-particle and the PVS is less than 10% at distances in excess of 200 metres[5].

*Zero cross frequency (zc)* - zero crossing frequency is the frequency at the peak particle velocity of the recorded wave.

## 10.22 References

[1] Siskind, D.E., Stagg, M.S., Kopp, J.W. and Dowding C.H., *Structural response and damage produced by ground vibration from surface mine blasting,* United States Bureau of Mines (USBM), Report of Investigations No. RI 8507, 1980. OSMRE –The U.S. Office of Surface Mining (OSM) regulation given by the solid line is a modification of USBM

[2] DIN 4150: Part 3: 1986, *Vibrations in buildings; effects on structures.*

[3] BS 7385: Part 2: 1993 *Evaluation and measurement for vibration in buildings,*

Part 2. Guide to damage levels from ground borne vibration.

[4] Dowding, Charles, H. (1996). *Construction Vibrations*, 610 pages, Prentice Hall.

[5] O'Reilly, B., (2000), Noise and Vibration Monitoring Around an Active Base Metal Mine, M.Phil Thesis, Liverpool University, U.K.

[6] BS 5228-1:2009: Code of Practice for noise and vibration and open sites- Part 1: Noise

# Section 11: CLIMATE

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# 11 CLIMATE

## 11.1 Introduction

This section of the EIAR assesses potential impacts that the development may have with regards to climate and climate change. Climate can be thought of as the 'average weather' over an extended period of time and so refers to temperature, precipitation and wind.

The topic of 'Climate' is commonly discussed with reference to 'Climate Change' which is any significant change in the measures of climate over an extended period of time. Climate change includes major changes in temperature, precipitation or wind patterns, among others, that occur over several decades or longer.

## 11.2 Methodology

The methodology for the description of the current climate in the region of the proposed development included a desk study of the available data from Met Eireann, the Environmental Protection Agency (EPA) and other bodies which have a responsibility for Climate records in Ireland and Europe. Met Eireann data from Malin Head recording station was used to assess the climate in the region of the application site. Malin Head is the nearest Met Eireann recording station located approximately 59 km to the north of the application site.

## 11.3 Climate Change

Climate change is a significant change recorded for the climate of a region. Climate change can be caused by natural occurrences such as volcanic eruptions or variations in solar intensity. Recent use of the term climate change more commonly refers to changes in the climate due to anthropogenic activity, namely the build-up of Greenhouse gases (GHGs) in the atmosphere. This build-up of GHGs is caused by emissions associated with human activity such as the burning of fossil fuels for energy, transport and heating.

### 11.3.1 Kyoto Protocol

The Kyoto Protocol was an historical agreement in that it was the first international agreement in which many of the world's industrial nations concluded a verifiable agreement to reduce their emissions of six greenhouse gases in order to prevent global warming. The major feature of the Kyoto Protocol is that it sets binding targets for 37 industrialised countries and the European community for reducing emissions. These amount to an average of five per cent against 1990 levels over the five-year period 2008-2012.

The Kyoto Protocol was adopted in Kyoto, Japan, on 11 December 1997 and entered into force on 16 February 2005. 184 Parties of the Convention have ratified its Protocol to date. It is an international agreement linked to the United Nations Framework Convention on Climate Change.

The major distinction between the Kyoto Protocol and the United Nations Framework Convention on Climate Change is that while the Convention encouraged industrialised countries to stabilise greenhouse gas emissions, the Protocol commits them to do so. Recognizing that developed countries are principally responsible for the current high levels of emissions in the atmosphere as a result of more than 150 years of industrial activity, the Protocol places a heavier burden on developed nations under the principle of "common but differentiated responsibilities."

Under the Kyoto Protocol, Ireland was required to limit total national GHG emissions to 3.14 Mtonnes of CO2eq over the 5-year period 2008-2012 which is equivalent to 62.8Mtonnes of CO2eq per annum. The Kyoto Protocol limit was calculated as being 13% above Ireland's 1990 baseline which was established and fixed at 55.61 Mtonnes CO2eq following an in-depth review of Ireland's 2006 GHG inventory submission to the UNFCC (United Nations Framework Convention of Climate Change).

In December 2012 the Kyoto Protocol was amended. The amendment was referred to as the 'Doha Amendment to the Kyoto Protocol' which included the following amendments.

- New commitments for Annex I Parties to the Kyoto Protocol who agreed to take on commitments in a second commitment period from 1st January 2013 to 31st December 2020.
- A revised list of greenhouse gases (GHG) to be reported on by the Parties in the second commitment period.
- Amendments to several articles of the Kyoto Protocol which specifically referenced issues pertaining to the first commitment period and which needed to be updated to the second commitment period.

During the second commitment period, parties committed to reduce GHG emissions by at least 18% below 1990 levels in the eight-year period between 2013 and 2020. This placed binding targets on Ireland regarding climate change, with penalties for non-compliance.

### 11.3.2 Paris Agreement 2015

A legally binding global agreement on climate change was agreed in Paris on 12th December 2015. The Paris Agreement put in place the necessary framework for all countries to take ambitious mitigation action. It sets out a long-term goal to put the world on track to limit global warming to well below 2 degrees Centigrade above pre-industrial levels and to pursue efforts to limit the temperature increase to 1.5 degrees. It aims to tackle 95% of global emissions through 188 Nationally Determined Contributions (NDCs). The agreement also places significant importance on actions needed, both nationally and globally, to help people adapt to climate change.

Ireland will contribute to the Paris Agreement via the NDC tabled by the EU in March 2015 on behalf of Member States, which commits to at least a 40% reduction in EU-wide emissions by 2030 (compared with 1990 levels): this is based on reductions in the Emissions Trading Scheme (ETS) and non-ETS sectors of 43% and 30% respectively (compared to 2005).

In July 2016, the European Commission presented a legislative proposal, The Effort Sharing Regulation (ESR) setting out binding annual GHG targets for Member States or the period 2021 to 2030. Under the ESR, targets have been proposed for Member States based on GDP per capita and the cost-effectiveness of domestic emissions reductions within individual Member States. The final agreement sets a target of 30% reduction in greenhouse gas emissions (compared to 2005 levels) by 2030 for Ireland. This will be Ireland's contribution to the overall EU objective to reduce its emissions in the non-ETS sectors by 30% by 2030 compared to 2005. The ESR was provisionally agreed by the European Council and the European Parliament in December 2017 and was formally adopted in May 2018.

It is clear that meeting its climate change obligations will be a huge challenge for Ireland. It will require substantial investment by both the public and private sectors, as well as a broad range of non-financial policy tools, including regulations, standards, education initiatives and targeted information campaigns. Work is ongoing to cost various suites of measures that could meet the 2030 target as cost-effectively as possible.

### 11.3.3 Compliance with EU and International Commitments

The latest data available is taken from the publication 'Ireland's Provisional Greenhouse Gas Emissions 1990-2020' produced by the EPA in October 2021. Key findings in the report are listed below.

- 2020 total national greenhouse gas emissions are estimated to have declined by 3.6% on 2019 levels to 57.70 million tonnes carbon dioxide equivalent (Mt CO2eq). This reduction in total emissions was driven by the COVID impact on Transport and less peat used for electricity generation. It highlights that further transformative measures will be needed to meet National Climate ambitions

- The Provisional estimates of greenhouse gas emissions indicate that Ireland will exceed its 2020 annual limit set under the EU's Effort Sharing Decision (ESD) by 6.73 Mt CO2eq, the 5th year in a row limits were exceeded. The cumulative exceedance for the 2013-2020 period is 12.02 Mt CO2eq.

- In 2020, emissions from Ireland's Emissions Trading Sector (ETS) decreased by 6.2% or 0.89 Mt CO2 eq while non-ETS emissions decreased by 2.8% or 1.26 Mt CO2 eq. Since 2005, emissions in the ETS sector have decreased by 40.8% or 9.15 Mt CO2 eq whereas emissions under the non-ETS only decreased by 7.0% or 3.33 Mt CO2 eq, considerably short of Ireland's 20% reduction commitment

- Emissions in the Energy Industries sector show a decrease of 7.9% or 0.74 Mt CO2eq in 2020, which is attributable to a 51% decrease in peat used in electricity generation. Electricity generated from wind increased by 15.3% in 2020. The reduced peat use and increased wind and hydro-electricity resulted in a 8.1% decrease in the emissions intensity of power generation in 2020 to 295 g CO2/kWh.

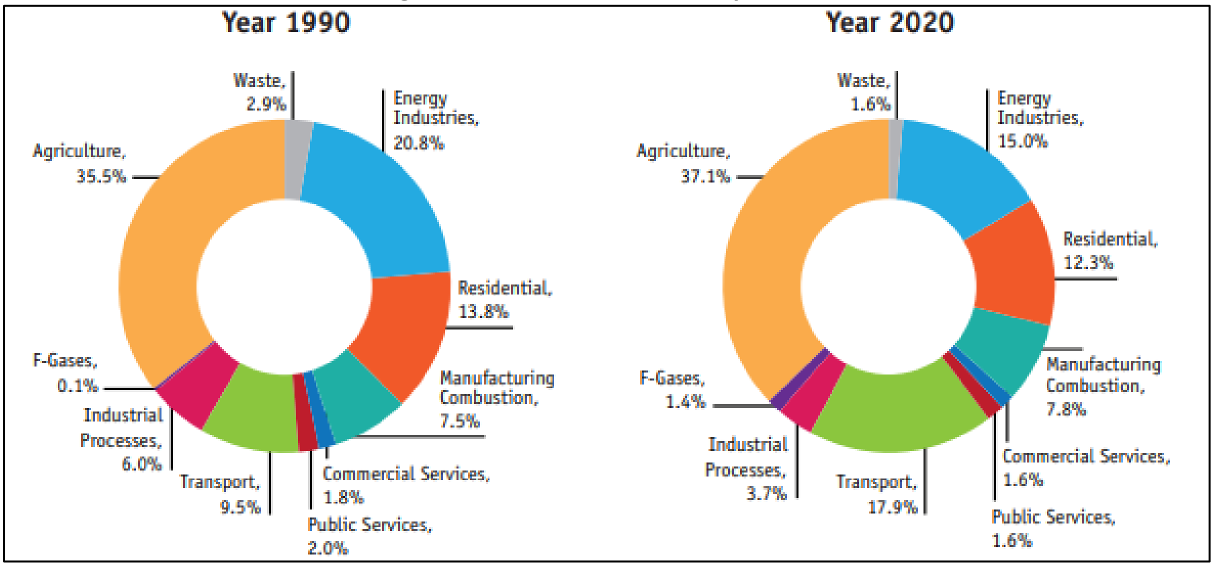
- Agriculture emissions increased by 1.4% or 0.3 Mt CO2eq in 2020, driven by increased fertiliser nitrogen use (3.3%) increased numbers of livestock including dairy cows (3.2%), other cattle (0.6%), sheep (4.8%) and pigs (2.5%). Total milk production increased by 3.8% in 2020, with only a marginal increase in the milk output per cow (0.6%).

- Greenhouse gas emissions from the Transport sector decreased by 15.7% or 1.92 Mt CO2eq in 2020. This decrease was largely driven by the impact of COVID restrictions on passenger car and public transport usage. International aviation, not included in national total emissions, declined by 65% in 2020 or by 2.17 Mt CO2 eq.

- Greenhouse gas emissions from the Residential sector increased by 9.0% or 0.59 Mt CO2eq due to substantial increases in carbon intensive fossil fuel use; coal +6%, peat +3% and Kerosene +19%. Natural gas use decreased marginally by -0.3%. Accelerated retrofitting required to decarbonise home heating.

Figure 11.1 below illustrates the change in contribution by sector to GHG from 1990 to 2019.

**Figure 11.1: GHG Emissions by Sector**




(from EPA provisional report)

GHG emission projections for the period 2020 – 2040 have been made and published by the EPA in July 2021 'Ireland's Greenhouse Gas Emissions Projections 2020-2040'. Key findings in the report are listed below.

- Implementation of "Additional Measures" (including those in the 2019 Climate Action Plan) is projected to save 58 Mt CO2 eq over the period 2021-2030 compared to the "With Existing Measures". This represents a reduction of 1.8% per annum in emissions over the period.

- Ireland's emissions covered by the 2013-2020 EU Effort Sharing Decision target are estimated to have been 7% below 2005 levels in 2020. Ireland is estimated to have cumulatively exceeded its compliance obligations by 12.2 Mt CO2 eq over the 2013- 2020 period and will need to use credits and/or purchase surplus annual emission allocations from other member states to achieve compliance.

- These Projections indicate that Ireland can meet its non-ETS EU targets over the period 2021 to 2030 assuming full implementation of the 2019 Climate Action Plan and the use of the flexibilities available. Future, more ambitious targets as presented in the European Climate Law and Ireland's Climate Bill will require many (as yet unidentified) additional measures.

- Increased renewable electricity generation, including a projected 5GW of offshore wind generation, is expected to contribute to a 70% contribution of renewable energy in electricity generation by 2030. Energy industries emissions are projected to decrease by one third by 2030 compared to the most recent figures in 2019.

- Agriculture emissions are projected to decline by 1.2% per annum over the 2021- 2030 period, provided the 16.5 Mt CO2 eq savings from the agriculture sector identified in the 2019 Climate Action Plan are realised. Increase use of protected urea fertilisers and low emission slurry spreading, along with other measures targeting methane emissions from animals, will be required.

- The impact of COVID is projected to have led to a 14% reduction in transport emissions in 2020 compared to 2019. The measures in the 2019 Climate Action Plan include 936,000 electric vehicles on the road by 2030 and are projected to reduce emissions to 25.5% below 2019 levels by 2030. It will be necessary to avoid a post COVID surge in emissions to achieve that reduction.

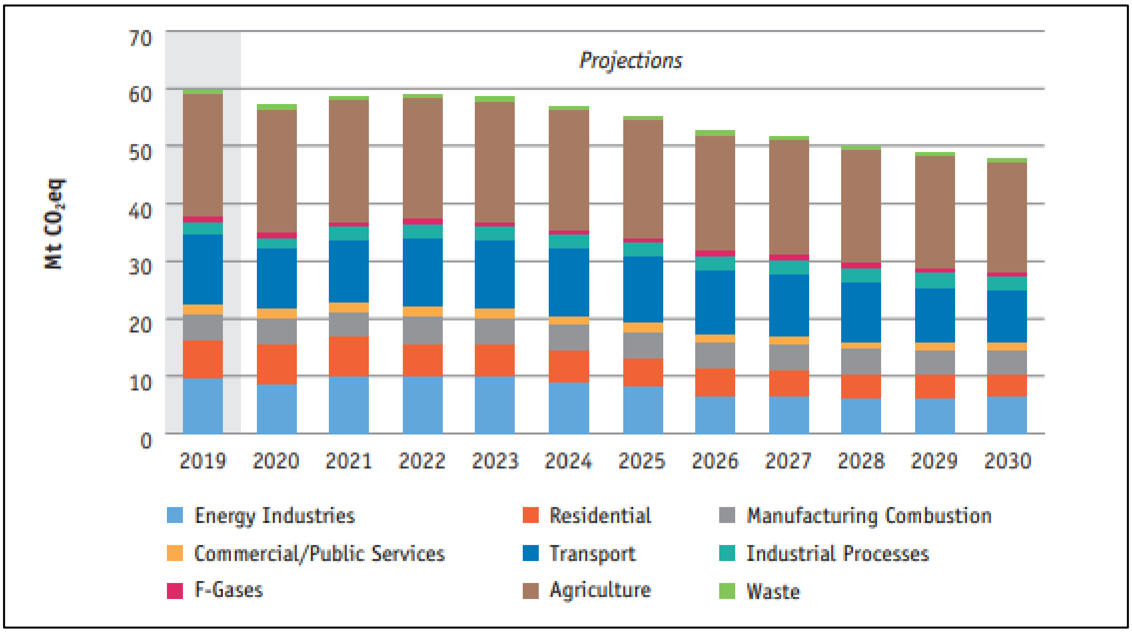
- The projected impact of COVID in the residential sector in 2020 is an increase of almost 9% in emissions compared to 2019, driven by increased working from home. This highlights the need for our houses to become far more efficient, particularly in the context of broader home working. Implementing the 2019 Climate Action Plan measure for the installation of over 600,000 heat-pumps by 2030 as well as retrofitting 500,000 homes to a B2 equivalent BER will help achieve this

- A strong impact from COVID is seen in the emissions projections for 2020 and 2021. A decrease of transport emissions and increase in residential emissions are the most obvious effects projected. Agriculture emissions are projected to have been little affected and energy emissions decreases are not primarily COVID related. As the economy exits from COVID restrictions, a "green recovery" where investment is targeted at measures which reduce or avoid greenhouse gas emissions, can result in better outcomes for society and the environment.

- The scale and pace of the changes needed to achieve the targets set out in the 2019 Climate Action Plan are significant, but the extent of change required to meet the Climate Bill and European Climate Law targets is unprecedented. Further ambitious measures in key sectors such as agriculture, transport and power generation will need to be identified, planned and implemented as soon as possible.

Total GHG emissions projections by sector under the 'with additional measures' scenario to the year 2030 are represented graphically below in Figure 11.2.

**Figure 11.2: Total GHG emission projections to 2030**




(from EPA GHG projections 2020-2040)

### 11.3.5 Local and Regional Climate

Ireland has a typical maritime climate, with relatively mild and moist winters and cool, cloudy summers. The climate of the application site is typical of the Irish climate. The climate is influenced by warm maritime air associated with Gulf Stream which has the effect of moderating the climate, and results in high average humidity across the country. The area of highest precipitation is along the western coast.

Data from Met Eireann's Malin Head weather station for mean monthly temperature, and monthly rainfall for the past three complete years is shown in Table 11.1.

**Table 11.1: Monthly values for temperature and precipitation for Malin Head 2019, 2020 & 2021**

MONTHLY VALUES FOR MALIN HEAD UP TO 12-FEB-2022

Total rainfall in millimetres for MALIN HEAD

| Year | Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec | Annual |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 2022 | 93.1 | 55.6 | | | | | | | | | | | 148.7 |
| 2021 | 126.9 | 96.1 | 90.7 | 31.6 | 99.3 | 49.0 | 52.0 | 69.1 | 68.3 | 156.2 | 95.4 | 115.2 | 1049.8 |
| 2020 | 79.3 | 210.4 | 79.4 | 20.1 | 37.3 | 106.3 | 133.8 | 123.1 | 115.7 | 148.4 | 130.0 | 144.3 | 1328.1 |
| 2019 | 81.5 | 59.7 | 138.8 | 49.9 | 79.9 | 67.3 | 85.9 | 162.9 | 124.5 | 83.4 | 91.7 | 124.2 | 1149.7 |
| LTA | 119.7 | 87.4 | 88.4 | 64.7 | 58.4 | 70.2 | 80.8 | 95.4 | 96.4 | 120.6 | 108.6 | 116.4 | 1107.0 |

Mean temperature in degrees Celsius for MALIN HEAD

| Year | Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec | Annual |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 2022 | 7.3 | 6.9 | | | | | | | | | | | 7.2 |
| 2021 | 5.1 | 6.1 | 7.5 | 7.3 | 9.4 | 13.2 | 14.9 | 14.4 | 14.3 | 11.8 | 9.6 | 7.2 | 10.1 |
| 2020 | 7.1 | 5.6 | 6.6 | 8.8 | 11.2 | 12.5 | 13.5 | 14.5 | 13.2 | 10.4 | 9.1 | 6.4 | 9.9 |
| 2019 | 6.4 | 8.1 | 7.6 | 9.3 | 10.0 | 12.4 | 15.4 | 15.1 | 13.5 | 10.2 | 7.3 | 7.0 | 10.2 |
| LTA | 5.9 | 5.8 | 6.8 | 8.2 | 10.3 | 12.5 | 14.3 | 14.5 | 13.1 | 10.7 | 8.2 | 6.4 | 9.7 |

(Met Eireann)

Long term averages are calculated from the latest complete 30-year data set. The latest available long-term average is calculated from data recorded between 1981-2010. The long-term average annual precipitation value for Malin Head is 1,076 mm. The long-term average annual mean temperature for Malin Head is 9.8 degrees Celsius.

According to Met Eireann the average hourly wind speed in Donegal experiences significant seasonal variation over the course of the year. The windier part of the year lasts for 5.6 months, from October 11 to March 29, with average wind speeds of more than 14.0 miles per hour. The calmer time of year lasts for 6.4 months, from March 29 to October 11. Table 11.2 show the number of days with mean wind speeds exceeding 15 m/s for 10 minutes or more for the years 2018-2020 inclusive.

**Table 11.2: No of days with 10 min wind speeds> 15 m/s (2018-2020 inc.).**

Number of days with a maximum 10-min. mean wind speed >= 15m/s

| Year | Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 2021 | n/a | n/a | n/a | n/a | n/a | n/a | n/a | n/a | n/a | n/a | | |
| 2020 | 19 | 26 | 10 | 3 | 4 | 4 | 5 | 3 | 5 | 15 | 11 | 15 |
| 2019 | 11 | 10 | 13 | 9 | 1 | 3 | 0 | 4 | 7 | 9 | 10 | 16 |
| 2018 | 21 | 13 | 11 | 9 | 2 | 2 | 1 | 1 | 9 | 9 | 11 | 11 |

(Met Eireann)

### 11.3.6 Land Use

The site is located in rural area with one-off houses, farmsteads, agricultural land and forestry plantations. Land use is predominantly agriculture with grazing of sheep and cattle on improved grassland.

## 11.4 Characteristics of the Development

The planning application is for a period of 25 years and the proposal is to reopen an existing quarry on the application site. Proposals are to extract and process rock from the original footprint of disturbed ground and also to extract from an additional area of new ground immediately to the northeast of the existing quarry void. The new ground is proposed to be stripped, drilled and blasted. It is proposed to deepen existing extraction depths to approximately 10m below the existing quarry deck level. When the material is loose from the rock face it will be moved to a primary crusher where uniform stone size will be achieved through grading. Material will be taken from the crushers and screeners and stockpiled on site for use throughout Donegal. All of the material will be processed to IS EN 13242 and SR 21 standards as per the National standard for Civil Engineering products. No washing of stone is planned on this site.

The development is proposed in a phased manner with 5, 5-year stages proposed. The initial phase of operation will involve the construction of an office building, weighbridge, machinery shed and all site drainage. A 4-stage settlement tank system with constructed wetland is proposed to treat all effluent and stormwater. The applicant will seek a trade discharge licence for the outflow from the settlement system from Donegal County Council. A wastewater treatment system is to be installed to treat wastewater and sewage from the office building. Noise abatement measures and dust control measures are proposed. The office will have an electricity supply and telecommunications connection.

Landscaped berms surrounding the site are proposed to screen workings. It is anticipated that initially the quarry will employ 8 persons directly with more employed indirectly. The application also includes restoration proposals which will form an integral part of the operation to ensure that the quarry site can return to use as a natural habitat once production ceases.

Further details on the characteristics of development are provided in Section 3, Project Description, of this EIAR.

## 11.5 Impact Assessment

There will be an initial construction phase and then extraction is planned for five operational phases associated with the proposed development. The potential impacts for the construction and operational phases are outlined below.

### 11.5.1 Construction Impacts

#### 11.5.1.1 Plant and Vehicle Emissions

The operation of plant and movement of vehicles will generate exhaust emissions. These emissions are an inevitable consequence of construction. The quantities of exhaust emissions and $CO_2$ released from construction activities will not results in an adverse impact to the local micro-climate or the broader macro climate. These impacts will be temporary as construction is expected to last for less than 12 months. Emissions associated with the development are assessed as not significant.

### 11.5.2 Operational Impacts

#### 11.5.2.1 Plant and Vehicle Emissions

The operation of plant and movement of vehicles will generate exhaust emissions. These emissions are an inevitable consequence of the production of quarry product. Inevitably over the lifetime of the project plant and quarry vehicles will need replaced. Priority will be given to energy efficient low emission vehicles and plant when considering new replacement plant and vehicles.

The development of the site as a quarry supplying quality product to the local market is likely to reduce emissions by reducing the distance customers have to travel to source product. This may have an overall positive effect of emissions levels in a regional context. Overall, the development is assessed as having a slightly positive impact.

#### 11.5.2.2 Loss of Vegetation

There will be an inevitable loss of vegetation with clearance for site infrastructure and to facilitate extraction. This will be offset with the landscaping plan for the site which will increase biodiversity in the overall site and introduce a tree planting scheme for carbon sequestration. The planned constructed wetland will also contribute to carbon capture, increase biodiversity and offset the loss of vegetation. Overall, the impact is assessed as long term neutral.

### 11.5.3 Unplanned Events

The proposed development must also be assessed in relation to unplanned events in terms of vulnerability to the risks of major accidents or disasters relevant to the project. The types of event considered are floods, extreme temperatures and storms.

- Flooding. Extreme rainfall events are becoming more common. This site has been assessed in a basic flood risk assessment as part of Section 8, Water, and found to be not at risk of flooding.
- Extreme Temperatures. Operational procedures will be in place for times when the temperature is low enough to case freezing including gritting areas and re-scheduling potentially hazardous dispatches of material. The quarry will not operate when a ‘red’ level weather warning is issued by Met Eireann.
- Storm Events. Extreme windy conditions could potentially lead to damage to infrastructure and buildings. Plant and buildings on the application site will be regularly inspected for structural integrity. Loose items that may be moved by high winds will be secured. The quarry will not be operational when a ‘red’ level weather warning is issued by Met Eireann.

#### 11.5.4 Cumulative Impact

The application site must also be considered in association with other developments located within or close to the application site.

#### 11.5.4.1 Other Developments

There are no other developments in the vicinity of the application site which would result in a significant cumulative impact. A search of the planning portal of the Donegal County Council website revealed no planned development which may result in significant cumulative impact in the vicinity of the application site. The application site is situated in a rural environment where the two main land uses are livestock farming and private commercial forestry. Agriculture is a significant contributor to Ireland's GHG emissions, but the type of agriculture practiced in the vicinity of the application site is low intensity livestock farming. The many private forestry stands in the area surrounding the application site will be acting as a carbon sink for greenhouses gases.

#### 11.5.5 Do-Nothing Option

If the proposed is not granted planning permission then the site is likely to remain in agricultural use. Potential employment from the construction and operational phase will not occur. The likely significant secondary benefit to the wider local economy with the development of the project will not occur with the do-nothing option.

Any benefit from a reduction in greenhouse gas emissions from the proposed activities are likely to be outweighed by increased greenhouse gas emission relating to customers in the locality/region having to source quarry products from much further afield. A reduction in the greenhouse gas emissions at the application site is likely to result in an increase in greenhouse gas emissions at an alternative quarry (or quarries).

### 11.6 Mitigation Measures

The following mitigation measures will be practiced at the proposed development to reduce greenhouse gas emissions in order to limit the effects of the development on the local and regional climate.

- Strict adherence to good operational practice such as switching off plant and vehicles when not in use during the construction phase
- All plant and vehicles involved in the construction phase will be regularly serviced to ensure they are running as efficiently as possible
- Energy consumption ratings will be considered when upgrading new vehicles associated with the site.
- It is proposed to implement regular energy audits in order to assess energy requirements and areas where energy usage can be reduced. This will lead to a reduction in greenhouse gas emissions.
- Landscaping plan (section 15) to offset vegetation loss and increase net biodiversity.

### 11.7 Residual Impacts

Residual impacts are those that remain after the implementation of the mitigation measures.

No residual impacts are expected, other than the slight positive impact on climate due to the reduced travel distance customers are to travel for quarry product.

### 11.8 Determination of Significance of Impact Pre-Mitigation

| **Impact** | **Receptor** | **Description of Impact (Character/Magnitude/ Duration/Probability/ Consequences)** Negligible - High | **Existing Environment (Significance / Sensitivity)** Negligible -High | **Significance** Imperceptible - Profound |
|---|---|---|---|---|
| Plant & Vehicle emissions during | Climate | Low-Negligible | Medium | Not Significant |

| Impact | Receptor | Description of Impact (Character/Magnitude/ Duration/Probability/ Consequences) Negligible - High | Existing Environment (Significance / Sensitivity) Negligible -High | Significance Imperceptible - Profound |
|---|---|---|---|---|
| construction and operational phases | | | | |
| Loss of vegetation | Climate | Low | Medium | Slight |

### 11.9 Summary of Mitigation Measures

| Summary of Mitigation Measures Proposed |
|---|
| Strict adherence to good operational practice must be implemented, such as switching off plant and vehicles when not in use during the construction phase. |
| All plant and vehicles involved in the construction phase must be regularly serviced to ensure they are running as efficiently as possible. |
| Energy consumption ratings and emission levels must be considered when upgrading new vehicles associated with the site. |
| Regular energy audits must be implemented to assess energy requirements and areas where energy usage can be reduced. This will lead to a reduction in greenhouse gas emissions. |
| Landscaping plan (section 15) must be implemented to offset vegetation loss and increase net biodiversity. |

### 11.10 Determination of Significance of Impact Following Mitigation

| Impact | Receptor | Description of Impact (Character/Magnitude/ Duration/Probability/ Consequences) Negligible - High | Existing Environment (Significance / Sensitivity) Negligible -High | Significance Imperceptible - Profound |
|---|---|---|---|---|
| Plant & Vehicle emissions during construction and operational phases | Climate | Low-Negligible | Medium | Imperceptible |
| Loss of vegetation | Climate | Low | Medium | Neutral |

### 11.11 Impact Assessment Conclusion

There is expected to be a slight positive impact on climate following the implementation of the recommended mitigation measures.

### 11.12 Technical Difficulties

There were no technical difficulties encountered.

# Section 12: MATERIAL ASSETS - TRAFFIC

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# 12 MATERIAL ASSETS – TRAFFIC

## 12.1 Introduction

This section of the Environmental Impact Assessment Report (EIAR) evaluates the effects that the projected quarry traffic will have on the existing road network in its vicinity.

## 12.2 Scope

The scope of this section includes

1. An assessment and description of the existing road network surrounding the existing quarry.
2. An assessment of the impact of the quarry traffic within the road network.
3. A recommendation of remedial measures to reduce or mitigate against any potential negative impacts.

## 12.3 References

Data sets, publications and information from the following organisations were consulted during the preparation of this section:

1. Ordnance Survey of Ireland, www.osi.ie
2. The National Roads Authority, www.nra.ie

The scope and content of this section was largely guided by the documents below:

1. The Environmental Protection Agency (EPA) 2017 – *'Draft Guidelines on the information to be contained in Environmental Impact Assessment Reports (EIAR)'*
2. The Environmental Protection Agency (EPA) 2002 – *'Guidelines on the information to be contained in EIS'*
3. Donegal County Council 2018 – *'Donegal County Development Plan 2018-2024'*
4. National Roads Authority 2014 - *'Traffic and Transport Assessment Guidelines'*

## 12.4 Methodology

The methodology involved in the assessment of the roads and traffic impact of the site was through a desk top study of the road network combined with analysis of traffic data available. Interpretation and analysis of the information gathered is presented in this report.

## 12.5 Site Description

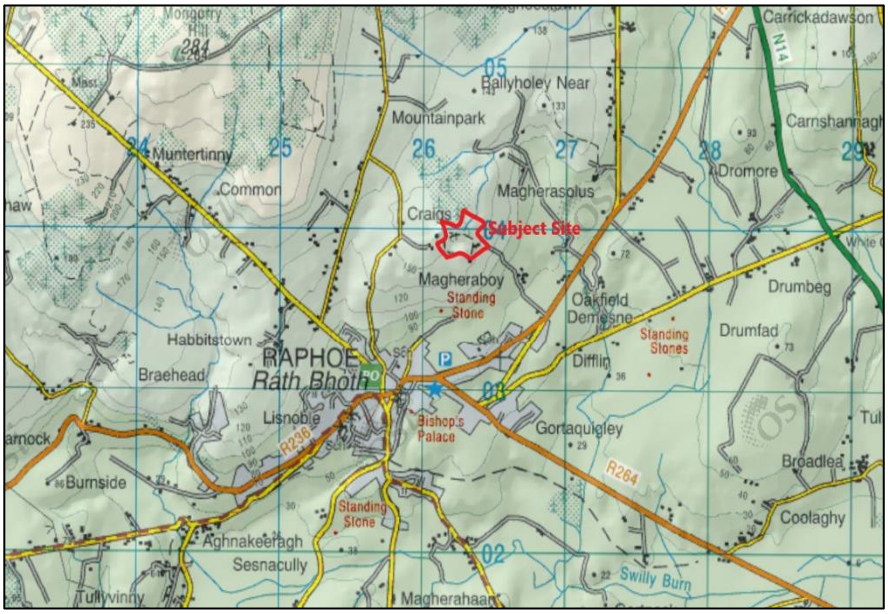
The subject site and associated activities are fully described in Section 3. This section of the EIAR will focus on the description of the subject site and its activities which have an impact on the road network and traffic of the area.

## 12.6 Road Network

The subject site is located within the townlands of both Craigs and Magherasolis, Raphoe, County Donegal. The quarry is served by the L-23749 which is a local tertiary road and is in good condition. This road leads directly onto the R236 regional road and the R236 then meets the N14 national road 2.45 kilometres from the main entrance to quarry.

Map 12.1 shows the network of local roads surrounding the quarry and the overall distribution of roads in the general area.

**Map 12.1: Site Location in Relation to Road Network**




**CYAL50244901** © Ordnance Survey Ireland/Government of Ireland

Photograph 12.1, below, shows the Local Road L-23749 at the main entrance.

**Photograph 12.1:**
**The existing roadway entrance to the subject site looking right towards Raphoe.**

**Photograph 12.2:**
**The Existing roadway entrance to the subject site looking left.**


**12.6.1 Local Road Network**

The quarry is served by the L-23749 which is a country road and is in good condition. This road leads directly onto the R236 regional road and Raphoe town is located 900m SW of this road junction and 780m SW from the nearest boundary of the subject site (930m to quarry face). The R236 meets the N14 national road 2.45 kilometres from the main entrance to quarry.

## 12.7 Road Traffic

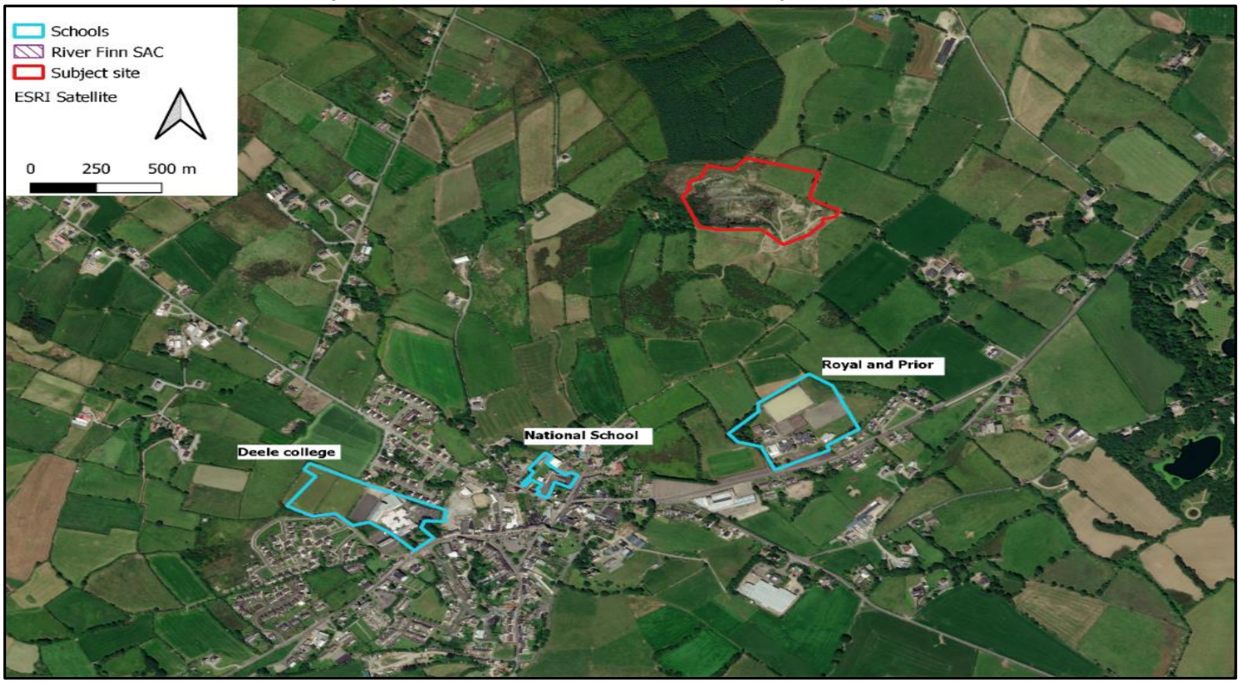
There are three schools located in the area which contribute to the road traffic levels. The Royal and Prior Comprehensive School is located 540m south of the subject site and 690m from the quarry face. Raphoe Central National School is located 745m SW from the nearest subject site boundary and 850m from the quarry face. Deele College Vocational School is located 1.03km SW from the closest border of the subject site and 1.14Km from the quarry face.

Raphoe livestock mart is located 710m south from subject site and 760m from quarry face, sheep sales are held on a Monday and beef sales on a Thursday. Both have a start time of 11am which means that tractors, jeeps with trailers and cattle lorries are arriving from 7am. This mart also holds a number of special sales throughout the year, many of which have evening sales times to facilitate part time farmers. There is a large car park located directly across from the mart and this is usually full on mart days. There is also a car park to the rear of the mart with approximately 40 parking spaces marked out. Additional mart traffic (mainly lorries and tractors) park at the mart entrance. Cars will also park along the roadside approaching the mart.

**12.7.1 Local business traffic:**

Raphoe is also home to the Department of Agriculture Food and the Marine. The County District Veterinary Office is also based in the same location. Approximately 40 staff are based here on a fulltime basis. Raphoe is also a busy commercial town with a thriving supermarket and butchers.

**Figure 12.1:**
**Location of subject site in relation to the town of Raphoe and local schools.**




**CYAL50244901** © Ordnance Survey Ireland/Government of Ireland

**Photograph 12.3:**
**View from the carpark of Raphoe livestock mart.**


## 12.8 Traffic Surveys

Three traffic surveys were carried out, the first on 10/02/22 from 8.30am-10.30am, the second on 03/03/2022 from 8.30am-10.30am and the third was carried out on 11/03/2022 from 8.30am-10.30am as part of the EIAR which surveyed the number of vehicles travelling on the main road to the south of the main entrance. Data from the survey is shown in Table 12.1.

**Table 12.1: Traffic Survey 1**

| Direction of travel | Vehicle type | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | Car/4x4 | Small Van | Large Van | Lorry | Tractor | Tractor and Trailer | 4x4 and Trailer | Pedestrians |
| *L-North along the main road to the east of the main entrance* | 355 | 36 | 24 | 14 | 3 | 10 | 30 | 38 |
| *R-South along the main road to the east of the main entrance* | 323 | 26 | 22 | 14 | 4 | 16 | 26 | 61 |

**Table 12.2: Traffic Survey 2**

| Direction of travel | Vehicle type | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | Car/4x4 | Small Van | Large Van | Lorry | Tractor | Tractor and Trailer | 4x4 and Trailer | Pedestrians |
| *L-North along the main road to the east of the main entrance* | 325 | 35 | 28 | 15 | 7 | 30 | 57 | 47 |
| *R-South along the main road to the east of the main entrance* | 280 | 20 | 23 | 8 | 3 | 24 | 45 | 61 |

**Table 12.3: Traffic Survey 3**

| Direction of travel | Vehicle type | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | Car/4x4 | Small Van | Large Van | Lorry | Tractor | Tractor and Trailer | 4x4 and Trailer | Pedestrians |
| *L-North along the main road to the east of the main entrance* | 301 | 27 | 16 | 11 | 6 | 2 | 8 | 43 |
| *R-South along the main road to the east of the main entrance* | 289 | 14 | 9 | 5 | 2 | 1 | 11 | 46 |

## 12.9 Road Safety Considerations

Guidelines state that sightlines must be provided for an entrance onto a county road which is 2.5m back from the road and provides clear sightlines of 70m in each direction. These conditions are fulfilled for the main entrance to the site.

## 12.10 Surface Run-off

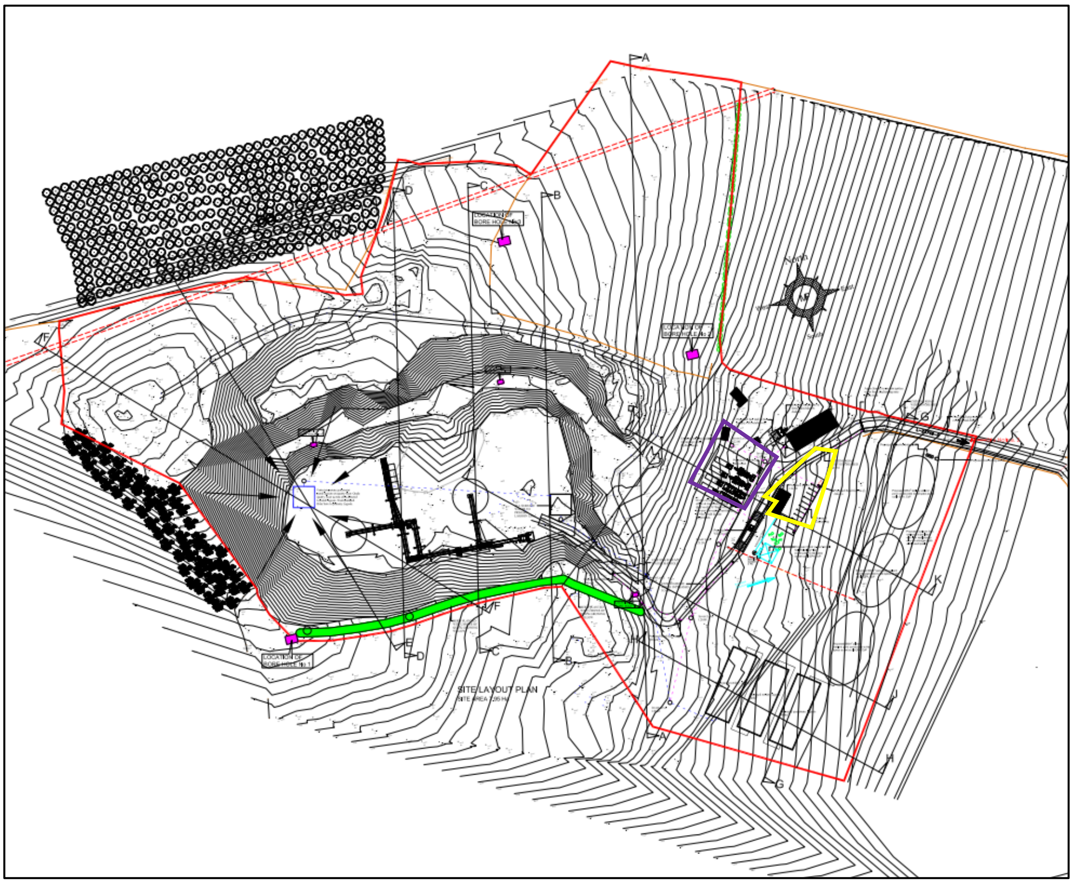
Mechanisms and infrastructure are proposed to ensure that effluent leaving the site is treated to the highest standard and will not negatively affect surface or groundwaters outside of the site. Constructed settlement tanks and a wetland system are proposed to treat all runoff from the quarry (see Section 8 of this EIAR for full detail on the proposed water management system).

Outflow from the wetlands is directed through the hydrocarbon interceptor. This will trap any oils/hydrocarbons present in the effluent before the treated effluent is discharged off site to the surface water drain. Immediately before final discharge off site to the surface water drain it is proposed to install a monitoring point. A robust water quality monitoring regime will be put in place for the lifetime of the project, monitoring the quality of site discharge and the quality of the receiving waters. A trade discharge licence will be sought from Donegal County Council for the final discharge and all licence conditions will be adhered to. With the above measures in place, there will be no effect on the local road system due to runoff from the quarry.

## 12.11 Car Parking

The proposed suitable parking for staff and visitor vehicles is outlined in yellow with parking for trucks and plant machinery outlined in purple in figure 12.2 below

**Figure 12.2: Carparks for Staff, Visitors and Machinery**



This Map was provided by Michael Friel Architects and Surveyors.

## 12.12 Impact of Quarry Traffic

It is predicted that approximately 18-20 loads of product per day will be transported off site creating approximately 40 traffic movements per day. This equates to a mean flow of 4.5 vehicle movements/hour. It is a possibility that demand could increase over a time period which would result in an increase in machinery operating and delivering lorries on the road. Raphoe is a busy commercial town as shown by the number of travelling vehicles recorded in the traffic surveys undertaken as part of this assessment. The surveys show that an average of 400 vehicles per hour travel along the main road (R236) to the east of the quarry. The projected vehicle movement of 4.5 per hour from the quarry would have no significant negative effect on traffic levels. The 20 vehicle movements relating to workers traffic to and from the quarry is also considered as not significant. The impact on roads and traffic is therefore assessed as imperceptible.

## 12.13 Remedial and Mitigation Measures

There are no specific mitigation measures proposed. The potential impacts of dust are dealt with in Section 10: *AIR (Dust & Ambient Noise)*, and mitigation measures are proposed such as the use of tailboards and dust suppression measures to reduce any potential negative impacts.

# Section 13: MATERIAL ASSETS - SITE SERVICES

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# 13 MATERIAL ASSETS – SITE SERVICES

## 13.1 Introduction

This section of the Environmental Impact Assessment Report (EIAR) evaluates the impact of the proposal on Material Assets – Site Services. They may be of either human or natural origin and the value may arise for either economic or cultural reasons.

The assessment is made by an examination of the material assets of the area and any potential impact that the proposed quarrying activities may have on existing surface water, water supply, foul drainage and utility services in the vicinity of the site as well as identifying proposed mitigation measures to minimise any impacts.

The material assets considered in this Section of the EIAR include Surface Water Drainage, Foul Drainage, Water Supply, Power, Gas and Telecommunications. These are resources that are valued and are intrinsic to the area.

## 13.2 Methodology

The information for the assessment of the impacts of the subject site was obtained from:

- The Environmental Protection Agency (EPA) 2017 – *'Draft Guidelines on the information to be contained in Environmental Impact Assessment Reports'*
- The Environmental Protection Agency (EPA) 2015 – *'Draft Advice Notes for Preparing Environmental Impact Statements'*
- Donegal County Council 2018 – *'Donegal County Development Plan 2018-2024'*
- The Environmental Protection Agency (EPA) 2006 – '*Environmental Management Guidelines - Environmental Management in the Extractive Industry (Non-Scheduled Minerals)'*
- Site Visits

The material assets which have been identified as being within and adjacent to the site and which may be directly affected by the activities undertaken are addressed below. The EPA *'Draft Guidelines on the information to be contained in Environmental Impact Assessment Reports'* (EPA 2017), states that the material assets should be addressed under the headings of:

- Built Services
- Roads and Traffic (see Section 12 *Material Assets Traffic*)
- Waste Management

There is an element of cross-over between this section and certain other sections. Some of the areas listed above are dealt with under the relevant sections of the EIAR, for example Impacts on Geological Heritage have been dealt with in Section 7 *Land, Soils and Geology*. Road damage is dealt with under Section 12 *Material Assets – Traffic*. Designed Landscape is dealt with under Section 15 *Landscaping & Restoration*. Archaeological Heritage, Folklore, Architecture and Monuments have all been dealt with in Section 14 *Cultural Heritage*.

## 13.3 Existing Environment

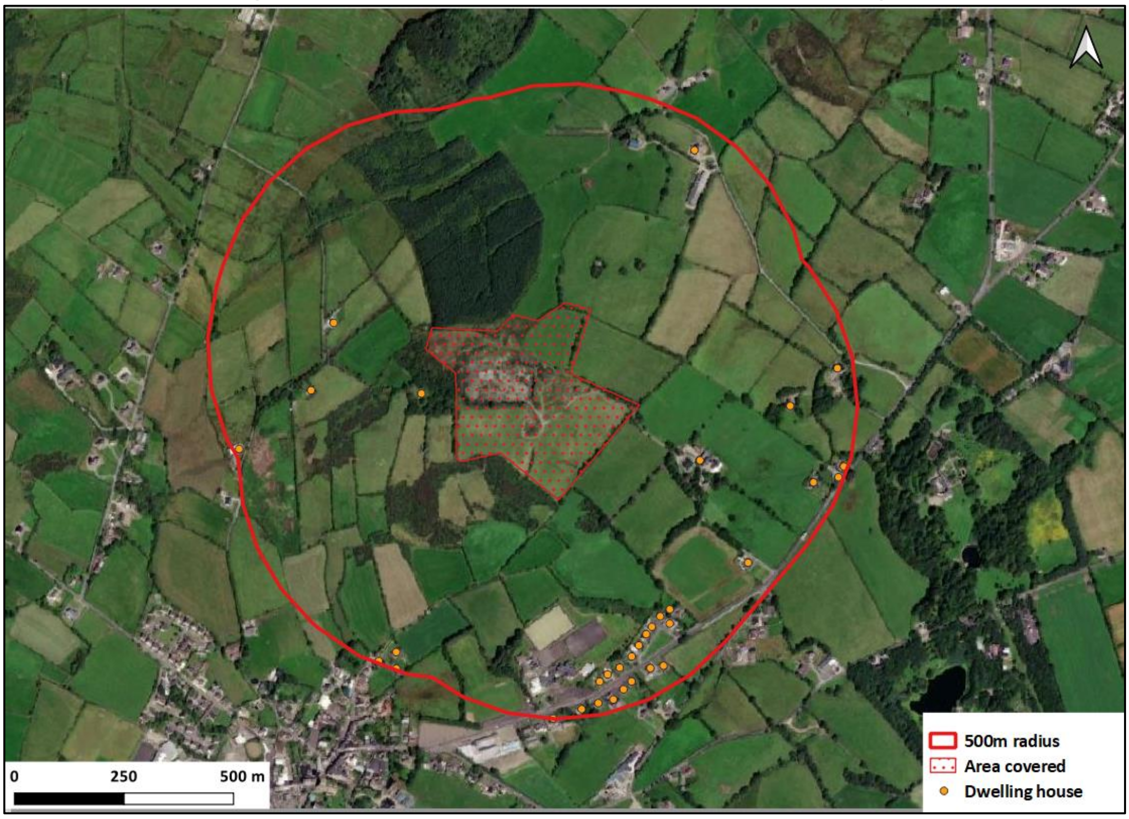
The subject site is located within the townlands of both Craigs and Magherasolis, Raphoe, County Donegal. The quarry is served by the L-23749 which is a local tertiary road and is in good condition. This road leads directly onto the R236 regional road. Raphoe town is located 900m Southwest of this road junction and 780m Southwest from the nearest boundary of the subject site (930m to quarry face). The site is surrounded by improved agricultural land, upland grassland and an area of commercial forestry.

The site is c.7.95 hectares in size and the proposal is for permissions for development at Magherasolis & Craigs, Raphoe, Co. Donegal to quarry the site which will be subject to extraction and processing of rock by drilling, blasting, crushing and screening, landscaping of the quarry during the operational phase and restoration of the quarry on completion of extraction, the erection of site offices and canteen facilities and the installation of a wastewater treatment unit and percolation area as well as all associated ancillary facilities for a period of 25 years.

### 13.3.1 Residential Buildings

The quarry is situated in a sparsely populated rural area with sporadic once off housing, the closest occupied dwelling is approximately 160m west of the subject site. There are 2 dwellings situated on the L-2182 local road on the approach to the quarry. The closest dwelling is approximately 150m from the quarry entrance.

**Figure 13.1: Site Location in Relation to Local Dwellings**

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### 13.3.2 Geological Resource

The area is underlain by meta-sedimentary rocks which are assigned to the Ballybofey Succession of the Dalradian. Most of the rocks in the Ballybofey Succession belong to the Argyll Group and the Southern Highland Group of Middle to Upper Dalradian age, and the rocks were originally deposited about 600 to 700 million years ago (see Section 7 for full detail on site geology). There are no County Geological Sites near the application site. The nearest County Geological Site is Lough Swilly (IGH site code ND015) located approximately 10 km to the north of the application site. The geological features of interest of Lough Swilly are the long wide fjord bordered by high bold cliffs in the north, passing to gentler coastal slopes and shallow flats in its southern reaches

### 13.3.3 Land Resource

The GSI mapviewer lists two different types of soils on the application site. A review of the EPA/Teagasc Soil map of Ireland shows the subject site as listed as Rock with the surrounding land classified as NBP4 ‘Loamy drift with igneous and metamorphic stones’. This is classified as a highly productive soil type and facilitates the intensive agricultural production in and around the Raphoe area which is known as the “Lagan Valley”.

The application site and existing quarry is situated on the uppermost south-eastern slopes of a small hill approximately 165 m OD. Topography on the application site varies from 170 m OD in the northwest corner, 128 m OD on the existing quarry deck and approximately 107 mOD along the eastern site boundary. Drainage is to the southeast from the site and to the Swilly Burn stream flowing through Oakfield Park Estate and onwards emptying into the Foyle system.

The Natura 2000 sites occurring within 15 Km of the subject site are listed in Table 13.1 and are screened for possible threats from the proposed development. pNHA sites are not a designated Natura 2000 sites but pNHA sites are still offered protection under planning legislation which requires that planning authorities give recognition to their ecological value[19].

**Table 13.1: Natura 2000 Sites within the Zone of Influence**

| Site Name | Site Code | Distance from Subject Site | Avenue of Connectivity to Subject Site | Significant Threat Possible (Y/N) |
|---|---|---|---|---|
| ***River Finn SAC*** | 002301 | 8.94km E | Through surface water run-off, potential for indirect effects. | **Y** |
| ***River Foyle and Tributaries SAC*** | UK0030320 | 8.94km E | Through surface water run-off, potential for indirect effects. | **Y** |
| ***River Foyle, Mongavlin to Carrigans pNHA*** | 002067 | 8.94km E | Through surface water run-off, potential for indirect effects. | **Y** |
| ***Feddyglass Woods pNHA*** | 001129 | 3.94 km E | No avenue for direct effects or indirect effects. | N |
| ***River Swilly Valley Woods pNHA*** | 002011 | 12.25km NE | No avenue for direct effects or indirect effects. | N |
| ***Port Lough pNHA*** | 000180 | 14.42km NE | No avenue for direct effects or indirect effects. | N |
| ***Lough Swilly Including Big Isle, Blanket Nook & Inch Lake pNHA*** | 000166 | 7.55km NW | No avenue for direct effects or indirect effects. | N |
| ***Lough Swilly SAC*** | 002287 | 7.51km NW | No avenue for direct effects or indirect effects. | N |
| ***Lough Swilly SPA*** | 004075 | 7.51km NW | No avenue for direct effects or indirect effects. | N |

[19] National Parks and Wildlife Services - https://www.npws.ie/protected-sites/nha

A separate Natura Impact Statement (NIS) has been prepared for this planning proposal.

## 13.4 Utilities and Services

### 13.4.1 Water

Water use in the main office block is to be supplied from a deep drilled borehole. Water required for dust suppression measures and for the wheelwash is supplied by harvesting rainwater from the roofs of the office and workshop buildings. If needed, this supply can be supplemented by pumping water from the settlement tanks. The subject of water for the site is covered in detail in Section 8 *Water*.

### 13.4.2 Wastewater

A wastewater treatment system has been proposed to serve the office block. A site suitability assessment has been carried out by Michael Friel Architects and found the site to be suitable.

### 13.4.3 Electricity

There will be an ESB connection established to serve the office block. There will also be a telecommunications connection to the office block.

## 13.5 Impact Assessment

### 13.5.1 Residential Buildings

The main potential impacts on residences from the existing and proposed development would be associated with the landscape and potential noise because of day-to-day quarrying activities.

The proposed development will not result in a significant increase in traffic from the quarry as per Section 12.12 of Section 12 of this EIAR. Noise, vibration and air emissions will be below the recommended guideline values at the nearest dwellings as detailed within Sections 9 and 10 of this EIAR.

Proposed mitigation measures, in relation to quarrying activities, are detailed in various sections of this EIAR. These measures will aid in reducing the impact of the quarrying activity such as the planting of screening berms as per Figure 15.6, implementation of the robust water management system to treat all runoff (see Section 8) and the appointment of an Ecological Clerk of Works (ECoW's) who will advise on the appropriate implementation of the mitigation measures outlined within this EIAR and the separate NIS. Environmental monitoring of noise, vibration and dust emissions will be carried out to ensure the development is compliant in relation to standards as set by the EPA within the Environmental Management Guidelines – Environmental Management in the Extractive Industry (Non-scheduled minerals) 2006 document.

Negative effects from quarrying activities post mitigation have been assessed as imperceptible.

### 13.5.2 Geological Resource

By its nature the proposed development will result in the loss of the geological resource which cannot be replaced. However, the extracted material will be supplied to the local construction market which consists of both private and public sector developments thereby contributing to the local, regional and national economy. The loss of geological resources in the area post mitigation has been assessed as Moderate (see Section 7 of this EIAR for full detail).

### 13.5.3 Land Resource

The removal of c.2.3 Ha of habitat is considered a loss but is mitigated against using overburden to create a new berm around the site boundaries. A full restoration planned is outlined in section 15 of this EIAR which further highlights measures which will be taken to offset the impact on biodiversity. Loss of habitat within the site post mitigation has been assessed as imperceptible (see Sections 6 and 15 of this EIAR for full detail).

#### 13.5.4 Public Utilities

It is unlikely the existing dormant quarry has negatively impacted on the availability or quality of public utilities in the local area. The planned development will likely add some demand for public utilities such as water, electricity, gas and telephone in the local area as there is currently no activity taking place within the site. New ESB and telephone connections will need to established to serve the office block.

#### 13.5.5 Groundwater and Water Supplies

It is unlikely the planned development will impact on the demand for public utilities in the local area. Water use in the main office block is to be supplied from a deep drilled borehole with water for dust suppression measures and wheel washing being supplied by harvested rainwater. No new connection will be made to the public mains, therefore no impact is predicted.

#### 13.5.6 Scenic Routes

No focal points or views listed in the Donegal County Development Plan 2018-2024 are in the vicinity of the quarry and subject site. Therefore no impact is predicted.

### 13.6 Mitigation Measures

Mitigation Measures are detailed in the relevant sections of this EIAR to ameliorate impacts on Material Assets – Site Services (see Sections 6-10 for all relevant mitigation measures).

### 13.7 Residual Impacts

No residual impacts are envisaged.

### 13.8 References

Central Statistics Office, www.cso.ie

Ordnance Survey of Ireland, www.osi.ie

The National Parks and Wildlife Service, www.npws.ie

Geological Survey of Ireland, www.gsi.ie

County Donegal Development Plan 2018-2024 www.donegalcoco.ie

# Section 14: CULTURAL HERITAGE

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# 14 CULTURAL HERITAGE

## 14.1 Introduction

This section of the Environmental Impact Assessment Report (EIAR) evaluates the significant effects, if any, on the cultural heritage, archaeology and architecture that can reasonably be expected to occur associated with further development of the park extension. An impact assessment and mitigation strategy has been prepared. The scope of this section includes:

- An assessment and description of the archaeological heritage of the area.
- An assessment and description of the cultural heritage of the area.
- A recommendation of mitigation or remedial measures to reduce or mitigate against any potential impacts.

## 14.2 Methodology

This study complies with the requirements of Directive EIA 2014/52/EU and is an assessment of the known or potential cultural heritage resources within the general area and includes the information that may reasonably be required for reaching a reasoned conclusion on the significant effects of the project on the cultural environment, taking into account current knowledge and methods of assessment. It consists of a collation of existing written and graphic information in order to identify the likely context, character, significance and sensitivity of the known or potential cultural heritage, archaeological and structural resources using an appropriate methodology (EPA 2002 and 2003).

The study involved detailed investigation of the cultural heritage including the archaeological, architectural and historical background of the proposed development site and the surrounding area. Information was accessed from the following sources:

- Records of Monuments and Places of Donegal County Council https://www.donegalcoco.ie//culture/heritage/archaeologicalheritage/recordofmonumentplacesrmp/ The Sites and Monuments Record which is maintained by the Department of Culture, Heritage and the Gaeltacht and can be viewed at https://maps.archaeology.ie/HistoricEnvironment/
- Donegal County Council 2018 – *'Donegal County Development Plan 2018-2024 Part B: Objectives and Policies of the Plan Chapter 7: The Natural and Built Heritage'*
- Archaeological Survey of Ireland, www.archaeology.ie
- Database of Irish Excavation Reports www.excatations.ie

## 14.3 Existing Environment

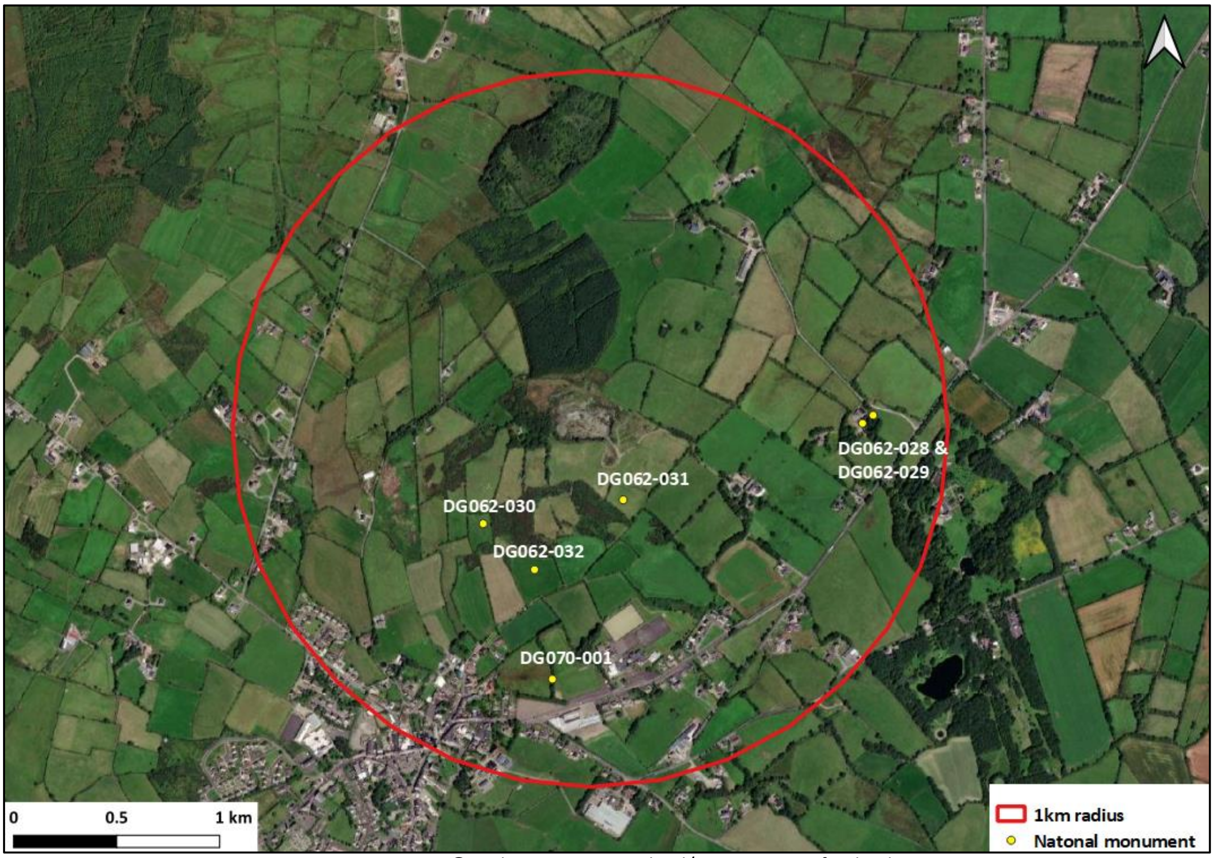
The subject site is located within the townlands of Craigs and Magherasolis. The quarry is served by the local L-23749 road which leads directly onto the R236 regional road. Raphoe town is located 900m Southwest of this road junction and 780m Southwest from the nearest boundary of the subject site (930m to quarry face). The quarry is situated in a rural area with sporadic housing and is surrounded mainly by improved agricultural land. There are also blocks of commercial forestry to the North and Northwest of the subject site

The extraction area of the subject site has been defined as 5.37ha which consists of previously blasted faces and benches as well as additional ground to the North of the site which is proposed to be stripped, drilled and blasted.

## 14.4 Archaeological Heritage

There are four Recorded Archaeological Monuments not far from the subject site. These are site No. DG 062-031 which is an enclosure and is c.200m South of the quarry, No. DG 062-030 which is a holy well which is c.400m to the South of the quarry, No. DG062-032 which is a standing stone which is c.40m to the South of the quarry, site No. DG070-026001 which is a bronze age stone circle and viewing point. No other known monuments are close to the proposed development. The nearest sites of archaeological interest listed by the National Monuments Service are presented in Table 14.1 and shown in Figure 14.1.

**Figure 14.1.**
**Recorded National Monument sites within a 1km radius of the subject site**




**CYAL50244901** © Ordnance Survey Ireland/Government of Ireland

**Table 14.1: Nearest sites of archaeological interest listed by the National Monuments Service**

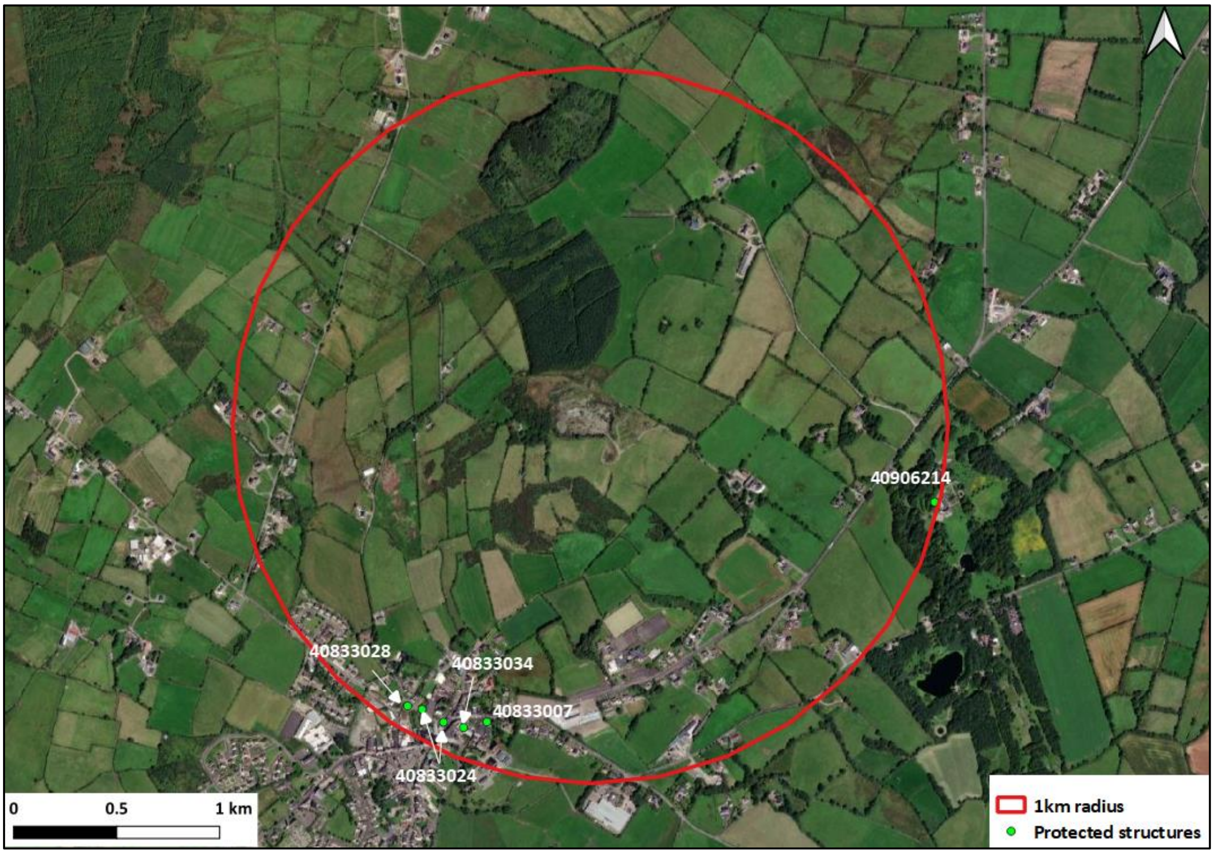
| SMR No. | Distance from Subject site | Class | Townland |
|---|---|---|---|
| DG 062-028 | c. 790m | Souterrain | Magherasollus |
| DG 062-029 | c. 820m | Bullaun stone | Magherasollus |
| DG 062-031 | c.200m | Enclosure | Magherasollus |
| DG 062-030 | c.400m | Ritual site - holy well | Craigs |
| DG062-032 | c.40m | Standing stone | Raphoe Townparks |
| DG070-001 | c. 710m | Standing stone | Raphoe Townparks |

### 14.4.1 Record of Protected Structures

Oakfield Manor is a protected structure number 40906214 which is located 800m SE of the nearest boundary of the subject site and 1000m from the quarry face. Oakfield Manor is a privately owned estate and railway, which has won several National awards for the restoration of its gardens and buildings. For this development a ground vibration limit of 10 mm/sec is proposed with a limit of 6 mm/s for the protected structure Oakfield Manor could apply. The effect of noise and vibrations on this structure are discussed in more detail in Section 10 of this EIAR.

Listed structures 40833028, 40833024, 40833034 and 40833007 have been classed as residential dwellings and a retail unit (40833034). Figure 14.2 shows the listed protected structures within a 1km radius

**Figure 14.2:**
**Location of protected structure in relation to subject site**

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## 14.5 Cultural Heritage

The effect of noise and vibrations from this subject site on architectural structures is discussed in more detail within Sections 9 and 10 of this EIAR. The predicted noise levels are well within the levels recommended by the EPA Environmental Management Guidelines-Environmental Management in Extractive Industry (Non-Scheduled Minerals). Ground vibration and air-overpressure will be kept below the guidelines recommended and below the regulatory limits. Controls specified to limit ground vibration and air-overpressure will be in place as a component of good management procedures. Negative effects from noise and vibration after mitigation have been assessed as imperceptible. The subject site does not affect any aspect of folklore, tradition, religion and language and dialect.

## 14.6 Material Assets

Natural material assets include the landscape amenity value of surrounding area, air and water resources and both renewable and non-renewable resources. Impacts to both air and water quality post mitigation have been assessed as imperceptible. (See Sections 8-10 of this EIAR for full detail).

Man-made material assets include local settlements, transport infrastructure and major utilities and detailed in Section 12 Material Assets – Traffic and Section 13 Material Assets – Site Services. Negative effects from quarrying activities on material assets post mitigation have been assessed as imperceptible.

## 14.7 Natural Assets

The subject of landscape is addressed in Section 15. The resources of water and air quality are dealt with in Sections 8 and 9. The extraction of rock from the quarry is a depletion of a non-renewable resource. The extraction of rock will significantly adversely affect this natural resource, but this is inevitable with the nature of the project. The loss of geological resources in the area post mitigation has been assessed as Moderate (see Section 7 of this EIAR for full detail). The loss of habitat within the site post mitigation has been assessed as imperceptible (see Sections 6 and 15 of this EIAR for full detail). There are no renewable resources (wind energy, hydro power) associated with the quarry site and no impact on any renewable resources outside the site boundary is predicted with the development.

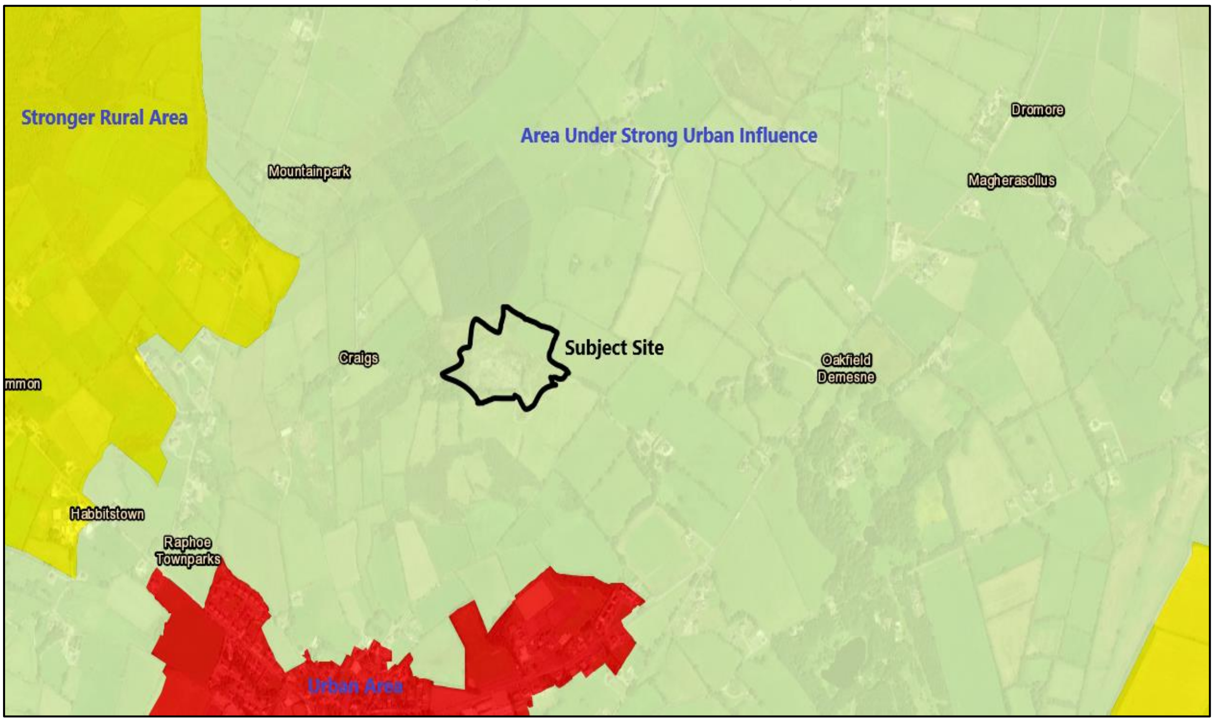
## 14.8 Transport Network

The subject of Traffic is addressed in Section 12. It is predicted that approximately 18-20 loads of product per day will be transported off site, which equates to 4-5 loads per lorry creating approximately 40 traffic movements per day. This equates to a mean flow of 4.5 vehicle movements/hour. Demand for quarry product may increase over time resulting in an increase in machinery operating and delivering lorries on the road. Raphoe is a busy commercial town as shown by the number of travelling vehicles recorded in the traffic surveys undertaken as part of this assessment. The surveys show that an average of 400 vehicles per hour travel along the main road to the east of the quarry. The projected vehicle movement of 4.5 per hour from the quarry would not have any significant impact on traffic levels. The impact on roads and traffic is therefore assessed as imperceptible.

## 14.9 Settlements

The subject site is located in the rural townlands of Craigs & Magherasolis, Raphoe Co. Donegal. In the Donegal County Development Plan 2018-2024 the area is classed as a 'Area Under Strong Urban Influence' as shown in Figure 14.3.

**Figure 14.3:**
**Rural Area Types in relation to the subject site**

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The location of dwellings and the main amenities/structures of concern are outlined figure 14.4 below, these are:

- Landowners house (1) *
- Agricultural yard(2)
- House owned by landowner's brother (3)*
- Roadside entrance (4)
- Royal and Prior Secondary School (5)*
- Raphoe livestock mart (6)
- Derelict house (7)
- Dwelling house (8)*
- Dwelling house (9)*
- Oakfield Manor House (10)*

**Figure 14.4:**
**The location of dwellings and the main amenities/structures in relation to the subject site**


This Map was made using Arcgis.

The main negative effects on the listed structures above are from noise and vibration as well as air quality. As mentioned in Sections 14.5 and 14.6, negative effects from air quality and noise & vibration post mitigation have been assessed as imperceptible.

## 14.10 Utilities

Existing utilities are limited to ESB. There is currently no mains water supply or mains wastewater facilities available to the subject site. There are toilet facilities proposed within the office block. A wastewater treatment system has been proposed to serve the office block. A site suitability assessment has been carried out by Michael Friel Architects and found the site to be suitable. Potable water is to be sourced from a borehole located upgradient of the wastewater treatment system.

## 14.11 Potential Negative Impacts

### 14.11.1 Potential Negative Impacts on Material Assets

Mitigation measures have been proposed for natural material assets that have potential to be negatively affected. These are presented in Section 6: *Biodiversity*, Section 7: *Land Soils & Geology,* Section 8: *Water*, Section 9: *Air* and Section 15: *Landscaping & Restoration*. The loss of geological resources in the area post mitigation has been assessed as Moderate (see Sectioon 7 of this EIAR for full detail). Habitat loss within the site post mitigation has been assessed as imperceptible (see Sections 6 and 15 of this EIAR for full detail). Negative impacts to air & water quality and impacts from noise/vibration post mitigation have all been assessed as imperceptible.

### 14.11.2 Potential Negative Impacts on Archaeology

An archaeological report has been prepared by Mr David Sweetman on behalf of the client which is attached as Appendix 14.1 to this section of the EIAR. The report concluded:

"*The site of the proposed quarry extension has had an amount of over burden removed by the previous owner, in this area it has exposed only rock, there is another portion of the proposed quarry extension which is currently within farmland, which is in grass pasture, this area would have been ploughed by the current owner and the soil depth is evidently quite shallow. The area which has had the over burden removed if it had any archaeological importance it has now been removed, it is however highly unlikely that anything of archaeological interest was ever on the site as it is not suitable for human habitation. There is no archaeological reason to test - trench the site since there is no soil on it. The area which is currently in grass land is unlikely to contain any items of archaeological importance as the land has been farmed for generations, has a soil depth of a shallow nature and is the further away than any other part of the site to sites of archaeological importance. The site will not extend any closer to the Recorded Archaeological Monuments to the South and a physical barrier, namely a berm, will be erected to stop any further incursion South it is therefore recommended that no further archaeological input will be necessary at this site*".

Based on this conclusion, the potential negative impacts on archaeology can be assessed as imperceptible.

## 14.12 Mitigation Measures

### 14.12.1 Mitigation Measures when Breaking New Ground

No mitigation is proposed as there are no negative impacts envisioned on local archaeology from the proposed development.

### 14.12.2 Mitigation Measures to Material Assets

Any negative effects to Material Assets as described above in section 14.6 and 14.7 post mitigation have been assessed as imperceptible. Any relevant mitigation measures are listed in Section 13 of this EIAR.

## 14.13 References

Donegal County Council, County Donegal Development Plan 2018-2024, Rural Area Types Map. https://donegal.maps.arcgis.com/apps/View/index.html?appid=7b44cab1b818490a9d6c264db534d4d2&extent=-9.0677,54.5439,-6.4309,55.3836

Excavations.ie. Database of Irish Excavation Reports. https://excavations.ie/advanced-search/?exca_a=advanced_search&y=&c=Donegal&a=&snu=&sna=&st=&rtc=&itm=&smrn=&eln=

Records of Monuments and Places of Donegal County Council https://www.donegalcoco.ie//culture/heritage/archaeologicalheritage/recordofmonumentplacesrmp/

# Appendix 14.1: Archaeological Report

Report on Archaeological Impact Assessment

For proposed Quarry extension

at

Magherasolis and Craigs, Raphoe, County Donegal

ITM 626167 – 903873

To accompany a Planning Application

For Patrick Bonar

David Sweetman, MA, MRIA,FSA,
Roestown,
Drumree, Co. Meath.
Tel & Fax 01-8259344
E-mail: pdavidsweetman@live.ie

# Introduction

The client Patrick Bonar, is applying for planning permission for an extension to an existing Quarry at Magherasolis and Craigs, Raphoe, County Donegal. This archaeological assessment will accompany the planning application and is an assessment of the site.

The proposed development site is situated not far from Raphoe town and there are three Recorded Archaeological Monuments not far from the site, South and South West of the proposed development site. These are DG 062-031 which is an enclosure site and is c.200m South of the Quarry, No. 30, which is a holy well and is c.400m to the South and No.32 which is a standing stone and is c.40m to the South of the Quarry. No other known monuments are close to the proposed development.

**Plate1 proposed development site looking west from existing quarry**

The extraction area for the proposed extension is c. 5.37 Ha and is in an elevated area at the W side of the existing quarry. The site has been walked-over. The site will not extend W as far as the present tree line.

## Site location and Description

The proposed development site is located at the W end of the existing quarry. The area for development lies N of three Recorded Archaeological Monuments (see Introduction) on relatively high ground which drops away to the E. The existing quarry is surrounded by green fields except at the W where the proposed quarry extension is located.

**Plate No.2 Looking S.W. Site for quarrying to right showing exposed bedrock**

The area for the proposed quarry extension has been stripped of its top soil by the previous owner resulting in a barren landscape of rock and new gorse growth. A small section of this area has had boulder clay and other clay dumped on it. There appears to be no existing overburden anywhere on the area for the proposed quarry extension and the undisturbed clay is clearly visible all-over the site. The area for the proposed development viewed from the existing quarry bedrock is clearly visible in the section face and no overburden can be seen.

**Plate No.3 Area at north side of quarry. Roadway marks demarcation between quarry and agricultural land.**

It is proposed to place a site office at the E side of the quarry site but there will be virtually no ground disturbance. The office will be placed on a thin concrete slab which will be laid on a small area of levelled-off ground which has already been disturbed.

**Plate No.4 Area being farmed at S side of quarry. Berm will be erected along quarry's edge here**

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## Physical and Visual Impact

The site of the proposed quarry extension was stripped of its overburden by the previous owner, so that there is nothing showing on the surface except rock, gorse and a few small pockets of soil. Had anything of archaeological interest been on site it has now been removed by the soil stripping. However, the terrain would not have been suitable for any habitation or other human activity as well as been very exposed. There will therefore be no physical archaeological impact from the proposed quarry extension.

**Plate No.5 Quarried floor at S side. S. field as shown in plate 4. Berm to be built on quarry's edge here.**

Since the Recorded Archaeological Monuments lie to the S of the proposed quarry extension, a berm (marked in green on map) will screen them from any visual impact. The berm will also act as a barrier to machines possibly straying S from the proposed quarry area.

Plate No.6 E side of quarry where site office is to be situated near sandy area.

## Mitigation

1. The area of the proposed quarry extension has had its overburden removed by the previous owner and the present surface has been walked-over.
2. The proposed quarry extension will not go as far as the tree-line at the W side and will not go further S than the proposed berm.
3. Had there been anything of archaeological interest on the site, it was removed by stripping of the overburden.
4. It is highly unlikely that there was ever anything of archaeological interest on the site because it is so inhospitable.

## Conclusion and Summary

The site of the proposed quarry extension has had an amount of over burden removed by the previous owner, in this area it has exposed only rock, there is another portion of the proposed quarry extension which is currently within farmland which is in grass pasture, this area would have been ploughed by the current owner and the soil depth is evidently quite shallow.

The area which has had the over burden removed if it had any archaeological importance it has now been removed, it is however highly unlikely that anything of archaeological interest was ever on the site as it is not suitable for human habitation. There is no archaeological reason to test – trench the site since there is no soil on it.

The area which is currently in grass land is unlikely to contain any items of archaeological importance as the land has been farmed for generations, has a soil depth of a shallow nature and is the further away than any other part of the site to sites of archaeological importance.

The site will not extend any closer to the Recorded Archaeological Monuments to the South and a physical barrier, namely a berm, will be erected to stop any further incursion South it is therefore recommended that no further archaeological input will be necessary at this site.

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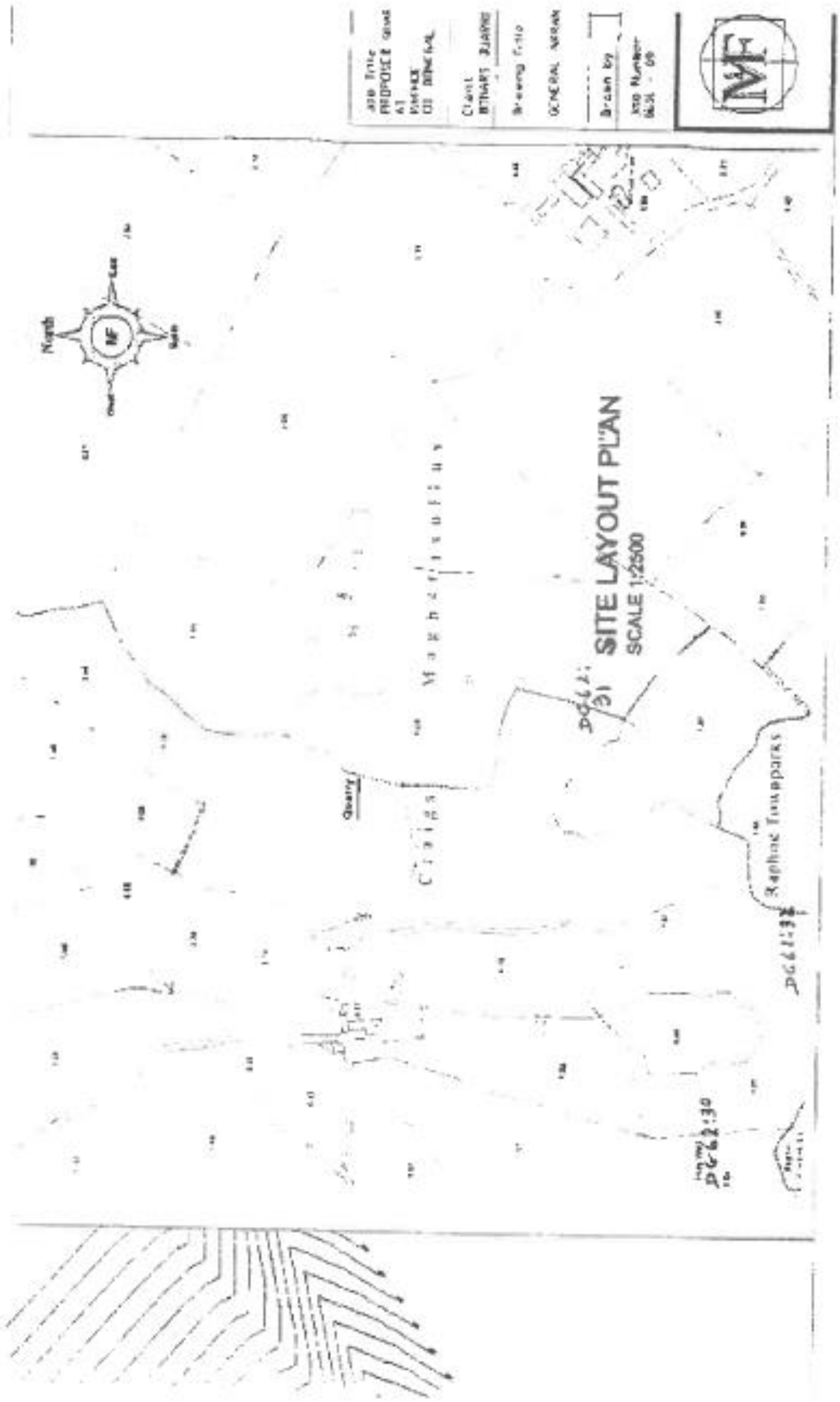


Site location map

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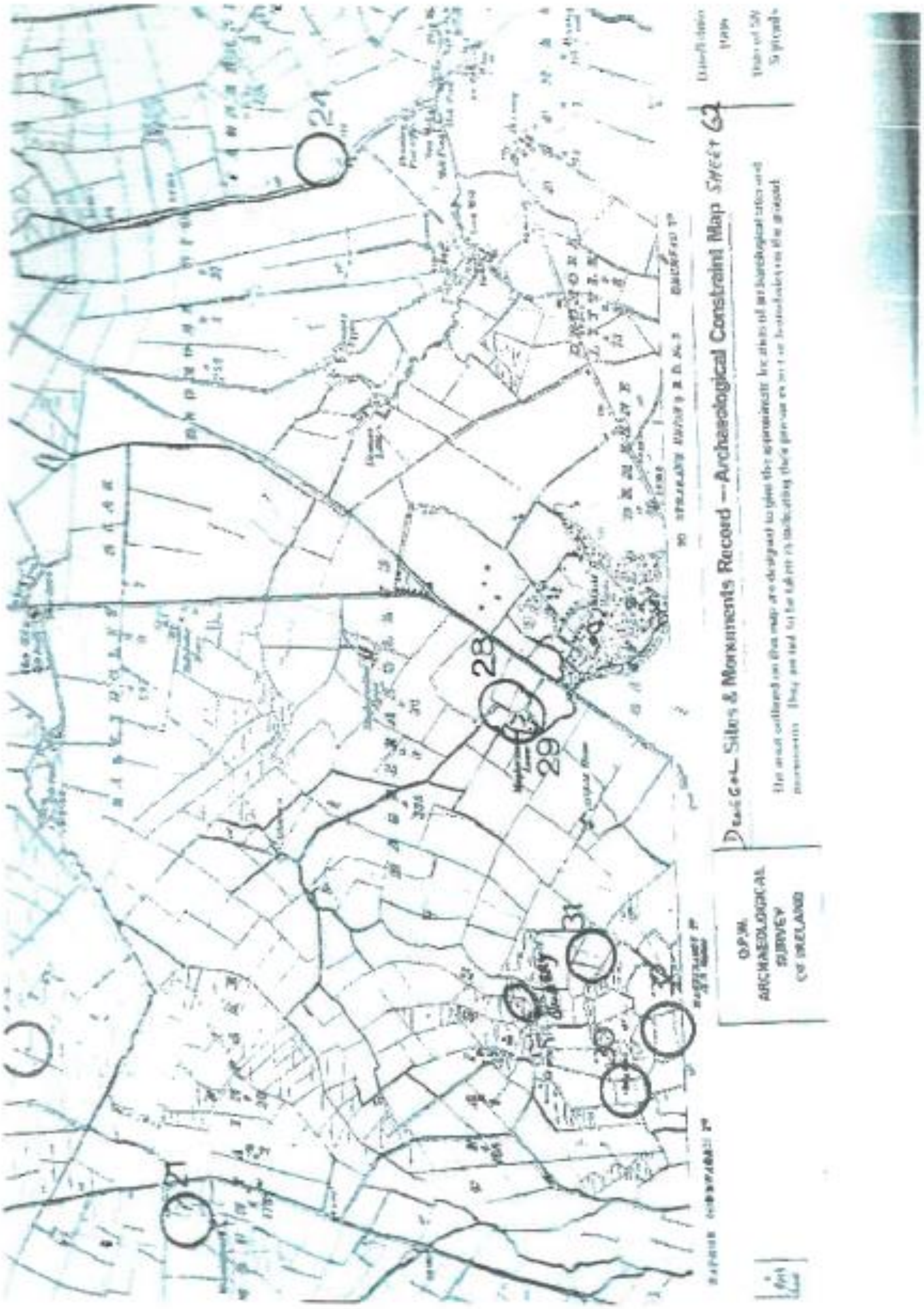


Extract from RMP mapping showing location of quarry and relevant monuments

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# Section 15: Landscaping & Restoration

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# 15 LANDSCAPING & RESTORATION

## 15.1 Introduction

This section of the EIAR will establish potential landscape and visual impacts/effects arising from proposed extraction and ancillary operations associated with this quarry site at Craigs and Magherasolis, Raphoe Co. Donegal. It aims to identify and assess the effects on the appearance and character of the local environs arising from the proposed development. A landscaping plan is proposed which will be implemented during the operational lifetime of the new extraction site with a restoration plan to be implemented on closure of the quarry.

A Landscape and Visual Impact Assessment combines the magnitude of change with the sensitivity of the landscape to the existing development, which provides a measure of the significance of the impacts. The acceptability of a development is determined by the extent to which the long-term landscape and visual effects are significant. Understanding the character, quality and value of the landscape determines the sensitivity of that landscape to accommodate change through development. The two principal factors determining the visual impact of a development are the sensitivity of the location or receptor and the scale or magnitude of the development.

## 15.2 Methodology

A detailed landscaping and visual assessment were undertaken to assess the impact of the proposed development on the surrounding landscape. This involved field work and a desk-based study to gather information on the existing landscape, visual resources, planning context and landscape designations. Information has been gathered from:

- Ordnance survey Ireland
- Aerial photography
- Field surveys
- Donegal County Development plan 2018-2024

The following methodologies for assessment of landscape character, sensitivity and visual impact have also been used in the preparation of this report:

- DOE Landscape and landscape assessment guidelines (June 2000)
- EPAs Guidelines on the information to be contained in an Environmental impact statement, 2002.
- Guidelines for landscape and visual impact assessment, (GLVIA) by the landscape Institute of Environmental Management and assessment (Second edition, 2002)
- The landscape Institute with the Institute of Environmental Management and Assessment, 2013, Guidelines for landscape and visual assessment (Third edition).

Field observations were undertaken to assess the landscape character and structure of the subject site and surroundings. A visual impact assessment of the subject site was undertaken from publicly accessible viewpoints in the vicinity. This section now assesses the potential impacts that may arise from the proposed development on the landscape within the receiving environment.

### 15.2.2 Landscape assessment criteria

When assessing the potential impacts on the landscape resulting from a development, the following criteria are considered:

- Landscape character, values and sensitivity.
- Magnitude of likely impacts.
- Significance of landscape effects.

The sensitivity of the landscape to change is the degree to which a particular landscape receptor can accommodate changes or new features without unacceptable detrimental effects to its essential characteristics. Table 15.1 outlines landscape value and sensitivity classified using the following criteria:

**Table 15.1: Landscape value and sensitivity**

| Sensitivity | Description |
|---|---|
| ***High*** | A landscape of particularly distinctive character, susceptible to relatively small changes. |
| ***Medium*** | A landscape of moderately valued characteristics reasonably tolerant to change. |
| ***Low*** | A relatively unimportant landscape, the nature of which is potentially tolerant to substantial change. |

The magnitude of a predicted landscape impact is a product of the scale, extent or degree of change that is likely to be experienced because of the development. The magnitude considers whether there is a direct physical impact resulting from the loss of landscape components and/ or change that extends beyond the proposal site boundary that may have an effect on the landscape character of the area, as outlined in Table 15.2.

**Table 15.2: Magnitude of landscape impacts**

| Magnitude of impact | Description |
|---|---|
| ***High*** | Notable changes in landscape characteristics over an extensive area and/ or permanent long-term change. |
| ***Medium*** | Moderate changes in a localised area and/or medium-term change. |
| ***Low*** | Small change in any components and/or short term/temporary change. |

The significance of a landscape impact is based on a balance between the sensitivity of the landscape receptor and the magnitude of the impact. Table 15.3 outlines the significance of landscape impacts is arrived at using the following matrix.

**Table 15.3: Landscape impact significance matrix**

| Magnitude of landscape resource change | Landscape Sensitivity | | |
|---|---|---|---|
| | Low | Medium | High |
| ***No change*** | No change | No change | No change |
| ***Low*** | Slight | Slight/ Moderate | Moderate |
| ***Medium*** | Slight/ Moderate | Moderate | Moderate/Substantial |
| ***High*** | Moderate | Moderate/Substantial | Substantial |

### 15.2.3 Visual Impact Assessment criteria

As with the landscape impact, the visual impact of the development is accessed as a function of sensitivity versus magnitude. In this instance the sensitivity of the visual receptor is weighted against the magnitude of the visual effect.

***Sensitivity of visual receptors***

Unlike landscape sensitivity, the sensitivity of visual receptors, see Table 15.4, has an anthropogenic basis (i.e. it balances the visual susceptibility of the viewer against the value of the view on offer). The susceptibility of a viewer to changes in a particular view related to the occupation or activity they are engaged in at that location and whether views of the surrounding landscape are an important aspect of that occupation or activity i.e., hill walkers versus commuters. By comparison, the value of the view relates to the visual setting of the viewer and whether this is recognised through county designations and guidebooks or is likely to just have local value.

**Table 15.4: Visual receptor sensitivity**

| Sensitivity | Description |
|---|---|
| ***High*** | e.g. users of an outdoor recreation feature which focuses on the landscape; valued views enjoyed by the community; tourist visitors to scenic viewpoint; occupiers of residential properties with a high level of visual amenity. |
| ***Medium*** | e.g. users of outdoor sport or recreation which does not offer or focus attention on landscape; occupiers of residential properties with a medium level of visual amenity |
| ***Low*** | e.g. regular commuters, people at place of work; occupiers of residential properties with a low level of visual amenity. |

***Visual impact magnitude***

The magnitude of visual effects, see Table 15.5, is determined on the basis of two factors; the visual presence of the development and its effects on the visual amenity. Visual presence is something of a quantitative measure relating to how noticeable or visually dominant the proposal is within a particular view. This is based on a number of aspects beyond simply scale in relation to distance. Some of these include the extent of the view as well as its complexity and the degree of movement is presented and its relationship with other focal points or prominent features within the view is also considered. Visual presence is essentially a measure of the relative visual dominance of the proposal within the available vista.

**Table 15.5: Magnitude of visual impact**

| Criteria | Description |
|---|---|
| ***High*** | Total loss or alteration to key elements/features/characteristics of the existing landscape or view and/or introduction of elements considered totally uncharacteristic when set within the attributes of the receiving landscape or view. |
| ***Medium*** | Partial loss or alteration to key elements/features/characteristics of the existing landscape or view and/ or introduction of elements that may be prominent but not necessary substantially uncharacteristic when set within the attributes of the receiving landscape/ view. |
| ***Low*** | Minor loss or alteration to key elements/features/characteristics of the existing landscape or view and/or introduction of elements that may not be uncharacteristic when set within the attributes of the receiving landscape/view. |
| ***No change*** | Very minor loss or alteration to key elements/features/characteristics of the existing landscape or view and/or introduction of elements that are not uncharacteristic when set within the attributes of the receiving landscape/ view. |

***Visual impact significance***

As stated above, the significance of visual impacts is a function of visual receptor sensitivity and visual impact magnitude. The relationship is expressed in the significance matrix in Table 15.6.

**Table 15.6: Visual impact significance matrix**

| Magnitude of visual resource change | Visual sensitivity | | |
|---|---|---|---|
| | Low | Medium | High |
| ***No change*** | No change | No change | No change |
| ***Low*** | Slight | Slight/Moderate | Moderate |
| ***Medium*** | Slight/Moderate | Moderate | Moderate/Substantial |
| ***High*** | Moderate | Moderate/Substantial | Substantial |

## 15.3 Scope

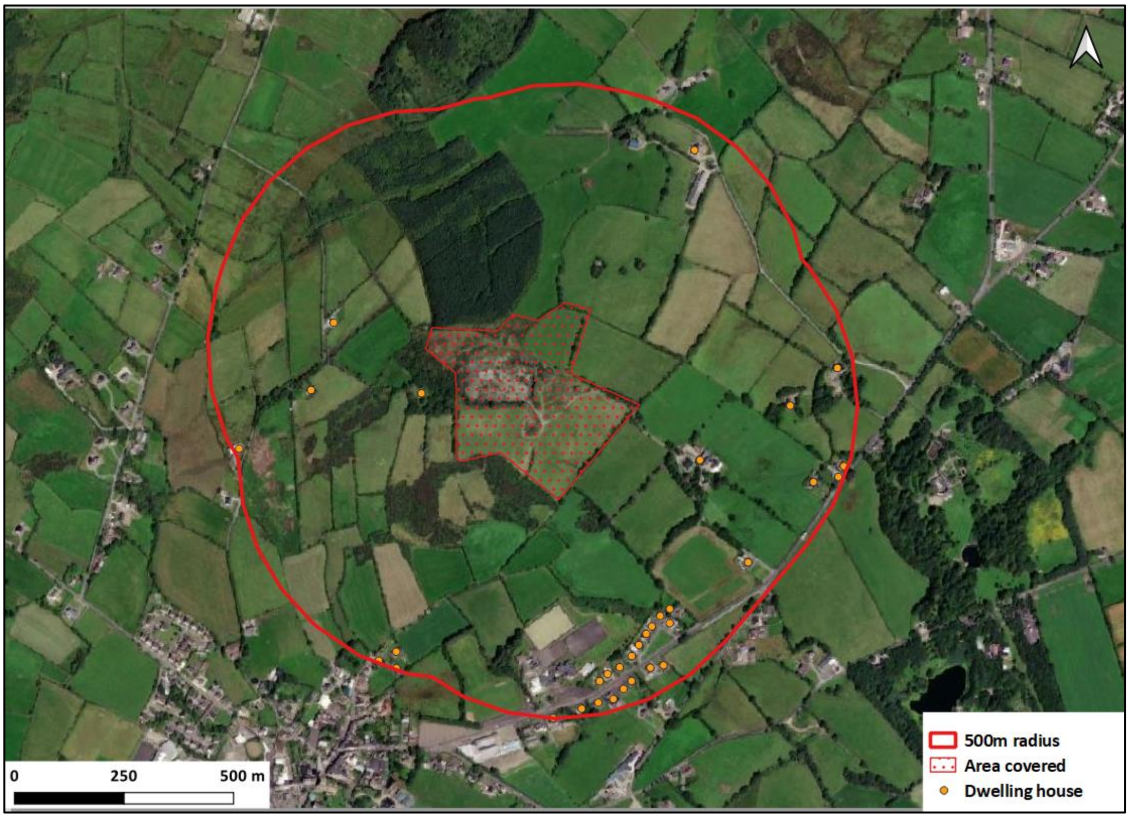
The scope of this section includes:

- An assessment and description of the existing landscape.
- The capacity of the existing landscape to absorb the proposed development.
- An assessment of the impact of the quarry development and its ancillary activities on the landscape character and the visual impact of the quarry development.
- Recommendation of remedial measures to reduce or mitigate against any potential visual impacts or adverse effect on landscape character.

## 15.4 Existing environment

The quarry is situated in a sparsely populated rural area with sporadic once off housing, the closest occupied dwelling is approximately 160m west of the subject site. There are 2 dwellings situated on the L-2182 local road on the approach to the quarry. The closest dwelling is approximately 150m from the quarry entrance. Figure 15.1 shows domestic dwellings in relation to the quarry. Map 15.1 illustrates the existing road network.

**Figure 15.1: Site Location in Relation to Local Dwellings**




**CYAL50244901** © Ordnance Survey Ireland/Government of Ireland

**Map 15.1: Existing road network surrounding the subject site.**


**CYAL50244901** © Ordnance Survey Ireland/Government of Ireland

The quarry is situated in a rural area with sporadic housing. The surrounding environs have a mixture of land uses including agriculture and forestry. A detailed habitat assessment of the subject site and surrounding environs was conducted as part of Section 6: *Biodiversity*. Figure 15.2 has been taken from Section 6: *Biodiversity* and demonstrates the locations of improved grassland (green lines) which can be used for agricultural purposes and existing areas of conifer plantations (green dots).

**Figure 15.2: Location of habitats in the surrounding environs**


This map was created on QGIS software using data collected during site visits according to Fossitts guide to habitats in Ireland

Land use immediately surrounding the quarry site is predominantly agricultural. Intensive livestock grazing is the dominant agricultural activity surrounding the existing quarry void. The field pattern in the general area is regular with elongated rectangular fields extending from the regional road R-236-6 and surrounding the quarry. The majority of the site boundaries consist of hedgerows and treelines. Combined, these have an approximate length of 1.4km. These borders are very overgrown and have become dominated heavily by gorse and bramble. Other species present include Goat willow, Mountain ash, and Common Hawthorn which is being overcome with Ivy. Several conifer plantations (WD4) are also noted within the vicinity of the quarry site.

Some of the poorer quality land to the north and east of the site has been afforested. These are mainly plantations of Sitka Spruce and Lodgepole Pine. Most of these commercial plantations which are private owned and currently providing ecological roles within these areas.

The existing quarry is situated on the uppermost south-eastern slopes of a small hill approximately 165 m OD. Topography on the application site varies from 162 m OD at the northeast corner to 126 m OD on the existing quarry deck.

The planning proposal is to extract and process rock from the original footprint of disturbed ground and also to extract from an additional area of new ground immediately to the northeast of the site. The new ground is proposed to be stripped, drilled and blasted. It is proposed to deepen existing extraction depths to approximately 10 m below the existing quarry deck level. When the material is loose from the rock face it will be moved to a primary crusher where uniform stone size will be achieved through grading. Material will be taken from the crushers and screeners and stockpiled on site for use throughout Donegal. All the material will be processed to IS EN 13242 and SR 21 standards as per the National standard for Civil Engineering products. No washing of stone is planned on this site.

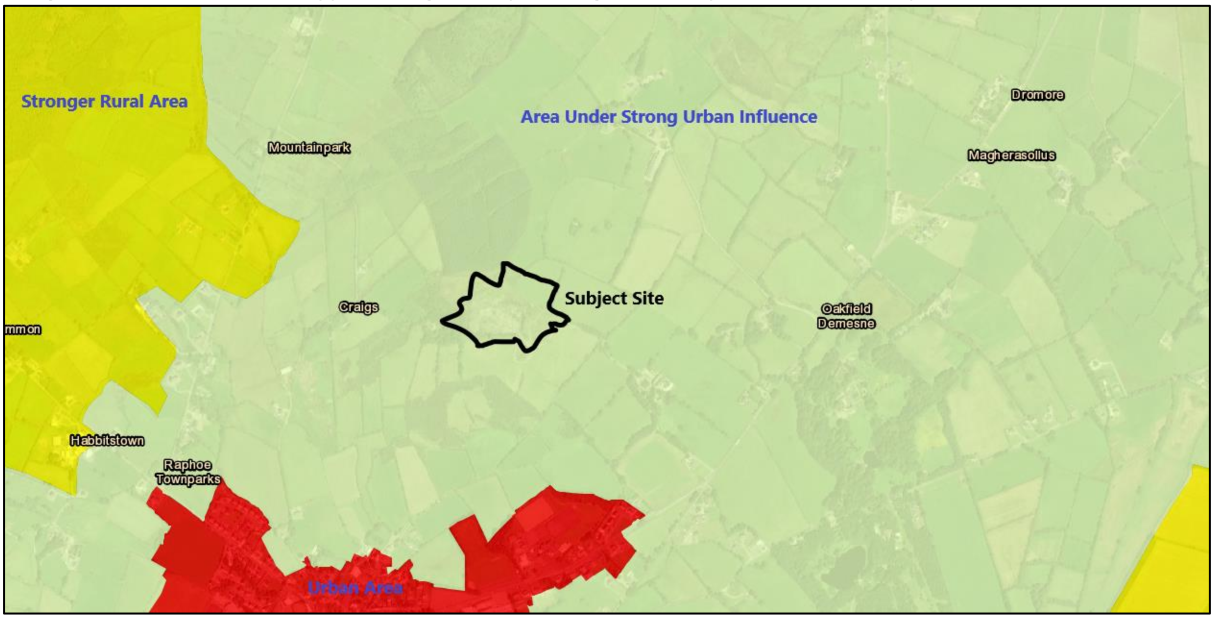
The development is proposed in a phased manner with 5, 5-year stages proposed. The initial phase of operation will involve the construction of an office building, weighbridge, machinery shed and all site drainage. A 4-stage settlement tank system with constructed wetland is proposed to treat all effluent and stormwater. The applicant will seek a trade discharge licence for the outflow from the settlement system from Donegal County Council. A wastewater treatment system is to be installed to treat wastewater and sewage from the office building. Noise abatement measures and dust control measures are proposed. The office will have an electricity supply and telecommunications connection.

Landscaped berms surrounding the site are proposed to screen workings. These are to be created in the initial phase of development. It is anticipated that initially the quarry will employ 8-10 persons directly with more employed indirectly. The application also includes restoration proposals which will form an integral part of the operation to ensure that the quarry site can return to use as a natural habitat once production ceases.

## 15.5 Landscape Character Assessment

The Donegal County Council development plan 2018-2024 classifies the subject site as being located in an area under strong urban influence, with an urban area located 1km from proposed site in the town of Raphoe and adjacent environs to the east classed as a stronger rural area as shown in Figure 15.3.

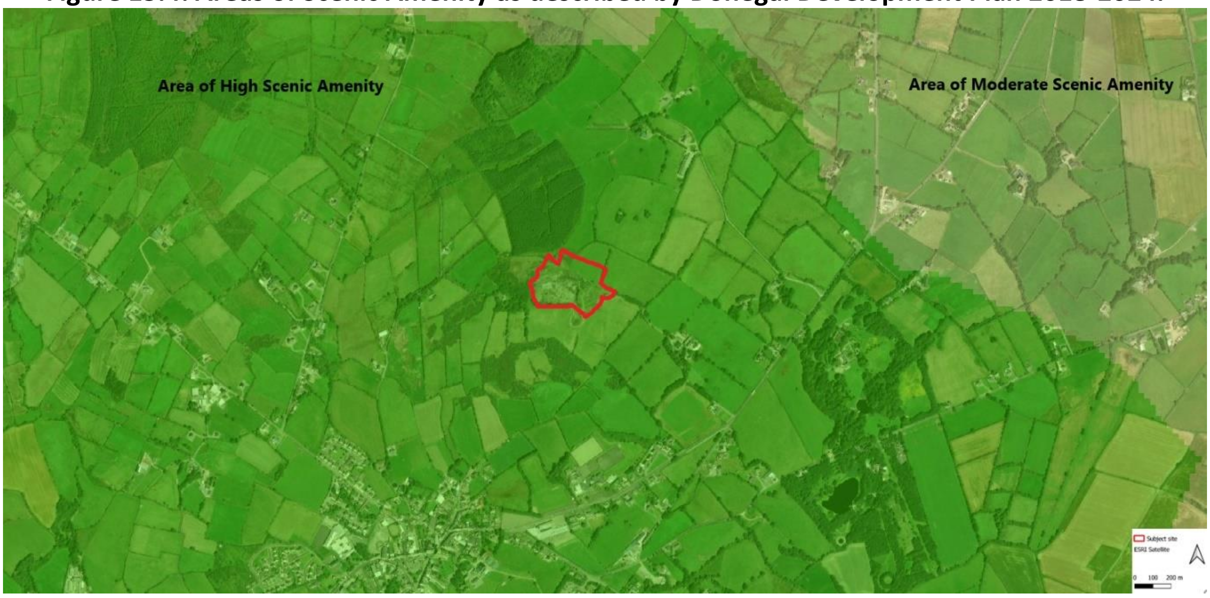
**Figure 15.3: Rural area types assigned by Donegal County Council Development Plan 2018-2024**




CYAL50244901 © Ordnance Survey Ireland/Government of Ireland

The County Development plan for 2018-2024 highlights areas of Especially High Scenic Amenity (EHSA) as worthy of protection from any deterioration in landscape character. The quarry site is located outside of the EHSA. The quarry site is classified as being located within an Area of High Scenic Amenity shown in Figure 15.4.

**Figure 15.4: Areas of Scenic Amenity as described by Donegal Development Plan 2018-2024.**




**CYAL50244901** © Ordnance Survey Ireland/Government of Ireland

## 15.6 General Visual Impact

The recently redundant faces of the dormant quarry can be seen from the north and north-west of the site. The quarry faces are not visible from the south or east of the site. This is due to the topography which falls away to the north and the faces having a north-westerly aspect. The quarry extraction area is not visible from the entrance lane below. As part of the initial works the South-Western boundary will be screened by planting native trees. (see Figure 15.6 for all proposed planting).

The visibility of the quarry site was initially assessed by a desktop study of OS and street view maps to identify potential viewpoints. This was followed up by a field survey where viewpoints were generally chosen at locations from which the development was visible. The viewpoints were chosen to give a representative sample of views of the development within the landscape to illustrate the impact on local residential properties and on protected views, where relevant. Figure 15.5 identifies locations within the surrounding environs which were investigated regarding the visual impact of the quarry site from these viewpoints. Pictures from these points are included where the quarry is visible and descriptions of landscape features screening it from view where applicable.

**Figure 15.5: Locations from which the visual assessment of the site was assessed**


This map was created using QGIS

**Photograph 15.1: View from point 1.**


**Photograph 15.2: View from point 2**

**Photograph 15.3: View from point 3**


**Photograph 15.4: View from point 4.**

**Photograph 15.5: View from point 5**

**Photograph 15.6: View from point 6.**

**Photograph 15.7: View from point 7.**

**Photograph 15.8: View from point 8.**

**Photograph 15.9: View from point 9.**

**Photograph 15.10: View from point 10.**

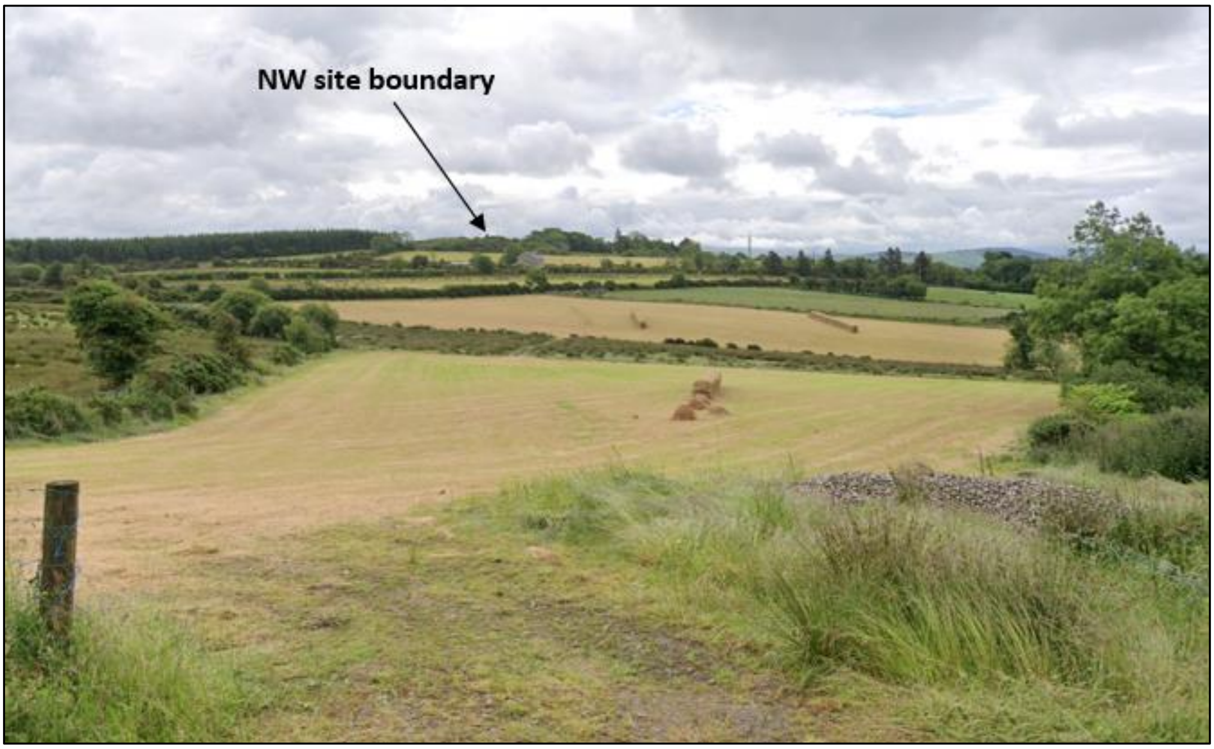


**Table 15.7: Descriptions of view from viewpoints as shown in figure 15.5**

| Viewpoint | Location of Viewpoint | Description of View from Viewpoint |
|---|---|---|
| 1 | R236 c. 490m SE from the nearest site boundary | No aspect of the development is visible from this site due to the existing boundary planting which aids in screening the site |
| 2 | Entrance laneway to the quarry c. 150m from the nearest boundary | No aspect of the development is visible from this site due to the existing boundary planting which aids in screening the site |
| 3 | Carpark of the Royal and Prior Comprehensive School c. 590m S of the subject site | No aspect of the development is visible from this site due to the existing boundary planting which aids in screening the site |
| 4 | Carpark of the Raphoe Mart c. 650m S of the subject site | No aspect of the development is visible from this site due to the existing boundary planting which aids in screening the site |
| 5 | Carpark of Raphe National School c. 770m SW of the subject site | No aspect of the development is visible from this site due to the existing boundary planting which aids in screening the site |
| 6 | Dwelling house along the L-5624-1 c. 500m W of the subject site | No aspect of the development is visible from this site due to the existing boundary planting which aids in screening the site |
| 7 | View from L-5514-1 road c. 190m from the subject site | No aspect of the development is visible from this site due to the existing boundary planting which aids in screening the site |
| 8 | Agricultural laneway c. 470m NE of the subject site | No aspect of the development is visible from this site due to the existing boundary planting which aids in screening the site |
| 9 | Agricultural laneway c. 690m E of the subject site | No aspect of the development is visible from this site due to the existing boundary planting which aids in screening the site |
| 10 | Dwelling house along the L-5624-1 c. 660m NW of the subject site | No aspect of the development is visible from this site due to the existing boundary planting which aids in screening the site |

From this investigation of the visual impact of the quarry site and proposed extraction area from viewpoints in the surrounding environs are minimal due to existing boundary planting which aids in screening the development.

## 15.7 Impact Assessment

### 15.7.1 Landscape

Based on the field survey and reference to the current Donegal County Development Plan, the landscape character has been given a landscape value and sensitivity of “*High”* (Table 15.1). The area is considered of high scenic amenity in the Donegal County Development Plan, however due to the existing quarry site, the surrounding landscape would be reasonably tolerant to change. While rock extraction and processing operations to-date have altered the landform and vegetation cover, the magnitude of additional change as a result of the proposed development has been assessed as ‘*Medium’* (Table 15.2) due to the localised nature of the proposal and location within an established quarry site. As defined by Table 15.3, the significance of landscape impacts of the development is assessed as “*Slight/Moderate”*.

The losses of existing vegetation as a result of removal of overburden to allow extraction of rock from the proposed extraction area will be offset by the creation and maintenance of berms and the covering of same by translocated vegetation and judicious planting on the eastern and southern berm sides. The proposed restoration of the extraction site will allow for the creation of new habitats and the rewilding of this area for reclamation by nature.

#### 15.7.2 Visual

The field survey confirmed that the application area is screened from all of the viewpoints due the existing mature boundary planting which aids in screening the subject site from all the viewpoints in this assessment.

As illustrated in Table 15.6, the assessment of the significance of the visual impacts on the viewpoint is based on a combination of the visual sensitivity and magnitude of visual changes to the viewpoint. The visual receptor sensitivity was considered "Medium" due to the High Scenic of the surrounding environs the visual amenities enjoyed by occupiers of neighbouring residential properties, the magnitude of visual impact was considered "*Medium*" due to the minor loss of characteristics of the existing landscape and the degree to which rock extraction activities have altered the landscape to date. The magnitude of visual impact as a result of the proposed development has therefore been assessed as "*Moderate*" (Table 15.6).

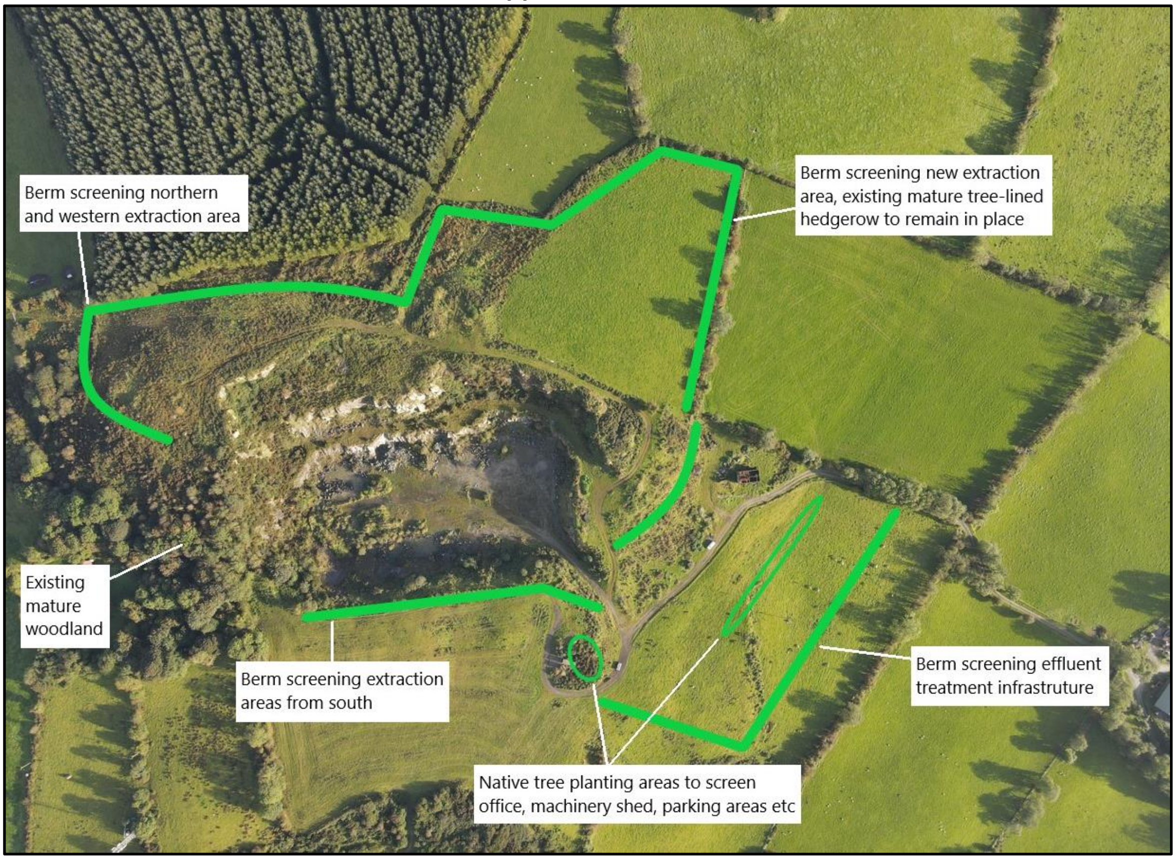
### 15.8 Landscaping and Restoration Measures

#### 15.8.1 Berm Construction

Berms will be constructed in and around the quarry site which have been allowed to regenerate with indigenous vegetation over time. To mitigate the loss of vegetation on the planned extraction site, the vegetation layer will be carefully removed and used to cover the new berms, thus preserving existing biodiversity onsite. Planting of additional vegetation around the eastern and northern banks of the new berms will also add to the biodiversity value of the area and mitigate against loss of stripped habitat within the new extraction area. The use of native species will support a wider range of insects and animals and will contribute to the connectivity and biodiversity value of the region.

Additional berms are proposed for the south-eastern corner of the site to screen the settlement tanks and effluent treatment systems. These berms will also aid the screening of some of the site infrastructure such as the office building and machinery workshop. The location of the proposed berms is illustrated schematically on the aerial photograph in Figure 15.6. The berm on the eastern boundary of the new extraction area will augment the screening value of the existing mature tree-lined hedge containing along this boundary.

**Figure 15.6: The locations of proposed vegetated berms and tree planting areas surrounding application site.**




## 15.8.2 Planting works

Planting of semi mature native species is to be carried out to the southern and eastern banks of the berms surrounding both the extraction area and effluent treatment area for additional screening.

In addition to the supplementary planting of the banks of the berms, two additional areas are proposed to be planted with native trees to aid screening of both the extraction area and the site infrastructure such as the site office, machinery workshop, refuelling bay etc. Both these areas are located between the effluent treatment area and the main extraction/processing area and are indicated on Figure 15.1.

All planting works will be carried out during the dormant season (November to March). The planting mix to be used on site is as follows:

- Alder
- Aspen
- Ash
- Blackthorn
- Crab apple
- Elm
- Hazel
- Hawthorn
- Holly
- Pedunculate oak
- Sessile oak
- Rowan
- Whitebeam
- Willow

In-planting between trees must also include the following:

- Spindle
- Guelder rose
- Dog rose
- Woodbine honeysuckle
- Cherry.

Suitable areas will also be planted with native wildflowers sourced from a DAFM approved supplier. All plants and trees must be purchased from a source compliant with the plant health regulation 2016/2031/EU. Any trees that fail should be replaced during the next dormant planting season.

## 15.9 Mitigation Measures and Monitoring

The existing perimeter vegetation around the dormant extraction area will be retained and act as a natural buffer area running into the new proposed extraction area from the North. The new berms created from the stripped overburden will serve to reduce the long-term visual impact of the new extraction area. Mitigation measures such as maintaining existing berms throughout the subject site and continual additional planting as required will also be employed to reduce any visual impact resulting from the ongoing development of the subject site.

As part of this proposal measures will be put in place to reduce loss of biodiversity and enhance the conservation value of the subject site area and reduce environmental impacts of quarrying activity. These include:

- Creation of new berms around the proposed excavation site to screen the development and to maintain natural vegetation and ecosystems onsite and to create corridors of connectivity.
- The use of a mix of native species (15.8.2) to plant around the eastern and southern boundary of the new berm which will help support a wide range of insects and animals and will contribute to the ecological value of the area.
- Using plants suited to the given soil type and conditions to reduce the need for expensive and intrusive remedial measures (ex. Replacing failed plants).
- All planting of trees and shrubs must take place during the first dormant season, avoiding times of frost.
- Planting to be monitored by the Ecological Clerk of Works with appropriate advice and guidance given to the site Ecological Officer. A report to be submitted to the local authority when planting has commenced.

## 15.10 After Use

The greatest potential for increased biodiversity in relation to the subject site is after the operation has ceased. With time, nature reclaims a quarry, and the landscape can revert to a rich zone of biodiversity with little intervention from human hands. The aim of any natural restoration plan is to restore ecological balance and to produce self-sustaining plant and wildlife communities and habitats. Restoration/decommissioning of a quarry can fall within three main activities, namely:

- Do Nothing
- Land Forming
- Revegetation/planting

Each activity and relation options/recommendations are now examined in more detail.

### 15.10.1 Do Nothing

The most frequent form of reinstatement is the “do nothing” approach and allow nature to take its’ course. In effect, this process is already under way within the current quarry void which is showing early signs of recolonisation by species such as gorse and bramble. Upon decommissioning, the subject site will similarly be reclaimed by nature. The seedbank will have the opportunity to germinate and vegetation in the surrounding area will spread into the bare soils. As production in the extraction area ceases, pumping to the settlement tank system will no longer take place, water will gather in the quarry void until it reaches a level whereby it will be channelled by pipework and flow by gravity to the effluent treatment system before being discharged off site.

An option is open to create a capture-drain network on the redundant quarry floor and pipe this by gravity to the effluent treatment system before discharge off site. In this scenario the redundant quarry floor would remain largely dry and not become inundated with water.

#### 15.10.2 Land forming

The subject site will have vertical faces with various crevices and ledges upon decommissioning. The vertical faces of the quarry after use could provide potential nesting sites for birds and other small mammals. The available overburden within the dormant quarry area should be formed on the available benches against the bottom of the quarry face creating a buttress of approximately 0.5 to 1m in height. This buttress will provide a foot hold for vegetation to become established at the bottom of the quarry face to improve biodiversity.

Within the wider subject site available overburden will be spread to create/improve additional external berms. Judicious berm creation within the subject site can also be undertaken to screen bare ground that will take time to recolonise.

#### 15.10.3 Revegetation/planting

Recolonisation will take place naturally and the spread overburden will carry a natural seed burden. Allowing natural revegetation will establish a suitable habitat in line with adjacent habitats and also create an unobtrusive, stable feature. The site boundaries and exposed areas will be planted with semi mature native species to provide soil stability and cover preventing invasive invasions, giving the natural seed bank time to germinate and establish. Any plants that die, are removed or become seriously damaged or diseased, within a period of five years of planting, shall be replaced within the next planting season with others of similar size and species, unless otherwise agreed in writing with the planning authority.

#### 15.10.4 Mitigation:

A full and comprehensive restoration plan must be submitted and agreed with the planning authority in relation to one or both of the following as they become relevant:

- Restoration of the 5.37Ha excavation area.
- Restoration of the entire subject site.

### 15.11 Residual Impacts

The proposed extraction area will not cause a significant negative landscape or visual impact. The proposed berms covered with topsoil and vegetation from the extraction area and planted with semi mature native vegetation will screen the new extraction site and reduce the residual impact of the proposal. The proposed restoration plans will create supporting habitat for many species with opportunities for nesting, foraging and water. The formation of new habitats will increase the biodiversity of the area and will go some way to mitigating the initial disturbances in the longer term.

Upon decommissioning of the quarry, the existing land my go back to agricultural use. The subject site has a possibility to be used as a waste facility for soil and stone. It could also be used as a recreational outdoors amenity for activities such as rock climbing, the quarry could be filled and used for water sports, forest paths may be utilised by walkers to enjoy the pondlife, trees and supported species.

### 15.12: Determination of Significance of Impacts Pre-mitigation

| Impact | Receptor | Description of Impact (Character/Magnitude/ Duration/Probability/ Consequences) Negligible to High | Existing Environment (Significance/ Sensitivity) Negligible to High | Significance Imperceptible to Profound |
|---|---|---|---|---|
| Negative visual impact on the landscape character of the surrounding environs from stripping and extraction activities | Visual receptors within the vicinity of the subject site | Medium | Medium | Moderate |
| Loss of habitat from stripping from quarrying activities | Wildlife within the surrounding environs | Medium | Medium | Moderate |
| Loss of soils/subsoils due to extraction | Soils/ subsoils | High | Low | Moderate |
| Loss of bedrock geology as extracted product | Bedrock geology | High | Low | Moderate |

### 15.13: Summary of Mitigation Measures Proposed

| Summary of Mitigation Measures Proposed |
|---|
| New berms must be created around the proposed excavation site to screen the development and to provide natural vegetation and wildlife corridors of connectivity. |
| A mix of native species (15.8.2) must be planted around the eastern and southern boundary of the new berm to support a wide range of insects and animals and contribute to the ecological value of the area. |
| All planting of trees and shrubs must take place during the first dormant season, avoiding times of frost. |
| Planting to be monitored by the Ecological Clerk of Works with appropriate advice and guidance given to the site manager. |
| A full and comprehensive restoration plan must be submitted and agreed with the planning authority in relation to one or both of the following as they become relevant:<br>• Restoration of the 5.37Ha excavation area.<br>• Restoration of the entire subject site. |

### 15.14: Determination of Significance of Impacts Post mitigation

| Impact | Receptor | Description of Impact (Character/Magnitude/ Duration/Probability/ Consequences) Negligible to High | Existing Environment (Significance/ Sensitivity) Negligible to High | Significance Imperceptible to Profound |
|---|---|---|---|---|
| Negative visual impact on the landscape character of the surrounding environs from stripping and extraction activities | Visual receptors within the vicinity of the subject site | Low | Low | Imperceptible |
| Loss of habitat from stripping and construction works | Wildlife within the surrounding environs | Low | Medium | Imperceptible |

| **Impact** | **Receptor** | **Description of Impact (Character/Magnitude/ Duration/Probability/ Consequences)** Negligible to High | **Existing Environment (Significance/ Sensitivity)** Negligible to High | **Significance** Imperceptible to Profound |
|---|---|---|---|---|
| Loss of soils/subsoils due to extraction | Soils/ subsoils | Medium | Low | Slight |
| Loss of bedrock geology as extracted product | Bedrock geology | High | Low | Moderate |

## 15.12 Technical Difficulties

No technical difficulties were encountered.

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# 16 INTERACTIONS

## 16.1 Introduction

This section addresses the cumulative impacts, indirect impacts and main interactions between different aspects of the environment that may be impacted on as a result of the development. Only topics that could be logically linked to the development have been examined in detail. Accordingly, when a topic is not mentioned, it is concluded that no potential for conflict exists.

## 16.2 Interactions

Inter-relationships relate to the interactions between impacts within a project and the interactions between impacts identified under one topic with impacts identified under another topic. Each of the various environmental and related topics have been discussed separately in the preceding sections of the EIAR and the major interactions between the recorded environmental impacts are accessed within the individual Sections of the EIAR.

On examining the interactions of the potential impacts for this development, one must investigate the combined physical, environmental, visual and socio-economic impact of the development on the receiving environment. Table 16.1 illustrates the interaction of impacts assessed for this project.

**Table 16.1: Interactions**

| | Population & Human Health | Biodiversity | Lands, soils & Geology | Water | Climate | Air | Noise and Vibration | Traffic | Landscape and Restoration | Material Assets | Cultural Heritage |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **Population & Human Health** | | | | | | | | | | | |
| **Biodiversity** | | | | | | | | | | | |
| **Land, soils & geology** | | X | | | | | | | | | |
| **Water** | X | X | X | | | | | | | | |
| **Climate** | X | | | | | | | | | | |
| **Air** | X | X | X | X | X | | | | | | |
| **Noise and vibration** | X | X | | | | | | | | | |
| **Traffic** | X | | | | | X | X | | | | |
| **Landscape and Restoration** | X | X | X | | | | | | | | |
| **Material assets** | X | | X | | | | | X | X | | |
| **Cultural Heritage** | | | | | | | | | | | |

### 16.2.1 Population & Human Health and Water

Contaminants or leakages from plant and vehicles can potentially leak into surface waters and groundwater which could impact on water quality. Procedures are in place for dispensing fuel, servicing plant and equipment and for dealing with accidental spillages should they arise. Re-fuelling of site vehicles is done from the on-site fuel tank. The tank is situated in the bunded fuel storage area which is serviced by a hydrocarbon interceptor. Strict adherence to pollution control protocols will be for re-fuelling operations. Drip trays must be used and spill kits are available if required. Re-fuelling of plant is to be carried out using a mobile bowser. The mobile bowser must be fully bunded and drip trays used when re-fuelling and spill kits available if required. Effluent from the processing and manufacturing area will be recycled through a series of constructed settlement ponds. A hydrocarbon interceptor will in place within the drainage system leading from the machinery shed area. Given that there will be no effect on water quality standards, the effects on human health from water are assessed as Imperceptible.

#### 16.2.2 Population & Human Health and Climate

Plant associated with the operation of the development will result in emissions to air associated with the day-to-day operations undertaken at the quarry which are difficult to eliminate. Measures in place will reduce emissions in so far as possible in order to reduce the impact on climate from day-to-day operations.

#### 16.2.3 Population & Human Health and Air

The primary interaction between air and humans would relate to potential dust emissions associated with extraction, processing, manufacturing and transport of material around and off-site. Emissions from the processing plants and exhaust emissions from vehicles and plant are also a source of air pollutants. Dust deposition monitoring will be undertaken to ensure that levels are within the recommended guideline values. Dust suppression actions are included as part of mitigation. These include water sprinkling and reduced speed within the subject site. Provided that dust emission limits applied to the quarry are adhered to no residual impacts to the air quality are envisaged with the impacts assessed as imperceptible.

#### 16.2.4 Population & Human Health and Noise & Vibration

Activities undertaken at the quarry will generate noise and vibration associated with the fragmentation of rock by blasting means, extraction, processing, manufacturing, loading of vehicles and transportation of material within and off site. Various measures will be implemented to ensure noise levels are not elevated. A projected noise and vibration survey of the quarry showed that the proposed development will not result in an increase in noise levels above recommended guideline values at noise sensitive receptors. Regular noise monitoring and vibration and air overpressure monitoring associated with blasts will be undertaken to ensure levels at noise sensitive locations are below recommended guideline values. Provided that noise limits applied to the quarry are adhered to no residual impacts are envisaged with the impacts assessed as imperceptible.

#### 16.2.5 Population & Human Health and Traffic

It is predicted that approximately 18-20 loads of product per day will be transported off site creating approximately 40 traffic movements per day. This equates to a mean flow of 4.5 vehicle movements/hour. It is a possibility that demand could increase over a time period which would result in an increase in machinery operating and delivering lorries on the road. Raphoe is a busy commercial town as shown by the number of travelling vehicles recorded in the traffic surveys undertaken as part of this assessment. The surveys show that an average of 400 vehicles per hour travel along the main road (R236) to the east of the quarry. The projected vehicle movement of 4.5 per hour from the quarry would have no significant negative effect on traffic levels. The 20 vehicle movements relating to workers traffic to and from the quarry is also considered as not significant. The impact on roads and traffic is therefore assessed as imperceptible.

#### 16.2.6 Population & Human Health and Landscape & Restoration

The proposed landscape and restoration plan will serve to reduce the impact associated with quarrying activity. The creation of a new berm and associated planting will screen the proposed new extraction area from the south of the subject site. The restoration of the quarry on completion of extraction will aid in increasing the biodiversity of the area. The associated impacts have been assessed as imperceptible.

**16.2.7 Population & Human Health and Material assets**

Extraction of rock has and will result in the loss of a geological resource which cannot be replaced. The proposed landscape and restoration plan will mitigate the impact associated with quarrying activity. Quarry product will serve the demand for material both locally and regionally.

**16.2.8 Biodiversity and Land, Soils & Geology**

Mitigation measures have been included in order to minimise the potential effects on groundwater and soil quality and wildlife as a result of the proposed quarrying activity. The proposed restoration plan will offset the impact of quarrying activity and increase the biodiversity of the site.

**16.2.9 Biodiversity and Water**

A robust settlement pond and wetland system is proposed to treat all runoff from the subject site. All runoff will also be treated through a hydrocarbon interceptor before discharge offsite to ensure that all water is of good quality before discharging offsite to the Swilly Burn system. There will be no impact on the biodiversity of the area provided all mitigation measures are implemented and best practice is followed.

**16.2.10 Biodiversity and Air**

Activities undertaken at the quarry will have the potential to create windblown dust which can impact on flora and fauna. Mitigation and management measures as described throughout this EIAR must be in place at the quarry to prevent dust blow. Monitoring must be undertaken on a regular basis to ensure levels of dust deposition are within the recommended guideline values.

**16.2.11 Biodiversity and Noise & Vibration**

Extraction of the resource and related traffic can lead to noise emissions. Noise levels at quarry sites may affect some birds and mammals particularly those sensitive to noise. The predicted noise levels for the proposed quarrying activities are well within the levels recommended by the EPA Environmental Management Guidelines-Environmental Management in Extractive Industry (Non-Scheduled Minerals). Mitigation measures have also been proposed to protect wildlife onsite and in the surrounding environs and it has been established that quarrying activity will not result in any negative impact on the flora and fauna in the vicinity of the subject site. Noise and vibration emissions will be monitored and maintained within the parameters specified.

**16.2.12 Biodiversity and Landscape & Restoration**

A landscape and restoration plan has been compiled to offset the impact associated with quarrying activity. These include reinstatement and construction of berms where required and planting native species of trees and shrubs which will enhance the biodiversity of the area. Post mitigation the loss of habitat has been assessed as imperceptible.

**16.2.13 Land, Soils & Geology and Water**

The removal of overburden and bedrock can increase the risk of contamination of groundwater in the event of accidental spillages occurring. Procedures will be in place for overburden removal, landscaping, berm construction, dispensing fuel and servicing plant and equipment. All fuel must be stored in bunded fuel tanks which will contain potential leaks from tanks. The implementation of the proposed water management plan using the proposed settlement pond and wetland system will also protect receiving waters.

**16.2.14 Land, Soils & Geology and Air**

Soil and vegetation removed from the proposed areas for extraction will be used to create berms. The extraction of material and storage of material onsite can give rise to windblown dust. Measures and procedures will be in place to mitigate against ground and air pollution by machinery and associated activities.

### 16.2.15 Land, Soils & Geology and Landscape & Restoration

Within the subject site landscaping works will include the construction of berms, planting and allowing areas to rewild once quarrying activities have ceased at the site. The impact on the geology and landscape will be mitigated in the longer term by the proposed landscape and restoration plan.

### 16.2.16 Land, Soils & Geology and Material Assets

The geological resource extracted from the site will result in a larger quarry void than currently present. Rock extracted from the quarry is used as a raw material in the construction industry which is seen as a beneficial use. The quarry will create significant employment in the area and will employs in the region of 8-10 people with further indirect employment also created. The proposed quarrying activity for the 25-year period would continue to provide employment in this rural area.

### 16.2.17 Water and Air

Dust associated with quarrying activities has the potential to contaminate surface water and groundwater if appropriate measures are not in place. Management measures will be in place at the quarry such as employing dust suppression on processing equipment and dampening down haul roads during dry windy conditions.

### 16.2.18 Climate and Air

Plant and machinery operating at the quarry will result in emissions to air and climate associated with the operations which is difficult to mitigate against. Energy conservation measures and good management practices will serve to reduce the missions in so far as is possible.

### 16.2.19 Air and Traffic

There will be no increase in levels of traffic and air emissions as it is not proposed to increase traffic levels above that experienced in the past when the quarry was previously in operation.

### 16.2.20 Noise & Vibration and Traffic

Traffic associated with the development generates noise and a minor source of vibration. The development will not result in an increase in quarry traffic on the local road infrastructure therefore noise levels are not anticipated to increase.

### 16.2.21 Landscape & Restoration and Material Assets

The proposed landscape and restoration plan will offset the impact associated with quarrying activity.

### 16.2.22 Material Assets and Cultural heritage

Archaeological artefacts are part of our national heritage and history. There are four recorded protected structures within 1km of the quarry. These are not within the boundary of the subject site and are not affected by any quarry activity. The quarry and associated activities will have no negative impact on the existing cultural links within the surrounding environs.

### 16.2.23 "Do Nothing" Scenario

If the proposed is not granted planning permission, then the site is likely to remain in agricultural use. Potential employment from the construction and operational phase will not occur. The likely significant secondary benefit to the wider local economy with the development of the project will not occur with the do-nothing option.

# Section 17: MITIGATION & MONITORING SUMMARY

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# 17 MITIGATION & MONITORING SUMMARY

## 17.1 Introduction

This final section of the EIAR provides a summary of the mitigation measures proposed to avoid, reduce or remedy the potential impact identified and monitoring proposed to ensure that mitigation measures are effective.

## 17.2 Population and Human Health

### 17.2.1 Mitigation Measures

The following mitigation measures should be implemented and/or continuously practiced at the site.

- Security fencing and warning signs must be erected around the boundary of the quarry where required.
- Daily inspections of the quarry must be undertaken.
- Daily inspections of the public roads in the vicinity of the entrance to ensure that the road is free of dirt and debris must be undertaken.
- Noise and dust must be maintained within permitted legal limits.

### 17.2.2 Monitoring

Environmental monitoring must be carried out in accordance with the requirements of the conditions attached to the grant of planning permission.

## 17.3 Biodiversity

### 17.3.1 Mitigation Measures

- An Ecological Clerk of Works (ECoW's) must be appointed for the site who will advise on the appropriate implementation of the mitigation measures outlined within the EIAR and the separate NIS.
- Prior to the commencement of any extraction and major clearance works, an extensive water management system must be implemented as detailed in section 8 of this report
- Areas proposed for soil stripping must be assessed by the ECoW prior to work commencing, during works and on completion of works. ECoW to liaise with site manager in relation to any issues that need to be addressed.
- Removal of overburden for berm construction must be in accordance with demand and must be controlled to reduce the risk of runoff containing silt.
- Any precipitation that falls on stripping or berm construction areas must be directed to the new primary settlement pond.
- A silt fence must be erected along the outside of the berms to stop runoff flowing offsite
- Should any haul routes cross the drainage system throughout the site, a culvert must be constructed.
- Any excess overburden remaining after the creation of the berms must be removed off site to an approved waste facility or a site which is planning compliant.
- Drains and silt traps must be maintained throughout all excavation and works, ensuring that they are clear of sediment build-up and are not severely eroded.
- Clearance works must cease in periods of heavy rainfall denoted by a Met Eireann status orange warning.
- Strict control of the site boundaries must be enforced by the Site Manager, including minimal land clearance and restrictions on the use of machinery near waterbodies.
- The quarry must adhere to the terms and condition of the new water discharge licence once issued.

- The water management system as detailed in Section 8 of this EIAR must be fully implemented before any extraction commences.
- All fuel and other chemicals must be stored within a fully bunded area within the machinery shed. The area must contain appropriate drip trays and spill kits available, for vehicle refuelling operations.
- The concrete bunded area adjacent to the fuel storage area must be used for vehicle refuelling operations.
- All drainage from the proposed machinery shed, refuelling area and lubricant storage shed must be directed through a hydrocarbon interceptor before flowing through the settlement treatment system.
- Maintain the hydrocarbon interceptor installed into the drainage system immediately before discharge of surface waters off site.
- Regular inspections and maintenance scheduling must be undertaken for all plant and vehicle to minimise the potential for malfunction or leak.
- Regular visual monitoring of all surface waters onsite for any surface sheen or sign of potential hydrocarbon pollution must be undertaken.
- Regular maintenance of settlement tanks must be undertaken to ensure efficiency and appropriate disposal of material removed.
- An emergency spill kit with oil boom, absorbers etc. must be kept on site for use in the event of an accidental spillage/leak.
- Suspension of extraction and material handling activities for the duration of a red level rainfall warning issued by Met Eireann must be adhered to.
- The site must maintain and continually update the environmental monitoring programme and monitor water, noise, dust, and blasting on a regular basis to demonstrate that the development is not having an adverse impact on the surrounding environment.
- Drawings and planned routes must be adhered to, thus ensuring the correct route corridor is followed.
- Prior to clearance during the construction stage the ECoW is to be consulted. Sensitive areas that are to remain untouched from clearance must be highlighted.
- Once the construction works are complete, the site boundaries will be interplanted with a mix of native trees and shrubbery. The existing boundaries must be strengthened with the planting of additional trees.
- The site of the proposed works must be thoroughly walked by the ECoW's and examined prior to works occurring to confirm that there are no birds nesting within the area and to give any resting animals warning and opportunity to escape safely.
- If birds are observed breeding within the extraction area, then works must immediately cease until chicks have fledged and the birds have all moved on.
- Invasive activities are to be avoided during the primary breeding periods of wildlife, including removal of vegetation. The cutting of hedgerows is illegal from March 1st to August 31st, as per the Wildlife Act 1976 as amended 2000.
- All construction activity must be undertaken in line with BS 5228 -1:2009+A1 2014 which includes guidance on several aspects of construction site practices such as: (a) Selection of quiet plant, (b) Control of noise sources, (c) Screening, (d) Hours of work.
- Plant used at the site must have noise emission levels that comply with the limiting levels defined in EC Directive 86/662/EEC and any subsequent amendments. Any plant that is used intermittently must be shut down when not in use to minimise noise levels.
- The best means practical, including proper maintenance of plant, must be employed to minimise the noise produced by on-site operations.
- All vehicles and mechanical plant must be fitted with effective exhaust silencers and maintained in good working order for the duration of the contract.

- Compressors must be of the "sound reduced" models fitted with properly lined and sealed acoustic covers which must be kept closed whenever the machines are in use and all ancillary pneumatic tools must be fitted with suitable silencers.
- All outdoor lighting (outside of the yard area) is to be hooded and limited to 10 watts maximum. Outdoor lighting should face downwards and be minimised at night and utilise motion sensors to reduce interference to nocturnal species.
- The external site boundaries must be vegetated with a mixture of native shrubs and trees which will act an acoustic barrier for the site.
- The proposed operational works must be monitored periodically, particularly during the bird breeding season, by a qualified ecologist to ensure that the mitigation measures proposed are implemented.
- Bat and bird boxes to be erected throughout the subject site to provide roosting opportunities. Location of same to be advised by the ECoW's.
- Two inspections per annum must be undertaken for nesting birds within the site by the site manager and the appointed ECoW, one of which is during the breeding season.
- All mitigation prescribed in Section 10 *Blast and Vibration* and Section 9 *Noise & Dust*, and in the accompanying NIS must be adhered to. All such mitigation measures must be implemented by the site manager and ECoW.
- Prior notification of blasting (24 hours) to the NPWS by email or telephone and adhere to any additional mitigation measures as may be suggested. This will allow local ranger to take seasonal and localised factor relating to other fauna into consideration, if relevant.
- Overburden won from site clearance must be used to create berms as per figure 15.6
- Landscaping must use a mix of native species which will help support a wide range of insects and animals and will contribute to the ecological value of the area. Details of landscaping are laid out in Section 15 of this EIAR.
- Additionally, Section 15 details a full restoration plan which must be implemented once quarrying activities have ceased which will allow the quarry void to be reclaimed by nature over time.
- The attenuation and wetland system must be specifically sized to deal with the additional runoff generated from site stripping so there is no risk of flooding occurring within the site nor in the surrounding environs due to the removal of the grassland habitat.

#### 17.3.2 Monitoring

It is recommended that the proposed operational works are monitored periodically, particularly during the bird breeding season by a qualified ecologist to ensure that the mitigation proposed is implemented and that the conservation interests within the receiving environment are effectively protected. Two inspections per annum must be undertaken, one of which is during the breeding season. Ongoing monitoring of water quality will continue to be undertaken during the operation of the quarry to ensure that all mitigation measures as set within the EIAR and NIS are being implemented. Water quality monitoring will be in line with conditions that will be set within the discharge licence which will be applied for should planning be granted. This role will be taken on by the nominated ECoW who will be responsible for all ongoing monitoring required (including monitoring requirements as set within the possible future discharge licence) throughout the operational lifetime of the quarry. Reports on findings should be submitted to the competent authority, Donegal County Council, as required.

### 17.4 Land, Soils and Geology

#### 17.4.1 Mitigation measures

- Fuel storage beside the machinery shed must be in a fully bunded area
- A concrete bunded area adjacent to the fuel storage area with appropriate drip trays and spill kits must be used for vehicle refuelling operations.

- A hydrocarbon interceptor must be installed into the drainage system downstream of the area containing the machinery shed, lubricant storage shed and vehicle refuelling bay.
- A second hydrocarbon interceptor must be installed into the drainage system downstream of the constructed wetlands before final discharge of effluent off site.
- Oils and lubricants must be stored in a bunded area in the machinery shed.
- A dedicated bay with a concrete apron next to the machinery shed must be used for vehicles undergoing routine maintenance, washing etc.
- Refuelling of static plant on site must be carried out using a fully bunded bowser or by licenced fuel contractor with mobile tanker.
- Drip trays must be used for all refuelling operations. Best practice for refuelling is incorporated into the Environmental Management System for the site.
- Regular inspections and maintenance scheduling must take place for all plant and vehicle to minimise the potential for malfunction or leak.
- An emergency spill kit with oil boom, absorbers etc. must be kept on site for use in the event of an accidental spillage/leak.
- Regular visual monitoring of all surface waters onsite (including settlement tanks) must be undertaken for any surface sheen or sign of potential hydrocarbon pollution.
- Geotechnical assessments of quarry face over 20 m height, and those over 30 m height with multiple benches, must be conducted by a geotechnical specialist once the face is created and when dormant. Reports to be held by site manager for inspection upon request by the consent authority.
- A professional geologist must provide reports as required by the NSAI to ensure that the aggregate produced meets the NSAI required specification for end purpose.
- Overburden and unsuitable material must be used for the creation of screening berms around the external boundary of the application site.
- Excess overburden must be stockpiled in a suitable location for use in the restoration phase.

#### 17.4.2 Monitoring

An inspection of the geological environment must be undertaken by a competent Geologist and a Geotechnical Engineer annually or as otherwise specified in conditions attached to grant of planning.

### 17.5 Water

#### 17.5.1 Mitigation measures

- Silt fence must be installed around the perimeter of newly constructed berms and kept in place until berms have been colonised with vegetation and risk of sediment transport in runoff is negligible
- Temporary silt traps and channels to be used to direct runoff to settlement system where practical.
- Adequate constructed settlement tank capacity and constructed wetland system must be put in place to reduce sediment load in the effluent to acceptable levels before discharging offsite (Section 8.6.2). This work must be done before any quarrying activity is undertaken.
- Suitable drainage system must be put in place to direct effluent and runoff that may become contaminated with suspended sediment to the settlement tank and wetland system.
- Regular maintenance of settlement tanks (and drainage system) must be undertaken to ensure efficiency and appropriate disposal of material removed.
- Suspension of extraction and material handling activities for the duration of a red level rainfall warning issued by Met Eireann must be implemented.
- Regular monitoring of the discharge point must be undertaken.

- Single discharge point to be subject to the conditions of a trade discharge licence from Donegal County Council.
- The concrete bunded area adjacent to the fuel storage area with appropriate drip trays and spill kits available must be used for vehicle refuelling operations.
- Fuels and lubricants must be stored in a bunded area in the machinery shed.
- Maintain both hydrocarbon interceptors.
- Refuelling of static plant on site must be carried out using a fully bunded bowser/mobile fuel truck.
- Drip trays must be used for all re-fuelling operations. Best practice for re-fuelling to be incorporated into the Environmental Management System for the subject site.
- Regular inspections and maintenance scheduling to take place for all plant and vehicle to minimise the potential for malfunction or leak.
- Emergency spill kit with oil boom, absorbers etc. to be kept on site for use in the event of an accidental spillage/leak.
- Regular visual monitoring of all surface waters onsite to take place for any surface sheen or sign of potential hydrocarbon pollution.

#### 17.5.2 Monitoring

Monitoring must be undertaken in accordance with the conditions attached to a grant of permission or discharge licence attached to the subject site.

### 17.6 Air

#### 17.6.1 Mitigation measures

- Drill rigs used for blasting the rock bench as the extraction area is extended must be operated with dust bag suppression systems.
- All plant machinery including dump trucks and other smaller on-site trucks, excavators and loaders operating within the quarry site must be properly maintained to control and reduce exhaust emissions from running diesel engines.
- A dust suppression system must operate on the aggregate production plant. This comprises several pressurised spray bars installed at feeds to the crusher plant and at the end of inclined conveyors to prevent fugitive dust and PM emission's when aggregate is being discharged onto stockpiles.
- A mobile water tanker or a fixed pressurised water spray network must be regularly used to spray the surface of the haul roads during dry weather conditions to control dust emissions from trucks.
- A wheel wash, incorporating high pressure top and side spray bars must be installed at the exit of the quarry. All vehicles departing from the quarry must pass through this wash system.
- The quarry site entrance must be regularly maintained, especially during dry weather periods, to remove any accumulations of silt deposited on the road surface from trucks and other traffic departing from the quarry onto the public road being re-suspended by passing vehicles.
- Truck speeds must be controlled along unpaved haul roads within the quarry site and along the access road to reduce re-suspension of silt deposits on the road surface by the movement of trucks.
- All trailer loads carrying loose aggregates must be covered and checked at the weighbridge before departing from the quarry site.
- Heights of stockpiles must be kept as low as possible to limit dust blow of same.

### 17.6.2 Monitoring

It is recommended that 3 Bergerhoff Standard Gauges be set up at locations close to the boundary of the site one being west of site, one being south of site and one being east of site. In practice monitoring is reported monthly (average 28-32days as 350mg/m$^2$/day).

## 17.7 Noise & Vibration

### 17.7.1 Mitigation measures

- Proper management procedures (pre-blasting management procedures, loading management procedures and blasting management procedures) must be in place at all times.
- Blasting can only take place between 12:00hrs and 16:00 hrs, Monday to Friday. Blasting must not be conducted on weekends or bank holidays.
- Prior to drilling the blasting pattern, the quarry foreman must mark the position of the boreholes and the blast number on the ground as per the agreed blasting plan approved and signed by the Drilling and Blasting Manager.
- A blasting plan must be issued by the blaster in charge for agreement to the Drilling and blasting manager prior to the drilling of any blast.
- Only personnel with appropriated certification in drilling and blasting can be allowed to operate the blasting programs.
- A drillers log must be in place at all times.
- A site-specific scale distance regression for the proposed development site must be developed (or equivalent) as blasting continues over the life of the quarry.
- Monitoring locations for ground vibration and air overpressure must be agreed prior to blasting. Monitoring data will be used to allow for future adjustments to the maximum instantaneous charge of the blast if required.
- All seismographs must have a certificate of calibration from the manufacturer and all certificates and serial numbers of each seismograph to be used for the monitoring of the blast must be kept on file. All seismometers must have blast wave frequency analysis facility.
- Advance warning notice of all blasts must be given to residents in the environs of the quarry at least 24hrs prior to blasting.
- Ensure that the optimum blast ratio is maintained and ensure that the maximum amount of explosive on any one delay, the maximum instantaneous charge (MIC) is optimised so that the ground vibration levels are kept below the regulatory limits.
- Explosive charges must be properly and adequately confined by a sufficient amount of quality of stemming by using angular chippings and/or a combination of angular chippings and plug.
- The adequate confinement of all charges by means of accurate face survey and the subsequent judicious placement of explosives by certified personnel.
- Overcharging must be avoided by considering depth, burden and spacing when calculating charge weight per hole
- There must be no exposed detonating cord used in surface.
- The initiation sequence in the blast must be set in a way that it progresses away from the nearest sensitive locations or structures to be protected, were practical.
- An adequate powder factor and energy factor must be chosen for each blast by considering safety, confinement and productivity.
- Borehole deviation studies must be conducted in order to have a better control in potential borehole deviation.

- Only the necessary sub drilling to achieve good breakage must be used (Normally 1 to 1.5 m), excessive sub-drilling must be avoided at all times.
- Use of decked charges if required in order to reduce the Maximum Instantaneous Charge (MIC).
- Pre-splitting technique must be used for the final slope stability.

#### 17.7.2 Monitoring

Blast vibration monitoring must be carried out for each blast at a minimum of two locations with locations varying throughout the life of quarry. Where practical one monitor must be placed at a receptor location away from active face (i.e no void between blast source and receptor).

### 17.8 Climate

#### 17.8.1 Mitigation Measures

- Strict adherence to good operational practice such as switching off plant and vehicles when not in use during the construction phase
- All plant and vehicles involved in the construction phase must be regularly serviced to ensure they are running as efficiently as possible
- Energy consumption ratings must be considered when upgrading new vehicles associated with the site.
- Regular energy audits must be implemented to assess energy requirements and areas where energy usage can be reduced. This will lead to a reduction in greenhouse gas emissions.
- Landscaping plan (section 15) must be implemented to offset vegetation loss and increase net biodiversity.

#### 17.8.2 Monitoring

- No monitoring is proposed.

### 17.9 Material Assets

#### 17.9.1 Mitigation Measures

There are no specific mitigation measures proposed. Monitoring is proposed in various sections of the EIAR which will identify any future needs of additional measures to be considered regarding material assets.

### 17.10 Cultural heritage

#### 17.10.1 Mitigation Measures

No mitigation is proposed as there are no negative impacts envisioned on local archaeology from the proposed development.

### 17.11 Landscape & Restoration

#### 17.11.1 Mitigation Measures & Monitoring

- New berms must be created around the proposed excavation site to screen the development and to provide natural vegetation and wildlife corridors of connectivity.
- A mix of native species (15.8.2) must be planted around the eastern and southern boundary of the new berm to support a wide range of insects and animals and contribute to the ecological value of the area.
- All planting of trees and shrubs must take place during the first dormant season, avoiding times of frost.

- Planting to be monitored by the Ecological Clerk of Works with appropriate advice and guidance given to the site manager.
- A full and comprehensive restoration plan must be submitted and agreed with the planning authority in relation to one or both of the following as they become relevant:
    - Restoration of the 5.37Ha excavation area.
    - Restoration of the entire subject site.