Property

Resource Planning Management & Development

NOVEMBER 2017 | Project No. 33.1.13.39.2015.10

ENVIRONMENTAL IMPACT ASSESSMENT REPORT (EIAR)

For further extraction of a quarry & and all related ancillary site works over an application site area of 21.9 ha. with excavation over an area of 13.6 ha.

To accompany an application for permission for a quarry under S.37L of the Planning & Development Act, 200 (as amended)

Powerstown,

Nurney,

Co. Carlow

On behalf of

Dan Morrissey Ireland Ltd. (In Receivership)

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ACRONYMS & ABBREVIATIONS GLOSSARY

AA	Appropriate Assessment
AADT	Annual Average Daily Traffic
ABP	An Bord Pleanála
ACA	Architectural Conservation Area
AOD	Above Ordnance Datum
ARV	Annual Rate on Valuation
ASI	Archaeological Survey of Ireland
BAT	Best Available Techniques
CIE	Coras Iompair Éireann
CFRAM	Catchment Flood Risk Assessment and Management
CORINE	COoRdinate INformation on the Environment
CSO	Central Statistics Office
DAHRRG	Department of the Arts, Heritage, Regional, Rural and Gaeltacht Affairs
DMIL	Dan Morrisey Ireland (In Receivership)
ED	Electoral Division
EIA	Environmental Impact Assessment
EIAR	Environmental Impact Assessment Report (rEIAR remedial Environmental Impact Assessment Report)
EIS	Environmental Impact Statement (rEIS remedial Environmental Impact Statement)
EPA	Environmental Protection Agency
EU	European Union
FRA	Flood Risk Assessment
GSI	Geological Survey Ireland
ha	hectares (1 ha. = 10,000 m^2)
IPCC	Integrated Pollution Control
ITM	Irish Transverse Mercator
JOTT	Joint Option to Tax
Km	kilometres
LVIA	Landscape and Visual Impact Assessment
m^2	square metres (also: sqm)
NAV	Net Annual Value
NHA	Natural Heritage Area (pNHA proposed Natural Heritage Area)
NIAH	National Inventory of Architectural Heritage
NIS	Natura Impact Statement (rNIS remedial Natura Impact Statement)
NPWS	National Parks and Wildlife Service
NRA	National Road Authority (Now TII Transport Infrastructure Ireland)
pa	per annum (per year)
PCVE	Pre-contract VAT enquiries
TOB	Transfer of Business
TTA	Traffic and Transport Assessment
RMP	Record of Monuments & Places
SAC	Special Area of Conservation (cSAC candidate Special Area of Conservation)
SA	Small Area
SAPS	Small Area Population Statistics
SPA	Special Protection Area (pSPA proposed Special Protection Area)
SMR	Sites and Monuments Record
EIAR	Environmental Impact Assessment Report (rEIAR Remedial Environmental Impact Assessment Report)
P&D Act	Planning & Development Act, 2000 as amended

1.0 INTRODUCTION

This Environmental Impact Assessment Report [EIAR] has been prepared to accompany an application for permission for the further development consisting of quarrying and ancillary site works over a total of approximately 21.9 hectares [ha.] at Powerstown, Nurney, Co. Carlow.

The application for permission is made direct to An Bord Pleanála under Section 37L of the Planning and Development Act, 2000, as amended. This application for permission is for simultaneous development to that for which substitute consent has been sought under ref. ABP-300034-17 related to an existing quarry void in two land units at neighbouring townlands; Clonmelsh and Garyhundon, Nurney, Co. Carlow.

This EIAR is submitted on instruction of Mr. Paul McCann & Mr. Stephen Tennant of Grant Thornton, 24-26 City Quay, Dublin 2 receivers of the entire assets and undertakings of Dan Morrissey (Irl) Limited appointed by Allied Irish Banks plc by deed of appointment dated the 18th June 2014.

This EIAR is therefore on behalf of Dan Morrissey (Irl) Limited (In Receivership) [DMIL] as the owner and / or occupier of lands located at Clonmelsh and Garyhundon and Powerstown, Nurney Co. Carlow which extend to about 170 ha. in on contiguous unit, a significant proportion of which are in use for aggregate extraction, namely sand and gravel and limestone.

The lands the subject of this EIAR [the subject lands] encompass the application area of approximately 21.9 ha. proposing an excavation area of approximately 13.6 ha. The subject lands occur at ITM [Irish Transverse Mercator] 671856, 669302 in the townland of Powerstown in the Electoral Division [ED] of Nurney, County Carlow. The lands are a rational rectangular shape with a south to north orientation onto an existing quarry void in the townland of Clonmelsh. The remaining western, southern and eastern sides of the subject site are bounded by local roads (L3045 to the east and south and the L3044 to the south and west). See figure 1.1 for strategic site location.

Figure 1.2 indicates the location of the subject site at *Powerstown* relative to the aforementioned existing quarry void in two land units at neighbouring townlands; *Clonmelsh* and *Garyhundon*, Nurney, Co. Carlow the subject of substitute consent application ABP-300034-17.

Figure 1.1 Site Location Map (Repeat of Site Location Map – Regional submitted as part of planning application)

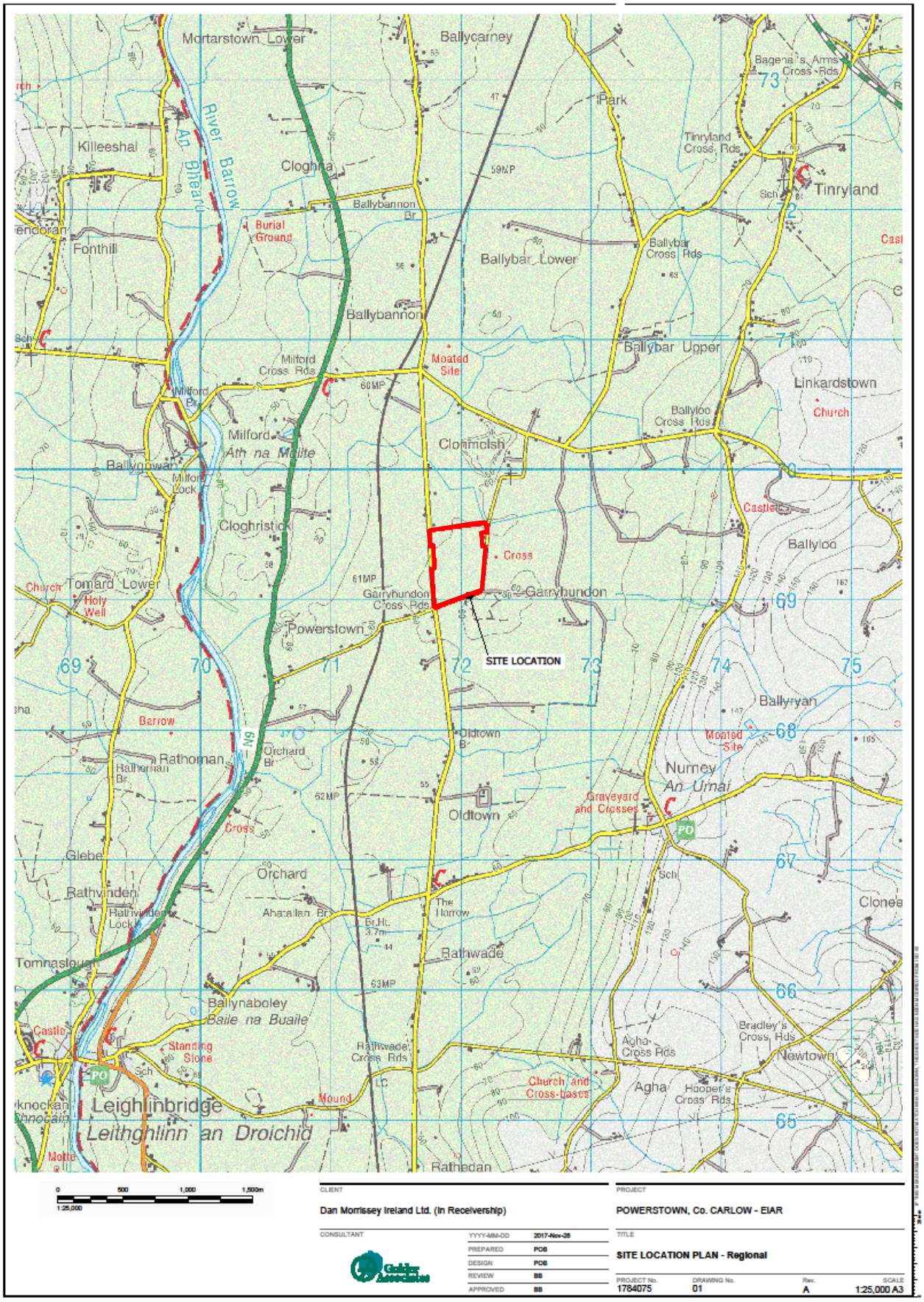
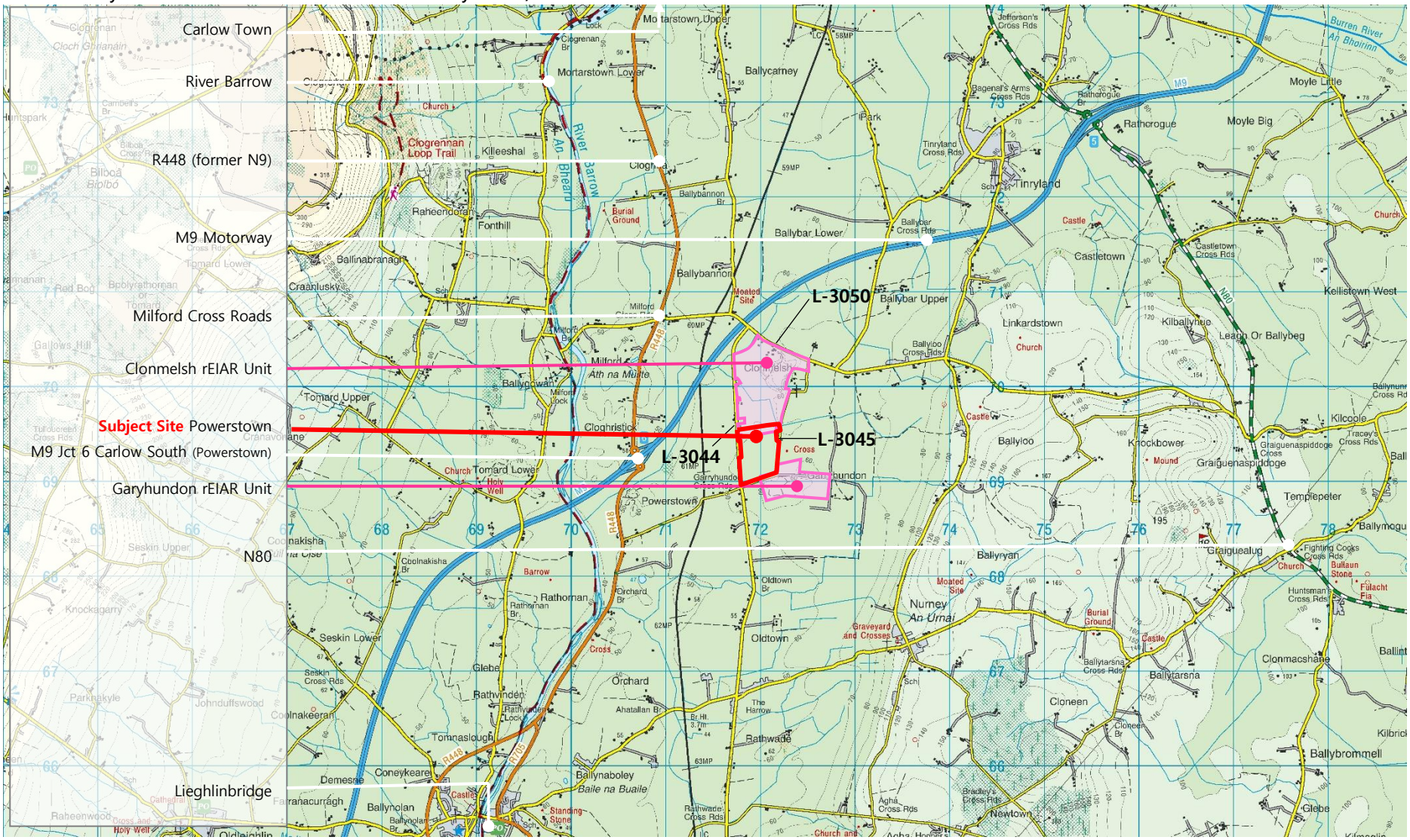


Figure 1.2 Site Location Map Indicating Subject Site location in Powerstown relative to Extant Quarry void over two other townlands Clonmelsh & Powerstown (On Discovery Series Tile OS2616_D)



1.1 Requirement for EIAR

This EIAR is submitted to support a planning application in the townland of Powerstown for further extraction of an extant quarry unit in the townlands of Clonmelsh and Garyhundon, Nurney Co. Carlow.

The application for permission area is concordant with the EIAR area at approximately 21.9 ha. with a lateral extraction area of approximately 13.6 ha. within a larger contiguous landholding of approximately 170 ha.

The type and extent of the proposed extraction use requires an EIAR. Part X of the Planning and Development Act 2000, as amended is concerned with environmental impact assessment for the purposes of planning permission. Section 172 prescribes the requirement for environmental impact assessment for certain types and or intensities of development as set out in Schedule 5 of the Planning and Development Regulations. Included amongst scheduled development is Part 2, 2 Extractive industry *"(b) Extraction of stone, gravel, sand or clay, where the area of extraction would be greater than 5 hectares."* In this instance the extraction of limestone over an approximate area of 13.6 ha. is proposed.

1.1.1 Concurrent rEIAR

The proposed development is designed in such a manner as to be a continuation of an extant quarry void located in Clonmelsh, Nurney, Co. Carlow. For this reason, the southern face of that quarry is included in the current application site area.

This extant quarry area in Clonmelsh is approximately 51 ha. in extent and alongside an extant sand and gravel pit to the south of the current site in Garyhundon are together a single quarry unit the subject of an application for substitute consent ref. ABP-300034-17 supported by a remedial Environmental Impact Assessment [rEIAR].

In July 2015 a single application for leave for substitute consent was made under ref. PL19.0019 for land constituting a quarry with associated processing plant over a total site area of 81 ha. in two land parcels. During the currency of consideration of that application for leave for substitute consent it was determined that the lands constituted two distinct but cooperating units. By orders dated 7th April 2017 leave for substitute consent for both units were made allowing that the same remedial Environmental Impact Statement (rEIS) and remedial Natura Impact Statement (rNIS) be used for both applications. Both applications were made 24th October 2017 supported by a single rEIAR. In summary:

- **01.LQ.0001 (01.SH0.235)** application for leave for substitute consent was granted for a **quarry** under S.261A(24)(a). This application has received the ref. ABP-300034-17.

The application consists of:
a quarry over two areas; 51 ha. in Clonmelsh to an average depth of approximately 25AOD and 27 ha. in Garyhundon to an average depth of approximately 57AOD. The development also holds supporting infrastructure consisting of; existing entrance to the L3045 at Garyhundon permitted under Reg. Ref. 2979; asphalt plant permitted under Reg. Ref. 92/137; 2 no. aggregate processing plants permitted under Reg. Refs. 76/3642 and 76/3842. Ancillary site development includes; water management system consisting of settlement ponds, mobile pump and underground pipeline crossing associated plant area at Garyhundon, mobile aggregate processing plant, storage containers and haul routes.

This application is hereafter referred to as ABP-300034-17 (Quarry)

- **01.LS.0019 (SH 01.SH.0236)** leave for application for substitute consent was granted for a **plant area** at Clonmelsh under S.177(D). This application has received the ref. ABP-300037-17.

The application consists of:
A plant area over about 3.22 ha. containing; Readymix concrete batching plant (110 sqm) & shed (1,224 sqm); Mobile canteen (container) (27 sqm); Demountable Readymix concrete plant (219 sqm); Shipping Office (103 sqm) Container 1

(storage) (14.5 sqm); Container 2 (mobile office) (29 sqm); Weighbridge (53 sqm) originally permitted under Reg. Ref. 2981; Demountable asphalt production plant (Amman) (847 sqm) the subject of APL10/01 & control room (66.5 sqm); ESB Substation (50.6 sqm); Bunded fuel tanks (168 sqm) & Pumphouse (34.56 sqm); and Workshop (180 sqm). The development also holds supporting infrastructure consisting of; entrance onto the L3050 and water management system including septic tank; water holding tanks; well; settlement pond; discharge license DL7/233 and ancillary site works including aggregate and precast, concrete and cold asphalt product storage areas.

This application is hereafter referred to as ABP-30037-17 (Plant Area)

The two substitute consent application areas at approx. 3.22 ha. for the plant area and 51 and 27 ha. for the quarry area together total 81.22 ha. which slightly exceed the stated 81 ha. measurement for the rEIAR area for reason of part of the quarry infrastructure (water drainage pipe) crossing the plant area.

1.1.2 Concurrent remedial Natura Impact Assessment [rNIS] & Accompanying Natura Impact Assessment [NIS]

Part XAB of the Planning and Development Act 2000, as amended is concerned with Appropriate Assessment [AA] for the purposes of planning permission. In summary, the location and characteristics of the development proposed, alongside previous Screening for Appropriate Assessment [AA] and rNIS for lands associated with the current site, combine to indicate an AA requirement and thus, as a precautionary measure, an NIS has been prepared to accompany the application for further extraction of an extant quarry alongside this EIAR. The companion NIS is submitted to aid the Bord in AA should they determine AA is required.

The location, characteristics and precedent for AA on lands associated with the subject site are detailed below:

- The subject site is located approximately 2km from the River Barrow to the west. The River Barrow is designated as a candidate Special Area of Conservation (cSAC) as the River Barrow and River Nore. The subject lands hold Clonmelsh Stream running east to west close to the northern boundary of the subject site. This stream is proposed to be moved in a southerly direction, although retained in the application and EIAR land unit, as part of the proposed development.

- In 2005 the lands the subject of this EIAR were included in a single S.261 registration under ref. QY/25 where the total site area was declared at 323 ha. and the then extraction area at 85 ha. There was no indication of void on registration map submitted. See figure 1.3 for S.261 boundary (no differentiation between control and void boundaries).

- In 2010 an application for the continuation of quarrying under S.261(7) was submitted under Reg. Ref. 10/130 and declared a total 'land interest;' of 171.1 ha. and planning application area of 166.1 ha. to a depth of -75 AOD that included the subject site. After 3 rounds of further information this development was notified a grant of planning permission omitting proposed stream diversion and permitting demolition of 3 no. houses. See figure 1.3 for Reg. Ref. 10/130 boundaries.

  The decision was appealed to An Bord Pleanála receiving ref. PL01.238679 with significant alterations from the original proposal; reduced extraction area from the then 123.5 ha. to approximately 70 ha.; raise floor from -75mOD to -25mOD; and eliminating two local road closures and realignment. The development was ultimately refused planning permission. DMIL applied for and were granted leave to apply for judicial review to quash the decision of the Board (High Court Record No. 213/556). These proceedings are pending before the High Court. Notwithstanding the further information requests included a requirement for Screening for AA that was prepared and submitted and the Inspector's Report of PL01.238679 at Section 11.36 carries out AA.

- The orders granting leave for substitute consent for the extant quarry and plant areas, as outlined at section 1.1. above, required rEIAR and rNIS.

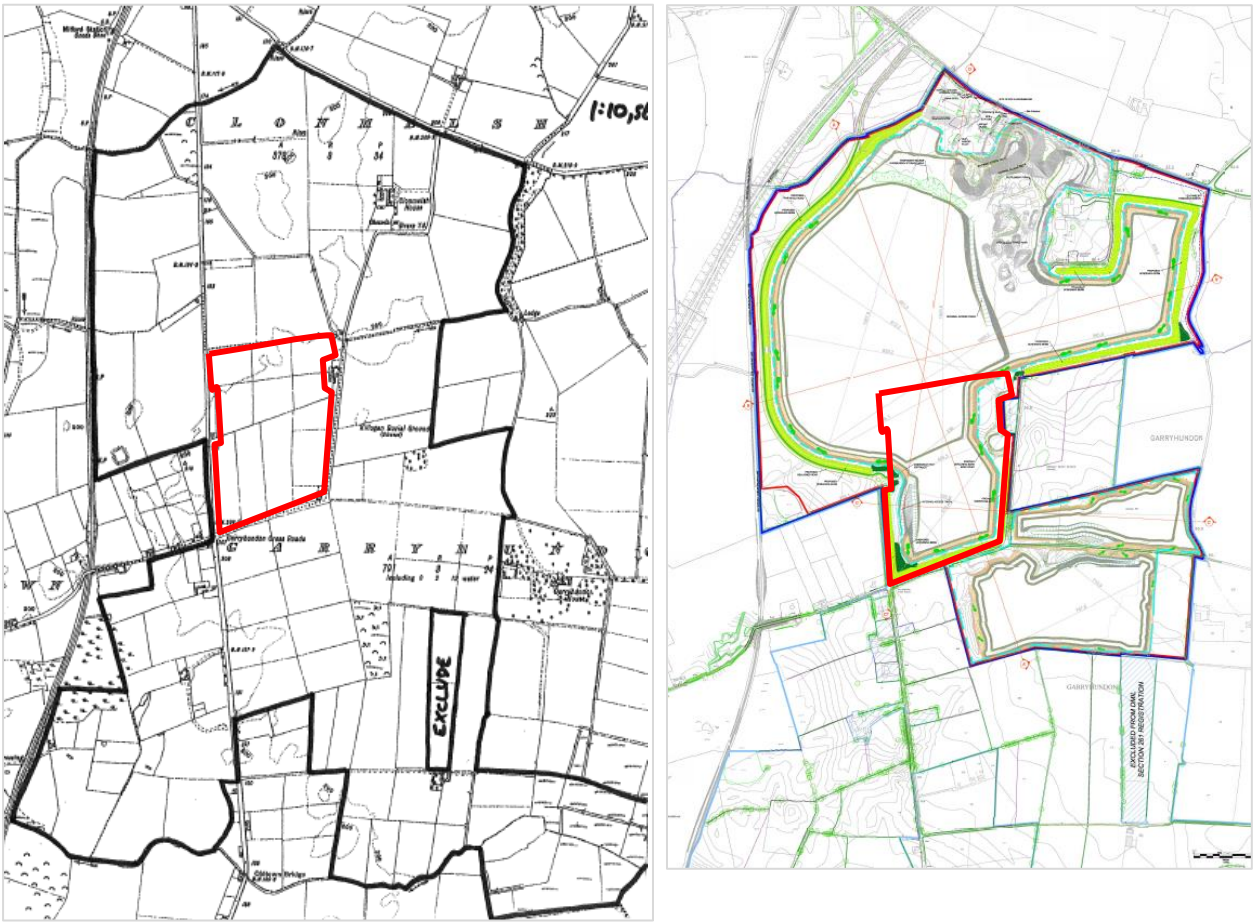


Figure 1.3 Copy of S.261 Registration boundary (April 2005) & Proposed Site Layout Reg. Ref. 10/130 (April 2010). Subject Site overlain

1.2 Structure & Content of EIAR

The report to aid the environmental impact assessment by the authority is here presented as an Environmental Impact Assessment Report [EIAR] for reason of government provision and guidance for the transposition of the 2014 EIA Directive into Irish Law.

The following subsections outline the evolution of EIA Directives and their interpretation in the Irish jurisdiction in order to define the purposes and content of the EIAR.

Please note that in this EIAR, in keeping with the precautionary approach, latest commensurate government advice and guidance in respect of the implementation of the 2014 EIA Directive has been followed as explicit transposing statutory provision is currently being formulated.

1.2.1 EIA Directives & Transposition

The requirement for an Environmental Impact Assessment [EIA] process arises from European Union [EU] Directives required to be adhered to by member States and transposed into national laws.

The original EIA Directive 85/337/EEC has been amended and superseded by Directives 97/11/EC, 2003/35/EC, 2009/31/EC to Directive 2011/92/EU.

On 16th April 2014 Directive 2011/92/EU was amended by Directive 2014/52/EU of the European Parliament and of the

Council [2014 EIA Directive].

The amending 2014 EIA Directive consists of 16 no. Articles and 5 no. Annexes that define EIA and the supporting information and processes available and required for EIA determination in the form of reasoned conclusion of significant effects by the competent authority.

This is the environmental impact assessment report [EIAR] by the developer defined at Article 1 and required under Article 3 in order EIA, may be undertaken. This report relates to lands the subject of extraction in a total application area of 21.9 ha. with extraction area of 13.6 ha. that automatically attracts the requirement for EIA under the Planning and Development Act 2000, as amended [P&D Act] for reason of the quarry extraction area exceeding a 5 ha. threshold. The threshold extraction area size is imposed after Article 4(2) of the Directive that allows thresholds to be set for Annex II projects. Annex II projects include 'Extractive Industry'.

The EIA is undertaken in accordance with articles 5 through 10.

Article 5 of the 2014 EIA Directive sets down the minimum information to be supplied in an EIAR including those matters at Annex IV as follows;
"(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."

The 2014 EIA Directive required that *"Member States shall bring into force the laws, regulations and administrative provisions necessary to comply with this Directive by 16 May 2017."*

The requirement for the current EIAR arises as a compulsory requirement for a quarry project with extraction area over 5 ha. seeking planning permission as a project to be simultaneously considered with an extant substitute consent application for a quarry under ABP-300034-17 (Quarry). The provision for such an application is at S.37L of the Planning and Development Act 2000, as amended that prescribes submission of the application to An Bord Pleanála. Therefore the competent authority undertaking EIA of this project, including the contents of this report is An Bord Pleanála. It is noted that this assessment will be simultaneous with that of the rEIAR submitted in support of ABP-300034-17 (Quarry).

In order this EIAR is found to respond to information and assessment requirements as set down in the 2014 EAI Directive Appendix 1.2 repeats the information requirements of Annex IV after Article 5(1).

1.2.2 Statutory Provisions

As stated above the requirement for the current EIAR arises as planning permission is sought for a project of a prescribed type (quarry) above a 5 ha. extraction area threshold size (extraction area proposed 13.6 ha.) in the Planning and Development statutes. Therefore the planning and development statutes and related policy and guidance are relied upon to contextualise and define this report.

The report of the assessment of environmental effects to be prepared and submitted by a developer is referred to as an Environmental Impact Statement [EIS] in the current planning and development statutes pending the full transposition of

the 2014 EIA Directive.

At S.2 'Interpretation' The P&D Act defines an EIS as "*statement of the effects, if any, which proposed development, if carried out, would have on the environment and shall include the information specified in Annex IV of Council Directive No. 2011/92/EU".*

Part X of the P&D Act at S.171A defines environmental impact assessment [EIA] as "*an assessment, which includes an examination, analysis and evaluation, carried out by a planning authority or the Board, as the case may be, in accordance with this Part and regulations made thereunder, that shall identify, describe and assess in an appropriate manner, in light of each individual case and in accordance with Articles 4 to 11 of the Environmental Impact Assessment Directive, the direct and indirect effects of a proposed development on the following:*
(a) human beings, flora and fauna,
(b) soil, water, air, climate and the landscape,
(c) material assets and the cultural heritage, and
(d) the interaction between the factors mentioned in paragraphs (a), (b) and (c).

(2) Subject to this Part, a word or expression that is used in the Part and that is also used in the Environmental Impact Assessment Directive has, unless the context otherwise requires, the same meaning in this Part as it has in the Environmental Impact Assessment Directive."

Having regard to the planned transposition of the 2014 EIA Directive summarised at the last section of this report the references to the EIA Directive in the P&D Act are here interpreted to refer to that latest 2014 Directive.

Part X of the P&D Act sets down the requirement for the competent authority to carry out EIA on projects listed at Schedule 5 of the Planning and Development Regulations and further the requirement upon an applicant to furnish an EIS (EIAR) for this purpose for prescribed projects.

Regulations have been made to administer EIA. For the purposes of this EIAR and the statutes under which the requirement for its preparation has arisen the following Statutory Instruments are relevant and have informed this report:

- European Communities (Environmental Impact Assessment) Regulations, as amended (1989-2006)
- Planning and Development Regulations, 2001 – 2017 [the P&D Regulations]

Schedule 6 of the P&D Regulations prescribe the information that "*shall*" be contained in an EIS at paragraph 1; further information depending on the stage, consent procedure, specific characteristics of a project, and best practice to describe the project and set out assessment of impacts; and a non technical summary.

Please see Appendix 1.3 for a rendition of the requirements for EIS as set down under Schedule 6 of the P&D Regulations.

1.2.3 Guidance

Under the P&D Act the minister may make regulations and issue guidance. Summarily, Sections 28 and 29 of the P&D Act require that planning authorities and An Bord Pleanála have regard to guidelines and comply with policy directives, respectively in the performance of their functions.

In addition, the minister may issue clarifications of certain procedural matters in the form of Circulars to planning authorities. **Circular PL1/2017** 15th May 2017 issued by the minister for Housing, Planning Community & Local Government [HPC&LG] is entitled *"Implementation of Directive 2014/52/EU on the effects of certain public and private projects on the environment (EIA Directive)".* This Circular advice to "*consider*" assessing planning applications with the 2014 EIA Directive requirements from 16 May 2017.

Thus in deference to the required transposition of the 2014 EIA Directive into Irish Law and advices from the minister in Circular 01/2017 this EIAR has been prepared in order the competent authority may undertake EIA in accordance with the 2014 EIA directive. In particular this EIAR has had regard to Article 5 and Annex IV of the 2014 EIA Directive in conjunction with Schedule 6 of the P&D Regulations. The reader is again referred to Appendices 1.2 and 1.3 setting out a summary of the response of the EIAR to the information requirements of the Directive and the Regulations for this report.

The structure and content of this EIAR is in accordance with the following guidance:

Guidelines issued by the Housing, Planning Community & Local Government Department

- 2013 March Guidelines for Planning Authorities and An Bord Pleanála on carrying out Environmental Impact Assessment, Department of the Environment, Community and Local Government
- 2012 July Section 261A of Planning and Development Act, 2000 and related provisions Supplementary Guidelines for Planning Authorities, Department of the Environment, Community and Local Government
- 2012 January Section 261A of Planning and Development Act, 2000 and related provisions Guidelines for Planning Authorities, Department of the Environment, Community and Local Government
- 2009 December (revision February 2010) Appropriate Assessment of Plans and Projects in Ireland**,** Department of Environment, Heritage and Local Government
- 2009 November The Planning System and Flood Risk Management G*uidelines for Planning Authorities,* Department of Environment, Heritage and Local Government
- 2004 April *Quarries and Ancillary Activities Guidelines for Planning Authorities*, Department of the Environment, Heritage and Local Government

Guidance issued by the Environmental Protection Agency [EPA]

- August 2017 DRAFT Guidelines on the Information to be Contained in Environmental Impact Assessment Reports [Draft 2017 EPA Guidance which updated that Draft Guidance of May 2017]
- September 2015 DRAFT Revised Guidelines on the Information to be Contained in Environmental Impact Statements
- September 2015 DRAFT Advice Notes For Preparing Environmental Impact Statements
- 2006 Environmental Management Guidelines, Environmental Management in the Extractive Industry (Non-Scheduled Minerals)
- 2003 September Advice Notes On Current Practice In The Preparation Of Environmental Impact Statements
- 2002 March Guidelines On The Information To Be Contained In Environmental Impact Statements

1.2.4 Purpose & Content of EIAR

The purpose of the EIAR is to support an application under S.37L of the P&D Act for further extraction of a quarry already the subject of an application for substitute consent under ref. ABP-300034-17.

Taking the definition of an EIS as in the Planning & Development Act 2000, as amended together with that by reference to Articles 3 and 5 of the 2014 EIA Directive this EIAR is:

An environmental impact assessment report of the direct and indirect significant effects, if any, on the environment, which can reasonably be expected to occur because the proposed development the subject of the application for planning permission consent is carried out. The report is prepared to aid An Bord Pleanála in environmental impact assessment.

In addition to the aforementioned Directives, statutory provisions and guidance the contents of this EIAR including baseline data, anticipated potential environmental effects and mitigation measures have been entirely informed by preceding and subsequent planning and license applications and outcomes related to the subject lands, including the rEIAR supporting current applications for substitute consent.

The EIAR has been prepared in a 'Grouped Format' structure having regard to the prescribed environmental factors of the EIA Directive and the 2017 EPA Guidance; "*Population and Human Health; Biodiversity, Land & Soils, Water, Air, Climate, Material Assets, Cultural Heritage, Landscape, Interactions.*"

In this way each aspect of the environment is presented as a separate section referring to the environment as it exists, likely significant impacts, and proposed mitigation measures.

The EIAR has therefore been systematically organised to provide the following Information:

Section 1 Context and Requirement for rEIAR	1.0 Introduction
Section 2 A description of the existing environment.	2.0 Description of the Site & Receiving Environment
Section 3 A description of the project.	3.0 Description of the Project
Sections 4 to 13 Identification of likely significant impacts during construction and operation of the development and a description of mitigation measures to avoid, reduce and, if possible, remedy significant adverse impacts.	4.0 Population & Human Health 5.0 Biodiversity 6.0 Land, Soils & Geology 7.0 Water & Hydrogeology 8.0 Air & Climate 9.0 Noise 10.0 Material Assets & Traffic 11.0 Cultural Heritage 12.0 Landscape
Section 14 Sets down the cumulative and in combination significant effects of the project and considers expected effects deriving from the vulnerability of the project to risks of major accidents and/or disasters that are relevant to the project concerned.	13.0 Interactions

Table 1.1 Summary Information contained within an EIAR & Chapter Headings of this rEIAR

Alternatives are examined by reference to locations, designs and processes, as appropriate.

Likely significant effects are identified, described as direct, indirect, secondary, cumulative; by duration short, medium and long-term, permanent and temporary; and by type positive and negative, as appropriate.

1.3 Summary description of development the subject of rEIAR

The lands the subject of this EIAR [the subject lands] encompass the application area of approximately 21.9 ha. at the centre of a landholding in the control of the applicant of just under 170 ha. The subject lands are located approximately 7.5km directly south of the centre of Carlow town and a little over a kilometre north west of junction 6 of the M9. The subject lands occur in the townland of Powerstown in the Electoral Division [ED] of Nurney, County Carlow at ITM [Irish Transverse Mercator] Easting 671856, Northing 669302 and 52°46'1.88"N, -6°56'6.56"W. See figure 1.1 for strategic site location.

The subject lands in Powerstown townland are a rational rectangular shape with a south to north orientation onto an existing quarry void in the townland of Clonmelsh. The remaining western, southern and eastern sides of the subject site are bounded by local roads (L3045 and the L3044).

The development consists of:

- further extraction of a quarry and all related ancillary site works over an application site area of 21.9 ha. with excavation over an area of 13.6 ha.
- The proposed continued extraction site is to extend from the existing southern face of the quarry at Clonmelsh, Nurney, Co Carlow itself the subject of an existing application for substitute consent to An Bord Pleanála under ref. ABP-300034-17. The proposed continued extraction site is further bounded by local roads on its remaining 3 sides; the L3045 to the east and the L3044 to the south and west.
- The proposed continued extraction area is estimated to hold approx. 10M tonnes of limestone reserve to be extracted in 4 phases over 2 benches to a final proposed excavation depth to match that of the existing quarry at Clonmelsh, Nurney, Co. Carlow at 25AOD.
- Ancillary site works do not include new access to public roads or services as it is intended to continue to use the existing facilities and access at the plant area at Clonmelsh, Nurney, Co. Carlow itself the subject of a concurrent application for substitute consent to An Bord Pleanála under ref. ABP-300037-17.
- Extraction rates will be in line with market demand. Current extraction is at a rate of 180,000 to 200,000 tonnes per annum and is expected to remain at this rate for the short term with uplift thereafter. Extraction rates have been declared at maximum rates of 1M tonnes per annum in previous submissions by former operators of the quarry. Therefore a life of at least 20 years is sought in the application for further extraction of a quarry under S.37L of the Planning & Development Act, 2000 (as amended) which this EIAR supports.

1.4 Limitations & Difficulties in Compiling the Specified Information (Schedule 6 of SI 600 of 2001, as amended)

Having regard to the Planning and Development Regulations and Section 3.7.2 of the 2017 EPA Guidelines no significant limitations and difficulties have been encountered in preparing this EIAR. However, the attention of the authority is brought to two key matters both related to the characteristics of the planning permission here sought and that simultaneously sought by substitute consent.

1.4.1 Concurrent EIAR & application for substitute consent

S.37L of the P&D Act applies specifically in instances of quarry extraction at extant quarries the subject of extant or intended substitute consent applications allowed and required under S.261A of the P&D Act. The purpose of the EIAR is to support an application under S.37L of the P&D Act for further extraction of a quarry already the subject of an application for substitute consent under ref. ABP-300034-17 (Quarry).

The Act allows for and thus requires simultaneous consideration of substitute consent applications and those made under S.37L.

In view of the simultaneous consideration of S.37L applications for permission alongside substitute consent applications after S.261A of the P&D Act, it is recognised that simultaneous EIA is required. For this reason this EIAR relies on the

foregoing rEIAR and thus the difficulties encountered in preparing and compiling that rEIAR are relevant and primarily extend to lack of historic data and information on rates, methods and direction of extraction and associated impacts.

Substitute consent applications may only seek approval for development which has already been carried out and for this reason ability of the developer to identify, design and implement alternatives does not exist. Notwithstanding, the rEIAR and rNIS accompanying application for substitute consent under ref. ABP-300034-17 (Quarry) are mindful of the requirement to identify predicted impacts albeit from an established, extant use.

The contributors and experts who have compiled this EIAR rely on assessments undertaken for the rEIAR as the site the subject of this EIAR is located between the two quarry units the of the rEIAR within the larger DMIL ownership/control unit. Furthermore plant and welfare facilities at Clonmelsh and the subject of ABP-300037-17 (Plant Area) are proposed to be used in this proposal.

It is submitted that there is too a particular requirement to identify Residual Impact from the 2014 EIA Directive. In this regard the major residual impact of the development for which substitute consent is sought (ABP-300034-17 (Quarry)) with and now proposed is the direct significant effect of the removal of 'land' in the form of the proposed permanent removal of limestone rock reserve from the subject lands at Powerstown and the removal of reserve already undertaken at the immediately contiguous lands at Clonmelsh. In order to meet 2014 EIA Directive and P&D Regulations EIS requirements the rEIAR included a concept restoration plan was enclosed at Chapter 10 of the rEIAR.

1.4.1 Quarry Design & Assessment

The preparation of the rEIAR and rNIS for Clonmelsh and Garyhundon was instructed simultaneously with the rEIAR and NIS for Powerstown for efficiencies in site visits, exchange of expert information and the need to secure further reserve. The rEIAR was required to be finalised ahead of the EIAR and in any event, matters that arose as result of the assessment supporting the remedial environmental reports might have altered the design of the current proposal as those nlands sandwiched the current site.

At the time of instruction, the Powerstown application site sat contiguous with the Clonmelsh quarry void on its northern side but matched the western, southern and eastern boundaries before the board as the intention was to continue the extant quarry void at Clonmelsh. Finalising of detailed quarry design; lateral and vertical, began in earnest after the preparation of the rEIAR.

In the first instance, in early October 2017 the Cultural Heritage expert submitted their draft report identifying two recorded monuments on the subject lands with mitigation requirements for offsets from each. The design being developed at that time allowed for a setback form the monument in the south eastern side of the site (RMP CW12 202) but none whatsoever had been provided for that in the northern part of the site (RMP CW12 093). This northern feature was to be removed, having previously been proposed for removal and not refused on this basis under (Reg. Ref. 10/130, appeal ref. PL01.238679). The retention of the monument (RMP CW12 093) in the northern portion of the subject lands was a major impediment to recovering adequate levels of reserve from the subject lands, and gaining access to those lands from the extant Clonmelsh quarry void.

Alternative designs were assessed but effectively the protection of the northern monument (RMP CW12 093) would have required the retention of the southern Clonmelsh quarry face in situ and thus the benefits of avoidance of indirect impacts in the form of new public road access to the Powerstown lands and traffic generation over roads not currently experiencing same was lost. In tandem a comprehensive review of the archaeological records of the site and those publicly available was undertaken. On or around, 20th October 2017 evidence of the preservation by record of the monument was identified by the specialist consultant (Chapter 11.0 of this EIAR) that allows for the removal of the northern monument (RMP CW12 093) and accessing of reserve beneath and behind (south). This was a positive evolutionary step in the detailed design

process and allowed the development of a detailed quarry plan, allowing estimate of reserve life, that incorporated the mitigation measures of specialist contributors to the final design described at Chapter 3.0 of this EIAR and set out on accompanying application drawings.

The final quarry design, including estimate of overburden and reserve, and restoration proposal is a specialist undertaking. Golder and Associates provided the detailed quarry design by 23rd November 2017 and this was passed to landscape architects. Due to administrative time constraints and the prescribed time limits for S.37L applications Chapter 12.0 of this EIAR is limited to an identification of significant effects reliant on the high level assessment capable of being carried out on the land unit, rather than the preferred full Landscape and Visual Assessment [LVIA] possible after a detailed quarry design. Notwithstanding a full LVIA had been commissioned and is underway to support the strategic findings are here presented. We will pass this LVIA to An Bord Pleanála upon receipt. Therefore Chapter 12.0 of this EIAR strategically assesses the potential effects of the proposed scheme considered against the 2017 baseline conditions, including the concept restoration plan which forms part of the Clonmlesh and Garyhundon rEIAR (the subject of substitute consent applications ABP-300034-17 (Quarry) and ABP-300037-17 (Plant Area)).

1.5 EIAR Contributors

In the interests of consistency and the leveraging of existing specialist knowledge of the subject site and associated lands, competent experts have been retained to compile this EIAR.

Aspect of the Environment	EIAR Specialist Contributors
1. Introduction	Property Resource Planning Management & Development
2. Description of the Site & Receiving Environment	Property Resource Planning Management & Development & All
3. Description of Development	Golder & Associates and Property Resource Planning Management & Development
4. Population & Human Health	Property Resource Planning Management & Development and Golder & Associates
5. Biodiversity	Golder & Associates
6. Land, Soils & Geology	Golder & Associates
7. Water & Hydrogeology	Golder & Associates
8. Air & Climate	Golder & Associates
9. Noise	Golder & Associates
10. Material Assets & Traffic	Property Resource Planning Management & Development & PMCE
11. Cultural Heritage	John Purcell
12. Landscape	Restoration Plan by Golder & Associates, Property Resource Planning Management & Development reviewed by landscape architects
13. Interactions	All (considered throughout & incorporated into rEIAR – sections 4 to 12)

Table 1.2 Specialist Contributors

1.6 The Applicant/Developer

The developer for the purposes of this EIAR and applicant for planning permission under S.37L of he P&D Act is Dan Morrisey Ireland Ltd. (In Receivership) [DMIL].

DMIL operated a number of quarries and related activities in County Carlow and surrounding counties with the lands immediately north in Clonmelsh and south in Garyhundon being their inaugural extraction and processing site in operation since 1947. This quarry and associated plant was the largest of the DMIL operational sites and the most sophisticated having regard to the range of construction products being produced on the site; asphalt, concrete, blocks, pre-cast products

and derivatives.

1.6.1 Operation of contiguous quarry and plant areas

All quarry and associated operations on the lands surrounding the subject site were suspended upon the appointment of the receivers in June 2014. Within 24 hours, the company entered examinership which reinstated operations. By August 1st the examinership was discharged and the receivers reinstated whereupon operations at the subject site were again suspended. Within 30 days the subject lands quarrying and processing activities had been reinstated upon the granting of license to operate to Plazamont Ltd. for the purposes of quarrying and processing of aggregate. The lands the subject of this EIAR and further quarrying proposal have been rented out by DMIL on an annual basis for the purposes of potato crop since 2014.

The licensee is required to operate the subject lands in compliance with all planning permissions, licenses and permits and therefore monitoring data for the license period has been available for the preparation of this EIAR. The Receivers have had full access to the subject site, offices and records, including access to former employees of DMIL in order to perform their duties, including the preparation of this EIAR.

In this instance the subject lands have variously been the subject of, or part of, previous planning applications, including EIS, and Screening for AA and other monitoring that are relied upon to establish baseline and discern the anticipated environmental impact of development on the subject lands before, during and after their extraction phases. In particular hydrological, hydrogeological and land information has been relied upon as the subject site had a series of boreholes and drilling testing performed in 2007 which was reported in a planning application from 2010 (Reg. Ref. 10/130) that allowed the submitted detailed quarry design and assessment of geological effects.

Notwithstanding that parts of the lands around the subject site operate without current planning permission there exists historic grants of planning permission and licenses that together allowed for a compilation of emission thresholds. Those emission thresholds were used to set development emission limits and assess impacts in the rEIAR and are similarly relied upon in this EIAR.

1.7 The Need for the Development and Consideration of Alternatives

The Receivers recognise the importance of this quarry unit with processing capabilities to DMIL and as an aggregate product supplier and employer in the county and further afield. The Receivers are responsible for recovering the best possible value for the subject site and as such are cognisant of the goodwill and local market share achieved by DMIL and the absolute necessity of securing the status of the subject site and associated lands as a quarry and processing facility albeit one which at this time and since coming into Receivership operating at minimal levels of production commensurate with the downturn in construction witnessed over the last 10 years.

The receivers too recognise their responsibility to establish and maintain the planning compliant status of the quarry and processing complex and to that end in July 2015 sought application for leave for substitute consent for the lands, granted in April 2017 (ref. LS.0019) and the resultant two applications for substitute consent with combined rEIAR and rNIS were submitted in October 2017 (ABP-300034-17 (Quarry) and ABP-300037-17 (Plant Area)).

The Receivers recognise the limitations of substitute consent application in that they are entirely retrospective and do not secure further extraction and therefore economic sustainability of the quarry unit. For this reason, the receivers as DMIL instructed the design of an extension to the quarry. The development the subject of this EIAR is that design. At all times the receivers remained mindful of the environmental sustainability of any proposal and having regard to previous applications at the quarry unit and the progression of the receivership. They instructed that the future reserve to be

secured for the continued operation of the quarry be at a location, extent and in a manner as to mitigate environmental effects.

Therefore the S.37L application for permission is made solely to secure the continuation of the extant contiguous quarrying and associated land use and represents the final planning application for these lands at this time.

In summary; the subject site is part of an asset of a company that is in Receivership. The aim of the receivership process is to maintain and realise the value of this asset which only lies in maintaining the subject site and associated lands status as a quarry notwithstanding that remaining reserve extraction will be contingent on a greater improvement in the construction market that has begun to occur. Maintaining the subject site and adjacent lands as a viable quarry with associated processing plants will ultimately realise the sustainable extraction potential of the subject lands and maintain those jobs which existed at the time of administration (2014) when the reduced demand for aggregate and aggregate products had already seen a reduction in the number of direct jobs.

1.7.1 Introduction

As with all aggregate development the nearer the supply of aggregate to the market the more economically viable it is and given the nature of aggregate deposits, quarries can only be worked where the sediments occur. Aligned to this economic situation is the environmental and social preferability of locally sourced aggregates. Aggregates sourced close to their market are preferable to that sourced at more remote locations as it lessens road traffic and associated environmental impacts and economic costs. Socially, the local sourcing of construction aggregate strengthens the local economy through job provision and associated spending and exploits advantages and opportunities inherent in local supply chains.

Aggregates are an essential material for the construction industry and are used in all major development plans (housing, road surfacing, infrastructure etc). As such, they are of major significance to the overall growth of the county and an important economic resource despite the current low, but growing, levels of construction.

1.7.2 'Do Nothing' Scenario

It is impossible for the applicant to not make application to secure the future sustainability and therefore availability of the extant, historic quarry and processing units. At this time, notwithstanding a judicial review of Reg. Ref. 10/130 (appeal ref. PL01.238679) pending (High Court Record No. 213/556), there is no planning permission to extract and process aggregate reserve on the lands constituting the ownership/control unit at Clonmelsh, Powerstown and Garyhundon.

As noted in section 1.2 and 1.4 the recent applications for substitute consent (ABP-300034-17 (Quarry) and ABP-300037-17 (Plant Area)) may only seek permission for development that has already taken place and thus the future of the extant quarry land use is not secured by those applications, for which an approval cannot be assumed. In the event these applications are approved they cannot allow for future extraction.

As such, an application for permission for the extraction of reserve on the larger quarry unit is required to continue the supply of aggregate to the plant area and secure the viability of the extant, established land use at this strategic location. Any planning application made would be premature to the determination of the applications for substitute consent save for one made under S.37L of the P&D Act that specifically allows for the consideration of applications for further quarrying simultaneous with a substitute consent application for quarrying. The application made in this instance is under S.37L of the P&D Act with reference to ABP-300034-17 (Quarry).

The current proposal does not increase aggregate extraction on the overall lands but intends to replace that for which substitute consent is currently being sought.

1.7.3 Site Selection

As stated above, aggregate reserve must be extracted where it occurs. Mitigation suggests that, for the limitation of road traffic, and economic and environmental cost of transport of material it is preferable that extracted material be also processed where it is extracted. In this instance the applicant control just a contiguous land unit of just under 170 ha. of lands in Clonmelsh, Powerstown and Garyhundon, Nurney, Co. Carlow. There is an extant quarry the subject of substitute consent application under ABP-300034-17 (Quarry) over a void area of 54 ha. at Clonmelsh and 27 ha. at Garyhundon. There is also an extant processing plant area at Clonmelsh for which substitute consent application is also sought under ABP-300037-17 (Plant Area). The existence of the established quarry and processing complex suggests that the persistent, continuous use of the subject lands for a quarry was more feasible, in environmental and economic impact terms, than developing a new greenfield quarry.

Therefore, the site selection process for this applicant began with a review of lands within their control.

The subject site was selected for reason of its location and proven reserve.

The subject site is located immediately south of the existing quarry void at Clonmelsh (the subject of ABP-300034-17 (Quarry)). Planning permission is sought under S.37L of the P&D Act, 2000 that specifically applies only to further development of quarry for quarrying purposes.

The proposed development does not seek permission or any works besides the extension of the existing quarry void and in this way must be attached to the extant void. The extant quarry void at Clonmelsh is 54 ha. in extent and is bounded on the north, west and east by local roads (L3050, L3044 and L3045 respectively). No direct extension of the existing quarry void is therefore possible on the north, western or eastern sides of the extant Clonmelsh quarry void without closure and realignment of local roads that under Roads Act come under the auspices of Carlow County Council as the Roads Authority.

For reason of the requirement for the further quarrying being delimited to that under S.37L and the presence of local roads on the northern, western and eastern side of the extant quarry void there remains extension potential only in a southerly direction.

There is a proven limestone rock reserve at the subject site, as evidenced by a series of drill core testing carried out on the subject lands in 2007 first reported in the EIS with planning application Reg. Ref. 10/130 and reported at Chapter 6.0 of this EIAR. The reserve already extracted at Clonmelsh is of a proven good quality capable of being used as aggregate fill and for further processing to concrete and asphalt products. Therefore it is intended that the material proposed to be extracted at the subject site will continue to be suitable aggregate for construction purposes and may be used to continue to supply to the existing plant at Clonmelsh.

The subject site is fully integrated with the extant void at Clonmelsh and thus will not require that material extracted be transported on the public road network. Th subject site can access the extant plant area and quarry gate at Clonmelsh via internal haul routes without traversing third party lands nor interfacing with public traffic.

The deepening of the existing void at Clonmelsh was rejected for reason of potential for further impact on groundwater levels and thus potential to effect third party water supplies. The deepening of the existing void at Garyhundon was rejected for reason of the limited lateral extent of void capable of being developed on these lands having regard to the proximity of third party dwellings on the same side of the road as the void and pervious commitments to setbacks from these dwellings. Lateral limitations also limit vertical extraction and therefore overall reserve outputs. In addition sand and gravel extracted at Garyhundon currently exits the site via an extant public road gate and is transported to the plant area at Clonmelsh for onward processing or sale. Extant recorded traffic levels from Garyhundon are minimal and the development of this site a limestone quarry would necessitate an increase in public road traffic that is not part of the

current baseline environment.

1.7.4 Alternative Designs Considered at the Subject Site

Best practice suggests that quarry voids become narrower as they deepen. This is as a result of each preceding working bench requiring geotechnical stability and sloped faces for safety. Best practice further suggests that the optimal depth of a working bench is 15 to 20 metres to minimise injury from fall and allow installation of haul routes of benign gradient. Aggregate reserves generally occur in large, shallow, homogenous units and are therefore more efficiently extracted as open quarries rather than as underground mines. For this reason aggregates are recovered from the 'top down'.

The strategic design of the proposed development is dictated by the reserve presence and therefore is a void of a depth of 25 AOD that matches the extant void at Clonmelsh and is not proposed any deeper to avoid further groundwater effects. This strategic void shape does not alter and therefore the only 'alternatives' in relation to the design capable of being considered are method of access and lesser or more phases.

Having regard to the need to access each working bench, vehicular access for HCVs and mobile plant must be afforded. In order to avoid making a new accesses on established public roads and contiguous extant quarry void it is evident that access to the proposed further quarrying should be from the extant void at Clonmelsh.

Having regard to optimal bench heights a 5 no. phase extraction plan has been developed, described in detail at Chapter 3.0, that strips and stores overburden in visual mitigation bunds before accessing the reserve below over two bench (30 metres) to a depth of 25 AOD. The phasing is implemented to ensure that the level of overburden striping and movement and therefore loss of economic agricultural land, biodiversity and soil fertility is minimised.

The method of extraction is blasting and given the reserve is limestone rock no other efficient method of primary extraction is available.

2.0 DESCRIPTION OF THE SITE AND THE RECEIVING ENVIRONMENT

This Environmental Impact Assessment Report [EIAR] has been prepared to accompany an application for permission under S.37L of the P&D Act for further extraction of a quarry and all related ancillary site works over an application site area of 21.9 ha. with excavation over an area of 13.6 ha at Powerstown, Nurney, Co. Carlow.

2.1 Location of Subject Site

The townland of *Powerstown* is located within the Electoral Division of Nurney, Co. Carlow alongside 15 no. other townlands.

Notable neighbouring townlands are: *Clonmlesh* to the immediate north of the subject site that contains an existing quarry void to a maximum depth of 25AOD that is the subject of an application for substitute consent (ABP-300034-17 (Quarry)) with plant area over 3.22 ha. also the subject of an application for substitute consent (ABP-300037-17 (Plant Area)); and *Garyhundon* to the south of the subject site that also contains an existing quarry void (sand and gravel pit) to an average depth of 57 AOD also the subject of ABP-300034-17 (Quarry). Those applications for substitute consent are accompanied by an rEIAR and rNIS.

The site the subject of this EIAR is centrally located at Carlow at ITM [Irish Transverse Mercator] Easting 671856, Northing 669302 and 52°46'1.88"N, -6°56'6.56"W. See figure 1.1 for strategic site location. The lands are approximately 7.5km directly south of the centre of Carlow town and a little over a kilometre north west of junction 6 of the M9. See Figure 1.2.

2.2 Site Context & Landscape Character

The lands the subject of this EIAR are roughly rectangular in shape with a north to south orientation onto a local road to the south that denotes the townland boundary between Powerstown and Garyhundon (L3045). The subject site is also bounded by local roads to its west (L3044) and east (L3045).

The subject site is located in a landscape characterised by human intervention notably for use as transport infrastructure, quarrying, landfill, economic agricultural lands and dispersed residential development.

2.3 Surrounding extant transport infrastructure

The subject site is proximate to a motorway (the M9) about 1km north west of the site and running parallel its western boundary and the Dublin-Waterford rail line to the east again of the Motorway. The aggregate proposed to be excavated at the site will be transported by road only via existing public road access onto the L3050 at Clonmelsh plant and quarry areas as set out in the material asset and traffic section of this rEIAR at Chapter 10.0.

2.4 Surrounding extant extraction and landfill sites

Non-agricultural land uses consist of further sand and gravel pits and quarries; 2 no. non-contiguous pits within DMIL control at Powerstown, an extraction and processing site operated by Kilcarrig Quarries at Powerstown and a municipal landfill at Powerstown.

Most notably the northern margin of the site the subject of this EIAR and the application for further quarrying under S.37L

of the P&D Act overlaps with an extant quarry void in the townland of Clonmelsh. This is to allow the accessing of the subject lands for extraction from the existing void, without recourse to public roads. This extant quarry void at Clonmelsh is under the control of DMIL and together with that at Garyhundon are the subject of an existing rEIAR and rNIS submitted to accompany applications for substitute consent (ABP-300034-17 (Quarry) and ABP-300037-17 (Plant Area)). A summary of their planning and permitting history is supplied at Appendix 2.1.

DMIL extant Quarry at Clonmelsh: The Clonmelsh land unit contains the processing plant area in its north western quadrant where the main entrance to the quarry is centrally located on this boundary onto the L3050. It is through this entrance that all traffic generated on the entire of the rEIAR lands use to access the public road network and proposed to be used by traffic generated by the subject site. The larger and deeper of the excavations (54 ha.) the subject of this rEIAR is located in Clonmelsh townland and is the overriding, persistent landscape feature of that townland since the 1940s now at a depth of 25 AOD. Review of historic mapping indicate that the lands were under grass prior to their extraction.

DMIL extant Quarry at Garyhundon: Another excavation (27 ha.) south and south east of the subject site on the other side of the L3045 is located in Garyhundon townland and consists of a sand and gravel pit to a depth of about 57 AOD. This site does not hold permanent plant but relies on the Clonmelsh plant area for the processing and on selling of product recovered at this location transported through the centrally located entrance onto the L3045. In common with the Clonmelsh land unit Garyhundon pit is a persistent feature of the landscape since the 1950s.

2.5 Surrounding extant agricultural and residential land use

The remaining lands surrounding the subject site consist of agricultural grass and tillage lands with dispersed ribbon development pattern one-off houses. The landscape of the subject site and in the immediate vicinity is gently undulating with the subject lands averaging heights of between 55 to 60 AOD which is commensurate with the former land level of Clonmelsh quarry and the lands surrounding the Garyhundon pit.

2.5.1 Residential Development

The subject lands are immediately bunded by two houses; one in the northern portion of the western boundary of the subject site (the western house) and another in the northern portion of the eastern boundary of the subject site (the eastern house). Neither house is currently occupied.

These residences are of note as they occur on the same side of the public road as the subject site and are contiguous with it.

The western house is in the ownership control of DMIL and is a single storey detached dwelling. This dwelling alongside 6 no. other farther north and either side of the L3044 were proposed to be demolished under Reg. Ref. 10/130. The notification of decision to grant permission for that development from the local authority by condition no. 4(b) specifically included the demolition of this house and tow others. This decision was later overturned on appeal and is subject to judicial review. For reason of this dwelling being under the control of DMIL and capable of being used to house site staff it is not now proposed for demolition having regard to its location close to the road margin and the fact that its retention in situ does not sterilise a significant amount of reserve. The creation of generous setbacks from the public road to assure long term geotechnical stability of the proposed quarry and outlying roads and for visual screening is preferred to obtaining the reserve beneath the dwelling and therefore that dwelling and its lot are excluded from the current proposal.

The eastern house is also a single storey detached dwelling that sits on a plot of less than 5,000m^2 and is not in DMIL control. This plot with centrally located dwelling close to the rear of the plot is contiguous on its northern portion with extant extraction from the Clonmelsh quarry void. In the current proposal it has been provided a setback of over 100

metres in order to protect its residential amenity and retain its immediate setting.

2.6 Description of Subject Site

The subject site is currently in agricultural use as tillage lands without field boundaries save for roadside boundaries that consist of mature hedges and are fenced. The subject lands are at an average height of 55 AOD to 60 AOD at their centre where the lands are slightly raised. Since 2014 and the coming of the lands in to the control of the applications they have been rented on an annual basis and been under potato crop.

There is no built development on the subject lands nor any historic planning permission associated with the lands save for an application for the continuation, deepening and extension of the extraction operations over the subject lands and contiguous lands under the control of DMIL (Reg. Ref. Reg. Ref. 10/130 & appeal ref. PL01.238679). An outline of the subject site relative to that application site area is at figure 1.3.

Under that application (Reg. Ref. 10/130) it was proposed to deepen the extant quarry at Clonmelsh from just over 25 AOD to -75 AOD and include the subject lands, the extant quarry at Garyhundon and remining lands at Powerstown, Clonmelsh and Garyhundon in that proposed void. The proposed final depth of currently proposed extraction is to match that of the extant Clonmelsh void at 25 AOD.

Besides the aforementioned tillage lands the only other features of note on the subject lands are; a slightly raised earthen enclosure in the lower quadrant of the eastern site boundary and a stream running east to west along the northern site boundary. The undisturbed mound is a recorded monument (RMP CW012 202) proposed to be retained with setback in the current proposal as assessed at Chapter 11.0 Cultural Heritage. The aforementioned stream is the Clonmelsh Stream that originally ran along the Clonmelsh and Powerstown townland boundaries but was moved slightly southward as a result of the extraction of the lands at Clonmelsh. It is proposed to move the stream further southward to a position inside the site boundaries, still running east to west as part of this application and assessed at Chapter 7.0 Water and Hydrogeology.

3.0 DESCRIPTION OF THE PROJECT

3.1 Introduction

This Section provides a more detailed description of the development and is supported by drawings submitted as part of the application for further extraction of a quarry at Powerstown, Nurney, Co. Carlow. The drawings submitted in support of that application include existing and proposed site layouts and sections and are referred to throughout this EIAR.

3.2 Nature & Extent of Development

Summary description of development is provided at Section 1.3 of this EIAR and is here repeated:

The development consists of further extraction of a quarry and all related ancillary site works over an application site area of 21.9 ha. with excavation over an area of 13.6 ha. The proposed continued extraction site is to extend from the existing southern face of the quarry at Clonmelsh, Nurney, Co Carlow itself the subject of an existing application for substitute consent to An Bord Pleanála under ref. ABP-300034-17. The proposed continued extraction site is further bounded by local roads on its remaining 3 sides; the L3045 to the east and the L3044 to the south and west. The final proposed excavation depth is to match that of the existing quarry at Clonmelsh, Nurney, Co. Carlow at 25AOD. Ancillary site works do not include new access to public roads or services as it is intended to continue to use the existing facilities and access at the plant area at Clonmelsh, Nurney, Co. Carlow itself the subject of a concurrent application for substitute consent to An Bord Pleanála under ref. ABP-300037-17.

3.2.1 Concurrent substitute consent applications

As set out in at in the introduction the subject site is contiguous with an existing quarry at Clonmelsh, Nurney, Co. Carlow. That existing quarry and another to the immediate south east of the subject site at Garyhundon are together the subject of an application for substitute consent for a quarry under ref. ABP-300034-17 (Quarry).

Immediately contiguous with the north western tip of the quarry at Clonmelsh is a plant area of about 3.22 ha. that is the subject of a concurrent application for substitute consent under ref. ABP-300037-17 (Plant Area).

The site the subject of this EIAR proposes continuation of extraction of the extant quarry at Clonmelsh identified in ABP-300034-17.

3.2.2 Subject Site Location & Extent

The subject site lies immediately south of the existing quarry at Clonmelsh and is an extension of that quarry. As it is an extension of that quarry, relying on accessing the subject lands through the southern face of the extant void, the subject site area overlaps with the substitute consent southern application boundary of ref. ABP-30037-17 (Quarry).

The application area encompasses all lands within DMIL control bounded by Clonmelsh quarry to the north and existing local roads to the east (L3045), south (L3044 & L3045) and west (L3044) to an area of 21.9 ha.

3.2.3 Extraction Area Lateral Extent

The lateral area identified to be excavated is 13.6 ha. reflecting significant setbacks from the aforementioned local roads that mitigate potential negative landscape, visual, cultural heritage and human health impacts. In particular;

- Chapter 11.0 Cultural Heritage identifies two recorded monuments have the subject lands;

  RMP CW012 093 toward the centre of the northern boundary and identifiable upon site walk over survey. This monument a 'rectangular ditched feature' was preserved by record in 2008 and was previously proposed for removal under Reg. Ref. 10/130. It is proposed to rely on the record of preservation and remove this feature in the course of the proposed development.

  RMP CW012 202 is located to the immediate south of the detached house just outside the eastern boundary of the subject site. This feature is visible as an overgrown raise mound on walk over survey and is recorded as a 'ring ditch'. Mitigation measures at Chapter 11.0 include an exclusion area of a minimum of 20m from the outer extent of his monument. The proposed design provides for an exclusion zone of 50m around this monument in order mitigation be clearly implemented and the maximum possible setting and area of potential be retained for the feature.

- Noted at Chapter 4.0 Population and Human Health and at Chapters 8.0 Air Quality and Climate and 9.0 Noise and Vibration are two single storey, currently vacant houses abutting the northern ends of the western (the western house) and eastern (the eastern house) boundaries. As set out at section 2.5.1 the western house is under the ownership control of DMIL and may be used for staff accommodation. The plot on which the houses sits is excluded from the current site. The eastern house is in 3rd party ownership and the extent at Clonmelsh quarry void has already moved toward the northern plot boundary of this house. It is proposed to bring the exclusion zone around the recorded monument (RMP CW12 202) also around the dwelling in order to provide a minimum setback of over 100 metres in order to protect its residential amenity and retain its immediate setting.

- At Chapter 7.0 of the EIAR, and considered as part of the phasing and design of the proposed extraction part of this Chapter, is the presence of the Clonmelsh stream along the northern boundary of the subject site. This stream originally ran along the Clonmelsh and Powerstown townland boundary but has moved southward as a result of the extraction of the lands at Clonmelsh. It is proposed to move the stream further southward to a position inside the site boundaries, still running east to west as part of this application assessed at Chapter 7.0 Water and Hydrogeology. The capacity and role of the stream will remain effectively unchanged from baseline.

The presence of recorded monuments, houses and the Clonmelsh Stream have combined to dictate setbacks from the local roads bounding the western, eastern and southern boundaries of the subject site. These setbacks from local roads have been incorporated into the design of not less than 15m to maintain the extant mature hedge boundaries of these roads, allow for internal service haul routes and for the storage of overburden in bunds that will be planted in order to provide a visual screen over the operational phase and retain soil fertility for later use as ground cover in the restoration proposal at drawing no. 05 submitted with the application.

3.2.4 Extraction Area Vertical Depth

The area to be excavated currently ranges from 55 to 60AOD at its centre with overburden at an average depth of 5.75m as discerned from site testing in 2007 and referred to at Chapters 2.0 and 6.0. This is a yield of about 1.34M tonnes of overburden all of which is to be dedicated to visual screening over the operational lifetime of the site and restoration upon completion of extraction.

The vertical depth of the proposed further quarrying will be approximately 30m to match the extant floor of Clonmelsh quarry to avoid further potential groundwater supply effects from baseline where Clonmlesh quarry already creates a drawdown cone as assessed at Chapter 7.0 Water & Hydrogeology.

Best practice indicates that the optimal depth of a working bench is 15 to 20 metres to minimise injury from fall and allow installation of haul routes of benign gradient. In this instance geotechnical stability of faces and surrounding lands, together with this advice have dictated two extraction benches.

3.2.5 Method of Working

- The reserve is a limestone rock quarry and therefore material is to be extracted by blasting.
- Blasting practices currently employed accord with best industry practice and are carried out by independent, licensed contractors Irish Industrial Explosives (IIE) who also monitor and report each blast. Chapter 9.0 of the EIAR considers noise and vibration. It is noted that the 2010 EIS with Reg. Ref. 10/130 noted employment of a dedicated blasting team which is no longer the case, nor was their duration of employment known.
- Blasted rock is proposed to be crushed via mobile primary plant at the face and transported to other mobile crushing, screening and chipping plant that will remain in the vicinity of the settlement pond system already at the centre of the Clonmelsh quarry.
- Internal haul routes in situ from the Clonmelsh void to the plant area will be used to transport rock to the plant area for sale or further onward processing as ingredients to asphalt and concrete products.

3.2.6 Direction of Working

- The Clonmelsh quarry is already excavated to an average depth of 30 metres below original ground levels and all slopes do not generally exceed 1:10 and are therefore stable.
- A review of the historic mapping and aerial photography associated with the lands is indicative of the quarry beginning extraction works close to its main entrance onto the L3050, located centrally in the northern boundary of the Clonmelsh quarry unit. It is proposed to generally to continue this north to south working direction over the subject lands.
- The proposed further quarrying is to occur over 4 no. phases and 2 no. benches; each of about 15 in height in order the final excavated depth matches that of the existing Clonmelsh quarry at 25 AOD.
- The further quarrying therefore proposed will match the current working below watertable at Clonmelsh and the current pumping of water via pipeline from the existing void northwards across the plant area to discharge at a point close to the site office will also remain. Chapter 7.0 of this EIAR sets out water management arrangements and effects.

3.2.7 Phases

- The estimated limestone reserve is to be extracted in 4 phases over 2 benches to a final proposed excavation depth to match that of the existing quarry at Clonmelsh, Nurney, Co. Carlow at 25AOD.
- Phase 5 of the proposal is restoration that has had regard to the restoration concept masterplan submitted as part of the rEIAR for substitute consent applications ABP-300034-17 (Quarry) and ABP-300037-17 (Plant Area). The entire of the overburden material identified at 3.2.4 above is to be retained on site for final restoration but in the interim is to be used to form bunds around the western, eastern and southern boundaries of the subject site inside the mature hedgerows of the subject lands, also to be retained. The hedgerows with planted bunds behind will act as a visual screen to the proposed quarry workings from the public roadway for the operational lifetime of the quarry.
- Figures 3.1 – 3.6 are a conceptual outline of the proposed phases. The reader is also referred to table 3.1 which is a rendition of the plans submitted in support of the application for permission for this further extraction.

Drawing No.	Name	Scale	Size
01	Site Location Plan - Regional	1:25,000	A3
02	Site Location Plan - Local	1:2,500	A0
03	Existing Site Conditions	1:750	A0
04	Proposed Site Conditions	1:750	A0
05	Proposed Restoration	1:750	A0
06	Cross Section Details	1:1,000	A1

Table 3.1 Drawings submitted in support of application for permission for further extraction of quarry

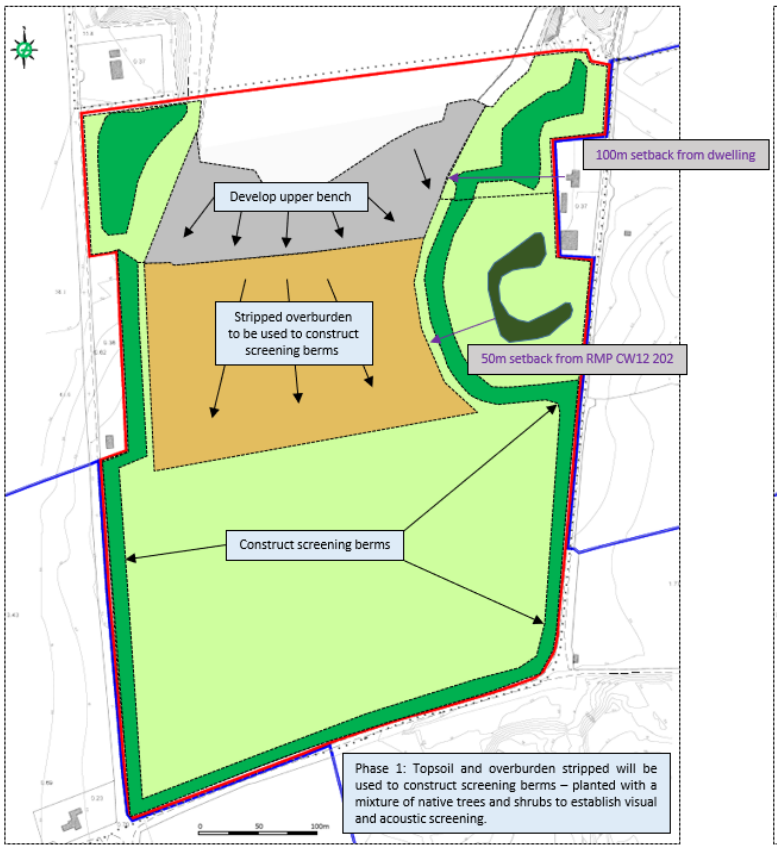


Figure 3.1 Proposed Extraction Plan Phase 1

Figure 3.2 Proposed Extraction Plan Phase 2

Figure 3.3 Proposed Extraction Plan Phase 3

Figure 3.4 Proposed Extraction Plan Phase 4

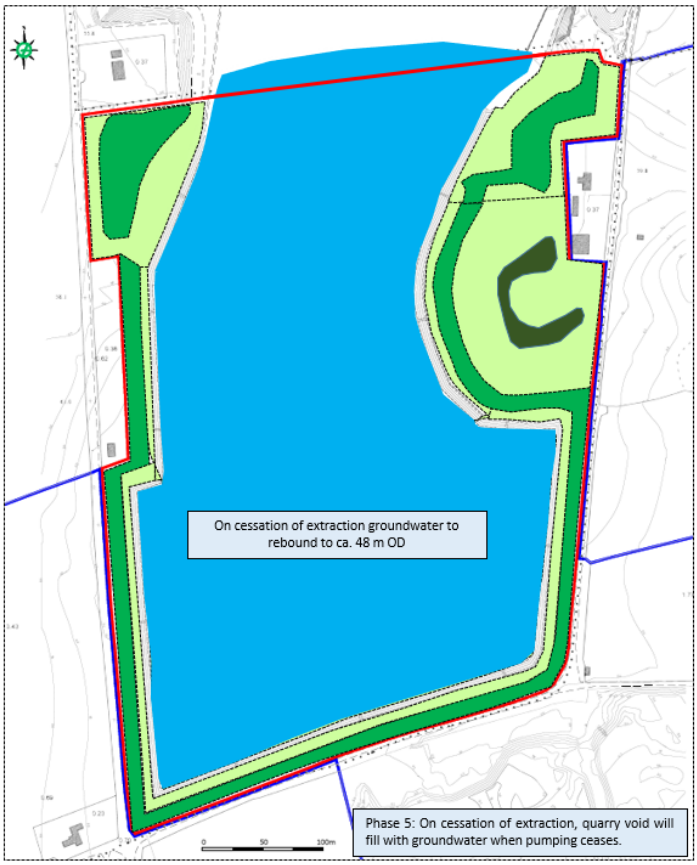


Figure 3. Proposed Restoration (Extraction complete)

3.2.8 Reserve Life & Extraction Rates

The estimated limestone reserve is estimated at approximately 10 million tonnes.

Extraction rates will be in line with market demand. Current extraction is at a rate of 180,000 to 200,000 tonnes per annum and is expected to remain at this rate for the short term with uplift thereafter. Extraction rates have been declared at maximum rates of 1M tonnes per annum in previous submissions by former operators of the Clonmelsh and Garyhundon quarry areas (S.261 registration under P&D Act ref. QY25 and Reg. ref. 10/130).

For reason of fluctuating expected extraction rates a life of at least 20 years is sought in the application for further extraction of a quarry under S.37L of the Planning & Development Act, 2000 (as amended) for which this EIAR and companion NIS have been prepared.

3.3 Traffic Control

All traffic occurring within the proposed further quarry unit at Powerstown will be internal traffic using internal informal haul routes. Once excavated rock leaves the proposed Powerstown void it is to be brought imported to the Clonmelsh plant area (via internal haul route) by truck for storage and on selling or processing in the plant area.

Internal traffic will retain the 15 kph speed limit extant on haul routes in the surrounding quarry unit.

In this way traffic using public roads and arsing as a result of working and extracting the Powerstown will continue to use the Clonmelsh entrance which is the primary entrance for the development thus caters for all employees, visitors and aggregate products and materials (import/export). The material to be extracted at Powerstown will replace that currently arising from Clonmelsh and Garyhundon quarry units the subject of substitute consent application ABP-300034-17 (Quarry).

A Traffic and Transport Assessment [TTA] is included in Chapter 10.0 of this EIAR sets down a description of the extant traffic arising from this entrance and assess the effects of the proposed development on traffic and roads in the cavity of the site.

3.4 Hours of Operation

In common with the hours of operation set down in the rEIAR accompanying the substitute consent application ABP-300034-17 (Quarry) that had regard to S.261 P&D Act registration QY25; Reg. Ref. 10/130; Reg. Ref. 12/240; and observed operational practices on site over the licensee period, those operational hours declared and requested at S.261 registration and deepening and extension of the quarry remain: 0600 to 900 Monday to Friday and 0600 to 1700 Saturdays. It further declared 24/7 operations from time to time. No working on Sundays or bank holidays.

3.5 Employment

Over the licensee period of operation of the Clonmelsh and Garyhundon quarry units and Clonmelsh plant area the subject of substitute consent applications ABP-300034-17 (Quarry) and ABP-300037-17 (Plant Area) an equivalent of 12 no. full time site staff are employed.

There are other effective employees in the form of hauliers and contractors but they do not have their permanent work place on site. The 12 no. employees with these hauliers and other contractors and service employees generate secondary employment of a further 20 no. fulltime equivalents.

It is noted that at peak; a work force of 60 to 80 personnel was declared in the 2010 EIS for the Clonmelsh quarry extension

and deepening (Reg. Ref. 10/130 and appeal PL01.238679) including direct employees, sub-contractors, hauliers, maintenance contractors, material suppliers etc. It is submitted that this level of employment is unlikely to be generated at the subject site even upon the occurrence of previously observed and sought 1M tonnes per year extraction rates. This submission is made having reference to the fact that the previous declaration of 60 to 80 site personnel included reference to office personnel to occupy an office that was previously proposed under Reg. Ref. 12/240, overturned on appeal PL01.242648 and never constructed.

It is submitted that were maximum extraction rates to be reached over the lifetime of the current proposal that 20 no. full time staff equivalent extracting, processing, maintaining and performing back office/shipping functions would be generated. The number of associated hauliers, service and contractor employees would be expected to increase at the same proportionate rate but not as a full-time staff equivalent.

3.6 Fuel & Chemical Storage

The proposed extraction will be by primary method of blasting with mobile crushing and screening plant undertaking rock breaking and grading at the face of the quarry. No fuel or chemical storage on the subject site will be required for this plant.

Material recovered at the face will be processed in the plant area the subject of application for substitute consent under ABP-300037-17 (Plant Area). The rEIAR submitted to accompany that application sets out the elements of the plant area including that fuel storage is in bunded fuel tanks in the plant area (P12 on site layouts submitted with substitute consent application for plant area). Remaining oils, chemicals and admixtures are ordered and used as needed used oil and chemical containers are separately stored within the maintenance shed in the plant area for disposal by licensed contractor. Bunded admixture tanks are stored on the blockyard in the plant area and disposed of via licensed waste contractor.

3.7 Waste Management

There will be no waste arising on site. Overburden stripped on site will be sorted into top and subsoils for formation into screening bunds along the western, eastern and southern site boundaries for eventual use in restoration of the lands. All limestone rock reserve will be sold off site or further processed at the Clonmelsh plant area the subject of application for substitute consent under ABP-300037-17 (Plant Area).

The anticipated waste arising on site will be municipal waste from staff welfare activities within the Clonmelsh plant area and will continue to be disposed of via domestic waste collection.

3.8 Waste Water

There is no requirement nor proposal for foul water generation or disposal on the subject site. Staff operating in the subject lands will be blast contractors and mobile plant operators who will use the welfare facilities in the Clonmelsh plant area the subject of substitute consent ABP-300037-17 (Plant Area) and accompanying rEIAR. Chapter 7.0 Water & Hydrogeology of that rEIAR assesses the extant proprietary wastewater treatment system.

3.9 Potable, Surface and Groundwater

There is no requirement nor proposal for potable water on the subject site. Staff operating in the subject lands will use the welfare facilities in the Clonmelsh plant area the subject of substitute consent application ABP-300037-17 (Plant Area)

and accompanying rEIAR. Chapter 7.0 Water & Hydrogeology of that rEIAR records the existing potable water source in the plant area (P12 on site layouts submitted with substitute consent application for plant area).

The proposed further quarrying the subject of this EIAR will match the extant void at Clonmelsh to 25 AOD and thus will include below watertable working.

Chapter 7.0 of this EIAR performs a water balance for the proposed further quarry area that builds on that undertaken at Chapter 7.0 of the rEIAR. This water balance demonstrates the ability of the existing settlement ponds in the Clonmelsh quarry area (Q8 on site layouts submitted with substitute consent application for quarry area) and that in the plant area (P17 on site layouts submitted with substitute consent application for plant area) together with the discharge point licensed in 2010 (Carlow County Council DL7/233 & ABP 01.WW.0371) to manage surface and groundwater arising.

3.10 Power Supply & Telecommunications

There is a substation in the Clonmelsh plant area (P11 on site layouts submitted with substitute consent application for plant area ABP-300037-17).

There is no requirement for power supply to the subject lands and no powerlines currently cross the lands. Power for the mobile plant and vehicles will be from generator or diesel fuel.

There is no requirement for lighting outside of the subject lands but within the lands, certain working hours (after dark in winter periods) necessitate lighting that is extinguished when the site is closed thus causing no external light pollution.

Any lighting required on site will be temporary in winter months and will be supplied by mobile light stands powered by generator. Lighting may be required at the active face of the proposed development and thus will site in the void to avoid light spill to surrounding lands.

No permanent telephone line is required for operations proposed on the subject lands. Remote communications will be by mobile telephone and walkie talkie.

3.11 Safety & Security

The subject site will be required to meet conditions of existing planning permissions, licences and permits and certain statues. In particular, the relevant Health & Safety legislation (*Safety, Health & Welfare at Work Act, 2005*, the *Mines and Quarries Act, 1965)* and subsequent Quarries Regulations relating to safety health and safety, training, appropriate site management etc. will be complied with. Amongst these regulatory requirements are the need to keep on site and up to date Health and Safety File which records safe procedures, deviations from those procedures and accident reports. Compliance with these requirements was a condition of license occupation 2014 – 2017.

The two extant agricultural entrances to the subject lands will be permanently closed and locked and a fence installed in the setback area, behind exiting hedges and fences along the western southern and eastern boundaries. The only two vehicular entrances currently in operation on the associated quarry units are that from the L3050 to Clonmelsh which is observed by the shipping office and that onto the L3040 to Garyhundon which permanently closed and locked and only opened by site staff in the vent of wishing to collect material. It is the entrance to the plant area at Clonmelsh that will continue to be used for public roads access to the subject site.

The associated quarry and plant units at Clonmelsh and Garyhundon are remotely secured via CCTV cameras with 24 hour monitoring. This monitoring will be extended to the subject lands.

3.12 Rehabilitation

The proposed quarry design includes a restoration proposal indicated at figure 3.5 and at drawing no. 05 submitted in support of the application for further quarrying the subject of this EIAR.

The proposed final restoration accords with that included in the rEIAR and considered at the rNIS accompanying the substitute consent applications ABP-300034-17 (Quarry) and ABP-300037-17 (Plant Area). Although it is recognised that substitute consent applications cannot propose works a Restoration Plan was prepared to accompany that rEIAR in view of the EIA requirement to identify effects and mitigation measures. That restoration plan is described at Chapter 12 of the rEIAR and in summary consists of the flooding of the Clonmelsh unit with the creation of beach and other habitats to encourage greater biodiversity. Garyhundon lands are proposed to be restored using available material in the rEIAR.

The proposed final restoration of the current site consists too of the gentle grading of the upper circa. 7m of the proposed excavation area, the reuse of the overburden in the screening berms for grading and planting in the former setback areas.

3.13 Site Management

Any future operator of the development proposed in this EIAR will also be responsible for the management of the subject site and will therefore be subject to the conditions existing on all planning permissions, licences and / or permits existing for the proposed and associated extant quarry and plant complexes.

4.0 POPULATION & HUMAN HEALTH

4.1 Introduction

This chapter of the EIAR assesses the likely significant effects of the further quarrying of 13.6 ha. of lands at Powerstown, Co. Carlow within a total application site area of 21.9 ha. on population and human health.

Ultimately, all the effects of a development on the environment will impinge upon human beings, directly and indirectly, positively and negatively.

Direct effects may include such matters as safety, air and water quality, noise landscape quality and road traffic. Indirect effects pertain to such matters as flora, fauna, heritage and archaeology. These matters form discreet sections of this EIAR in their own right and corresponding mitigation measures are comprehensively provided in those sections.

4.2 Methodology

Regard has been had to the 2017 EPA Draft EIAR Guidelines that updated those adopted for EISs in 2002 and those draft published in May 2015. The draft EIS Guidance at May 2015 suggest that the following topics be used for the purposes of the description and identification of potential impacts on 'Population and Human Heath: *"Economic Activity; Land-use; Employment; Settlement Patterns; Social Patterns; Human Health (considered with reference to other headings such as air quality and the landscape)."*

Those 2017 EPA Draft EIAR Guidelines suggest the following sub headings under which to arrange issues; *"Employment, Human Health (considered with reference to other headings such as water and air), Amenity (e.g. effects on amenity uses of a site or of other areas in the vicinity – may be addressed under the factor of Landscape)."*

Having regard to the above guidance and the characteristics and context of the lands the subject of this EIAR this chapter aims to identify the likely significant impacts that the development has and may have on Land-use, Settlement Patterns, Employment, and Human Health for population groups identified as relevant to the lands.

The description of the receiving environment for this retrospective EIAR is set out under the above headings at the current time to establish baseline. Sources of information used consist of site visits, observations of the site under the licensee period 2014 – 2017, inspection of the surrounding area in July 2017 augmented with a desktop review of previous assessments of the development in historic planning applications, government surveys and local authority plans.

In regard to Human Health the reader is minded that other chapters of this rEIAR assess effects and set down mitigation measures for other environmental factors that ultimately require emission regulation by national/internal standard or specific planning / licensing condition for reason of protection of human health and the environment. Those assessments are referenced in this chapter to address potential anticipated Human Health impacts in accordance with the 2017 EPA Draft EIAR Guidelines*; "In an EIAR, the assessment of impacts on population & human health should refer to the assessments of those factors under which human health effects might occur, as addressed elsewhere in the EIAR e.g. under the environmental factors of air, water, soil etc. The Advice Notes* [Advice Notes on Current Practice (in the preparation of Environmental Impact Statements, Sept. 2003] *provide further discussion of how this can be addressed."*

Two population groups have been identified as likely to experience effects from the quarry and plant area land-uses the subject of this EIAR:

1. The local non-EIAR population. This is the existing and planned population of the area including residents and related groups having a connection to the area by occasional or habitual presence e.g. workers, students and visitors.

In order to build the population profile of the immediate area containing the EIAR lands Small Area Population Statistics (SAPS) compiled by the Central Statistics Office (CSO) are relied upon. The latest census year for which figures are available

is 2016 and are reported here alongside analysis and government surveys at county, regional or national level. These are considered reasonable indicators of the up to date profile of the resident population in the immediate vicinity of the subject ands.

2. The EIAR population. This is the non-indigenous population consisting of the employees and related service providers of the lands the subject of this EIAR. This population group includes the employees and related service providers.

Potential likely significant felt / anticipated effects of the rEIAR development on each of the receiving environment headings are then set out, followed by a description of mitigation measures proposed in order to avoid, reduce, and if possible, remedy significant adverse impacts where those effects are identified to be negative.

4.3 Receiving Environment

The subject site's receiving environment is occupied by identified resident and working existing populations. The receiving environment is described under each of the following topic headings 4.3.2 Land Use, 4.3.3 Settlement Patterns, 4.3.4 Employment, and 4.3.5 Human Health for each of the population groups identified.

4.3.1 Population

rEIAR site population (workers): The lands the subject of this rEIAR do not hold a resident population. The lands hold sessional population in the form of workers described at 4.3.4 Employment.

Local population: the subject site is located within the Electoral Division (ED) of Nurney and further within the Small Area (SA) of Nurney census ID 017036002 (area of 14.02 km^2) with a recorded population of 314 in 2016 at a population density of 22.39 per km^2. This SA also contains part of the M9 and lands in Milford and Clonmelsh. The townland of Clonmlesh (census ID 10193) was recorded at 1.540 ha. and that of Garyhundon (Garryhundon) (census ID 12275) at 3.204 ha. in 2016.

This SA population represents 0.55% of the county in 2016 (56,932). This low percentage and low population density together reflect the rural nature of the area within which the site is located. In turn, the county of Carlow accounted for 1.2% of the country's population in 2016.

Small Area Population Statistics have only been tracked since 2006. Census data is available back to 1971 but only reliably i.e consistently at county level. Using table E1011 from the CSO 'Private Households in Permanent Housing Units 1971 to 2016 (Number) by Persons per Household, County, Aggregate Town or Rural Area and Census Year' it is possible to set down the occupation rate of households, albeit only private, in the county of Carlow relative to the site and further the difference in those rates between aggregate rural and aggregate town areas. This site is within a rural area.

Table 4.1 below uses this source information to provide a rendition of total persons in private households in Carlow as a percentage of total persons in private households in the State. The rate was 1.2 in 2016, consistent with total population expressed as a percentage of the total population. Since 1971 the rate, indicative of Carlow's population generally following national trends, has remined consistent.

	1971	1981	1991	2002	2006	2011	2016
Expressed as 0.00	1.16	1.16	1.17	1.18	1.19	1.20	1.21
Expressed as 0.0	1.2	1.2	1.2	1.2	1.2	1.2	1.2

Table 4.1 Total persons in private households in Carlow as a % of total persons in private households in the State

We further note that indicative household formation rate has remained consistently higher in Carlow than the State over the same period, generally indicative of a younger population and larger family size. It is possible to express aggregate town and aggregate rural area private household formation size that has been generally dropping over the same period. The site is within a rural area that throughout the state, since 1981 consistently shows higher household formation rates than urban areas. Household formation rates in both the urban and rural areas of Carlow has been higher than the State generally and in turn rural households are larger than urban ones in the county.

	1971		1981		1991		2002		2006		2011		2016	
	State	Carlow	State	Carlow	State	Carlow	State	Carlow	State	Carlow	State	Carlow	State	Carlow
Occupation rate of private households (all areas)	3.9	4.2	3.7	3.9	3.3	3.6	2.9	3.0	2.8	2.9	2.7	2.8	2.7	2.8
Occupation rate of private households (aggregate town area)	4.0	4.2	3.6	3.8	3.3	3.4	2.9	2.8	2.7	2.7	2.6	2.6	2.7	2.6
Occupation rate of private households (aggregate rural area)	3.9	4.1	3.7	4.0	3.5	3.7	3.1	3.2	3.0	3.1	2.9	3.0	2.8	2.9

Table 4.2 Private household formation rates in the State and Carlow over census years 1971 – 2016.

Accessing Pobal geo-profiling and mapping resources sets out a composite score as measure of socioeconomic, education and family formation factors called the deprivation index. The country average is rated at 0 at each census year. These resources reveal that the deprivation score for Carlow has only been measured since the 2006 census when it was at -2.8; 2011 at -3.41 and -3.66 at 2016.

The deprivation score for Nurney ED within which the site occurs was worse when first recorded relative to the county at -3.55 in 2006. It then improved relative to the county to -2.29 in 2011 and -1.86 in 2016.

The deprivation score for the SA within which the site occurs is improved relative to the county and more in line with country averages, and now exceeds the rate of the county at -4.60 in 2006; 0.40 in 2011 and -0.44 in 2016.

According to the 2016 Pobal HP Deprivation Index for Small Areas (SA) Conceptual Basis, Haase & Praatschke, August 2017 *"The most basic pattern of affluence and disadvantage has remained broadly intact over this 15-year period: affluence is highest in the urban peripheries and gradually declines as one moves towards more rural locations."* With this in mind it is likely that the SA within which the site occurs is more affluent than most rural areas given its deprivation score so close to the national average. This extrapolation is borne out by a review of unemployment rates by Pobal over the period 2006 to 2011 for the SA relative to the county that indicates the SA has a better employment rate than the county.

	2006		2011		2016	
	Male	Female	Male	Female	Male	Female
Co. Carlow	17.65	16.85	26.47	19.04	9.07	9.63
Carlow Average	8.83		13.24		4.54	
SA ID 017036002	8.33	15	14.1	6.5	6.6	22.2
SA Average	4.17		7.05		3.30	

Table 4.3 Unemployment rates (%) in Small Area within which site occurs relative to Co. Carlow 2006, 2011, 2016

We reviewed the Quarterly National Household Survey [QNHS] that provides benchmark estimates of employment and unemployment for each quarter for the State since the beginning of 1998. To correct for typical seasonal patterns, the data series included have been concurrently seasonally adjusted. In October 2017, the latest month for which unemployment figures are available is August. Figure 4.1 indicates that Carlow unemployment rate at table 4.3 is consistent with the national average.

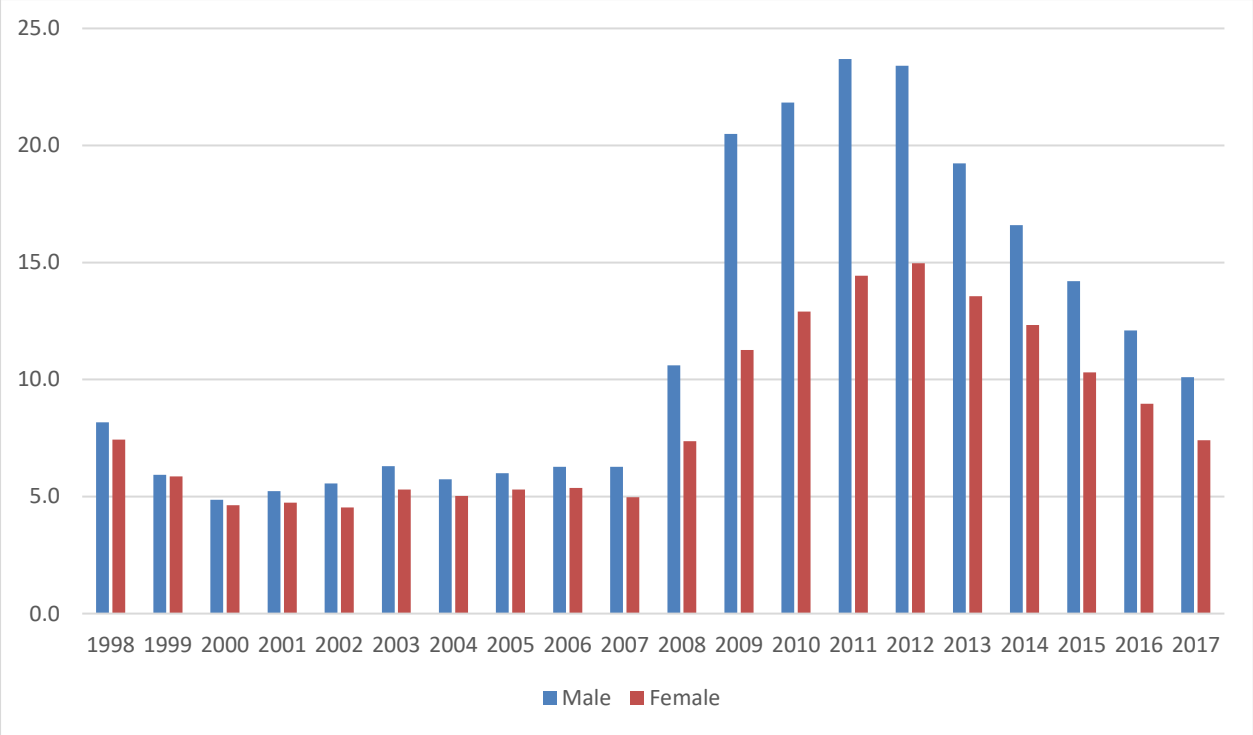


Figure 4.1 Seasonally Adjusted Monthly National Unemployment Rate (%), August 1998-2017 from QNHS

4.3.2 Land Use & Settlement Patterns

The development the subject of this EIAR consists of further quarrying over a total application site of 21.9 ha. with void area of 13.6 ha. Material excavated is to be processed at the Clonmelsh plant area and thus the Clonmelsh entrance and welfare facilities the subject of ABP-30034-17 (Quarry) and ABP-300037-17 (Plant Area) are to be used. Quarrying is a persistent land use originating in the 1940s and 1950s north (Clonmelsh) and south (Garyhundon) of the subject site by DMIL and its predecessors.

Extraction rates will be in line with market demand. Current extraction is at a rate of 180,000 to 200,000 tonnes per annum and is expected to remain at this rate for the short term with uplift thereafter. Extraction rates have been declared at maximum rates of 1M tonnes per annum in previous submissions by former operators of the quarry.

Please refer to Chapter 6.0 Land, Soils & Geology for a rendition of effect of the land use in removing land but retaining soils and subsoils to be used in restoration. Please also refer to Chapters 3.0 Description of Development that includes the detailed extraction and restoration plans and Chapter 12.0 Landscape for a rendition of the effect of the land use on the landscape of the area, including topography which is detailed at Chapter 6.0.

The landscape around the subject lands is characterised by low density, once off ribbon development as indicated by a review of local population.

There are no dwellings within the EIAR lands. From up-to-date aerial mapping there are approximately 23 no. residential properties within 250 of the lands in the control of the developer. Of these; 8 no. are under the control of DMIL. See figure 4.1.

Within 250m of the application site boundary area 11 no. dwellings, 5 no. of which are under the control of DMIL. Between the 250m and 500m radius of the application site are a further 5 no. dwellings; 5 no. of which are under the control of DMIL. See figure 4.2.

There are two single storey, currently vacant houses abutting the northern ends of the western (the western house) and eastern (the eastern house) boundaries. As set out at section 2.5.1 and 3.2.3 the western house is under the ownership control of DMIL and may be used for staff accommodation. The plot on which the houses sits is excluded from the current site. The eastern house is in 3rd party ownership and the extent at Clonmelsh quarry void has already moved toward the northern plot boundary of this house. It is proposed to bring the exclusion zone around the recorded monument (RMP CW12 202) also around the dwelling.

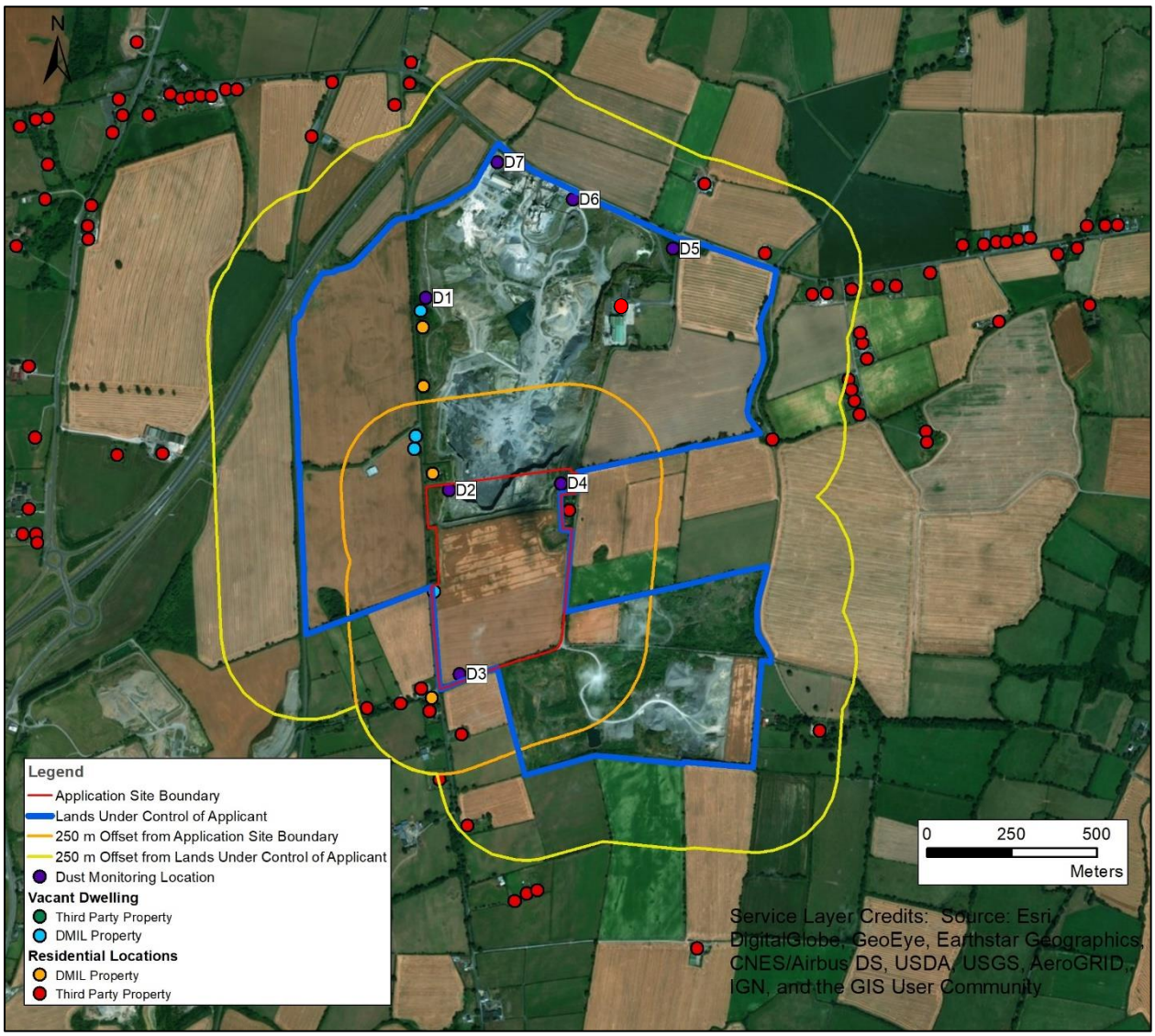


Figure 4.2 Dwellings in the vicinity of the EIAR site. 250m radius of EIAR site and 250m radius of the contiguous DMIL landholding. (source: figure 8.1)

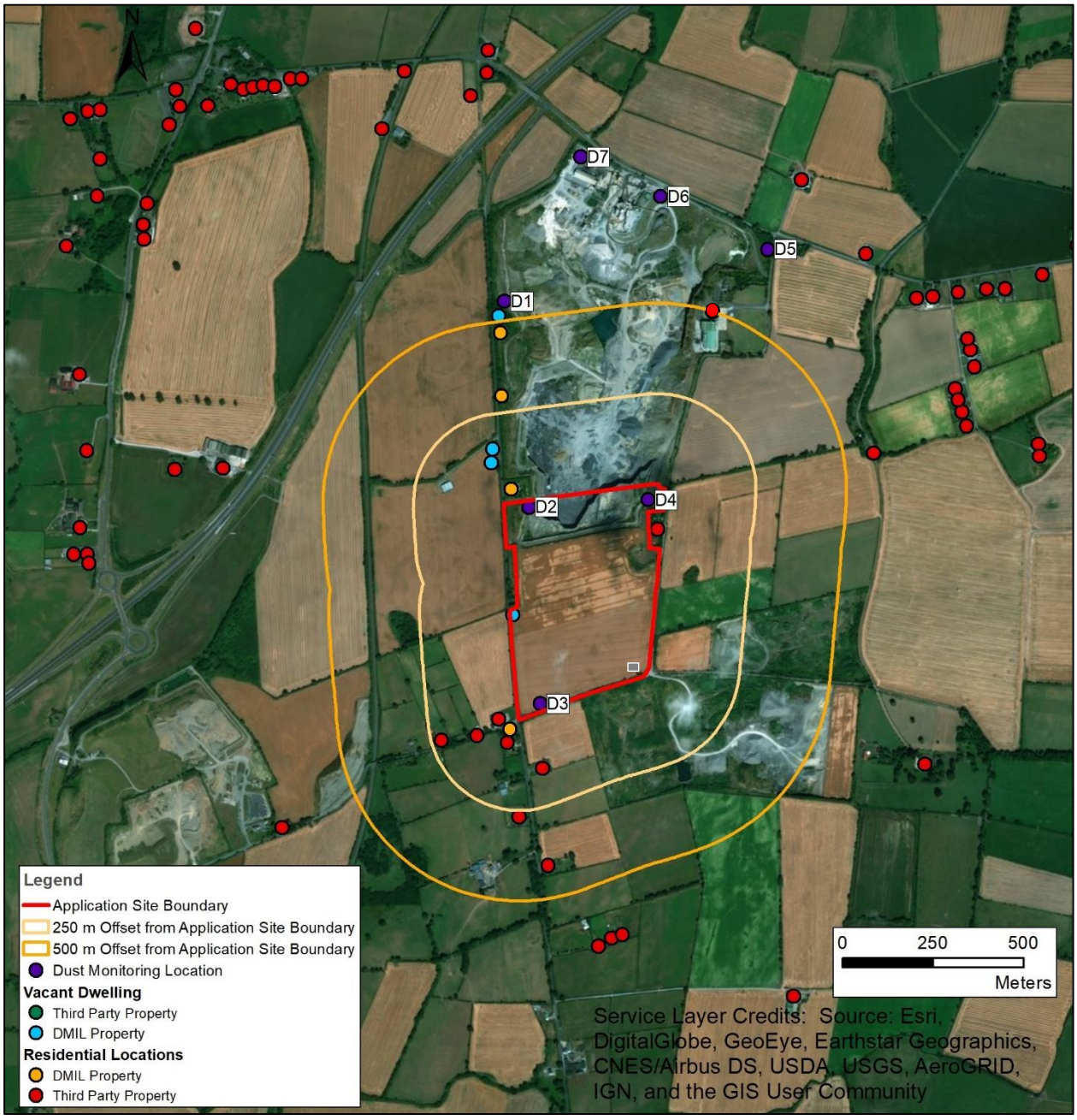


Figure 4.1 Dwellings in the vicinity of the EIAR site. 250m and 500 radius of EIAR site. (source: figure 8.2)

A review of the historic OSI map originating from the 1940s ahead of development indicates that 1 no. dwelling exited within the EIAR boundary in the south eastern corner of the site indicated thus ■ on figure 4.2. A review of aerial photography from 1995 at figure 10.1 indicates that the southern dwelling was removed by that time.

The future direction of settlements and land use patterns are guided by planning policy currently set down in Carlow County Development Plan 2015 – 2021 that promotes sustainable development and is supported by an SEA. The lands for the purposes of the Plan are considered *agricultural*.

The other notable land uses, besides agriculture and low density housing are other extraction sites in the vicinity of the subject lands at Powerstown.

4.3.3 Amenity

The subject lands does not offer amenity opportunities for the public being a private commercial enterprise. Please refer to Chapter 12.0 Landscape & Visual assessment for a rendition of the effect of the land use on the landscape of the area, including conceptual restoration plan proposing increased land cover type areas around a waterbody.

Chapter 11.0 identifies that the subject site contains two recoded monuments; one of which (RMP CW12 202) is visible just south of the 'eastern house'. Mitigation at Chapter 11.0 requires a minimum 20 buffer zone from the base of this feature. The other monument (RMP CW 12 093) is to be preserved by record. It is proposed to bring the exclusion zone around the recorded monument (RMP CW12 202) also around the dwelling in order to provide a minimum setback of 50m to the monument and over 100 metres in order to protect its residential amenity and retain its immediate setting

There are no further material assets or amenities on the subject lands save for the Clonmelsh Stream that runs east to west along the northern boundary of the subject site. This stream has been moved southerly by the extant Clonmelsh quarry void and it is proposed to move it more southerly to the inside of the subject site boundaries as part of this proposal. An assessment of this impact is considered in detail at Chapter 7.0 of this EIAR.

Within the area controlled by the developer but excluded is an historic graveyard in Clonmelsh. This is owned and maintained on behalf of visiting members of the public and is noted as recorded monument CW012-024003-at Chapter 11 of this EIAR.

Just south west of the area controlled by the developer is the municipal landfill and amenity (recycling) centre owned and operated by Carlow County Council. Table 2.1 of this rEIAR sets out 'principal' projects in the vicinity of the subject lands and notes that the landfill began operating in 1975 and thus has operated in tandem with the subject lands.

Infrastructure to the benefit of a wider population in the form of an upgraded M9 and the commuter Dublin – Waterford Rail line have been in place since 2009 and the 1800s respectively and are described at Chapter 10.

4.3.4 Employment

As at Section 3.5 currently the aggregate extraction and processing sites the subject of substitute consent applications ABP-300034-17 (Quarry) and ABP-300037-17 (Plant Area) and abutting the subject lands generates employment for the equivalent of 12 no. full time staff. The subject lands whilst in economic agricultural land use do not generate equivalent employment being a tillage operation capable of being remotely monitored and occasionally planted, inspected and harvested.

There are other effective employees in the form of hauliers and contractors but they do not have their permanent work place on site. The 12 no. employees with these hauliers and other contractors and service employees generate secondary employment of a further 20 no. fulltime equivalents.

It is submitted that were maximum extraction rates to be reached over the lifetime of the current proposal that 20 no. full time staff equivalent extracting, processing, maintaining and performing back office/shipping functions would be generated. The number of associated hauliers, service and contractor employees would be expected to increase at the same proportionate rate but not as a full-time staff equivalent.

The current proposal seeks to maintain aggregate extraction to feed the extant processing areas and plant and thus the observed and expected maximum employment rates will be maintained.

4.4 Impacts of the Development

The effects of the project can be positive, neutral or negative. Likely significant impacts are here described by their significance to the existing environment:

- imperceptible, not significant, slight, moderate, significant, very significant and profound;

and their duration:

- momentary (seconds to minutes), brief (less than a day), temporary (less than 1 year), short term (1 to 7 years), medium term (7 to 15 years), long term effects (15 to 60 years), permanent (over 60 years).

The felt that predicted impacts of the proposed scheme on Population and Human Health have been assessed in other Chapters of this EIAR:
Chapter 5 – Biodiversity
Chapter 6 – Land, Soils & Geology
Chapter 7 – Water & Hydrogeology
Chapter 8 – Air Quality & Climate
Chapter 9 – Noise (and vibration)
Chapter 10 – Material Assets & Traffic
Chapter 11 – Cultural Heritage
Chapter 12 – Landscape

4.4.1 Human Health

The companion chapters of this EIAR define and asses the predicted impact of the development and set out mitigation measures from the perspective of discreet environmental factors and include matters of cultural, archaeological and natural heritage. Where it is determined that the assimilative capacities of those environmental factors including air, water, geology, soils and landscape are sufficient, with mitigation measures, to accommodate the development without significant negative impacts it is considered that the human health will be protected. However, for this assumption to be drawn the mitigation measures set out in each chapter of the EIAR must be implemented.

4.4.2 Land Use & Settlement Patterns

The removal of lands constituting the rEIAR units is a direct, negative, permanent and profound impact in removing the original agricultural use of those lands.

Due to the lands not being identified for planned settlement the effect on settlement patterns is direct, neutral, permanent and not significant.

The subject site formerly had a dwelling located in the south eastern corner of the site. See figure 10.1. This house appears to have been removed between the 1960s and now. The dwelling does not therefore form part of baseline and no impact is discerned.

4.4.3 Amenity

The removal of lands constituting the EIAR units is a direct, negative, permanent and profound impact in removing the original agricultural use and appearance of those lands.

The cumulative impact of traffic the rEIAR land uses and those other quarrying land uses in Powerstown with the municipal landfill also in Powerstown have a cumulative, indirect, negative, long term effect on the local road network.

The impact on RMP CW12 202 is indirect and neutral as its content and setting is preserved by avoidance.

The removal of RMP CW12 is indirect, negative and negligible as it is preserved by record and does not attract any visitors.

4.4.4 Employment

Loss of agricultural lands employment equivalent is a direct, negative, permanent and not significant.

Creation and sustaining of employment at the subject lands is a direct, positive, long term, significant effect on the site working and local populations. There is an associated indirect, positive, long term, slight positive effect in the land use and jobs on site supporting other services employment.

4.5 Mitigation Measures

As set out at section 4.4 the felt and predicted impacts of the development on Population and Human Health have been assessed at succeeding Chapters 5 to 12 of this EIAR for reason of all impacts ultimately affecting humans and accepted industry standards or parent and license conditions are to protect human health and the sustainable development of an area.

Design mitigation as set out in Chapter 3.0 to protect the residential amenity of the eastern dwelling by providing a set back of 100m is a direct, negative, permanent and not significant impact.

A minimum setback of 20m from the outer ring of RMP CW12 202 is set down as mitigation measure at Chapter 11.0 of this EIAR. Chapter 3.0 and submitted drawings indicates a more generous setback of 50m from this feature.

A conceptual restoration plan is provided at Chapter 3.0 and on submitted drawing no. 5 which follows the conceptual restoration masterplan submitted with the previous rEIAR consisting of flooding the void and creating diverse habitats at upper levels.

4.6 Residual Impacts

The removal of the site from agricultural land to a quarry and processing land use is the significant, permanent, adverse impact.

The restoration of the lands to amenity lake is a residual, positive, and slight impact.

5.0 BIODIVERSITY - ECOLOGICAL IMPACT ASSESSMENT

5.1 Introduction

This assessment presents a summary of ecological features which are likely, or have the potential to be, residually affected by the proposed extractive extension works within arable habitat south of the Clonmelsh Quarry (the subject of substitute consent application ABP-300034-17 and accompanying rEIAR and rNIS) at Powerstown, Nurney, Co. Carlow (referred to as the 'Site'). It evaluates the importance of the ecological resources present and defines the degree of significance of potential impacts resulting from the proposed further quarrying activities. The report also identifies appropriate mitigation measures and defines residual impacts should they be identified.

5.2 Assessment Methodology

5.2.1 Desktop Survey

A desktop review was conducted of available published and unpublished information, including a review of data available on the National Parks and Wildlife Services (NPWS) and National Biodiversity web-based databases. This work was conducted in order to identify key habitats and species that may be present, particularly those protected by legislation. The designated search area was 5 km from the Site for Natural Heritage and proposed Natural Heritage sites.

5.2.2 Designated Nature Conservation Site Assessment

Sites of international importance including Special Areas of Conservation (SACs) and Special Protection Areas (SPAs) are collectively known as Natura 2000 sites. These sites contain examples of some of the most important natural and semi-natural ecosystems in Europe. Designated sites, which also include Natural Heritage Areas (NHA's) and proposed Natural Heritage Areas (pNHA's) were also identified within the proposed development's area of influence. The designated search area was 15 km from the Site for Natura 2000 sites.

In the subsequent analysis of designated sites, particular attention was given to potential for the Site operations to influence a designated site. In other words, potential current and historical ecological pathways were identified, these pathways can be hydrological, physically overlapping or exhibiting habitat and species synergies that could result in temporary or residual effects being afforded to a designated site.

5.2.3 Ecological Survey

A walkover survey of the Site was conducted on the 12th July 2017 to record the habitats currently present on, and adjacent to, the Site. Habitats are named and described following Fossitt (2000). Habitat Assessment follows the Joint Nature Conservation Committee (JNCC) Phase One Habitat Survey methodology (JNCC, 1990, revised 2010). Additionally, aerial photographs (satellite imagery) and Site mapping (including surface water) assisted the habitat survey.

An assessment of hedgerow quality was made based upon a truncated version of the Hedgerow Appraisal System (Foulkes, *et al*, 2013). The objective of the methodology is to record the extent (i.e. quantitative survey), and floristic composition, context, physical structure, condition, and management of hedgerows (i.e. qualitative survey) in any given locality, County or region of Ireland using a semi-random sample selection (Foulkes, *et al*, 2013). Only hedgerows that would be afforded likely residual ecological impact via historical and present day Site operations were assessed.

Other additional flora and fauna information was provided within a flora and fauna chapter for an Environmental Impact Statement (EIS) prepared to accompany a planning application for the quarry development at Clonmelsh & Garryhundon,

Co. Carlow submitted to Carlow County Council by Dan Morrissey Ireland Ltd. and prepared by SLR Consulting Ireland (SLR, 2010) for Dan Morrissey Ltd., in compliance with the notice received from Carlow County Council under Section 261, Planning and Development Act, 2000.

5.2.4 Impact Assessment Method

Habitats and species were assessed in accordance with the guidance contained in the document *Guidelines for Ecological Impact Assessment for the United Kingdom and Ireland* (CIEEM, 2016) which recommends that the value of an ecological resource be determined within a defined geographical context (Figure 5.1).

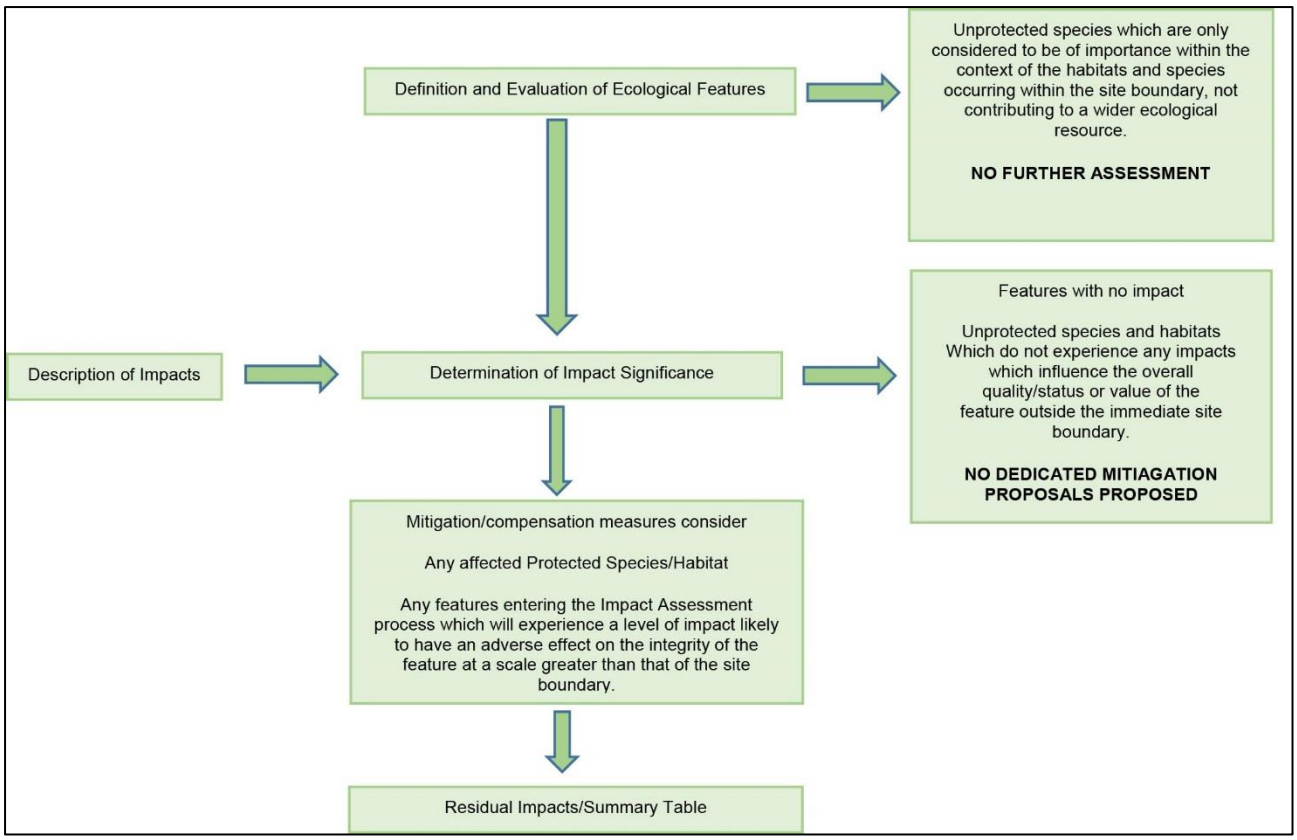


Figure 5.1: Impact Assessment Method

Defining importance: The relative importance of each ecological feature has been defined on a geographical scale, from international importance, to having relevance only in the context of the Site boundary. The definitions employed for the basis of the evaluation are presented in Table 5.1. It should be noted that professional judgement has been employed in the allocation of a level of importance to each feature as it occurs on the Site. In other words, the value of the feature is presented in the context of its actual status within the Site. Therefore a single individual of a species which is protected under the EU Habitats Directive would not automatically be considered to be of European (international) Importance, but would be evaluated in the context of its relationship to the overall population.

Defining impact: The impacts to ecological features are defined by their geographical significance in terms of the likely effect and the defined importance of the feature being affected. It is not possible in this system to have an impact greater than the overall geographical importance of the feature (e.g. the maximum possible impact to a feature of regional importance would be one which is of regional significance). Impacts which do not have significance beyond the immediate area (the Site) will be managed through the implementation of construction and habitat management plans. One exception to this is the case of impacts on Protected Species, where any impact would result in the implementation of mitigation measures.

Defining Magnitude of Change: Considering the potential for impacts as defined above, an assessment of the magnitude of change is arrived at. This is based on the table below and relies on professional subjective judgement in deciding the level of magnitude of change.

Table 5.1: Criteria for Assessing Magnitude of Change

Impact Level	Description
Severe Impact	Ecological effects of a scale or magnitude which would result in permanent, total loss of an irreplaceable species or habitat of international or national importance (occasionally of local importance), or which would result in the substantial loss of a protected/rare habitat or a population of a protected/rare species. They represent key factors in the decision-making process. Typically, mitigation measures would be unlikely to remove such effects.
Major Impact	These effects are likely to relate to permanent impacts at a regional or local level, or temporary impacts at an international or national level, and could be potential concerns to the project depending upon the relative importance attached to the issue during the decision making process. The effects are likely to be large in scale or magnitude, and result in substantial medium term loss of protected/rare species or habitats. Mitigation and detailed design work are unlikely to entirely eliminate all ecological effects.
Moderate Impact	These effects are usually only at local or regional level, and may be short or medium term only, or temporary impacts on a small part of an international site. However, the cumulative effects of such issues may lead to an increase in the overall effect on ecological features. They represent issues where effects will be experienced, but mitigation measures and detailed design work may ameliorate/enhance some of the consequences upon affected interests, but some residual effects will still arise.
Minor Impact	These effects are likely to be local issues only; or small magnitude impacts at the regional and national level, they are usually temporary, and are unlikely to be of importance in the decision making process. However, they are of relevance in enhancing the subsequent design of the development and consideration of mitigation measures.
Not Significant / No Impact	No perceivable impacts on ecological features (habitat or species). Impacts may be beneath levels of perception, within normal bounds of variation, within the margin of forecasting error, or impacting on exceptionally poor baseline conditions.
Beneficial / Positive Impact	These effects are those, which through implementation, would be anticipated to benefit the ecology of the Site. They may advance the objectives of local, national or international species or habitats.

Outlining mitigation, compensation and enhancement measures: Receptors subject to significant impacts (those which have the potential to affect the ecological resource outside of the immediate Site boundary) are the focus of provision of mitigation measures which have been formulated according to the mitigation hierarchy (avoid, reduce / minimise, compensate). All proposed mitigation measures follow industry best practice. Those for protected species follow the prescribed regulatory protocols.

Defining residual impact: Following the application of mitigation measures, impacts to each ecological feature are reassessed, and any residual impacts are reported.

As stated by the CIEEM (2016), 'the value or potential value of a feature/receptor should be determined within a defined geographical context'. Accordingly, each feature has been assessed based on the scale described in Table 5.2.

Table 5.2: Criteria for Establishing Receptor Sensitivity/Importance

Importance	Ecological Valuation
International	Sites, habitats or species protected under international legislation e.g. Habitats and Species Directive. These include, amongst others: SAC's, SPA's, Ramsar Sites, Biosphere Reserves, including sites proposed for designation, plus undesignated sites that support populations of internationally important species.
National	Sites, habitats or species protected under national legislation e.g. Wildlife Act 1976 and amendments. Sites include designated and proposed NHAs, Statutory Nature Reserves, National Parks, plus areas supporting resident or regularly occurring populations of species of national importance (e.g. 1% national population) protected under the Wildlife Acts, and rare (Red Data List) species.
Regional	Sites, habitats or species which may have regional importance, but which are not protected under legislation (although Local Plans may specifically identify them) e.g. viable areas or populations of Regional Biodiversity Action Plan habitats or species.
Local/County	Areas supporting resident or regularly occurring populations of protected and red data listed-species of county importance (e.g. 1% of county population), Areas containing Annex I habitats not of international/national importance, County important populations of species of habitats identified in county plans, Areas of special amenity or subject to tree protection constraints.
Local	Areas supporting resident or regularly occurring populations of protected and red data listed-species of local importance (e.g. 1% of local population), Undesignated sites or features which enhance or enrich the local area, Sites containing viable area or populations of local Biodiversity Plan habitats or species, local Red Data List species etc.
Low Local	Undesignated sites or features, which enhance or enrich the wildlife resource at a Parish or neighbourhood level.
Within Site	Very low importance and rarity. Ecological feature of no significant value beyond the Site boundary.

5.3 Baseline Ecology

5.3.1 Designated Nature Conservation Sites

There are three (3) Natura 2000 sites located within 15 km of the Site (refer Figure 5.2 below):

- River Barrow and Nore SAC;
- Black Mountains SAC; and
- Slaney River Valley SAC;

The closest Natura site is the River Barrow and Nore SAC which is ca. 900m west of the Application Site. The Slaney River Valley SAC is ca. 12 km east of the Application Site and the Black Mountains SAC is ca. 15 km to the south east.

The following summary of the River Barrow Nore SAC is included verbatim from the National Parks and Wildlife service website[1] .

"This site consists of most of the freshwater stretches of the Barrow/Nore River catchments. The Barrow is tidal as far upriver as Graiguenamanagh while the Nore is tidal as far upriver as Inishtioge. The site also includes the extreme lower

[1] https://www.npws.ie/protected-sites/sac/002162 Accessed 07/07/2017

reaches of the River Suir and all of the estuarine component of Waterford Harbour extending to Creadan Head. The larger of the many tributaries include the Lerr, Fushoge, Mountain, Aughavaud, Owenass, Boherbaun and Stradbally Rivers of the Barrow and the Delour, Dinin, Erkina, Owveg, Munster, Arrigle and King's Rivers on the Nore. Both rivers rise in the Old Red Sandstone of the Slieve Bloom Mountains. They traverse limestone bedrock for a good proportion of their routes, though the middle reaches of the Barrow and many of the eastern tributaries run through Leinster Granite. A wide range of habitats associated with the rivers are included within the site, including substantial areas of woodland (deciduous, mixed), dry heath, wet grassland, swamp and marsh vegetation, salt marshes, a small dune system, biogenic reefs and intertidal sand and mud flats. Areas of improved grassland, arable land and coniferous plantations are included in the site for water quality reasons.

The site supports many Annexed habitats including the priority habitats of alluvial woodland and petrifying springs. Quality of habitat is generally good. The site also supports a number of Annex II animal species - Salmo salar, Margaritifera margaritifera, M.m. durrovensis, Alosa fallax fallax, Austropotamobius pallipes, Petromyzon marinus, Lutra lutra, Lampetra fluviatilis and L. planeri. Annex I Bird species include Anser albifrons flavirostris, Falco peregrinus, Cygnus cygnus, Cygnus columbianus bewickii, Limosa lapponica, Pluvialis apricaria and Alcedo atthis. A range of rare plants and invertebrates are found in the woods along these rivers and rare plants are also associated with the saltmarsh."

The site is a Special Area of Conservation (SAC) selected for the following habitats and/or species listed on Annex I / II of the E.U. Habitats Directive (* = priority; numbers in brackets are Natura 2000 codes):

- Estuaries [1130];
- Mudflats and sandflats not covered by seawater at low tide [1140];
- Reefs [1170];
- Salicornia and other annuals colonising mud and sand [1310];
- Atlantic salt meadows (*Glauco-Puccinellietalia maritimae*) [1330];
- Mediterranean salt meadows (*Juncetalia maritimi*) [1410];
- Water courses of plain to montane levels with the *Ranunculion fluitantis* and *Callitricho-Batrachion* vegetation [3260];
- European dry heaths [4030];
- Hydrophilous tall herb fringe communities of plains and of the montane to alpine levels [6430];
- Petrifying springs with tufa formation (Cratoneurion) [7220];
- Old sessile oak woods with Ilex and Blechnum in the British Isles [91A0];
- Alluvial forests with *Alnus glutinosa* and *Fraxinus excelsior* (*Alno-Padion, Alnion incanae, Salicion albae*) [91E0];
- *Vertigo moulinsiana* (Desmoulin's Whorl Snail) [1016];
- *Margaritifera margaritifera* (Freshwater Pearl Mussel) [1029];
- *Austropotamobius pallipes* (White-clawed Crayfish) [1092];
- *Petromyzon marinus* (Sea Lamprey) [1095];
- *Lampetra planeri* (Brook Lamprey) [1096];
- *Lampetra fluviatilis* (River Lamprey) [1099];
- *Alosa fallax fallax* (Twaite Shad) [1103];
- *Salmo salar* (Salmon) [1106];
- *Lutra lutra* (Otter) [1355];
- *Trichomanes speciosum* (Killarney Fern) [1421]; and
- *Margaritifera durrovensis* (Nore Pearl Mussel) [1990].

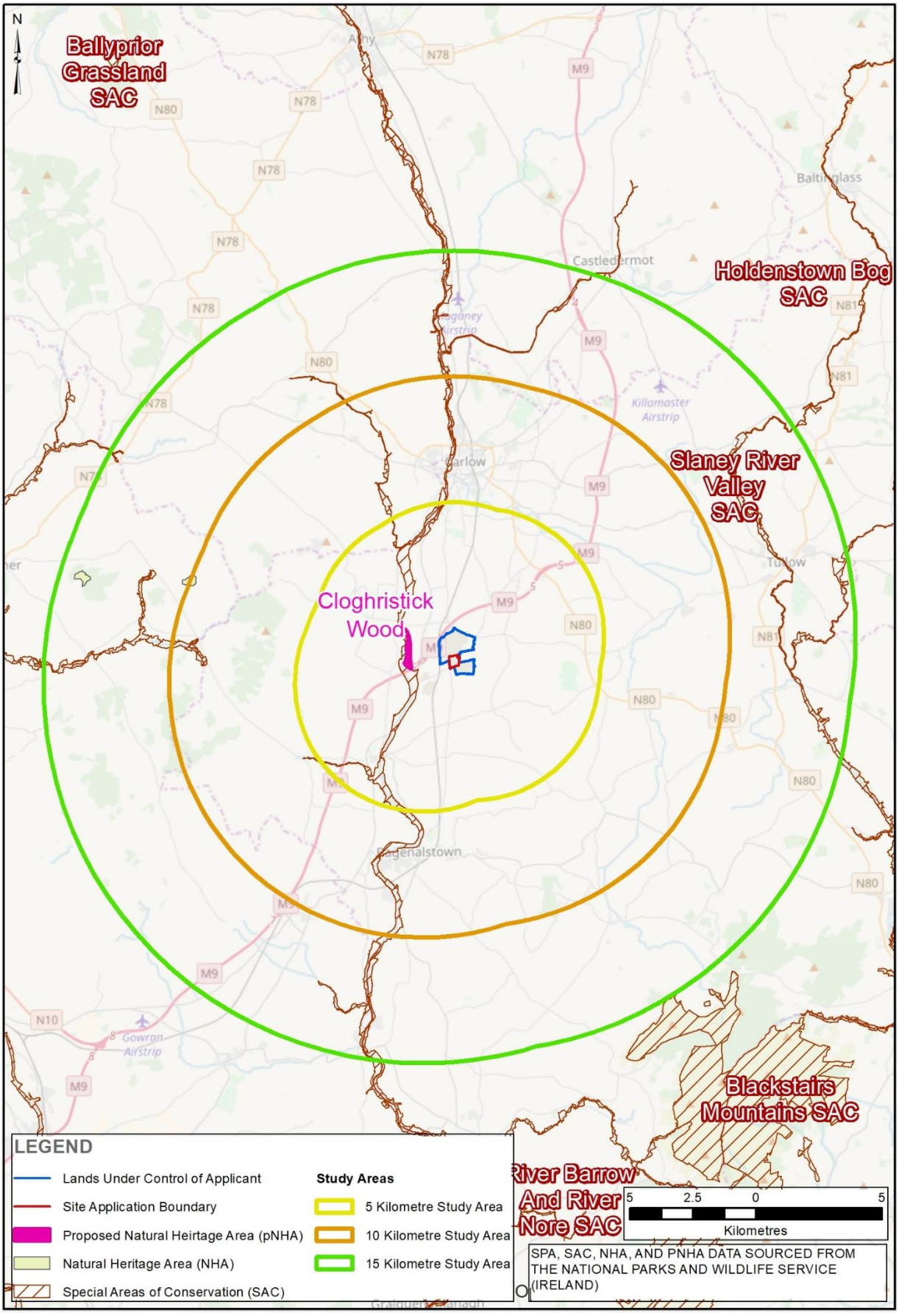


Figure 5.2: Natura 2000 and Nationally Protected sites (NPWS, 2012) within 15km and 5km of the Site respectively.

No NHA's were identified within the desk study area. However, a single pNHA was identified within 5 km of the proposed Site (Figure 5.2). The Clog wood pNHA is situated ca. 1.1 km from the Site. It contains examples of Oak Quercus spp., Beech *Fagus sylvatica* and Hazel *Corylus avellana* woodland, although Willows Salix spp. are the dominant species. The ground flora comprises a range of wetland and woodland species. The wood is of value as it is typical and, by standards prevailing in County Carlow, quite large.

In terms of assessing the potential for ecological pathways it is important to note that there is no hydrological or obvious terrestrial connectivity from the Site to this pNHA. Furthermore, the surface water regime for the Site will remain unchanged with no elevations in total suspended sediments, changes to water quality or quantity to receptors (Chapter 6.0). Cumulatively, it is considered that no residual effects would be afforded to the pNHA detailed above and it is no longer discussed within this report.

5.3.2 Habitat Assessment

The Site is almost entirely comprised of arable habitat, presently hosting a carrot crop. The Site periphery is bounded by defunct hedgerow and scattered scrub. The habitat map of the Site and surrounds is presented in Drawing 5.1 at the end of this section.

Table 5.3: Habitats on Site (Fossitt, 2000)

Habitat	Habitat code	Location and prevalence
Arable Crops (Cultivated Land)	BC1	The extent of arable habitat within the Site amounts to approximately 16 ha. It is ubiquitous at the Site, local, regional and national scale.
Scrub	WS1	Noted within the Site periphery.
Hedgerows	WL1	Species-poor intact and defunct hedgerows occur on Site field boundaries.
Drainage Ditch	FW4	A single on-Site drainage ditch was recorded at the South of the Clonmelsh Quarry on the northern boundary of the Site.

Arable BC1

Arable habitat is dominant within the Site footprint. This cropping regime, by definition, creates a monoculture of species-poor habitat of negligible biodiversity value. However, the arable field margins are considered to be of some limited biodiversity interest. Species, considered to be weed flora in these margins include forget-me-not *Myosotis arvensis*, corn marigold *Chrysanthemum segetum,* field pansy *Viola arvensis* and fool's parsley *Aethusa cynapium* as recorded by SLR (2010).

Figure 5.3: Arable Habitat (carrots) situated within the proposed extraction Site

Scrub WS1

Scattered and dense scrub occurs frequently at hedge junctions on the periphery of the Site. Species composition includes blackthorn *Prunus spinosa*, hawthorn *Crataegus monogyna,* brambles, gorse, willow *Salix* spp., cleavers *Galium aparine,* dog-rose *Rosa canina.* The scrub transitional habitat includes; gorse *Ulex europaeus*, brambles *Rubus fructicosus agg*, Yorkshire fog *Holcus lanatus,* cocksfoot *Dactylis glomerata,* creeping buttercup *Ranunculus repens* and creeping thistle *Cirsium arvense.*

Figure 5.4: Scrub and pioneer plant succession on the Site periphery.

Hedgerows WL1

Hedgerows were recorded adjacent to the quarry workings on the periphery of the Site. These hedgerows are generally species-poor. However, many of the hedgerows also exhibit associated features such as standard trees and connecting hedges that provide ecological connectivity. Frequent standard trees include ash and elder *Sambucus nigra*. Other woody species include blackthorn and privet *Ligustrum vulgare*. The scramblers, bramble *Rubus fructicosus* and dog rose *rosa canina* are also frequent. A review of historical mapping indicates that the Site would have exhibited hedgerows within what is now the Site quarry footprint.

Drainage Ditch FW4

At the northern boundary of the Site a surface water ditch flows in an easterly to westerly direction before being diverted northerly off Site (refer to Drawing 5.1 at rear). This feature appeared dry at the time of survey. However, the floral assemblages recorded within indicates that this feature is periodically inundated in accordance with the seasons and water management of the Site. Water mint *Mentha aquatica*, watercress *Rorippa nasturtium-aquaticum* and great willowherb *Epilobium hirsutum* were evident and symptomatic of seasonally wet conditions.

5.3.3 Flora and Fauna Assessment (Desk Study)

The National Parks and Wildlife Service (www.npws.ie mapviewer) do not hold records of protected and notable species within the desk study search area (15 km grid square). However, the freely available desk study results should not be considered definitive data sets for the desk study area. An absence of desk study data does not necessarily correspond that a Site is absent of notable flora or fauna.

5.3.4 Fauna Assessment

The presence, or potential presence, of species on the Site was identified from the desk study and Phase 1 Habitat survey. Table 5.4 lists the species which were considered likely to occur within the Site, on the basis of the presence of suitable habitat and/or the occurrence of recent records in the vicinity. The species, together with its legislative designation is listed. The source(s) of information relating to each species could include:

- Existing records from desk study;
- Presence of suitable habitat identified during the Phase 1 survey; and / or
- Direct observation.

For each species with the potential to occur on Site, the final column of Table 5.4 presents a brief summary of the status of the species in relation to the Site itself. If the survey fails to record the species and the habitats are unsuitable, then it is concluded that the species is unlikely to occur and it is not considered further within the assessment. If a species is confirmed as present, an indication of the likely population size/status within the Site is provided. This information is used in the evaluation presented in Table 5.5.

Table 5.4: Species Recorded

Species/ Group	Protection Status	Source	Summary of status on site
Badger	Wildlife Acts (1976 – 2010)	Survey (suitability)	The Site is suitable for foraging and hedgerows may be suitable for sett building.
Fox	-	Survey (suitability)	Likely to occur within the Site.
Rabbit	-	Survey (suitability)	Likely to occur within the Site.
Irish Hare	Wildlife Acts (1976 – 2010)	Survey (suitability)	Potential to occur within the Site.
Stoat	Wildlife Acts (1976 – 2010)	Survey (suitability)	Potential to occur within the Site
Hedgehog	Wildlife Acts (1976 – 2010)	Survey (suitability)	Potential to occur within the Site
Red Squirrel	Wildlife Acts (1976 – 2010)	Sub-optimal - Survey (suitability)	No available resource (mixed woodland). Not considered further within this assessment.
Pygmy Shrew	Wildlife Acts (1976 – 2010)	Survey (suitability)	Potential to occur within the Site.
Bats	Wildlife Acts (1976 – 2010) – EU Habitat Directive.	Survey (suitability – Foraging only)	Some foraging habitat was observed within the Site periphery. Trees on the Site periphery may exhibit low (Collins, 2016) bat roosting potential.
Breeding Birds	Wildlife Acts (1976 – 2010), EU Birds Directive and Birds of Conservation Concern (BoCC[2], Ireland).	Survey (suitability) Phase 1 habitat survey (direct observation)	Common and widespread species such as magpie *Pica*, rook *Corvus frugilegus* and wren *Troglodytes* were recorded on Site. No Annex 1 (EU Birds Directive) species were recorded. The Site's peripheral hedgerow systems, offer opportunities for nesting, foraging and commuting habitat for bird species.
Other Taxa	Lepidoptera / Odonata	Sub-optimal - Survey (suitability)	Limited to no available resource situated within the application Site boundary. Not considered further within this assessment.

[2] Colhoun, K. & Cummins, S. (2013) Birds of Conservation Concern in Ireland 2014–2019. Irish Birds 9: 523–544.

5.3.5 Natura 2000 and Protected Sites

The potential impact of the project on Natura 2000 sites is dealt with in the accompanying Natura Impact Assessment.

5.3.6 Evaluation

The evaluation of ecological features (sites, habitats and species) which could be affected by the Project proposals is presented in Table 5.5. The table includes:

- Any statutory designated areas, with the exception of Natura 2000 sites, which are situated within 5 km of the Project Site that have potential ecological connection (s) with the Site;
- Any surface or groundwater bodies that have hydrological connectivity with the Site;
- Any habitat type recorded within the Site; and
- Any species of conservation importance which has been confirmed as occurring within the Site.

The value of the feature is based upon how important the feature is in relation to its geographical context. In other words, at what level of geographical resolution would the feature contained within the Site (Designated Area, habitat or species) be recognised as contributing to biodiversity to a significant degree. The evaluation takes into account any statutory or non-statutory conservation status, its extent (or population size) within the Site compared to the resource elsewhere and whether it has characteristics which either elevate or depress its importance in comparison with a 'typical' example (for example, whether a habitat is particularly species rich, or depleted in species).

Common and widespread species or habitats, therefore, only have a level of importance in respect to the biodiversity of their immediate area (taken in this case to be represented by the boundary of the Site). Such features are not considered further within the Impact Assessment. Some protected species may, under certain circumstances (such as a single example occurring within the Site, as part of a much larger local population) be considered to only be of importance within the Site itself. Such species, on the basis of legal and planning regulation compliance, are included within the Impact Assessment and, (if necessary) dedicated impact mitigation measures are provided. Table 5.5 presents each feature occurring, together with the rationale for its evaluation.

Table 5.5: Classifying the Geographical Importance of Key Ecological Features

Key Ecological Features	Importance	Rationale
Habitats		
Arable Crops (Cultivated Land)	Site	This type of habitat is considered to be ubiquitous and not inherently biodiverse or rare in accordance with ecological value based upon the criteria defined by Ratcliffe (1977), namely: naturalness, size, rarity and diversity. Not considered further in this assessment.
Scrub	Site	This type of habitat is considered to be ubiquitous and not inherently biodiverse or rare in accordance with ecological value based upon the criteria defined by Ratcliffe (1977), namely: naturalness, size, rarity and diversity. Not considered further in this assessment.
Hedgerows	Local	Hedgerow quality on the Site periphery is generally poor. However, these features may still offer some nesting, commuting and foraging resource for species of conservation concern. Boundary hedgerows will be retained and no hedgerows dissect the Site. Not considered further in this assessment.
Drainage Ditch	Site	Drainage ditch habitat has been created on Site in accordance with the needs of the adjacent working quarry. This feature is not considered to be inherently unique, irreplaceable or able to host species of conservation concern in isolation. This feature will be diverted to compensate for its functional loss. Not considered further in this assessment.

Key Ecological Features	Importance	Rationale
Species		
Badger	Site	The Site does not exhibit habitats that would be suitable for sett building (earth banks/woodland/dense hedgerows). The Site offers some, limited foraging potential. This feature (species) is carried forward into the design mitigation and impact assessment sections.
Irish Hare	Site	The Site does not afford Irish hare any optimal or indeed sub-optimal habitat. The Site periphery exhibits some sub-optimal foraging and commuting habitat. This feature (species) is carried forward into the design mitigation and impact assessment sections.
Small Mammal Group	Site	The Site does not afford small mammals any optimal or indeed sub-optimal habitat. The peripheral Site supports suitable foraging and commuting habitat. This feature (species group) is carried forward into the design mitigation and impact assessment sections.
Bats	Site[3]	The Site supports some limited foraging and commuting habitat. Some low potential roosting habitat may still be available on the Site periphery (mature trees). Quarrying at the neighbouring facility has resulted in a mosaic of habitats being formed including the creation of standing water bodies. These features could encourage species such as the Daubenton's bat to forage on Site. This feature (species group) is carried forward into the design mitigation and impact assessment sections.
Breeding Birds	Site	The Site footprint is sub-optimal for ground nesting birds. The arable footprint will have been intensively managed for crop production over many decades. The Site periphery offers some limited nesting, foraging and commuting habitat. This feature (species group) is carried forward into the design mitigation and impact assessment sections.

5.4 Design Mitigation

This section describes the mitigation measures that have been implemented in congruence with official statutes pertaining to environmental working best practice. Additional mitigation measures not incorporated at the design stage are considered in relevant sections throughout the EIAR. The ecologists and the Project design team have devised a number of measures to mitigate the residual impacts likely to have occurred since quarrying operations commenced on the ecological environment at the Site:

- All Site operations will continue to be undertaken in accordance with industry best practice and adhere to the HSA's *'Guidelines to the Safety, Health and Welfare at Work (Quarries) Regulations 2008'*);
- Vegetation clearance will continue to be undertaken outside of the bird nesting season (March to August) or under the supervision of a suitable qualified ecologist; and
- Lighting will be minimised and will not illuminate peripheral natural vegetation to maintain dark skies to benefit bat and other nocturnal species.

[3] Whilst bats are internationally protected, individuals on Site that are part of a much wider population cannot be reasonably considered to be of 'international' significance.

5.5 Impact Assessment

Impacts associated with the proposed quarry extension have been defined and their significance assessed in relation to their implications on ecological features in a historical context up to the present day, they are defined in terms of their geographical extent (Table 5.6).

The key operational impacts assessed are:

- Disturbance to habitats and species;
- Habitat loss;
- Species loss;
- Impacts of dust and Site runoff as a result of extraction and restoration activities;
- Potential for suspended sediments within the quarry to be discharged into the Powerstown Stream; and
- Impact on the water environment from quarrying related activities arising from accidental spillage of fuels or oils to the groundwater environment during refuelling operations. This potential impact is likely to occur if contaminants are allowed to infiltrate to ground during refuelling operations.

5.5.1 Irish Hare and Badger

The potential for ecological impact to Irish hare and badger, in the absence of mitigation focuses on the following factors:

- Operational noise disturbance;
- Vegetation removal/soil stripping; and
- Dust deposition and subsequent changes in habitat composition (changes to structural, foraging and commuting habitat).

Irish hare *Lepus timidus hibernicus* and badger *Meles meles* are mobile species and badger in particular display a level of resilience to anthropogenic pressure. Operational impacts attributed to land take, noise, vegetation/soils removal and dust deposition must be considered.

Effects likely to be afforded to hare and badger include displacement owing to land take, potential mortality owing to vehicular movements, severance of commuting habitat and operational noise disturbance. Noise effects associated with the operation of the quarry will be temporary during diurnal parts of the day and no nocturnal noise effects will be experienced. Effects experienced with operational noise would be temporary and reversible.

Characterisation of Unmitigated Impact

Owing to the relative mobility of these species it is considered unlikely that habitat removal or modification will afford a negative impact. Noise effects associated with the operation of the quarry would be temporary during diurnal parts of the day and no nocturnal noise effects would be experienced. In the absence of mitigation foraging and commuting habitat may be restricted during the operational life of the quarry.

Rationale for Prediction of Effect

The variable effects associated with land take, operational noise and habitat severance and loss at different distances from the source of disturbance, are very little understood for small to medium mammals. Habitat loss would be likely to afford a level of perceived stress and possible mortality, dependent on species mobility, though this is not certain.

Minor losses of foraging habitat and habitat severance is less likely to cause stress to these species given the abundance of optimal habitat (hedgerow, scrub, arable and pasture) within the local setting. On a precautionary basis, it is considered likely that this impact would negatively affected the conservation status of the hare and badger population at the Site level.

The rationale for effect to hare and badger considers that habitat loss and disturbance will occur over the operational life

of the Quarry. However, it is also acknowledged that these species are mobile and the habitat that they favour are ubiquitous at the Site, Local and National scale.

Effect without Mitigation

The unmitigated effect to these species is likely to result in a **minor** permanent impact to species of **Site level** sensitivity and importance. Mammals such as hare are protected under the Wildlife Acts (1976-2010). Badgers are protected under the Wildlife Acts (Wildlife Act, 1976; Wildlife Amendment Act, 2000), and in Northern Ireland under the Wildlife (N.I.) Order of 1985. Also protected under Appendix III of the Berne Convention.

5.5.2 Feature Small Mammal Group Including Bats

The likely ecological impact afforded to the small mammal group, in the absence of mitigation focuses on the following factors:

- Operational noise disturbance;
- Vegetation removal/soil stripping (land take/modification); and
- Dust deposition and subsequent changes in habitat composition (changes to structural, foraging and commuting habitat).

The small and medium mammal group includes stoat *Mustela erminea*, pygmy shrew *Sorex minutus*, and hedgehog *Erinaceus europaeus*.

Although this group of species are generally fairly mobile, operational impacts attributed to noise, vegetation/soils removal and dust deposition must be considered. Dust which settles on plants, can affect the plants' transpiration, respiration and other metabolic activity, by clogging pores and damaging waxy cuticles on the leaves, and by reducing available light. Dust can alter soil and water chemistry, structure and trophic status which may have impacts on the composition of plant and invertebrate communities. Dust can have direct impacts on insect and other invertebrate populations. Impacts on plant and invertebrate communities may result in effects further up the food chain (small mammals).

Potential effects to bat species include a negative biophysical effect to scrub and peripheral habitat which may inhibit bat commuting value. Linear landscape features, such as hedgerows and tree lines, are important habitats for bats, providing flight paths between roosts and foraging sites and as foraging habitats (e.g. Verboom & Huitema 1997, Oakeley & Jones 1998, Russ & Montgomery 2002).

In addition, low level effects attributed to minor to negligible foraging habitat loss and operational noise may be afforded. Noise effects associated with the operation of the quarry would be temporary during diurnal parts of the day and no nocturnal noise effects will have occurred. Effects associated with operational noise will have been temporary and reversible. The loss of foraging habitat would be temporary within the life of the quarry. Commitments defined within the design mitigation section to negate Site lighting will ensure dark skies are preserved.

Characterisation of Unmitigated Impact

Owing to the relative mobility of these species it is considered unlikely that habitat removal or modification would afford a negative impact. Noise effects associated with the operation of the quarry would be temporary during diurnal parts of the day and no nocturnal noise effects would have occurred. In the absence of mitigation foraging and commuting habitat may be restricted during the operational life of the quarry.

Rationale for Prediction of Effect

The variable effects associated with operational noise and habitat severance and loss at different distances from the source of disturbance, are very little understood for small to medium mammals. Habitat loss would be likely to afford a level of perceived stress and possible mortality, dependent on species mobility, though this is not certain.

Losses of foraging habitat and habitat severance is less likely to cause stress to this species group given the abundance of optimal habitat (hedgerow, scrub and pasture) within the local setting. On a precautionary basis, it is considered likely that this impact could negatively affect the conservation status of the local small mammal population.

The rationale for effect to bat species considers that no bat roosts will be affected by the quarrying extension at the Site. Losses of foraging habitat are unlikely to cause stress to this species group given the abundance of habitat (mature trees, ditch networks, hedgerow and pasture) within the local setting. On a precautionary basis, it is considered likely that this temporary impact could negatively affect the conservation status of the bat population.

Effect without Mitigation

The unmitigated effect to this group would result in a **minor** permanent impact to species of **low local** sensitivity and importance. Small mammals such as stoat are protected under the Wildlife Acts (1976-2010). All bat species are protected under the Irish Wildlife Acts (1976 – 2012) and they are also listed on the EU Habitats Directive. As such, there is an identified, albeit low, potential for a breach of relevant legislation.

5.5.3 Breeding Birds

Ecological impact to the breeding bird group, in the absence of mitigation focuses on the following factors:

- Operational noise disturbance including blasting;
- Vegetation and soil removal; and
- Dust deposition and subsequent changes in habitat composition (changes to structural, foraging and commuting habitat);

Effects to bird species include a negative biophysical effect to scrub and hedgerow availability which may have disturbed breeding birds and minimally reduced available forage such as hawthorn berries.

Noise effects associated with the operation of the quarry would be temporary during diurnal phases and this has the potential to affect avian behaviour. Ground nesting bird species such as skylark *Alauda arvensis* could have be disturbed, killed or injured during scrub clearance and soil strip in the absence of mitigation. The effects of increased noise during operation would are temporary and reversible.

Characterisation of Unmitigated Impact

The loss of available nesting habitat as a result of the quarry extension would be relatively discrete when considering the available habitat at the local scale. In the context of the available nesting habitat at the local scale it may be considered negligible.

Noise effects associated with the operation of the quarry will be temporary and reversible. The minor loss of foraging habitat can be seen to be temporary within the life of the quarry subject to restoration proposals being implemented at closure.

Rationale for Prediction of Effect

The rationale for effect to bird species considers that losses of available scrub nesting habitat will have occur. However, the Site footprint is considered to be generally sub-optimal in terms of foraging and ground nesting value and any effects to scrub habitat will be discrete and are wholly reversible. Losses of foraging and breeding habitat are unlikely to cause stress to this group given the abundance of habitat (mature trees, ditch networks, hedgerow and pasture) within the local setting. On a precautionary basis, it is considered likely that this impact would negatively affected the conservation status of the bird population.

Effect without Mitigation

The unmitigated effect to this feature would result in a **minor** permanent impact to species of **low local** sensitivity and

importance. The majority of bird species are protected under the Wildlife Acts (1976 – 2012) where it is an offence to hunt, interfere with or destroy their breeding or resting places unless authority is obtained via statutory licence provision.

5.6 Mitigation, Compensation and Enhancement Measures

Committed mitigation, compensation and enhancement measures are undertaken to remove and reduce any potentially significant impacts on the surrounding habitats and species in the vicinity of the Site. Mitigation measures in place at the Site are in accordance with the "*best practice/possible mitigation measures*" as set Quarries and Ancillary Activities: Guidelines for Planning Authorities, DoEHLG (2004) and the discharge licence requirements set out in DL7/233 (granted in 2009).

It is proposed that the following mitigation measures will continue to be adhered to at the Site to ensure that no adverse environmental impacts will occur to the habitats, species hydrology and underlying hydrogeology as a result of the present activities. These are provided as follows:

Habitat Clearance

As defined within the design mitigation section vegetation clearance will continue to be undertaken outside of the bird nesting season (March to August inclusive) or under the supervision of a suitable qualified ecologist.

Hydrocarbons/Chemicals

Mitigation measures that are already implemented at the existing quarry site adjacent are as follows:

- All plant and machinery will continue to be regularly serviced before being used on Site;
- Refuelling will be completed in a controlled manner using drip trays at all times;
- Only designated trained operators will be authorised to refuel mobile plant on Site; and
- An emergency spill kit with oil boom, absorbers etc. will be kept on-Site for use in the event of an accidental spill in the quarry floor.

Potential Release of Dust Suppression

Dust suppression will continue to be implemented in accordance with best practice guidance (Environmental Management in the Extractive Industry (2006), and Quarries and Ancillary Activities Guidelines for Planning Authorities (Department of Environment, Heritage and Local Government, 2004)).

Surface Water Monitoring

The following measures will be undertaken:

- As part of the compliance with the discharge licence for the quarry (DL7/233), regular water quality monitoring of the discharge and the Powerstown and Clonmelsh Streams takes place, with results being submitted to Carlow Co. Council;
- The quarry discharge considerably dilutes the levels of nitrate in the Powerstown Stream (Chapter 7.0). This is considered to be a positive impact;
- Surface water channels constructed within the quarry to collect surface water runoff and any perched groundwater seepage. These channels are cleaned out regularly, with the fine materials used on site in remediation works;
- Measures implemented within the quarry to ensure that adequate settlement time is available to discharge water to mitigate against an excessive suspended solids load;
- All soil / overburden stockpiles to be covered (i.e. vegetated) to minimise the risk of rain / wind erosion and reduce TSS;

- Restoration with topsoil and overburden will be carried out on an *'rolling-basis'* (on-going basis) to reduce the vulnerability of the bedrock aquifer to possible contamination;
- Most mobile plant will use the existing concrete apron at the current quarry garage for refuelling. Static plant or tracked excavators will refuel over a drip tray with an absorbent mat;
- Any processing plant and/or mobile plant on the Application Site will be regularly maintained, and where plant is damaged or leaking it will be fixed or replaced immediately, as part of the ongoing operational management of the quarry to reduce the risk of leaks; and
- The water management system set out under the existing discharge licence (DL7/233) includes provision for settlement ponds and provides for a hydrocarbon interceptor.

Groundwater Monitoring

Ongoing monitoring of groundwater levels in the vicinity of the proposed development will continue on a regular basis from monitoring wells installed within the existing quarrying operation. In addition:

- The Applicant has provided an undertaking to carry out appropriate remedial measures to restore water well supplies in the event that it is demonstrated that quarry operations are having an adverse impact on private wells;
    - Data loggers (divers) will be placed in selected monitoring boreholes and private wells to monitor fluctuations in groundwater levels on an ongoing basis;
    - Data loggers will also act as an early warning system should a dramatic drawdown in groundwater levels occur;
- No excavation shall take place below +25 m OD; and
- Monthly monitoring of quarry specific groundwater monitoring boreholes and private wells within a 500 m wide radius to monitor possible drawdown and groundwater quality will occur.

Habitat Creation

Extant permissions for the Site do not contain references or commitments for habitat creation at restoration. However, the post-closure condition of the Site will include the provision of freshwater habitats, marginal aquatic plants and shallow drawdown areas. These marginal aquatic and terrestrial transitional habitats will be planted with native hedgerows to compensate for the historical losses if these features.

5.7 Residual Impacts

In the absence of mitigation, compensation and enhancement detailed within Section 5.6 **Minor** effects to features of **Local**, **Low Local** and **Site** value were realised. However, consideration of the measures outlined in Section 5.6 has resulted in residual effects being considered to be **Not Significant**. In essence this can be described as having no perceivable impacts on ecological features (habitat or species). Impacts may be beneath levels of perception, within normal bounds of variation, within the margin of forecasting error, or impacting on exceptionally poor baseline conditions.

5.8 Cumulative Impacts

A review of the relevant County Council planning website was undertaken for details of other developments in the area which may lead for the potential for cumulative impacts to arise. Proposed developments identified were mainly for dwelling or extension/alterations to dwellings, a landfill and light industrial infrastructure development. As such, it is

considered that no cumulative impacts will be derived from this application and subsequent implementation.

5.9 Conclusions

When cumulatively considering the mitigation, compensation and enhancement measures outlined within this section it is considered that a net gain for biodiversity will be afforded over the long term (closure and post closure life of the quarry). Many new species may appear during the evolution and eventual closure of the Site. As natural succession and planned restoration takes place, a variety of different habitats will occur. This will provide important habitat for a variety of species. Peripheral woodland and scrub will eventually develop adjacent to large waterbodies providing structural ecological connectivity.

5.10 References

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Russ JM, Montgomery WI (2002). Habitat associations of bats in Northern Ireland: implications for conservation. Biological Conservation 108: 49-58.

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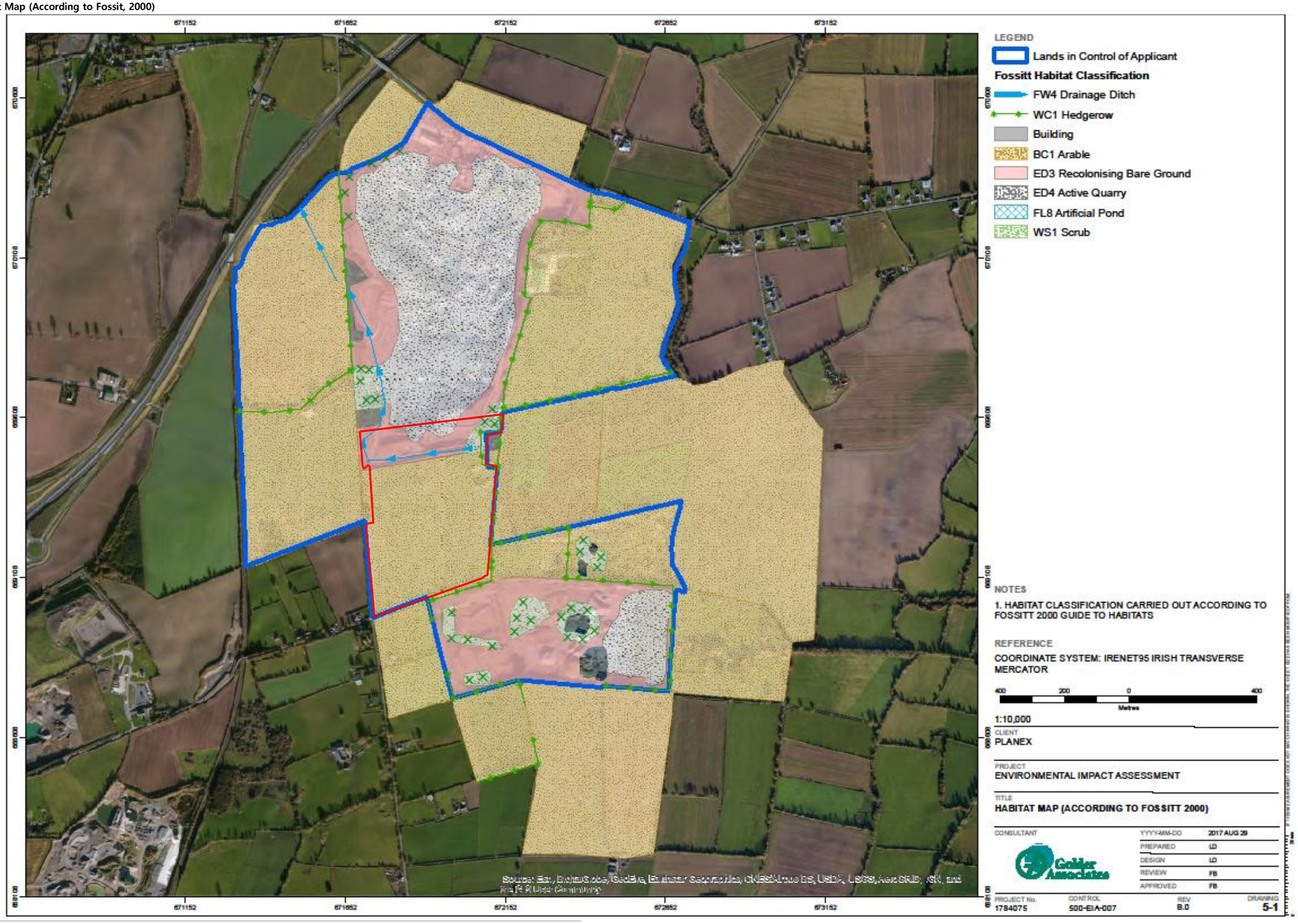
Golder & Associates (2017) rEIAR (Chapter 5) Biodiversity – Ecological Impact Assessment for lands at Clonmelsh & Garyhundon, Nurney, Co. Carlow, 2017, Golder & Associates

Drawing 5.1 Habitat Map (According to Fossit, 2000)



6.0 LAND, SOILS & GEOLOGY

6.1 Introduction

This Chapter of the EIAR considers and assesses any potential impacts resulting from quarrying related activities that will be carried out at the Application Site the subject of this EIAR on the surrounding soils and geology. Information for this assessment was obtained through a desk based review of site specific studies, and publically available information from the Geological Survey of Ireland (GSI) and the Environmental Protection Agency (EPA). It is noted that activity at the lands the subject of this EIAR that concord with the site the subject of an application for planning permission under S.37L of the P&D Act will involve limestone extraction. Blasting activities will be carried out at this Site and extraction activities will take place below the water-table.

6.6.1 Land

According to the EPA 2017 EIA Draft Guidelines in referencing and describing 'land' it is clarified that the amended Directive introduces Land as a prescribed environmental factor; "*Recital 9 gives context to this addition, showing that it relates to the issue of 'land take'. This change aligns the Directive with proceedings of the United Nations Conference on Sustainable Development (Rio de Janeiro, 2012) and with Commission strategy."*

The Environment Directorate-General of the European Commission sets down policies in relation to myriad environmental factors including 'land' opening as follows;

"Land is a finite resource. It is subject to competing pressures from urbanisation, infrastructure, increased food, feed, fibre and fuel production and the provision of key ecosystem services.

But it's also a shrinking resource. Almost 1000 km2 of agriculture or natural land disappears every year in the EU, as it is converted into artificial areas. More EU land is affected by degradation all the time, and ecosystem services are lost as a result.

This is a global problem. The EU contributes to land degradation in third countries, as we are a net "importer" of land embedded into imported products. Demand for areas to settle, grow food and biomass is rising around the world, and climate change is likely to impact on land demand, availability and degradation.

But the EU is taking action. The 2011 Road Map for Resource-Efficient Europe, part of Europe 2020 Strategy has the following aim: "By 2020, EU policies take into account their direct and indirect impact on land use in the EU and globally, and the rate of land take is on track with an aim to achieve no net land take by 2050"."

The total application site area is 21.9 ha., the lateral extent of the proposed void is 13.6 ha. and it is estimated that total of 17 ha. of land will be disturbed in the course of this application (combination of lateral vid and formation of screening bunds behind existing roadside a, residential and archaeological monument features).

6.2 Methodology

The EPA provide policy and information resources in relation to EIA and SEA. They provide information in relation to 'Land' as part of 'Land & Soils'. In this regard there exists resources to track land take in the form of the then updated CORINE landcover Europe-wide resource (2012) that is integrated into the EPA Geoportal Site.

The geological information described in this Chapter is based primarily on data gleaned from the Geological Survey of Ireland (GSI) interactive special data resources map database (www.gsi.ie). Additional data has been taken from an EIS previously undertaken at the Site (2010). This EIS included resultant data from trial pitting undertaken in 2005, and a

drilling program carried out at the Site in 2007; both assessments were performed by SLR Consulting Ltd. The trial pitting aimed to examine the content of the overburden in detail, and the drilling programme assessed the rock quality and thickness of the overburden present across the Site. Fifteen trial pits were conducted within the Application Site boundary. The drilling programme was conducted in the lands surrounding the Application site boundary with BH05, BH04 and BH03 located within the Application boundary to the south, north and west, respectively.

In order to assess impacts on the soil and geology, 'Guidelines for the Assessment of Geology, Hydrology and Hydrogeology for National Road Schemes' published by the National Roads Authority (2009) and 'Guidelines for the Preparation of Soils, Geology and Hydrogeology Chapters of Environmental Impact Statements' published by the Institute of Geologists of Ireland (2013) have been consulted.

6.3 Existing Environment

6.3.1 Topography

The area west and east of the Application Site is dominated by an agricultural landscape. Land use to the south of the Site is agricultural with residential ribbon development along the roads. The M9 Motorway runs north-east to south-west approximately 53 m at its closest point.

The topography on the Site is relatively flat lying at ca. 60 m AOD.

6.3.2 Land

The EPA mapping resource shows the subject EIAR site categorised under Corine 2012 as *"211 Non-irrigated land"*. The lands to the immediate north and south; Clonmelsh and Garyhundon quarry unit and south of Garyhundon are recorded as *'131 mineral extraction sites"*.

Powerstown landfill to the south west of the subject lands and lands immediately contiguous to it appear as '132 dump'

The M9 appears on the Corine landcover map as *'122 Roads and rail networks'*.

Since 1990 Corine has continuously recorded the subject lands as *"211 Non-irrigated land"*.

Please also refer to Chapter 5 Biodiversity for a record of removed, instated and proposed reinstated / instated landcover and resultant ecological impacts. Proposed reinstatement to be read in conjunction with Chapter 12 where a conceptual restoration plan is presented.

6.3.3 Soils

The soils at the Application Site are defined by the GSI as shallow well drained materials (BminSW) in the Renzinas, Lithosols Soil Group. Their parent group has been identified as limestone sands and gravels (GLs), (Figure 6.2).

6.3.4 Subsoils

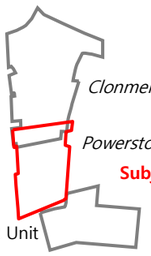
The GSI define subsoils as Glaciofluvial sands and gravels derived from a limestone material (GLs) (Figure 6.3).

Previous trial pitting noted variable overburden thicknesses (4 m to > 12 m) in the lands around and in the vicinity of the Application Site. Logs of the trial pits Site show that the overburden consists predominantly of glacial till composed of medium sand, clay-rich gravels and sands, clay-rich small stone till, coarse limestone gravel and sandy, poorly cohesive till.

Figure 6.1 Corine landcover data, 1990, 2000, 2006, 2012 (extracted from EPA, Ireland, Maps)

KEY

Subject rEIAR site shown outlined in grey approximately located on landcover map thus



Clonmelsh rEIAR Unit

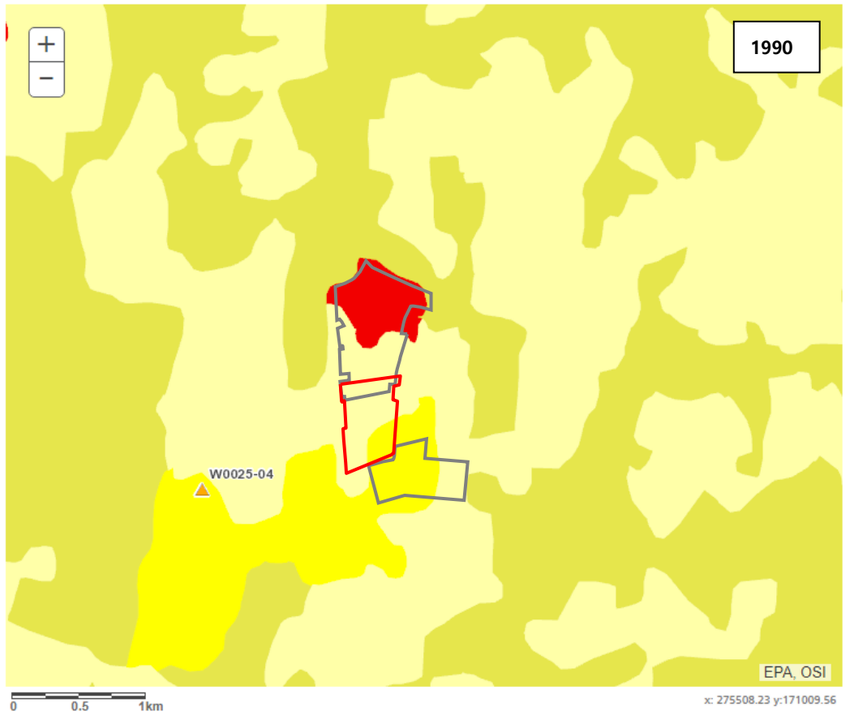
Powerstown further Quarry Unit

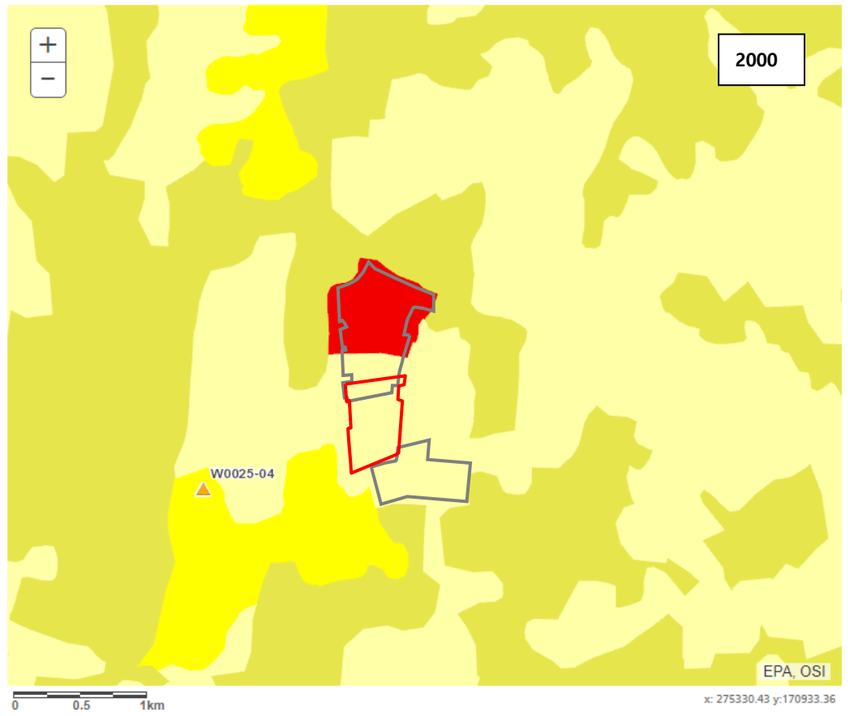
Subject Application Site

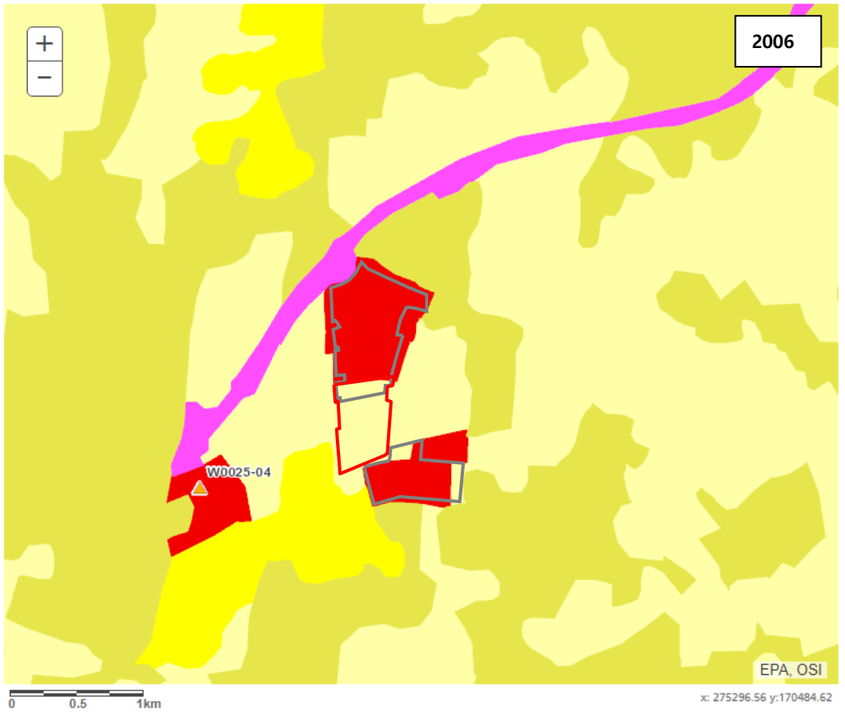
Garyhundon rEIAR Unit

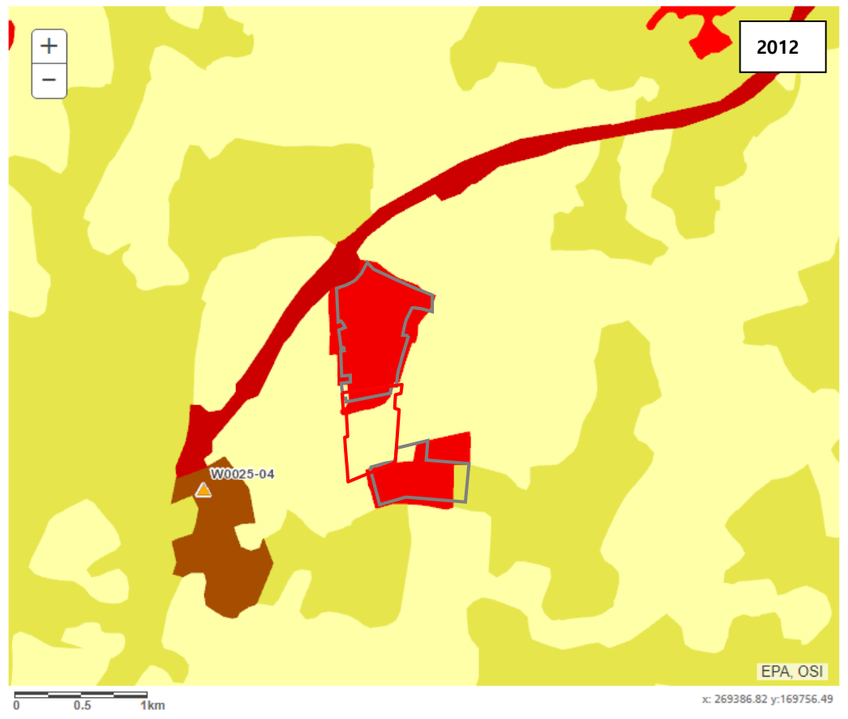
CORINE Land Cover Key

- 111 Continuous urban fabric
- 112 Discontinuous urban fabric
- 121 Industrial or commercial units
- 122 Road and rail networks
- 123 Sea ports
- 124 Airports
- 131 Mineral extraction sites
- 132 Dump
- 133 Construction sites
- 141 Green urban sites
- 142 Sport and leisure facilities
- 211 Non-irrigated land
- 222 Fruit trees and berry plantation
- 231 Pastures
- 242 Complex cultivation patterns









6.3.5 Bedrock Geology

The GSI bedrock 1:500,000 map (www.gsi.ie) show that the regional geology of the area is mainly comprised of marine shelf and ramp facies; argillaceous bioclastic limestone and subsidiary shale (Figure 6.4).

The local geology 1:100,000 map (Figure 6.5) shows that the Site area is underlain by The Ballysteen Formation, which is described as a dolomitised dark-grey muddy limestone. The lithology of the formation in this area notes that much of the Ballysteen Formation in Carlow and mid-Kilkenny is dolomitised. The dolomitisation has not destroyed the original limestone fabrics.

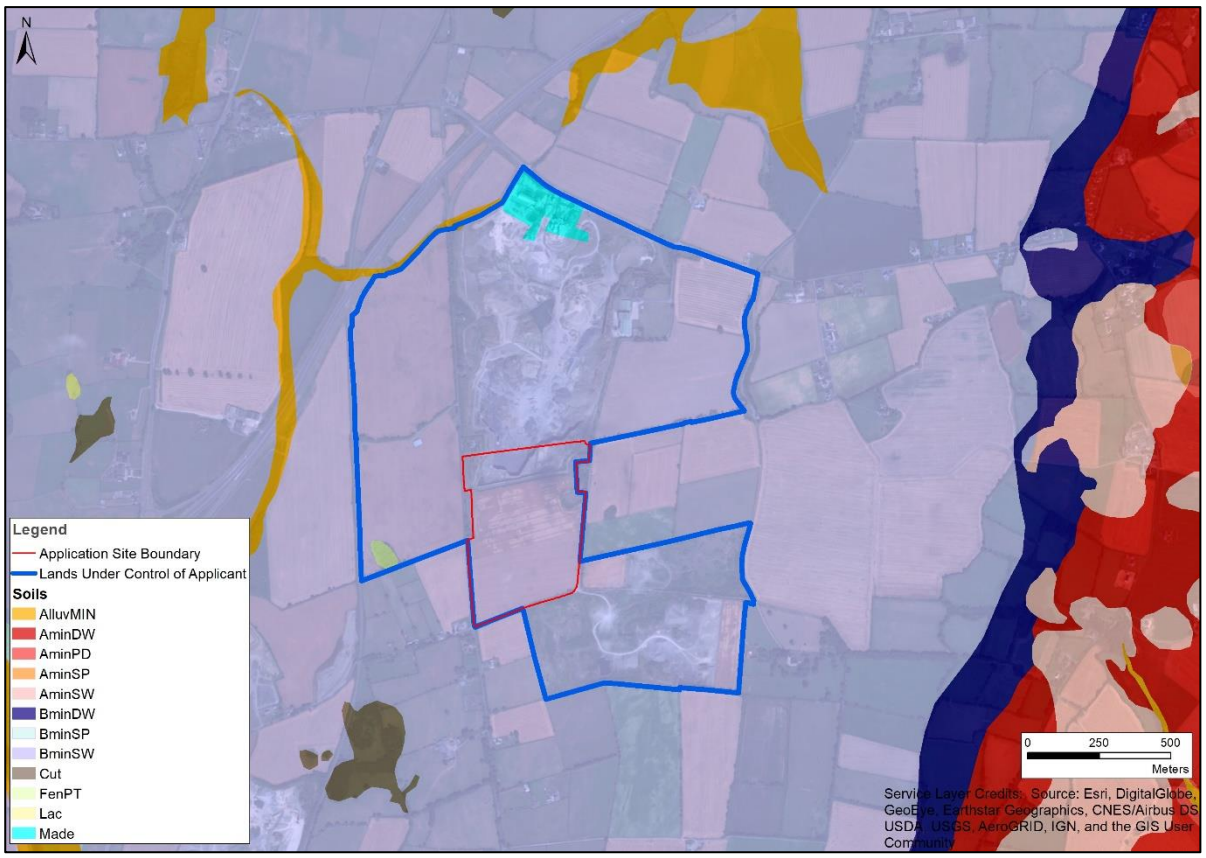


Figure 6.2: Underlying soils at the Site, (GSI)

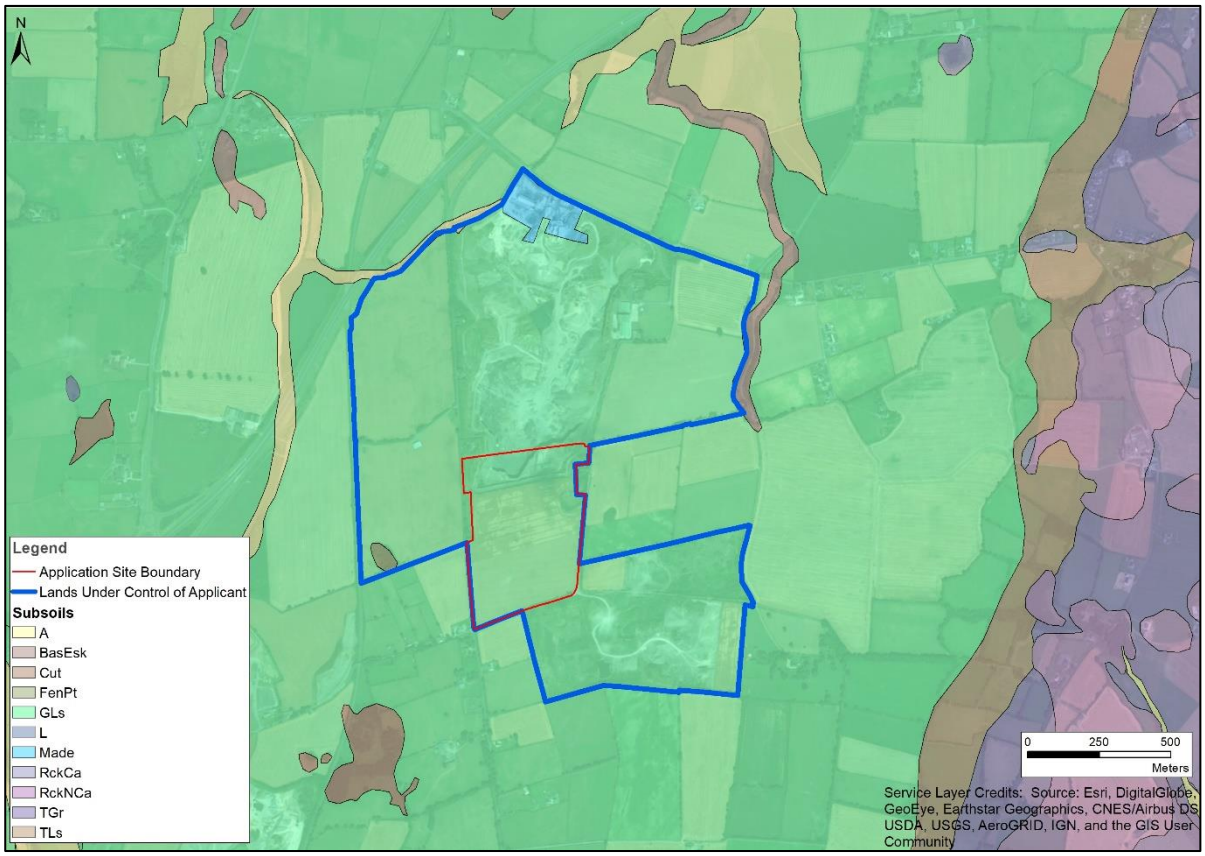


Figure 6.3: Underlying subsoils at the Site, (GSI)

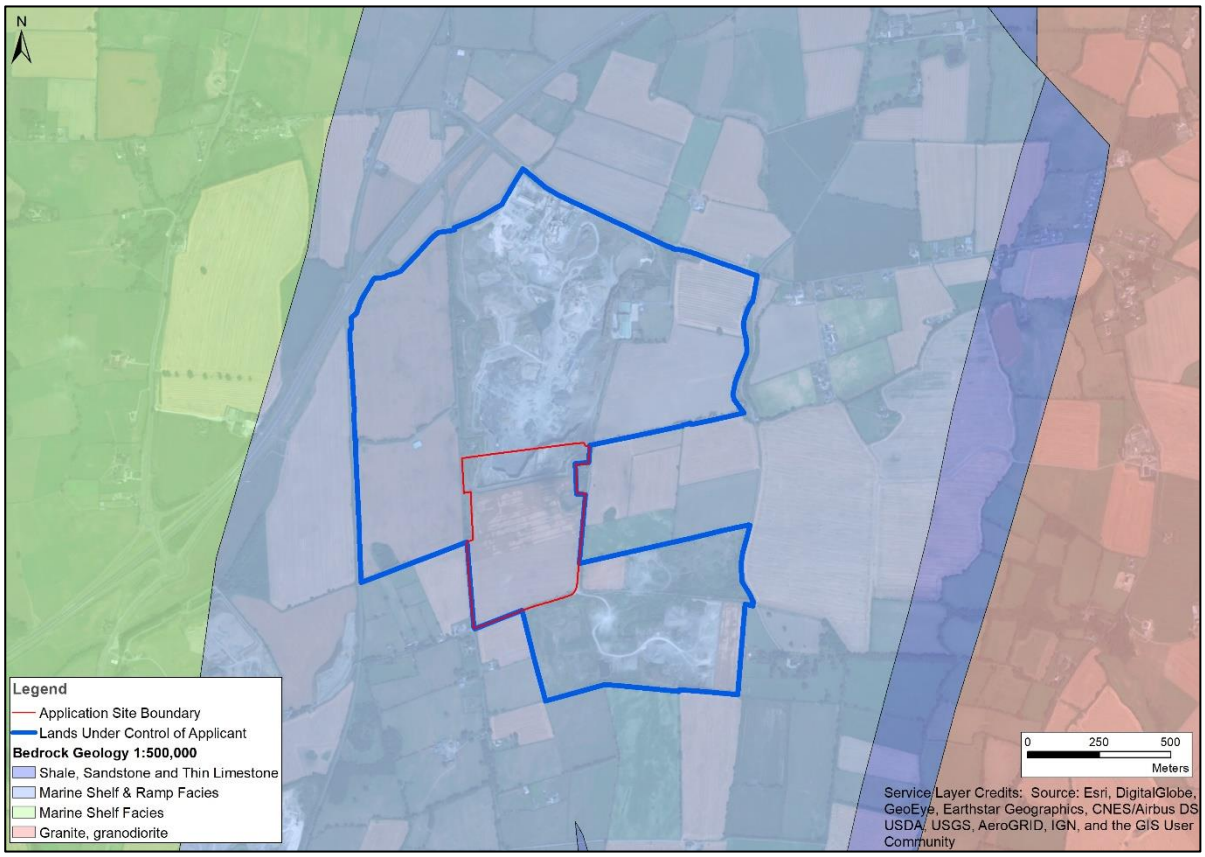


Figure 6.4: Underlying 1:500,000 bedrock geology, (GSI)

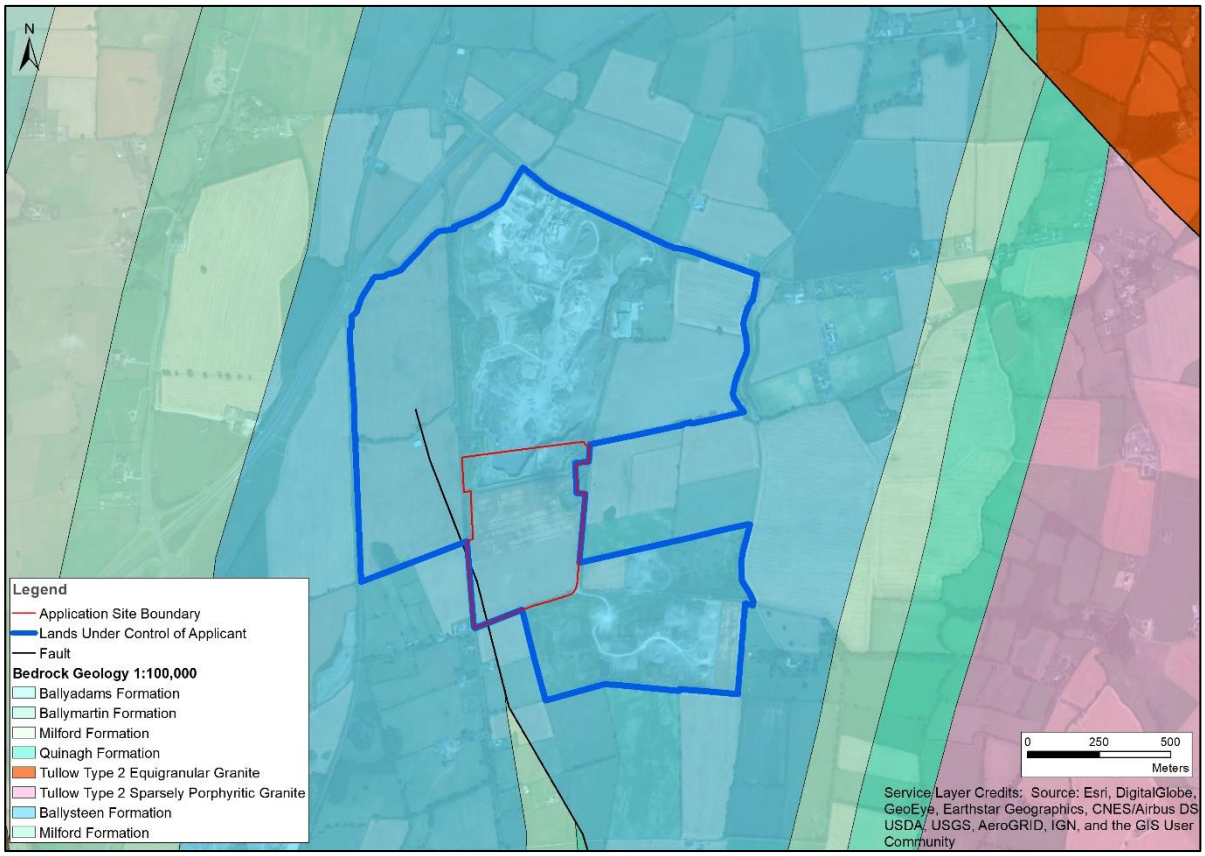


Figure 6.5: Underlying 1:100,000 bedrock geology, (GSI)

6.3.6 Structural Geology

The major sub surface structures of the regional and local geology are shown in Figures 6.4 and 6.5. The regional structures identified by the GSI on the 1:100,000 GSI bedrock geology are in an approximate north-west to south-east trending orientation. A north-northwest – south-southeast orientated fault is located in the southwestern corner of the Site and internally offsets the Ballysteen Formation. Previous geological assessments within the ownership boundary have noted that bedrock has a 10º westerly dip. The previous SLR EIS identified that minor faults were encountered in the existing quarry to the north and south of the Application Site but have had little effect on quarrying operations in the past.

6.4 Previous Work

Previous works performed at and in the vicinity of the Site which describe the baseline geological conditions include boreholes drilled in 2007 and trial pits dug in 2005. The locations of these works (performed by SLR Consulting Ltd) are shown on Figure 6.6. All of the trial pits excavated and three of the boreholes are within the Application Site boundary.

The 2007 boreholes were drilled to assess the overburden depth and stripping ratios for the proposed quarry, and to assess the lateral continuity and quality of the bedrock. The 2007 boreholes were designed to assess the limestone resource across the proposed quarry development area. It was noted in this study that the limestone bedrock present over the survey area was identical to that exposed in the existing Clonmelsh quarry faces and in the sand and gravel quarry areas to the south.

BH03 was drilled to 42.9 mAOD and encountered overburden composed of ca. 10.6 m of sand and gravel with ca. 2.4 m of gravelly clay at 52.82 mAOD and a ca. 1.3 m basal gravel horizon. BH04 was drilled to ca. 47.99 mAOD and encountered 8.5 m of overburden sand and gravel with minor clay and bedrock limestone was found at 52.49 mAOD. BH05 was drilled to ca. 38.9 mAOD and encountered overburden composed of ca. 11.9 m of sand and gravel, ca. 2.1 m of gravelly clay and ca. 1.1 m of boulder gravel. A summary of the borehole findings is presented in Table 6.1.

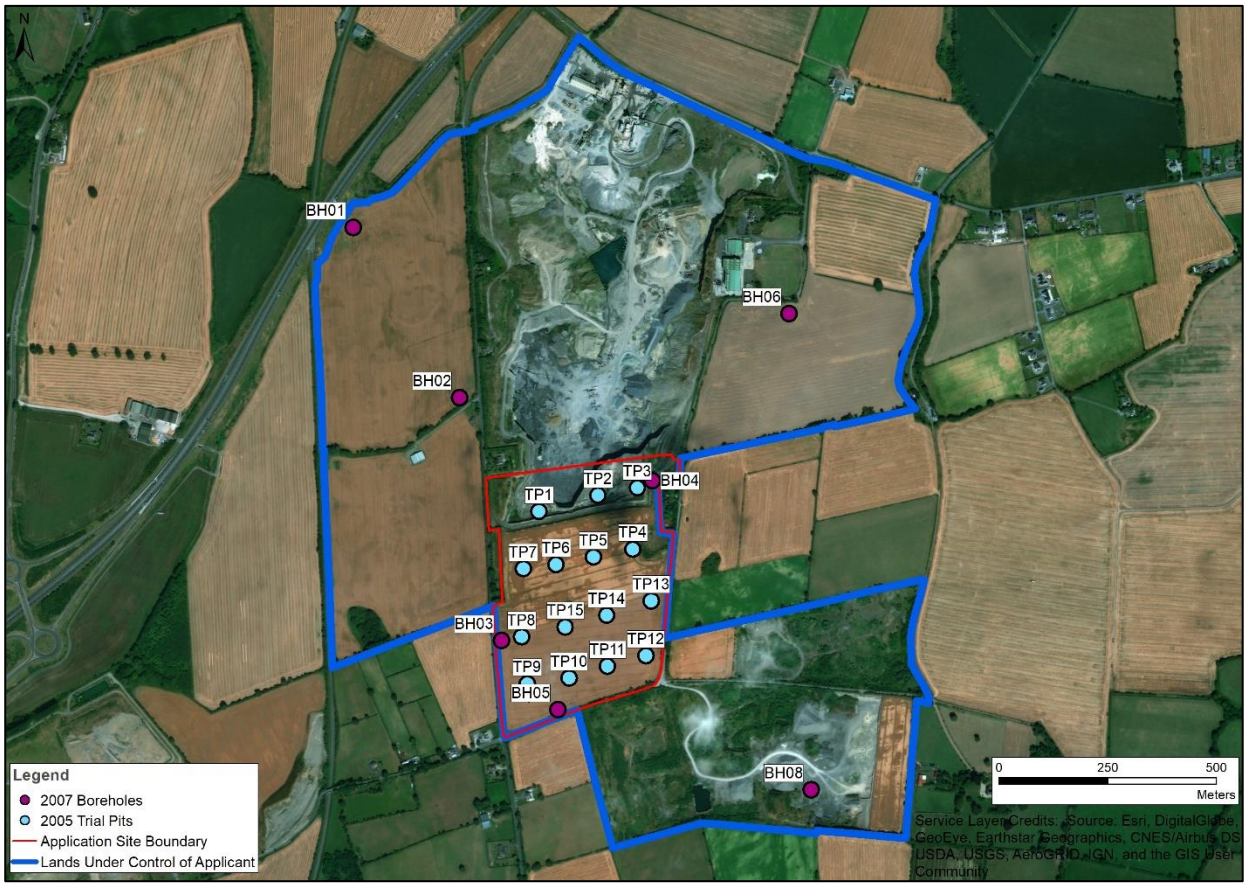


Figure 6.6: Location of trial pits and boreholes at the Site

Table 6.1: Borehole Summary

	BH03	BH05
Borehole Location	271786E 169243N	271964E 169015N
Thickness of Overburden (m)	15.8	15.0
Thickness of Sand & Gravel (m)	13.4	12.9
Depth to Bedrock (mAOD)	47.6	48.4
Depth of Borehole (mAOD)	42.9	38.9

The SLR trial pit logs have been summarised in Appendix 6.1. These note that the composition of overburden in the trial pits within the Application Site to be variable. The trial pits are predominantly composed of a mixture of clay-rich small stone till, coarse limestone gravel and a sandy, poorly cohesive till. A clay-rich gravel is found in five of the trial pits. Notably, the clay-rich gravel is present in TP7 and TP6 to the north-west of the Site, in TP7 it is the only component (8.2 m) other than a 0.5 m layer of topsoil and is 5.4 m thick within TP6. In the south of the Site in TP10, TP11 and TP12, the clay-rich gravel is again present but is a thinner layer (1.1 m – 1.5 m) than that in the north-west. Three of the trial pits (TP10, TP12 and TP13) have a well-bedded medium grained yellow sand below 5.7 m – 6.4 m which has variable thicknesses of 2.4 m - > 4 m.

6.5 Assessment

The single greatest impact of the development the subject of this this EIAR is the removal of approximately 10 million tonnes geological limestone reserve for the purposes of providing construction inputs over a lateral area of 13.6 ha. to a depth of

25 AOD (absolute depth of 30 m). This is removal of part of 'land' as the overlying soils and subsoils are to be retained on site for use as screening berms in phases 1 to 4 of development as restoration material at phase 5 of the development as set out in Chapter 3.0 of this EIAR (see also drawing no.s 3 through 5 of the submitted application).

Notwithstanding the retention of soils and subsoils on site, the extant agricultural tillage lands are incapable of being reinstated to agricultural land use for reason of their restoration consisting of void flooding with planting of the upper ground levels.

The evaluation of impacts on the soils and geology at and in the vicinity of the subject Application Site is based on a methodology similar to that outlined in the '*Guidelines for the Assessment of Geology, Hydrology and Hydrogeology for National Road Schemes*' published by the National Roads Authority (2009) and '*Guidelines for the Preparation of Soils, Geology and Hydrogeology Chapters of Environmental Impact Statements'* published by the Institute of Geologists of Ireland (2013).

A rock quarry has been gradually excavated to the north and south of the Site since the 1940s. The future excavation footprint at the Application Site will be 13.6 ha. and the depth of the workings will be from approximately 30m to 25 mAOD. Soils and subsoils will be used to enhance the screening of the Site.

As rock will be removed, moderate adverse impacts will occur on the bedrock environment, however this is a localised impact which occurs at the point of extraction. This localised impact is mitigated through the future restoration of the Site, which will return setback areas back to agricultural grazing land use and create a lake. This is a significant, permanent residual impact.

The importance of soil and geology attributes both existing and over the assessment as identified above is assessed in Table 6.2 below.

Table 6.2: Importance of Geological Attributes in Vicinity of Application Site

Attribute	Status	Importance
Geohazards	Blasting of bedrock and removal of topsoil.	High
Geological Heritage	According to the Geological Survey of Ireland Spatial Resources the adjoining quarry immediately to the north of the Application Site is a Geological Heritage area, as the carboniferous limestones of the Ballysteen Formation are well exposed in the quarry of the Application Site.	High
Economic Geology	Economic extraction at the pit and existing quarry.	High
Agricultural Soils	Productive soil will be removed and stockpiled at the Application Site. Other soil in vicinity of Site used for agricultural activities including grazing and tillage. Overburden is glacial till and is common.	Low
Made Ground	There is no Made Ground at the Application Site.	Negligible
Soil and Subsoil Contamination	Potential for oil and chemical leakages or spillages to migrate down and contaminate soils, subsoils and groundwater.	Moderate

The significance of the impacts on the soils and geology attributes is assessed in Table 6.3 below.

Table 6.3: Significance of Impacts on Soil and Geology

Attribute	Status	Magnitude of Impact
Geohazards	Geotechnical assessments will be conducted during extraction life and incorporated into the design of the Site.	Small Adverse
Geological Heritage	Prior consultation with the GSI for the quarry to the immediate north of the proposed development has noted that the exposure of the Ballysteen Limestone in this part of Ireland significantly adds to the knowledge and geological understanding of the area.	Moderate Beneficial
Economic Geology	The proposed development will facilitate the extraction of limestone at the Site.	Major Beneficial

Attribute	Status	Magnitude of Impact
Agricultural Soils	Sands and gravels will be extracted from the Site on a phased basis with restoration taking place on cessation of extraction. Drainage measures will be put in place to avoid pollution to groundwater from activities. Topsoil and overburden will be used in the creation of screening berms on the Site.	Small Adverse
Made Ground	No impact	None
Soil and Subsoil Contamination	Management practices controlling the use and storage of chemicals at the site have reduced the risk of spillages over the assessment period. On site fuelling takes place on hardstanding surfaces or upon spill trays or matting. There is no know contamination at the Application Site.	None, low probability

6.6 Mitigation

The following mitigation measures will be adopted for the proposed extraction activities to reduce any potential impacts of the receiving soils and geology environment.

In addition, regarding the operational activities which will occur on the Site, the following mitigation measures will be employed during the proposed activities at the Application Site:

- All refuelling of mobile plant to be undertaken with care on designated fuelling areas which will be composed of a hardstanding base with associated interceptors. In areas where this is not possible precaution will be taken and plant nappies will be utilised to protect surfaces from spillages. These practices will have little or no effect on glacial till/overburden or bedrock material;
- Any processing plant and / or mobile plant on the Site be regularly maintained, and where plant is damaged or leaking, this will be dealt with as part of ongoing operational management of the Site;
- Overburden will only be removed in favourable environmental conditions;
- Re-handling of the topsoil will be kept to a minimum to preserve the integrity of the material;
- Groundwater monitoring of existing wells on Site;
- Regular geotechnical assessments be conducted; and
- The qualified quarry manager ensures compliance with relevant safety and statutory legislation and best practices recommended by the Irish Concrete Federation (ICF), Guidelines to the Safety, Health and Welfare at Work (Quarries) Regulations 2008 and company policies.

6.7 Residual / Likely Significant Effects

The materials to be extracted will be used as raw materials in the construction industry, which is considered an acceptable use of the resource. The proposed extraction of the limestones on the subject stie is considered an important aggregate resource but not an unusual geological unit and no geological importance or heritage value is attributed to them.

In the long-term, there will be no deleterious effects on the remaining aggregate bedrock or groundwater in the quarry.

The use of the lands for the extraction of economic aggregate reserve will end the current economic agricultural land use of the application site over approximately 17 ha. This impact will occur over the operational life span of the quarry in phases 1 and 2 (approximately 9 ha. apiece lost when overburden stripped and used as visual screening bunds). During the life of the proposed quarry this impact is deemed to be permanent but insignificant as the economic land use to which the lands will be put generates increased employment density.

The removal of the reserve as proposed is a permanent irreversible impact and will result in a restoration plan that floods much of the subject site thereby losing a land unit of approximately 12 ha. in extent. This is a permanent removal of land and thus a permanent, significant, residual impact.

6.8 Cumulative Impacts

As a result of the mitigation measures implemented at the Application Site, it is considered that any impacts associated with the quarrying related activities undertaken at the Application Site will not contribute to the cumulative impacts of any surrounding developments in the area. Potential cumulative impacts on other environmental elements such as surface water quality, ecology, noise and dust are examined in other chapters of this EIAR.

6.9 References

CORINE, landcover data, accessed October 2017

Geological Survey of Ireland website, www.gsi.ie; online mapping services (Accessed: 11/10/2017).

Institute of Geologist of Ireland (2013). Guidelines for the Preparation of Soils, Geology and Hydrogeology Chapters of Environmental Impact Statements.

National Roads Authority (2009). Guidelines on Procedures for Assessment and Treatment of Geology, Hydrology and Hydrogeology for National Road Schemes.

7.0 WATER & HYDROGEOLOGY

7.1 Introduction

This chapter provides an assessment of the potential impacts of the proposed further quarry development on the surrounding hydrogeological and hydrological environment. The development proposes to continue the extraction of aggregates below the water-table in a southerly direction from an adjacent quarry face, over an extraction area of ca. 13.6 ha of land, to a depth of 25 m OD (the depth of the adjacent quarry excavation) at Powerstown, Nurney, Co. Carlow. This proposed extraction area is part of a larger application site of 21.9 ha. for which this EIAR has been prepared. The site the subject of the EIA is referred to as the Application site throughout this chapter.

Hydrogeological aspects considered within this chapter include the underlying hydrogeology of the Site, groundwater vulnerability, aquifer status and groundwater quality. The potential hydrogeological impacts have been assessed for future impacts associated with quarrying activities (i.e. extraction) at the Application Site. Appropriate mitigation measures are proposed to offset any possible negative impacts associated with the proposed development.

The impact of the proposed development on the hydrology of the Application Site as are discussed in this chapter.

7.2 Study Methodology

The hydrogeological and hydrological impacts associated with the development at the Application Site were assessed by means of a desk study of the Site (review of available information), a site visit, a number of freely available technical references (e.g. Geological Survey of Ireland (GSI) on-line publications) and consultations with statutory bodies. Additional data has been taken from an EIS previously undertaken for the Site (2010). A list of the information referenced as part of the desk study is presented in Section. 6.4.

7.3 Existing Environment

The Application Site is currently a green-field Site, comprising arable agricultural land, and is located immediately to the south of an existing working quarry. The lands surrounding the Application Site can be characterised as rural in nature, with land uses in the area being generally agricultural and single-house residential. A series of public roads bound the Site to the west, south and east. The M9 motorway runs north-east to south-west immediately adjacent to the west of the Site.

Soils

The majority of the soils around the Site are defined by the GSI as shallow well drained materials (BminSW) in the Renzinas, Lithosols Soil Group. Their parent group has been identified as limestone sands and gravels (GLs).

Sub-soils

The GSI define subsoils underlying the Site as comprising Glacio-fluvial sands and gravels derived from a limestone material (Gls). Logs of the trial pits excavated within the Application Site show that the overburden consists predominantly of glacial till composed of medium sand, clay-rich gravels and sands, clay-rich small stone till, coarse limestone gravel and sandy, poorly cohesive till. Locally the sands and gravels are typically between 4 to 12 m in thickness, thickening westwards towards the River Barrow.

Bedrock

The local geology 1:100,000 map (Figure 6.5) shows that the Site is underlain by the Ballysteen Formation, which is described as a dolomitised dark-grey muddy limestone. The lithology of the formation in this area notes that much of the formation in Carlow and mid-Kilkenny is dolomitised. However, from mapping and drilling information, the bedrock exposed in the quarry is only locally dolomitised. It dips to the west at ca. 10º.

The rockmass exposed within the adjacent quarry is a well bedded and jointed limestone, with most joints being generally tight, although some joints appear washed-out close to the surface. Permeability of the bedrock is fracture-fissure controlled (i.e. secondary permeability), and decreases with depth. Weathering rarely occurs more than 20 m below ground level. No karst features have been noted in the adjacent quarry, except for a thin layer of epikarst which extends ca.1 m into the rock.

7.3.1 Surface Water – Hydrology

The Site is located in the catchment area of the River Barrow, in a valley that lies between the foothills of the Leinster Mountains to the east and the Castlecomer Plateau to the west. From Carlow to beyond Bagenalstown, the valley is ca. 6.5 km wide, with natural ground levels at the Site varying from between 55 and 65 m OD. The Site itself undulates gently towards the River Barrow (to the west), which flows in a southerly direction towards Waterford Harbour.

The Application Site is located within the South-eastern River Basin District, Hydrometric Area 17. Within the well-drained superficial deposits of the Site, there are four significant drainage features (streams) within the vicinity of the Site (Figure 7.1).

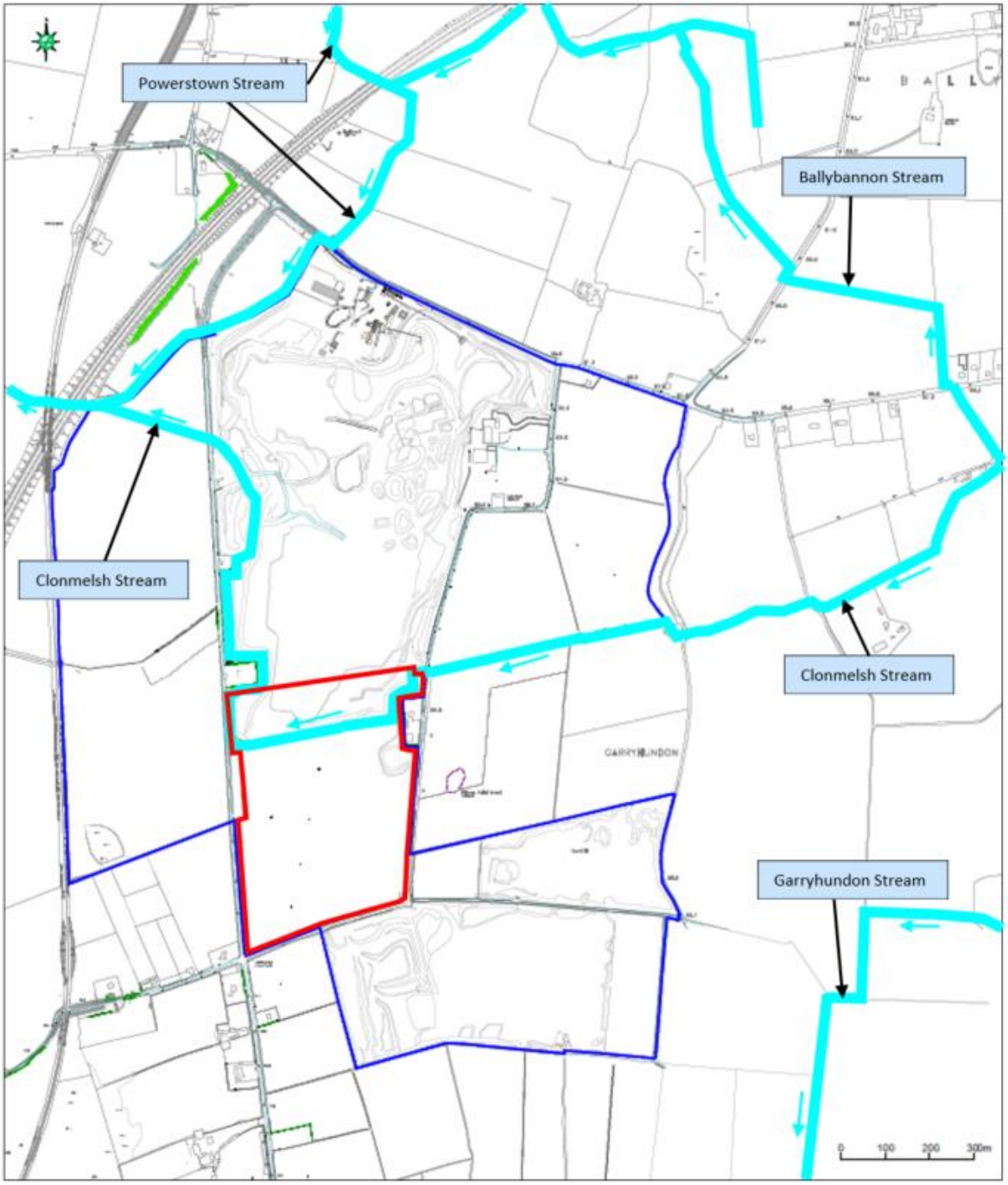


Figure 7.2: Main streams in proximity to the Site (red line)

- The Ballybannon Stream flows in a north-westerly direction to join the Powerstown Stream to the north of the Site (just east of the M9 motorway);
- The Powerstown Stream flows in a southerly direction along the north-western edge of the Site boundary before crossing back under the motorway and continuing south to join the River Barrow. The Clonmelsh Stream (also known as Nurney 14) joins the Powerstown Stream just before the Powerstown Stream leaves the boundary of the Site and flows under the motorway (at SW02). This stream receives discharge waters from the Site under licence (DL7/233) at DW01, via a drainage channel;
- The Clonmelsh Stream flows westwards around the southern edge of the main quarry excavation, before continuing in

a northerly direction along the western edge of the excavation. It joins the Powerstown Stream to the west of the quarry excavation at SW02. The Clonmelsh Stream has been diverted from its original course due to the extraction activities at the quarry. Much of the upper reaches of this stream (to the east of the Site) have been drained to provide improved farmland;

- The Garryhundon Stream flows in a westerly direction before turning abruptly south to the southeast of the Site and continuing on to the River Barrow.

As part of this application it is proposed to re-route the Clonmelsh Stream in an anti-clockwise direction around the current quarry to join the Powerstown Stream upstream of where the two streams currently meet. Re-routing (and lining) of part of the Clonmelsh Stream away from the quarry void will help to provide increased biodiversity, and ensure that quality and quantity of flow be maintained to the Powerstown Stream.

The thick deposits of relatively unconsolidated sands and gravels overlying the Site and its surrounding environment, coupled with a shallow groundwater table enables water to drain (re-charge) slowly, thereby providing high baseflows to the four streams surrounding the Site.

A number of residences are located within 500 m of the development, a number of which have private wells (surveyed in 2010). Wastewater discharging from local residences is treated in septic tank systems and soak pit/percolation areas.

7.3.1.1 Surface Water Quality

Four surface water monitoring points are located in the vicinity of the Application Site (SW01, SW02 and SW03 are located on the Clonmelsh Stream, with SW04 being located on the Garryhundon Stream (no discharge takes place into this stream)) (Figure 7.2). Surface water quality is currently monitored on a quarterly basis at SW01, SW02, SW03 and SW04 as part of the quarry's discharge licence monitoring regime (DL7/233) (see Appendices 7.1 and 7.2). Discharge Licence limits include 25 mg/l for both nitrates and suspended solids, and a limit of 2,000 m^3/d for flow.

SW01 is located upstream of the discharge point (DW01) in the adjacent quarry, while SW02 is located downstream of the discharge point (SW03 is an intermediate point upstream of the discharge). Surface water monitoring results from 2007 indicate elevated nitrate and ammonia levels for SW01 and SW03, probably due to agricultural activities (Table 7.1). More recent results taken in 2012 and the first 6 months of 2017 for SW01 and SW02 (Table 7.2) indicate similar elevations likely from agricultural sources.

Discharge water quality (Table 7.3) from the Site measured in 2009 - 2010 indicates slightly elevated sulphate and magnesium levels in the discharge when compared to the stream water, possibly due to the effect of mineralized groundwater. Suspended solids levels were elevated primarily in times of heavy rainfall. Elevated nitrate levels during the same period show a correlation with increased surface run-off in times of wet weather.

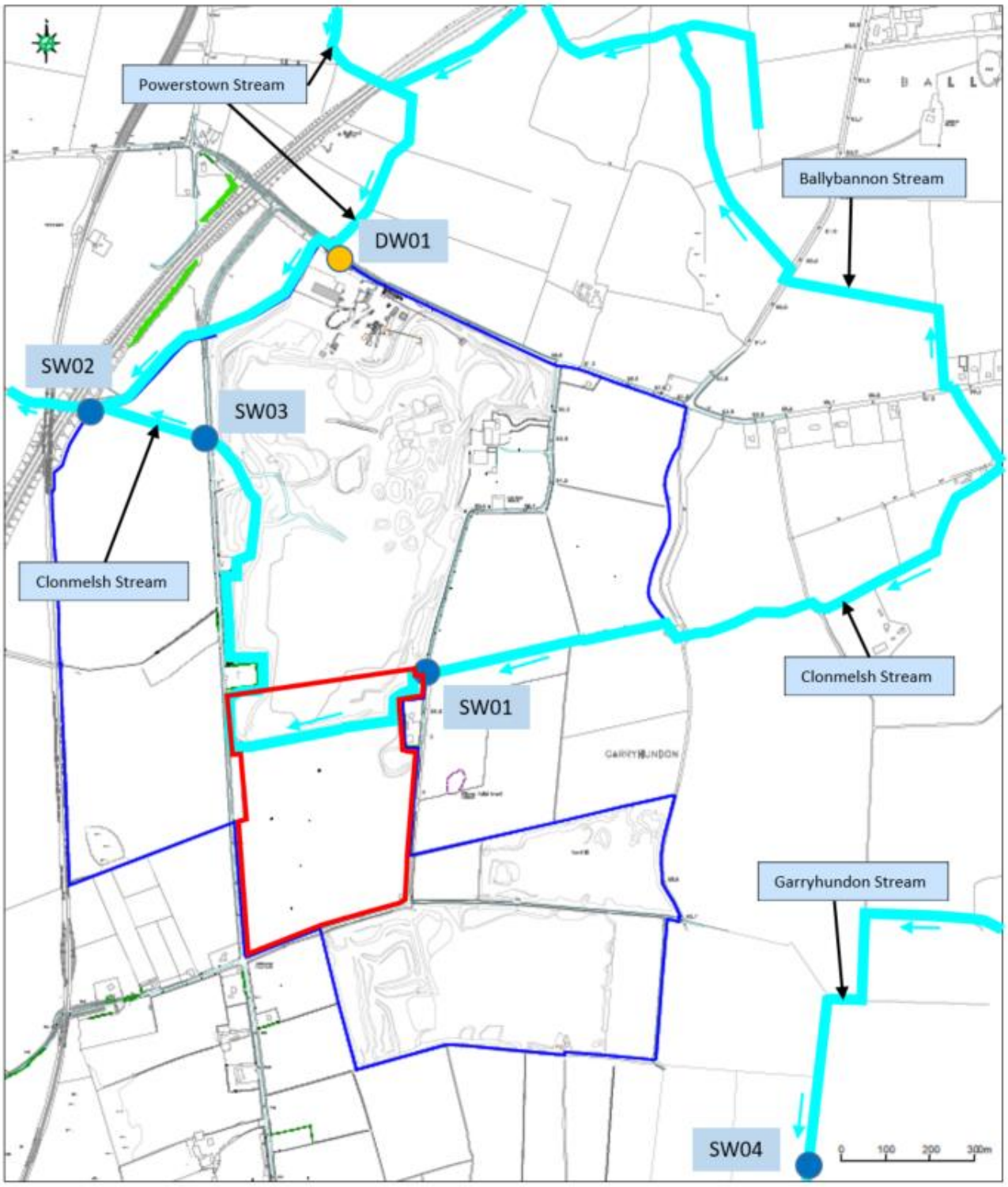


Figure 7.3: Surface water monitoring locations (SW01 to SW04)

Table 7.1a: Surface Water Quality Monitoring at SW01

Parameter	Unit	8/8/2007	16/1/08	8/5/08	11/3/09	6/5/09	5/8/09	22/9/09	20/10/09	16/12/09	11/3/10
Lab pH	pH Units	7.86	8.32	-	8.14	8.38	8.29	8.11	8.14	8.59	8.5
Ammonical Nitrogen	mg/l NH_3	<0.2	<0.04	-	<0.2	<0.2	<0.2	<0.2	<0.2	0.37	0.146
Total Suspended solids	mg/l	<10	9	<10	<10	<2	22	9.5	20	4	<6
BOD	mg/l	<2	-	<2	2	-	1.1	1.21	3.08	-	<1
COD	mg/l	-	-	-	22	7.72	14.8	14.1	30.7	13	7.66
Total Phosphorus	mg/l	-	-	-	<0.05	0.0683	0.0562	0.0517	0.361	0.018	0.039
Orthophosphate	mg/l PO_4	0.1	<0.08	-	0.5	<0.08	<0.08	<0.08	0.102	40.3	<0.026
Nitrate	mg/l NO_3	81.9	85	-	62.3	59.4	53.2	37.1	40.3	52.8	54.1
Temperature	ºC	-	8.4	-	7.79	11.62	15.05	13.38	-	7.31	-
Total Petroleum Hydrocarbons	µg/l	<10	-	-							
Conductivity	µS/cm	708	648	714							
Field Conductivity	µS/cm		770	-							
Calcium	mg/l	117.1	126	-							
Magnesium	mg/l	11.15	12.3	-							
Potassium	mg/l	4	3.28	-							
Sodium	mg/l	11	10.9	-							
Chloride	mg/l	19	21.2	-							
Sulphate	mg/l	29	26.8	-							
Nitrite	mg/l NO_2	<0.05	0.05	-							
Dissolved Iron	mg/l	0.114	<0.025	-							
Manganese	mg/l	0.01	0.007	-							
Alkalinity	mg/l $CaCO_3$	360	247	-							
Hardness	mg/l	-	366	-							
Total Organic Carbon	mg/l	5	3.84	-							
Mineral Oil	µg/l	<10	-	<10							
Dissolved Oxygen	% Sat.	-	89.5	-							

Table 7.1b: Surface Water Quality Monitoring at SW02

Parameter	Unit	5/7/07	16/1/08	8/5/08	11/3/09	6/5/09	5/8/09	22/9/09	20/10/09	16/12/09	11/3/10
Lab pH	pH Units	7.77	8.5	-	7.77	8.07	8.18	8.09	8	8.22	8.1
Ammonical Nitrogen	mg/l NH_3	<0.01	<0.04	-	<0.2	<0.2	<0.2	<0.2	<0.2	0.162	0.12
Total Suspended solids	mg/l	67	37	<10	29	<2	4	2	8.5	4.5	96
BOD	mg/l	2	-	<2	<2	-	1.54	1.45	<1	-	<1
COD	mg/l	-	-	-	<15	8.03	<7	<7	12.4	<7	7.9
Total Phosphorus	mg/l	-	-	-	<0.018	<0.018	<0.018	<0.018	<0.018	<0.018	<0.0063
Orthophosphate	mg/l PO_4	0.13	<0.026	-	0.35	<0.026	<0.026	<0.026	<0.026	<0.026	<0.026
Nitrate	mg/l NO_3	25	29.3	-	33.8	6.7	17.6	9.8	19.9	32.2	28.6
Temperature	ºC	-	7.6	-	10.67	13.07	17	14.88	-	7.68	-
Total Petroleum Hydrocarbons	µg/l	<10	-	-							
Conductivity	µS/cm	826	855	742							
Field Conductivity	µS/cm	864	649	-							
Calcium	mg/l	107.7	146	-							
Magnesium	mg/l	33.26	41.9	-							
Potassium	mg/l	3	3.31	-							
Sodium	mg/l	10	12	-							
Chloride	mg/l	27	25.9	-							
Sulphate	mg/l	203	250	-							
Nitrite	mg/l NO_2	0.11	0.07	-							
Dissolved Iron	mg/l	-	<0.025	-							
Manganese	mg/l	-	0.003	-							
Alkalinity	mg/l $CaCO_3$	167	221	-							
Hardness	mg/l	-	538	-							
Total Organic Carbon	mg/l	-	1.62	-							
Mineral Oil	µg/l	<10	-	<10							
Dissolved Oxygen	% Sat.	104.5	88.9	-							

Table 7.1c: Surface Water Quality Monitoring at SW03 and SW04

Parameter	Unit	SW03	SW04
Lab pH	pH Units	8/8/2007	8/8/2007
Ammoniacal Nitrogen	mg/l NH_3	8.	8.
Total Suspended Solids	mg/l	<0.2	<0.2
BOD	mg/l	<10	<10
COD	mg/l	<2	<2
Total Phosphorus	mg/l	-	-
Orthophosphate	mg/l PO_4	-	-
Nitrate	mg/l NO_3	<0,03	0.03
Temperature	ºC	82.	32.
Total Petroleum Hydrocarbons	µg/l	-	-
Conductivity	µS/cm	<10	<10
Field Conductivity	µS/cm	793	639
Calcium	mg/l		
Magnesium	mg/l	90.	97.
Potassium	mg/l	11.	9.
Sodium	mg/l	4.	2.
Chloride	mg/l	12.	11
Sulphate	mg/l	19	14
Nitrite	mg/l NO_2	33	19
Dissolved Iron	mg/l	0.25	0.1
Manganese	mg/l	0.219	0.046
Alkalinity	mg/l $CaCO_3$	0.011	0.006
Hardness	mg/l	290	310
Total Organic Carbon	mg/l	-	-
Mineral Oil	µg/l	5	5
Dissolved Oxygen	% Sat.	<10	<10

Table 7.1a: Surface Water Quality Monitoring at SW01 (2012)

Parameter	Unit	SW01	SW01	SW01	SW01	SW01	SW01	SW01
		26/1/12	28/2/12	27/3/12	26/4/12	23/5/12	21/6/12	17/7/12
pH	pH Units	7.24	8.3	7.8	8.1	8.01	7.9	8.1
Ammoniacal Nitrogen as N	mg/l N	1	1.6	0.05	0.44	<0.2	0.14	0.04
Total Suspended Solids	mg/l	<5	6	16	<5	7	<5	<5
BOD Unfiltered	mg/l	<4	<1	9	4	-	<4	<4
COD Unfiltered	mg/l	4.1	5	76	6.1	<7	3	20
Total Phosphorus	mg/l P	0.04	<0.02	<0.2	<0.2	<0.02	<0.2	<0.1
Orthophosphate	mg/l PO_4	0.12	0.062	0.12	0.11	0.054	0.32	0.16
Nitrate mg/l	mg/l NO_3	58	95	64	67	70.6	60	17
Temperature (field)	mg/l	6.17	10.23	14.6	8.61	13.72	12.18	14.66

Table 7.2b: Surface Water Quality Monitoring at SW02 (2012)

Parameter	Unit	SW02	SW02	SW02	SW02	SW02	SW02	SW02
		26/1/12	28/2/12	27/3/12	26/4/12	23/5/12	21/6/12	17/7/12
pH	pH Units	7.24	8.1	7.6	8	7.41	8	8.3
Ammoniacal Nitrogen as N	mg/l N	1.4	2.4	0.04	0.13	<0.2	0.1	<0.01
Total Suspended Solids	mg/l	<5	20	<5	10	<2	<5	<5
BOD Unfiltered	mg/l	<4	<1	15	<4	-	<4	<4
COD Unfiltered	mg/l	4.1	5	75	3.2	<7	<2	15
Total Phosphorus	mg/l P	<0.02	<0.02	<0.2	<0.2	<0.02	<0.2	<0.1
Orthophosphate	mg/l PO_4	<0.02	0.061	0.065	0.09	<0.05	0.042	0.08
Nitrate mg/l	mg/l NO_3	16	37	21	17	17.5	12	6.7
Temperature (field)	mg/l	7.26	10.36	11.97	10.5	13.67	13.91	15.96

Table 7.2c: Surface Water Quality Monitoring at SW01 (2017)

Parameter	Unit	SW01	SW01	SW01	SW01	SW01
		10/01/2017	08/02/2017	08/03/2017	04/04/2017	04/05/2017
pH	pH Units	8.25	8.28	8.17	8.24	8.31
Ammoniacal Nitrogen as N	mg/l N	0.0341	0.0457	0.0339	0.0485	0.0684
Total Suspended Solids	mg/l	8.54	<9	5.6	12.4	15.1
BOD Unfiltered	mg/l	<1	<1	<1	<1	<1
COD Unfiltered	mg/l	15.2	7.43	12.7	10.1	11.4
Orthophosphate	mg/l PO_4	0.07	0.053	0.062	0.074	0.075
Phosphorus	mg/l	0.0554	0.0504	0.0339	0.0573	0.0705
Nitrate mg/l	mg/l NO_3	56.8	58.5	68.5	58.1	56.5
TPH/ Oil & Greases	mg/l	<1				<1

Table 7.2d: Surface Water Quality Monitoring at SW02 (2017)

Parameter	Unit	SW02	SW02	SW02	SW02	SW02
		10/01/2017	08/02/2017	08/03/2017	04/04/2017	04/05/2017
pH	pH Units	8.06	7.94	7.89	7.85	8.07
Ammoniacal Nitrogen as N	mg/l N	0.0165	0.01 87	0.01 92	0.039	0.0613
Total Suspended Solids	mg/l	<4	<6	<2	<2	<9
BOD Unfiltered	mg/l	<1	<1	<1	<1	<1
COD Unfiltered	mg/l	10.4	<7	8.28	12.8	7.18
Orthophosphate	mg/l PO_4	<0.05	<0.05	<0.05	<0.05	<0.05
Phosphorus	mg/l	<0.02	<0.02	<0.02	0.0287	<0.020
Nitrate mg/l	mg/l NO_3	15.1	17.4	21.6	20.2	18.1
TPH/ Oil & Greases	mg/l	<1				2.07

Table 7.2a: Discharge Water Quality Monitoring (2009 - 2010)

Parameter	Unit	Discharge Limit	Average Value (2009-2010)	EC Environmental Objectives (Surface Waters) Regulations 2009	
				Good	High
pH	pH Units	6-9	8.02	6-9	
Ammoniacal Nitrogen	mg/l N	0.3	<0.2	<0.065	<0.04
Total Suspended Solids	mg/l	25	33	-	-
BOD Unfiltered	mg/l	5	<1.3	<1.5	<1.3
COD Unfiltered	mg/l	5	<10	-	-
Total Phosphorous	mg/l P	0.1	<0.02	-	-
Ortho-phosphate	mg/l P	0.03	<0.026	<0.035	<0.025
Nitrate	mg/l NO_3	25	22	-	-
Temperature	°C	25	11.3	-	-
Total Hydrocarbons	µg/l	1000	<10 (median)	-	-

Table 7.3b: Discharge Water Quality Monitoring (2012, 2016 - 2017)

Parameter	Unit	ELV	26/01/2012	28/02/2012	27/03/2012	26/04/2012	23/05/2012	21/06/2012	17/07/2012	29/08/2012	26/09/2012	27/11/2012	-
pH	pH Units	6 to 9	7.4	8	7.6	7.9	7.56	7.9	8.1	7.7	7.9	7.98	-
Ammoniacal Nitrogen as N	mg/l N	0.3	1.6	1.9	0.08	0.22	<0.2	0.12	<0.01	<0.01	6.1	0.15	-
Total Suspended Solids	mg/l	25	<5	21	25	13	<2	5	<5	120	6	13	-
BOD Unfiltered	mg/l	5	<4	<1	16	<4	-	<4	<4	<4	<4	13	-
COD Unfiltered	mg/l	5	3.6	2	21	3.6	<7	<2	14	20	11	9	-
Ortho Phosphate	mg/l PO_4	0.03	<0.02	0.063	0.063	0.08	<0.05	<0.02	0.075	0.023	0.14	<0.02	-
Nitrate	mg/l NO_3	25	17	32	21	16	18.2	11	2.5	17	18	18	-
Total Phosphorus	mg/l P	0.1	<0.00652	<0.00652	<0.00652	<0.00652	<0.00652	<0.00652	<0.0326	<0.0326	<0.1	<0.1	-
TPH/ Oils & Greases	mg/l	1	<1	<1	-	<1	<1	-	-	<1	<1	-	-

Parameter	Unit	ELV	13/12/2016	21/12/2016	05/01/2017	10/01/2017	16/01/2017	25/01/2017	31/01/2017	08/02/2017	13/02/2017	20/02/2017	27/02/2017
pH	pH Units	6 to 9	7.87	7.87	7.85	7.96	7.95	7.91	7.93	8.04	7.84	7.92	7.95
Ammoniacal Nitrogen as N	mg/l N	0.3	0.0183	0.0383	0.0165	0.0161	0.0179	0.0147	0.0146	0.0211	<0.01	0.0128	<0.01
Total Suspended Solids	mg/l	25	<2	<2	<2	<4	<2	<2	<2	<9	4.4	<2	<2
BOD Unfiltered	mg/l	5	-	-	-	<1	-	-	-	<1	-	-	-
COD Unfiltered	mg/l	5	-	-	-	<7	-	-	-	<7	-	-	-
Ortho Phosphate	mg/l PO_4	0.03	-	-	-	<0.05	-	-	-	<0.05	-	-	-
Nitrate	mg/l NO_3	25	-	-	-	15	-	-	-	17.9	-	-	-
Total Phosphorus	mg/l P	0.1	-	-	-	<0.02	-	-	-	<0.02	-	-	-
TPH/ Oils & Greases	mg/l	1	-	-	-	<1	-	-	-	-	-	-	-

Parameter	Unit	ELV	08/03/2017	15/03/2017	21/03/2017	27/03/2017	04/04/2017	13/04/2017	20/04/2017	28/04/2017	04/05/2017	-	-
pH	pH Units	6 to 9	7.91	7.98	7.93	7.96	8.03	7.98	7.89	7.95	8	-	-
Ammoniacal Nitrogen as N	mg/l N	0.3	0.0197	0.0165	0.019	<0.01	0.0405	0.0214	0.0207	0.0229	0.0505	-	-
Total Suspended Solids	mg/l	25	<2	<2	<2	<2	<4	<2	<2	<2	<6	-	-
BOD Unfiltered	mg/l	5	<1	-	-	-	<1	-	-	-	<1	-	-
COD Unfiltered	mg/l	5	<7	-	-	-	<7	-	-	-	11.2	-	-
Ortho Phosphate	mg/l PO_4	0.03	<0.05	-	-	-	<0.05	-	-	-	<0.05	-	-
Nitrate	mg/l NO_3	25	21.3	-	-	-	21.2	-	-	-	18.4	-	-
Total Phosphorus	mg/l P	0.1	<0.02	-	-	-	0.0229	-	-	-	<0.020	-	-
TPH/ Oils & Greases	mg/l	1	-	-	-	-	-	-	-	-	<1	-	-

Biological surface water quality data available from the EPA for their station at Cardinal Moran Bridge (RS14B012680) (located downstream of the Site on the River Barrow) gives a quality value (Q) rating of 3-4, which represents water which is classed as being of 'moderate status', similar to other stations both upstream and downstream on the Barrow catchment.

7.3.2 Groundwater - Hydrogeology

Groundwater is defined as water that moves through and is stored within sub-terrain geological strata. The groundwater flow in this region is controlled by the topography and the underlying glacio-fluvial sands and gravels and bedrock geology.

The principal hydraulic boundaries in the area are the Leinster Granite to the east and the River Barrow to the west. The groundwater in the bedrock and overlying sands and gravels are considered to be in hydraulic continuity and the water-table is therefore considered to be unconfined. The sands and gravels drain to the adjacent quarry void via the underlying limestone bedrock.

Bedrock exposure in the adjacent quarry would seem to indicate that bedding planes and minor faulting are the primary groundwater flow paths (no significant karstification or dolomitisation is evident in the quarry), while jointing in general tends to be tight and does not appear to permit significant groundwater flow. However, the main location where groundwater ingress has been identified in the adjacent quarry is at the basal sump, which receives water through fractures within the quarry floor. The oval shape of the cone of drawdown for the adjacent quarry as presented in Figure 7.8 reflects the general shape of the quarry void and is indicative of relatively low permeability of the bedrock.

The relatively uniform thickness of sands and gravels which overlay the limestone bedrock has been removed from the extraction area of the adjacent quarry. However, the sand and gravel aquifer is still intact overlying the Application Site, varying in thickness of between 10 and 15 m, with the depth to groundwater within the sand and gravel aquifer increasing in proximity to the quarry void (Figure 7.3). This sand and gravel aquifer plays a significant hydrogeological role in terms of its groundwater storage contribution (from rainfall) and recharge to the underlying bedrock aquifer.

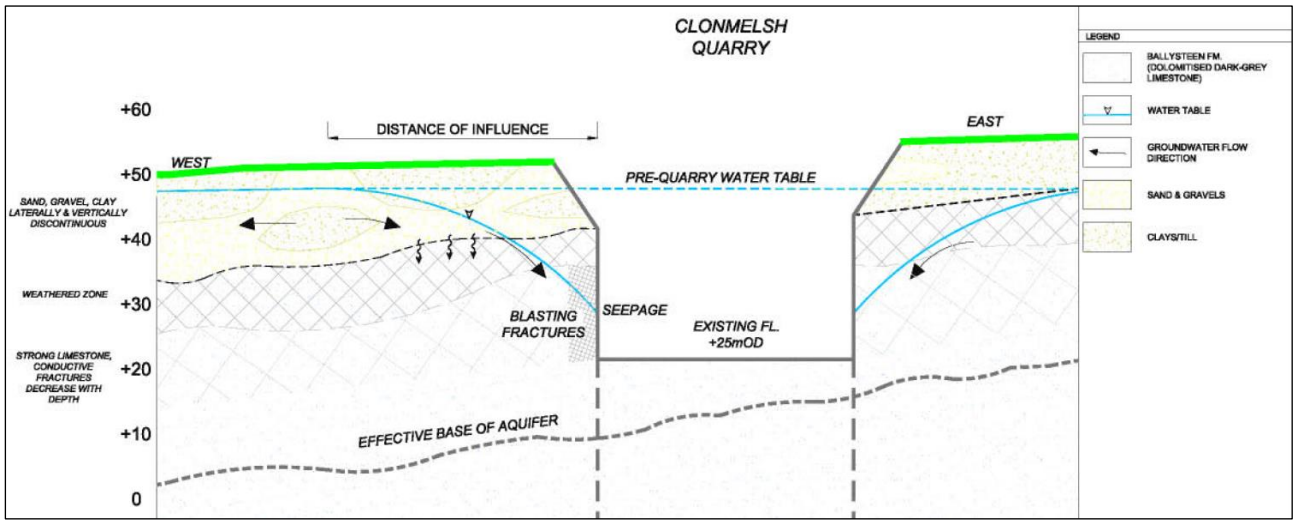


Figure 7.4: Cross-section showing relationship of groundwater with the adjacent quarry void

The Geological Survey of Ireland (GSI), Groundwater Section well database was consulted to obtain details of wells within 1 km of the boundary of the Site (Appendix 6.3). A total of 40 wells are recorded in the area, predominantly domestic water supply wells and those associated with monitoring of the Powerstown Landfill. A review of the database indicates that while some wells exhibited good yields (> 100 m^3/d) the aquifer is not uniformly productive.

In July 2007 a domestic well survey (non-inclusive) carried out by SLR identified 11 wells within a 500 m buffer area of the Site (Figure 6.4). None of those visited reported any problems with their well water supply as all wells surveyed extract

groundwater from the bedrock aquifer. (Appendix 6.4). The well survey determined that some of the houses to the northeast of the Site are supplied by mains water from the Ballyloo Reservoir.

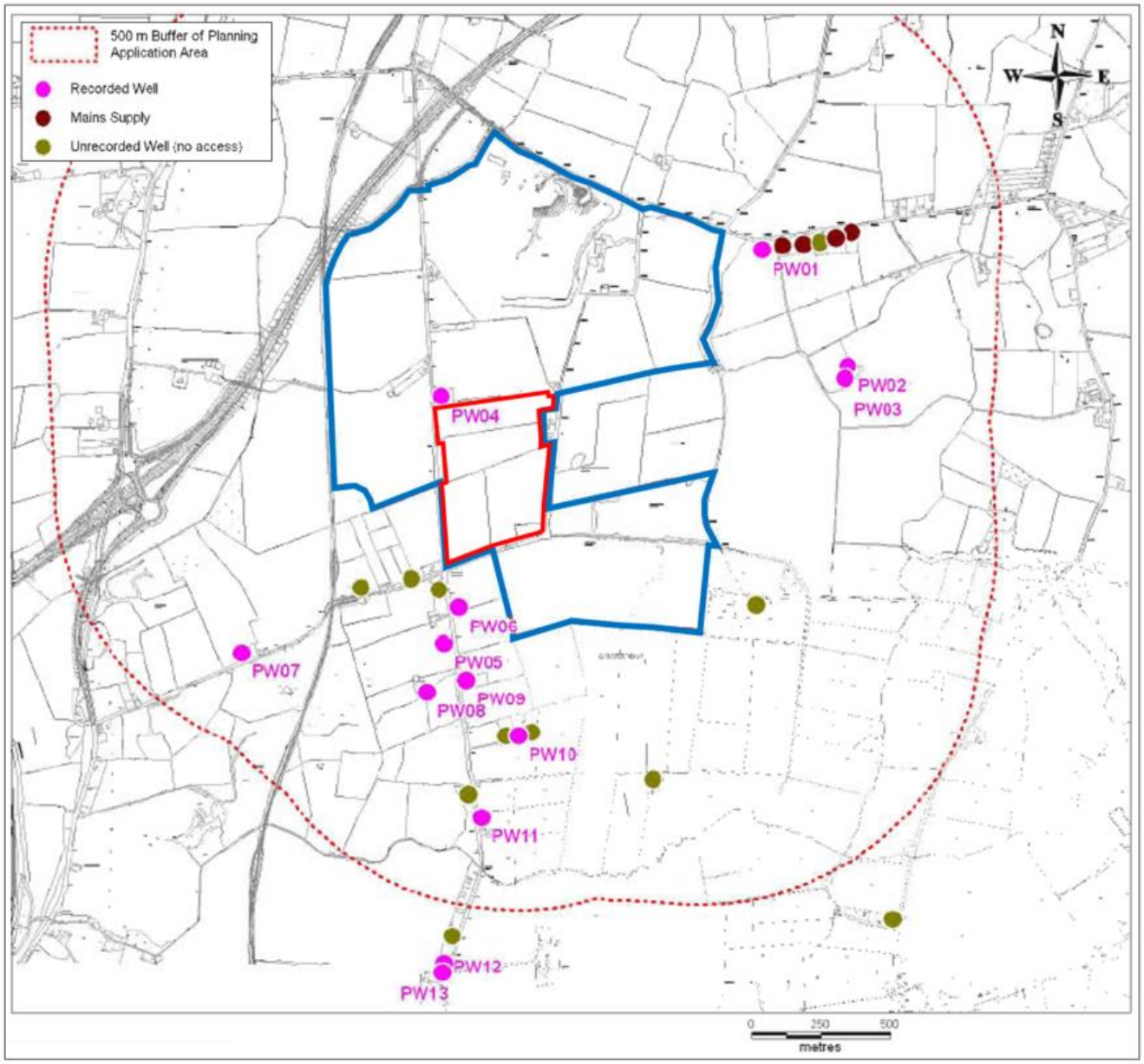


Figure 7.5: Plan showing location of private wells within 500m of the edge of the Site (2010 SLR)

7.3.2.1 Bedrock Aquifer

The bedrock aquifer underlying the Application Site has been characterised as 'Rkd', a regionally important diffuse karstified bedrock aquifer with good development potential (from discrete fractures) (Figure 7.5). However, the jointing in the limestone bedrock is predominately tight, restricting groundwater flow to discrete fractures/fissures.

In addition, the overlying Quaternary deposits of sands and gravels have been classified as a regionally important gravel aquifer (Rg), although with limited value due to the highly variable nature of the deposits themselves. The water-table is generally found less than 2 m below ground level within these deposits, and the main importance of this aquifer is in providing storage, and allowing recharge to the underlying limestone bedrock aquifer.

Figure 7.6: Bedrock aquifer map (application boundary in red, ownership boundary in blue)

7.3.2.2 Groundwater Vulnerability

'The vulnerability of groundwater depends on: (i) the time of travel of infiltrating water (and contaminants); (ii) the relative quantity of contaminants that can reach the groundwater; and (iii) the contaminant attenuation capacity of the geological materials through which the water and contaminants infiltrate. As all groundwater is hydrologically connected to the land surface, it is the effectiveness of this connection that determines the relative vulnerability to contamination. Groundwater that readily and quickly receives water (and contaminants) from the land surface is considered to be more vulnerable than groundwater that receives water (and contaminants) more slowly and in lower quantities. The travel time, attenuation capacity and quantity of contaminants are a function of the following natural geological and hydrogeological attributes of any area:

i. The sub-soils that overlie the groundwater;

ii. The type of recharge - whether point or diffuse; and

iii. The thickness of the unsaturated zone through which the contaminant moves.

In summary, the entire land surface is divided into four vulnerability categories Table 7.4: extreme (E), high (H), moderate (M) and low (L) - based on the geological and hydrogeological factors described above. This subdivision is shown on a groundwater vulnerability map. The map shows the vulnerability of the first groundwater encountered (in either sand/gravel aquifers or in bedrock) to contaminants released at depths of 1-2 m below the ground surface. Where contaminants are released at significantly different depths, there will be a need to determine groundwater vulnerability using site-specific data. The characteristics of individual contaminants are not taken into account.' GSI 1999.

Vulnerability Rating	Hydrogeological Characteristics				
	Subsoil Permeability (Type) and Thickness			Unsaturated Zone	Karst Features
	High Permeability (Sand/Gravel)	Moderate Permeability (Sandy subsoil)	Low Permeability (Clayey Till, Clay, Peat)	(Sand/gravel aquifers only)	(<30 m radius)
Extreme (E)	0 – 3.0 m	0 – 3.0 m	0 – 3.0 m	0 – 3.0 m	-
High (H)	> 3.0 m	3.0 – 10.0 m	3.0 – 5.0 m	> 3.0 m	N/A
Moderate (M)	N/A	> 10.0 m	5.0 – 10.0 m	N/A	N/A
Low (L)	N/A	N/A	> 10.0 m	N/A	N/A
Notes: i) N/A = not applicable ii) Precise permeability values cannot be given at present. iii) Release point of contaminants is assumed to be 1-2 m below ground surface.					

Table 7.4: Extract from 'Groundwater Protection Schemes', Department of the Environment and Local Government, Environmental Protection Agency, Geological Survey of Ireland, 1999

Groundwater vulnerability at the Application Site has been defined as 'High' (Figure 7.6). It can be seen that the vulnerability of the Application Site has been correlated with the sub-soils occurring at the Site (Figure 6.3).

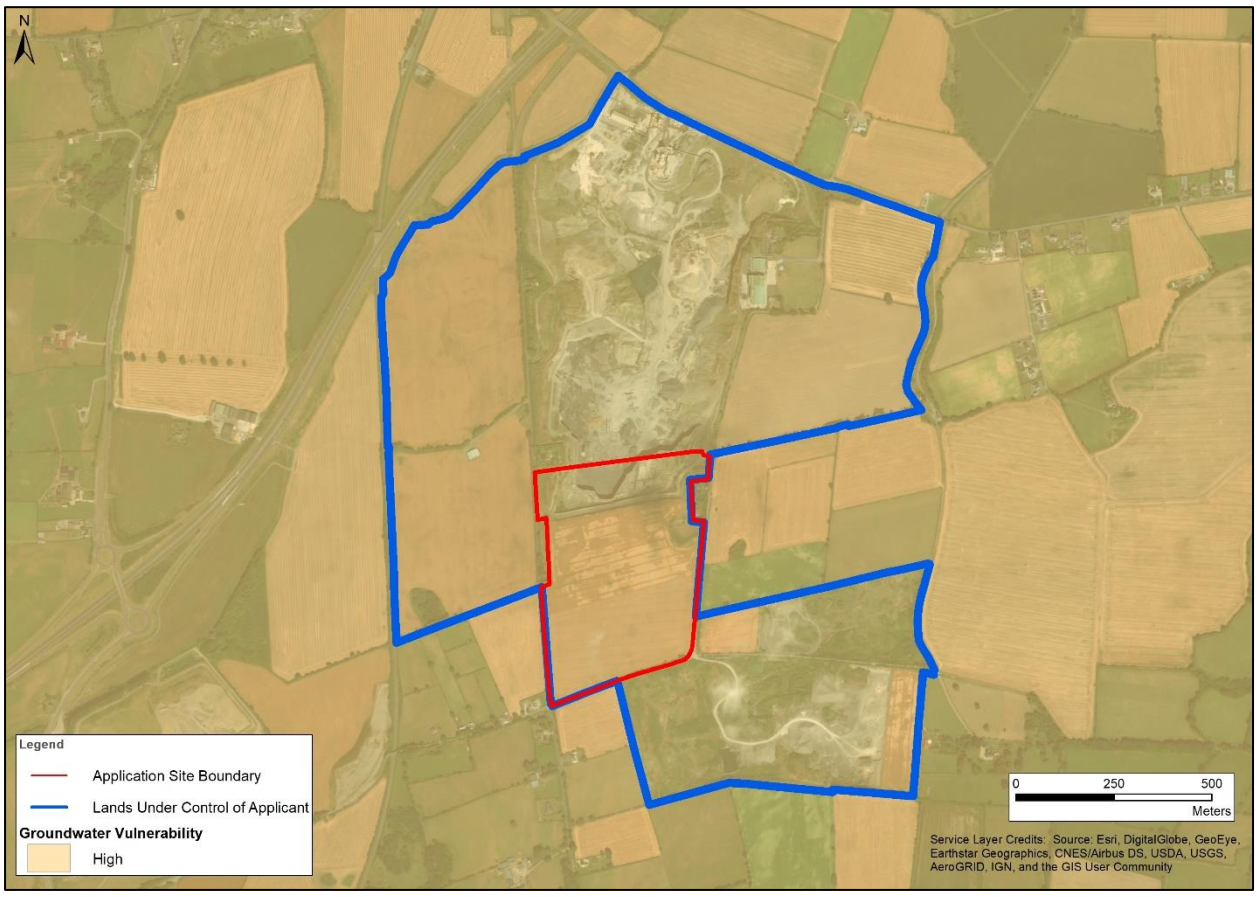


Figure 7.7: Groundwater vulnerability map (application area in red, ownership in blue)

7.3.2.3 Groundwater Levels

Groundwater levels for the 8 groundwater monitoring boreholes drilled in 2007 are presented in Figure 7.7. BH06 was destroyed by agricultural activity. The locations for the boreholes are shown on Figure 7.8.

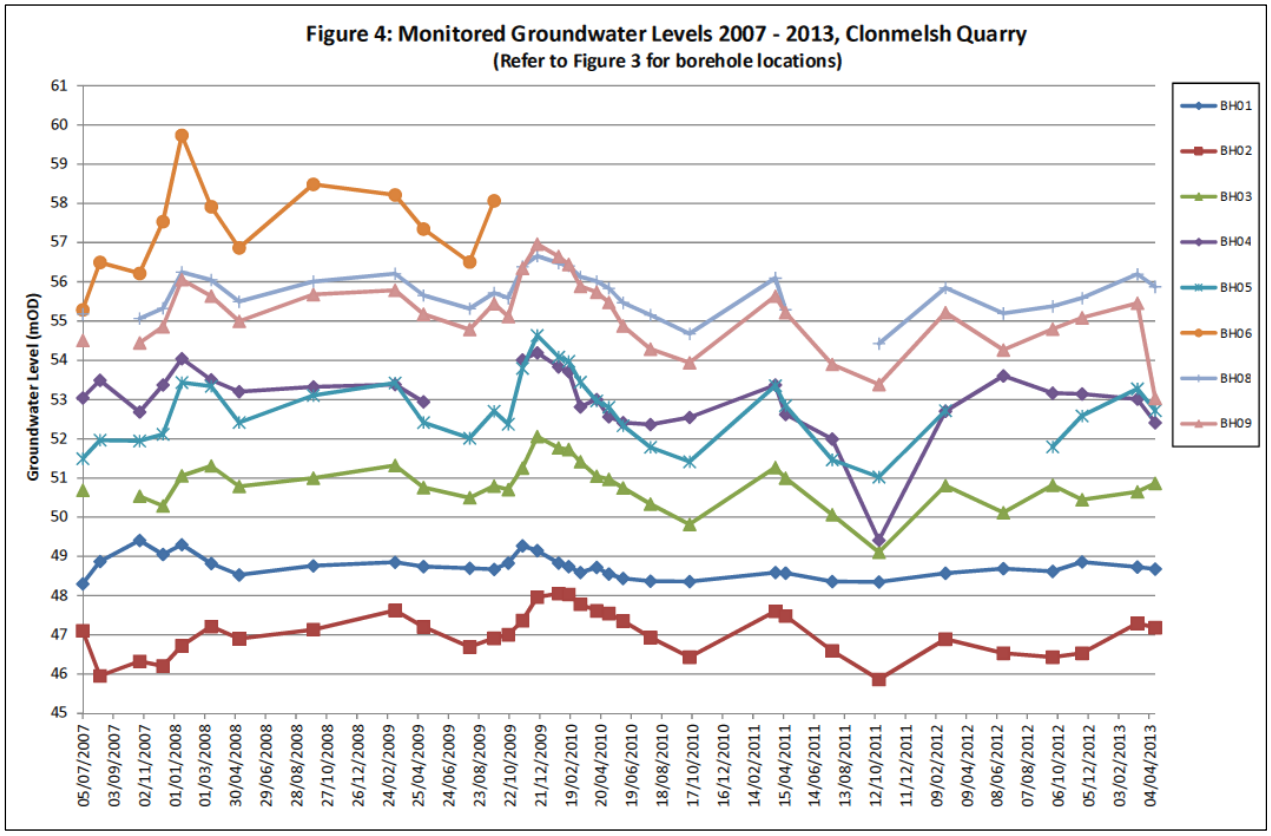


Figure 7.8: Hydrograph showing groundwater monitoring levels (2007 - 2013)

It can be seen from Figure 7.7 that groundwater levels around the adjacent quarry were relatively stable over the period of monitoring. However, the boreholes show a broad seasonal variation, with no significant reflection of ongoing quarrying activities (including the influence of pumping and increasing of the void footprint over time).

There is a general groundwater flow from east to west across the Site towards the River Barrow. Superimposed on this flow direction is the local flow into the quarry void from all sides. Figure 7.8 presents the interpreted groundwater flow direction superimposed on the drawdown cone for the Site in 2008. Groundwater levels are higher at the eastern and southern wells (BH06, BH08 and BH09), and lower to the west of the Site (BH01, BH02 and BH03).

Despite dewatering, the bedrock aquifer remains essentially fully saturated, with the depth to groundwater in the sands and gravels varying with distance from the excavation (refer to Figures 7.3, 7.7 and 7.8).

Groundwater is interpreted to move primarily within the porous sand and gravel aquifer and along bedding planes and fractures in the shallow bedrock. The water-table is unconfined. The hydraulic gradient measured across the ground to the south of the quarry is ca. 0.016, which is a moderate gradient. However, this gradient is expected to be very steep (ca. 0.17) at the quarry faces, as groundwater drains into the excavation. The bedrock aquifer remains almost fully saturated to within 10's of metres of the excavation. The bedrock aquifer is essentially fully saturated (and in hydraulic continuity with the overlying sands and gravels) except for a zone in the immediate vicinity of the quarry face, where monitoring borehole BH04 (the closest borehole to the quarry face (ca. 50 m) encountered bedrock at 52.5 m OD. Groundwater monitoring in this borehole has not seen the water-level fall below 52.4 m OD in over three years of monitoring (2007 - 2010), implying that overlying gravels help to keep the bedrock aquifer saturated.

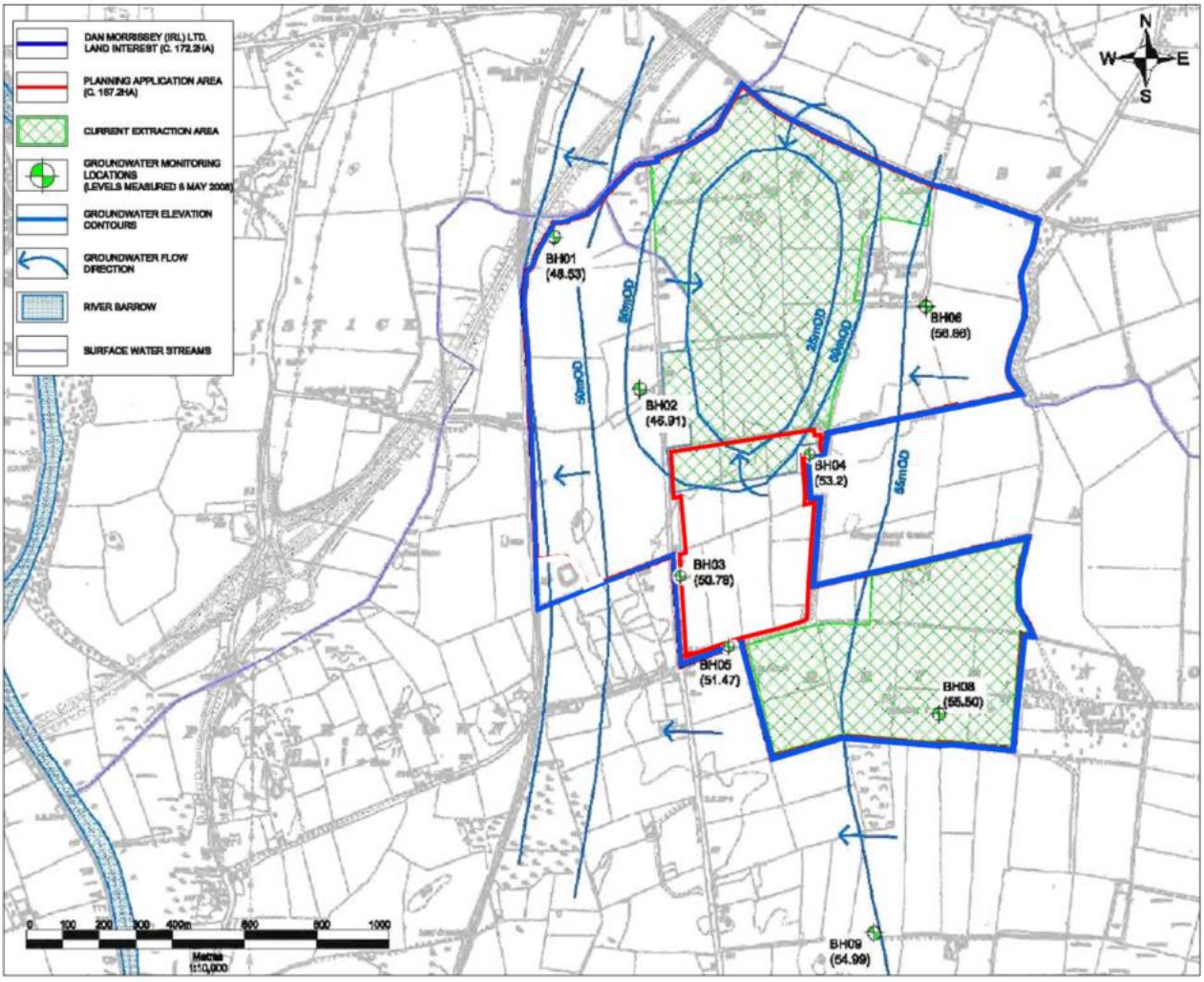


Figure 7.9: Groundwater drawdown and flow direction (2008)

The structural geology of the Application Site shows that the bedrock lies unconformably on the Leinster Granite, and has a gentle regional dip to the west of ca. 10°. Faults exposed within the quarry void trend NNE-SSW and dip steeply to the ESE. A second set of structures are represented as low angle faults dipping 25-35° to the SSE.

Master joints trend roughly N-S and dipping steeply to the west. They are typically weathered out in the near surface, becoming tight with depth; indicating that discontinuities (including bedding) in the rockmass do not appear to permit significant groundwater flow, other than from discrete fractures. The rockmass is generally strong to very strong, with weathering confined to within a few metres below the surface.

7.3.2.4 Source Protection Zones

There are no source protection zones within the area of the proposed quarry extension. The nearest source protection area to the development is located ca. 10 km to the south-east of the Application Site at Paulstown.

7.3.2.5 Groundwater Body

Groundwater bodies have been defined by the GSI to determine the catchment areas and divides within areas, in a similar fashion to the river basins defined for surface water features. The Application Site occurs within the Bagenalstown Lower Groundwater Basin (GWB) (IE_SE_G_157), which is classified as a regionally-important *'karstified diffuse-flow aquifer'* (Rkd), receiving much of its recharge from the slopes of the Barrow Valley. It is not at risk of over-abstraction as determined by the EPA.

The Quaternary deposits within which the Application Site lies, is classified as a regionally important gravel aquifer, and is referred to as the Barrow Valley GWB (GSI). Due to the highly variable nature of the deposit it has limited development potential for drinking water schemes. The main importance of this aquifer is in providing storage, and allowing recharge to the underlying limestone bedrock.

7.3.2.6 Karst Features

No karst features have been identified by the GSI within a 2 km radius of the Application Site. A thin epikarst zone is developed at the top of bedrock extending only 1 m into rock and is characterised by slight enlargement of joints by solution. No other karst features have been noted.

7.3.2.7 Groundwater Quality

The regional groundwater quality of the area is controlled by the limestone bedrock, the overlying Quaternary deposits of sands and gravels, and the impact of agricultural activities upon them. The waters are generally calcareous and very hard, with elevated nitrate levels having been detected at several locations within the Barrow Valley (one of the most intensely farmed/tilled regions in the country).

Eight (8) groundwater monitoring boreholes were installed around the Site in May and June 2007 (Figure 7.8). Table 7.5 presents a summary of the boreholes (logs are provided in Appendix 6.1).

Borehole Number	Ground Elevation (m OD)	Screen Interval (m bgl)	Geology	Depth to Bedrock (m bgl)
BH01	50.48	11.9 - 15.5	Limestone	11.9
BH02	54.75	11.0 - 80.0	Limestone	10.8
BH03	63.85	15.8 - 20.5	Limestone	15.8
BH04	61.55	8.5 - 13.0	Limestone	8.5
BH05	63.84	15.0 - 24.5	Limestone	15.0
BH06	67.78	11.2 - 16.0	Limestone	11.2
BH08	58.30	4.0 - 10.0	Silty Sand	NE
BH09	62.36	12.8 - 26.0	Limestone	13.0

Table 7.5: Borehole Summary

Groundwater quality analysis was collected from the 8 monitoring boreholes during 2007 and 2008. Each sample was tested for the following parameters:

- Dissolved Metals: Antimony, Arsenic, Barium, Boron, Cadmium, Chromium, Cobalt, Copper, Lead, Mercury, Molybdenum, Nickel, Phosphorus, Selenium and Zinc;
- Total Metals: Arsenic, Barium, Boron, Cadmium, Chromium, Cobalt, Copper, Lead, Mercury, Molybdenum, Nickel, Phosphorus, Selenium and Zinc;
- Extractable Petroleum hydrocarbons;
- Fluoride, Chloride, and Sulphate;
- Nitrate as NO_3, and Nitrite as NO_2;
- Orthophosphate as PO_4, and Molybdenum Reactive Phosphorus (MRP) as PO_4;
- Total Ammonia as NH_4;
- Total Alkalinity as $CaCO_3$;
- Electrical Conductivity;
- pH; and
- Volatile Organic Compounds (VOCs).

The results of the groundwater quality analysis at the Site are presented below and compared with EPA Interim Guideline Values for Groundwater Protection and S.I. No.9 (2010), the European Communities Environmental Objectives (Groundwater) Regulations regarding groundwater status (Table 7.6). The laboratory results are included in Appendix 7.2.

Table 7.6: Groundwater Quality Results

Parameter	Units	EPA IGV	S.I. No.9	BH01	BH01	BH02	BH02	BH03	BH03	BH04	BH04	BH04
				6/7/07	8/5/08	17/1/08	8/5/08	17/1/08	8/5/08	6/7/07	17/1/08	8/5/08
Temperature	ºC	25	-	11.8	10.1	11.3	11	10.7	11.1	13.4	9.7	11.9
pHmV	-	-	-	-	-17.3	-	-21.4	-	-26.7	-	-	-19
ORP	-	-	-	-	-43	-	-98	-	-86	-	-	-48
Field Elec. Conductivity	µS/cm	1000	800-1875	780	846	779	886	732	804	790	682	873
Lab Elec. Conductivity	µS/cm	1000	800-1875	756	657	770	807	717	567	787	653	810
Dissolved Oxygen	%	NAC	-	-	33.7	35	31.4	66	89.1	120	71	91.1
Dissolved Oxygen	mg/l	NAC	-	-	3.78	-	3.44	-	9.79	-	-	-
Field pH	pH units	6.5-9.5	-	-	7.08	-	7.13	-	7.23	-	-	7.09
Lab pH	pH units	6.5-9.5	-	7.69	7.48	7.3	7.71	7.41	7.72	7.69	7.68	7.29
Dissolved Ca	mg/l	200	-	137.9	130.6	151	131.9	141	64.5	130	134	129.9
Dissolved Mg	mg/l	50	-	15.09	14.44	18.9	16.33	17	9.38	16.3	15.6	14.05
Dissolved Na	mg/l	150	-	9	9.4	16	17.3	10.4	10.7	11.5	8.1	11.2
Dissolved K	mg/l	5	-	0.8	0.9	1.3	0.5	1.56	1.9	4.4	7.91	10
Total Alkalinity as $CaCO_3$	mg/l	NAC	-	250	250	317	230	294	220	160	278	220
Total Hardness as $CaCO_3$	mg/l	30	-	-	386	455	397	423	200	-	399	382
Chloride	mg/l	30	24-187.5	21	23	28.3	24	30.6	26	25	23	27
Sulphate	mg/l	200	187.5	55	62	66	64	10.4	29	40	24.9	27
Amm. Nitrogen as NH_4	mg/l	0.15	0.065 – 0.175	<0.01	<0.2	<0.04	<0.2	<0.04	<0.2	0.41	<0.04	<0.04
Nitrite as NO_2	mg/l	0.1	0.375	<0.05	-	<0.01	-	<0.01	-	0.11	0.03	-
Nitrate as NO_3	mg/l	25	37.5	19.2	27.3	37.7	38.2	60.3	53	101	55.4	78
Total Dissolved Fe	µg/l	200	-	<2	<2	<25	<2	<25	40	6	668	<2
Dissolved Mn	µg/l	50	-	11	2	298	116	4	20	50	29	4
Orthophosphate as PO_4	mg/l	0.03	-	<0.03	-	<0.03	-	0.03	-	0.11	0.06	-
Total Organic Carbon	mg/l	NAC	-	3	<2	1.55	<2	1.3	<2	3	1.92	<2
Total Pet. Hydrocarbons	µg/l	10	-	<10	<10	-	<10	-	<10	<10	-	<10
Mineral Oil	µg/l	10	-	<10	-	-	-	-	-	<10	-	-

NAC – No abnormal change

Table 7.6 continued: Groundwater Quality Results

Parameter	Units	EPA IGV	S.I. No.9	BH05	BH05	BH05	BH06	BH06	BH06	BH08	BH08	BH08	BH09
				6/7/07	17/1/08	8/5/08	6/7/07	17/1/08	8/5/08	6/7/07	17/1/08	8/5/08	8/5/08
Temperature	ºC	25	-	11.8	10.7	11	13	11	-	13.5	10.9	12.1	10.7
pHmV	-	-	-	-	-	-31.5	-	-	-	-19.9	-	-53.2	-23.2
ORP	-	--	-	-	-	-54	-	-	-	-54	-	-18	-71
Field Elec. Conductivity	µS/cm	1000	800-1875	754	707	778	779	740	805	475	448	255	810
Lab Elec. Conductivity	µS/cm	1000	800-1875	759	692	692	760	726	740	421	453	390	732
Dissolved Oxygen	%	NAC	-	74.5	52.3	66.1	90	81.7	97.9	70	72	83.1	92
Dissolved Oxygen	mg/l	NAC	-	-	-	7.29	-	-	10.7	-	-	8.92	10.2
Field pH	pH units	6.5-9.5	-	-	-	7.32	-	-	7.1	-	-	7.72	7.17
Lab pH	pH units	6.5-9.5	-	7.58	7.39	7.72	7.57	7.46	7.48	8.06	7.77	7.99	7.52
Dissolved Ca	mg/l	200	-	131	136	113.8	112	144	116.9	70.75	83.3	63.86	113
Dissolved Mg	mg/l	50	-	14.6	16.8	15.03	28.1	17.9	14.1	9.81	11	8.5	14.54
Dissolved Na	mg/l	150	-	10.5	10.9	10	13	13.9	13.5	7.5	6.9	6.6	10.1
Dissolved K	mg/l	5	-	1.7	2.2	1.5	2.7	2.07	2.8	1	0.74	0.7	12.7
Total Alkalinity as $CaCO_3$	mg/l	NAC	-	200	292	180	190	296	200	167	191	150	200
Total Hardness as $CaCO_3$	mg/l	30	-	244	109	346	-	434	350	-	233	194	342
Chloride	mg/l	30	24-187.5	27	23.8	29	37	39.7	40	7	15.5	14	40
Sulphate	mg/l	200	187.5	27	33.1	36	35	34.8	32	38	27	21	15
Amm. Nitrogen as NH_4	mg/l	0.15	0.065 – 0.175	<0.01	<0.04	<0.2	0.38	0.37	<0.2	0.02	0.31	0.4	<0.2
Nitrite as NO_2	mg/l	0.1	0.375	<0.05	0.05	-	0.13	0.3	-	0.08	0.42	-	-
Nitrate as NO_3	mg/l	25	37.5	81.1	62.9	54.5	71.3	62.9	65.3	6.7	25.6	19.6	69.2
Total Dissolved Fe	µg/l	200	-	21	124	<2	9	99	<2	12	113	<2	<2
Dissolved Mn	µg/l	50	-	6	6	3	2	4	2	<1	<3	3	1
Orthophosphate as PO_4	mg/l	0.03	-	0.32	0.11	-	<0.03	0.39	-	0.26	0.5	-	-
Total Organic Carbon	mg/l	NAC	-	3	1.9	<2	3	1.68	<2	3	1.03	<0.2	<2
Total Pet. Hydrocarbons	µg/l	10	-	<10	-	<10	<10	-	<10	<10	-	<10	<10
Mineral Oil	µg/l	10	-	<10	-	-	<10	-	-	<10	-	-	-

NAC – No abnormal change

The groundwater analyses for this period indicate that elevated results were recorded for Chloride, Nitrate (NO_3), Nitrite (NO_2), Orthophosphate (PO_4), Potassium (K) and Ammoniacal Nitrogen as NH_4. These results suggest that groundwater within the vicinity of the Application Site are being impacted by agricultural activities. Total Hardness Dissolved (as $CaCO_3$) was elevated in all samples, however this is expected given the limestone geology.

7.4 Conceptual Hydrogeological Site Model

The boundaries of the groundwater catchment are the upland area to the east and the River Barrow to the west. Recharge occurs over the entire area and groundwater naturally discharges to the River Barrow. There is localised drawdown of the water-table due to quarrying activities directly to the north of the Application Site, however the distance of influence from the adjacent quarry and the proposed quarry extension will continue to be restricted due to the following contributory factors, which form the basis for a conceptual hydrogeological site model:

- The presence of a shallow water-table within the sands & gravels (ca. 2 m);
- An unconfined flow, predominantly shallow through permeable sands & gravels;
- Bedrock fully saturated, fracture flow only;
- Permeability decreases with depth in bedrock, effective base of bedrock aquifer conservatively assumed at ca. 20 to 30 m below the rock-head (top of rock);
- Sands & gravels in hydraulic continuity with bedrock;
- Sands & gravels thicken to the west and thin/absent to the east;
- Shallow groundwater flow to east within granite and Quinagh Formation (mudstones);
- Deeper groundwater flow to west within Milford Formation (dolomitised limestones);
- Recharge occurs over entire area; and
- Groundwater discharges to the River Barrow ca. 1.5 km to the west.

7.5 Water Management

Chapter 3.0 of this EIAR presents an operational plan for the Site, with the extraction of limestone taking place in a southerly direction from the adjacent quarry, below the water-table. Site drainage water will continue to be discharged to the Powerstown Stream at a single discharge point (DW01), via a series of Settlement Ponds which currently exist in the in the adjacent quarry. A discharge licence (DL7/233) is in place for the adjacent quarry, which allows for 25 mg/l suspended solids and nitrates in terms of quality, and 2,000 m^3/d in terms of volume (Appendix 7.1). It is proposed that the discharge from the enlarged quarry footprint will be maintained within current limits, with winter working of the quarry at higher bench levels and summer working taking place at lower bench levels. In the case of a storm event occurring, excess water will be 'stored' in the quarry void until such time as it can be safely discharged within the limits of the discharge licence (refer to Section 7.5.1 Water Balance).

The water management system for the adjacent quarry will remain and can be divided into the following main components (Figures 7.9 and 7.10):

- Rainfall water and surface run-off collects on the quarry floor, and drains into the Quarry Sump; from where it flows through a series of Settlement Ponds and subsequently into the Central Sump before being pumped via a high-capacity riser to a channel that crosses beneath the entrance of the quarry, and discharged (at DW01) into a channel prior to entering the Powerstown Stream;

- Groundwater is also collected in the Quarry Sump, from where it flows through the same series of Settlement Ponds and subsequently into the Central Sump before discharging (DW01) into a drainage channel which flows westwards into the Powerstown Stream;
- Attenuation capacity is provided in the lower parts of the quarry floor during periods of prolonged rainfall or extreme storm events;
- Rainfall water and surface run-off from buildings and the Plant Site floor area which is pumped to the Surface Settlement Pond where it is recycled and used in the Readymix Batching Plant, the Block Plant and Asphalt Plant;
- Water sourced from an additional group of Settlement Ponds adjacent to the quarry floor Settlement Ponds is used to provide 'top-up' water for the Aggregate Processing Plant which operates as a closed circuit system. Silt is pumped from the Aggregate Processing Plant to a large Silt Pond located to the north-east;
- An existing septic tank treats foul water from the Site; and
- Water for welfare facilities is supplied from a well located adjacent to the Surface Settlement Pond (drinking water is supplied by a commercial supplier).

At the quarry floor, the Central Sump's pump operates on a float switch, which activates once a certain water level within the sump is exceeded (providing an intermittent flow rate of up to ca. 22 l/s or 1,900 m^3/d). During 95% flow conditions, it is estimated that the pump is operational for ca. 50% of the time, producing an average discharge of about 11 l/s (or 950 m^3/d).

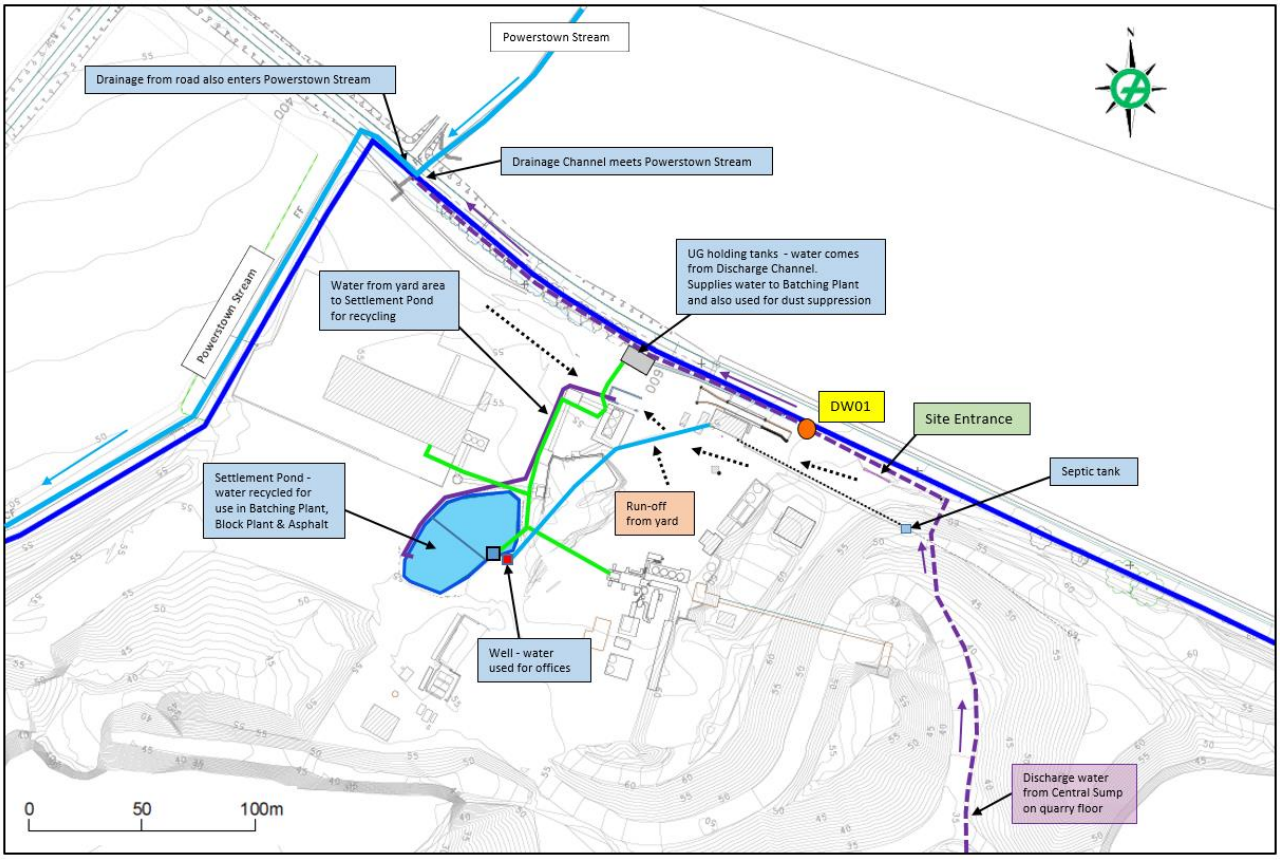


Figure 7.10: Water management plan – Plant Site subject of ABP-300037-17

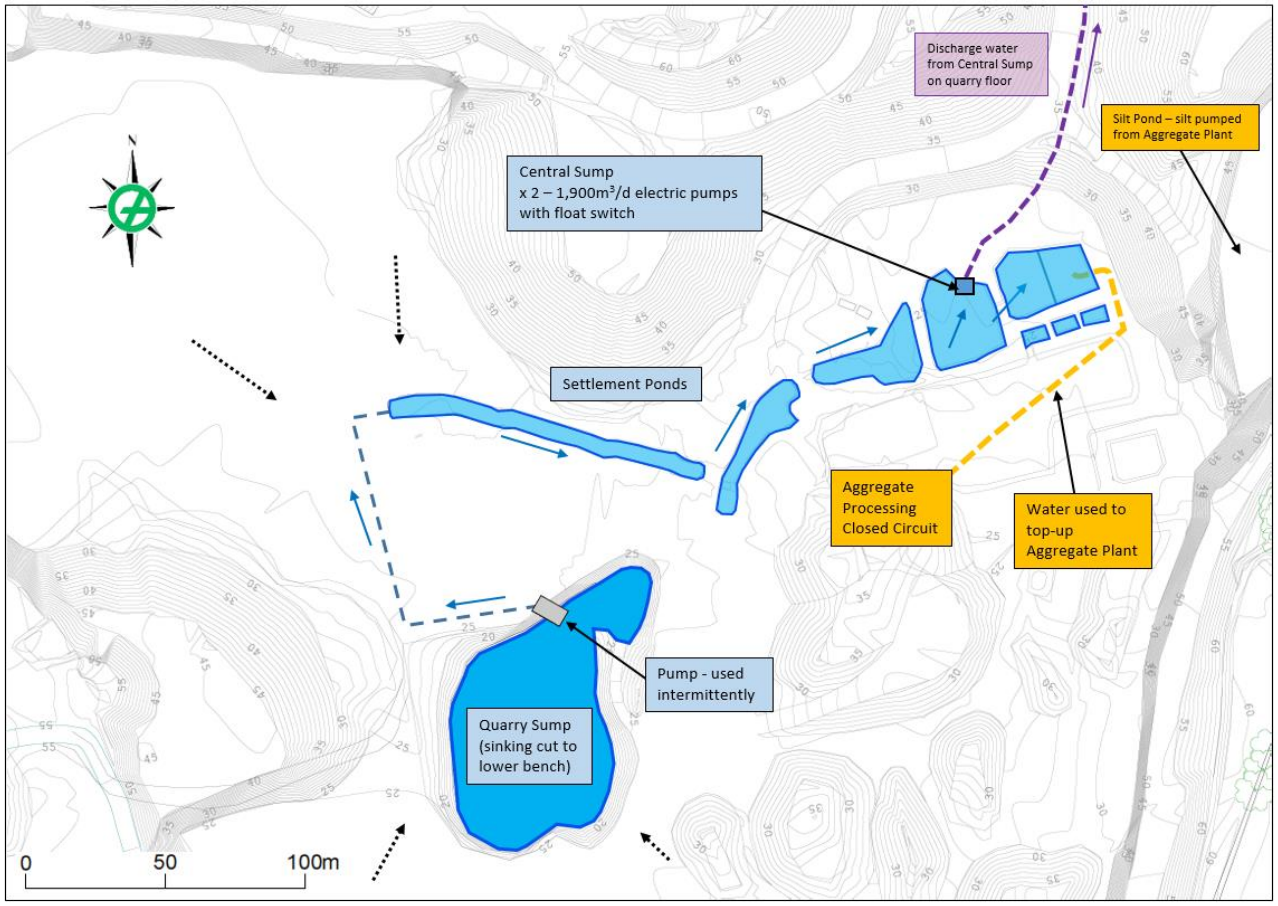


Figure 7.11: Water management – Quarry

7.5.1 Diversion of Clonmelsh Stream

In addition to the water management plan for the adjacent quarry, the Clonmelsh Stream has been diverted a number of times over the life of the adjacent quarry and which now runs along the northern boundary of the Application Site, will be re-routed in a clockwise direction around the proposed quarry extension to join the stream where it currently flows in the south-west corner of the existing quarry site (Figure 7.11).

Re-routing (and lining) of part of the Clonmelsh Stream will help to provide increased biodiversity, and ensure that quality and quantity of flow be provided throughout the seasons to the Powerstown Stream, as the current diversion of the stream is understood to 'leak' into the underlying sands and gravels that overly the limestone bedrock (SLR 2010). It is proposed that the diverted section of the stream will be lined with a 200 mm thickness of low-permeability clay and overlain with a substrate of unsorted gravels of varying thickness (up to a maximum of 100 mm) to encourage biodiversity.

The final route of the diversion and diversion design will only take place following consultation and agreement with the Inland Fisheries Ireland.

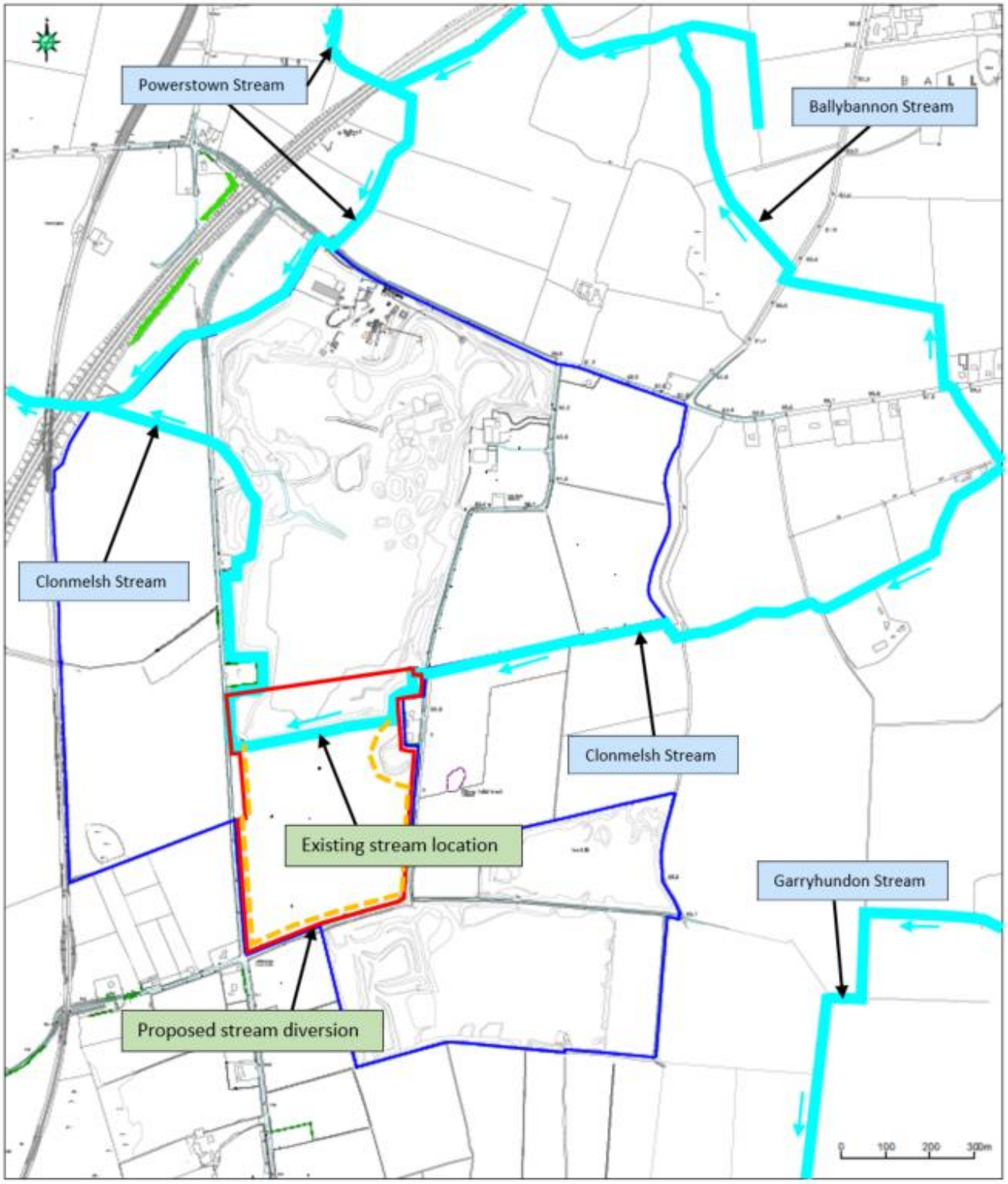


Figure 7.12: Diversion of Clonmelsh Stream

7.5.2 Water Balance - Adjacent Quarry Site and Proposed Extension Area

Water produced on the adjacent quarry site primarily consists of run-off from rainfall and groundwater emanating from the quarry void. The water balance presented below takes into account the area of the existing quarry site and the proposed extension to the south.

The storage capacity for a 1 in 100 year storm was estimated from rainfall data provided for the closest Met Éireann station.

7.5.2.1 Rainfall Data

There is no official meteorological data specific to the Clonmelsh Site. In order to give reliable climatic data, data from Met Éireann's synoptic station at Oakpark, Carlow was used (Appendix 7.5). This measuring station is ca. 9 km north of the Site. All rainwater falling within the operational area of the adjacent quarry is directed to the Quarry Sump. Water falling on the Site either evaporates, is used in quarry processes/activities, or is discharged from the adjacent quarry site.

7.5.2.2 Evapotranspiration and Effective Rainfall

Evapotranspiration is the return of water vapour to the atmosphere by evaporation from land and through transpiration by plants, generally measured from a short-grass covered surface (such as permanent pasture) adequately supplied with water. Evaporation is the return of water vapour to the atmosphere by evaporation from a free water surface such as a pan of water, known as a "Class A Pan", fitted with a depth-measuring gauge.

Evapotranspiration is very low during the winter months when plant growth is minimal. The vast majority of evapotranspiration during winter months is attributable to direct evaporation from ground surfaces. During summer months the rate of evapotranspiration increases and often exceeds the monthly rainfall. This is due to increased free evaporation from the surface and from transpiration from plants.

Using the rainfall data and the potential evapotranspiration data for Oakpark Synoptic Station, the effective rainfall for the Site has been calculated. The water balance for the Site is summarised below in Table 7.7. Calculations supporting Table 6.7 are presented in Appendix 7.5.

(1) Estimated Area of Site Catchments (m^2)	700,000 m^2
(2) Mean Annual Precipitation (mm) (up to 8th Aug 2017)	840.2 mm
(3) Annual Potential Evapotranspiration (mm)	522.2 mm
(4) Actual Evapotranspiration (mm) 90% of (3)	470.0 mm
(5) Effective Annual Precipitation (mm) (2)-(4)	370.2 mm
(6) Annual Volume of Water moving into Catchment Area (m^3) (1) x (5)	259,140 m^3
(7) Estimated Average Daily Volume of Water for Quarry Use*	150 m^3
(8) Estimated Average Monthly Volume of Water for Quarry Use*	3,400 m^3
(9) Estimated Average Annual Volume of Water for Quarry Use*	41,000 m^3
(10) Estimated Daily Groundwater Inflow (see Section 6.5.2.3)	1,300 m^3
(11) Estimated Annual Groundwater Inflow (see Section 6.5.2.3) (10) x 365 days	474,500 m^3
(12) Permitted Discharge Volume per day (DL7/233)	2,000 m^3
(13) Permitted Discharge Volume per year (12) x 365 days	730,000 m^3

(* see Table 6.8, estimates have been supplied by the quarry operator)

Table 7.7: Estimated Annual Water Balance (Adjacent Quarry & Proposed Extension Area)

The water requirements are satisfactorily met by the ingress of water into the quarry from rainfall and groundwater. Table

7.8 presents an estimate for the average daily water requirements for on-site activities based on a 10 hour day.

Operation	Requirement (m^3/day)
Aggregate Processing	Closed circuit
Readymix Concrete	50 - 100
Dust suppression (seasonal)	10 - 20
Concrete Blocks/Asphalt	20
Canteen	2
Total	<150

Table 7.8 Estimated Daily On-site Water Requirements

7.5.2.3 Groundwater Inflow

The 2013 Hydrological / Hydrogeological Impact Assessment (SLR Consulting Ltd, April 2013), used a radial flow model (Thiem-Dupuit Method) to provide an estimate of groundwater flow into the quarry void. This Method identified an inflow of ca. 1,300 m^3/d (ca. 15 l/s) based on groundwater levels in monitoring boreholes BH02 and BH04. Assumptions and inputs to their model included:

- Hydraulic conductivity (K) value of 0.15 m/d;
- Radius of Influence of 518 m from groundwater level monitoring;
- Equivalent radius of Clonmelsh Quarry, measured to be 318 m;
- Quarry floor level of 25 m OD;
- Aquifer base of 15 m OD;
- Height of the water-table at radius of influence from groundwater level monitoring of 53 m OD; and
- Height of the water-table at quarry floor of 25 m OD.

7.5.2.4 Extreme Weather Events

Extreme Rainfall Return Periods for the Site were provided by Met Éireann (Appendix 7.5). For storage of incident rainfall calculations, the runoff from a rainfall return event with a 60 minute, 100 year return period (33.7 mm in the Clonmelsh area) is taken to represent a suitable scenario. Over the 70 ha contributing area, the rainfall event will generate ca. 11,119 m^3 of water (Appendix 7.5) over the course of this period (assuming no percolation or evaporation during the event and that the Application Area is fully extracted (worst case scenario)). This is substantially higher than the permitted discharge volume of 2,000 m^3/d (DL7/233). Short-term water storage capacity will be provided on the quarry floor.

7.6 Predicted Impacts of the Proposed Development

Predicted impacts which may be experienced at the Application Site include the following:

- There is a potential for suspended solids-impacted waters generated within the extension area to be pumped to the existing Quarry Sump and potentially discharged into the Powerstown Stream;
- Stripping of topsoil and overburden to access the resource. Topsoil and overburden stripped will be used to construct screening berms and in the phased restoration of the Application Site (refer to Chapter 2.0 for details);

- Mechanical handling of materials. Primary and secondary processing of materials will take place at the Application Site. Extraction by blasting, primary crushing by mobile crusher, haulage of aggregate, processing of aggregate, manufacture of products and restoration of the areas on a phased basis are activities which will occur on the Application Site;
- Private water wells in the vicinity of the Application Site extract groundwater from the bedrock aquifer. Monitoring of groundwater levels (Figure 7.7) by the Applicant has shown that bedrock is fully saturated to within a short distance of the quarry. Drawdown occurs within the zone of influence but only within the overburden deposits - the bedrock remains saturated due to the blanket of water-bearing overburden deposits which 'top up' the bedrock and act as storage. Therefore it is anticipated that there will be no significant impact on water supplies from these private wells;
- A potential impact on the water environment from quarrying related activities could result from accidental spillage of fuels or oils to the groundwater environment during refuelling operations. This potential impact is likely to occur if contaminants are allowed to infiltrate to ground during refuelling operations, and then migrate offsite. There is no evidence of pollution of the water environment in the vicinity of the adjacent quarry site resulting from spillage of fuels or oils, during site visits undertaken during 2017. Mitigation measures, as described below have been implemented at the adjacent quarry site to reduce the risk of such an event occurring (and will continue to be adhered to on the Application Site); and
- Following closure of the quarry, the water level will be permitted to recover to pre-pumping levels (ca. 48 m OD), and the Application Site (and adjacent quarry) will be restored as a lake.

7.6.1 Potential Impacts on Groundwater

The main potential polluting impacts associated with the development are the introduction of hydrocarbons to the underlying groundwater. Given the proposed level of activity at the Application Site, as long as mobile plant (and any other machinery brought on site) is properly maintained it is considered very unlikely that hydrocarbon pollution will become an issue at the Application Site. A number of other factors also indicate that the likelihood of negatively impacting the groundwater will be very low. These include:

- The continuation of groundwater monitoring using existing boreholes;
- The development area of the Application Site is not located within a Source Protection Area of a public water supply scheme;
- The level of activity at the Application Site is in keeping with the level of activity currently taking place at the adjacent - existing quarry site; and
- Monitoring information demonstrates that the bedrock aquifer remains fully saturated until within a short distance from the adjacent quarry void (conservatively assumed in calculations at 200 m, but so far measured at less than 50 m (SLR 2010)).

The proposed development may result in a small increase in the depth to the water-table over parts of the adjoining landholdings. However, this will not cause crop dehydration. The water demand of crops where the water-table is not close to the surface, is entirely met by water extracted from the soils which is supplied by rainfall.

7.7 Mitigation Measures

Mitigation measures in place at the adjacent quarry site are in accordance with the "best practice/possible mitigation measures" as set Quarries and Ancillary Activities: Guidelines for Planning Authorities, DoEHLG (2004). These mitigation measures will continue to remain in place for the proposed Application Site.

It is proposed that the following mitigation measures will continue to be adhered to at the proposed Application Site to ensure that no adverse environmental impacts will occur to the underlying hydrogeology as a result of the proposed activities:

- As part of the compliance with the discharge licence for the adjacent quarry (DL7/233), regular water quality monitoring of the discharge and the Powerstown and Clonmelsh Streams takes place, with results being submitted to Carlow Co. Council;
- The Applicant has provided an undertaking to carry out appropriate remedial measures to restore water well supplies in the event that it is demonstrated that quarry operations are having an adverse impact on private wells;
    - Data loggers (divers) will be placed in selected monitoring boreholes and private wells to monitor fluctuations in groundwater levels on an ongoing basis; and
    - Data loggers will also act as an early warning system should a dramatic drawdown in groundwater levels occur.
- The quarry discharge considerably dilutes the levels of nitrate in the Powerstown Stream. This is considered to be a positive impact;
- Surface water channels constructed within the quarry to collect surface water runoff and any groundwater seepage. These channels are cleaned out regularly, with the fine materials used on site in remediation works;
- Continued revision of the existing Environmental Management System (EMS);
- No excavation shall take place below 25 m OD;
- Measures implemented within the adjacent quarry to ensure that adequate settlement time is available to discharge water to mitigate against an excessive suspended solids load;
- All soil / overburden stockpiles to be covered (i.e. vegetated) to minimise the risk of rain / wind erosion;
- Restoration with topsoil and overburden will be carried out on a phased basis to reduce the vulnerability of the bedrock aquifer to possible contamination;
- Most mobile plant will use the existing concrete apron at the adjacent quarry garage for refuelling. Static plant or tracked excavators will refuel over a drip tray with an absorbent mat;
- Any processing plant and/or mobile plant on the Application Site will be regularly maintained, and where plant is damaged or leaking it will be fixed or replaced immediately, as part of the ongoing operational management of the quarry to reduce the risk of leaks;
- No fuel will be stored on the Application Site;
- No chemicals or petroleum-based products will be stored on the Application Site;
- No mechanical repairs shall take place within the quarry floor area; and
- An emergency spill kit (including absorbers) will be available for use in the event of an accidental spill on the quarry floor.

The combined application of these measures will ensure that inputs to, and subsequent contamination of the water environment will not occur at the Application Site during quarrying related activities.

In the unlikely event that the quarry operations are demonstrated to have an adverse impact on third party water supply wells the operator will undertake appropriate remedial measures to restore / replace the water supply at his own expense.

7.8 Residual/Likely Significant Effects

Spillages could occur during refuelling. However, if the mitigation measures described above are adhered implemented and adhered to, it is considered unlikely that there has been any effect on the water environment as a result of quarrying related activities being undertaken at the Application Site.

There are a number of third party wells located in close proximity to the extant and proposed quarry void. All of the wells surveyed extract water from the bedrock aquifer, and it is anticipated that there will be no significant impact on water supply from these wells, as groundwater monitoring has demonstrated that the bedrock aquifer is saturated within a short distance of the quarry void (ca. 50 m). Notwithstanding this, the operator has provided an undertaking to carry out appropriate remedial measures to restore well water supplies in the event that it is demonstrated that quarrying operations are having an adverse impact on third party wells.

As a result of not having an effect (of drawdown) on groundwater wells in its immediate vicinity, it is unlikely that the development will have an effect on the River Barrow, located ca. 1.5 km to the west.

7.9 Cumulative Impacts

The existing development takes place below the water-table and there is discharge to surface water. The discharge of water from the Site coupled with discharge from the Powerstown Landfill further downstream on the Powerstown Stream has a cumulative impact on the receiving watercourse. Providing all mitigation measures are adhered no adverse effects on the Powerstown Stream are expected.

7.10 Summary of Site Conditions

- Clonmelsh Quarry has been excavated into bedrock (Ballysteen Limestone Formation) and the overlying Quaternary subsoil deposits. The former is predominantly limestone (with elements of argillaceous material) in character, and the latter consists of interbedded sands and gravels and tills.
- The limestone bedrock and the subsoil deposits are classified as Regionally Important aquifers in the Barrow Valley. This is not confirmed by the results of the investigations undertaken at this site.
- The subsoils in the site area are situated at the eastern edge of Quaternary deposits in the Barrow Valley and are thinly saturated. They have been fully excavated over part of the site area.
- The limestone bedrock in the quarry area has relatively low permeability whereas the permeability of the overlying subsoil deposits can be up to two orders of magnitude higher.
- A shallow cone of drawdown has developed in the bedrock and sands and gravels in response to dewatering of the quarry.
- Groundwater in the bedrock and sand and gravels are considered to be in hydraulic continuity in the site area and are unconfined. The principal hydraulic boundaries in the area are the Leinster granite to the east and the River

Barrow to the west.

- The stream (Clonmelsh Stream) that passes through the Site has been diverted to the southern part of the main excavation.
- Direct rainfall to the quarry working area, streamflow infiltration and groundwater inflow is directed to the Quarry Sump, and subsequently flows via a series of Settlement Ponds to the Central Sump, from where it is be pumped to a licenced surface water discharge point (DW01) on a drainage channel which flows into the Powerstown Stream.
- The seasonal fluctuation in the water-table in the site area ranges from about 1.5 m to 5 m. Groundwater flows in a generally westerly direction in the area aside from the immediate area around the quarry where it flows from all sides into the excavation.
- The average groundwater component of the discharge is estimated to be about 15 l/s (ca. 1,300 m^3/d) in the winter months.
- Groundwater in certain parts of the Barrow Valley have elevated nitrate concentrations. This has resulted mainly from intensive agricultural production and disposal of sewage from individual wastewater treatment systems. The local streams in the area appear to have high levels of nitrate. The quarry discharge dilutes the nitrate levels in the stream, and is broadly representative of regional groundwater quality; and

Groundwater is used in domestic and farm water supplies throughout the area.

7.11 References

Hydrological / Hydrogeological Impact Assessment, SLR Consulting Ltd, April 2013.

S.I. No. 389 - European Communities Environmental Objectives (Groundwater) (Amendment) Regulations 2011.

EIS Clonmelsh Quarry, Co, Carlow, SLR Consulting Ltd, 2010.

S.I. No. 9 - European Communities Environmental Objectives (Groundwater) Regulations 2010.

Environmental Protection Agency (EPA) Water Quality in Ireland 2004-2006, 2008.

Geology of Carlow-Wexford: A Geological Description, with accompanying Bedrock Geology 1:100,000 Scale Map, Sheet 19, Carlow - Wexford (GSI), 1994.

Daly, E.P., 1981. Nitrate Levels in the Aquifers of the Barrow River Valley. Geological Survey of Ireland.

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Chapter 7 Water & Hydrogeology, rEIAR Clonmelsh & Garyhundon, Golder & Associates, 2017

8.0 AIR QUALITY & CLIMATE

8.1 Introduction

The following Chapter of the EIAR assesses any potential impact the proposed extraction at the Application Site the subject of this EIAR may have on the surrounding environment, with regards to the local climate and the receiving air environment.

For quarrying related activities, the most likely emission to the air environment is dust, which arises predominantly from the excavation, processing and transporting of aggregate. These sources are generally dispersed sources rather than specific point sources and this dictates the measures required to mitigate dust related impacts.

A description of climatic factors relating to the Application Site has been derived from data obtained from Met Éireann's automatic weather station at Oak Park, Co. Carlow. The Oak Park station is located at Oak Park, Co. Carlow, ca. 10 km north of the Application Site.

8.2 Methodology

The impact of dust is usually monitored by measuring rates of dust deposition. According to the EPA Guideline Document entitled Environmental Management in the Extractive Industries (April 2006), there are currently no Irish statutory standards or EPA guidelines relating specifically to dust deposition thresholds for inert mineral dust. 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 Standard VDI 2119, 1972) – with dust nuisance. It is the only enforceable method available. On this basis, the EPA recommend a dust deposition limit value of **350 mg/m^2/day** (Table 8.1) (when averaged over a 30-day period) has been adopted at site boundaries associated with quarrying related activities.

The then Department of Environment, Heritage and Local Government (DoEHLG) published *'Quarries & Ancillary Activities: Guideline for Planning Authorities'* (2004) and the Irish Concrete Federation Environmental Code (2005) also recommends the TA Luft dust deposition limit is adopted at site boundaries near quarry developments. In addition, the DoEHLG have identified that residents within 500 m of the dust source can potentially be effected from emissions, with more severe concerns about dust within 100 m of the source.

Procedures	Monitoring Frequency	Standard
Dust Emissions	Monthly	<350 mg/m^2/day, Bergerhoff Method

Table 8.1: Dust Limit Values

Three dust monitoring points (D3, D2 and D4) have been operated within the Application Site since February 2007. These monitoring points are located at the south-west, north-west and north-east boundaries of the Application Site and are currently used to assess any impacts of extraction related activities from the adjacent existing quarry to the immediate north (Figure 8.1). Furthermore, the historical dust monitoring data from D2, D3 and D4 provide a baseline assessment of the Site and will be used to assess any impacts of extraction related activities from the proposed development.

In total, five dust monitoring points (D1, D2, D3, D4 and D5) have been operated in the vicinity of the Application Site since February 2007, a sixth location (D6) was included in the analyses in August 2010 and a seventh (D7) in May 2012. Their locations are at the adjacent existing extraction area boundaries and assess any impacts of extraction related activities on the existing site and on the local environs, (Figure 8.1). From up-to-date aerial mapping there are approximately 10 residential properties within 250 m of the Application Site, and approximately 4 further residential properties between 250 ma nd 500 m of the Application Site. When a 250m study area is set down around the lands under the control of the applicant approximately 13 residential properties of which 5 occur within the 250 m to 500m radius of the Application site, (as depicted in Figure 8.1 and Figure 8.2).

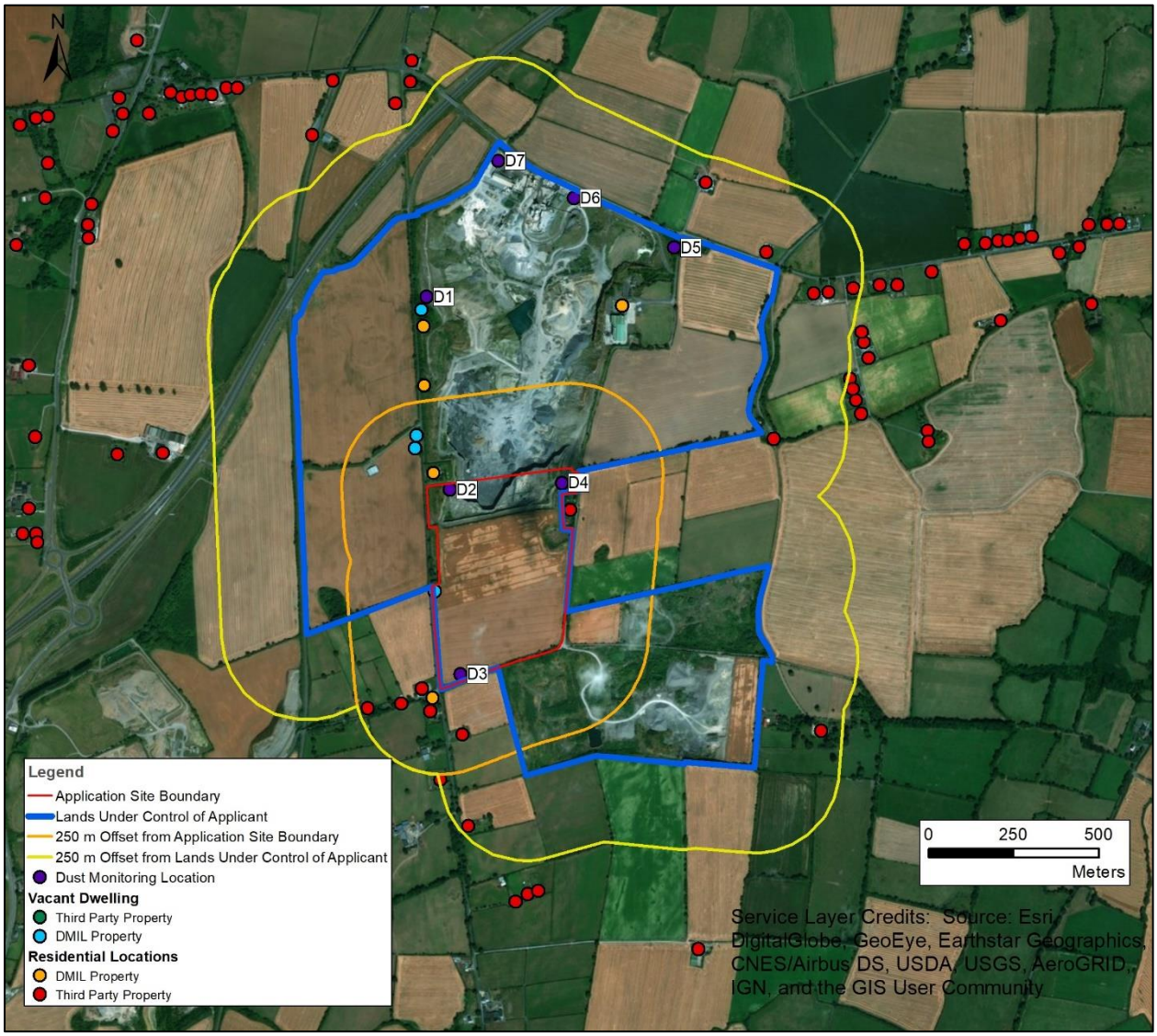


Figure 8.13: Plan showing dust monitoring locations on the Site (buffers from Application Site and Land Ownership Boundary)

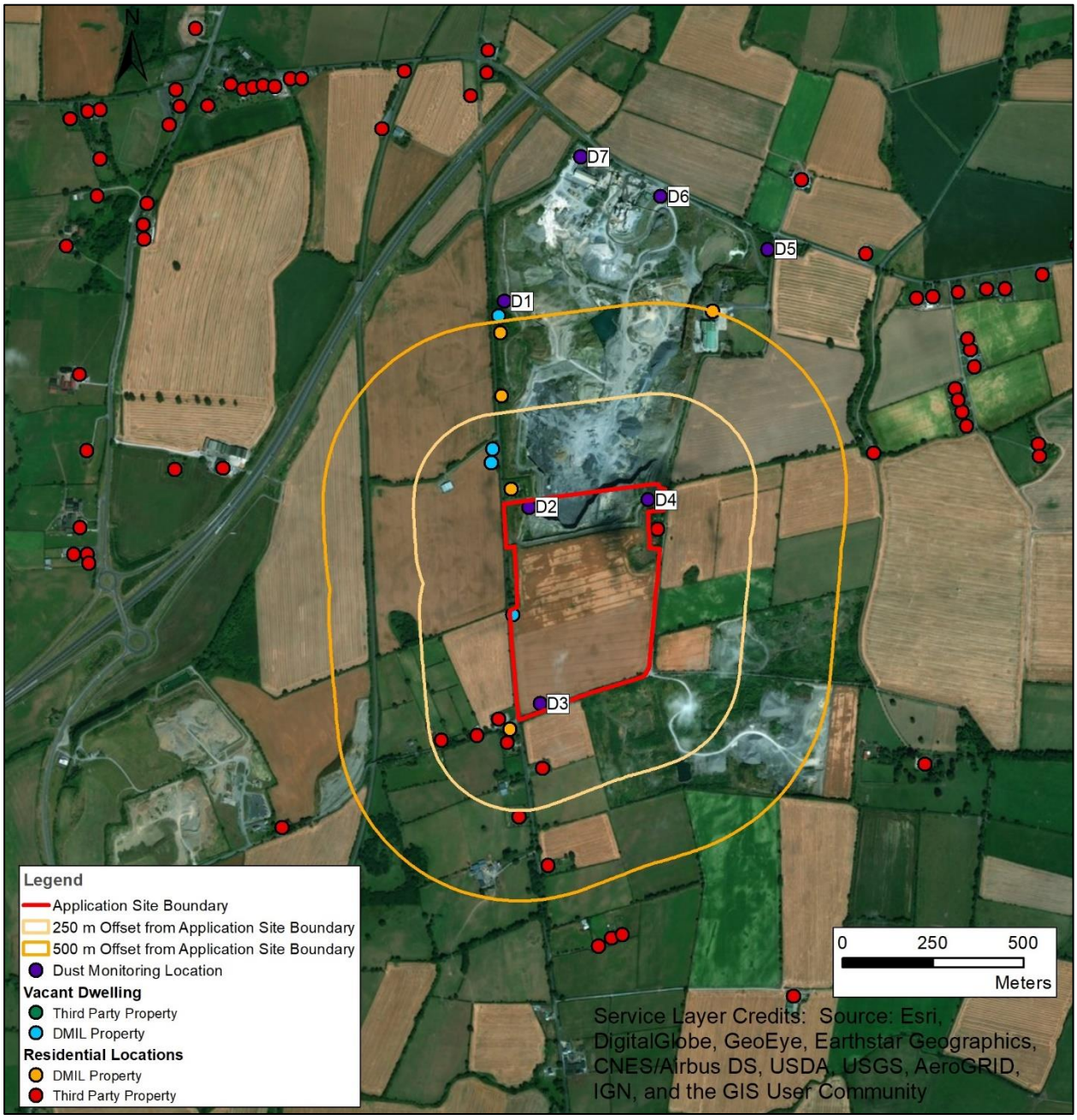


Figure 8.14: Plan showing dust monitoring locations on the Site (buffers from Application Site Boundary)

8.3 Existing Environment

An outline for the Application Site in the regional and local context is provided in Figure 1.1 (Chapter 1.0). The southern section of the Application Site itself is used for agriculture (arable crop production).

Quarry related activities have been undertaken at the adjacent Clonmelsh and Garryhundon sites since the 1940s. The lands surrounding the Application Site can be characterised as rural in nature, with land uses in the area being generally agricultural and single-house residential. The lands contiguous to the boundaries of the Application Site are in agricultural use (predominantly arable), with the existing extraction activities to the north and south-west of the Application Site. There are scattered residential properties in the vicinity of the Site, with ribbon form developments to the east. The M9 motorway runs north-east to south-west of the Site.

8.3.1 Climate at the Site

The Irish climate is subject to strong maritime influences, the effects decreasing with increasing distance from the Atlantic coast. The climate in the area of the Application Site is typical of the Irish climate, which is temperate maritime.

The closest Met Eireann Synoptic station was at Kilkenny, approximately 27 km south-east of the Site. This station was in operation between 1978 and 2007. Parameters recorded at the Met Éireann station during this period have been averaged monthly in Table 8.2 below. Monthly averages from 2007 to 2017 have been provided for a number of climactic parameters in Table 8.3.

Other parameters such as: Mean 10 cm soil temperature at 0900 UTC, Global Solar Radiation in Joules/cm^2, Potential Evapotranspiration, Evaporation and Degree Days Below 15.5°C which are recorded at Oak Park from January 2014 to August 2017 are also included in Table 8.2.

Table 8.2: Kilkenny 1978–2007 recorded weather averages

TEMPERATURE (°C)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Mean daily max	8.2	8.6	10.6	12.9	15.7	18.2	20.3	20.2	17.8	14.1	10.8	8.8
Mean daily min	1.6	1.9	3.2	4.2	6.5	9.3	11.3	11	9.1	6.5	3.7	2.4
Mean temperature	4.9	5.2	6.9	8.5	11.1	13.8	15.8	15.6	13.4	10.3	7.3	5.6
Absolute max.	14.1	15.6	19.2	22.4	26	29.6	31.4	30.8	26.6	21.4	17.5	15.5
Min. maximum	-3.3	-0.3	1.6	5	7.5	11.5	12.3	12.2	9.6	6.4	2.1	-1.9
Max. minimum	11.4	11.9	11.8	12.3	14.5	17	17.6	18.1	16.9	15.5	13.3	12.9
Absolute min.	-14.1	-8.5	-7.9	-4	-3	1	3.6	2.2	-0.9	-4.8	-7	-8.8
Mean num. of days with air frost	10.9	9	5.4	3.2	0.7	0	0	0	0.2	2	6.6	8.9
Mean num. of days with ground frost	20	16	15	14	9	2	0	1	4	9	15	18
Mean 5cm soil	3.6	3.7	5.5	8.5	12.8	16	17.5	16.4	13.3	9.3	6.1	4.4
Mean 10cm soil	4	4.1	5.6	8.1	12	15.1	16.8	15.9	13.2	9.6	6.6	4.8
Mean 20cm soil	4.6	4.9	6.4	8.8	12.2	15.2	17	16.5	14.2	10.8	7.6	5.6
RELATIVE HUMIDITY (%)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Mean at 0900UTC	88.4	87.7	84.8	79	75.8	76.7	78.1	80.9	84.8	88.5	90.1	89.6
Mean at 1500UTC	79.5	74.3	69.2	63.6	63.4	65.9	65.2	65.1	67.5	74.2	78.9	81.8
SUNSHINE (hours)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Mean daily duration	1.8	2.3	3.2	4.9	5.6	4.9	4.7	4.7	4	3	2.2	1.6
Greatest daily duration	8.4	9.8	11.6	13.7	15.5	16.3	15.4	14.5	11.8	10.2	8.7	7.2
Mean num. of days with no sun	9.9	7.1	5.4	2.3	1.7	1.7	1.8	2.2	2.9	5.4	8.7	11.6
RAINFALL (mm)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Mean monthly total	78.3	66.1	67.9	56.4	60.4	61	54.6	77.8	69	95.3	80.2	90.4
Greatest daily total	25.2	24.8	27.9	23.4	31.1	28.2	66.4	58.3	34.7	33.6	34.2	43.8
Mean num. of days with >= 0.2mm	18	16	18	14	16	14	14	15	15	18	17	18
Mean num. of days with >= 1.0mm	13	12	12	10	11	10	9	10	10	13	12	13
Mean num. of days with >= 5.0mm	5	4	4	4	4	3	3	4	4	6	5	6
WIND (knots)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Mean monthly speed	7.9	8	8.1	7	6.6	6.2	5.9	5.7	6.2	6.8	6.9	7.3
Max. gust	68	72	62	56	54	44	48	50	54	57	56	75
Max. mean 10-minute speed	44	39	43	34	32	27	29	29	30	38	36	47
Mean num. of days with gales	0.5	0.4	0.2	0	0	0	0	0	0	0.1	0.1	0.6
WEATHER (mean no. of days with...)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Snow or sleet	3.6	3.6	2.5	0.8	0.1	0	0	0	0	0	0.1	2
Snow lying at 0900UTC	1.5	1.1	0.3	0.1	0	0	0	0	0	0	0	0.2
Hail	0.7	1	2.1	2.5	1.2	0.3	0.2	0.1	0.1	0.3	0.2	0.2
Thunder	0.1	0	0.1	0.4	0.7	0.9	0.7	0.8	0.2	0.2	0.1	0
Fog	3.2	2.8	1.7	1.9	1.9	1.3	1.7	2.9	3.8	3.8	3.2	3.8

Table 8.3: Oak Park, Co. Carlow recorded Climate Information

Mean Air Temperature (ºC)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2007	6.7	5.8	6.5	11	11.7	14	14.9	15.3	13.3	11.3	8.3	6.5
2008	6.3	5.5	6	7.9	12.6	13.1	15.4	15.8	12.5	9	7.1	4.1
2009	3.9	5	6.9	8.9	11.2	14.3	15.1	15.5	13.1	11.4	7.4	2.9
2010	1.6	2.7	5.5	8.9	10.9	15.2	16	14.6	13.7	10.2	5.1	-0.8
2011	3.2	7.2	6.7	10.8	11.3	12.3	14.7	13.9	13.9	11.9	9.7	5.9
2012	6.5	6.9	8.5	7.1	10.8	13.4	14.4	16.0	12.4	9.0	6.1	5.3
2013	5.3	4.7	3.8	7.5	10.4	13.7	18.2	16.3	14.0	12.1	6.4	6.6
2014	5.5	5.7	7.0	10.1	11.9	14.5	16.9	14.5	14.3	11.4	7.2	5.6
2015	5.0	4.3	6.2	8.7	10.2	13.4	14.6	14.6	12.4	10.2	9.2	8.6
2016	5.9	4.9	6.1	7.5	12.3	15.1	16.0	16.0	14.6	10.6	5.2	6.3
2017	6.0	6.5	8.3	9.0	-	-	-	-	-	-	-	-
Maximum Air Temperature (ºC)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2007	13.4	14.6	14.3	19.9	21.8	24.4	21.7	23.7	22.3	19.2	15.5	15.1
2008	14.1	13.1	12.9	17.4	22.8	22.6	24.6	22.2	19	16.8	13.1	13
2009	11.6	11.6	14.9	17.8	22.3	26.8	21.5	22.2	21.2	16.9	14.3	11.8
2010	10.6	9.6	14.1	19.3	25.6	23.3	24.2	24.2	22.4	20.6	17.1	10.7
2011	12.1	14.6	16.7	21.6	16.9	25.5	24.4	22.5	21.1	20.1	15.9	13.7
2012	12.3	14.8	18.9	13.5	25.6	22.8	24.1	24	22.3	15.4	13.7	13.6
2013	13.4	12.3	11.9	17.4	19.3	23.4	29.5	24.3	23.9	19.5	14.2	13.3
2014	12.2	10.7	15.1	18.2	20.9	24.9	27.6	22.4	22.8	17.7	14.2	13.5
2015	16.2	12.8	14.2	18.9	19.2	24	23.4	23	19.4	19.1	17.7	14.1
2016	13.6	13.1	14.1	17.2	21.9	23.7	27.5	23.5	25.6	16.6	15.9	13.8
2017	11.9	14.1	16.3	17.2	-	-	-	-	-	-	-	-
Minimum Air Temperature (ºC)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2007	-1.8	-5.9	-3.2	-0.2	1.7	6.6	7	7.6	1	-0.2	-2.8	-3.3
2008	-2.3	-5.8	-1.2	-0.6	2.5	4.6	5.9	9	4	-2.2	-4	-5
2009	-7	-3.2	-1.8	0.8	3.9	4.6	7.8	7.6	4.2	1.4	-2.3	-4.9
2010	-12.1	-4.5	-6.2	-1	-0.4	5.8	8.5	3.3	1.8	-2.9	-9.1	-12.9
2011	-5.9	-1.5	-3.6	1	3.5	1.4	5.7	5.2	6.2	2	-2.1	-2.2
2012	-1.0	-4.4	-0.2	-0.7	-2.1	5.4	6.1	8.4	2.0	-2.1	-2.3	-3.7
2013	-3.6	-2.5	-3.4	-3.8	1.8	5.3	7.4	5.9	4.8	2.6	-1.9	-2.2
2014	-1.7	-0.5	-1.9	1.2	5.2	5.3	7.2	5.7	4.4	0.5	-2.1	-5.3
2015	-4.8	-5.6	-2.2	-0.4	1.6	3.6	6.4	6.0	3.8	0.3	-2.1	0.1
2016	-3.1	-3.2	-3.5	-1.4	3.4	4.7	6.8	7.8	4.5	2.1	-4.4	-4.7
2017	-4.4	-3.5	-0.6	-0.5	-	-	-	-	-	-	-	-
Mean Maximum Temperature (ºC)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2007	9.5	9.3	10.8	16.5	16.5	18.2	18.8	19.3	17.7	15.2	11.3	9.7
2008	9.6	9.7	9.9	12.2	17.3	17.6	19.4	18.9	16.7	12.9	9.9	7.5
2009	7.2	7.9	11.2	13	15.6	19.1	18.8	19.7	17.4	14.8	10.4	5.9
2010	4.8	6.2	9.9	13.8	15.8	19.9	19.9	19.4	17.8	14.4	8.4	2.2
2011	6.2	10.5	11.7	16.2	15.1	17.3	19.2	18.6	17.2	15.1	12.7	9
2012	9.3	9.4	12.7	10.9	15.4	16.9	18.2	19.7	16.7	12.4	9.4	8.4
2013	8.1	7.8	6.8	11.4	14.8	18.9	24.1	20.7	18.0	15.4	9.4	9.7
2014	8.5	8.8	10.8	14.4	15.8	19.1	21.9	18.7	19.4	15.3	10.7	8.6
2015	8.2	7.5	10.4	14.1	14.3	18.3	18.5	19.1	16.5	14.2	12.7	11.9
2016	9.0	8.4	10.3	11.9	17.2	19.2	20.1	20.3	18.5	14.4	8.9	9.6
2017	8.7	9.6	12.3	12.9	-	-	-	-	-	-	-	-

Table 8.3 continued: Oak Park, Co. Carlow recorded Climate Information

Mean Minimum Temperature (ºC)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2007	3.9	2.2	2.3	5.6	6.9	9.9	10.9	11.2	9	7.4	5.2	3.3
2008	3	1.3	2.2	3.7	7.9	8.6	11.3	12.6	8.4	5	4.3	0.8
2009	0.7	2.1	2.6	4.8	6.9	9.5	11.3	11.3	8.7	8.1	4.3	-0.1
2010	-1.7	-0.8	1.1	4.1	5.9	10.5	12.1	9.8	9.6	6	1.8	-3.9
2011	0.2	3.8	1.6	5.4	7.5	7.4	10.3	9.2	10.6	8.6	6.8	2.9
2012	3.7	4.4	4.3	3.2	6.1	9.9	10.7	12.3	8.2	5.6	2.9	2.2
2013	2.5	1.7	0.8	3.5	6.1	8.6	12.2	11.9	10.1	8.7	3.4	3.4
2014	2.6	2.5	3.2	5.8	8.0	9.8	11.8	10.4	9.1	7.5	3.8	2.6
2015	1.8	1.1	2.1	3.2	6.1	8.5	10.7	10.2	8.4	6.2	5.7	5.3
2016	2.8	1.3	1.9	3.0	7.5	10.9	11.9	11.8	10.6	6.8	1.5	3.0
2017	3.4	3.4	4.4	5.2	-	-	-	-	-	-	-	-
Precipitation Amount (mm)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2007	74.6	72.8	72.1	16.4	38.3	112.1	126.3	103.8				
2008	124.7	28.8	83.9	31.8	37.1	86.8	141.3	142.4	81.5	89.9	47.4	47.8
2009	113.4	29.2	32.6	102.4	69	65.4	152.4	100.9	41.8	127.8	215.5	73.7
2010	71.5	48	80.7	49	51.4	37.7	93.6	25.5	108.7	68.9	87.7	52.2
2011	50.6	121.9	16	19.5	50.7	75.2	46.4	25.5	93.9	93.9	89.2	55.5
2012	70.8	24.5	18.0	56.3	50.2	162.6	76.2	127.7	37.9	63.4	80.9	68.1
2013	76.2	35.8	57.6	44.4	35.6	37.5	-	85.6	24.4	170.0	27.7	136.6
2014	147.2	176.7	65.0	52.6	78.6	61.9	24.6	122.1	18.2	138.2	165.6	47.7
2015	66.0	36.3	53.5	26.3	89.4	29.7	79.4	83.0	27.6	56.8	110.0	270.9
2016	110.9	95.7	40.6	64.3	61.6	61.7	29.6	46.0	97.4	32.3	26.3	80.2
2017	36.3	57.8	66.6	15.8	-	-	-	-	-	-	-	-
Grass Minimum Temperature (ºC)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2007	-5.8	-9.7	-6.8	-5.1		3.7	4.4	3.8	-2.2	-3.6	-7.4	-7.5
2008	-6.7	-9.8	-6.1		-1.2	1.3	1.9	5.8	0	-7.3	-6.6	-9.4
2009	-10.9	-8.4	-6.3	-4	-0.3	1	3.7	3.5	-1.1	-1.3	-5.5	-10.9
2010	-11.6	-11	-11.8	-5.5	-4.2	3.5	6	-1.1	-2.9	-7.5	-7.8	-14.4
2011	-11.5	-7.1	-9.5	-4.7	-1.9	-3.3	1.2	-0.1	1.3	-2.4	-7.1	-7
2012	-5.0	-9.8	-5.2	-5.4	-7.6	1.9	-	3.4	-2.5	-6.7	-6.3	-10.2
2013	-8.7	-7.8	-9.6	-9.8	-2.6	1.4	-	1.0	0.6	-1.6	-7.1	-7.6
2014	-7.0	-3.8	-6.8	-3.1	-0.4	0.6	2.9	1.2	0.7	-2.1	-6.1	-10.2
2015	-9.6	-10.4	-7.1	-6.2	-4.5	-1.4	0.0	-0.8	-1.7	-5.1	-6.5	-3.5
2016	-10.1	-10.4	-9.5	-8.0	-1.2	-1.6	1.5	2.9	-0.4	-2.2	-8.6	-8.2
2017	-10.1	-8.0	-6.1	-5.0	-	-	-	-	-	-	-	-
Mean Wind Speed (knot)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2007	10.8	7.9	8.6	5.9	7.5	6.2	6.9	6.4	6.2	5.1	6.4	9.7
2008	9.7	8.1	10	7.6	6	6.9	6.9	7.5	6.7	8.6	8.1	6.1
2009	8.2	5.8	8.6	7.3	8.2	6	7.4	8.9	6.2	6.5	10.3	6.8
2010	5.8	5	6.7	6.6	6.1	5.8	7.5	6.7	7.2	6.7	7.1	4.5
2011	5.5	8.4	5.3	5.9	10.3	6.5	5.7	6.1	9.9	9.2	8.9	9.7
2012	9.3	6.9	6.4	7.5	5.8	6.9	6.7	7.6	7.0	5.8	7.4	7.8
2013	7.9	7.5	7.0	9.3	8.6	6.2	-	7.0	6.5	7.5	5.9	10.8
2014	9.0	12.0	7.9	7.1	7.1	5.3	5.7	7.5	4.2	8.5	5.8	8.3
2015	10.3	7.7	9.2	6.7	8.8	7.8	7.8	6.9	6.1	5.6	9.7	12.0
2016	9.2	8.7	7.3	7.2	6.3	6.2	7.0	7.5	8.2	5.3	6.0	6.7
2017	6.9	9.2	8.4	6.3	-	-	-	-	-	-	-	-

Table 8.3 continued: Oak Park, Co. Carlow recorded Climate Information

Highest Gust (knot)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2007	56	49	47	36	38	29	41	25	31	29	31	49
2008	47	50	54	41	33	40	33	31	35	37	38	34
2009	53	24	41	44	44	31	31	32	33	40	46	37
2010	40	34	42	43	27	27	31	31	31	36	47	31
2011	35	46	48	37	43	30	32	30	46	44	39	45
2012	45.0	31.0	36.0	41.0	30.0	35.0	27.0	36.0	32.0	38.0	40.0	43.0
2013	55.0	50.0	33.0	50.0	42.0	31.0	30.0	33.0	40.0	43.0	38.0	55.0
2014	52.0	68.0	45.0	31.0	38.0	27.0	27.0	31.0	22.0	43.0	38.0	38.0
2015	46.0	49.0	53.0	39.0	38.0	39.0	32.0	41.0	30.0	31.0	68.0	52.0
2016	46.0	42.0	44.0	43.0	41.0	27.0	32.0	34.0	39.0	35.0	39.0	37.0
2017	35.0	53.0	38.0	32.0	-	-	-	-	-	-	-	-

An important meteorological parameter with regard to the dilution and dispersal of air pollutants is wind speed and direction. A windrose for the Oak Park station is presented in Figure 8.3 for the period August 2003 to October 2017, (such data was not available at this station prior to August 2003). It is evident that the prevailing winds are from a southerly direction.

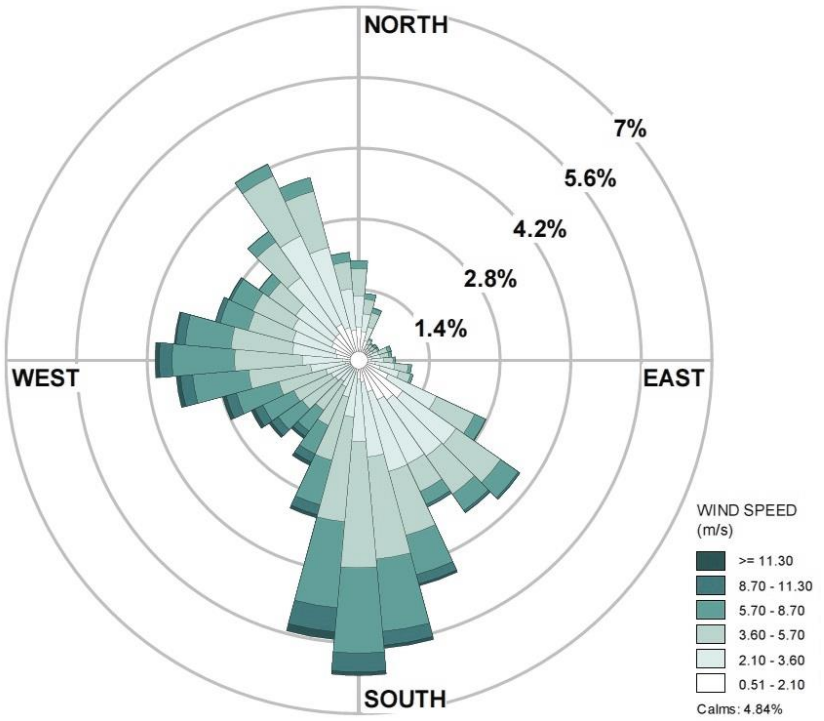


Figure 8.15: Dominant wind direction at Oak Park over assessment period August 2003 to July 2017

8.3.2 Characteristics of the Development

The extraction rate for the proposed development will be in line with market demand. Current extraction is at a rate of 180,000 to 200,000 tonnes per annum and is expected to remain at this rate for the short term with uplift thereafter. Extraction rates have been declared at maximum rates of 1M tonnes per annum in previous submissions by former operators of the quarry (see description of the proposed development in Chapter 2).

The following activities associated with the proposed development are the most likely dust generating sources:

- Movement of full and empty trucks along haul roads;

- Stripping of subsoil and overburden;
- Loading and movement of overburden to dump areas;
- Extraction of materials;
- Loading of materials;
- Screening of sand and gravel;
- Crushing of oversized materials;
- Unloading of overburden for restoration; and
- Wind erosion at dump areas and exposed faces.

8.4 Climate Change

Ireland's greenhouse gas emissions per person are amongst the highest on the planet and the fourth highest of the EU 28 countries. The reduction in greenhouse gas emissions in Ireland and other parts of the globe, which is primarily due to the global financial crisis, has shown that there is still a strong link between economic growth and emissions (EPA, 2011). The most recent emissions figures compiled show that in Ireland agriculture is the single largest contributor to the overall emissions, at 33.0% of the national total, followed by transport at 19.8 and energy at 19.7%. The remainder is made up by the residential sector at 10.1%, manufacturing and combustion at 7.6%, and industrial processes at 3.3% (DCCAE, 2017).

Ireland is a party to both the United Nations Framework Convention on Climate Change (UNFCCC) and the Kyoto Protocol, which together provide an international legal framework for addressing climate change. In December 2015, an ambitious new legally binding, global agreement on climate change was agreed in Paris. The Paris Agreement aims to restrict global temperature rise to well below 2°C above pre-industrial levels, and to pursue efforts to limit the temperature increase to 1.5°C. The EPA's 2020 Vision strategy sets out our vision for Ireland's environment over the coming decade and beyond. The strategy aims to achieve results in a number of critical areas, including climate change, and is set within the framework of sustainable development. The EPA recognises that social, economic and environmental issues are interconnected and that good decisions and policy should encompass these three elements in a balanced and harmonious way. The 2020 Vision outlines six environmental goals, reflecting the main challenges identified by the EPA for Ireland as well as key issues at global and EU levels (EPA, 2011). These goals are:

- Limiting and adapting to climate change;
- Clean air;
- Protected waters;
- Protected soil and biodiversity (native plants and animals);
- Sustainable use of natural resources (water, energy and materials); and
- Integration and enforcement.

8.5 Assessment

8.5.1 Dust Monitoring Locations

Descriptions of the dust monitoring locations within and in the vicinity of the Application Site are presented in Table 8.4 below and their locations are shown in Figure 8.1. Monitoring location D3 is located to the south-west of the Application Site and the other six monitoring locations are situated around the boundary of the adjacent quarry to the north. It is of note that (with the exception of D3) the dust monitoring points are located north of the Application Site which is in the prevailing wind direction as depicted in the Oak Park data for the assessment period of 2003 to 2017. As noted in Section 8.2, five dust monitoring points (D1, D2, D3, D4 and D5) have been in operation since February 2007. A sixth location (D6) was included in the analyses in August 2010 and a seventh (D7) in May 2012.

Location	Description
D1	Located to the west of the Clonmelsh Site
D2	Located to the south-west of the Clonmelsh site
D3	Located west of the Garyhundon Site
D4	Located to the south-east of the Clonmelsh Site
D5	Located north-east of the Clonmelsh Site
D6	Located to the north of the Clonmelsh Site
D7	Located to the north of the Clonmelsh Site

Table 8.4: Description of Dust Monitoring Locations

The following dust monitoring was undertaken in the vicinity of the Application Site; these monthly results for dust deposition rates from February 2007 to June 2017 are shown in Table 8.5.

Table 8.5: Total Particulates Data Results for 19 August 2008 to 10 January 2017, Results in mg/m^2/day.

From	To	D1	D2	D3	D4	D5	D6	D7	Comments
07/02/2007	04/04/2007	12	7	48	38	37			
04/04/2007	09/05/2007	53	89	94	118	103			
09/05/2007	07/06/2007	28	28	122	43	15			
07/06/2007	12/07/2007	54	59	57	118	54			
12/07/2007	08/08/2007	36	319 *	184 *	29	103			* Contaminated
08/08/2007	19/09/2007	17	16	776 *	887	41			* Clay in sample
19/09/2007	23/10/2007	35	33	59	392 *	70			* Clay in sample
23/10/2007	29/11/2007	11	2	27	115	24			
29/11/2007	22/01/2008	23	9	38	110	26			
22/01/2008	19/02/2008	41	41	139	68	77			
19/02/2008	15/04/2008	25	22	232	72	79			
15/04/2008	08/05/2008	141	254	436 *	57	436 *			* Samples dusty
08/05/2008	10/06/2008	303	179	110	236	41			
10/06/2008	18/07/2008	16	36	323	143	78			
18/07/2008	19/08/2008	27	64	152	32	114			
19/08/2008	01/10/2008	20	83	25	232	49			
22/04/2009	09/06/2009	152	57	53	6	28			
09/06/2009	09/07/2009	13	130	196	250	20			
09/07/2009	13/08/2009	<1	110	133	146	58			
13/08/2009	22/09/2009	12	2698 *	50	14	38			* Contaminated
22/09/2009	02/11/2009	1	346	38	5	14			
25/03/2010	06/05/2010	16	155	22	290	65			
06/05/2010	09/06/2010	18	38	88	166	14			
09/06/2010	07/07/2010	8	14	209	237	61			
07/07/2010	25/08/2010	<1	20	326	45	12			
25/08/2010	12/10/2010	14	89	N-S	219	25	312		
12/10/2010	17/11/2010	N-S	N-S	N-S	N-S	N-S	559		
17/11/2010	06/01/2011	N-S	N-S	N-S	N-S	N-S	46		
06/01/2011	17/02/2011	N-S	N-S	N-S	N-S	N-S	534		
17/02/2011	25/03/2011	N-S	N-S	N-S	N-S	N-S	1862		
30/03/2011	05/05/2011	91	150	*	50	85	N-S		* Missing
25/03/2011	09/06/2011	N-S	N-S	N-S	N-S	N-S	301		
05/05/2011	09/06/2011	37	27	*	198	72	N-S		* Missing
09/06/2011	20/07/2011	40	25	14	45	48	1314		

From	To	D1	D2	D3	D4	D5	D6	D7	Comments
20/07/2011	23/08/2011	35	84	16	164	28	1549		
23/08/2011	21/09/2011	32	6	44	56	129	211		
21/09/2011	20/10/2011	4	23	38	4	42	227		
20/10/2011	21/11/2011	4	43	1	6	11	67		
21/11/2011	20/12/2011	1	12	1	1	7	100		
20/12/2011	26/01/2012	1	8	*	**	8	197		* Destroyed ** Contaminated
26/01/2012	28/02/2012	1	3	3	32	*	160		* Missing
28/02/2012	30/03/2012	24	55	13	69	N-S	784		
30/03/2012	26/04/2012	20	681	22	432	N-S	477		
26/04/2012	31/05/2012	6	51	*	97	N-S	31		* No Access
31/05/2012	28/06/2012	1	47	*	55	26	193	87	* No Access
28/06/2012	01/08/2012	3	38	*	3	12	166	197	* No Access
01/08/2012	29/08/2012	39	19	*	9	22	46	239	* Contaminated
29/08/2012	26/09/2012	<1	9	1	22	14	21	14	
26/09/2012	23/11/2012	1	18	55	5	4	89	37	
23/11/2012	19/12/2012	164	1	1	1	<1	70	10	
19/12/2012	12/03/2013	14	40	48	20	6	38	87	
12/03/2013	16/04/2013	27	14	2	46	8	18	33	
16/04/2013	16/05/2013	<1	11	<1	72	49	9	7	
16/05/2013	24/06/2013	9	32	11	35	4	246	1	
24/06/2013	24/07/2013	9	30	<1	51	23	76	34	
24/07/2013	28/08/2013	<1	45	73	77	47	23	42	
28/08/2013	24/09/2013	4	25	27	21	5	58	10	
24/09/2013	30/10/2013	47	28	5	<1	3	7	1	
30/10/2013	26/11/2013	<1	3	1	22	31	18	8	
26/11/2013	20/01/2014	2	12	3	2	2	4	2	
20/01/2014	20/02/2014	<1	<1	4	4	2	100	4	
20/02/2014	20/03/2014	1	12	16	22	1	19	5	
20/03/2014	23/04/2014	6	1	8	4	3	11	5	
23/04/2014	22/05/2014	141	33	50	54	2	59	18	
22/05/2014	11/07/2014	53	11	91	9	22	32	10	
11/07/2014	03/12/2014	26	7	15	17	28	127	16	
16/12/2016	10/01/2017	<1	10	23	1	<1	18	11	
10/01/2017	08/02/2017	47	46	11	<1	5	181	221	
08/02/2017	08/03/2017	63	63	40	<1	14	216	102	
08/03/2017	05/04/2017	11	51	78	28	33	28	127	
05/04/2017	04/05/2017	40	160	156	121	48	141	60	
04/05/2017	14/06/2017	71	2	22	11	18	43	158	

Table 8.6 [ends]: Total Particulates Data Results for 19 August 2008 to 10 January 2017, Results in mg/m2/day. (N-S – No Sample)

Dust monitoring has been carried out on behalf of the Applicant at the adjacent quarry within the ownership boundary by SLR Consulting Ltd.; an independent company providing environmental services including air quality analysis, noise and dust monitoring,

SLR have noted that the dust deposition monitoring has been in general compliance with the DoEHLG (2004) recommended threshold limits. During this period 403 samples were collected and analysed. The records from this period shown fourteen exceedances. Comments on these note two of these samples to have been contaminated with clay and one with unspecified contamination. The eleven exceedances is the equivalent of 2.7% of the samples exceeding the 350 mg/m^2/day threshold.

8.6 Impacts

8.6.1 Microclimate

No impacts associated with the microclimate are expected as a result of the proposed extraction or restoration phases of this development.

8.6.2 Climate

Residual impacts of the proposed extraction activities on air quality, microclimate and climate change are considered to be imperceptible.

8.6.3 Air Quality

8.6.3.1 Dust Emission

As noted in Section 8.6.1 approximately of 2.7% of the samples exceeded the 350 mg/m^2/day threshold for the monitoring period. The overall impact from the existing extraction operation, in terms of dust emissions, has therefore been slight to imperceptible to the local air environment.

Dust generation rates depend on the Site activity, particle size, the moisture content of the material and weather conditions. Dust emissions are dramatically reduced where rainfall has occurred due to the cohesion created between dust particles and water and the removal of suspended dust from the air. It is typical to assume no dust is generated under "wet day" conditions where rainfall greater than 0.2 mm has fallen. Information collected from Met Eireann's Oak Park Meteorological Station (available data from August 2003 to June 2017) identified that 2,558 days over the period are "wet" (approximately 50% of days in that period).

Large particle sizes (greater than 75 microns) fall rapidly out of atmospheric suspension and are subsequently deposited in close proximity to the source. Particle sizes of less than 75 microns are of interest as they can remain airborne for greater distances and give rise to the potential dust nuisance at the sensitive receptors. This size range would broadly be described as silt. Emission rates are normally predicted on a site-specific particle size distribution for each dust emission source.

8.7 Mitigation

8.7.1 Climate

The following mitigation measures will be implemented at the Application Site for the duration of future works and during final restoration activities:

- Plant not left idling, thus reducing carbon footprint of the continued development;
- Vehicles and plant will be well maintained. Should any emissions of dark smoke occur (except during start up) then the relevant machinery will be stopped immediately and any problem rectified before being used;
- Plant is serviced regularly to ensure efficient fuel consumption; and
- The Applicant will explore initiatives which are mutually beneficial to the development's environmental goals and overall corporate profitability. These include the optimisation of transport through: efficient delivery and haulage by the use of GPS route planning, ensuring loads are at the safe loading full capacity, effective fleet management and journey optimisation.

8.7.2 Air Quality

Details of mitigation measures that will be employed at the Application Site are summarised below.

- Dust monitoring will continue to be carried out monthly at the 7 No. designated monitoring locations;
- The timing of operations within the Application Site will be optimised in relation to meteorological conditions;
- Material in outdoor stockpiling will be conditioned with water to minimise dust during dry and windy conditions. In addition, stockpiles will be sited to take advantage of shelter from wind;
- Overburden mounds will be grass-seeded and planted to eliminate wind-blown dust;
- Internal haul roads will be compacted and maintained;
- A water bowser/sprayer will be available at all times to minimise dust during dry and windy conditions where it is impractical or inappropriate to operate a fixed water spray/sprinkler system;
- On site speed restrictions (<25 kph) will be maintained in order to limit the generation of fugitive dust emissions;
- All vehicles exiting the Site will exit through the existing wheelwash on the adjacent quarry site; and
- All vehicles carrying fine dry loads will be covered prior to exiting the Site.

Emissions from vehicles during the extraction and restoration phases can add to the receiving air environment. Coupled with mitigations in Section 8.8.1, the engines and exhaust systems will be regularly serviced according to the manufacturer's recommendations and maintained to meet statutory limits/opacity tests.

The adoption of the above mitigation measures will ensure that the resulting impact significance is imperceptible.

8.8 Residual Impacts

Residual impacts of the proposed extraction activities on air quality, microclimate and climate change are considered to remain imperceptible. During long spells of dry weather, dust emissions can potentially be more elevated, however dust nuisance from the operation is expected to be unlikely if the above mitigation measures are implemented during production and restoration. The overall impact from the proposed quarry, in terms of dust emissions, is **not significant** to **imperceptible** to the air environment.

In the longer term, on completion of the site restoration, the concentration of airborne dust would expected to be reduced from operational levels as the result of covering and seeding of exposed, un-vegetated soil surfaces. This will most likely constitute a minor **positive impact** for the local environment.

8.9 Cumulative Impacts

Research has shown that the greatest proportion of dust predominately deposits within the first 100 m away from the source (*The Environmental Effects of Dust from Surface Mineral Workings, Volume 1 DETR, HMSO 1995*) as they have a higher deposition velocity than finer particles (i.e. PM10 and PM2.5). The finer particles of less than 10 microns aerodynamic diameter may remain airborne for longer and therefore travel larger distances, although a large proportion may still deposit within 200 m of the source.

As discussed, the maintenance of good site practice and the above mitigation measures will ensure that there are no cumulative impacts with the existing quarry operations. Overall impacts of the greater operation will gradually reduce as

the phased restoration plan is implemented at the Site.

The asphalt plant in the adjacent Clonmelsh quarry contains a point air emission source. The asphalt plant is regulated by an Air Pollution Licence (APL 10/01), granted by Carlow County Council. Particulates are required to be continuously monitored whilst NO_x, SO_2, Volumetric Flow and Temperature are required to be monitored quarterly. With the adherence to both the Air Pollution Licence ELVs at the point source, and the TA Luft Standards at the diffuse extraction source there are no anticipated cumulative impacts between the two emission sources.

Other industries in the area include Kilcarrig Quarries Ltd and the Powerstown Landfill and Recycling Centre located ca. 1 km and 600 m, respectively, to the south-east. However, as there are no extractive industry sites located in the immediate vicinity of the open-pit mine, cumulative impacts relating to air quality and climate are not envisaged.

8.10 References

Arup Environmental, Ove Arup and Partner (1995) The Environmental Effects of Dust from Surface Minerals Workings, HMSO, London (ISBN 11 75 3186 3)

Department of the Environment, Heritage and Local Government (2004) Quarries and Ancillary Activities, Guidelines for Planning Authorities.

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

Department of Communications, Climate Action and Environment (2017) Draft National Mitigation Plan.

Environmental Protection Agency (2015) Draft - Revised Guidelines on the Information to be contained in Environmental Impact Statements.

Environmental Protection Agency (2012) Ireland's Environment 2012 - An Assessment

Environmental Protection Agency (2011) The EPA & Climate Change: Responsibilities, challenges and opportunities 2011 Update.

Environmental Protection Agency (2006) Environmental Management in the Extractive Industry: Guidelines for Regulators.

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

Environmental Protection Agency (2002) Guidelines on the Information to be contained in Environmental Impact Statement. Environmental Protection Agency, Johnstown Castle Estate, Co. Wexford.

Institute of Geologist of Ireland (2013). Guidelines for the Preparation of Soils, Geology and Hydrogeology Chapters of Environmental Impact Statements.

Irish Concrete Federation (2005) Environmental Code, 2nd Edition.

TA Luft (1986) Technical Instructions on Air Quality Control – TA Luft in accordance with Article 48 of the Federal Emission Control Law (BImSchG) dated 15th March 1974 (BGBI, I p. 721). Federal Ministry for Environment, Bonn 1986 and amendments.

9.0 NOISE & VIBRATION

9.1 Introduction

This Chapter of the EIAR assesses the likely noise and vibration impacts on the environment during the proposed extraction (and restoration) activities at the Application Site the subject of this EIAR.The primary sources of noise from this development will include traffic, intermittent noises, reversing alarms, general plant machinery and blasting.

The primary source of vibration from this development will be from the blasting of bedrock.

As the Application Site is the extension area of the existing Clonmelsh quarry, there are noise assessment thresholds in place and noise monitoring has been carried out at both the Application Site and the existing Clonmelsh quarry since February 2008. In addition, vibration monitoring is been carried out during each blast at the quarry.

9.1.1 Noise

The noise assessment, which is a review of all existing information for the Site and its environs, is based on a desk based review of the following:

- Noise monitoring undertaken by the Applicant as part of their site's environmental management programme, between February 2008 and June 2017;
- Typical noise limits associated with quarry operation as applied by the Environmental Protection Agency Guideline Document for Extractive Industries (Non Scheduled Minerals April 2006). This EPA document presents a summary of current environmental management practices for surface workings within the extractive industry. They are based on a review of current environmental management practice in Ireland, the UK and Europe. The published guidelines are intended to provide general advice and guidance in relation to environmental issues to practitioners involved in the planning, design, development, operation and restoration of surface extractive industry developments and ancillary facilities in Ireland;
- Irish Concrete Federation published their 'Environmental Code' in 2005 which outlined commitments to environmental standard across the industry for a number of impacts, including noise and vibration; and
- Department of the Environment, Heritage and Local Government (DoEHLG) – Quarries and Ancillary Activities: Guidelines for Planning Authorities, 2004. These DoEHLG Planning Guidelines are primarily addressed to statutory planning bodies. They provide an overview of environmental issues and best practice / possible mitigation measures associated with surface working of aggregates and associated ancillary activities. The guidelines are routinely referred to by practitioners involved in the planning, design, development, operation and restoration of surface workings and ancillary facilities in Ireland.

9.1.1.1 Noise assessment thresholds for the adjacent site (the extant quarry at Clonmelsh)

The primary sources of noise from this development will include traffic, intermittent noises, screening, reversing alarms, general plant and machinery, noise associated with workings at the asphalt plant and blasting.

Current noise limits for the adjacent Clonmelsh Site and its ancillary activities have been specified in the below conditions to the activitiy's licence and planning conditions. These noise levels for day and night-time operations are in agreement with the levels recommended in the EPA Guideline Document for Extractive Industries, (2006) and the Irish Concrete Federation's (ICF) Environnemental Code, (2nd Edition, 2005), (Table 9.1).

- Condition 5.26 of the Site's Air Pollution Licence (APL 10/01) at the existing Clonmelsh site to the north specifies that

activities associated with the asphalt plant shall not give rise to noise levels off site, when measured at noise sensitive locations which exceed the sound pressure limits of: 55 db(A) (15 minutes, L_{eq}) during the daytime, and 45 db(A) (15 minutes, L_{eq}) during the night-time; and

- Condition 8 of Carlow County Council Planning Permission 12/240 which specifies that activities on site shall not give rise to noise levels at sensitive locations which exceed: 55 db(A) ($L_{Aeq\ 1\ hour}$) during the hours of 08:00 to 20:00, and 45 db(A) ($L_{Aeq\ 1\ hour}$) during the hour of 20:00 to 08:00.

Parameter	Emission Standard	Basis of Standard
Noise – Day (08:00 to 20:00hrs)	<55 dB(A) $_{LAeq\ 1\ Hour}$	EPA Guideline Document for Extractive Industries, 2006
Noise – Night (20:00 to 08:00hrs)	<45 dB(A) $_{LAeq\ 1\ Hour}$	ICF Environnemental Code, 2nd Edition, 2005

Table 9.7: Noise Limits Set Out Under Appropriate Guidance

9.1.2 Vibration

The vibration assessment, which is a review of all existing information for the Site and its environs, is based on a desk based review of the following:

- Vibration monitoring undertaken by the Applicant as part of their site's environmental management programme, during each blast;
- The *"Environmental Code"* (ICF), EPA guidelines in relation to blasting activities outlining the methodology and limits to be used for vibration measurement;
- Environmental Management in the Extractive Industry, EPA;
- Good Environmental Practice in the European Extractive Industry: a Reference Guide, Centre Terre & Pierre – Tournai (Belgium);
- Vibration Monitoring undertaken by the Applicant as part of the Environmental Management System in place at the Application Site;
- Department of the Environment, Heritage and Local Government – Quarries and Ancillary Activities: Guidelines for Planning Authorities, 2004;
- The Evaluation of Human Exposure to vibration in buildings, BS 6472:1992; and
- Evaluation and measurement for vibrations in buildings, BS 7385-1:1990.

As the Application Site is an extension of the Clonmelsh quarry, vibration monitoring has been undertaken at the Application Site during each blasting event. Furthermore, vibration monitoring will continue to be carried out at the Application Site during future blasting on the proposed extension. All future monitoring results will continue to be filed as part of the Environmental Management System (EMS) and in the annual environmental report.

9.1.2.1 Vibration assessment thresholds for the Application Site

Current vibration limits for the site and blasting activities has not been specified by final planning condition but is guided by Condition 31 of the notification of decision to grant planning permission under Reg. Ref. 10/130.

The following vibration and air overpressure Emission Limit Values were specified in Condition 31. These are measurable at the nearest vibration and air overpressure sensitive locations (e.g. residential property);

- Ground-bourne vibration: Peak Particle velocity = 12mm/s, measured in any of the three mutually orthogonal directions at the receiving location (for vibration with a frequency of less than 40 Hz).
- Air overpressure: 125 dB (linear maximum peak value), with a 95% confidence limit."

Blasting is not carried out at the adjacent quarry before 0800 or after 1800 hours Monday to Friday and on Saturdays, Sundays or bank holidays.

In the case of traffic, vibration is perceptible at around 0.5 mm/s and may become disturbing or annoying at higher magnitudes. However, higher levels of vibration are typically tolerated for single events or events of short duration like blasting.

BS 7385 states that there should typically be no cosmetic damage if transient vibration does not exceed 15 mm/s at low frequencies rising to 20 mm/s at 15Hz and 50 mm/s at 40Hz and above. Both the ICF 'Environmental Code' and the Agency's 'Environmental Management in the Extractive Industry' publications specify ppv limits of 12 mm/s. Furthermore, these documents both specify that blasting should not give rise to air overpressure values at sensitive locations which are in excess of 125 dB(Lin) max peak. To allow for wind fluctuations and weather conditions, 95% of all air over-pressure levels measured at the nearest noise sensitive locations should conform to the specified limit value. No individual air over-pressure value should exceed the limit value by more than 5 dB(Lin).

9.2 Method

9.2.1 Study Area and Sensitive Receptors

From up-to-date aerial mapping there are approximately 10 residential properties within 250 m of the Application Site, and approximately a further 5 properties between 250 m and 500 m from the Site, (as depicted in Figure 9.1 and Figure 9.2).

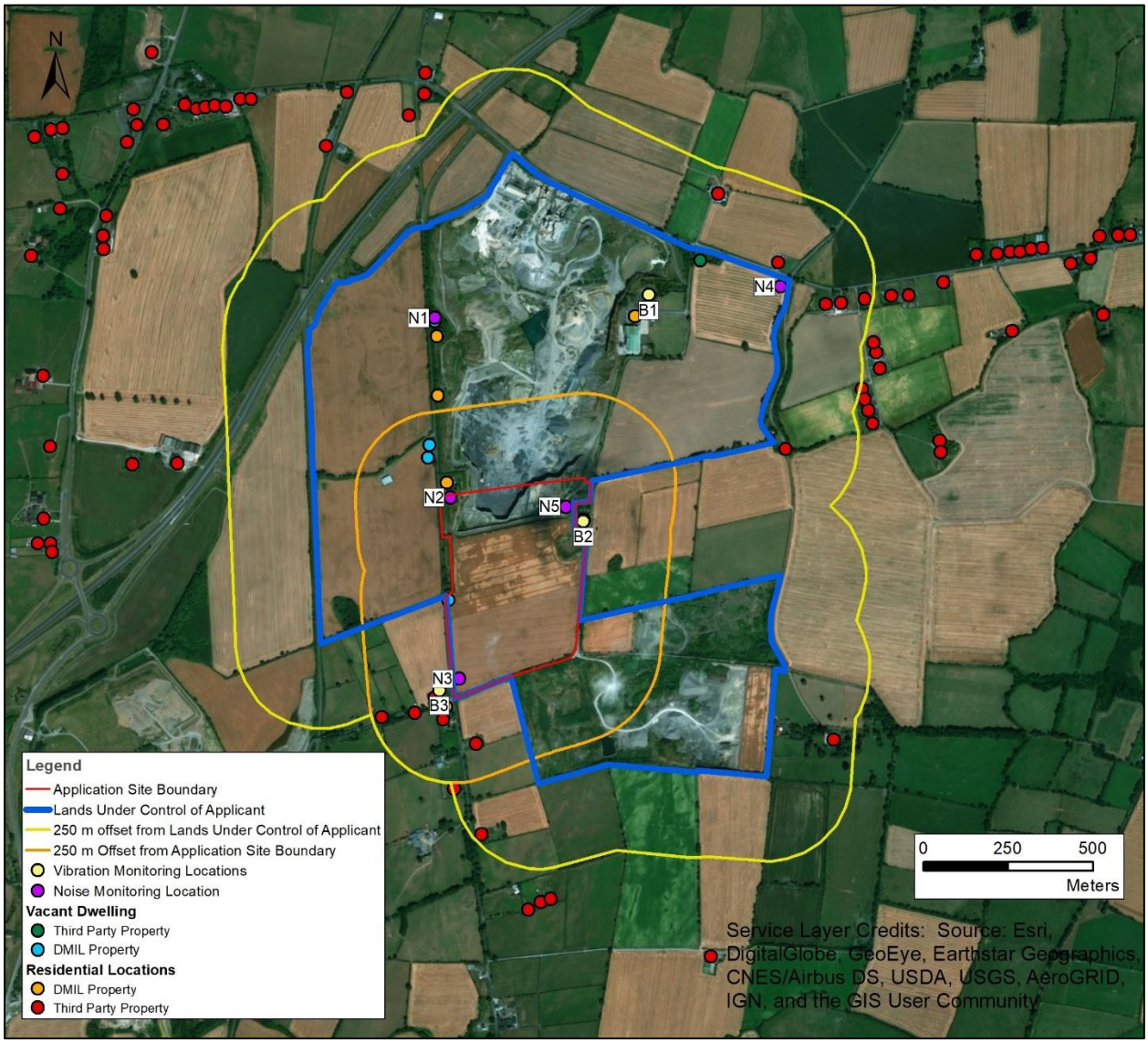


Figure 9.16: Noise and vibration monitoring locations at the Site (buffers from Application Site and Land Ownership Boundary)

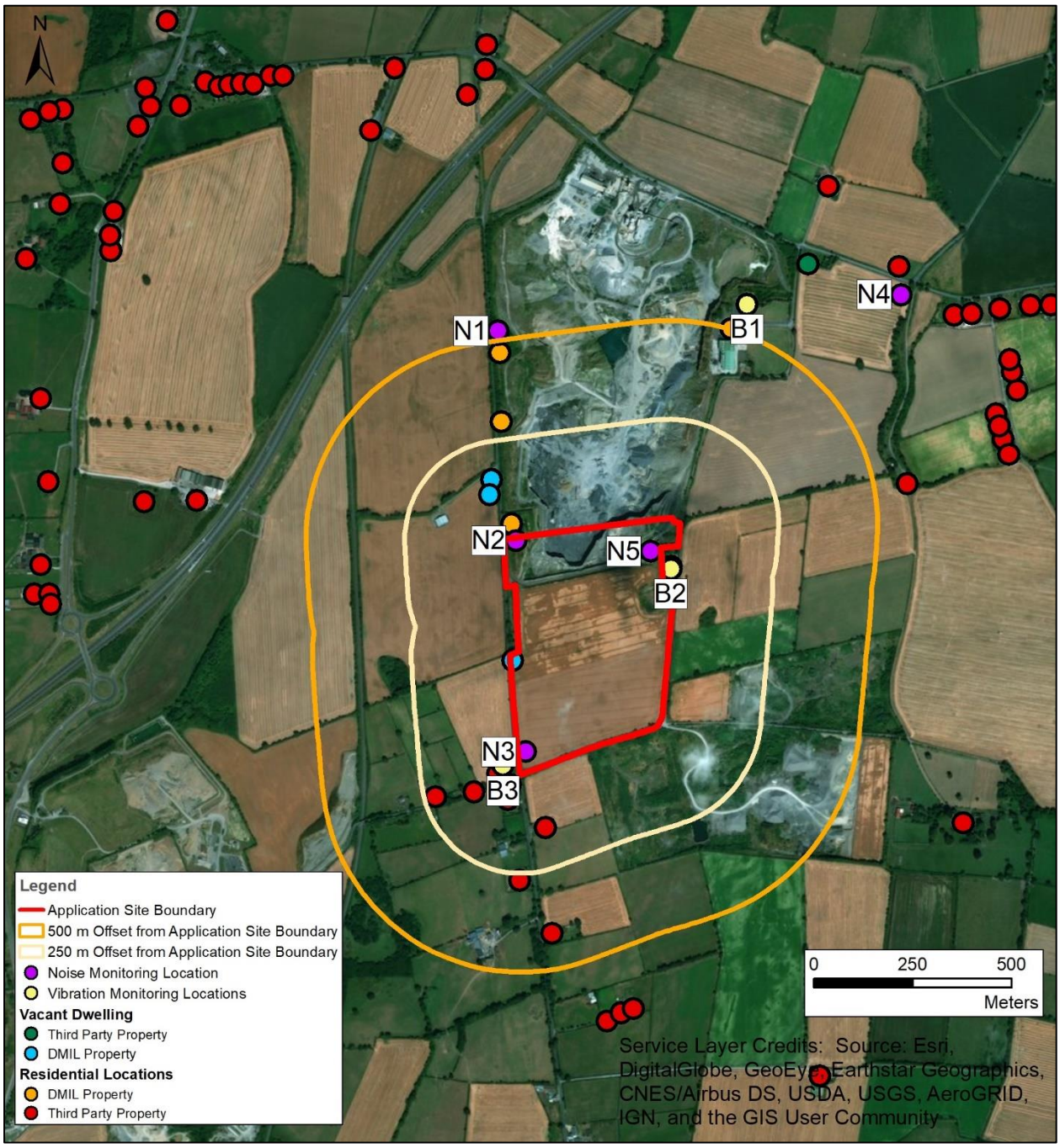


Figure 9.17: Noise and vibration monitoring locations (buffers from Application Site Boundary only)

SLR Consulting Ltd., an independent company providing environmental services including air quality analysis, noise and dust monitoring, carried out noise monitoring surveys at noise monitoring locations on behalf of the Applicant at the adjacent quarry within the ownership boundary. The Noise levels were measured in general accordance with International Standard ISO 1996: "Acoustics Description and Measurement of Environmental Noise" and the Environmental Noise Survey Guidance Document issued by the EPA.

Ground borne vibration and air overpressure levels are measured and recorded for each blast in the adjacent quarry operations. The blasting results for 2009 have been reviewed as part of this assessment. Vibration monitoring is carried out on site by Irish Industrial Explosives (IIE).

9.2.2 Evaluation Criteria

Noise Measurement Parameters

At the measurement positions, the following noise level indices have been recorded:

- LAeq,T – the A-weighted equivalent continuous sound pressure level over the measurement period T, effectively represents an "average" energy level of all the sampled levels. The ambient sound level is usually measured as an LAeq,T and is made up of all the sound in the area from sources near and far.
- LA90,T – the A-weighted noise level exceeded for 90% of the measurement period, T. This parameter is often used to describe the" background" noise level, it gives a clear indication of the underlying noise level, or the level that is almost always there in between intermittent noisy events.
- LA10,T – the A-weighted noise level exceeded for 10% of the measurement period, T. This parameter is often used to describe or identify road traffic noise.

Vibration Measurement Parameters

- Ground vibration at sensitive receptors is measured as peak particle velocity (ppv) in mm / sec. The ppv is the maximum instantaneous velocity of a particle at a point during a given time interval; and
- Air Blast (Air-Overpressure) Noise is measured in dB (Lin). Air overpressure is energy transmitted from the blast site within the atmosphere in the form of pressure waves and is generally perceived as a loud bang.

9.3 Existing Environment

Quarry related activities have been undertaken at the Site since the 1940s. The lands surrounding the Application Site can be characterised as rural in nature, with land uses in the area being generally agricultural and single-house residential. The lands contiguous to the boundaries of the Application Site are in agricultural use, predominantly agricultural lands. There are scattered residential properties in the vicinity of the site, with ribbon form developments to the east. The M9 motorway runs north-east to south-west west of the Site.

9.3.1 Potential Noise and Vibration Sources on Site

The principal potential noise impact arising from the operation of the pit in the past is increased noise nuisance. Increased noise levels is likely to have arisen on account of:

- Increased traffic along existing access roads to the facility and internally across the applicant's landholding;
- Operation of plant within the Application Site for aggregate extraction processes;
- Drilling of blast holes; and
- Excavations and earthmoving for any preliminary restoration works.

With respect to the potential for noise impacts, the key objective at the Application Site has been to manage activities in order to ensure that any discernible increase in noise levels have been prevented and the effect of any increase in noise emissions has been minimised.

The only activity undertaken onsite which have potential to have given rise to ground borne vibration in the past is the blasting of bed rock. The activity of mechanical rock breaking using hydraulic excavator attachments has been considered. However, the rock breaking can give rise to relative levels of ground vibration in close proximity to the breaking area, but

the vibration tends to contain relatively little energy in the lower frequencies at which buildings and their occupants are most vulnerable. Furthermore, higher frequencies attenuate more rapidly than low frequencies, thus minimising the impact zone. For this reason, most vibration guidance documents such as *British Standard BS 5228-1:2009 Code of practice for noise and vibration control on construction and open sites – Part 2: Vibration* (2009) ignore rock breaking vibration.

9.3.2 Monitoring Locations

Table 9.1 below describes the noise monitoring locations at the Application Site, these have also been included on Figure 9.1.

Location	Description
Noise	
N1	Located at the residence to the western boundary of the Clonmelsh extraction area.
N2	Located at the residence to the western boundary of the existing extraction area.
N3	Located to the south of the Clonmelsh site and west of the Garyhundon Site.
N4	Located at the north-east corner of the Clonmelsh site, and approximately 1km north of the Garyhundon site.
N5	Located just south of the Clonmelsh extraction area and north of the Garyhundon site.
Vibration	
Clonmelsh House B1	Located east of the Clonmelsh site.
Monks Residence B2	Located 100 m south of the Clonmelsh site and approximately 300 m north of the Garyhundon site.
McGrath Residence B3	Located approximately 250 m west of the Garyhundon site.

Table 9.1: Description of Noise Monitoring Locations

9.3.3 Results from assessment period

Noise

As highlighted in Table 9.2 below, there have been a number of exceedances above the 55 dB(A) daytime threshold. SLR have determined in their reporting that the high noise levels recorded at all locations were mainly due to external traffic noise sources on the adjacent public roads as shown by the elevated L_{A10} readings, (as specified in monitoring reporting and previous . An additional noise monitoring survey was carried out on 05 March 2010 to assess the background noise levels arising from traffic on the external road network (when the quarry was not operational), noted similar results to the fully operational facility. This additional monitoring survey confirms that the high noise levels in the vicinity of the quarry are due to external noise sources (traffic on the external road network). There was no significant decrease in noise levels observed during the monitoring period when the quarry was not operational.

Ambient noise in the vicinity of the Application Site would have increased from the period of 2006 to present with the construction of the M9 Motorway and subsequent traffic noise.

Vibration

There has been no exceedances in peak particle velocity in blasts monitored in Table 9.3. Air Overpressure exceeded the limit on two occasion only, on 16 June 2009 and 03 April 2009, however it has been noted that this indicates a compliance within a 95% confidence limit.

Table 9.2: Summary of Noise Results at Clonmelsh Quarry for Assessment Period 2008 to 2017 (dBA)

N1	Date	27/02/2008	15/04/2008	05/11/2008	01/04/2009	09/06/2009	09/07/2009	27/11/2009
	Time	09:18 – 10:18	08:54 – 09:54	09:58 – 10:58	12:01 – 13:01	10:05 – 11:05	11:40 – 12:40	10:10 – 11:10
	$L_{Aeq, 1 hour}$	65.2	65.0	60.9	65.3	55.3	60.8	57.4
	$L_{A10, 1 hour}$	65.2	68.2	58.4	61.2	55.8	56.5	56.6
	$L_{A90, 1 hour}$	42.9	43.2	42.8	41.7	41.6	43.8	44.3

N2	Date	27/02/2008	15/04/2008	05/11/2008	01/04/2009	09/06/2009	09/07/2009	27/11/2009
	Time	10:21 – 11:21	09:58 – 10:58	11:02 – 12:02	10:53 – 11:53	11:11 – 12:11	10:37 – 11:37	11:15 – 12:15
	$L_{Aeq, 1 hour}$	68.6	66.5	64.9	60.3	65.5	55.3	68.0
	$L_{A10, 1 hour}$	63.6	61.3	60.4	59.7	65.3	56.5	66.5
	$L_{A90, 1 hour}$	41.6	38.0	42.9	37.9	50.1	43.0	47.2

N3	Date	27/02/2008	15/04/2008	05/11/2008	01/04/2009	09/06/2009	09/07/2009	27/11/2009
	Time	11:25 – 12:25	14:33 – 15:33	12:08 – 13:08	09:47 – 10:47	12:50 - 13:50	12:44 – 13:44	12:57 – 13:57
	$L_{Aeq, 1 hour}$	57.9	65.5	47.8	55.7	61.0	58.9	55.3
	$L_{A10, 1 hour}$	60.1	64.3	41.9	58.1	57.2	61.0	58.2
	$L_{A90, 1 hour}$	39.7	45.9	32.5	36.7	43.7	40.5	41.3

N4	Date	27/02/2008	15/04/2008	05/11/2008	01/04/2009	09/06/2009	09/07/2009	27/11/2009
	Time	12:31 – 13:31	15:40 – 16:40	13:42 – 14:42	13:22 – 14:22	14:10 – 15:10	09:26 – 10:26	14:07 – 15:07
	$L_{Aeq, 1 hour}$	65.3	67.1	68.9	57.3	67.9	66.1	69.6
	$L_{A10, 1 hour}$	64.7	65.5	68.3	58.6	66.7	63.4	69.6
	$L_{A90, 1 hour}$	43.4	43.4	36.7	36.5	41.3	37.2	45.4

N5	Date	-	-	-	-	-	-	-
	Time	-	-	-	-	-	-	-
	$L_{Aeq, 1 hour}$	-	-	-	-	-	-	-
	$L_{A10, 1 hour}$	-	-	-	-	-	-	-
	$L_{A90, 1 hour}$	-	-	-	-	-	-	-

Table 9.2 continued: Summary of Noise Results at Clonmelsh Quarry for Assessment Period 2008 to 2017 (dBA)

N1	Date	22/01/2010	05/03/2010	04/04/2012	27/09/2012	03/12/2014	08/02/2017	16/06/2017
	Time	08:44 – 09:44	17:03 – 17:33	08:03 – 09:03	09:01 – 10:01	14:02 – 15:02	08:29 – 09:29	09:24 – 10:24
	$L_{Aeq, 1\ hour}$	63.7	65.4	62	60.8	61	64	51
	$L_{A10, 1\ hour}$	63.2	63.7	63	59.3	63	64	52
	$L_{A90, 1\ hour}$	51.2	51.4	50	52.0	48	51	41

N2	Date	22/01/2010	05/03/2010	04/04/2012	27/09/2012	03/12/2014	08/02/2017	16/06/2017
	Time	11:27 – 12:27	17:42 – 18:12	09:06 – 10:06	10:03 – 11:03	11:31 – 12:31	09:33 – 10:33	10:30 – 11:30
	$L_{Aeq, 1\ hour}$	68.0	68.9	63	62.1	64	65	49
	$L_{A10, 1\ hour}$	66.0	67.6	60	56.1	62	61	51
	$L_{A90, 1\ hour}$	44.3	49.9	47	49.3	37	47	41

N3	Date	22/01/2010	05/03/2010	04/04/2012	27/09/2012	03/12/2014	08/02/2017	16/06/2017
	Time	10:15 – 11:15	17:01 – 17:31	10:09 – 11:09	11:06 – 12:06	10:28 – 11:28	10:35 – 11:35	11:35 – 12:35
	$L_{Aeq, 1\ hour}$	56.8	58.9	52	48.0	58	53	65
	$L_{A10, 1\ hour}$	57.6	62.0	53	49.0	57	55	61
	$L_{A90, 1\ hour}$	44.6	42.6	43	43.5	50	37	36

N4	Date	22/01/2010	05/03/2010	04/04/2012	27/09/2012	03/12/2014	08/02/2017	16/06/2017
	Time	12:32 – 13:32	17:40 – 18:10	12:17 – 13:17	13:45 – 14:45	8:15 – 9:15	12:43 – 13:43	12:46 – 13:46
	$L_{Aeq, 1\ hour}$	67.7	66.6	63	68.4	57	58	58
	$L_{A10, 1\ hour}$	66.8	68.0	64	66.3	61	59	57
	$L_{A90, 1\ hour}$	37.2	44.0	44	43.3	48	43	31

N5	Date	-	-	04/04/2012	27/09/2012	03/12/2014	08/02/2017	16/06/2017
	Time	-	-	11:14 – 12:14	12:37 – 13:37	9:23 – 10:23	11:41 – 12:41	13:55 – 14:55
	$L_{Aeq, 1\ hour}$	-	-	51	51.4	45	44	54
	$L_{A10, 1\ hour}$	-	-	53	55.6	47	45	53
	$L_{A90, 1\ hour}$	-	-	47	45.1	42	43	50

Table 9.38: Summary of Vibration Results at Clonmelsh Quarry for Assessment Period 2009

Date	Location	Peak Particles Velocity (mm/sec)			Air Over Pressure dB(Lin)$_{max.peak}$)
		Tran	Vert	Long	
20/01/2009	Clonmelsh House B1	2.3	1.2	2	119.7
20/01/2009	McGrath Residence B3	1.3	1.5	1.5	106
03/03/2009	McGrath Residence B3	1.4	1.4	2.3	109
03/04/2009	Clonmelsh House B1	1.8	1.0	2.2	130
03/04/2009	McGrath Residence B3	2.0	3.1	3.0	104
12/05/2009	McGrath Residence B3	2.2	2.3	1.8	107
12/05/2009	Clonmelsh House B1	2.92	2.6	2.16	117.8
16/06/2009	Clonmelsh House B1	1.27	1.14	1.84	125.7
16/06/2009	McGrath Residence B3	2.0	2.2	2.2	102
28/07/2009	McGrath Residence B3	1.84	2.03	0.88	103.5
28/07/2009	Clonmelsh House B1	1.2	1.2	1.8	124
03/09/2009	Monks Roadway B2	*	*	*	*
03/09/2009	McGrath Residence B3	1.1	1.3	1.1	108
08/10/2009	Monks Residence B2	7.6	10.7	10.6	119
08/10/2009	McGrath Residence B3	1.6	1.2	1.4	107
06/11/2009	McGrath Residence B3	2.48	1.33	1.04	107.5
04/12/2009	Monks Gate B2	5.91	5.4	4.95	114.2
04/12/2009	McGrath Residence B3	0.57	0.64	0.45	108

* Vibration from the blast was too low to trigger the monitor

9.3.4 Comments and conclusions from noise monitoring reports during assessment period 2014 to 2017

SLR Consulting Ltd concluded for all events in this period that the noise levels recorded at N1, N2, N3 and N4 were mainly influenced by external traffic noise sources on the adjacent public roads and on the M9 motorway as shown by the elevated LA10 readings. Noise levels recorded at location N5 (the closest existing noise monitoring location to the Application Site) were more representative of adjacent quarry activity as the noise levels at this location were not influenced by external noise sources at the time of monitoring. The values measured at N5 have remained under the 55 dB(A) level as specified in Condition 31 of the adjacent quarry's notification of decision to grant by Carlow County Council (Reg. Ref. 10/130); and those levels specified by the EPA and the ICF guidelines. Taking into account the external traffic noise sources, SLR noted that the noise monitoring results indicate that the noise emissions from the adjacent quarry has complied with the daytime noise threshold limit of 55 dB(A), measured at 'sensitive locations' recommended in Quarries and Ancillary Activities: Guidelines for Planning Authorities (DoEHLG, 2004):

- An LAeq,1hr value of 55 dB(A) - Daytime, at the nearest noise sensitive location; and
- Due to the inactivity at the quarry during the night it can be considered to comply with an LAeq,15min level of 45 dB(A) - Night time, at the nearest noise sensitive location.

9.3.5 Comments from vibration monitoring results

A review of the blast monitoring results from 2009 indicates compliance with the DoEHLG (2004) recommended threshold limits for groundborne vibration of 12 mm/sec (peak particle velocity) and for air overpressure of 125 dB

(Lin) with a 95% confidence limit.

All blasts are monitored, with records kept detailing the results of vibration, air over pressure, and the blast design as part of the Environmental Management System (EMS) implemented at the Clonmelsh quarry and will continue to be monitored and recorded for the Application Site.

It has been reported that current site practices are to review the scope of the blast monitoring annually, and assessed if amendments are required in light of prior results.

9.4 Mitigation

Noise mitigation measures and control will be adopted into site management, working practices and site design. The effective application of these mitigation measures will be monitored at the Application Site. Through their implementation on site it is considered that the extraction and ancillary activities will have no significant impact at nearby NSRs. Measures implemented at the site to reduce potential noise impacts will include:

- The maintenance of haul routes and site surfacing to ensure rattles and other impulsive noises associated with machinery on rough terrains are minimised;
- Undertaking activities and the routing of haul roads within the site in a manner where landforms and berms offer noise attenuation benefits to noise sensitive locations. This will be included the screening and processing of materials within the base of the quarry, to ensure noise attenuation;
- Noise minimisation practices for machinery operators which are currently employed at the adjacent quarry include; elimination of unnecessary revving of engines, reduction in drop heights of materials in to stockpiles and truck, and turning off idling plant when not in use;
- Proper upkeep of machinery and plant, including lubrication of moving parts and the maintenance of exhaust silencers and engine covers, with damaged components being replaced as soon as practicable;
- A 'good neighbour' policy is adopted in adjacent quarry site practices and will be maintained at the proposed development. Site Management are conscious of noise emissions during activities. This has been evident as the site, over the licensee occupation of the adjacent quarry from the period for 2014, has not received any noise complaints from neighbouring dwellings or businesses.

The following controls will be implemented at the Application Site during blasting to ensure that Ground Vibration and Air Overpressure Noise is minimised and kept within the specified guideline limits:

- Laser profiling will been used to establish an accurate geometry of the quarry face, thereby enabling the optimum burden and spacing to be applied for the blasts;
- All blasts will be initiated by an electronic detonation system, which is the latest technology available to fire a blast;
- Blast ratios will be optimised to ensure that the maximum amount of explosive on any one delay, the maximum instantaneous charge has been optimised so that the ground vibration levels are kept below those specified;
- Explosive charges will be properly and adequately confined by using a sufficient quality of 20 mm aggregates for stemming, as they provide the best particle interlock;
- Adequate confinement of all charges by means of accurate face survey and the subsequent judicious placement of explosives;

- No blasting will be carried out at weekends or public holidays;
- No exposed detonating fuse will be used in blasting;
- All blasts will be measured (ground vibration & air overpressure) in the area of at least one of the sensitive residence to ensure compliance with the aforementioned limits. This information will be used to employ modifications to subsequent blast designs, if required;
- Notice of all blasts will be given to local residents by means of a phone call, text message or letter drop prior to the blast taking place;
- All monitoring equipment will be calibrated at the appropriate intervals to ensure that peak particle velocity and air overpressure generated from each blast are accurately measured;
- Blasting at the Application Site will only be carried out by professionally trained blast engineers; and
- Drilling contractors will complete a log for every borehole drilled.

9.5 Indirect Impacts

For the EIAR assessment period there are no anticipated indirect impacts associated with noise or vibration at the Site.

9.6 Residual Impacts

Any impacts resulting from quarry related activities at the Application Site are considered slight based on historical monitoring at the adjacent quarry site. Noise monitoring reports for the 2012-2017 period detail that quarry activities in the vicinity of the Application Site are audible at low levels at some locations, however these are concluded to be in compliance with the appropriate conditions. The overall noise impact as a result of the proposed development is deemed to be not significant and it is considered that there will be no detrimental effect from noise at the Application Site on the local environs.

From the implementation of the above mitigation measures at the adjacent site during blasting, there have been no residual impacts from vibration at the Site. There are no anticipated residual impacts from vibration once current site practices are maintained and periodically reviewed.

9.7 Cumulative Impacts

The predicted vibration levels from the proposed development to the closest Sensitive Receptors will not be any greater than currently exists in the vicinity and as such there will not be any cumulative impact from quarry activities. It has been noted that noise emanating from the existing quarry operations are considerably lower than the background noise levels arising from traffic and the local road network.

10.0 MATERIAL ASSETS & TRAFFIC

10.1 Introduction

The development the subject of this EIAR consists of further extraction of a quarry and all related ancillary site works over an application site area of 21.9 ha. with excavation over an area of 13.6 ha at Powerstown, Nurney, Co. Carlow.

In accordance with section 1.2.4 of this report an EIAR is a report of the direct and indirect significant effects, if any, on the environment, which can reasonably be expected to occur because the proposed development.

The objective of this chapter is therefore to identify and assess the significant effects that can be reasonably expected to occur in respect of material assets and the existing road network.

10.2 Description of Development

The proposed continued extraction site at Powerstown is to extend from the existing southern face of the quarry at Clonmelsh, Nurney, Co Carlow itself the subject of an existing application for substitute consent to An Bord Pleanála under ref. ABP-300034-17 (Quarry) concurrent with an application for substitute consent for a plant area under ref. ABP-30037-17 (Plant Area).

The proposed continued extraction site is further bounded by local roads on its remaining 3 sides. The L3045 bounds the site to the east and south and the L3044 to the west and further south.

The proposed continued extraction area is estimated to hold approx. 10M tonnes of limestone reserve to be extracted in 4 phases over 2 benches to a final proposed excavation depth to match that of the existing quarry at Clonmelsh, Nurney, Co. Carlow at 25AOD.

Ancillary site works do not include new access to public roads or services as it is intended to continue to use the existing facilities and access to the L3050 at the plant area at Clonmelsh, Nurney, Co. Carlow itself the subject of a concurrent application for substitute consent to An Bord Pleanála under ref. ABP-300037-17. The proposal the subject of this EIAR will effectively replace the extant traffic as this proposal is to replace and thus continue extraction for the large quarry unit.

Extraction rates will be in line with market demand. Current extraction is at a rate of 180,000 to 200,000 tonnes per annum and is expected to remain at this rate for the short term with uplift thereafter. Extraction rates have been declared at maximum rates of 1M tonnes per annum in previous submissions by former operators of the quarry.

Therefore a life of at least 20 years is sought in the application for further extraction of a quarry under S.37L of the Planning & Development Act, 2000 (as amended).

This section of the EIAR should be read in conjunction with Chapter 10.0 of the rEIAR required to be prepared to accompany applications for substitute consent ABP-300034-17 (Quarry) and ABP-300037-17 (Plant Area). Chapter 10.0 of the rEIAR included a review of extant and historic traffic and transportation conditions, including existing public roads accesses at the Garyhundon and Clonmelsh quarry units (both the subject of subsite consent under ABP-300034-17).

10.2.1 Material Assets, excluding Roads & Traffic

As outlined at Chapter 2.0 of this EIAR the subject site contains no built development and no development beyond extraction and landscaping in the form of screening bunds during the operational phase of development (Phases 1 to 4 at Chapter 3.0) and restoration (Phase 5 at Chapter 3.0) is proposed.

The extraction void proposed requires the movement of Clonmelsh Stream further southward from its existing east – west orientation across the northern part of the subject site assessed at Chapter 7.0 of this EIAR. The void further necessitates the removal of a recorded monument (RMP CW12 093) that has already been preserved by record and the protection by offset from another monument (RMP CW12 202). These recorded monuments are considered at Chapters 3.0 and 4.0 and assessed at Chapter 11.0 of this EIAR.

The subject lands are not currently oversailed by telecommunications or power lines. No access to either is required as part of the development as all plant, machinery and communications on the subject site will be mobile as set out at Chapter 3.0 of this EIAR.

Existing staff welfare facilities at the plant area in Clonmelsh will be used by proposed site staff obviating the requirement for waste or potable water management proposals.

10.2.2 Roads & Traffic

No access to the public roads is required from the subject site at *Powerstown*. It is proposed to use the existing site entrance at *Clonmelsh* that services the extant quarry unit and plant area the subject of substitute consent applications with rEIAR (ABP-300034-17 (Quarry) and ABP-300037-17 (Plant Area)). In this way all traffic arising on the subject lands will be as a result of the transportation of extracted material and staff internal to the large quarry unit i.e. transportation will be confined to haul routes from the subject site to the plant area at Clonmelsh.

There are two main accesses from the site onto the public road; one at *Clonmelsh* and one at *Garyhundon*:

- *Clonmelsh*: The main access for Clonmelsh is onto the L3050, located near the centre of the northern site boundary, and serves the 'plant site' and Clonmelsh. This will serve as the public roads access for the proposed development.
- *Garyhundon:* The main access for Garyhundon is onto the L3045, located to the centre of the western boundary. Material recovered from Garyhundon was predominantly processed at the Clonmelsh plant site, and thus the public road haul route from Garyhundon would have been to Clonmelsh for storage/processing of the sand and gravel recovered there from the 1970s onward.

10.3 Methodology

In order to meet the objective of this Chapter, to identify and assess the significant impact the EIAR development may have on material assets and the existing road network the baseline is established for each of the infrastructure services (material assets) required to be used in the development. An assessment of the significant effects on each follows with recommended mitigation measures where appropriate.

It is noted that in relation to roads and traffic that a Traffic and Transposition Assessment [TTA] has been prepared to identify, assesses and mitigate significant effects.

10.4 Existing Environment

The lands the subject of this EIAR, whose imports and exports, including staff vehicles are proposed to enter and leave the site via the Clonmelsh entrance onto the L3050 are located approximately 7.5km south of Carlow Town and 2km east of the M9.

The L3044 bounds the subject lands to the west and the L3045 bounds the lands to the east and south.

The M9 is the main arterial road in the area.

The Dublin – Waterford Rail line lies to the 500 metres west of the subject lands.

Figure 10.1 updates figure 10.2 of the rEIAR for Clonmelsh and Garyhundon by overlaying the site the subject on this EIAR. Figure 10.1 presents Ordnance Survey mapping from the 1960s and aerial photography from 1995 and 2010 to illustrate the locations of the above primary pieces of transport infrastructure and the appearance of the lands over that time period.

10.5.1 Power & Telecommunications

As noted at section 10.2 the subject lands do not hold a power source nor are they oversailed by power or communications lines. Access to neither is required in the proposed development as existing facilities at Clonmelsh will be relied upon as set out at Chapter 3.0.

10.5.2 Water & Wastewater

As noted at section 10.2 the subject lands do not hold waste or potable water management systems, nor are either required in the proposed development as existing facilities at Clonmelsh will be relied upon as set out at Chapter 3.0.

As also noted at section 10.2 the extraction void proposed requires the movement of Clonmelsh Stream further southward from its existing east – west orientation across the northern part of the subject site assessed at Chapter 7.0 of this EIAR. Chapter 7.0 of the EIAR also assess the implications and impacts of the proposed below groundwater extraction depth of 25 AOD to match the void extant at Clonmelsh and together with likely surface water arising undertakes a water balance for the proposed development.

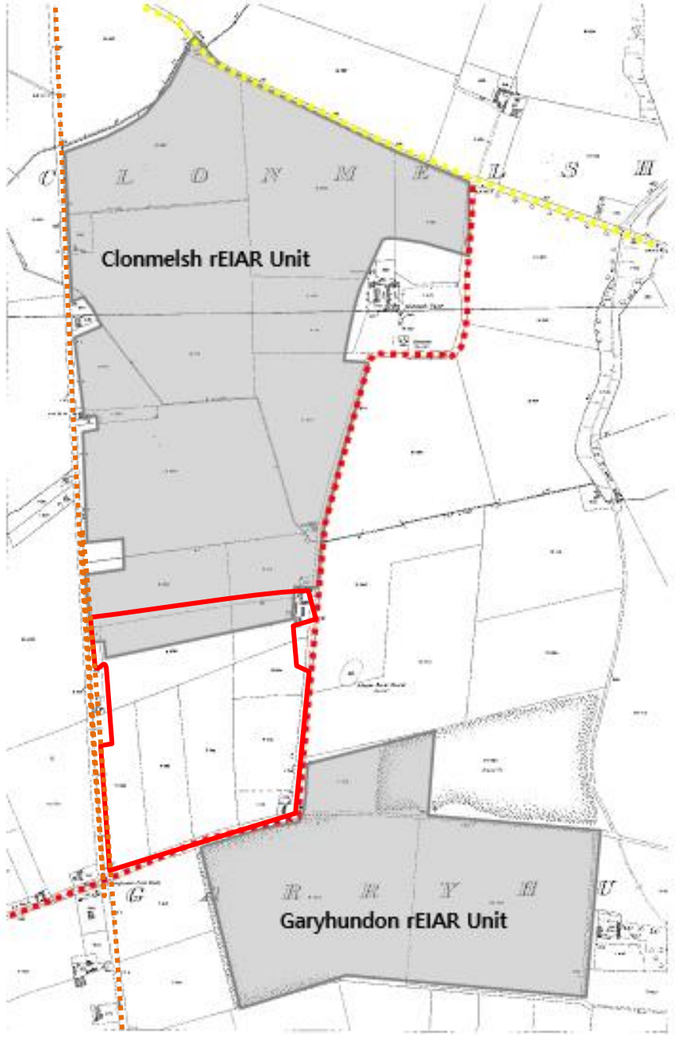
10.5 Traffic & Transportation Assessment [TTA]

The TTA is prepared by PMCE ltd. consulting traffic engineers and is contained in its entirety as Appendix 10.1 to this EIAR.

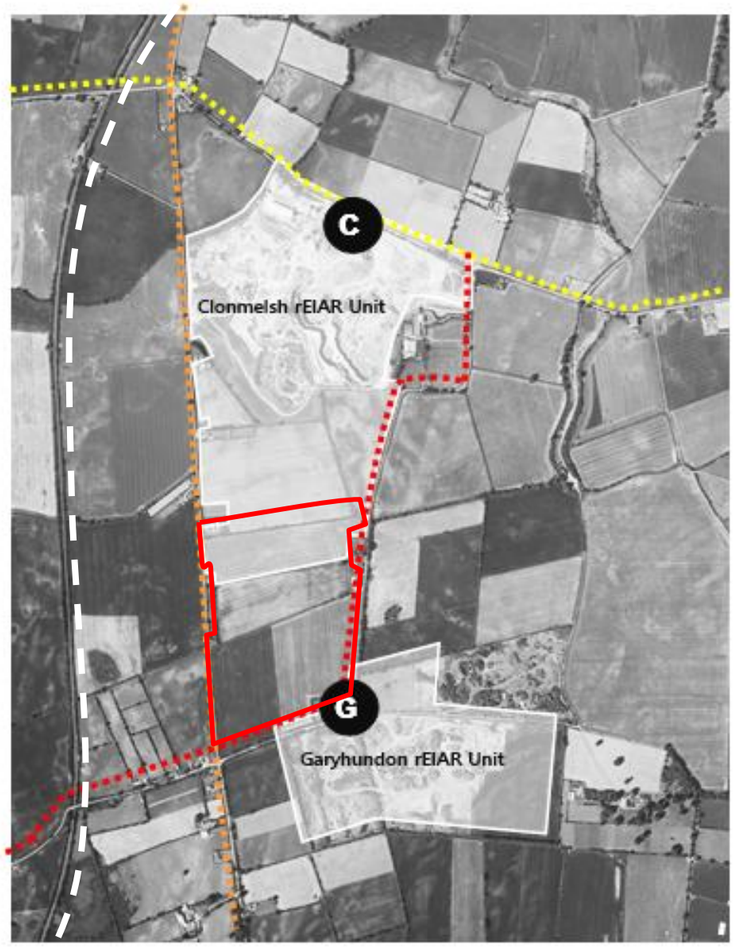
The objective of the TTA is to examine the traffic implications associated with the continuation of existing extraction works at Clonmelsh quarry into lands at Powerstown in terms of its integration with existing traffic in the area. The TTA determines and quantifies the extent of trips generated by the development, and the impact of operational performance of such trips on the local road network.

The assessment is supported by desktop review of historic information, including Chapter 10.0 of the Clonmelsh & Garyhundon rEIAR, site visits and a traffic count carried out 7th November 2017.

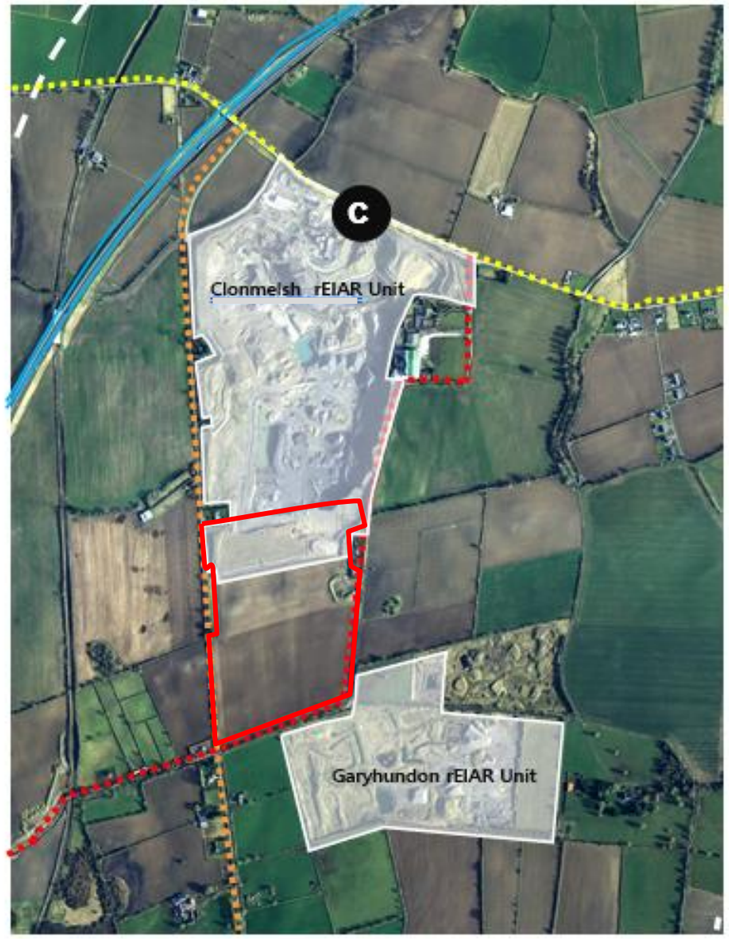
Figure 10.1 Receiving Environment progression of surrounding infrastructure and quarry development from 1960s



6" OSI Map (Surveyed 1906, revised 1960s, levelled 1940s)



OSI Aerial Image June 1995



OSI Aerial Image April 2010

KEY

Areas shown shaded correspond with Clonmelsh and Garyhundon rEIAR land units

L3050

L3044

L3045

M9

Dublin – Waterford Intercity rail line

Approximate location of main *Clonmelsh* entrance

Approximate location of main *Garyhundon* entrance

Further quarry area at Powerstown subject of current EIAR

The TTA relies on the discerned and observed traffic generation submitted with the rEIAR in order to develop thresholds of observed and expected traffic generation. In this regard, the observed extraction rate of Clonmelsh quarry in 2017 was 180,000 to 200,000 tonnes. The site imports material in order to manufacture some if the concrete and asphalt products from the Clonmelsh plant area (substitute consent application ABP-300037-17 (Plant Area)) at a rate of 40:60 (extracted on site : imported). The proposed development aims to replace the current on site extracted supply currently obtained from Clonmelsh and Garyhundon quarry units the subject of application for substitute consent under ABP-300034-17 (Quarry).

10.6 Mitigation Measures

The mitigation measures proposed as part of this development are here set out.

12.6.1 Power Supply & Telecommunications

No works proposed. No mitigation required.

12.6.2 Water & Wastewater

Implement the mitigation measures set out at Chapter 7.0 as Clonmelsh Stream is to be realigned as part of this proposal.

10.6.3 Roads & Access

No public roads access is proposed. As set out at section 10.5 above the current and expected road network is of sufficient capacity to accommodate the development whose traffic generation onto the public road network is to be by the extant access at Clonmelsh onto the L3050. The Clonmelsh access has been assessed in the TTA at Appendix 10.1 and found to be of sufficient width onto roads of adequate alignment to provide safe access for vehicles to the EIAR lands. No mitigation required.

10.6.4 Road Condition

The local public road network is maintained by Carlow County Council. No mitigation required beyond contribution for roads infrastructure to aid in public road upkeep.

All HGV vehicles entering and leaving the subject site are either covered in the case of aggregates or enclosed in the case of hot and cold products (asphalt, concrete). This avoids debris falling onto the local road pavement.

A water browser is available on the Clonmelsh site to dampen haul routes and faces during dry weather to avoid dust blow to sensitive receptors, including public road users.

10.6.5 Signage

The L3050 in the vicinity of the quarry currently has a speed limit of 80 km/h. Warning signs are currently in place along the L3050 approaching the Clonmelsh entrance advising motorists to the presence of a quarry entrance ahead. This signage will be maintained for the life of the proposal.

Within the site boundaries a speed limit to less than 15 km/h is strictly enforced and augmented by signage. There is also directional signage within to avoid conflict of visitors, haulage and plant traffic. Haul routes within the lands are marked via signage.

10.6.6 Visitors

There is no access for visitors' vehicles past the visitor car parking at the office at the Clonmelsh site entrance and thus no unsupervised visitor access to the subject lands. No mitigation proposed.

10.6.7 Parking Provision

There are 8 no demarcated car parking spaces on site adjacent to the office at Clonmelsh for visitors and office staff. Other parking for staff private vehicles is provided at the maintenance shed that holds sufficient turning and parking space for 10 no. cars and light vehicles. The subject site contains no dedicated truck parking facilities and none are in view of the operations taking place within the subject site boundaries; all trucks entering and leaving the site are transporting material onto the public road network. No parking is be required or porsoped as part of the proposed development. No mitigation proposed.

10.6.8 Pedestrians

Avoidance mitigation proposed. Pedestrian access to the subject site will be forbidden.

10.6.9 Cyclists

Avoidance mitigation proposed. Bicycle access to the subject site will be forbidden.

10.6.10 Public Transport

There is a regular Bus Éireann commuter service in operation in the vicinity of the quarry. But, it is considered that this development is, and was, neutral in terms of public transport as staff and product use dedicated private, not public transport modes. No mitigation proposed.

10.6.11 Access for People with Disabilities

Due to the nature of the development and limited site access for visitors it not considered necessary to provide specific disabled access facilities on the subject site. Workers who have a disability will have had or be provided with adapted equipment.

10.7 Impacts

10.7.1 Material Assets, excluding Roads & Traffic, Impacts

As outlined at Chapter 2.0 of this EIAR the subject site contains no built development and no development beyond extraction and associated landscaping in the form of screening bunds during the operational phase of development (Phases 1 to 4 at Chapter 3.0) and restoration (Phase 5 at Chapter 3.0) is proposed.

As noted at section 10.2:

- No built development beyond extraction are proposed on the subject lands
- The movement of the Clonmelsh stream as assessed at Chapter 7.0 of this EIAR is considered as a secondary, permanent effect on this surface water material asset. As the function of the stream will remain in place during operation and after closure phases of the development this effect is considered not significant and neutral.
- The subject lands are not currently oversailed by telecommunications or power lines. No access to either is required as part of the development as all plant, machinery and communications on the subject site will be mobile as set out at Chapter 3.0 of this EIAR. No anticipated effects.
- Existing staff welfare facilities at the plant area in Clonmelsh will be used by site staff obviating the requirement for waste or potable water management proposals. No anticipated effects.

10.7.2 Road Impacts

The TTA at Appendix 10.1 assesses traffic at opening year (2018) and + 5 and +15 years in accordance with TII guidance and in accordance with the predicted reserve lifespan of the proposed extraction site of around 20 years.

Link and junction capacity analysis in the TTA find that the extant local road (L3050) access at Clonmelsh and associated junctions have sufficient capacity to continue to accommodate the proposed development traffic. As the traffic expected to be generated replaces that which currently arises there is no significant direct effect on the baseline traffic environment.

10.8 Residual Impacts

After extraction of the subject lands the restoration proposal at phase 5 of chapter 3.0 and drawing no. 5 submitted with the application will be implemented. The proposed development relies on the Clonmelsh plant and quarry areas to process extracted material and provide welfare facilities that will close when the extractive life of the site ends.

An indirect residual impact will be the removal of quarry and associated product generated traffic on the local rod network. However this impact is considered slight to negligible having regard to the low elves of traffic on links and junctions discerned in the TTA.

10.9 Cumulative Impacts

The development proposes to use material assets outside of its application site boundaries in the form of the welfare, plant and entrance facilities at Clonmelsh. These are the subject of a substitute consent application (ABP-300034-17 (Quarry) and ABP-300037-17 (Plant Area)). The extraction proposed from the subject lands will replace that recovered at Clonmelsh and Garyhundon. Therefore, no significant cumulative impact on material assets is anticipated for reason of the proposed development proposing continuity of extracted reserve and not additional reserve thus no alteration to existing material asset baseline environment is anticipated.

11.0 CULTURAL HERITAGE

11.1 Introduction

This report presents the results of an Environmental Impact Assessment Report for an extension to an existing quarry in the townland of Powerstown, Co. Carlow. The adjacent limestone quarry at Clonmelsh & Garyhundon was in operation from the 1950's. The site consists of an area covering 21.9 hectares which is in use for tillage. The site consists of a large field surrounded by mature hedgerows.

The report includes a desktop study and a site inspection to assess the impact of the works to date on the cultural heritage landscape. The desktop section of the report was compiled using: The Records of Monuments and Places; buildings of Ireland, Excavations Bulletin; historic maps; aerial photographs; place names and historic books and journals.

A field inspection of the proposed site was also carried out as part of the assessment. This was undertaken on a dry day in October 2017.

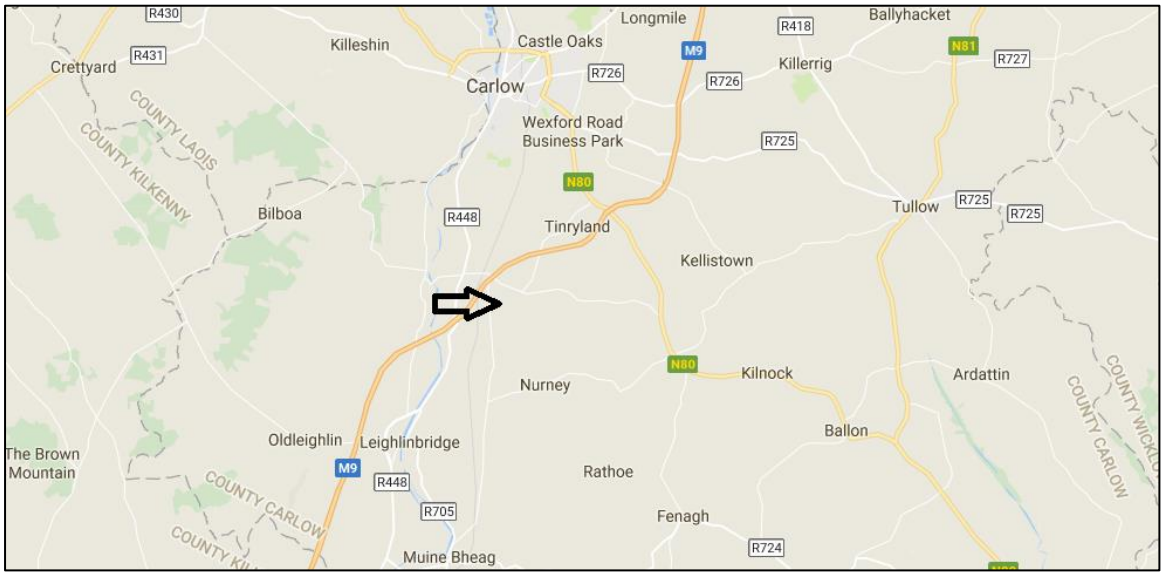


Figure 11.1: Location of the development in Co. Carlow

11.2 Assessment Methodology

11.2.1 Study Methodology

This assessment consists of a paper survey identifying all recorded sites within the vicinity of the proposed development and a site inspection. The methodology has been conducted based on the guidelines from the Department of the Arts, Heritage, Regional, Rural and Gaeltacht Affairs (DAHRRG.).

11.2.2 Desktop Survey

The desktop survey undertaken consisted of a document and cartographic search utilising a number of sources including the following:

- Record of Monuments and Places (RMP); The RMP records known upstanding archaeological monuments, the original location of destroyed monuments and the location of possible sites identified through, documentary, cartographic, photographic research and field inspections. The RMP consists of a list, organised by county and subdivided by 6" map sheets showing the location of each site. The RMP data is compiled from the files of the Archaeological Survey of Ireland.

- National Inventory of Architectural Heritage; This database outlines all the protected structures in the country and gives a description of their importance.
- County Development Plans; The Development plan was consulted in order to ascertain if any structures listed in the Record of Protected Structures (RPS) and/or any Architectural Conservation Areas (ACAs). The Record of Protected Structures lists all protected structures and buildings in Dublin. This includes structures of architectural, historical, archaeological, artistic, cultural, social, scientific or technical importance.
- Cartographic Sources; The following maps were examined: 1st edition Ordnance Survey Maps (1836-1846) and 2nd edition Ordnance Survey Maps (1908).
- Literary Sources; Various published sources, including local and national journals, were consulted to establish a historical background for the proposed development site. Literary sources are a valuable means of completing the written record of an area and gaining insight into the history of the environs of the proposed development. Principal archaeological sources include:
- The Excavations Bulletin; Local Journals; Published archaeological and architectural inventories; Peter Harbison, (1975). Guide to the National Monuments of Ireland; and O'Donovan's Ordnance Survey Letters.

11.2.3 Site Inspection

An archaeological field inspection survey seeks to verify the location and extent of known archaeological features and to record the location and extent of any newly identified features. A field inspection should also identify any areas of archaeological potential with no above ground visibility.

11.3 The Receiving Environment

The site is located in the townland of Powerstown, Co. Carlow, to the east of the Carlow to Dunleckny road and south of Carlow town. The proposed area for extraction lies between two areas of quarry in Clonmelsh to the north of the study area and in Garryhundon to the south. The total area measures 21.9 hectares. The Clonmelsh quarry has been in use since the 1950's and has been extensively truncated. This study area is currently in use for tillage.

11.4 General Archaeological and Historical Summary

11.4.1 Prehistory

The Sites and Monuments Record (SMR) lists a number of prehistoric sites in the area. These include a number of megalithic monuments, however the commonest are barrows and cists. These are associated with the Bronze/Iron Age burial tradition (c. 2400 BC - AD 400) and are defined by an artificial mound of earth or earth and stone, normally constructed to contain or conceal burials. These sites vary in shape and scale and can be variously described as bowl-barrow, ditch barrow, embanked barrow, mound barrow, pond barrow, ring-barrow and stepped barrow. The incidence and frequency of these sites in the area attests to the extent of prehistoric settlement in this area from earliest times.

Archaeological excavations undertaken as part of the M9 motorway uncovered a number of Bronze Age sites including a Bronze Age cemetery of four barrows and 8 pit burials in Ballybannon and pits and

postholes associated with Bronze Age pottery from Powerstown,

Cloghristick, Clonmelsh and Ballybar Lower.

11.4.2 Iron Age to Early Medieval Period

In late Bronze Age Ireland the use of the metal reached a high point with the production of high quality decorated weapons, ornament and instruments, often discovered from hoards or ritual deposits. The Iron Age however is known as a 'dark age' in Irish prehistory. Iron objects are found rarely, but there is no evidence for the warrior culture of the rest of Europe, although the distinctive La Tené style of art with animal motifs and spirals was adopted. Political life in the Iron Age seems to have been defined by continually warring petty kingdoms vying for power. These kingdoms, run on an extended clan system, had their economy rooted in mixed farming and, in particular, cattle. Settlement was typically centred on a focal hillfort.

Settlement in the Early Medieval Period is defined by the ringfort. These are the commonest monument across Co. Carlow and the country and have been frequently recorded in the area.

The introduction of Christianity to Ireland in the fifth century had a profound impact on Gaelic society, not in the least in terms of land ownership and the development of churches and religious houses. A number of early Christian Monuments are located in the vicinity of the site including a settlement in Carlow to the northwest. These sites were proto towns with a thriving settlement and a number of religious monuments including churches, Holy Wells and Bullaun stones.

11.4.3 Historic Period

The barony of Carlow was retained by Strongbow and was transferred by marriage to the Marshall and the Bygod families. The county had a strong Anglo Norman settlement and this is seen in the quantity of remains frim this period. Many of the early castles built were of earth and timber, called a motte and bailey. There would have been a strong timber tower on top of the motte with a defensive palisade around it. The bailey would also have had timber defences and would have contained the main residence, a hall for meetings and feasts, farm buildings and sometimes a chapel. These were superseded by the stone castle and later by the commonly built tower house.

11.4.4 Archaeological Monuments

The site includes two monuments recorded as part of the archaeological survey of Ireland database. The wider environs has been richly settled over the years as seen in the density of monuments and the quantity and quality of monuments recorded during excavation as part of the M9 motorway these are detailed below (all details from archaeology.ie).

Within the study area;

CW012-202----
Class: Ring-ditch
Townland: POWERSTOWN
Description: Aerial photograph (GB96.FX.19) shows cropmark of a ring-ditch.

CW012-093----
Class: Enclosure
Townland: POWERSTOWN
Description: Aerial photographs (GB89.O.34 and GB89.S.06) shows cropmark of a rectilinear enclosure (with entrance facing east) defined by a fosse. A short internal fosse is attached to outer fosse (Barrett 1989). This site and a number of features were excavated in 2008 as part of a proposed extension to the quarry and were preserved by record.

Sites in the environs of the study area;

CW012-026----
Class: Enclosure
Townland: GARRYHUNDON
Description: The following description is derived from the published 'Archaeological Inventory of County Carlow' (Dublin: Stationery Office, 1993). In certain instances the entries have been revised and updated in the light of recent research. This site has been removed as part of quarrying works.

CW012-027----
Class: Enclosure
Townland: GARRYHUNDON
This site has been removed as part of quarrying works.

CW012-101----
Class: Enclosure
Townland: CLONMELSH
Description: Aerial photograph (GB89.O.42) shows cropmark of a D-shaped enclosure with entrance facing SE, with an attached incomplete curvilinear enclosure; both enclosures defined by a fosse. Quarrying has removed all remains of this site.

CW012-136----
Class: Enclosure
Townland: GARRYHUNDON
Description: Aerial photograph (GB90.AV.21, 30 May 1990) shows cropmark of a curvilinear enclosure defined by a fosse. No surface trace of this monument is visible.

CW012-024002-
Class: Font
Townland: CLONMELSH
Description: Reference in the Journal of Association for the Preservation of the Memorials of the Dead, Ireland' (1901, 7-8) about an 'old font' with an inscription on it which was found in the churchyard at Clonmelsh (CW012-024001-) and placed inside the church. Church completely overgrown when inspected by ASI in 1988 and it was not possible to ascertain if this was still present.

CW012-024003-
Class: Graveyard
Townland: CLONMELSH
Description: Rectangular graveyard (map dims. c. 30m N-S; c. 28m E-W) with a church (CW012-024001-) aligned E-W along the northern boundary of the graveyard.

CW012-183----
Class: Ring-ditch
Townland: CLONMELSH
Description: Aerial photograph (GB95.FR.31) shows cropmark of a ring-ditch.

CW012-185----
Class: Ring-ditch

Townland: CLONMELSH
Description: Aerial photograph (GB95.FR.31) shows cropmark of a ring-ditch.

CW012-194----
Class: Ring-ditch
Townland: CLONMELSH
Description: Aerial photograph (GB96.GE. 03) shows cropmark of a ring-ditch.

CW012-180----
Class: Ring-ditch
Townland: CLONMELSH
Description: Aerial photograph (GB95.FR.31) shows cropmark of a ring-ditch.

CW012-188----
Class: Ring-ditch
Townland: CLONMELSH
Description: Aerial photograph (GB95.FR.31) shows cropmark of a small ring-ditch; one of a pair located in close proximity (see also CW012-187----).

CW012-126----
Class: Enclosure
Townland: BALLYBANNON
Description: Partially excavated in advance of construction of the N9/N10 Kilcullen-Waterford Road (Excavation Licence number E2612 (a)). A ditch (Excavated portion L 42m; Wth 3.2m, D 1.2m) was uncovered which represented c. one-third of the projected extent of the enclosure. A piece of oak charcoal recovered from the ditch produced a calibrated radiocarbon date of 404-238 BC. A number of pits, postholes and stake-holes were discovered in the interior. (Richardson, Á. 2009, 44; Breen G, Kozlowska D and Clark L. 2009, 6-7)

CW012-101----
Class: Enclosure
Townland: CLONMELSH
Description: Aerial photograph (GB89.O.42) shows cropmark of a D-shaped enclosure with entrance facing SE, with an attached incomplete curvilinear enclosure; both enclosures defined by a fosse.

CW012-125----
Class: Excavation - miscellaneous
Townland: BALLYBANNON
Description: Test excavations in advance of construction of the N9/N10 Kilcullen-Waterford Road uncovered two pits and a number of possible field boundaries/drainage ditches. (Hughs J. 2008, 27). Full excavation (Excavation Licence number E2611) failed to locate the pits. The linear features were of post-medieval date. (O' Connell, T. 2009, 4)

CW012-127----
Class: Excavation - miscellaneous
Townland: BALLYBANNON
Description: Excavated in advance of construction of the N9/N10 Kilcullen-Waterford Road (Excavation Licence number E2612 (b)). A number of post-holes and pits were uncovered. Radiocarbon dates from the Neolithic and Bronze Age were obtained from these. (Richardson, Á. 2009, 44; Breen G, Kozlowska D and Clark L. 2009)

CW012-141----
Class: Excavation - miscellaneous
Townland: BALLYBANNON
Description: Excavated in advance of construction of the N9/N10 Kilcullen-Waterford Road (Excavation Licence number E2613). A large concentration of pits, post-holes and ditches were uncovered. (Richardson Á. 2009, 37)

CW012-012----
Class: Earthwork
Townland: BALLYBANNON
Description: Shown on 1839 'OS 6-inch' map as circular earthwork, probably mound (max. diam. c. 20m). Area has been quarried extensively. No visible surface traces.
Limited excavation as part of the N9/ N10 Kilcullen to Waterford road scheme revealed evidence for two heavily truncated curvilinear ditches (Hughes, J. 2008, 19).

CW012-196001-
Class: Enclosure
Townland: GARRYHUNDON
Description: Aerial photograph (GB96.FX.21) shows cropmark of a curvilinear enclosure defined by a fosse and with an entrance facing south-east. Adjacent faint cropmarks suggest an associated field system (CW012-196002-).

CW012-025002-
Class: Cross - High cross
Townland: GARRYHUNDON
Description: The following description is derived from the published 'Archaeological Inventory of County Carlow' (Dublin: Stationery Office, 1993). In certain instances the entries have been revised and updated in the light of recent research.

CW012-196001-
Class: Enclosure
Townland: GARRYHUNDON
Description: Aerial photograph (GB96.FX.21) shows cropmark of a curvilinear enclosure defined by a fosse and with an entrance facing south-east. Adjacent faint cropmarks suggest an associated field system (CW012-196002-

CW012-209----
Class: Enclosure
Townland: GARRYHUNDON
Description: Aerial photograph (GB20.GP.15) shows cropmarks of two concentric curved fosses, probably defining the northern boundary of a curvilinear enclosure located immediately north of the Ecclesiastical Enclosure surrounding 'Killogan' burial ground (CW012-025001-).

CW012-189----
Class: Ring-ditch
Townland: GARRYHUNDON
Description: Aerial photograph (GB95.FR.22) shows cropmark of a ring-ditch; one of two ring-ditches located in close proximity (see also CW012-190----).

CW012-190----
Class: Ring-ditch
Townland: GARRYHUNDON
Description: Aerial photograph (GB95.FR.22) shows cropmark of a ring-ditch; one of two ring-ditches located in close proximity (see also CW012-189----).

CW012-135----
Class: Burial
Townland: GARRYHUNDON
Description: Human remains of one individual discovered during work at a sandpit in August 1973. (Cahill and Sikora 2011, Vol. 2, 237-8).

The variety of sites show a consistent pattern of settlement from the earliest times. Evidence of additional archaeological remains may be preserved below the ground level. Houses constructed in prehistoric times and up to the 11th century AD were generally made of wood once this decayed the remains can only be detected through archaeological excavation. Similarly, burial sites may not have any surface markers and remain undetected below the surface. Ground disturbance may uncover buried archaeological sites, features or artefacts.

Figure 11.2: Extract from the RMP for the development with the existing quarry visible and the study area marked

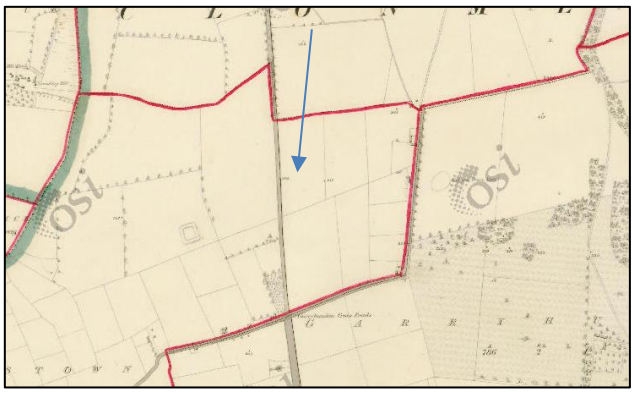


Figure 11.3: First edition OS map extract for the site with the enclosures marked

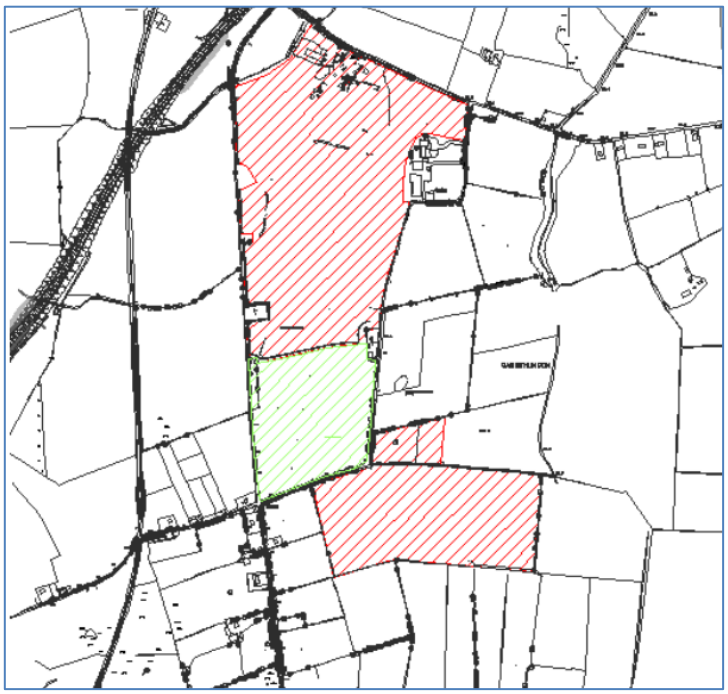


Figure 4: Current layout of the Clonmelsh & Garyhundon Quarry the subject of rEIAR with substitute consent applications ABP-300034-17 (Quarry) and ABP-300037-17 (Plant Area). Approximate extents of proposed extension at the centre marked in green

11.5 Impact on the Cultural Heritage Landscape

11.5.1 Recorded Monuments

Field walking undertaken in October 2017, has shown that the proposed development includes two monuments recorded by the Archaeological Survey of Ireland. The enclosure at the north of the site, was preserved by record in 2008[4]. The other monument at the southeast of the site was not visible at ground level and the site has not been excavated. No other archaeological monument exists within the excavated area or was visible as part of the field walking. A series of archaeological monuments are located to the east of the of the site. These will be unaffected by the proposed works.

11.5.2 Previous Archaeological Works

In 2008 a geophysical report was undertaken at the study area and to investigate the remains at CW012 093. This identified a rectangular ditched feature and a number of features in the ditch. These were excavated in 2008 by the Archaeology Company under licence 08E0960. It was identified as a rectangular moated site with a sunken house. This feature measured 46m x 42m in diameter and was enclosed by a single curvilinear ditch with an entrance at south-west. A series of pits and stake holes were excavated throughout the remainder of the site. The excavation detailed above covered the majority of the study area.

11.5.3 Cartographic and Ariel Photographic Evidence

The first edition OS map, the 25" maps or the aerial photographs do not include any unrecorded archaeological finds, features or anomalies that could be interpreted as features within the study area. The two enclosures within the study area

[4] Information taken from unpublished report Licence Number 08E0960

were recorded as part of an aerial survey (Figure 4). The current OS map includes does not include any other features or anomalies that may be archaeological.

11.5.5 Field Walking

Field walking was undertaken in October 2017 to access the study area (Plates 1-6). The field work identified the location of the archaeological monuments and confirmed that the location of the two sites. The remainder of the study area was assessed and there was no evidence of any further archaeological remains.

11.5.6 Architectural Heritage

Only one structure listed in the National Inventory of Architectural Heritage exists within the study area. This lies to the southeast of the quarry and has not be directly impacted on by the works to date or proposed.

11.5.7 Archaeological Potential

A geo physical survey and excavation of the identified features was undertaken in 2008. This involved works across most of the site. The ring ditch at the southeast remains unexcavated. The extent of the works and the previous excavation has exhausted the archaeological potential of the site.

11.6 Mitigation Strategies

The site is located in an area of high archaeological potential and contains a ring ditch at the southeast (RMP CW012 202). In order to protect this site and any potential sub surface features a series of mitigation strategies have been recommended

An exclusion area must be established surrounding the ring ditch (CW 012 202). This must be a minimum of 20m from the outer extent of the monument.

The sites must be fenced off prior to any excavation works on the site. This will prevent any accidental damage to the sites by machinery crossing the area and should be undertaken with archaeological overview.

11.7 Conclusion

This report was undertaken to assess a proposed extension to an existing quarry in Powerstown, Co. Carlow on the cultural landscape. The study area lies to the south of a quarry in the townland of Clonmelsh. As part of a previous plan to extend the quarry a geophysical report of the site was undertaken and the identified features were excavated. This included the enclosure CW012 093. This was preserved by record under licence 08E0960 by the Archaeology Company.

The ring ditch at the southeast corner of the site was not visible at ground level (CW012 202). Field walking did not identify any other archaeological remains across the site. As a result of the assessment a number of mitigation strategies have been recommended. This includes establishing a buffer zone where no excavation will take place or machinery will enter surrounding the ring ditch.

The site has not impacted on any structures listed in the National Inventory of Architectural Heritage.

12.0 LANDSCAPE

12.1 Introduction

The development the subject of this EIAR consists of further extraction of a quarry and all related ancillary site works over an application site area of 21.9 ha. with excavation over an area of 13.6 ha at Powerstown, Nurney, Co. Carlow ('the Site').

After section 1.4.1 of this report this Chapter is a summary of potential landscape and visual effects of the Clonmelsh quarry lateral extension into Powerstown. It focuses on effects of the broad land unit in advance of a detailed Landscape and Visual Impact Assessment [LVIA] being undertaken following detailed quarry design.

This is an outline of the potential effects of the proposed scheme considered against the 2017 baseline conditions, including the concept restoration plan which forms part of the Clonmlesh and Garyhundon rEIAR (the subject of substitute consent applications ABP-300034-17 (Quarry) and ABP-300037-17 (Plant Area)), specifically:

- Potential effects of the proposed operational scheme considered against the existing site (a worst case scenario is considered of maximum extraction); and
- Potential residual effects of the proposed restoration scheme considered against the concept restoration plan which forms part of the rEIAR.

Phase 5 of the proposed quarry described and depicted at Chapter 3.0 is the proposed restoration plan for this EIAR. This plan is also separately submitted as drawing no. 5 and has been prepared by Golder & Associates. This Restoration Plan aped on the concept restoration plan that formed part of the Clonmelsh & Garyhundon rEIAR and is therefore here resubmitted for reference as; Figure L1 Concept Final Restoration Plan, rEIAR Area; Figure L2 Concept Final Restoration Plan, Clonmelsh; and Figure L3 Concept Final Restoration Plan, Garyhundon.

12.2 Baseline Conditions

The County Carlow Development Plan 2015 – 2021 provides the following policy which is relevant to the LVIA:

Heritage Policy 1

- It is the policy of Carlow County Council to (inter alia):
    - Protect, manage and enhance the natural heritage, biodiversity, landscape and environment of County Carlow in recognition of its importance as a non-renewable resource, unique identifier and character of the county and as a natural resource asset
    - Protect designated Views, Prospects and Scenic Routes in the county as appropriate

The designated Views, Prospects and Scenic Routes within the study area include:

- Protected View: 26, 27, 28, 29, 30 and 33;
- Scenic Routes 5 and 9

12.2.1 Landscape Character

The character of the local landscape has been assessed in the Carlow County Landscape Character Assessment and Schedule

of Protected Views (2015).

The Site is located within the Central Lowlands principal landscape character area ('LCA') and the Farmed Lowland landscape type ('LT').

The key characteristics of the Central Lowlands LCA are:

- Most of the County lies within this character area
- Landscape is level to gently rolling
- Predominantly fertile agricultural lands with medium to large fields defined by low trimmed hedgerows and occasional to frequent mature hedgerow trees.
- Open views and vistas, notably on ridge farmland.
- Low vegetation – grassland - and long distant views with a limited capacity to absorb developments unobtrusively.
- Extensive road network penetrating the character area.
- The character area contains most of the County's designated habitats and listed buildings.

Key issues are identified as:

- Development pressure on the countryside particularly in the vicinity of Carlow Town and the other centres. Impact on water supplies.
- Degrading of the typical landscape character through the removal of internal hedgerows.
- Over management of roadside hedges.
- Degrading of the typical landscape character through the construction of modern one-off houses in the countryside, many of them two storied with prominent elements in an open landscape and lacking any connection to the characteristic styles of rural houses in the County.
- Erosion of the landscape setting of existing settlements by inappropriate developments.
- Tourism and recreation pressure.

Recommendations for landscape management are:

- Maintain the existing grain of the landscape with its well-developed pattern of fields, hedgerows, trees and shelterbelts.
- Review the hedge maintenance regime. Overcutting reduces species richness and consequently, their contribution to biodiversity.
- Discourage the replacement of hedgerow boundaries with wire fences.
- Encourage the use of native and indigenous planting in new developments to integrate buildings into the surrounding landscape. Compile a list of suitable trees and shrubs for planting in the County.
- Small villages and scattered residences and farm buildings are the typical rural settlement pattern. New development should be monitored to protect the integrity of the settlement pattern. Continuous ribbon development along the roads leading into the major settlements should be discouraged. Likewise scattered small

clusters of residential developments in rural areas should be discouraged. The expansion of villages by developments on their edges or by sporadic development should be discouraged as they erode the integrity and character of the villages.

- The use of traditional styles, materials and colours in new developments should be encouraged.
- New developments should not be sited in prominent locations such as ridges and areas with open exposed vistas.
- Infrastructure for tourism should be carefully sited and in sympathy with the character of the landscape.

The landscape character assessment also provides generic capacity and sensitivity guidance, however this does not take the place of site specific sensitivity assessment which is a necessary part of any LVIA (the site specific sensitivity assessment for the Site is set out in Appendix B).

For the Central Lowlands LCA the generic capacity and sensitivity guidance states (inter alia):
'The Central Lowlands character area is deemed to be moderately sensitive to development. It has capacity to absorb most types of development subject to the implementation of appropriate mitigation measures.'

The strategic policy within the landscape character assessment states, with reference to extractive industries:

'Applications for quarrying should be accompanied by a detailed landscape plan setting out mitigation measures with particular reference to land grading and screen planting.'

12.2.2 Visual Receptors

Visual receptors within the study area which may have experienced a significant effect include:

- Residents at dwellings within close proximity to the Site;
- Road users on the L3044, Ballybar Upper Road and minor roads passing the site (the M9 is also considered although it was not present at the 1990 baseline); and
- Recreational walkers on the Barrow Way.

12.3 Clonmelsh & Garyhundon rEIAR Restoration Plan

The rEIAR includes a proposed concept restoration plan for the existing Clonmelsh and Garryhundon sites which includes:

Clonmelsh Quarry:

- The removal of all plant and machinery from the site;
- The creation of a large water body comprising the majority of the site, to the 48m AOD level, with marginal aquatic species;
- Regrading of the landscape profile and disturbed ground where required to create calcareous grassland habitat with intermittent areas of bare rock habitat;
- Planting of new native tree and shrub vegetation along the site boundaries; and
- Areas which are already naturally regenerating would be left undisturbed where possible to allow the naturally occurring regeneration to continue

Garryhundon Quarry:

- Regrading of the landscape profile and disturbed ground at Garryhundon to restore the site to agricultural grassland;
- Planting of new native hedgerows with hedgerow trees as part of the restoration of historic field boundaries; and
- Planting of new native woodland.

12.4 Proposed Powerstown Restoration Plan

The proposed restoration plan for Clonmelsh Quarry accounting for the lateral extension comprises the following additions to the current rEIAR concept restoration plan:

- The creation of a larger water body comprising the majority of the site, to the 48m AOD level;
- Regrading of the landscape profile and disturbed ground where required to create calcareous grassland habitat;
- Advance planting of new native tree and shrub vegetation along screen mounds along the site boundaries (undertaken prior to the extraction to provide maximum screening benefit); and

12.5 Potential Landscape Effects

12.5.1 Landscape Fabric: Operational Effects

The lateral extension would extend the current void to the south, temporarily increasing the areas of disturbed ground within the Site during the working phase, and resulting in the loss of agricultural land. The changes to landscape fabric comprise:

- Approximately 17 ha loss of agricultural land;
- Approximately 17 ha increase in disturbed ground; and
- Approximately 4 ha of additional tree and shrub planting on screening mounds

The loss of agricultural land and increase in disturbed ground would be considered adverse impacts, however the addition of tree and shrub planting would mitigate the loss of field boundary vegetation.

Overall the long term, but partially reversible operational effects upon landscape fabric would not be significant.

12.5.2 Landscape Fabric: Residual Effects

The proposed restoration plan proposes a near 13 ha extension of the waterbody included with the rEIAR concept restoration plan in addition to the tree and shrub planting on screening mounds along the boundary which would be introduced during the operational phase.

The waterbody and associated aquatic/marginal species would provide some biodiversity benefits.

Whilst the concept restoration scheme would not restore the grain of field patterns within the landscape, it would comply with the landscape guidelines within the landscape character assessment in that it would use native and indigenous species.

Overall the residual effect upon landscape fabric would not be significant.

12.5.3 Landscape Character: Operational Effects

The site is located within the Central Lowlands LCA. The sensitivity of this area of the Central Lowlands LCA to the proposed development is considered to be medium.

The influence of the proposed lateral extension upon landscape character would be limited to the landscape within close proximity of the site.

To the north of the site, whilst the buildings and plant will remain clearly visible detracting features within the landscape, the proposed extension will not be visible, being screened by the existing working site.

Within close proximity to the east, visibility would be limited by hedgerows across the landscape. From rising ground at greater distance the extended void likely be visible beyond the planted boundary screen bunds, however it would be a minor component of wide, long distance views.

From the south, visibility of the extended void would be largely restricted by the existing site at Garryhundon, and also hedgerows and trees across the landscape.

From close proximity to the west the planted boundary screen bunds would be visible and would screen the extended working void. Further west than the M9 the motorway embankment would likely screen the site. Only from rising ground at greater distance to the west would views be possible of the extended void beyond the planted boundary screen bunds, however it would be a minor component of wide, panoramic long distance views.

In summary, visibility of the proposed operational working scheme would be very limited. Consequently, whilst a medium or large scale change to character may occur within the immediate vicinity of the site, it would quickly reduce with distance. Overall, any impact upon landscape character would be very limited and would not be significant.

12.5.4 Landscape Character: Residual Effects

Due to the limited visibility of the site as described above, the residual effects of the fully restored scheme would be limited.

The proposed planting around the boundaries of the site would provide effective screening of the waterbody and intermittent former working faces from most parts of the surrounding landscape. When visible in glimpsed views or elevated distant views, the waterbody and former working faces, whilst a new feature within the landscape, would provide a natural landscape element which would complement the waterbody forming part of the concept restoration plan within the rEIAR.

Overall the residual effects of the proposed scheme would not be significant.

12.6 Potential Visual Effects

12.6.1 Residents: Operational Effects

There are very few residential dwellings around the periphery of the site. To the south west there is a cluster of dwellings from which views towards the site are largely screened by existing garden and roadside vegetation. The proposed native woodland planted screen bund around the site boundary would limit any remaining views of the extended void.

To the east is a bungalow enclosed by mature vegetation and tree planting. This existing vegetation, combined with the proposed planted screen mounds would limit visibility of the extended void.

From other dwellings and settlement within the study area, visibility of the works would be limited by hedgerow and tree

cover across the landscape, and also distance.

Overall, no significant visual effects for residents would occur as a result of the operational working scheme.

12.6.2 Residents: Residual Effects

Due to the limited visibility from dwellings described above, no residual significant visual effects would occur for residents.

12.6.3 Recreational Receptors: Barrow Way

The Barrow Way follows the River Barrow, which runs on a north-south alignment through the study area to the west of the site. Views from the Barrow Way towards the Site are restricted by tree cover along the river and across the wider landscape. No effects would occur as a result of the proposed development for users of the Barrow Way.

12.6.4 Road Users: Operational Effects

For road users passing the site, views into the working void would be screened by the planted screen bunds around the site boundary. Whilst the screen bunds would result in the loss of views across currently open countryside, the magnitude of change would be limited. Combined with the short duration that such change would be experienced, and the lower sensitivity of road users, effects would not be significant.

12.6.5 Road Users: Residual Effects

Due to the limited visibility of the site, and short duration of views as described above, residual effects for roads would not be significant.

12.7 Summary

There would be both beneficial and adverse impacts upon landscape fabric as a result of the proposed development. Overall the effect upon landscape fabric would not be significant.

The impact of the works upon landscape character would be very limited, due primarily to the screening effects of hedgerows and tree cover across the landscape. No significant effects would occur as a result of the proposed development.

No significant effects would occur at any of the protected viewpoints, prospects or scenic routes which are designated within the Development Plan.

There are very few dwellings within close proximity to the site and from each one visibility towards the site is limited by existing vegetation. No significant effects would occur from dwellings.

No significant effects would occur from roads (including those) which pass the site, or from the only recreational route in the area, the Barrow Way.

In summary, the landscape and visual effects of the proposed development would be limited in extent and degree, and would not be significant.

DESCRIPTION OF FINAL RESTORATION

Clonmelsh Quarry

The final restoration of the site would aim to provide nature conservation benefit via establishing a locally enhancing landscape afteruse comprising:

- Calcareous grassland, with areas of bare limestone rock habitat;
- Large waterbody with peripheral ephemeral wetland areas. The waterbodies would be bound by marginal aquatic vegetation established through natural regeneration or bare limestone former working face edges;
- Native tree and shrub vegetation; and
- naturally regenerated areas of native scrub.

Garryhundon Quarry

The final restoration of the site would aim to primarily return the landscape to the pre-developed afteruse comprising agricultural land with former field boundaries also restored. Native woodland is proposed in the vicinity of the eastern parts of the site.

The landscape profile would be to a reduced AOD level as a result of the minerals operations, although the landscape would be acceptable for agricultural afteruse and include a peripheral boundary gradient of a maximium 1:3.

The proposed landscape afteruse would comprise:
Agricultural grassland;

- Non-agricultural grassland within native tree and shrub planting areas; and
- Native tree and shrub vegetation incorporating proposed woodland areas and field boundary hedgerows.

Proposed calcareous grassland with areas of bare rock habitat with likely naturally regenerated native scrub vegetation.
minor re-grading works required to create final landform

Existing hedgerow & tree vegetation retained undisturbed

PROPOSED WATERBODY
48M AOD

CLONMELSH QUARRY

Former quarry working faces retained

Proposed native tree & shrub planting to integrate the restored site with the surrounding landscape

Marginal aquatic vegetation

Existing agricultural field

Proposed agricultural field restored to pre-developed landuse

Existing hedge retained undisturbed

Proposed native tree & shrub planting

GARRYHUNDON QUARRY

Proposed native field boundary hedge row in accordance with the historic field boundaries.

Existing field boundary hedge & trees to be retained

KEY

- Remedial EIA Site Boundaries
- Contours from site survey 2017 and dtm data @2m intervals
- Proposed Garryhundon Concept Final restoration contours @ 2m intervals
- Aerial photography dated 2011
- Existing native tree and shrub vegetation to remain undisturbed
- Existing agricultural grassland to remain undisturbed
- Proposed native tree and shrub vegetation
- Proposed calcareous grassland with intermittent bare areas of limestone habitat
- Proposed native scrub vegetation through natural regeneration
- Proposed water body with marginal aquatic vegetation
- Proposed agricultural land restored back to historic field boundary
- Proposed non-agricultural grassland
- Proposed field boundary post & wire fencing and field access gates
- Proposed native hedgerow

Note:
The final restoration landscape profile for Clonmelsh & Garryhundon Quarries has conceptually been prepared and not incorporated 3D volumetric analysis.

Clonmelsh & Garryhundon Quarries

STEPHENSON HALLIDAY
ENVIRONMENTAL PLANNING · LANDSCAPE ARCHITECTURE

QUARRY DEVELOPMENT PLAN:
Concept Final Restoration Masterplan

FIGURE L1

0 100 200m

NORTH

Date	By	Paper	Scale	QA	Rev
SEP 2017	LD	A3	1:4,000	TC/DF	-

CLN-001K Concept Restoration.dwg

KEY

- Remedial EIA Site Boundaries
- Contours from site survey 2017 and dtm data @2m intervals
- Aerial photography dated 2011
- Existing native tree and shrub vegetation to remain undisturbed
- Proposed native tree and shrub vegetation
- Proposed calcareous grassland with intermittent bare areas of limestone habitat
- Proposed native scrub vegetation through natural regeneration
- Proposed waterbody with marginal aquatic vegetation
- Proposed field boundary post & wire fencing and field access gates

Note:
The final restoration landscape profile for Clonmelsh Quarry has conceptually been prepared and not incorporated 3D volumetric analysis.

Clonmelsh & Garryhundon Quarries

STEPHENSON HALLIDAY
ENVIRONMENTAL PLANNING · LANDSCAPE ARCHITECTURE

QUARRY DEVELOPMENT PLAN:

Concept Final Restoration Clonmelsh Quarry

FIGURE L2

0 100 200m

NORTH

Date	By	Paper	Scale	QA	Rev
SEP 2017	LD	A3	1:4,000	TC/DF	-

CLN-001K Concept Restoration.dwg

Marginal aquatic vegetation

Existing agricultural field

Proposed agricultural field restored to pre-developed landuse

Existing hedge retained undisturbed

Proposed native tree & shrub planting

GARRYHUNDON QUARRY

Proposed native field boundary hedge row in accordance with the historic field boundaries.

Existing field boundary hedge & trees to be retained

KEY

- Remedial EIA Site Boundaries
- Contours from site survey 2017 and dtm data @2m intervals
- Proposed Garryhundon Concept Final restoration contours @ 2m intervals
- Aerial photography dated 2011
- Existing native tree and shrub vegetation to remain undisturbed
- Existing agricultural grassland to remain undisturbed
- Proposed native tree and shrub vegetation
- Proposed calcareous grassland with intermittent bare areas of limestone habitat
- Proposed agricultural land restored back to historic field boundary
- Proposed non-agricultural grassland
- Proposed field boundary post & wire fencing and field access gates
- Proposed native hedgerow

Note:
The final restoration landscape profile for Garryhundon Quarry has conceptually been prepared and not incorporated 3D volumetric analysis.

Clonmelsh & Garryhundon Quarries

STEPHENSON HALLIDAY
ENVIRONMENTAL PLANNING • LANDSCAPE ARCHITECTURE

QUARRY DEVELOPMENT PLAN:

Concept Final Restoration Garryhundon Quarry

FIGURE L3

0 100 200m

NORTH

Date	By	Paper	Scale	QA	Rev
SEP 2017	LD	A3	1:4,000	TC/DF	-

CLN-001K Concept Restoration.dwg

13.0 INTERACTIONS

This EIAR has been prepared to accompany an application for planning permission under S.37L of the P&D Act. The development consists of further extraction of a quarry and all related ancillary site works over an application site area of 21.9 ha. with excavation over an area of 13.6 ha at Powerstown, Nurney, Co. Carlow.

The proposed continued extraction site is to extend from the existing southern face of the quarry at Clonmelsh, Nurney, Co Carlow itself the subject of an existing application for substitute consent to An Bord Pleanála under ref. ABP-300034-17 concurrent with an application for substitute consent for a plant area under ref. ABP-30037-17.

The application under S.37L is considered simultaneous with that for substitute consent for a quarry and thus this EIAR should be read and considered together with the rEIAR accompanying the substitute consent applications for the purposes of EIA.

The proposed development is to use plant and welfare facilities for which substitute consent is sought. There will be no significant cumulative impact from this aspect of the proposal as the quarrying proposed and considered in this EIAR is to secure reserve to continue aggregate extraction and processing at Clonmelsh, rather than add to it and thus increase usage and predicted impacts.

13.1 Introduction

All environmental factors are inter-related to some extent. The European Communities Environmental Impact Assessment (Amendment) Regulations, 1998, require that an EIS describes the impacts and likely significant effects on the interaction between principal elements of the environment media: Human Beings, Ecology – Flora and Fauna, Soils, Geology, Water, Traffic, Air and Climate, The Landscape.

The 2014 EIA Directive provides that certain elements be considered in assessing the impact of a development and this EIAR has been prepared having regard to those elements and the 2017 EPA Guidance; "*Population and Human Health; Biodiversity, Land & Soils, Water, Air, Climate, Material Assets, Cultural Heritage, Landscape, Interactions.*" The EIAR has organised to provide the following Information in accordance with the guidance over chapters 4 to 12. Tale 13.1 repeats table 1.1 to illustrate this:

Section 1 Context and Requirement for rEIAR	1.0 Introduction
Section 2 A description of the existing environment.	2.0 Description of the Site & Receiving Environment
Section 3 A description of the project.	3.0 Description of the Project
Sections 4 to 13 Identification of experienced / likely significant impacts during construction and operation of the development and a description of the measures employed / envisaged in order to avoid, reduce and, if possible, remedy significant adverse impacts.	4.0 Population & Human Health 5.0 Biodiversity 6.0 Land, Soils & Geology 7.0 Water & Hydrogeology 8.0 Air & Climate 9.0 Noise 10.0 Material Assets & Traffic 11.0 Cultural Heritage 12.0 Landscape
Section 14 Sets down the cumulative and in combination significant effects of the project and considers expected / experienced effects deriving from the vulnerability of the project to risks of major accidents and/or disasters that are relevant to the project concerned.	13.0 Interactions

Table 13.1 Summary Information contained within an EIAR & Chapter Headings of this rEIAR

This is an environmental impact assessment report of the direct and indirect significant effects, if any, on the environment, which can reasonably be expected to occur because the proposed development the subject of the application for planning permission consent is carried out. The report is prepared to aid An Bord Pleanála in environmental impact assessment.

Each section of the EIAR identifies likely significant effects, described as direct, indirect, secondary, cumulative; by duration short, medium and long-term, permanent and temporary; and by type positive and negative, as appropriate.

The comprehensive assessments undertaken as part of this EIAR have revealed that there is an overriding residual significant negative environmental impact by the permanent removal of the original agricultural land cover and the geological layer beneath. This removal of land has been identified as a negative impact at Chapter 4.0, 6.0, 11.0 (recorded monument to be preserved by record) and 12.0.

The restoration of the lands will mitigate to some extent the direct negative visual impacts albeit that there are no significant public viewports into the subject site. Restoration is presented at Drawing no. 5 submitted with the planning application, described in Chapter 3.0 and considered at Chapter 12.0 of this EIAR. Conversely, in the Do Nothing scenario the extant economic reserve will not be extracted or processed, the associated quarry employment and socio-economic history will be permanently lost which would be a direct, negative and permanent impact. The proposal is for the extraction of the reserve that this location and therefore it is identified as a significant direct, positive, long-term impact at Chapter 4.0.

Each of the environmental factors assessed in this report and their primary interactions are set out below. Please have regard to the mitigation measures and significant impacts identified at each section of the EIAR. The summaries below, in conjunction with Appendices 1.1 and 1.2, aim to demonstrate that all aspects of the EIAR requirement have been met and all mitigation measures have either been implemented in the development design or are committed to in the event of the approval of the proposal that this EIAR accompanies.

Please note that the visual impact of the proposed development has been considered in each section of the EIAR during the operational plan phases an as indicated in the restoration plan submitted with the application (drawing no. 5). As such landscape change is considered throughout the EIAR and visual impact at 3.1 below.

13.1 Population & Human Health

Ultimately, all of the effects of a development on the environment impinge upon human beings, directly and indirectly, positively and negatively. Direct effects include such matters as air and water quality, noise and landscape quality. Indirect effects pertain to such matters as flora, fauna, services and road traffic. Companion chapters of this rEIAR define and asses the predicted impact of the development and set out mitigation measures to cumulatively protect Human Health from the perspective of discreet environmental factors.

The major negative residual impact of the loss of agricultural lands and underlying geological layer against the direct, positive, long term impact of the continuation of quarrying from this land unit to use extant plant and welfare facilities is set out above.

Mitigation of significant setbacks to accommodate screening berms during the operational phases of the development and retention of existing mature hedgerows at the edge of public roads means there are minimal visual implications for the existing landscape in view of the subject site's backland location remote from public view and within a wider established quarry setting.

Noise and vibration; aspects related to air and water quality; and the impact on climate and biodiversity, subject to mitigation measures, all record minimal to potential residual impacts to the receiving environment for the same reasons of remoteness of sensitive receptors and established extraction setting.

The site has no direct access to a public road. Social and travel patterns, pedestrian or otherwise, were not be disrupted by extraction onsite as no roads or pedestrian ways transverse the subject lands.

13.2 Biodiversity

The subject lands largely comprise agricultural lands that have been assessed to require mitigation measures in respect of the Irish hare and badger; small mammal group including bats; and breeding birds.

The implementation of the mitigation measures within the design of he proposal at Chapter 32.0 and in monitoring of waters and air result in a *not significant* residual impact.

A companion NIS has been prepared to accompany the application for permission.

13.3 Land, Soils & Geology

All stripped topsoil is stored within the site for visual screening and eventual restoration.

As set out in the introduction to this Chapter, the removal of ands and gravels the limestone from the subject site to a deepest depth of approximately 30 metres is an irreversible permanent effect and results in the permanent alteration of the topography of the site and loss of recongnised agricultural land cover.

The rock on site is not geologically unique to the extent that is not indicated for special protection and its removal, subject to the environmental mitigation and health and safety measures set out in this EIAR means the residual effect is visual and defined as moderate to minimal relative to the baseline situation.

13.4 Water

Extraction of material is proposed at this location has to a depth below groundwater to match the extant void at Clonmelsh to 25AOD. Ancillary facilitating site works include the movement further south inside the site boundaries of the already realigned Clonmelsh Stream that currently runs east – wet along the northern boundary of the subject site.

Chapter 3.0 of this EIAR presents an operational plan for the Site, with the extraction of limestone taking place in a southerly direction from the adjacent quarry, below the water-table. Site drainage water will continue to be discharged to the Powerstown Stream at a single discharge point (DW01), via a series of Settlement Ponds which currently exist in the in the adjacent quarry. A discharge licence (DL7/233) is in place for the adjacent quarry, which allows for 25 mg/l suspended solids and nitrates in terms of quality, and 2,000 m^3/d in terms of volume (Appendix 7.1). It is proposed that the discharge from the enlarged quarry footprint will be maintained within current limits, with winter working of the quarry at higher bench levels and summer working taking place at lower bench levels. In the case of a storm event occurring, excess water will be 'stored' in the quarry void until such time as it can be safely discharged within the limits of the discharge licence (refer to Section 7.5.1 Water Balance).

Mitigation measures are proposed in design and monitoring of the site that have the result that there is not an effect (of drawdown) on groundwater wells in its immediate vicinity, it is unlikely that the development will have an effect on the River Barrow, located ca. 1.5 km to the west.

There are a number of third party wells located in close proximity to the extant and proposed quarry void it is anticipated that there will be no significant impact on water supply from these wells.

The existing development takes place below the water-table and there is discharge to surface water. The discharge of

water from the Site coupled with discharge from the Powerstown Landfill further downstream on the Powerstown Stream has a cumulative impact on the receiving watercourse. Providing all mitigation measures are adhered no adverse effects on the Powerstown Stream are expected.

13.5 Air & Climate

The use of the subject site as a quarry has no anticipated effect on the microclimate in the immediate vicinity of the site. Historic monitoring results for the wider area including the subject site indicate that operations, at their peak, did not generate dust levels well in excess of limits imposed by planning conditions in accordance with EPA guidance.

13.6 Noise and Vibration

Noise and vibration emanate from the method of extraction (blasting) and working of extraction machinery and from the associated vehicular movements.

The overall noise impact as a result of the proposed development is deemed to be not significant and it is considered that there will be no detrimental effect from noise at the Application Site on the local environs.

From the implementation of the above mitigation measures at the adjacent site during blasting, there have been no residual impacts from vibration at the Site. There are no anticipated residual impacts from vibration once current site practices are maintained and periodically reviewed.

The predicted vibration levels from the proposed development to the closest Sensitive Receptors will not be any greater than currently exists in the vicinity and as such there will not be any cumulative impact from quarry activities.

13.7 Material Assets & Traffic

As outlined at Chapter 2.0 of this EIAR the subject site contains no built development and no development beyond extraction and associated landscaping in the form of screening bunds during the operational phase of development (Phases 1 to 4 at Chapter 3.0) and restoration (Phase 5 at Chapter 3.0) is proposed.

The TTA assesses traffic at opening year (2018) and + 5 and +15 years in accordance with TII guidance and in accordance with the predicted reserve lifespan of the proposed extraction site of around 20 years. Link and junction capacity analysis in the TTA find that the extant local road (L3050) access at Clonmelsh and associated junctions have sufficient capacity to continue to accommodate the proposed development traffic. As the traffic expected to be generated replaces that which currently arises there is no significant direct effect on the baseline traffic environment.

No significant cumulative impact on material assets is anticipated for reason of the proposed development proposing continuity of extracted reserve and not additional reserve thus no alteration to existing material asset baseline environment is anticipated.

13.8 Cultural Heritage

The site is located in an area of high archaeological potential. Field walking undertaken in October 2017, has shown that

the proposed development includes two monuments recorded by the Archaeological Survey of Ireland.

The site contains a ring ditch at the southeast (RMP CW012 202). As part of a previous plan to extend the quarry a geophysical report of the site was undertaken and the identified features were excavated. This included an enclosure CW012 093 in the north of the subject site. This was preserved by record under license 08E0960 by the Archaeology Company.

Mitigation requires that an exclusion area must be established surrounding the ring ditch (CW 012 202). This must be a minimum of 20m from the outer extent of the monument. The design of the proposed quarry has allowed a 50m exclusion zone to better preserve the feature and its setting and indirectly that of the 3rd party house to its immediate north.