MKO Planning and Environmental Consultants

Environmental Impact Assessment Report

Coshla Quarry Extension EIAR

Non-Technical Summary; Main Body, Environmental Impact Assessment Report; Appendices

DOCUMENT DETAILS

Client:	Coshla Quarries
Project Title:	Coshla Quarry Extension EIAR
Project Number:	180918
Document Title:	Environmental Impact Assessment Report
Document File Name:	EIAR – F – 2020.03.25 - 180918
Prepared By:	MKO Tuam Road Galway Ireland H91 VW84

Planning and Environmental Consultants

Rev	Status	Date	Author(s)	Approved By
01	Final	25/03/2020	TB	MH

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NON-TECHNICAL SUMMARY

1. Introduction

This Environmental Impact Assessment Report (EIAR) has been prepared by McCarthy Keville O'Sullivan Ltd. (MKO) on behalf of Coshla Quarries Ltd., which intends to apply to Galway County Council for planning permission to expand the extraction area of their existing quarry in the townland of Barrettspark, Co. Galway.

The site of the development is approximately 27.7 hectares in extent and is located in the townland of Barrettspark which is approximately 6.5 kilometres to the west of Athenry and approximately 6 kilometres to the northeast of Oranmore, Co. Galway.

The applicant for the proposed development is Coshla Quarries Ltd. Coshla Quarries Ltd. are the owners and operators of the existing quarry site located at Cashla, Athenry, Co. Galway. The company and quarry specialise in extracting bulk limestone and processing it into graded aggregates for supply and sale to meet local demand for aggregates on construction, civil engineering and infrastructure projects.

Need for the Development

The extractive industries and quarrying operations such as the subject operation, make a significant contribution to economic development in Ireland. The products and by-products of the industry are vital to the construction, transport and infrastructural sectors, in providing basic materials essential for construction and day-to-day life.

As the intrinsic value of this natural resource is often low, it is essential that quarries can be located where the resource is found or close to the markets they serve. Coshla Quarries supplies a high-quality bulk aggregates to the local and regional markets, keeping the cost of those aggregates competitive for the end users given the location of the quarry and proximity to the markets and outlets for the product. The recent upturn in the economy and thus the construction industry has led to an increase in demand for high-quality bulk aggregates which the proposed extension to the existing Coshla quarry will be able to provide for.

The proposed development can avail of the existing site infrastructure, site management procedures and the experienced staff all of which contributes to this being the most sustainable option for the delivery of products to industry.

Purpose and Structure of this EIAR

The purpose of the EIAR is to document the current state of the environment in the vicinity of the proposed development site and to quantify the likely significant effects of the proposed development on the environment. The EIAR submitted by the applicant provides the relevant environmental information to enable the Environmental Impact Assessment (EIA) to be carried out by the competent authority.

The information to be contained in the EIAR is prescribed by statutory regulation and informed by various guidelines. The Environmental Protection Agency (EPA) recently published its 'Draft Guidelines on the Information to be Contained in Environmental Impact Assessment Reports' (EPA, August 2017), which are intended to guide practitioners during the transition to new Regulations transposing the updated Directive. These draft guidelines have also been used in the compiling of this EIAR.

The EIAR project team comprises a multidisciplinary team of experts with extensive experience in the assessment of similar developments and in their relevant area of expertise. Each chapter of this EIAR has been prepared by a competent expert in the subject matter. The chapters of this EIAR are as follows:

1. *Introduction*
2. *Background to the Proposed Development*
3. *Description of the Proposed Development*
4. *Population & Human Health*
5. *Biodiversity. Flora & Fauna*
6. *Land, Soils and Geology*
7. *Hydrology and Hydrogeology*
8. *Air and Climate*
9. *Noise and Vibration*
10. *Landscape and Visual*
11. *Archaeology & Cultural Heritage*
12. *Material Assets (including Traffic and Transport)*
13. *Interactions of the Foregoing*

A Natura Impact Statement has also been prepared in line with the requirements of the Habitats Directive, and will be submitted to the Planning Authority as part of the planning application documentation.

2. Background to the Proposed Development

The Background to the Proposed Development chapter presents information on the strategic planning context for the proposed development, a description of the proposed development site and its planning history, scoping and consultation, and the cumulative impact assessment process.

Section 6 of the Galway County Development Plan 2015-2021 (GCDP) relates to Waste, Wastewater, Waste Management & Extractive Industry. Sections 6.20 and 6.21 specifically relate to mineral extraction and quarries. It is stated in Section 6.20 that

'The Council will facilitate harnessing the potential of the area's natural resources while ensuring that the environment and rural and residential amenities are appropriately protected.'

The following policies are contained in Section 6.20 of the Plan

Policy EQ 1 – Environmental Management Practice
Have regard to evolving best environmental management practice as set out in Environmental Protection Agency (EPA) Guidelines Environmental Management in the Extractive Industry: Non-Scheduled Minerals and to the recommendations of the EU guidance document Undertaking Non-Energy Extractive Activities in Accordance with Natura 2000 Requirements.

Policy EQ 2 – Adequate Supply of Aggregate Resources
Ensure adequate supplies of aggregate resources to meet future growth needs within County Galway, facilitate the exploitation of such resources where there is a proven need and market opportunity for such minerals or aggregates, and ensure that this exploitation of resources does not adversely affect the environment or adjoining existing land uses.

The following objectives are also included in Section 6.21 of the Plan

Objective EQ1 – Protection of Natural Assets
Protect areas of geo-morphological interest, groundwater and important aquifers, important archaeological features Natural Heritage Areas and European Sites from inappropriate development.

Objective EQ 2 – Management of Aggregate Extraction
The Council shall require the following in relation to the management of authorised aggregate extraction –

(a) All quarries shall comply with the requirements of the EU Habitats Directive, the Planning and Development (Amendment) Act 2010 and by the guidance as contained within the DoEHLG Quarries and Ancillary Facilities Guidelines 2004, the EPA Guidelines 'Environmental Management in the Extractive Industry: Non-Scheduled Minerals 2006 (including any updated/superseding documents) and to DM Standard 37 of this Development Plan;
(b) Require development proposals on or in the proximity of quarry sites, to carry out appropriate investigations into the nature and extent of old quarries (where applicable). Such proposals shall also investigate the nature and extent of soil and groundwater contamination and the risks associated with site development works together with appropriate mitigation;
(c) Have regard to the Landscape Character Assessment of the County and its recommendations including the provision of special recognition to the Esker areas as referenced in Galway County Council Galway's Living Landscapes – Part 1: Eskers;
(d) Ensure that any quarry activity has minimal adverse impact on the road network;
(e) Ensure that the extraction of minerals or aggregates does not adversely impact on residential or environmental amenity;
(f) Protect all known un-worked deposits from development that might limit their scope for extraction.

Objective EQ 3 – Sustainable Reuse of Quarries
Encourage the use of quarries and pits for sustainable management of post recovery stage construction and demolition waste, as an alternative to using agricultural land, subject to normal planning and environmental considerations.

Objective EQ 4 – Compliance with Article 6(3) of the EU Habitats Directive
Ensure that all projects associated with the mineral extractive industry carry out screening for Appropriate Assessment in accordance with Article 6(3) of the Habitats Directive, where required.

The proposed expansion of the quarry is consistent with the policies and objectives set out in the Galway County Development Plan 2015-2021.

A scoping letter providing details of the application site and the proposed development, was prepared by MKO and circulated on 14th November 2019 to statutory agencies, NGOs and other relevant parties.

This EIAR also considers the potential for cumulative effects from the proposed development with other key existing, permitted or proposed projects.

3. Description of the Proposed Development

The project site comprises approximately 27.7 hectares of land located within the townland of Barretstown Park, approximately 6.5 kilometres to the west of Athenry. The site consists of an existing, operational quarry with associated infrastructure. The quarry site is accessed from the north via a junction with Coshla Road (L7109) in the townland of Barrettspark. The entrance road leading from the junction with the public road into the main extraction area is surfaced with tarmac.

The historical development of the quarry site has resulted in the majority of the site management infrastructure being located in the west and north of the site, close to the entrance to the site, with the main quarrying and rock extraction occurring in the eastern side of the site. Quarrying and rock extraction has progressively moved further south and east from where it originally commenced. The

large quarry floor area is used for the storage of quarried and graded aggregates in preparation for their sale and transport off-site. An existing layout drawing of the site is shown on Figure 3.1 below.

The proposed quarry operations will include the following site related infrastructure which is similar to that used historically at the site:

- Site office which also includes toilet and shower, canteen and staff room;
- Machinery shed
- 2 no. concrete batching plants
- 2 no Loading silo/hopper
- 1 no. Wash down area
- 1 no. Mobile tracked excavator
- 2 no. Loading Shovels
- 2 no. crushers
- 3 no. screeners
- Wheel wash

An automated full-underbody truck wash is installed near the site entrance in a position that required all trucks entering and exiting the quarry area to pass through it. The truck wash is powered by electricity, and can be switched on and off as required. The truck wash is shown on Figure 3.1.

It is not proposed to alter the existing infrastructure at the site or introduce any new methods of extraction or new types of plant items. The proposed development is intended to allow for the future use of the limestone resource using the existing site infrastructure, plant items and the methods used as part of the development of the quarry.

The previous quarrying extraction area covers an area of approximately 6.0 hectare (ha). The extraction area as it currently exists has an exposed quarry face approximately 20 metres in height on the eastern, southern, and northern faces of the quarry, which has been worked in a single bench. The current quarry floor is at a level of approximately 5 metres below ordnance datum (mAOD). There is a bench at approximately 15m AOD on the western side giving a quarry face of approximately 10 metres in height.

It is intended to extend the extraction area of the existing quarry using the adjacent land to the south, north and east of the existing extraction area. The total area of the proposed extension to the existing quarry is approximately 67,000m2 or 6.7 hectares. All of the proposed extension area is within the same landholding. It is anticipated that the extraction within the quarry will take place over a 20-year period.

4. Population & Human Health

One of the principle concerns in the development process is that people, as individuals or communities, should experience no diminution in their quality of life from the direct or indirect impacts arising from the construction and operation of a development.

Information regarding human beings and general socio-economic data were sourced from the Central Statistics Office (CSO), the 'Galway County Development Plan 2015 – 2021', Fáilte Ireland and any other literature pertinent to the area. The study included an examination of the population and employment characteristics of the area. This information was sourced from the Census of Ireland 2016, which is the most recent census for which a complete dataset is available, also the Census of Ireland 2011, the Census of Agriculture 2000 and 2010 and from the CSO website, www.cso.ie.

In order to make inferences about the population and other statistics in the vicinity of the subject site, the Human Beings Study Area for the Human Beings section of the EIAR was defined in terms of the Electoral Divisions. The site of the quarry lies primarily within Aughrim ED, as shown in Figure 4.1.

The following four EDs have also been included in the Human Beings Study Area for the Human Beings impact assessment due to their proximity to the site:

- An Carn Mór ED
- Lisín an Bhealaigh ED
- Stradbally ED
- Greethill ED

The Population and Human Health Study Area has a combined population of 7,151 persons and comprises a total land area of 10,940 hectares or 109.4 square kilometers.

The proposed quarry site is not located within a village or settlement. The overall level of residential development in the area around the site is low. There are 3 no. houses located within 500m of the proposed quarry site as shown in Figure 4.2. The closest occupied dwelling is located approximately 20 metres from the southern site boundary. The primary land-use in the vicinity of the site comprises a mix of agricultural land and rural housing

The operational phase of the proposed development will have no significant residual effects on Population or Human Health. The analysis of the likely effects of the proposed development indicate that the project will likely have a medium to long-term, imperceptible, negative impact on human health in terms of health and safety and air quality, and a medium to long-term, moderate, positive impact in terms of employment and investment.

5. Biodiversity

A multidisciplinary ecological walkover survey of the development site and surrounding area was conducted on the 30 November 2018. Given the nature (active quarry) and scale of the study area, comprehensive walkover of the entire site was completed.

The walkover survey was designed to detect the presence, or likely presence, of a range of protected species. The survey included a search for badger setts and areas of suitable habitat, potential features likely to be of significance to bats and additional habitat features for the full range of other protected species that are likely to occur in the vicinity of the proposed development. In addition, other species of local biodiversity interest were also noted.

The multi-disciplinary walkover surveys comprehensively covered the entire study area and based on the survey findings, further detailed targeted surveys were carried out for features and locations of ecological significance. These surveys were carried out in accordance with NRA *Guidelines on Ecological Surveying Techniques for Protected Flora and Fauna* on National Road Schemes (NRA, 2009). During the multidisciplinary surveys, a search for Invasive Alien Species (IAS) listed under the Third Schedule of the European Communities Regulations 2011 (S.I. 477 of 2015) was also conducted.

The habitats on the site of the proposed development were the subject of a detailed survey and assessment. This habitat mapping and assessment was undertaken following '*A Guide to Habitats in Ireland*' (Fossitt, 2000). The majority of the eastern portion of the site currently consists of an active quarry void which is categorised as *Active quarries and mines (ED4)* with areas of *Spoil and Bare Ground (ED2)* and *Recolonising bare ground (ED3)*. Within the existing quarry void, an area of open water exists, resulting from surface water ingress. This has been categorised as *Other artificial lakes and ponds (FL8)* and macrophyte or fringe vegetation was not recorded from the surface water features during the site visits. Much of the immediate surrounding habitat, within the proposed expansion areas, has been subject to some level of ground disturbance associated with overburden stripping and other quarrying activities. These areas form a mosaic of *Spoil and bare ground (ED2), Recolonising bare ground (ED3)* and areas of remnant rank grassland catagorised as *Dry meadows and grassy verges (GS2)*. These areas of disturbed habitats were mapped in detail as they are highly modified and of low ecological value. The site boundary is mainly demarcated by a low *Stone wall (BL1),* and some

Hedgerows (WL1). A new *Treeline (WL2)* has been planting along an existing spoil berm which forms the southern boundary of the site. A number of areas of scrub, dominated by gorse, also occur within the site boundary, predominantly along the southern boundary of the site. The north-western portion of the site comprises of large areas of *Buildings and artificial surfaces (BL3)* consisting of the quarry administrative and maintentance buildings, and other infrastructure.

No watercourses were recorded within or immediately adjacent to the site of the proposed development. No third schedule invasive species were recorded within the study area. The only non-native invasive species recorded on site include butterfly bush (*Buddleja davidii*) and *Cotoneaster dammeri.* Although invasive species, these are not listed on the Third Schedule. No botanical species protected under the Flora (protection) Order (1999, as amended 2015) were recorded during the survey.

A peregrine falcon (*Falco pergrinus*) was recorded flying over the site on the November visit. As the steep quarry walls provide suitable habitat for the species, a dedicated peregrine falcon survey was undertaken on the 05 March 2020 to further assess the usage of the site by the species. Although not observed during the March 2020 visit, recent signs (splashing beneath regularly used perches) was recorded. In addition, quarry staff had reported seeing individuals in recent weeks. Peregrine falcons are protected under Annex I of the Birds Directive. All other bird species recorded during the site visit were common birds that are typical of the habitats on the site and adjacent lands.

Effects upon nationally designated sites as a result of the proposed development are not anticipated, given that impacts to groundwater and surface waters will be prevented, or mitigated where necessary, during the operation of the proposed development.

Effects upon European Sites are discussed within the Natura Impact Statement which accompanies this report. The NIS concluded that the proposed development, by itself or in combination with other plans and projects, in light of best scientific knowledge in the field, will not adversely affect the integrity of European sites, and no reasonable scientific doubt remains as to the absence of such effects. No significant effects upon biodiversity, flora and fauna as a result of the proposed development are anticipated, given that the proposed development is carried out in compliance with procedures of best practice, and that mitigation is duly applied where necessary.

The proposed quarry activities are largely confined to habitats of Local importance (lower value), predominantly existing areas of Active quarries and mines (ED4), Spoil and bare ground (ED2), Recolonising bare ground (ED3) and Dry meadows and grassy verges (GS2). There will be no loss of habitats identified as of local importance (higher value), such as hedgerows or treelines.

Potential negative effects on peregrine falcon have been mitigated through the avoidance of the known nest ledge, used since 2016, and the undertaking of blasting within a 125m radius of the nest ledge outside of the peregrine falcon nesting season. As such, the residual effects on peregrine falcon have been assessed as not significant at any local geographic scale, subject to the proper operation of the proposed development as specified in this EIAR.

Taking the above information into consideration and having regard to the precautionary principle, it is considered that the proposed development will not result in the loss of habitats and species conservation and will not have any significant impacts on the ecology of the wider area.

Provided that the development is operated in accordance with the design and best practice that is described within this application, significant impacts on biodiversity are not anticipated at any geographic scale.

6. Land, Soils and Geology

A desk study of the quarry site and the surrounding study area was completed in advance of undertaking the initial walkover survey and follow up site investigations. The desk study involved collecting all the relevant geological data for the proposed development study area. Geological mapping and site investigations were undertaken by HES between 21st November 2018 and 28th March 2019. In summary, site investigations to assess the Land, Soil and Geology section of the EIAR included the following:

- An initial walkover survey to assess the ground conditions and layout of the quarry site including walkover surveys of adjacent land;
- Logging of exposed subsoil profiles and existing bedrock quarry side walls;
- Mineral subsoils were logged according to BS: 5930:2015 Code of practice for ground investigations; and,
- Investigation drilling (18 no. exploration holes) to assess bedrock hydrogeological conditions in the proposed quarry continuation area.

Previous investigations at the site included the drilling of 5 no. boreholes (BH1-BH5) by Patrick Briody in July 2007 (refer to Appendix 6.1). Four of the 5 no. boreholes are still in-situ and are used as groundwater monitoring wells (BH1 – BH4).

The topography of the local area is undulating with the local ground elevation being between 20 and 40m OD (Ordnance Datum). The overall slope is to the southwest towards Oranmore Bay. The natural ground elevation of the quarry landholding varies between approximately 20 and 32m OD (Ordnance Datum).

The quarry has been worked extensively in the past, and the site includes a large excavated area (quarry floor) on the eastern half of the landholding which has a lower bench level at -5m OD and two upper benches at approximately 5 and 13.5m OD. The middle bench (i.e. at 5m OD) has the largest footprint area. The ground elevation surrounding the extraction area is between 20 – 24m OD.

The proposed extraction expansion area is located on the far east of landholding and comprises an area of approximately 8.5ha. A significant portion of the proposed continuation area is stripped of subsoil down to the top of bedrock and current ground elevations is at approximately 25m OD. The stripped subsoil is temporarily mounded on the north-western section of the continuation area.

Landuse in the surrounding area is largely agricultural with scattered rural pattern of residential dwellings along the local roads to the north and east of the site. A 110 Kv electrical ESB substation is located immediately to the northeast of the site and overhead power lines pass through the quarry landholding.

The mapped soil type in the area of the quarry site is deep well drained mineral soil which comprises mainly grey Brown podzolics and brown earths. Much of the soils at the site have been removed due placement of made ground and/or quarry extraction. Based on the GSI subsoils map (www.gsi.ie), limestone tills are the dominant subsoil type in the area of the quarry and wider area. The majority of subsoils at the quarry landholding have been removed due to past quarry workings. A large quantity of this removed subsoil has been used to create berms along the boundaries of the quarry landholding.

The underlying bedrock strata at the development site is mapped as the Burren Formation which is a Pure Bedded Limestone. This formation is typified by pale-grey packstones and wackestones, but also contains intervals of dark cherty limestones, often associated with oolitic grainstones.

No geological heritage sites are mapped within 8km of the proposed development site. There are no known areas of soil contamination on the site. During the site walkovers or investigations, no areas of particular contamination concern were identified.

An assessment of the likely significant effects of proposed development has been completed, along with a cumulative assessment for the development. An assessment of the potential health effects in relation to soils and geology has also been undertaken. Based on this analysis, with implementation of the outlined mitigation measures, no significant impacts on human health and the soils and geology environment are predicted to occur.

7. Hydrology and Hydrogeology

A desk study of the quarry site and surrounding area was largely completed prior to the undertaking of the walkover and follow on site investigations. The desk study involved collecting all relevant geological, hydrological, hydrogeological and meteorological data for the study area. Walkover surveys, site investigations and groundwater monitoring were undertaken by Hydro-Environmental Services (HES) between 21st November 2018 and 28th March 2019. In summary, site investigations to address the Hydrology and Hydrogeology section of the EIAR included the following:

- Walkover surveys and hydrological mapping of the site and the surrounding area were undertaken whereby water flow directions and drainage patterns were recorded;
- A preliminary assessment of flood risk was completed for the locality of the site;
- Logging of exposed subsoil profiles and existing quarry walls;
- Mineral subsoils were logged according to BS: 5930:2015 Code of practice for ground investigations;
- Installation of pressure transducers (data loggers) in the 4 no. on-site monitoring wells for continuous groundwater level monitoring;
- Groundwater sampling (4 no. monitoring wells);
- Investigation drilling (18 no. exploration holes) to assess bedrock hydrogeological conditions in the proposed expansion area; and,
- Field hydrochemistry measurements (electrical conductivity, pH and temperature).

There are no natural surface water features within the quarry site itself or nearby. All effective rainfall that lands on the extraction area gathers in sumps on the quarry floor benches. There is a large sump located on the southern end of the middle bench and a smaller sump located on the floor of the lower bench. Surface water from both sumps is then pumped vertically up to a concrete settlement pond which drains via an oil interceptor to a large soakaway located on the west of the site for discharge to ground. Discharge of water (trade effluent) to the soakaway is carried out under a Discharge Licence (W/469/13) which limits the volumetric discharge to 360m3/day. Surface water runoff from the area of the batching plant and concrete block yard drains to a staged precast concrete settlement tank which is located adjacent to the batching plant. The settlement tank is a close system as water is recycled for cement production. During dry periods, the tank is topped up from the on-site well.

Due to the lack of surface water features in the area there is no risk of fluvial flooding at the quarry. Based on the PFRA mapping pluvial flooding is also not an issue.

The underlying bedrock strata at the quarry site and in this region in general is mapped as the Burren Formation which is a Pure Bedded Limestone. This formation is typified by pale-grey packstones and wackestones, but also contains intervals of dark cherty limestones, often associated with oolitic grainstones. The Burren Formation is classified by the GSI (www.gsi.ie) as a Regionally Important Karstified Aquifer with conduit groundwater flow characteristics.

The current quarry and the proposed expansion area exist below the local groundwater. As with the existing quarry, dewatering will be required to maintain the floor of the proposed expansion area dry. This has the potential to further impact on local groundwater levels away from the site.

However, the measured groundwater levels at the quarry would suggest that the current quarry operation is having only a very small effect on local groundwater levels and this would be consistent with the hydrogeological conditions that the current quarry is operating in (i.e. competent,

unweathered, low permeability limestone). Site investigations in the proposed expansion area indicate similar hydrogeological conditions to those is the existing extraction area and therefore significantly increased groundwater inflows are not expected. Consequently, significant effects on groundwater levels as a result of the proposed expansion are not expected. No mitigation is required. The proposed development will have a Negative, slight, indirect, likely, long term effect on groundwater levels.

The proposed development will have no significant effects on groundwater or surface water quality, and will have no significant hydrological effects on local designated sites. No significant effects on human health are anticipated.

8. Air and Climate

Due to the nature of the development, the general character of the surrounding environment and publicly available information on air quality, air quality sampling, was deemed to be unnecessary for the EIAR.

The Environmental Protection Agency (EPA) has designated four Air Quality Zones for Ireland:

Zone A: Dublin City and environs

Zone B: Cork City and environs

Zone C: 16 urban areas with population greater than 15,000

Zone D: Remainder of the country.

These zones were defined to meet the criteria for air quality monitoring, assessment and management described in the Framework Directive and Daughter Directives. The site of the proposed development lies within Zone D, which represents rural areas located away from large population centres

The ambient air quality monitoring carried out closest to the Proposed Development site is at Galway City, located approximately 16 kilometres southwest of the Proposed Development site. This monitoring location lies within Zone C. Lower measurement values for all air quality parameters would be expected for the Proposed Development site as it lies in a rural location, within Zone D.

Dust is a common emission from quarry sites and requires management. A number of mitigation measures are proposed to limit potential dust emissions from the quarry. Based on the implementation of these measures the proposed development will have no significant impact on air quality.

The use of machinery during the operation of the quarry may result in the emission of greenhouse gases. Operations such as the transport of equipment and materials as well as rock breaking are typical examples of machinery use. This impact is considered to be slight given the insignificant quantity of greenhouse gases that are emitted. The proposed development will have no significant impact on climate.

9. Noise and Vibration

The site is an operational quarry in the townland of Barrettspark, Co Galway. It is bounded to the north, south and east by agricultural land. The R339 road runs east-west at a distance of 1.2 km from the northern boundary. The M6 motorway runs east-west at a distance of approximately 165m from the southern boundary. A smaller quarry operation lies to the east with agricultural land beyond.

An attended noise survey was undertaken to obtain typical baseline noise levels at noise sensitive locations surrounding the site on the 10th December 2018. Measurements were carried out on a cyclical basis with measurement durations of 15 minutes over three rotations. The measurements were made

using a Brüel & Kjaer type 2250 Light Logging integrating Sound Level Meter. This instrument is a Class 1 instrument in accordance with IEC 651 regulations. The Time Weighting used was Fast and the Frequency Weighting was A-weighted as per IEC 651.

Three measurement locations were selected in order to obtain a representative baseline noise levels at noise sensitive locations, in this case houses, in the vicinity of the quarry extraction area. Depending on the measurement location, the existing noise environment of the general area is dominated by the traffic on the M6, traffic on the local road network, agricultural plant and machinery working the land and the operation of the Coshla quarry.

During the operational phase of the project the main sources of noise will be extraction, processing of rock through crushing and screening on the quarry floor, the transport of material along the haul routes, the processing of stone at the concrete batching plant and then the export of product off site.

Processing plant and mobile equipment will be located close to the working face of the quarry when used within the site. The existing primary crushing and screening plant will be at the quarry floor.

Potential noise impacts are associated with the following:

- Drilling and blasting of rock;
- Breaking of oversize rock;
- Crushing plant;
- Screening of crushed rock into various aggregate sizes;
- Stockpiling of product,
- Loading of product and transport off-site;
- Additional traffic along public roads
- Concrete making (batching plant)

The residual extraction phase impacts associated with the proposed extraction works are not predicted to increase above existing noise and vibration levels. The expected noise and vibration effects for the operational phase can be summarised as Negative quality, Not Significant and of Long-Term duration

As part of the continuation operations, blasting will be undertaken periodically at the site within the proposed extraction areas. There is no change proposed to the current blasting procedure associated with the proposed continuation operations and future extraction. In line with the current best practice operations and conditions of planning at the site, all blasts will be designed to ensure the PPV limit of 12mm/s and AOP of 125dB Lin is not exceeded at the nearest sensitive dwellings. A review of the most recent blast monitoring in 2019 indicates that blasting does not exceed the blasting criteria. The expected operational phase vibration effects at the nearest NSR's to the site are summarised as Negative quality, Slight and of Brief duration. The proposed quarry expansion will have no significant effects in terms of noise or vibration.

10. Landscape and Visual

The Landscape & Visual assessment is based on desk study of the study area, field surveys of the site and surrounds and the use of photographs and photomontages from representative viewpoints of the site. The landscape of the area is described in terms of its existing character, which includes a description of the physical and visual character, landscape values and the landscape's sensitivity to change. The potential impacts in both landscape and visual terms are then assessed, including cumulative impact.

The topography of the subject site is relatively flat along the boundaries at the highest point being 25 meters above Ordnance Datum (OD). In the northeast and southeast corners of the site, the site slopes down, in some places very steeply, to an elevation of 5 meters (OD). Land-use in the wider landscape is a mix of agricultural and industrial, with a number of one off houses also present.

The dominant landscape characteristics of this area and indeed the site are the field patterns as defined by tree lines and stone walls. These field patterns and hedgerows are not considered unique from a landscape perspective and have been produced by manmade interventions in the landscape therefore, the susceptibility of the landscape to change is deemed low.

Neither are there any rare landscape features on site or cultural or heritage associations on site. The site is considered modified due to its agricultural use and many other very similar examples of its kind exist in the wider landscape. On the grounds of these points and taking the landscape policies and Landscape Character Assessment from the county development plan into account, the landscape value is considered low.

Landscape Effects

The dominant landscape characteristics of this area and indeed the site are the field patterns as defined by stone walls and hedgerows. The changes to the physical landscape, as a result of the subject development will be very minor in nature. The subject development has been designed to fit with that of the existing industrial landscape type of the quarry into the surrounding agricultural landscape. Therefore, changes to the landscape are insignificant and will be in keeping with county landscape policies.

Overall the proposed development will have a Long-term, Imperceptible, Neg[illegible] impact on the character of the landscape.

Visual Effects

During the site visit, views towards the site from the surrounding road network as well as from other amenity routes were assessed. Visibility of the subject development site could be excluded from the west of the study area, due to topography as well as the presence of hedgerows, tree lines and buildings, both immediately adjacent to roads and in the intervening landscape. Actual visibility was difficult to established, hence, viewpoints were chosen on anticipated potential visibility.

Overall the proposed development will have a Long-term, Imperceptible, Neutral-Negative visual impact.

11. Archaeological & Cultural Heritage

No Protected Structures are located on or within the immediate vicinity of the proposed development site. No protected structures are located within 2km and the nearest structure is located 3.5km to the southwest in Frenchfort townland. The existing and proposed extension will not result in any direct or indirect impacts.

Based on the assessment the proposed development will have no significant effect on architectural heritage, as no protected structures are located within or in the immediate vicinity of the proposed development site.

No National Monuments, recorded monuments (RMP), NIAH, RPS or previously unrecorded (above-ground) monuments are located within or immediately adjacent to the site application boundary. No direct impact on the known Cultural Heritage resources will therefore occur. Sub-surface archaeological potential within the site is deemed to have already been assessed through archaeological monitoring of topsoil removal when quarry activities began. The proposed expansion area has been reduced to natural strata with topsoil removed and therefore impacts on sub-surface sites will not occur.

National Monuments within 10km of the site were assessed with the potential indirect impacts identified as imperceptible. Thirty-five RMP sites are located within 2km of the proposed development site with

only three within 1km. The potential effects on the monuments in the 2km study area are considered to be imperceptible due to the presence of an existing quarry in the landscape and the nature of the proposed works (i.e. below ground). The landscape in which the proposed development site is located has the capacity to absorb the quarry extension without noticeable effects. Mitigation measures are therefore not deemed necessary

The artefact bearing potential of the sub soil and the potential for finding sub-surface archaeological deposits is considered to be low. Archaeological monitoring of all topsoil removal took place in 2007 when construction began within the quarry. No archaeological finds, features or deposits were uncovered. In this regard, since topsoil has been removed from the area of the proposed extension, there is no requirement for mitigation measures.

Based on the assessment above there will be no significant effects on archaeological heritage.

12. Material Assets

Traffic and Transport

The existing Coshla Quarry is located to the north of the M6, to the south of the R339 Monivea Road and to the west of the L-7109 Coshla Road. The quarry is accessed via an access drive from the L-7109. The section of the L-7109 leading to the Coshla Quarry is generally straight and has sufficient width for 2 vehicles to pass. The existing access junction serving the Coshla Quarry off the local L-7109 Road is located approximately 1 km south of the junction with the R339 Monivea Road. The R339 Monivea Road connects with the L-7109 by means of a priority junction, with the latter forming the minor arm. The R339 Monivea Road serves as a radial route to / from Galway City and the M6 motorway. Both the R339 Monivea Road and the section of the local L-7109 between the quarry and the R339 have designated speed limits of 80 kilometres per hour (kph).

An analysis of the likely effects of the proposed development on traffic and transport was conducted by Alan Lipscombe Traffic and Transport Consultants. A detailed assessment of the capacity of the R339 / L-7109 junction was undertaken, with the method and findings set out in Appendix 12.4. The principal finding of the assessment is that the proposed development will have a slight impact on the operation of the junction, increasing the maximum ratio of flow to capacity (RFC) from 53.8% based on the existing level of development during the PM peak hour, to 58.9% with the introduction of the proposed quarry extension, and to 63.8% with the inclusion of the Battery Storage facility tested for the purpose of potential cumulative impact. With up to 85% considered to be acceptable, it is forecast that the R339 / L-7109 junction will operate well within capacity for all scenarios, and that the proposed quarry extension will have a slight impact on the junction capacity. If the proposed Quarry Extension is implemented it is forecast that the increase in traffic levels on the R339 and the L-7109 leading towards the site will have a slight negative effect and will be long term.

It is demonstrated that the modest increase in traffic that will be generated by the proposed extension will have slight negative impacts on general traffic on the R339 and the L-7109 and on existing traffic movements generated by the Coshla Quarry. It is also established that the additional traffic movements will be adequately accommodated by the existing R339 / L-7109 junction.

Other Material Assets

There are two 100kV overhead electricity cables crossing the proposed site. No underground electrical services exist within the proposed quarry expansion area. Relocation of the overhead electrical services that cross the site will not be required. The quarry operator is in communication with ESB Networks regarding work in the vicinity of overhead lines. The operation of the proposed development will have an imperceptible impact on above ground or underground electrical or telecommunications networks. There are no known telecommunication services in the proposed quarry expansion area.

13. Interaction of the Foregoing

Chapters 4 to 12 of this EIAR identify the potential environmental impacts that may occur as a result of the proposed development in terms of Population and Human Health, Biodiversity, Flora and Fauna, Land, Geology and Soils, Hydrology and Hydrogeology, Air and Climate, Noise and Vibration, Landscape and Visual, Archaeological and Cultural Heritage and Material Assets. All of the potential significant effects of the proposed development and the measures proposed to mitigate them have been outlined in the preceding sections of this report. However, for any development with the potential for significant environmental effects there is also the potential for interaction amongst these potential significant effects. The result of interactive effects may exacerbate the magnitude of the effects or ameliorate them, or have a neutral effect.

A matrix is presented in Table 13.1 to identify interactions between the various aspects of the environment already discussed in this EIAR. The matrix highlights the occurrence of potential positive or negative effects of the proposed development. The matrix is symmetric, with each environmental component addressed in the previous sections of this EIAR being placed on both axes of a matrix, and therefore, each potential interaction is identified twice.

Interactions have been identified between effects on Population and Human Health and effects on Noise and Vibration, Air and Climate, Hydrology and Hydrogeology, Landscape, and Material Assets. Interactions have been identified between effects on Biodiversity, Flora and Fauna with effects on Soils and Geology, Hydrology and Hydrogeology, Noise and Vibration. Interactions have been identified between effects on Soils and Geology with effects on Hydrology and Hydrogeology. Interactions have been identified between effects on Air and Climate with effects on Material Assets.

Where any potential interactive effects have been identified, appropriate mitigation is included in the relevant sections (Sections 4-12) of the EIAR.

In general, there are no significant negative effects associated with the proposed development or potential interactions. The development has been designed to ensure it is in keeping with its surrounds, and has limited potential for environmental.

1. INTRODUCTION

1.1 Introduction

This Environmental Impact Assessment Report (EIAR) has been prepared by McCarthy Keville O'Sullivan Ltd. (MKO) on behalf of Coshla Quarries Ltd., which intends to apply to Galway County Council for planning permission to expand the extraction area of their existing quarry in the townland of Barrettspark, Co. Galway.

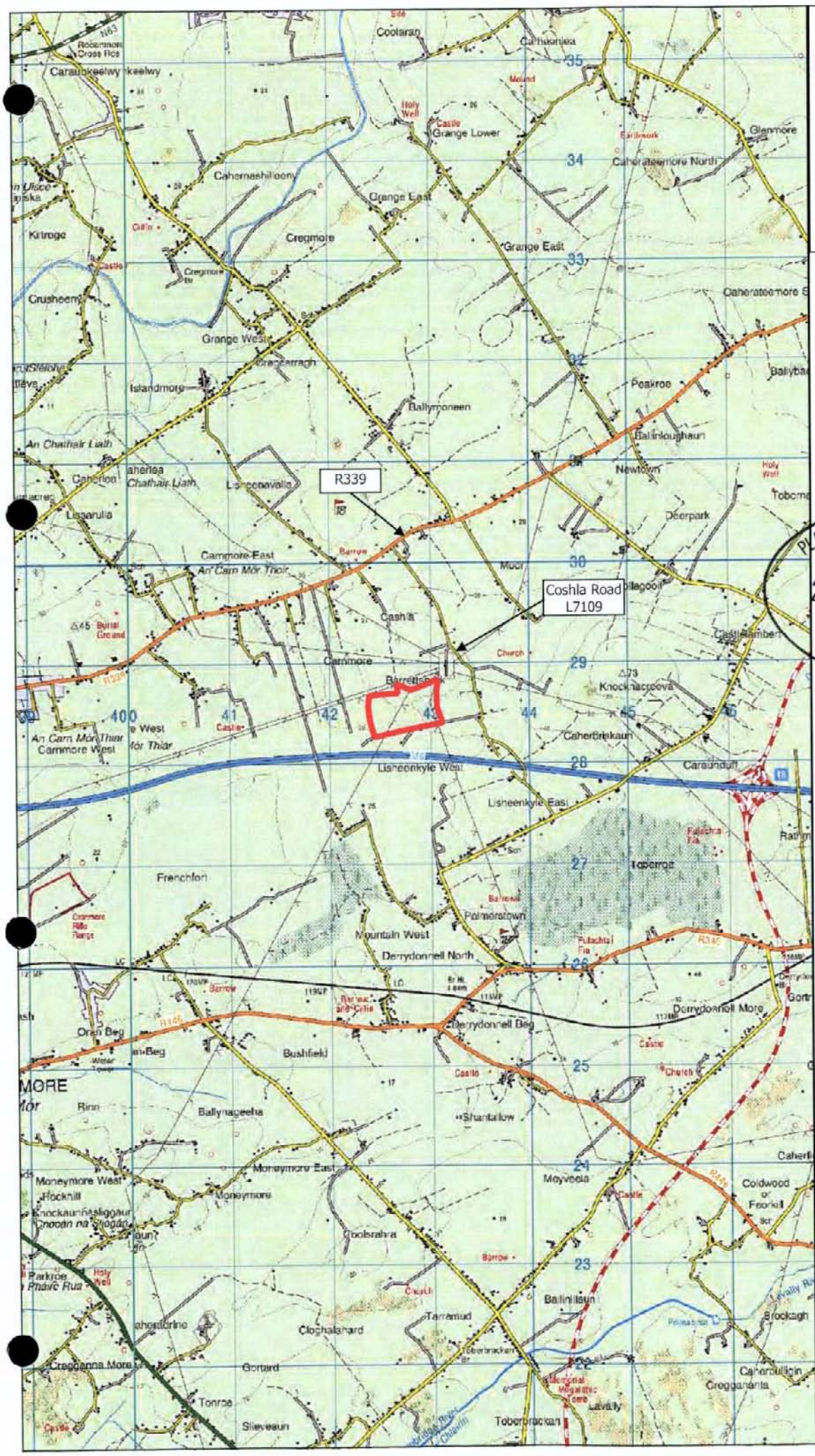
The site of the development is approximately 27.7 hectares in extent and is located in the townland of Barrettspark which is approximately 6.5 kilometres to the west of Athenry and approximately 6 kilometres to the northeast of Oranmore, Co. Galway. A site location map is included as Figure 1.1.

1.2 The Applicant and Project Background

Coshla Quarries Ltd. are the owners and operators of the quarry site located at Cashla, Athenry, Co. Galway. The company and quarry specialise in extracting bulk limestone and processing it into graded aggregates for supply and sale to meet local demand for aggregates on construction, civil engineering and infrastructure projects.

The applicant, Coshla Quarries Ltd., is a joint venture between Mr. John Morris of Statcroft and Mr. John Flaherty of C & F Tooling. Mr. John Morris of Statcroft currently operates quarries in Lackaghmore and Turloughmore and therefore has extensive quarry operation experience. The principal business of Statcroft is the supply of sand and gravel. Both Mr. John Morris and Mr. John Flaherty are well known for having good relationships with surrounding landowners in the communities where they operate.

The quarry has been in operation since 2007 when it was granted planning permission as a 13-hectare quarry by Galway County Council in 2007 (Pl. Ref. No: 06/4125). In 2011, An Bord Pleanála granted a 10-year planning permission for the operator to continue quarrying activities at the subject site, and to operate a concrete batching plant and a bitumen batching plant within the quarry site. The 13-hectare extraction area and the 27.7-hectare site boundary remained identical to that outlined in the existing quarry planning permission for Coshla Quarries Ltd (P06/4125). In October 2019 An Bord Pleanála granted retention permission for a concrete batching plant, which was an extension to the existing concrete batching plant permitted under Pl. Ref. No: 09/230 and included for associated structures and hardstanding areas (GCC Ref: 19/517, ABP Ref: 304769-19). All current planning permissions for the site will expire in March 2021.



Map Legend

Site Boundary

PLANNING & DEVELOPMENT SECTION
21 APR 2020 0499
GALWAY COUNTY COUNCIL

Drawing Title: Site Location

Project Title: Coshla Quarry Extension

Drawn By	Checked By
TJB	MW
Project No.	Drawing No.
180918	Figure 1.1
Scale	Date
1:50000	22.01.20

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1.3 Legislative Context

European Union Directive 2011/92/EU on the assessment of the effects of certain public and private projects on the environment (the 'EIA Directive'), is currently transposed into Irish planning legislation by the Planning and Development Act 2000 (as amended) and the Planning and Development Regulations 2001 (as amended). The EIA Directive was amended by Directive 2014/52/EU which has been transposed into Irish law with the recent European Union (Planning and Development) (Environmental Impact Assessment) Regulations 2018 (S.I. No. 296 of 2018).

Accordingly, this EIAR complies with the EIA Directive as amended by Directive 2014/52/EU. To the extent relevant and necessary, regard has been had to the existing provisions of the Planning and Development Act 2000 (as amended) and the Planning and Development Regulations 2018 insofar as they transpose the EIA Directive.

The European Union Directive 2011/92/EU, amended by EU Directive 2014/52/EU on the assessment of the effects of certain public and private projects on the environment (the 'EIA Directive'), requires Member States to ensure that a competent authority carries out an assessment of the likely significant effects of certain types of project, as listed in the Directive's, prior to development consent being given for the project. The Environmental Impact Assessment (EIA) of the proposed development will be undertaken by Galway County Council as the competent authority.

Article 5 of the EIA Directive as amended by Directive 2014/52/EU provides where an EIA is required, the developer shall prepare and submit an EIAR previously referred to as an Environmental Impact Statement ('EIS'). The information to be provided by the developer shall include at least:

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

MKO was appointed as environmental consultants on the proposed project and commissioned to prepare this EIAR in accordance with the requirements of the EIA Directive as amended by Directive 2014/52/EU.

1.4 EIA Screening

The relevant classes/scales of development that normally require Environmental Impact Assessment (EIA) are set out in Schedule 5 (Part 2) of the Planning and Development Regulations 2001, as amended. The relevant class of development in this case relates to:

"*Extraction of stone, gravel, sand or clay, where the area of extraction would be greater than 5 hectares*", as per Item 2 (b) of the Schedule.

In addition, Paragraph 13(a) of Part 1 requires Environmental Impact Assessment where there is:

"Any change or extension of development already authorised, executed or in the process of being executed (not being a change or extension refer to in Part 1) which would:-

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

ii. result in an increase in size greater than –

25 per cent, or

an amount equal to 50 per cent of the appropriate threshold, whichever is the greater."

The EIAR study area measures approximately 27.7 hectares whilst the proposed extension area measures approximately 6.7 hectares bringing to total extraction area to approximately 12.7 hectares. The extraction area is greater than 5 hectares and therefore is subject to EIA.

The EIAR provides information on the receiving environment and assesses the likely significant effects of the project, and proposes mitigation measures to avoid or reduce these effects. The function of the EIAR is to provide information to allow the competent authority to conduct the EIA of the proposed development.

1.4.1 EIAR Guidance

The EIAR has been carried out in accordance with the *'Draft Guidelines on the Information to be Contained in Environmental Impact Assessment Reports'* (EPA, August 2017), which are intended to guide practitioners during the transition to new Regulations transposing the updated EIA Directive 2014/52/EU.

Regard has also be given to the provisions of the *'Guidelines for Planning Authorities and An Bord Pleanála on Carrying out Environmental Impact Assessment'*, published by the Department of Housing, Planning and Local Government (DHPLG) in August 2018 to the extent these guidelines are relevant having regard to the enactment of the revised EIA Directive.

The EIAR has also been carried out with regard to the the following 2017 European Union guidance documents:

- European Union (2017). Environmental Impact Assessment of Projects: Guidance on the preparation of the Environmental Impact Assessment Report (Directive 2011/92/EU as amended by 2014/52/EU)
- European Union (2017). Environmental Impact Assessment of Projects: Guidance on Scoping (Directive 2011/92/EU as amended by 2014/52/EU)
- European Union (2017). Environmental Impact Assessment of Projects: Guidance on Screening (Directive 2011/92/EU as amended by 2014/52/EU)

1.5 Brief Description of the Development

The existing quarry is a limestone rock quarry. Bulk limestone has been extracted from the site to meet local demand for aggregates since the quarry first became operational. The quarry also operates a concrete batching plant on the site. The quarry is a self-contained, well-managed and efficient operation, and is a good example of how a quarry can operate when managed properly to minimise potential nuisance and impacts.

The proposed development allows for the continuation of quarrying and processing activities at the site and the extension of the existing quarry extraction area into lands to the east, north, and south of the current extraction area. The proposed extension area measures approximately 6.7 hectares and will bring the total extraction area up to 12.7 hectares. The quarrying methods that will be employed in the extension areas will be a continuation of those that have been used in the existing quarry. It is not proposed to construct any new buildings or other infrastructure or introduce any new plant items or processes as part of this application.

The existing management area of the quarry close to the site entrance consists of a site office and shed, a full-underbody truck wash and car parking area. Quarrying operations currently take place over a 6 hectare area of the site from which overburden and rock has been removed from approximately 4.8 hectares. An additional approximately 9 hectares of the site is currently taken up by stockpiles, storage areas, drainage infiltration field, a concrete batching plant, and quarry management area.

1.6 Need for the Development

The extractive industries and quarrying operations such as the subject operation, make a significant contribution to economic development in Ireland. The products and by-products of the industry are vital to the construction, transport and infrastructural sectors, in providing basic materials essential for construction and day-to-day life.

As the intrinsic value of this natural resource is often low, it is essential that quarries can be located where the resource is found or close to the markets they serve. Coshla Quarries supplies a high-quality bulk aggregates to the local and regional markets, keeping the cost of those aggregates competitive for the end users given the location of the quarry and proximity to the markets and outlets for the product. The recent upturn in the economy and thus the construction industry has led to an increase in demand for high-quality bulk aggregates which the proposed extension to the existing Coshla quarry will be able to provide for.

The proposed development can avail of the existing site infrastructure, site management procedures and the experienced staff all of which contributes to this being the most sustainable option for the delivery of products to industry.

The alternative to using the resource which exists to the east, north and south of the current extraction area and taking advantage of the existing infrastructure and expertise onsite is to source new bulk limestone sources and develop new supporting infrastructure and systems.

1.7 Purpose and Scope of the EIAR

The purpose of this EIAR is to document the current state of the environment in the vicinity of the proposed development site and to quantify the likely significant effects of the proposed development on the environment, in accordance with the requirements of the EIA Directive. The compilation of this document served to highlight any areas where mitigation measures may be necessary in order to protect the surrounding environment from the possibility of any negative impacts arising from the proposed development.

It is important to distinguish the EIA to be carried out by Galway County Council, from the EIAR accompanying the planning application. The EIA is the assessment carried out by the competent authority, which includes an examination that identifies, describes and assesses in an appropriate manner, in the 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 the proposed development on the following:

a) *population and human health*
b) *biodiversity, with particular attention to species and habitats protected under Directive 92/43/EEC and Directive 2009/147/EC*
c) *land, soil, water, air and climate*
d) *material assets, cultural heritage and the landscape*
e) *the interaction between the factors referred to in points (a) to (d)*

The EIAR submitted by the applicant provides the relevant environmental information to enable the EIA to be carried out by the competent authority. The information to be contained in the EIAR is prescribed Article 5 of the revised EIA Directives described in Section 1.3 above.

1.8 Structure and Content of the EIAR

1.8.1 General Structure

This EIAR uses the grouped structure method to describe the existing environment, the potential impacts of the proposed development thereon and the proposed mitigation measures. Background information relating to the proposed development, scoping and consultation undertaken and a description of the proposed development are presented in separate sections. The grouped format sections describe the impacts of the proposed development in terms of human beings, biodiversity, land, soils and geology, hydrology and hydrogeology, air and climate, noise and vibration, landscape and visual, cultural heritage and material assets such as traffic and transportation, together with the interaction of the foregoing.

The chapters of this EIAR are as follows:

- Introduction
- Background to the Proposed Development
- Description of the Proposed Development
- Population and Human Health
- Biodiversity,
- Land, Soils and Geology
- Hydrology and Hydrogeology
- Air and Climate
- Noise and Vibration
- Landscape and Visual
- Cultural Heritage
- Material Assets – including Traffic and Transport
- Interaction of the Foregoing

The EIAR also includes a non-technical summary, which is a condensed and easily comprehensible version of the EIAR document. The non-technical summary is laid out in a similar format to the main EIAR document and comprises a description of the proposed development followed by the existing environment, impacts and mitigation measures presented in the grouped format.

1.8.2 Description of Likely Significant Effects and Impacts

As stated in the *'Draft Guidelines on the Information to be contained in Environmental Impact Statements'* (EPA, 2017), an assessment of the likely impacts of a proposed development is a statutory requirement of the EIA process. The statutory criteria for the presentation of the characteristics of potential impacts requires that potential significant impacts are described with reference to the extent, magnitude, complexity, probability, duration, frequency, reversibility and trans-frontier nature (if applicable) of the impact.

The classification of impacts in this EIAR follows the definitions provided in the Glossary of Impacts contained in the following guidance documents produced by the Environmental Protection Agency (EPA):

- *'Guidelines on the Information to be contained in Environmental Impact Assessment Reports – Draft August 2017'* (EPA 2017).
- *'Advice Notes on Current Practice in the Preparation of Environmental Impact Statements'* (EPA, 2003).
- *'Guidelines on the Information to be contained in Environmental Impact Statements'* (EPA, 2002).
- *'Revised Guidelines on the Information to be contained in Environmental Impact Statements – Draft September 2015'* (EPA 2015).
- *'Advice Notes for Preparing Environmental Impact Statements – Draft September 2015'* (EPA 2015).

Table 1.1 presents the glossary of impacts as published in the EPA guidance documents. Standard definitions are provided in this glossary, which permit the evaluation and classification of the quality, significance, duration and type of impacts associated with a proposed development on the receiving environment. The use of pre-existing standardised terms for the classification of impacts ensures that the EIA employs a systematic approach, which can be replicated across all disciplines covered in the EIAR. The consistent application of terminology throughout the EIAR facilitates the assessment of the proposed development on the receiving environment.

Table 1-1 Impact Classification Terminology (EPA, 2017)

Impact Characteristic	Term	Description
Quality	Positive	A change which improves the quality of the environment.
	Neutral	No effects or effects that are imperceptible, within normal bounds of variation or within the margin of forecasting error.
	Negative	A change which reduces the quality of the environment.
Significance	Imperceptible	An effect capable of measurement but without significant consequences.
	Not significant	An effect which causes noticeable changes in the character of the environment but without significant consequences.
	Slight	An effect which causes noticeable changes in the character of the environment without affecting its sensitivities.

Impact Characteristic	Term	Description
	Moderate	An effect that alters the character of the environment in a manner consistent with existing and emerging baseline trends.
	Significant	An effect, which by its character, magnitude, duration or intensity alters a sensitive aspect of the environment.
	Very significant	An effect which, by its character, magnitude, duration or intensity significantly alters most of a sensitive aspect of the environment.
	Profound	An effect which obliterates sensitive characteristics.
Extent & Context	Extent	Describe the size of the area, number of sites and the proportion of a population affected by an effect.
	Context	Describe whether the extent, duration, or frequency will conform or contrast with established (baseline) conditions.
Probability	Likely	Effects that can reasonably be expected to occur because of the planned project if all mitigation measures are properly implemented.
	Unlikely	Effects that can reasonably be expected not to occur because of the planned project if all mitigation measures are properly implemented.
Duration and Frequency	Momentary	Effects lasting from seconds to minutes.
	Brief	Effects lasting less than a day.

Impact Characteristic	Term	Description
	Temporary	Effects lasting less than a year.
	Short-term	Effects lasting one to seven years.
	Medium-term	Effects lasting seven to fifteen years.
	Long-term	Effects lasting fifteen to sixty years.
	Permanent	Effect lasting over sixty years.
	Reversible	Effects that can be undone, for example through remediation or restoration.
	Frequency	Describe how often the effect will occur. (once, rarely, occasionally, frequently, constantly – or hourly, daily, weekly, monthly, annually).
Type	Indirect	Impacts on the environment, which are not a direct result of the project, often produced away from the project site or because of a complex pathway.
	Cumulative	The addition of many minor or significant effects, including effects of other projects, to create larger, more significant effects.
	'Do Nothing'	The environment as it would be in the future should the subject project not be carried out.
	Worst Case'	The effects arising from a project in the case where mitigation measures substantially fail.
	Indeterminable	When the full consequences of a change in the environment cannot be described.
	Irreversible	When the character, distinctiveness, diversity, or

Impact Characteristic	Term	Description
		reproductive capacity of an environment is permanently lost.
Type	Residual	Degree of environmental change that will occur after the proposed mitigation measures have taken effect.
	Synergistic	Where the resultant effect is of greater significance than the sum of its constituents.

Each impact is described in terms of its quality, significance, extent, duration, and type, where possible. A 'Do-Nothing' impact is also predicted in respect of each environmental theme in the EIAR. Residual impacts are also presented following any impact for which mitigation measures are prescribed. The remaining impact types are presented as required or applicable throughout the EIAR.

1.9 Project Team

The companies and staff listed in Table 1-2 were responsible for completion of the EIA of the proposed development. Further details regarding project team members are provided below.

The EIAR project team comprises a multidisciplinary team of experts with extensive experience in the assessment of quarry developments and in their relevant area of expertise. The qualifications and experience of the principal staff from each company involved in the preparation of this EIAR are summarised in Section 1.9.1 below. Each chapter of this EIAR has been prepared by a competent expert in the subject matter. Further details on project team expertise are provided in the Statement of Authority at the beginning of each effect assessment chapter.

Table 1-2 Companies and Staff Responsible for EIAR Completion

Consultants	Principal Staff Involved in Project	EIAR Input
MKO Tuam Road, Galway, H91 VW84	Michael Watson Thomas Blackwell Jimmy Green Pat Roberts Sean McCarthy John Staunton Julie O'Sullivan Joanna Mole David McNicholas Una Nealon Audrey Williams Joseph O'Brien James Newell	EIAR Project Managers, Scoping and Consultation, Preparation of Natura Impact Statement, EIAR Sections: 1. Introduction 2. Background to the Proposed Development 3. Description of the Proposed Development 4. Population & Human Health 5. Biodiversity, Flora & Fauna. 8. Air & Climate 10. Landscape & Visual 13. Interaction of the Foregoing 14. Schedule of Mitigation
Hydro Environmental Services 22 Lower Main Street	Michael Gill David Broderick	Drainage Design, Preparation of EIAR Sections:

Consultants	Principal Staff Involved in Project	EIAR Input
Dungarvan Co. Waterford		6. Land, Soils & Geology 7. Hydrology & Hydrogeology
AWN Consulting Ltd. IDA Business & Technology Park, Clonshaugh, Dublin 17	Dermot Blunnie Jennifer Harmon	Baseline Noise Survey and preparation of EIAR Section 9. Noise and Vibration
Tobar Archaeological Services Saleen, Midleton, Co. Cork	Miriam Carroll Annette Quinn	Archaeological Impact Assessment and preparation of EIAR Section: 11. Cultural Heritage
Alan Lipscombe Traffic and Transport Consultants Claran, Headford, Co. Galway	Alan Lipscombe	Speed survey and preparation of EIAR Section 12. Traffic & Transport

1.9.1 **MKO Team**

Michael Watson – Project Director

Michael Watson is Project Director and head of the Environment Team in McCarthy Keville O'Sullivan (MKO). Michael has over 17 years' experience in the environmental sector. Following the completion of his Master's Degree in Environmental Resource Management, Geography, from National University of Ireland, Maynooth he worked for the Geological Survey of Ireland and then a prominent private environmental & hydrogeological consultancy prior to joining MKO in 2014. Michael's professional experience includes managing Environmental Impact Assessments, EPA License applications, hydrogeological assessments, environmental due diligence and general environmental assessment on behalf of clients in the wind farm, waste management, public sector, commercial and industrial sectors nationally. Michaels key strengths include project strategy advice for a wide range and scale of projects, project management and liaising with the relevant local authorities, Environmental Protection Agency (EPA) and statutory consultees as well as coordinating the project teams and sub-contractors. Michael is a key member of the MKO senior management team and as head of the Environment Team has responsibilities to mentor various grades of team members, foster a positive and promote continuous professional development for employees. Michael also has a Bachelor of Arts Degree in Geography and Economics from NUI Maynooth, is a Member of IEMA, a Chartered Environmentalist (CEnv) and Professional Geologist (PGeo).

Thomas Blackwell – Senior Environmental Consultant

Thomas is a Senior Environmentalist with MKO with over 15 years of progressive experience in environmental consulting. Thomas holds a BA (Hons) in Geography from Trinity College Dublin and a M.Sc. in Environmental Resource Management from University College Dublin. Prior to taking up his position with MKO in August 2019, Thomas worked as a Senior Environmental Scientist with HDR, Inc. in the United States and held previous posts with private consulting firms in both the USA and Ireland. Thomas is a registered Professional Wetland Scientist with the Society of Wetland Scientists with specialist knowledge in wetland assessment and delineation, mitigation planning and design, stream geomorphic assessment, and stream and wetland restoration design. Thomas' professional experience includes managing Environmental Impact Assessments, environmental permitting,

environmental due diligence and compliance, and general environmental assessment on behalf of clients in the solar farm, mining, solid waste management, residential and commercial development, and public sectors. Thomas' key strengths and areas of expertise are in project management and strategy development, environmental permitting and assessment for renewable energy projects, fluvial geomorphology and stream restoration design. Since joining MKO, Thomas has been involved as an Environmental Consultant on a range of energy infrastructure, and residential projects.

Jimmy Green – Senior Planner

Jimmy Green is a Senior Planner with McCarthy Keville O'Sullivan Ltd. and is a professional planner with over 15 years of experience in both private practice and local authorities. Prior to taking up his position with McCarthy Keville O'Sullivan in 2004, Jimmy worked as an Assistant Planner, Executive Planner and Senior Executive Planner in Galway County Council and as an Assistant Planner in Donegal County Council. Since moving into the private sector, he has provided consulting services to a wide range of private and public-sector clients, and his experience includes planning application project management, EIAR preparation/ coordination/ project management, preparation of planning assessments, planning risk assessments, due diligence, submissions to Development Plans/Local Area Plans, securing planning condition compliance and advising in relation to enforcement issues.

Jimmy is primarily involved in coordinating and preparing EIAR, leading significant and complex renewable energy development proposals through the planning process and has a strong ability to work with many other disciplines and individuals, as well as with Council officials, elected members and members of the public.

Jimmy has project managed the planning application process for numerous developments through the various stages of the planning and appeals process. He has also brought three wind farm proposals through the Strategic Infrastructure Development (SID) consultation process with An Bord Pleanála as well as coordinating the lodgment and monitoring of the subsequent applications directly to the Board.

Pat Roberts – Ecology Director

Pat Roberts joined MKO (then Keville & O'Sullivan Associates) in 2005 following completion of a B.Sc. in Environmental Science. He has extensive experience of providing ecological services in relation to a wide range of developments at the planning, construction and monitoring stages. He has wide experience of large scale industrial and civil engineering projects. He is highly experienced in the completion of ecological baseline surveys and impact assessment at the planning stage. He has worked closely with construction personnel at the set-up stage of numerous construction sites to implement and monitor any prescribed best practice measures. He has designed numerous Environmental Operating Plans and prepared many environmental method statements in close conjunction with project teams and contractors. He has worked extensively on the identification, control and management of invasive species on numerous construction sites.

Pat has worked as project manager and ecologist on numerous ecological assessments completed by the company to date, including a wide range of work within sensitive ecological areas, and currently manages the work of the MKO Ecology Team.

Sean McCarthy – Project Planner

Sean McCarthy is a Project Planner with McCarthy O'Sullivan Ltd. with over 5 years of experience in both private practice and local authorities. Sean holds BSc. (Hons) in Property Studies and a Masters in Regional & Urban Planning. Prior to taking up his position with McCarthy Keville O'Sullivan in September 2015, Sean worked as a Planning Officer with the Western Isles Council in Scotland in the UK and prior to that worked as a Graduate Planner with Tipperary County Council. Sean is a chartered town planner with specialist knowledge in one off rural housing, renewable energy developments, quarry consents and retail planning. Since joining MKO Sean has been involved as a Project Planning Consultant on a significant range of energy infrastructure, commercial, housing, retail

and residential projects in addition to project managing circa 26MW of solar energy planning applications through the statutory planning system, with more projects in the pipeline. Sean holds chartered membership of the Royal Town Planning Institute.

Dr. John Staunton – Environmental Scientist

John Staunton is a Project Environmental Scientist with McCarthy O'Sullivan Ltd. with almost 10 years of postgraduate experience in both research and private consultancy. John holds both a BSc (1st class Hons) and a PhD in Environmental Science. Prior to taking up his position with McCarthy Keville O'Sullivan in October 2014, John worked as a research assistant for several soil and hydrogeological contamination research projects being undertaken by the Earth and Ocean Sciences department in NUI Galway. John also carried out research as part of a PhD, is lead author on four international peer-reviewed scientific papers, and presented at numerous national and international conferences. John's key strengths and areas of expertise are in project management, report writing, map making, communication and impact assessments. Since joining MKO, John has been involved as an Assistant Environmental Scientist on a significant range of energy infrastructure projects, hydrological and ecological monitoring, report writing of Environmental Reports (ER), Environmental Impact Statements/Environmental Impact Assessment Reports (EIS/EIAR) & Strategic Environmental Assessments (SEA) and carrying out research/literature reviews. This is in addition to project managing multiple jobs ranging from small projects to multi-million euro energy developments. Within MKO John works as part of a large multi-disciplinary team to produce EIS/EIAR, ER and SEA documents.

Julie O'Sullivan – Ecologist

Julie is an Ecologist with MKO. She holds a BSc (Hons) in Biology from University College London and a Masters in Ecological Assessment from University College Cork. Prior to taking up her position with us, Julie gained experience in practical habitat management and developed a range of field skills in plant, habitat, bird and bat surveying through working with several conservation organisations in the UK and Ireland including the RSPB, Cumbria Wildlife Trust and Bat Conservation Trust. Julie has experience surveying birds through her involvement with the RSPB in Northern Ireland. Julie is trained in bat survey, terrestrial invertebrate and freshwater macroinvertebrate sampling and in taking vegetation relevés of vascular plants and bryophytes. She also has experience in habitat identification, habitat mapping, Annex I habitat quality assessment and Phase 1 habitat survey. Julie has worked within our Ornithology Team on several renewable energy developments, utilising a broad range of bird survey methodologies including vantage point surveys, breeding raptor, adapted brown & shepherd and waterfowl distribution surveys. Julie was part of a team of bird usage surveyors working on the Shannon/Fergus Estuary. Within MKO Julie is responsible for independently carrying out and planning Ornithological field surveys in accordance with required Scottish Natural Heritage standards as part of the ornithology team, and for carrying out bat surveys, habitat surveys, and Appropriate Assessment screenings as part of the ecology team.

Joanna Mole – Project Landscape Architect

Joanna Mole is a Landscape and Visual Impact Assessment Specialist and Chartered Landscape Architect with McCarthy O'Sullivan Ltd. with over 15 years of experience in both private practice and local authorities. Joanna holds a BSc (Hons) in Landscape Design & Plant Science from Sheffield University, a Postgraduate Diploma in Landscape Architecture from Leeds Beckett University, a MSc in Renewable Energy Systems Technology from Loughborough University. Prior to taking up her position with McCarthy Keville O'Sullivan in October 2017, Joanna worked as a Landscape Architect with Kav-Banof in Israel and held previous posts with CSR in Cork, LMK in Limerick, Geo Architects in Israel and Groundwork Bridgend in South Wales. Joanna is a Chartered Landscape Architect with specialist knowledge in Landscape and Visual Impact assessments for projects ranging from individual houses to large windfarms, cycle route design and landscape contract management. Since joining MKO Joanna has been involved in projects such as energy infrastructure, extraction industry and residential projects.

Within MKO Joanna works as part of a large multi-disciplinary team to produce EIA Reports. Joanna holds chartered membership of the British

Landscape Institute since 1998 and has been an examiner for British Landscape Institute professional practice exam.

Audrey Williams – Graduate Landscape Architect

Audrey Williams is a Graduate Landscape Architect and Landscape and Visual Impact Assessment Specialist with McCarthy Keville O'Sullivan Ltd. with two years professional working experience in both private and educational teaching practices from Canada and Sweden. Audrey holds a Bachelor of Landscape Architecture (BLA) from Canada. Prior to taking up her position with McCarthy Keville O'Sullivan Ltd. in January 2020, Audrey held previous positions as a landscape architecture research assistant at the Swedish University of Agriculture Sciences, as well as a landscape architecture technician for HKLA in Canada. Since joining MKO, Audrey has been involved in a range of projects including wind energy, extraction industry and landscape concept designs.

David McNicholas – Senior Ecologist

David McNicholas is a Senior Ecologist at McCarthy Keville O'Sullivan, Planning & Environmental Consultants. David holds a BSc (First Class Hons) Environmental Science and an MSc (Hons) Environmental, Health and Safety Management. David specialises in the preparation of EIAs, EcIAs (Ecological Impact Assessments) and NISs including ecological surveys and monitoring. David has worked on all phases of wind farm development from feasibility/ scoping, ecological surveys, preparation of full EIS chapters, construction phase environmental monitoring and post-construction ecological monitoring. David has worked as an Ecological Clerk of Works (ECoW) during the construction phase of ten large scale wind farms in Ireland and Northern Ireland, gained significant experience on the implementation of the environmental and ecological measures.

Dr. Una Nealon – Project Ecologist

Úna Nealon is a Project Ecologist and Bat specialist with McCarthy O'Sullivan Ltd. With over 8 years of experience in consultancy, research and conservation management. After gaining a first class honours degree in Environmental Science at NUIG, Úna worked as an Environmental Consultant for OES Consulting where she gained experience in multidisciplinary ecological surveys and impact assessment. In addition, she has held research roles in Tanzania and Madagascar, studying local flora and fauna, and developing conservation management plans. Before joining MKO in June 2016, she completed her PhD with the Centre for Irish Bat Research, examining the impacts of wind farms on Irish bat species. Úna's primary expertise lies in bat ecology, particularly in relation to wind farm EIA. Beyond this, she is a skilled general ecologist, with experience in flora identification, habitat classification, GIS mapping, mammal surveys, Ecological Impact Assessment and Appropriate Assessment. Since joining MKO, Úna has been responsible for managing bat survey requirements for a variety of wind and solar energy planning applications, as well as other commercial, residential and infrastructure projects. This includes scope development, roost assessments, acoustic surveying, sonogram analyses, impact assessment and report writing. Within MKO, she works as part of a multi-disciplinary team to quickly identify potential ecological constraints and to produce EIS Reports, Appropriate Assessment Screening Reports and Natura Impact Statements. Úna is a member of the Irish Ecological Association, Bat Conservation Ireland and is Secretary of Galway Bat Group.

James Newell – CAD & Graphics Technician

James Newell has held the position of CAD and Information Technology/Graphics Technician with McCarthy Keville O'Sullivan since 2006. Prior to joining the company, James worked as a graphic designer and illustrator for over eight years. His previous experience included illustration of a number

of book projects, in addition to layout, design and typesetting associated with his graphic design position. Since joining the company, originally as CAD Technician, James' role has expanded to include design work on projects completed by the company, including public education projects. He has produced numerous photomontages and visibility maps for wind energy projects ranging from single turbine developments to extensive large-scale developments, and is proficient in the use of MapInfo GIS software in addition to AutoCAD and other design and graphics packages.

Joseph O'Brien – CAD & Mapping Technician

Joseph O'Brien holds the position of CAD Technician with McCarthy Keville O'Sullivan Ltd. since joining the Company in June 2016. Prior to joining MKO, Joseph worked as a free-lance Modelmaker and CAD Technician. His previous experience included designing various models and props through CAD and then made them for various conventions such as Dublin Comic Con and Arcade Con. Joseph holds a BA Honors Level 8 in Modelmaking, Design and Digital Effect from the Institute of Art Design and Technology and also holds a City & Guilds Level 3 in 2D and 3D AutoCAD. Joseph is responsible for mapping and drawings completed by the company and is proficient in the use of MapInfo GIS software in addition to AutoCAD and other design and graphics packages.

1.9.2 External Team

1.9.2.1 Hydro Environmental Services Ltd.

Michael Gill

Michael Gill is an Environmental Engineer with over 17 years' environmental consultancy experience in Ireland. Michael has completed numerous hydrological and hydrogeological impact assessments of wind farms in Ireland. He has also managed EIA/EIS assessments for infrastructure projects and private residential and commercial developments. In addition, he has substantial experience in wastewater engineering and site suitability assessments, contaminated land investigation and assessment, wetland hydrology/hydrogeology, water resource assessments, surface water drainage design and SUDs design, and surface water/groundwater interactions.

David Broderick

David Broderick is a hydrogeologist with over 12 years' experience in both the public and private sectors. Having spent two years working in the Geological Survey of Ireland working mainly on groundwater and source protection studies David moved into the private sector. David has a strong background in groundwater resource assessment and hydrogeological/hydrological investigations in relation to developments such as quarries and wind farms. David has completed numerous geology and water sections for input into EIAs for a range of commercial developments.

1.9.2.2 AWN Consulting – Noise & Vibration

Dermot Blunnie

Dermot Blunnie (Senior Acoustic Consultant) holds a BEng(Hons) in Sound Engineering, an MSc in Applied Acoustics and has completed the Institute of Acoustics Diploma in Acoustics and Noise Control. He has ten years' experience working in the field of acoustics. He is a member of both Engineers Ireland (MIEI) and the Institute of Acoustics (IoA). He has prepared numerous environmental impact assessment report chapters for various developments such as major infrastructural developments, mixed use developments and wind energy development projects.

Mike Simms

Mike Simms (Senior Acoustic Consultant) holds a BE and MEngSc in Mechanical Engineering, and is a member of the Institute of Acoustics and of the Institution of Engineering and Technology. Mike has

worked in the field of acoustics for over 19 years. He has extensive experience in all aspects of environmental surveying, noise modelling and impact assessment for various sectors including, wind energy, industrial, commercial and residential.

1.9.2.3 Tobar Archaeological Services

Miriam Carroll & Annette Quinn

Tobar Archaeological Services have been in operation since 2003 and offer professional nationwide services ranging from pre-planning assessments to archaeological excavation, and cater for clients in state agencies, private and public sectors.

Tobar's Directors, Annette Quinn and Miriam Carroll are licensed by the Department of Arts, Heritage and the Gaeltacht (DoAHG) to carry out excavations in Ireland and have carried out work directly for the National Monuments Services of the Department of the Environment, Heritage and Local Government (now DoAHG). Tobar has a proven track record in the renewable energy industry from EIS stage through to construction stage when archaeological monitoring and/or testing are frequently required.

1.9.2.4 Alan Lipscombe Traffic and Transport Consultants – Traffic

Alan Lipscombe MIHT

In January 2007 Alan Lipscombe set up an independent traffic and transportation consultancy providing advice for a range of clients in the private and public sectors. Prior to this Alan was a founding member of Colin Buchanan's Galway office having moved there as the senior transportation engineer for the Galway Land Use and Transportation Study. Since the completion of that study in 1999, Alan has worked throughout the West of Ireland on a range of projects including: major development schemes, the Galway City Outer Bypass, Limerick Planning Land-Use and Transportation Study, Limerick Southern Ring Road Phase II, cost benefit analyses (COBA) and various studies for the NUI Galway. Before moving to Galway in 1997, Alan was involved in a wide variety of traffic and transport studies for CBP throughout the UK, Malta and Indonesia. He has particular expertise in the assessment of development related traffic and transport modelling and is an accomplished analyst who has experience of a wide variety of modelling packages and methods.

1.10 Preparation

MKO is responsible for the preparation of this EIAR. No difficulties, such as technical deficiencies, lack of information or knowledge, were encountered in compiling any specific information contained in the EIAR.

2. BACKGROUND TO THE PROPOSED DEVELOPMENT

2.1 Site of Development

2.1.1 Site Location

The application site is located in the townland of Barretspark, Co. Galway, approximately 13km east of Galway City and 7km west of the town of Athenry. Site location maps are presented in Figures 2.1 and 2.2. Where the 'site' is referred to in this Environmental Impact Assessment Report (EIAR), this refers to the core Study Area for the assessments undertaken in order to prepare the EIAR. This area is located within the existing Coshla Quarries facility.

The EIAR study area measures approximately 27.7 hectares or 68.5 acres. The application site and EIAR study area are all contained within a landholding in the control of the applicant. The additional area of extraction for the quarry considered within this EIAR amounts to approximately 6.7 hectares, with an additional buffer area for landscaping and reinstatement works. The Grid Reference co-ordinates for the approximate centre of the site are E142,750 N228,528.

2.1.2 Site Access

The site is accessed via the L7109, a local road, which in turn connects to the R339 Monivea Road by way of a priority junction.

2.1.3 Physical Characteristics of Site and Surrounding Lands

Area 3-East central Galway (Athenry, Ballinasloe to Portumna). The landscape is flat, coarse grassland, occasional clumps of coniferous forestry between 1- 3 km² in size, fields defined principally by stone walls. There are no areas of particular scenic value although the stone walls are quite distinct. The Landscape Value of this area is deemed to be Low in the Galway County Landscape and Landscape Character Assessment 2015-2021 (LCA). The Landscape Sensitivity is deemed to be Class 1 – Low with pockets of Class 2 – Moderate. The LCA notes the following about this area:

> *'The landscape is flat therefore height restrictions should apply to built development to avoid long distant visual intrusion. Development is prohibited in the areas (primarily bogs) that carry a nature designation. Development in the class 1 area should be either set close to existing medium sized blocks of forestry or screened by either new commercial forestry or mixed deciduous woodland, both of which are present in this area. Due to the rural nature of the area scattered development which cannot be screened by forestry should be of natural stone or rendered finish of a colour that is sympathetic to the colours of the landscape. Stonewalls are a distinct element of the character of this area and should be constructed to match traditional style around new development.'*

The surrounding area can be primarily characterised of comprising open countryside with typical patterns of rural one-off housing. There is an electrical substation located to the north of the site as well as the C&F Tooling Manufacturing Facility. The M6 motorway is located to the south of the subject site.

The closest designated sites to the subject site are the Galway Bay Complex SAC (Site Code: 000268) located 4.1km to the east and the Lough Corrib SAC (Site Code: 000297) located approximately 4 km to the north.

Map Legend

Site Boundary

PLANNING & DEVELOPMENT SECTION
21 APR 2020 0499
GALWAY COUNTY COUNCIL

N

Drawing Title: Site Location

Project Title: Coshla Quarry Extension

Drawn By	Checked By
TJB	MW
Project No.	Drawing No.
180918	Figure 2.1
Scale	Date
1:15000	22.01.20

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email:info@mkoireland.ie
Website: www.mkoireland.ie

Map Legend

Site Boundary

PLANNING & DEVELOPMENT SECTION
21 APR 2020 0499
GALWAY COUNTY CO

N

Drawing Title: Site Location - Aerial

Project Title: Coshla Quarry Extension

Drawn By	Checked By
TJB	MW
Project No.	Drawing No.
180918	Figure 2.2
Scale	Date
1:15000	22.01.20

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2.2 Planning History

The quarry was granted planning permission by Galway County Council in 2007 for the development of a 13-hectare quarry with associated roads and services (Pl. Ref. No: 06/4125). This decision was issued on 25th June 2007. Subsequently An Bord Pleanála granted planning permission in September 2009 for retention for a concrete batching plant and temporary access haul road from Coshla Quarries Ltd adjacent to the N6 construction site (GCC Ref: 09/230, ABP Ref: PL 07.233579). Planning permission was also granted by Galway County Council in 2009 for the retention of a maintenance shed for quarry machinery (gross floor space 394sqm) (GCC Ref: 09/610). In 2011 An Bord Pleanála granted planning permission for the operator to continue quarrying with associated roads and ancillary services and to operate a concrete batching plant and a bitumen batching plant within the quarry. The 13-hectare extraction area and the 27.5-hectare site boundary remained identical to that outlined in the existing quarry planning permission for Coshla Quarries Ltd (P06/4125). An Environment Impact Statement (EIS) was submitted with the planning application (GCC Ref: 09/1958, ABP Ref: PL 07.235821). In October 2019 An Bord Pleanála granted retention permission for a concrete batching plant, which was an extension to an existing concrete batching plant permitted under Pl. Ref. No: 09/230 and included for associated structures and hardstanding areas (GCC Ref: 19/517, ABP Ref: 304769-19).

2.3 Strategic Planning Context

2.3.1 Background

The extractive industry makes an important contribution to economic development in Ireland and is essential to support the construction industry. This is necessary to meet the wide-ranging demands of the construction sector, ranging from minor works and single house projects, through to major commercial developments and infrastructure projects.

By their very nature, aggregates can only be extracted at the locations where they occur. Sand and stone have a low value-to-weight ratio and, consequently, it is not normally economically viable to transport them significant distances from quarry to market. Indeed, many gravel pits and quarries are located relatively close to settlements and urban areas, where general construction activity is normally concentrated. However, it is also the case that the high cost of transportation results in a need for a dispersed network of quarries across the country, each with its own local hinterland.

Further to the economic costs of transport referred to above, there is also a clear need for a dispersed network of quarries to serve local areas in the interests of sustainability. Indeed, the proximity principle applies in this regard, whereby sustainable development is compromised as the transport distances from quarry to market increase. In addition, there are other environmental considerations that result in a need for a nation-wide network of quarries, including the desire for local provenance of stone used in new developments.

2.3.2 Planning Policy

There is no national planning policy or strategy in Ireland for construction aggregates or dimension stone. Mineral extraction may be considered in Regional Planning Guidelines, although this is most often at a high level only. Similarly, most planning authorities consider the land use and planning issues associated with quarries and the extractive industry in their respective County Development Plans.

2.3.2.1 Galway County Development Plan 2015-2021

Section 6 of the Galway County Development Plan 2015-2021 (GCDP) relates to Waste, Wastewater, Waste Management & Extractive Industry. Sections 6.20 and 6.21 specifically relate to mineral extraction and quarries. It is stated in Section 6.20 that

'The Council will facilitate harnessing the potential of the area's natural resources while ensuring that the environment and rural and residential amenities are appropriately protected.'

The following policies are contained in Section 6.20 of the Plan

Policy EQ 1 – Environmental Management Practice
Have regard to evolving best environmental management practice as set out in Environmental Protection Agency (EPA) Guidelines Environmental Management in the Extractive Industry: Non-Scheduled Minerals and to the recommendations of the EU guidance document Undertaking Non-Energy Extractive Activities in Accordance with Natura 2000 Requirements.

Policy EQ 2 – Adequate Supply of Aggregate Resources
Ensure adequate supplies of aggregate resources to meet future growth needs within County Galway, facilitate the exploitation of such resources where there is a proven need and market opportunity for such minerals or aggregates, and ensure that this exploitation of resources does not adversely affect the environment or adjoining existing land uses.

The following objectives are also included in Section 6.21 of the Plan

Objective EQ1 – Protection of Natural Assets
Protect areas of geo-morphological interest, groundwater and important aquifers, important archaeological features Natural Heritage Areas and European Sites from inappropriate development.

Objective EQ 2 – Management of Aggregate Extraction
The Council shall require the following in relation to the management of authorised aggregate extraction –

(a) All quarries shall comply with the requirements of the EU Habitats Directive, the Planning and Development (Amendment) Act 2010 and by the guidance as contained within the DoEHLG Quarries and Ancillary Facilities Guidelines 2004, the EPA Guidelines 'Environmental Management in the Extractive Industry: Non-Scheduled Minerals 2006 (including any updated/superseding documents) and to DM Standard 37 of this Development Plan;
(b) Require development proposals on or in the proximity of quarry sites, to carry out appropriate investigations into the nature and extent of old quarries (where applicable). Such proposals shall also investigate the nature and extent of soil and groundwater contamination and the risks associated with site development works together with appropriate mitigation;
(c) Have regard to the Landscape Character Assessment of the County and its recommendations including the provision of special recognition to the Esker areas as referenced in Galway County Council Galway's Living Landscapes – Part 1: Eskers;
(d) Ensure that any quarry activity has minimal adverse impact on the road network;
(e) Ensure that the extraction of minerals or aggregates does not adversely impact on residential or environmental amenity;
(f) Protect all known un-worked deposits from development that might limit their scope for extraction.

Objective EQ 3 – Sustainable Reuse of Quarries
Encourage the use of quarries and pits for sustainable management of post recovery stage construction and demolition waste, as an alternative to using agricultural land, subject to normal planning and environmental considerations.

Objective EQ 4 – Compliance with Article 6(3) of the EU Habitats Directive
Ensure that all projects associated with the mineral extractive industry carry out screening for Appropriate Assessment in accordance with Article 6(3) of the Habitats Directive, where required.

The proposed expansion of the quarry is consistent with the policies and objectives set out in the Galway County Development Plan 2015-2021.

2.4 Scoping & Consultation

Scoping is the process of determining the content, depth and extent of topics to be covered in the environmental information to be submitted to a competent authority for projects that are subject to an Environmental Impact Assessment Report (EIAR). This process is conducted by contacting the relevant authorities and Non-Governmental Organisations (NGOs) with interest in the specific aspects of the environment likely to be affected by the proposal. These organisations are invited to submit comments on the scope of the EIAR and the specific standards of information they require. Consultees are invited to contribute to the EIAR process by suggesting baseline data, survey techniques and potential impacts that should be considered as part of the EIAR process and in its preparation. Comprehensive and timely scoping helps ensure that the EIAR refers to all relevant aspects of the proposed development and its potential effects on the environment. In this way, scoping not only informs the content and scope of the EIAR, it also provides a feedback mechanism for the proposed design itself.

A scoping report, providing details of the application site and the proposed development, was prepared by MKO and circulated on the 14th of November, 2019 to the agencies, NGOs and other relevant parties listed in Table 2.1. As the project description and proposed development will not alter significantly compared to the previous application, additional scoping was not deemed necessary.

MKO requested the comments of the relevant personnel/bodies in their respective capacities as consultees with regards to the EIA process.

2.4.1 Scoping Responses

Table 2.1 lists the responses received to the scoping document circulated on the 14th of November 2019. Copies of all scoping responses received are included in Appendix 2-1 of this EIAR. The recommendations of the consultees have informed the EIA process and the contents of the EIAR. If further responses are received, the comments of the consultees will be considered to further to assist documenting any impacts the quarry may have had on the surrounding environment during its lifetime.

The main recommendations of the consultees are summarised below in Table 2.1.

Table 2-1 Scoping Consultees

No.	Consultee	Response
1.	An Taisce	Email response on 20th of November, 2019
2.	Bat Conservation Ireland	No response
3.	BirdWatch Ireland	Email acknowledgement on 14th of November, 2019
4.	Commission for Regulation of Utilities Water and Energy	No response
5.	Galway County Council	No response
6.	Galway County Council	No response
7.	Galway County Council	No response
8.	Department of Agriculture, Food and the Marine	No response

No.	Consultee	Response
9.	Department of Communications, Climate Action and the Environment	No response
10.	Department of Transport, Tourism & Sport	No response
11.	Department of Culture, Heritage and the Gaeltacht	No response
12.	Failte Ireland	No response
13.	Geological Survey of Ireland	Letter response received on 27th of November, 2019
14.	Health Service Executive West	Letter response received on 16th of December, 2019
15.	Inland Fisheries Ireland	No response
16	Irish Water	No response
17	Irish Wildlife Trust	No response
18	Office of Public Works	No response
19	The Heritage Council	No response
20	Transport Infrastructure Ireland	Letter response received on 3rd of December, 2019
21	ESB Networks	Email acknowledgement on 14h of November, 2019

2.4.1.1 An Taisce

An email response was received on the 20th of November 2019. An Taisce made the following comments:

- "Compliance with conditions attached to An Bord Pleanala consent PL 07.235831 in 2010 should be demonstrated as preliminary matter".

2.4.1.2 Geological Survey of Ireland

A response letter was received on the 27th of November 2019. The Geological Survey of Ireland made the following comments:

- *"...our records show that there are no current County Geological Sites (CGSs) located within the vicinity of the Coshla Quarry".*
- *"The IGH programme has numerous working quarries on its database where there are significant geological sections or features exposed within the quarry. In fact, new exposures through quarrying may reveal new features of interest to the geologist, and we*

have in the past requested that periodic monitoring of the new faces be permitted. In this respect, Geological Survey Ireland would appreciate notification of commencement from the applicant".

- *"We also encourage discussion on end-of-life plans for the quarry and would be happy to recommend ways to promote the geology to the public or develop tourism or educational resources if appropriate. Geological Survey Ireland would like to offer help with interpretative signs where interesting geological features have been exposed, if appropriate".*
- *"With regard to Flood Risk Management, there is a need to identify areas for integrated constructed wetlands. We recommend using the GSI's National Aquifer and Recharge maps on our Map viewer to this end".*
- *"Geological Survey Ireland commends the use of our subsoils, aquifer and groundwater vulnerability datasets in the 'Description of the development site' section of the informal EIAR scoping, and hope to see these datasets also included in the final EIAR".*

2.4.1.3 Health Service Executive

A response letter was received on the 16th of December, 2019. The HSE made the following recommendations:

- The EIAR should identify the nearest sensitive receptors and consider the impact of the existing and proposed development on them. Sensitive receptors include, but are not limited to
  - occupied houses
  - farms (including stud farms and facilities for the production of vegetables and crops)
  - schools
  - childcare facilities
  - medical facilities and nursing homes
  - golf courses, sports and community facilities and
  - food premises.

- The Environmental Health Service (EHS) considers the following should be assessed in the Environmental Impact Assessment (EIA)
  - Any potentially significant emissions to surface water
  - Any potentially significant emissions to ground water
  - Any potentially significant emissions to air, including noise, vibration and dust
  - Staff welfare facilities
  - Public consultation
  - Potential for future health gain from the restoration of the proposed development
  - Cumulative impacts of developments in the locality

- It is recommended that an Environmental Management System (EMS) is put in place, with training of all site staff. There should be on-going review ofthe effectiveness of the EMS. The EMS should bedevised in accordance with international standards such as ISO 14001 2015 and EU EMAS (1993).
- When assessing the above potential impacts, the existing environment, the assessment methodology and evaluation criteria should be clearly reported in the EIAR.
- Should any proposed activities result in potential discharges to surface water, these activities must comply with the provisions of the Local Government (Water Pollution) Acts 1977 and 1990 and the Water Services Acts 2007-2013.
- It is recommended that detailed information is gathered on the location of private wells serving properties within a 2km radius of the proposed facility. The EIA should include proposals for sampling private wells (if planning permission is granted) prior to works

commencing to the quarry extension; at least biannually during the operation of the quarry and twice within the first year following cessation of operations at the site.

- The EHS recommends that the developer notes the limit values specified in the Air Quality Standards Regulations 2011 (S.I. No. 180 of 2011) which apply to ambient air quality in the vicinity of developments such as limestone quarries.
- The EHS emphasises the need for early and meaningful public consultation in the development process.
- A Decommissioning and Site Restoration Plan for the proposed extraction facility should be put inplace.
- Other extraction and quarrying facilities within a 5km radius of the proposed facility should be identified and assessed when considering the potential significant cumulative impacts from the proposed development.

2.4.1.4 Transport Infrastructure Ireland

A response letter was received on 3rd December, 2019. TII made the following comments with respect to EIAR scoping issues:

- *"....in view of the proximity of the site to the national road network, TII required demonstration of protection of the M6 at this location".*

2.4.1.5 ESB Networks

An automatic email was received confirming receipt of the scoping letter. No comment was given.

2.5 Cumulative Impact Assessment

This Environmental Impact Assessment Statement (EIAR) includes a description of likely significant impacts of the project, includes an assessment of cumulative impacts that may arise. The factors considered in relation to cumulative effects include human beings, flora and fauna, soil, water, climatic factors, landscape, cultural heritage and material assets.

The potential for cumulative impacts arising from the proposed development in combination with other projects has therefore been fully considered throughout this Environmental Report. This section of the Environmental Report provides an overview of other projects located within the wider area that have been considered within the cumulative impact assessments.

2.5.1 Methodology for the Cumulative Assessment of Projects

The potential for cumulative effects to arise from the proposed development was considered in the subject areas of human beings, flora and fauna, soil, water, climatic factors, landscape, cultural heritage and material assets. To comprehensively consider potential cumulative impacts, the final section of each relevant section within this Environmental Report includes a cumulative impact assessment where appropriate.

The potential cumulative impact of the proposed quarry development and other relevant developments has been carried out with the purpose of identifying what influence the proposed development will have on the surrounding environment when considered cumulatively and in combination with relevant permitted, proposed and constructed projects in the vicinity of the proposed site.

The Cumulative Impact Assessments (CIA) of projects has four principle aims:

1. To establish the range and nature of existing projects within the cumulative impact study area of the proposed quarry development.
2. To summarise the relevant projects which have a potential to create cumulative impacts.
3. To establish anticipated cumulative impact findings from expert opinions within each relevant field. Detailed cumulative impact assessments are included in each relevant section of the EIAR.
4. To identify the projects that hold the potential for cumulative interaction within the context of the proposed development and discard projects that will neither directly or indirectly contribute to cumulative impacts.

Assessment material for this cumulative impact assessment was compiled on the relevant developments within the vicinity of the proposed development. The material was gathered through a search of the Galway County Council online Planning Register, reviews of relevant Environmental Report, or Environmental Impact Assessment Report (EIAR) documents, planning application details and planning drawings, and served to identify past and future projects, their activities and their environmental impacts. These projects are summarised in Section 2.5.2 below.

2.5.2 Projects Considered in Cumulative Assessment

The comprehensive review of the Galway County Council planning register documented relevant general development planning applications within the vicinity of the proposed works, most of which relate to the provision and/or alteration of one-off rural housing and agriculture-related structures. The following developments have also been included in the context of the cumulative assessment.

Apple Data Centre – Planning Ref. No. 15/488

Apple Distribution International Ltd. applied for permission to construct the following: a 24,505sqm single storey data centre building, a 5232sqm single storey Logistics and Administration Building, a 289sqm single storey Maintenance Building, a 16sqm Security Hut and associated barriers, 2 number 48sqm Fibre Huts (max building eaves height = 10m), 18 external standby generators, all associated external plant, a 20kV Electricity Substation, contractor facilities, a main entrance including a new right turning lane, internal access roads and associated infrastructure, proprietary waste water treatment plants including percolation areas, mains water connection, fire water storage tanks; rainwater harvesting, provision of fibre optic data connections, car parking (207 spaces, including 7 visitor spaces, 50 internal staff mobility spaces and disabled parking spaces), bike parking, an amenity walkway and associated parking, site leveling for a laydown area and a 220kV substation, 2.4m high perimeter security fencing, landscaping including supplementary tree planting and all associated works. A report for screening for Appropriate Assessment and an Environmental Impact Statement (EIS) will be submitted with the planning application (gross floor space 30,138sqm)

Coshla Battery Storage Facility - Planning Ref. No. – 18/1883

Engie Developments Ireland Ltd. applied for permission for the development of an up to 100MW Battery Energy Storage Facility that will provide energy services to the national grid and will be delivered in 4 no. phases. The development will consist of the construction and operation of up to 34 metal containers to store up to a project total of up to 100MW in sealed battery cells each with entrances, fire suppression systems, heating, ventilation and air conditioning systems. The proposed development includes for inverters, control systems, other electrical components, security lighting and ancillary infrastructure and all associated works including security fencing and ancillary grid infrastructure.

Barrettspark Infill Facility – Planning Ref. No. – 19/325

MPL Plant Hire Ltd applied to Galway County Council to refill an existing disused quarry with inert material at Barrettspark in close proximity to Coshla Quarry. The Planner's Report in respect of this permission indicated that the applicant intends to deposit 25,000 tonnes of material per-annum on the

site which equates to 125,000 tonnes over the lifetime of the permission. Galway County Council granted planning permission for the development on 2nd September 2019.

None of these projects have yet been developed but their potential cumulative impact in the context of the proposed development have been considered.

3. DESCRIPTION OF THE PROPOSED DEVELOPMENT

3.1 Introduction

This section of the EIAR describes the existing quarry and its proposed extension. The chapter also describes the key features of the environmental controls that will be used within the quarry and the management of site operations. This description sets the basis against which the EIAR has been carried out.

For the purposes of the statutory public planning permission notices, the full description of the proposed development is as follows:

"Coshla Quarries Limited is applying to Galway County Council for a twenty-year planning permission for the continued operation of the existing quarry and associated uses and activities, as well as for an extension to the existing quarry extraction area and all associated site works including landscaping arrangements at Barrettspark, Athenry, Co. Galway. The proposed quarry extraction area extension is on lands to the north, south and east of the existing quarry and the additional extraction area amounts to approximately 6.7 hectares. The application is accompanied by an Environmental Impact Assessment Report (EIAR) and a Natura Impact Statement (NIS)".

3.2 Site Setting

3.2.1 Site Location

The site of the development is approximately 27.7 hectares in extent and is located in the townland of Barrettspark Co. Galway which is approximately 6.5 kilometres to the west of Athenry and approximately 6 kilometres to the northeast of Oranmore, Co. Galway. The approximate location for the centre of the site is E142,750 N228,528. The site location is shown Figure 1.1.

3.2.2 Site Description

The planning application boundary area measures approximately 27.7 hectares. The area of extraction for the quarry considered within this EIAR amounts to approximately 12.7 hectares. The site consists of an existing, operational quarry with associated infrastructure.

The historical development of the quarry site has resulted in the majority of the site management infrastructure being located in the west and north of the site, close to the entrance to the site, with the main quarrying and rock extraction occurring in the eastern side of the site. Quarrying and rock extraction has progressively moved further south and east from where it originally commenced. The large quarry floor area is used for the storage of quarried and graded aggregates in preparation for their sale and transport off-site. A drawing of the existing site layout, and the proposed extraction area expansion is included as Figure 3.1 below.

The site currently comprises the existing quarry extraction area, haul roads, quarry floor sump, Site office which also includes toilet and shower, canteen and staff room, machinery shed, concrete batching plants, loading silo/hoppers, wash down area, and truck wheel wash. There is an existing concrete settling tank and oil interceptor located in the centre of the operational quarry site. Existing landscaped and planted berms are located to the east and south of the extraction area. Please refer to Plate 3-1, 3-2, 3-3 and 3-4 for a view of the existing site quarry layout.

N

BARRETTSPARK
PÁIRC AN BHAIREADAIGH

Machinery Shed

Existing Building

Existing Concrete
Batching Plant

Drawing Legend

- Application Boundary
- Existing Quarry
- Proposed Quarry Expansion

DRAWING TITLE: Site Layout		DRAWING No.: Figure 3.1	
PROJECT TITLE: Coshla Quarry	OS SHEET: 3285, 3286, 3348, 3349	PROJECT No.: 180918	
DRAWING/MODIFIED BY: Joseph O Brien	CHECKED BY: Sean McCarthy	SCALE: 1:2,500	DATE: 30.03.2020

McCarthy Keville O'Sullivan Ltd. Planning & Environmental Consultants Block 1, Galway Financial Services Centre, Moneenageisha Road, Galway, Ireland. email: info@mccarthykos.ie Tel: +353 91 735611 Fax: +353 91 771279

Plate 3-1: View of existing quarry extraction area and concrete batching plant, facing southwest.

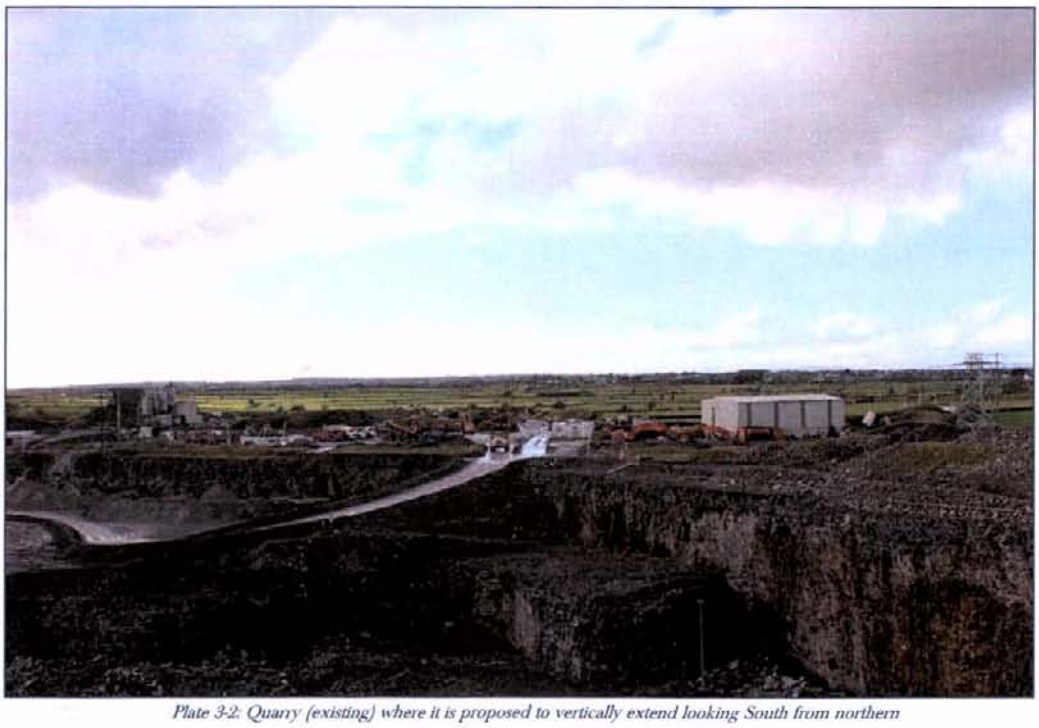

Plate 3-2: Quarry (existing) where it is proposed to vertically extend looking South from northern

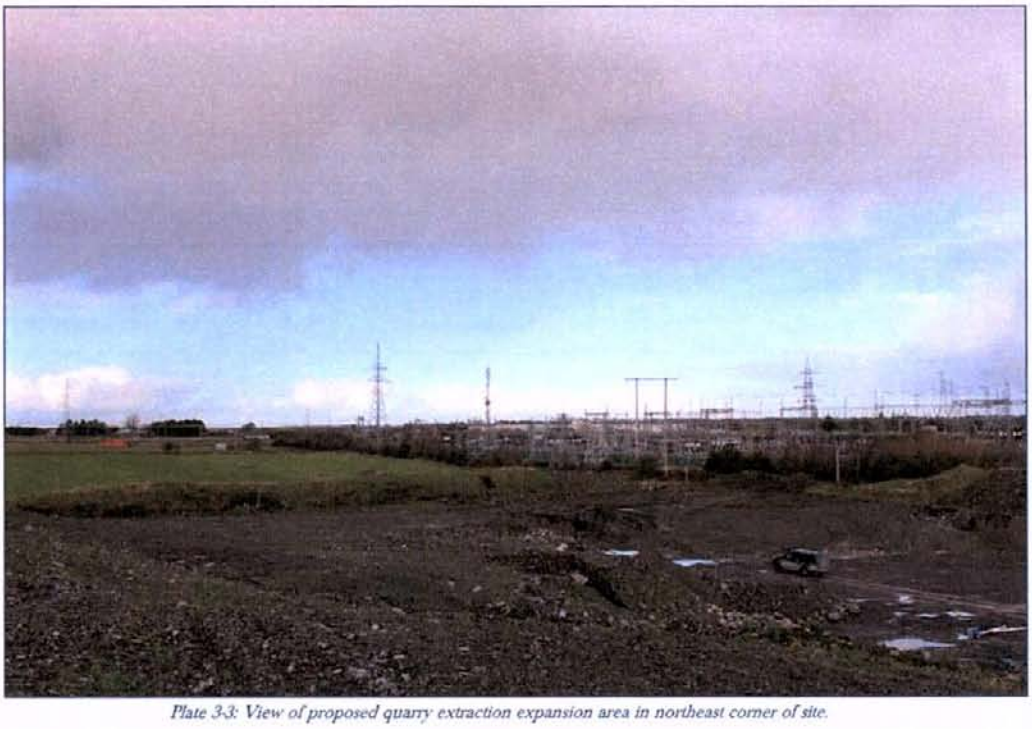

Plate 3-3: View of proposed quarry extraction expansion area in northeast corner of site.

Plate 3-4: View Existing planted landscape berm along southern site boundary.

The site is bounded by agricultural land, with a large electricity substation adjacent to the northeast corner of the site (see Plate 3-3).

The M6 motorway is located approximately 150 metres to the south of the subject site. The R339 Regional Road road is located 1.1 kilometres to the north of the subject site which connects to the quarry via the L7109 local road which is located approximately 300 metres to the east of the site.

There are no natural surface water features within the site or in close proximity to the site. The nearest surface water feature is the River Clare which is located approximately 4 kilometres to the northwest of the site.

3.2.3 Site Access

The quarry site is accessed from the north via a junction with Coshla Road (L7109) in the townland of Barrettspark (Plate 3-5). The quarry access road leading from the junction with the public road into the main extraction area is surfaced with tarmac. The quarry entrance is secured with vehicular barriers.

Plate 3.5 Quarry entrance from Coshla Road (L7109)

3.2.4 Quarry Management Area

Quarry operations will be controlled from a management area, located immediately inside (south) of the quarry gate, through which all vehicles entering and exiting the quarry must pass. The management area consists of a site office, machinery shed, weighbridge, and truck wheel wash. Staff and visitor car parking is provided immediately adjacent to the site office, to the southeast of the entrance gate.

The site office building will control quarry operations, records visitor and staff movements, truck movements in and out of the quarry, and general site operations, and includes an office, toilet and shower, and a canteen and staff room. Wastewater from the building's toilets is treated through an on-site septic system.

3.2.5 Existing Extraction Area

The existing quarrying extraction area covers an area of approximately 6.0 hectare (ha). The quarry has been worked extensively in the past, and the site includes a large excavated area (quarry floor) on the eastern half of the landholding which has a lower bench level at -5m OD and two upper benches at approximately 5 and 13.5m OD. The middle bench (i.e. at 5m OD) has the largest footprint area. The ground elevation surrounding the extraction area is between 20 – 24m OD.

3.3 Proposed Quarry Extension

3.3.1 Proposed Extraction Area

It is intended to laterally extend the extraction area of the existing quarry using the adjacent land to the south, north and east of the existing quarry as shown on Figure 3.1. The total area of the proposed extension to the existing quarry is approximately 67,000m^2 or 6.7 hectares. It is proposed to carry out quarry operations to the proposed extension area as described in Section 3.3.2 below. All of the proposed extension area is within the same landholding.

Based on the quantity of material available at the site, it is anticipated that the extraction within the quarry will take place over a 20-year period.

It is anticipated that the site will be worked in 3 no. phases as described below:

- Phase 1: The first phase of extraction will involve continued extraction in the existing extraction area. Extraction will then proceed to the east and north of the existing extraction area. Phase 1 will extend to a depth of -5 mAOD and will allow for the extraction of approximately 1,800,000m^3 of material using the current sump. Extraction of rock during Phase 1 is anticipated to occur during years 1 to 14.

- Phase 2: The second phase of extraction will extend to a depth -5 mAOD and will allow for the extraction of approximately 200,000m^3 of material in the southeastern corner of the site. Extraction of rock is anticipated to occur during years 14 to 16.

- Phase 3: The third phase of extraction will expand the excavation to the southwest, will extend to a depth of -5 mAOD and will allow for the extraction of approximately 500,000m^3 of material. Extraction of rock is anticipated to occur during years 16 to 20. Implementation of the quarry restoration plan will also occur during Phase 3.

The site will be worked over two benches at a height of approximately 10 metres, and approximately 18 metres, to minimise potential for injury from fall and to allow the provision of haul routes to a suitable gradient. The haul road will have a maximum width of approximately 10 metres. The proposed, phased extraction areas are shown in Figure 3.2. The natural variability inherent in the extractive industry means that some variation to the proposed extraction phasing may be necessary based on conditions encountered in the field. Any changes will be in timing only and will not change the likely impacts of the project. Proposed quarry extraction plans are included as Appendix 3-1 of this EIAR.

N

Drawing Title
Project Phasing

Project Title
Coshla Quarry Extension

Drawn By	Checked By
TJB	MW
Project No.	Drawing No.
180918	Figure 3.2
Scale 1:5,000	Date 20.03.25

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3.3.2 Site Operation

Initial expansion of the quarry area will commence in the centre of the site and proceed in an eastern direction toward the eastern boundary. It is proposed to extract rock to a finished level of approximately -5m below OD, which is the depth to which the existing quarry has been worked. The proposed site operation is described below

- Existing screening berms will remain in-situ until extraction of rock requires their relocation.
- Overburden will be stripped from the extraction area as needed and in advance of rock extraction activities.
- Stripped overburden from the expanded extraction area to be used for berm construction along the boundaries of the site, excess material will be stockpiled on-site for use during the reclamation phase of the project
- Extraction of rock will occur in the centre of site moving initially eastwards with the extraction anticipated to occur during years 1 to 25.
- The proposed extension to the extraction area covers approximately 6.7 hectares and is estimated to contain approximately 1,500,000 m^3 of rock.

3.3.3 Proposed Screening Methods

It is proposed to maintain an approximately 3 metre high earthern berm around the north, south and eastern perimeter of the site which will be used for landscaping and reinstatement works. This will also provide a noise barrier and visual screen for residents to the north, south and east of the site. These berms are already in place and are constructed using overburden (soils & subsoils) removed from the proposed extraction areas prior to the extraction of the rock as detailed in Section 3.5.1 below. Where possible, existing screening berms will be retained. If retention of existing berms is not practical, new berms will be constructed around the perimeter of the site.

3.3.4 Site Infrastructure

The proposed quarry development will not require significantly different methods of extraction to what is currently used. The proposed extraction will include the use of the following equipment and machinery, all of which is available on the existing quarry site and will be available for use in the future operation of the quarry:

- Site office which also includes toilet and shower, canteen and staff room;
- Machinery shed
- 2 no. concrete batching plants
- 2 no Loading silo/hopper
- 1 no. Wash down area
- 1 no. Mobile tracked excavator
- 2 no. Loading Shovels
- 2 no. crushers
- 3 no. screeners
- Wheel wash

An automated full-underbody truck wash is installed near the site entrance in a position that required all trucks entering and exiting the quarry area to pass through it. The truck wash is powered by electricity, and can be switched on and off as required. The truck wash is shown on Figure 3.1.

It is not proposed to alter the existing infrastructure at the site or introduce any new methods of extraction or new types of plant items. The proposed development is intended to allow for the future

use of the limestone resource using the existing site infrastructure, plant items and the methods used as part of the development of the quarry.

3.4 Description of Quarry Operations

3.4.1 Overburden Removal

Overburden has been largely removed from the proposed expansion area. Where soils and overburden remain, these will be removed from the working area prior to any rock being extracted from the extension area. This will typically be done by means of mechanical excavator, where the overburden is stripped and used to form berms around the perimeter of the site.

3.4.1.1 Berm Construction

Landscaped berms are already in place around the southern, eastern, and northern property boundaries adjacent to the extraction area. If additional berms are required, or repairs to berms are needed, these will be constructed by the applicant in accordance with relevant Health and Safety Guidance and other relevant guidelines.

- The permanent berm along the northern boundary of the site with the R353 will be approximately 300m in length, 2 to 3m high and will be graded to a slope of 2:1.
- The permanent berm along the eastern boundary of the site will be approximately 450m in length, 2 to 3m high and will be graded to a slope of 2:1.
- The permanent berm along the southern boundary of the site will be approximately 600m in length, 2 to 3m high and will be graded to a slope of 2:1.
- The berms will be planted with native species to assist in screening the quarry and to prevent erosion of soil.
- Where required, silt fences will be installed around berms to limit movement of entrained sediment in surface water runoff.

3.4.1.2 Volume of Overburden Available

The quantity of soil and other overburden material available on site for use in berm construction has been estimated to be approximately 20,000 m^3.

Table 3.1 below includes an estimate of the volume of material required to create the scale of berms proposed above.

Table 3.1 Soil Volumes for Berm Construction

Development Component	Required Soil/Overburden Volume (m^3) (approx.)
Permanent Berm (Southern Boundary)	7,200
Permanent Berm (Northern Boundary)	3,600
Permanent Berm (Eastern Boundary)	5,400
Total	**16,200**

It is therefore considered that there is more than the required volume of soil and subsoil material available on site for berm construction

Surplus soil and overburden material will be stored temporarily adjacent to the proposed working area to the east of the site. The temporary storage area will be assessed by an ecologist, geotechnical engineer and hydrologist prior to being used to temporarily store overburden destined for future reuse. If required, the stored material will be surrounded by silt fences to ensure sediment-laden run-off does not occur.

3.4.2 Rock Extraction

Rock will be extracted primarily by means of blasting. A mobile drilling rig is used to drill vertical boreholes into the area of rock that is to be blasted. The drilling rigs used are normally purpose built, self-propelled machines, designed specifically for drilling blast boreholes. A drilling rig working for 3-4 days would typically drill the necessary number of boreholes required for a single blast.

Prior to any drilling or blasting taking place the quarry manager will devise a quarry plan which will include the following:

- Identify areas for future blasting and highlight any specific local constraints.
- The blast engineer will assist in identifying the areas for future blasting on the ground and will conduct face profiling with laser surveying equipment. The face profiling data will assist the quarry manager in the determining blast design considerations.
- Inspection of the face will be conducted by the blast engineer in order to ascertain the bench face condition and local geology.
- A Blast Design Plan will be formulated which will include locations, depth and number of drill holes, angle, explosive load, sequence of detonation and any other relevant information.
- Using all the data gathered including face profile data, a blast design will be implemented to ensure that optimum fragmentation and safe blasting are attained.

The blast engineer would then arrange for the necessary quantity of explosive to be brought to site to undertake a single blast. The management of explosives onsite and the actual blasting operation would be agreed in advance with and supervised by An Garda Siochána. The blast engineer sets the explosives in place in the boreholes, sets the charges, and fires the blast. The blast takes only a matter of milliseconds, but may be perceived to take longer as blast noise echoes around the area.

A properly designed blast should generate rock of a size that can be loaded directly into a mobile crusher. The size of each blast will vary depending on the immediate and short-term demand. The potential impacts associated with noise are assessed in Chapter 9 Noise and Vibration.

3.4.3 Processing

Blasted rock will be loaded directly into a crusher to size it down to standard dimensioned aggregates. All crushing will be carried out by contract crushing contractors, employed to crush a specific volume of rocks. The mobile crusher used will be located as close as possible to the blasted rock face and blasted rock to minimise the distance over which the rock has to be transferred into the crusher.

Crushers and screeners will produce finished products of aggregates for use in concrete and other construction and civil engineering projects. The finished products are transported to stockpiles for storage until they are transported off site or used in concrete production.

The quarrying operations that will occur in the proposed extraction areas will not diverge from the quarry operations used to develop the previous quarried area. No additional types of quarrying plant will be brought on to site during the quarry operations of the proposed extraction areas

3.4.4 Site Drainage

The depth of excavation and current quarry floor level has not intercepted the water table, and therefore only small amounts rainfall runoff has to be managed within the quarry area. The majority of rainfall percolates to ground via the quarry floor. Excess runoff is directed to a sump, located in the centre of the quarry floor, into which all water from the working area of the quarry drains and will continue to drain from the proposed extension area.

Water draining to the sump is allowed to settle for long periods of time, before being pumped periodically up to the top of the quarry face, and discharged into a concrete settlement tank. Water leaves the settlement tank via a level weir and is then discharged to a large, stoned infiltration area, where it is reconverted to groundwater through infiltration of the soil.

The proposed extraction area will have a floor level no lower than the current floor level of the existing quarry. Drainage of surface water from these proposed areas will be managed with the same sump and pump arrangement as in the existing quarry. The storage volume of the existing sump will be increased to facilitate increased surface runoff from the proposed quarry extension. Regular maintenance of the sump pond will be carried out, which will involve removal and appropriate disposal of extracted silt.

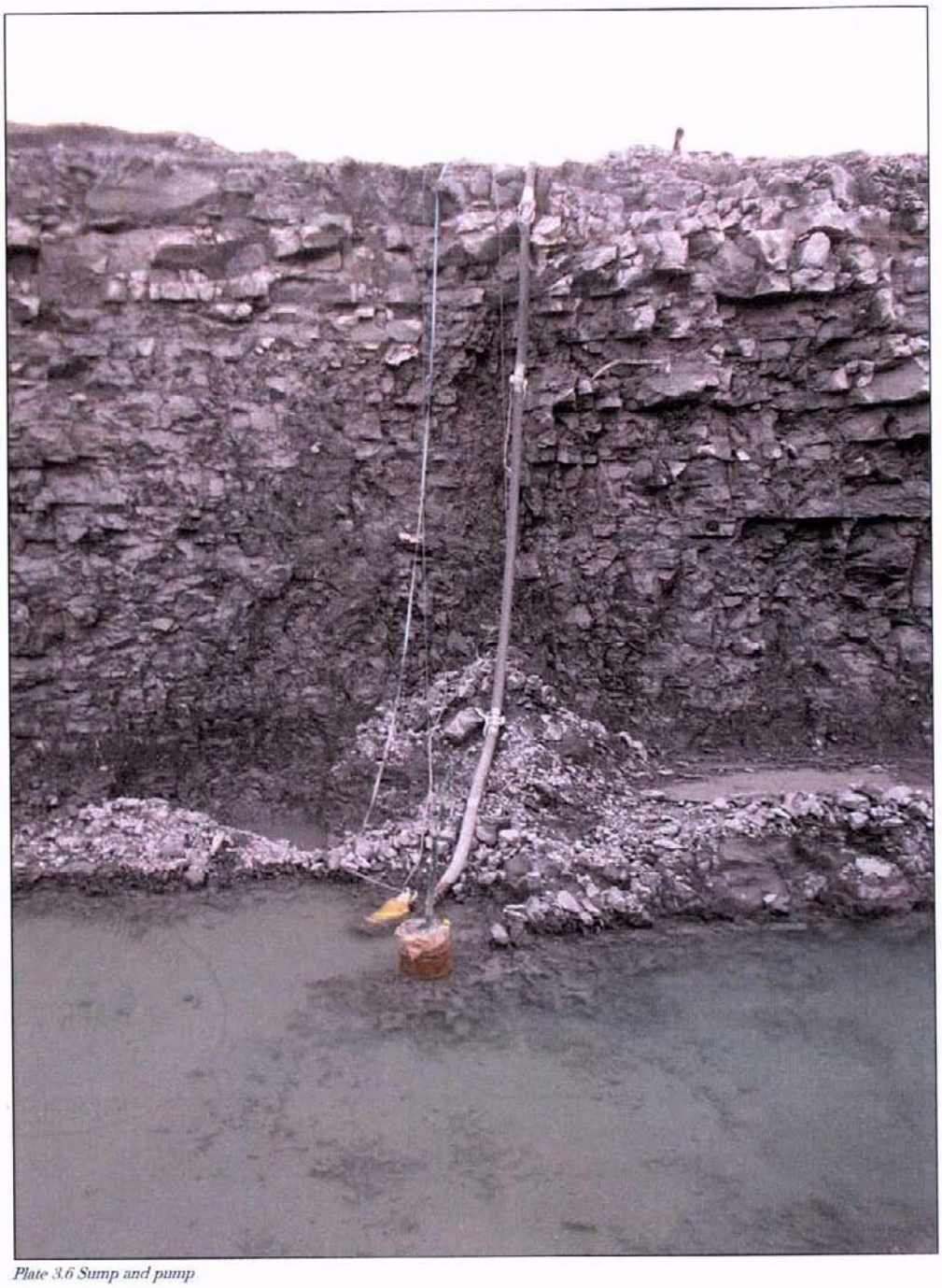


Plate 3.6 Sump and pump

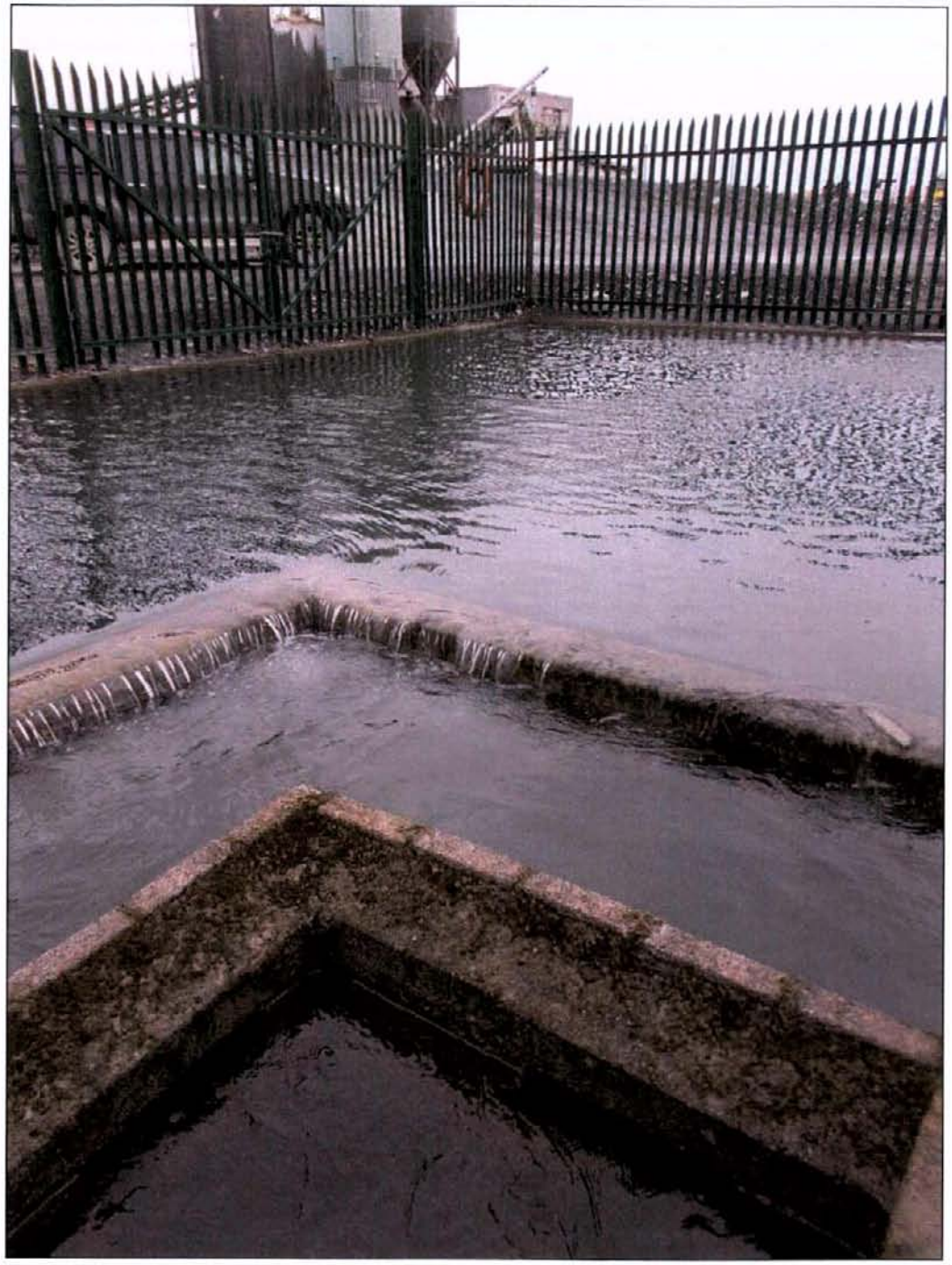


Plate 3.7 Concrete settling tank and weir

Plate 3.8 Infiltration Area

3.5 Management of Site Operations

3.5.1 Water Supply

Water to supply the quarry has is and will be sourced from the sump pond and a bored well on the quarry property. The sump pond supplies water for dust suppression and material wetting, while the bored well is and will be used for drinking water, supply the wheel wash and concrete production.

3.5.2 Wastewater Management

Wastewater arising on-site from the staff toilets is dealt with through a wastewater treatment system. It goes into a septic tank system and from there it is pumped to a soak away system on site.

3.6 Environmental Controls

3.6.1 Dust Control

- Permanent berms will be placed around the northern perimeter of the site and planted with native species to mitigate against potential impacts of dust on residential receptors. This will supplement the existing berms and vegetation located on the southern, western and south eastern boundaries.
- The hardstanding/roads adjacent the site will continue to be regularly inspected by the Site Manager for cleanliness, and cleaned as necessary.

- Water spraying of conveyors and stockpiles will be carried out when necessary to reduce the production of dust.
- Any hardstanding areas/site roads with the potential to give rise to dust will be regularly watered, as appropriate, during dry and/or windy conditions.
- Water bowser movements will be carefully monitored, as the application of too much water may lead to increased runoff.
- The transport of material, which has significant potential to cause dust, will be undertaken in tarpaulin-covered vehicles.
- All plant and machinery will be maintained in good operational order while onsite.
- All plant and materials vehicles shall be stored in the dedicated compound area.
- Monitoring of dust will continue as per the current permitted quarry (Chapter 8).

An assessment of potential dust emissions from the site is detailed further in Chapter 8 of this EIAR.

3.6.1.1 Dust Suppression

In periods of extended dry weather, dust suppression may be necessary in operational areas and along access roads to ensure dust does not cause a nuisance. If necessary, a water bowser will be used to dampen down haul roads and site compounds to prevent the generation of dust. Silty or oily water will not be used for dust suppression, because this would transfer the pollutants to the haul roads and generate polluted runoff or more dust. Water bowser movements will be carefully monitored, as the application of too much water may lead to increased runoff.

3.6.2 Noise Control

It is anticipated that there will be no significant noise effects from the plant and HGV movements associated with the proposed development. Notwithstanding this, the following general mitigation measures will be in operation at the site:

- Regular maintenance of items of plant to ensure that they are operating efficiently;
- Location of noisy items of plant at the lowest part of the working quarry floor and as close to the quarry face as possible to provide optimum noise screening;
- Design of internal haul roads with as low a gradient as possible to minimise excessive revving of vehicle engines travelling on-site;
- Regular maintenance of haul routes to avoid potholes and uneven surfaces;
- Avoiding unnecessary revving of engines, reducing speed of vehicle movement and keeping lorry tailgates closed where possible;
- All mobile equipment is throttled down or switched off when not in use;
- Use of rubber linings in chutes, dumpers, transfer points etc. to reduce the noise of rock falling on metal surfaces;
- Using simple baffles around washing drums, rubber mats around screening and crushing plants;
- Enclosing pumps, covering conveyors, cladding the plant and keeping noise control hoods closed when machines are in use;
- Within the constraints of efficient production, limiting the use of particularly noisy plant, limiting the number of items in use at any one time, starting plants one-by-one and switching off when not in use, and;
- Pointing directional noise away from sensitive areas where possible.

3.6.3 Refuelling

Wherever possible, vehicles are refuelled off-site. This will be the case for regular, road-going vehicles. However, for heavier plant and machinery that will be based on-site, a limited amount of refuelling has to take place on site.

On-site refuelling of machinery will be carried out using a mobile double skinned fuel bowser. The fuel bowser, a custom-built refuelling trailer will be re-filled on site, and towed around the site by a tractor to where machinery is located. It is not practical for all vehicles to travel back to a single refuelling point, given the size of the excavators, crushers, screeners, etc. The tractor will carry fuel absorbent material and pads in the event of any accidental spillages. Drip-trays will be used for fixed or mobile plant such as pumps and generators in order to retain oil leaks and spills. The drip tray will have a holding capacity of 110% of the volume contained within the machine/ generator. Only designated trained and competent operatives are authorised to refuel plant on site.

3.7 Site Reinstatement

Once quarry operations have ceased within the proposed extraction areas thin layers of soil and overburden shall be spread over the quarry floor, in targeted locations, and natural re-vegetation will be allowed to occur thereby enhancing the habitat diversity within the proposed study area. Overburden will also be spread on the safety benches and allowed to revegetate naturally. As stated in Section 3.4.1 above, earthen berms constructed from the overburden removed from the proposed extraction areas will surround the perimeter of the site. The berms will be planted with native species to assist in screening the quarry. A quarry restoration plan was developed as part of the 2009 planning permission for the quarry (GCC Ref: 09/1958, ABP Ref: PL 07.235821). No changes to this approved quarry restoration plan are proposed. Quarry Restoration Plan drawings are included as Appendix 3-2 of this EIAR.

3.8 Health and Safety

Health and Safety will be a priority on site at all times and will be undertaken in accordance with Coshla Quarry's existing Health and Safety procedures. Coshla Quarry shall at all times take such precautions as are necessary to protect the health and safety of its own employees, other employees and all other persons including members of the public, and shall comply with the requirements of the Safety, Health and Welfare at Work Act 2005 (as amended).

4. POPULATION AND HUMAN HEALTH

4.1 Introduction

This section of the Environmental Impact Assessment Report (EIAR) identifies, describes, and assesses the potential significant, direct and indirect effects of the proposed Coshla Quarry extension (the 'Proposed Development') on population and human health and has been completed in accordance with the guidance set out by the Environmental Protection Agency (EPA), in particular the *'Draft Guidelines on the Information to be Contained in Environmental Impact Assessment Reports'* (EPA, August 2017). The full description of the Proposed Development is provided in Chapter 3 of this EIAR.

One of the principle concerns in the development process is that individuals or communities, should experience no significant diminution in their quality of life from the direct or indirect impacts arising from the construction, operation, and decommissioning of a development. Ultimately, all the impacts of a development impinge on human health, directly and indirectly, positively and negatively. The key issues examined in this section of the EIAR include population, human health, employment and economic activity, land-use, residential amenity, community facilities and services, tourism and health and safety.

4.1.1 Statement of Authority

This section of the EIAR has been prepared by Thomas Blackwell and Michael Watson, both of MKO. Thomas is an experienced environmental consultant and has over 15 years' experience in environmental impact assessment. Thomas holds a BA (Hons) in Geography from Trinity College Dublin and a M.Sc. in Environmental Resource Management from University College Dublin. Prior to taking up his position with MKO in August 2019, Thomas worked as a Senior Environmental Scientist with HDR, Inc. in the United States and held previous posts with private consulting firms in both the USA and Ireland. Michael has over seventeen years' experience in the environmental sector and had worked for the Geological Survey of Ireland and then a prominent private environmental & hydrogeological consultancy prior to joining MKO in 2014. Michael completed an MA in Environmental Management at NUI, Maynooth in 1999. Michael is a professional geologist (PGeo) and full member of IEMA (MIEMA) as well as a Chartered Environmentalist (CEnv).

4.2 Population

4.2.1 Receiving Environment

Information used in this section was sourced from the Central Statistics Office (CSO), the *'Galway County Development Plan 2015 – 2021'*, Fáilte Ireland and any other literature pertinent to the area. The study included an examination of the population and employment characteristics of the area. This information was sourced from the Census of Ireland 2016, which is the most recent census for which a complete dataset is available, also the Census of Ireland 2011, the Census of Agriculture 2000 and 2010 and from the CSO website, www.cso.ie.

Census information is divided into State, Provincial, County, Major Town and District Electoral Division (DED or ED) level, but may not be available for all levels. For the purposes of this section of the EIAR, ED level data was used wherever possible. The information at this level was analysed and compared to the same information at national and county level. This method provides an average or standard with which the Human Beings Study Area information can be compared.

The site of the subject development is located in the townland of Barrettspark, Co. Galway, approximately 6.5 kilometres to the west of Athenry and 6 kilometres to the northeast of Oranmore, Co. Galway.

In order to make inferences about the population and other statistics in the vicinity of the subject site, the Human Beings Study Area for the Human Beings section of the EIAR was defined in terms of the Electoral Divisions. The site of the quarry lies primarily within Aughrim ED, as shown in Figure 4.1. The following four EDs have also been included in the Human Beings Study Area for the Human Beings impact assessment due to their proximity to the site:

- An Carn Mór ED
- Lisin an Bhealaigh ED
- Stradbally ED
- Greethill ED

The Population and Human Health Study Area is shown in Figure 4.1. The Study Area has a combined population of 7,151 persons and comprises a total land area of 10,940 hectares or 109.4 square kilometres (Source: CSO Census of the Population 2016).

The proposed quarry site is not located within a village or settlement. The overall level of residential development in the area around the site is low. There are 3 no. houses located within 500m of the proposed quarry site as shown in Figure 4.2. The closest occupied dwelling is located approximately 20 metres from the southern site boundary.

4.2.2 Population Trends

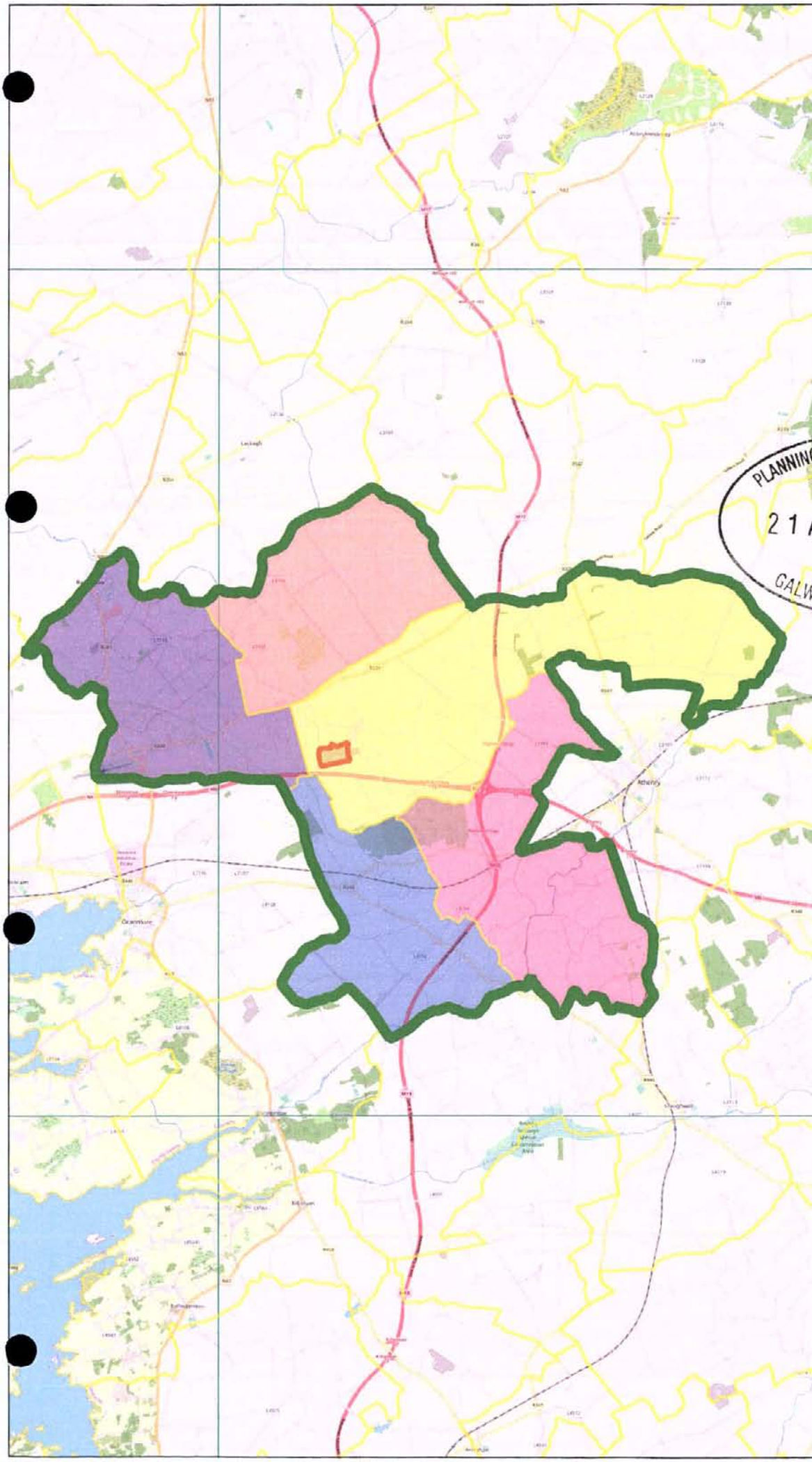
In the four years between the 2011 and the 2016 Census, the population of Ireland increased by 3.8%. During this time, the population of County Galway grew by 2.4% to 179,390 persons. Other population statistics for the State, County Galway and the Study Area have been obtained from the Central Statistics Office (CSO) and are presented in Table 4.1.

Table 4.1 Population 2011 - 2016 (Source: CSO)

Area	Population Change		% Population Change
	2011	2016	2011 - 2016
State	4,588,252	4,761,865	3.8
County Galway	175,124	179,390	2.4
Study Area	6,956	7,151	2.8

The data presented in Table 4.1 shows that the population of the Study Area increased by 2.8% between 2011 and 2016. This rate of population growth is higher than that recorded at County level but lower than that recorded at State level. When the population data is examined in closer detail, it shows that the rate of population increase within the Study Area has been unevenly spread through the EDs. The highest rate of population increase between 2011 and 2016 occurred within Greethill ED, which experienced a 8.6% population increase. In comparison, the population of An Carn Mór ED decreased by 1.2% during the same time period.

Of the EDs that make up the Study Area for this assessment (Human Beings Study Area), the highest population was recorded in An Carn Mór ED, with 2,577 persons recorded during the 2016 Census. The lowest population was recorded in Greethill ED, with 999 persons recorded during the 2016 Census.



Map Legend

- Site Boundary
- Population Study Area

Galway DEDs

- DED Boundaries
- 041 Aughrim
- 046 An Carn Mór
- 058 Lisín an Bhealaigh
- 064 Stradbally
- 114 Greethill

N

Drawing Title: Population Study Area

Project Title: Coshla Quarry Extension

Drawn By	Checked By
TJB	MW
Project No.	Drawing No.
180918	Figure 4.1
Scale	Date
1:120000	22.01.20

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email:info@mkoireland.ie
Website: www.mkoireland.ie

Map Legend

- Site Boundary
- 500m Buffer
- House Locations

PLANNING & DEVELOPMENT SECTION
APR 2020 0499
GALWAY COUNTY COUNCIL

N

Drawing Title: Adjacent Houses

Project Title: Coshla Quarry Extension

Drawn By	Checked By
TJB	MW
Project No.	Drawing No.
180918	Figure 4.2
Scale	Date
1:15000	22.01.20

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4.2.3 Population Density

The population densities recorded within the State, County Galway and the Study Area during the 2016 Census are shown in Table 4.2.

Table 4.2 Population Density in 2011 and 2016 (Source: CSO)

Area	Population Density (Persons per square kilometre)	
	2011	2016
State	65.57	68.06
County Galway	29.18	29.89
Study Area	63.58	65.37

The population density of the Study Area recorded during the 2016 Census was 65.37 persons per square kilometre. This figure is marginally lower than the national figure of 68.06 persons per square kilometre but higher than the figure of 29.89 persons per square kilometre recorded for County Galway.

Similar to the trends observed in population, the population density recorded across the Study Area varies between EDs. Aughrim ED has the lowest population density, at 38.8 persons per square kilometre, while An Carn Mór ED has the highest population density, at 133.94 persons per square kilometre.

4.2.4 Household Statistics

The number of households and average household size recorded within the State, County Galway and the Study Area during the 2011 and 2016 Censuses are shown in Table 4.3.

Table 4.3 Number of Households and Average Household Size 2011 - 2016 (Source: CSO)

Area	2011		2016	
	No. of House-holds	Average Size (persons)	No. of House-holds	Average Size (persons)
State	1,654,208	2.8	1,697,665	2.8
County Galway	60,952	2.8	63,040	2.8
Study Area	2,202	3.2	2,270	3.2

In general, the figures in Table 4.3 show that while the number of households at State, County and Study Area level continues to increase, the average number of people per household has stayed the same, i.e. there are more households and the same amount of people per house. Average household size recorded within the Study Area during the 2011 and 2016 Censuses are slightly higher than that observed at State and County level during the same periods.

4.2.5 Age Structure

Table 4.4 presents the percentages of the State, County Galway and Study Area population within different age groups as defined by the Central Statistics Office during the 2016 Census. This data is also displayed in Figure 4.3.

Table 4.4 Population per Age Category in 2016 (Source:CSO)

Area	Age Category				
	0 - 14	15 – 24	25 - 44	45 - 64	65 +
State	21.1%	12.1%	29.5%	23.8%	13.4%
County Galway	22.7%	10.9%	26.3%	25.6%	14.5%
Study Area	25.5%	12.4%	26.9%	25.7%	9.5%

The proportion of the ED Study Area population within each age category is similar to those recorded at national and County level for most categories. Within the Study Area, the highest population percentage occurs within the 25 - 44 age category.

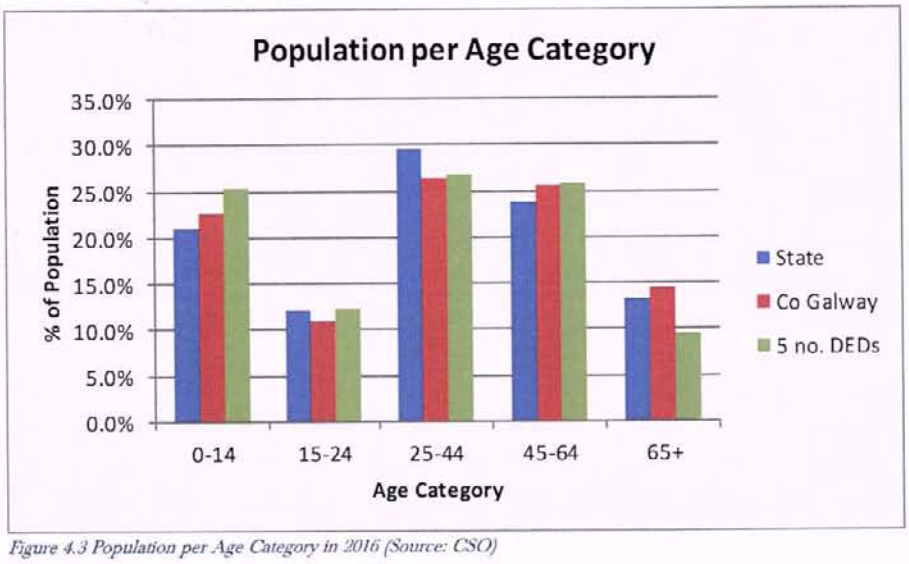


Figure 4.3 Population per Age Category in 2016 (Source: CSO)

4.2.6 Employment and Economic Activity

4.2.6.1 Employment by Socio-Economic Group

Socio-economic grouping divides the population into categories depending on the level of skill or educational attainment required. The 'Higher Professional' category includes scientists, engineers, solicitors, town planners and psychologists. The 'Lower Professional' category includes teachers, lab technicians, nurses, journalists, actors and driving instructors. Skilled occupations are divided into manual skilled, such as bricklayers and building contractors; semi-skilled, e.g. roofers and gardeners; and unskilled, which includes construction labourers, refuse collectors and window cleaners. Figure 4.4 shows the percentages of those employed in each socio-economic group in the State, County Galway and the Human Beings Study Area during 2016.

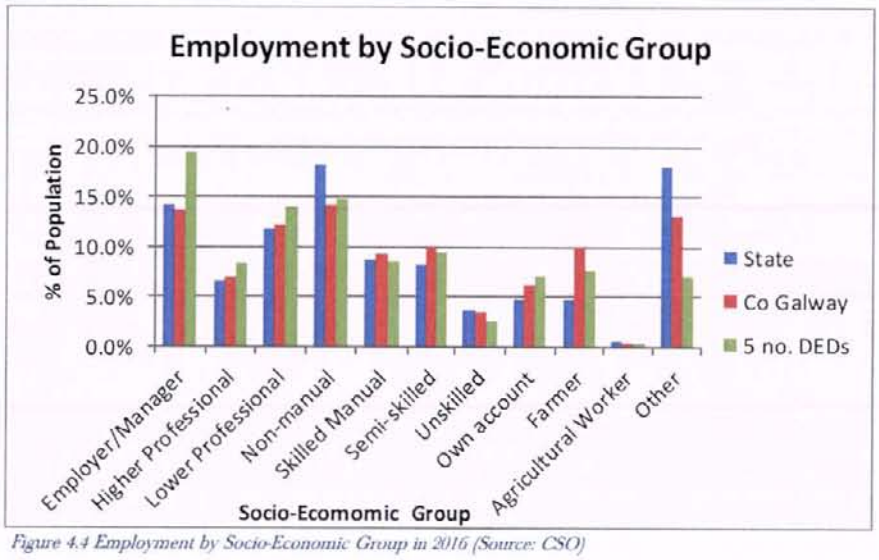


Figure 4.4 Employment by Socio-Economic Group in 2016 (Source: CSO)

The highest levels of employment within the Human Beings Study Area were recorded in the Employer/Manager category. The levels of employment within the Employer/Manager, Higher Professional, Lower Professional and Own Account Workers in the Human Beings Study Area were marginally higher than those recorded for the State and County Galway, while those recorded within the Skilled Manual, Unskilled and All Other categories were lower.

The CSO figures for socio-economic grouping have a limitation of including the entire population, rather than just those who are in the labour force. It is likely that this is what gives rise to the high proportion of the population shown to be in the 'Other' category in Figure 4.4.

4.2.7 Land-use

The primary land-use in the vicinity of the site comprises a mix of agricultural land and rural housing. The total area of farmland within the Study Area for the Human Beings assessment measures approximately 8,711 hectares or 80% of the Study Area, according to the CSO Census of Agriculture 2010. There are 299 farms located within the Study Area.

Within the Study Area, farming employs 647 people, and the majority of farms are family-owned and run. Table 4.5 shows the breakdown of farmed lands within the wider ED Study Area used for this section of the EIAR. Pasture accounts for the largest proportion of farmland, followed by tillage.

Table 4.5 Farm Size and Classification within the Study Area in 2010 (Source: CSO)

Characteristic	Value
Size of Study Area	10,940 hectares
Total Area Farmed within Study Area	8,711 hectares
Farmland as % of Study Area	79.6%
Breakdown of Farmed Land	**Area (hectares)**
Total Pasture	5,178 ha
Total Silage	2,411 ha
Grazing	506 ha
Total Hay	470 ha
Total Crops	144 ha
Total Potatoes	11 ha
Total Cereals	84 ha

4.3 Tourism

4.3.1 Tourist Numbers and Revenue

Tourism is one of the major contributors to the national economy and is a significant source of full time and seasonal employment. During 2018, total tourism revenue generated in Ireland was approximately €9.4 billion, an increase on the €8.8 billion revenue recorded in 2017. Overseas tourist visits to Ireland in 2018 grew by 6.5% to 9.6 million (*'Key Tourism Facts 2018'*, Fáilte Ireland, September 2019).

Ireland is divided into seven tourism regions. Table 4.6 shows the total revenue and breakdown of overseas tourist numbers to each region in Ireland during 2018 (*'Key Tourism Facts 2018'*).

The West region, in which the site of the Proposed Development is located, comprises Counties Galway, Mayo and Roscommon. This Region benefited from approximately 20.4% of the total number of overseas tourists to the country and approximately 13.9% of the total tourism income generated in Ireland in 2018.

Table 4.6 Overseas Tourists Revenue and Numbers 2018 (Source: Fáilte Ireland)

Region	Total Revenue (€m)	Total Number of Overseas Tourists by Region(000s)
Dublin	€2,095	6,309
Mid East/Midlands	€393	1,030
South-East	€261	1,028
South-West	€987	2,512
Mid West	€511	1,497
West	€727	1,963
Border	€244	752
Total	**€5,218**	**9,609[1]**

[1] *Total number of overseas tourists accounts for tourists who visit multiple regions on their trip.*

4.3.2 Tourist Attractions

There are no key identified tourist attractions pertaining specifically to the site of the proposed development itself. The closest tourist attraction to the proposed quarry site is Athenry Golf Club which is located approximately 1.5km to the southeast of the site. The majority of listed tourist attractions on the Discover Ireland website are located in Athenry and Galway City areas.

The site of the proposed quarry extension is located in an area designated as a Low Sensitivity Landscape. The subject site is located within LCA 3: East Central Galway (Athenry, Ballinasloe to Portumna). The relevant section of the Landscape Character Assessment describes the East Central Galway LCA as follows:

"The landscape is flat, coarse grassland, occasional clumps of coniferous forestry between 1-3 km² in size, fields defined principally by stone walls. There are no areas of particular scenic value although the stone walls are quite distinct.

The nearest viewpoint is listed as View No. 34 - Reservoir located north of the R339 northeast of Galway. This view lies approximately 3.3 kilometres west of the site.

The potential for visual impacts arising from the proposed development on the wider landscape and scenic roads is assessed in Chapter 10 of this EIAR.

4.4 Human Health

The consideration of potential impacts on human health are examined separately in the Air & Climate, Noise & Vibration, Geology and Soils, Hydrology & Hydrogeology and Traffic Sections of the EIAR. These chapters should be consulted for detailed information on potential impacts, however a brief summary of the key information is provided in Section 4.5 below. Potential issues relating to health and safety, and amenity concerns are also discussed below.

4.4.1 Vulnerability of the Project to Natural Disaster and Major Accidents

There is limited potential for significant natural disasters to occur at the proposed site. Ireland is a geologically stable country with a mild temperate climate. The potential natural disasters that may occur are therefore limited to flooding and fire. The risk of flooding is addressed in Chapter 10. It is considered that the risk of significant fire occurring, affecting the proposed development and causing the works to have significant environmental effects is limited. There are no significant sources of pollution associated with the works with the potential to cause environmental or health effects.

Major industrial accidents involving dangerous substances pose a significant threat to humans and the environment; such accidents can give rise to serious injury to people or serious damage to the environment, both on and off the site of the accident. The proposed development is not regulated or connected to or close to any site regulated under the Control of Major Accident Hazards Involving Dangerous Substances Regulations i.e. SEVESO sites and so there is no potential impacts from this source.

4.5 Property Values

Given that quarrying activities have occurred at this site since 2007, and that continued quarry operations would be located within the same land holding, property values will not be affected by the proposed extension to the quarry.

4.6 Likely and Significant Impacts and Associated Mitigation Measures

4.6.1 Do-Nothing Impact

If the proposed quarry extension were not to proceed, the current planning permission for the existing quarry would expire in 2021. The quarry would cease to operate from that time and the site reclamation plan would be implemented. This would result in the loss of jobs at the quarry site, and the loss of any additional investment and employment in the area in relation to the operation of the quarry.

4.6.2 Operational Phase – Quarrying Activity

4.6.2.1 Health and Safety

The operation of heavy machinery during the operational phase poses a potential health and safety risk to the employees of the quarry development.

The presence and operation of heavy machinery at the subject site also poses a potential risk to members of the public that might access the site from the main site entrance off the L7109 local road to the east of the site.

The presence of working faces and open quarried edges may pose a risk to employees of the quarry and members of the public who may enter the site.

These are considered to be long term potential significant negative impacts.

Mitigation

In order to mitigate the potential significant negative impacts associated with the operation of the quarry the following measures will be implanted:

- A site-specific Health and Safety Plan will be in place for the proposed facility. All site staff will be made aware of and adhere to the company Health and Safety Plan.
- Only appropriately qualified and trained personnel will be permitted to operate machinery onsite.
- Appropriate barriers and signage will be used.
- The proposed development site will not be accessible to members of the public.
- The site will also be secure to prevent the risk of trespass through signage and provision of barriers.

Residual Impact

The implementation of the mitigation measures discussed above will result in a residual **long-term, Imperceptible, Negative Impact**.

Significance of Effects

Based on the assessment above there will be **no significant effects** on health and safety

4.6.2.2 Employment and Investment

The proposed development will result in the preservation of permanent full and part-time employment positions in the area. Those employed at the quarry will be from the local community so any increased revenue from this employment returns directly to the local community.

The operational phase will require the hiring of those with specialist skills, which could result in the transfer of these skills into the local workforce, thereby having a long-term moderate positive impact on the local skills base.

Residual Impact

The development will have a **long-term, moderate, positive** residual impact

Significance of Effects

Based on the assessment above there will be **no significant effects** on employment and investment.

4.6.2.3 Population

The operational phase of the proposed quarry will have no impact on the population of the Study Area with regards to changes to trends, population density, household size or age structure.

Residual Impact

No impact

Significance of Effects

Based on the assessment above there will be **no significant effects** on population.

4.6.2.4 Tourism

The operational phase of the proposed development will have no impact on tourism within the local or regional area. Where the quarry is viewed in the context of scenic areas, the profile will be mitigated by the landscape measures which include maintaining a buffer and construction of berms around the site boundary. The continued operation of the proposed development will also include dust and noise control mitigation measures should these be required.

Residual Impact

No impact.

Significance of Effects

Based on the assessment above there will be **no significant effects** on tourism.

4.6.2.5 Land-use

The proposed extraction extension area is currently dominated by spoil and bare ground within an existing quarry site. The quarry extension will result in a change of land-use to extractive industry. The extension area measures approximately 6.7 hectares in area. The change in the land-use of this area would be insignificant in the context of the local and wider area, with resultant long term, slight neutral impact on land-use.

Residual Impact

Long term, slight, neutral impact

Significance of Effects

Based on the assessment above there will be **no significant effects** on land use

4.6.2.6 Noise and Vibration

The calculated noise levels at the nearest noise sensitive locations to the quarry for the two phases do not exceed the recommended operational criterion adopted for the quarry. Notwithstanding this, best practice noise mitigation measures will form part of site management practices to ensure noise from on-site operations do not cause a noise nuisance at the nearest NSR, the following measures are recommended.

Mitigation

Best practice measures for noise control will be adhered to onsite during the operational phase of the quarrying operations in order to mitigate the potential long term, not significant, negative impact associated with the operation of the quarry. The measures include:

- Regular maintenance of items of plant to ensure that they are operating efficiently;
- Location of noisy items of plant at the lowest part of the working quarry floor and as close to the quarry face as possible to provide optimum noise screening;
- Design of internal haul roads with as low a gradient as possible to minimise excessive revving of vehicle engines travelling on-site.
- Regular maintenance of haul routes to avoid potholes and uneven surfaces;
- Avoiding unnecessary revving of engines, reducing speed of vehicle movement and keeping lorry tailgates closed where possible;
- All mobile equipment is throttled down or switched off when not in use;

- Use of rubber linings in chutes, dumpers, transfer points etc. to reduce the noise of rock falling on metal surfaces;
- Using simple baffles around washing drums, rubber mats around screening and crushing plants;
- Enclosing pumps, covering conveyors, cladding the plant and keeping noise control hoods closed when machines are in use;
- Within the constraints of efficient production, limiting the use of particularly noisy plant, limiting the number of items in use at any one time, starting plants one-by-one and switching off when not in use, and;
- Pointing directional noise away from sensitive areas where possible.
- Laser profiling will be conducted to establish an accurate geometry of the quarry face, thereby enabling the optimum burden and spacing to be applied for the blast;
- Ensure that the optimum blast ratio is maintained and the maximum amount of explosive on any one delay, the 'maximum instantaneous charge' is optimised so that the ground vibration levels are kept below those specified;
- Explosive charges are properly and adequately confined by using a sufficient quality of aggregates for stemming;
- No blasting is carried out at weekends or public holidays;
- All blasts are measured (ground vibration & air overpressure) in the area of at least two sensitive receptors to ensure compliance with the appropriate limits;
- Notice of all blasts given to local residents prior to the blast taking place;
- Continue to adapt the monitoring requirements during blasting in line with existing conditions.
- All monitoring equipment calibrated regularly to ensure that peak particle velocity and air overpressure generated from each blast is accurately measured; and,
- Blasting is carried out by professionally trained blast engineers.

Residual Impact

The residual extraction phase impacts associated with the proposed extraction works are not predicted to exceed the recommended operational noise and vibration criterion adopted for the quarry. The expected noise and vibration effects for the operational phase can be summarised as follows: **Negative quality, Not Significant, and of Long-Term duration**.

Significance of Effects

Based on the assessment above there will be **no significant effects** on population and human health as a result of noise and vibration.

4.6.2.7 Dust and Air Quality

Potential dust and vehicle emission sources during the operational phase of the proposed development include the use of machinery and plant, rock extraction, crushing and screening and on-site vehicular traffic. The entry and exit of vehicles from the site may result in the transfer of debris to the public road, particularly if the weather is wet. This may cause nuisance to residents and other road users, thereby creating a long-term slight negative impact.

Mitigation

The following measure will be enforced to ensure that dust and vehicle emission nuisance during the operational phase beyond the site boundary is minimised:

- All construction vehicles and plant will be maintained in good operational order while onsite, thereby minimising any emissions that arise.

- Overburden will be progressively removed from the working area in advance of extraction.
- Road surfaces from the site entrance to the working area of the site will continue to be paved.
- The roads adjacent the site will be regularly inspected by the Site Manager for cleanliness, and cleaned as necessary.
- Water spraying of conveyors, stockpiles and roads will be carried out when necessary to reduce the production of dust.
- Water bowser movements will be carefully monitored to avoid, insofar as reasonably possible, increased runoff.
- The transport of material, which has significant potential to cause dust, will be undertaken in tarpaulin-covered vehicles where necessary.
- All plant and materials vehicles shall be stored in dedicated areas (on site).
- All plant and machinery will be maintained in good operational order while onsite.
- Monthly dust monitoring during the first year of extraction and quarterly thereafter if dust levels remain below the maximum daily soiling level of 350 mg/m²/day.

Residual Impact

Long-term, Imperceptible Negative Impact.

Significance of Effects

Based on the assessment above there will be **no significant effects** on population and human health as a result of dust and emmissions.

4.6.2.8 Traffic

Traffic on site will be controlled by the weighbridge operatives. Signs on site will indicate maximum permissible speeds and directional information. The weighbridge operator will provide the primary means of marshalling traffic. Traffic control at the site will involve restricting the number of vehicles entering the quarry void at any one time. No queuing of vehicles will be allowed outside the entrance to the quarry on the L7109 local road. All vehicles leaving the site will be weighed to ensure delivery loads are in compliance with the relevant Road Traffic Regulations.

The Traffic and Transport Assessment, as presented in Section 12 of the EIAR, assumes that the operation of the proposed quarry extension will result in a total of 94 Heavy Goods Vehicle (HGV) movements generated per day as a worst-case scenario. A capacity assessment was undertaken and concludes that the proposed increase in traffic movements to and from the site will be adequately accommodated by the existing road network.

Further details on the traffic and transportation impact assessment are presented in Section 12 of this EIAR.

Residual Impact

Slight, long term, negative effect

Significance of Effects

Based on the assessment above there will be no significant effects on traffic as a result of the proposed quarry extension.

4.6.3 Reinstatement Phase

The proposed after-use of the site includes partial restoration to improve habitat creation and biodiversity, with the retention of the water collection sump and use of soils and subsoils stripped from the site as part of the excavation for use in berm creation, quarry benches and on the quarry floor.

4.6.3.1 Health and Safety

There is the potential for significant impacts to health and safety associated with disused quarries. Potential impacts include, fall risks associated with vertical rock faces and drowning impacts associated with quarry lakes. Potential impacts are likely to be permanent, significant, and negative in effect. A number of measures will be put in place to mitigate the potential negative effect on health and safety

Mitigation Measures

The following site safety measures have been included in the restoration plan to mitigate against potential health and safety risk to members of the public, post operation:

- Stock proof fencing with signage is to be installed where not already in place in order to prevent public access to the site and ensure public safety during and following restoration.
- Warning signs are to be attached to the fence at 200 metre intervals. Public Information and warning signs are also to be placed at the site entrance.
- Fencing is also proposed around the surface water sump to be retained.
- Vertical rock faces greater than 10m in height will be benched and sloped to catch falling rocks and to mitigate against the risk of falling from height. Soil and overburden will be spread on the ledge and allowed to re-vegetate naturally.

Residual Impact

The implementation of the mitigation outlined above will result in a residual impact on health and safety that is **permanent slight, and of negative effect**.

Significance of Effects

Based on the assessment above there will be **no significant effects** on health and safety.

4.6.4 Cumulative Impacts

The potential cumulative impacts between the proposed quarry and the other projects described in Section 2 of this report, hereafter referred to as the other projects, have been considered in terms of impacts on human beings.

4.6.4.1 Health and Safety

Any potential cumulative impacts between the proposed quarry operation and the other projects in terms of health and safety will be mitigated by the requirement for all projects to adhere to Health & Safety legislation.

4.6.4.2 Dust and Noise

Potential cumulative impacts associated with dust and noise are addressed in Sections 8.3.13 and 9.6 of this EIAR respectively and conclude that there will be negligible impacts.

4.6.4.3 Traffic

Potential cumulative impacts associated with traffic are addressed in Sections 12.6.4 of this EIAR. There is potential for cumulative impacts between the proposed quarry extension, traffic from the C&F Tooling and plant, construction traffic from the recently granted battery storage facility, and traffic from the recently granted adjacent quarry in-fill project.. The analysis of the likely traffic impacts from the proposed project is provided in Chapter 12 of this EIAR. This analysis includes the cumulative traffic impacts of the quarry and surrounding businesses and projects. In the event that the proposed Coshla Quarry Extension is in operation at the same time as the recently granted Battery Storage facility is constructed, and the recently granted quarry in-fill is operational it is forecast that the cumulative impact on the R339 and L-7109 will be slight, short term, and of negative effect.

4.6.4.4 Employment and Investment

In terms of employment and economic benefit, there will be a significant, short-term, positive, cumulative impact between the proposed quarry and the other projects due to the majority of construction workers and materials being sourced locally, thereby helping to sustain employment in the construction trade.

The injection of money in the form of salaries and wages to those employed during the construction phase of the other projects and the operational phase of the quarry has the potential to result in a slight increase in household spending and demand for goods and services in the local area. This would result in local retailers and businesses experiencing a short-term positive impact on their cash flow.

4.6.4.5 Population

Those working on the Coshla quarry and the other projects in the area will travel daily to the site from the wider area. These projects will have no impact on the population of the Study Area in terms of changes to population trends or density, household size or age structure.

4.6.4.6 Land-use

The surrounding land-uses of agriculture, manufacturing, residential, and electrical infrastructure will continue during the operational phase of the quarry.

The impact of the proposed quarry is negligible as the subject site is already an active quarry, and the the site will be reinstated once operations cease. As there will be a negligible impact on land-use, the potential for cumulative impacts are also negligible.

4.6.4.7 Tourism and Amenity

There are no tourist attractions pertaining specifically to the site of the proposed quarry. The closest tourist attraction to the proposed quarry site is Athenry Golf Club which is located approximately 1.5km to the southeast of the site. Notwithstanding this, there will be no cumulative operational phase impacts on tourism between the proposed quarry and other projects in the area once the mitigation measures in Section 4.5.2 and Section 4.5.3 above are implemented. Therefore, the potential for cumulative impacts with the other projects and plans are negligible.

On completion, the proposed excavation will provide geologists with an increased section to study the geology of the bedrock in particular it's lithology and structure. New faces can be examined by relevant experts to enhance geological understanding of the area which is considered a permanent slight positive effect.

5. BIODIVERSITY

5.1 Introduction

This chapter assesses the likely significant effects (both alone and cumulatively with other projects) that the proposed development may have on Biodiversity, Flora and Fauna and sets out the mitigation measures proposed to award, reduce or offset any potential significant effects that are identified. The residual impacts on biodiversity are then assessed. Particular attention has been paid to species and habitats of ecological importance. These include species and habitats with national and international protection under the Wildlife Acts 1976-2019, EU Habitats Directive 92/43/EEC. The full description of the proposed development is provided in Chapter 3 of this EIAR.

The chapter is structured as follows

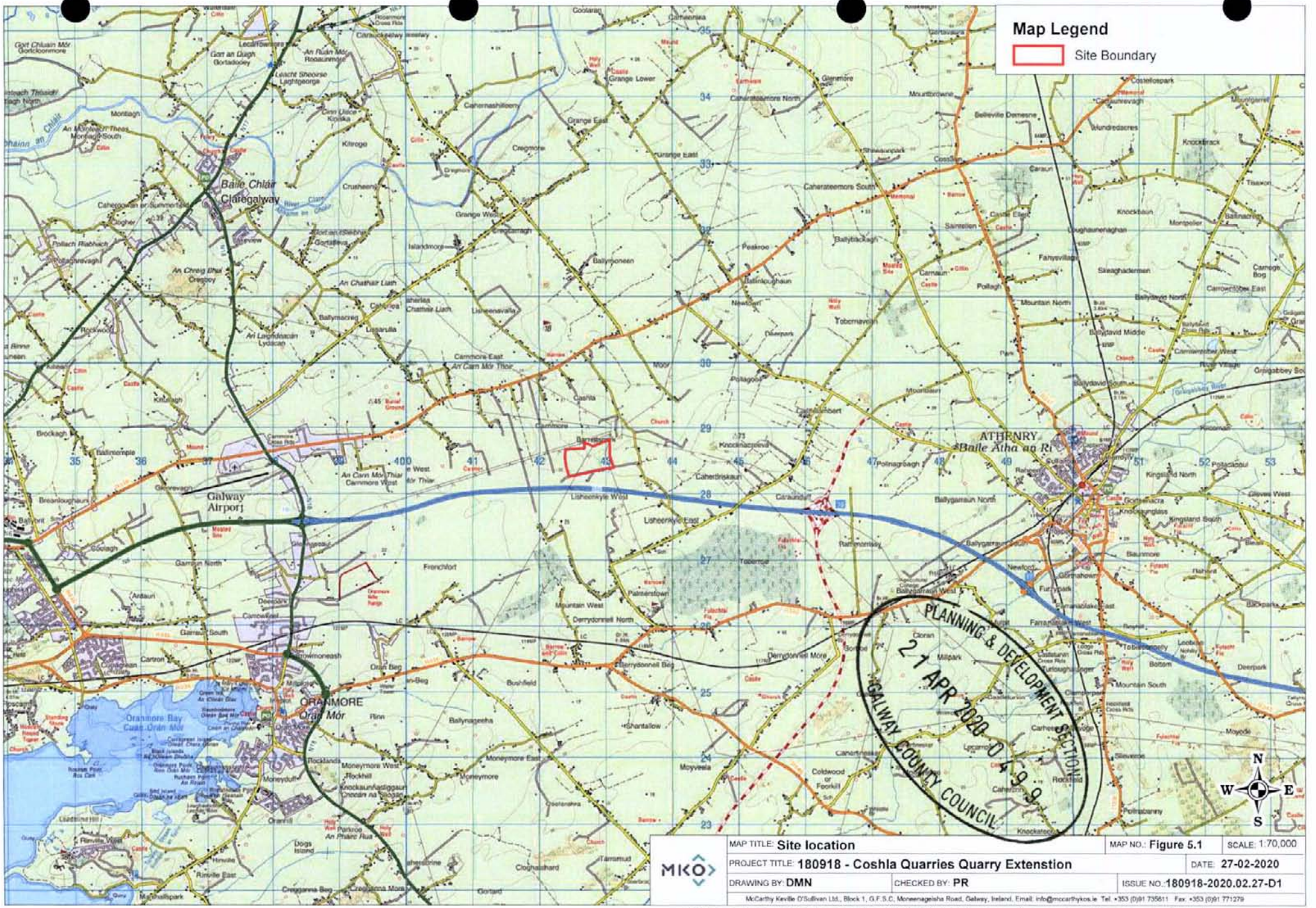
- The Introduction provides a description of the legislation, guidance and policy context applicable to Biodiversity, Flora and Fauna.
- This is followed by a comprehensive description of the ecological survey and impact assessment methodologies that were followed to inform the robust assessment of likely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

The following defines terms utilised in this chapter:

- For the purposes of this EIAR, the entire project is referred to as 'the Proposed Development'.
- For the purpose of this EIAR, the term 'EIAR Site Boundary' refers to the site red line boundary, as shown in Figure 5-1.
- "Key Ecological Receptor" (KER) is defined as a species or habitat occurring within the zone of influence of the development upon which likely significant effects are anticipated.
- "Zones of Influence" (ZOI) for individual ecological receptors refers to the zone within which potential effects are anticipated. ZOIs differ depending on the sensitivities of particular habitats and species and were assigned in accordance with best available guidance and through adoption of a precautionary approach.

5.2 Statement of Authority

A baseline ecological survey of the site was undertaken on the 30th of November 2018 by Julie O'Sullivan (B.Sc., M.Sc.). Julie is a highly experienced ecologist with over 5 years professional ecological consultancy experience. This report has been prepared by David McNicholas (B.Sc., M.Sc., MCIEEM, Senior Ecologist with McCarthy Keville O'Sullivan Ltd.). David is a full member of the Chartered Institute of Ecology and Environmental Management (CIEEM) and has over 9 years professional ecological consultancy experience. This report has been reviewed by Pat Roberts (BSc Environmental Science, MCIEEM) who has over 14 years' experience in management and ecological assessment.



MAP TITLE: **Site location** | MAP NO.: **Figure 5.1** | SCALE: 1:70,000

PROJECT TITLE: **180918 - Coshla Quarries Quarry Extenstion** | DATE: **27-02-2020**

DRAWING BY: **DMN** | CHECKED BY: **PR** | ISSUE NO.: **180918-2020.02.27-D1**

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5.3 Relevant Guidance

The guidelines listed below were consulted in the preparation of this document to provide the scope, structure and content of the assessment:

- Guidelines for Ecological Impact Assessment in the UK and Ireland. Terrestrial, Freshwater and Coastal (CIEEM, 2018).
- Draft Revised guidelines on the information to be contained in Environmental Impact Statements (EPA, 2017).
- Guidelines for Planning Authorities and An Bord Pleanála on Carrying out Environmental Impact Assessment. Department of the Environment, Community and Local Government DoEHLG (2013).
- Guidelines for assessment of Ecological Impacts of National Road Schemes, (NRA, 2009).
- Environmental Impact Assessment of National Road Schemes – A Practical Guide (NRA, 2009).
- Environmental Assessment and Construction Guidelines (NRA, 2006).
- Advice Notes on Current Practice (in preparation of Environmental Impact Statements) (Environmental Protection Agency (EPA), 2003).
- Guidelines on the information to be contained in Environmental Impact Statements (EPA, 2002).

This assessment has been carried out in accordance with the Environmental Impact Assessment guidance as outlined in Chapter 1 of the EIAR.

The following legislation applies with respect to non-native species:

- Regulation 49 and 50 of European Communities (Birds and Natural Habitats) Regulations 2011 (SI 477 of 2011).

This assessment has been prepared with respect to the various planning policies and strategy guidance documents listed below:

- Galway County Development Plan 2015-2021.
- Natura Impact Report in support of the Appropriate Assessment of the Galway County Development Plan 2015-2021.

5.4 Methodology

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

5.4.1 Desk Study

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

- Review of online web-mappers: National Parks and Wildlife Service (NPWS), EPA (Envision), Water Framework Directive (WFD) and Inland Fisheries Ireland (IFI).

- Data on potential occurrence of protected bryophytes – as per NPWS online map viewer; Flora Protection Order Map Viewer – Bryophytes[1].
- Review of the Bat Conservation Ireland (BCI) Private Database
- Review of the publicly available National Biodiversity Data Centre (NBDC) web-mapper
- Inland Fisheries Ireland (IFI) Reports, where available.
- Records from the NPWS web-mapper and review of specially requested records from the NPWS Rare and Protected Species Database for the hectads in which the Proposed development is located.

5.4.2 Scoping and Consultation

MKO undertook a scoping exercise during preparation of this EIAR, as described in Chapter 2, Section 2.4 of this EIAR.

Copies of all scoping responses are included in Appendix 2.1 of this EIAR. In addition, the following consultation approach was undertaken with the National Parks and Wildlife Service (NPWS):

- A scoping response was sent to the Development Applications Unit of the Department of the Department of Culture, Heritage and the Gaeltacht on the 14th November 2019. However, no response was received.
- A data request was sent to the National Parks and Wildlife Service - Scientific Data Unit on the 12th December 2019. A response was received on the 21st December 2019, the results of which are provided in Section 5.5.1.8 of this EIAR.
- The response from the Scientific Data Unit also suggested that the local NPWS ranger be contacted in relation to the potential for the site to support peregrine falcon.
- NPWS ranger Irene O'Brien has been undertaking monitoring of peregrine falcon in the north-west of Ireland in recent years, and consequently consultation was undertaken in March 2020. The results of this consultation are provided in Section 5.5.1.8 of this EIAR.

5.4.3 Field Surveys

The following sections fully describe the ecological surveys that have been undertaken and provide details of the methodologies, dates of survey and guidance followed.

5.4.3.1 Multi-disciplinary Walkover Surveys (as per NRA Guidelines, 2009)

A multidisciplinary ecological walkover survey of the development site and surrounding area was conducted on the 30 November 2018. The walkover survey was undertaken by Julie O'Sullivan. Given the nature (active quarry) and scale of the study area, comprehensive walkover of the entire site was completed.

The walkover survey was designed to detect the presence, or likely presence, of a range of protected species. The survey included a search for badger setts and areas of suitable habitat, potential features likely to be of significance to bats and additional habitat features for the full range of other protected species that are likely to occur in the vicinity of the proposed development. In addition, other species of local biodiversity interest were also noted.

The multi-disciplinary walkover surveys comprehensively covered the entire study area and based on the survey findings, further detailed targeted surveys were carried out for features and locations of ecological significance. These surveys were carried out in accordance with NRA *Guidelines on*

[1] *NPWS, 2019, Online map viewer; Flora Protection Order Map Viewer – Bryophytes. Online, Available at: http://dahg-maps.arcgis.com/apps/webappviewer/index.html?id=7108df3d03f48edbb703d0d7fb26b7e, Accessed: 26/02/2020.*

Ecological Surveying Techniques for Protected Flora and Fauna on National Road Schemes (NRA, 2009).

During the multidisciplinary surveys, a search for Invasive Alien Species (IAS) listed under the Third Schedule of the European Communities Regulations 2011 (S.I. 477 of 2015) was conducted.

5.4.3.2 Dedicated Habitat and Vegetation Composition Surveys

The walkover survey was undertaken to assess the habitats occurring on site and their correspondence with the Heritage Council's *'Guide to Habitats in Ireland'* (Fossitt, 2000). A representative photograph was also taken for each of the habitats recorded on site. Plant nomenclature for vascular plants follows '*New Flora of the British Isles*' (Stace, 2010), while mosses and liverworts nomenclature follows '*Mosses and Liverworts of Britain and Ireland - a field guide*' (British Bryological Society, 2010).

5.4.3.3 Terrestrial Fauna Surveys

The results of the desk study, incidental records of protected species during ecological survey work and multidisciplinary walkover surveys were used to inform the scope of targeted ecological surveys required. Dedicated surveys for badger and peregrine falcon were undertaken with the methodologies followed also provided below.

5.4.3.3.1 *Badger Survey*

Areas identified as providing potential habitat for badger were subject to specialist targeted survey. The badger survey covered the entire site boundary. The badger survey was not constrained by vegetation given the nature of the habitats within the site and the timing of the surveys (NRA 2006a).

The badger surveys were conducted in order to determine the presence or absence of badger signs within the study area. This involved a search for all potential badger signs as per NRA (2009) (latrines, badger paths and setts). If encountered, setts would be classified as per the convention set out in NRA (2009) (i.e. main, annexe, subsidiary, outlier).

The badger survey was conducted adhering to best practice guidance (NRA, 2009) and followed the *'Guidelines for the Treatment of Badger Prior to the Construction of National Roads Schemes'* (NRA, 2006a) and CIEEM best practice competencies for species surveys (CIEEM, 2013[2]).

5.4.3.3.2 *Bat Surveys*

Any trees likely to be affected or removed to facilitate the development, were visually assessed for potential as bat roosting habitat using a protocol set out in BCT *Bat Surveys for Professional Ecologists: good practice Guidelines (3rd edn)* (Collins, J (ed.), (2016). Table 4.1 of the 2016 Guidelines identifies a grading protocol for assessing structures, trees and commuting/foraging habitat for bats. The protocol is divided into four '*suitability categories*': High, Moderate, Low and Negligible.

5.4.3.3.3 *Bird survey*

A dedicated peregrine falcon survey of quarry was undertaken on the 05 March 2020 by David McNicholas (B.Sc., M.Sc., MCIEEM). The survey followed that prescribed in the standard best practice manual '*Raptors: A Field Guide for Surveys and Monitoring*' (Hardy, *et al.* 2013). Other incidental bird species were also recorded during the survey.

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[2] *CIEEM, 2013, Technical Guidance Series – Competencies for Species Survey, Online, Available at: https://cieem.net/resource/competencies-for-species-survey-css/ Accessed: 20.06.2019*

5.4.4 Methodology for Assessment of Impacts and Effects

5.4.4.1 Determining Importance of Ecological Receptors

The importance of the ecological features identified within the study area was determined with reference to a defined geographical context. This was undertaken following a methodology that is set out in Chapter 3 of the 'Guidelines for Assessment of Ecological Impacts of National Roads Schemes' (NRA, 2009). These guidelines set out the context for the determination of value on a geographic basis with a hierarchy assigned in relation to the importance of any particular receptor. The guidelines provide a basis for determination of whether any particular receptor is of importance on the following scales:

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

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

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

5.4.4.2 Characterisation of Impacts and Effects

The proposed development will result in a number of impacts. The ecological effects of these impacts are characterised as per the CIEEM '*Guidelines for Ecological Impact Assessment in the UK and Ireland*' (2018). These guidelines are the industry standard for the completion of Ecological Impact Assessment in the UK and Ireland. This chapter has also been prepared in accordance with the corresponding EPA guidance (EPA 2017). The headings under which the impacts are characterised follow those listed in the guidance document and are applied where relevant. A summary of the impact characteristics considered in the assessment is provided below:

- **Positive or Negative.** Assessment of whether the proposed development results in a positive or negative effect on the ecological receptor.
- **Extent.** Description of the spatial area over which the effect has the potential to occur.
- **Magnitude** Refers to size, amount, intensity and volume. It should be quantified if possible and expressed in absolute or relative terms e.g. the amount of habitat lost, percentage change to habitat area, percentage decline in a species population.
- **Duration** is defined in relation to ecological characteristics (such as the lifecycle of a species) as well as human timeframes. For example, five years, which might seem short-term in the human context or that of other long-lived species, would span at least five generations of some invertebrate species.

- **Frequency and Timing.** This relates to the number of times that an impact occurs and its frequency. A small-scale impact can have a significant effect if it is repeated on numerous occasions over a long period.
- **Reversibility.** This is a consideration of whether an effect is reversible within a 'reasonable' timescale. What is considered to be a reasonable timescale can vary between receptors and is justified where appropriate in the impact assessment section of this report.

5.4.4.3 Determining the Significance of Effects

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

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

When determining significance, consideration is given to whether:

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

The EPA draft Guidelines on information to be included in Environmental Impact Assessment Reports (EPA, 2017) and the *Guidelines for assessment of Ecological Impacts of National Road Schemes*, (NRA, 2009) were also considered when determining significance and the assessment is in accordance with those guidelines.

The terminology used in the determination of significance follows the suggested language set out in the Draft EPA Guidelines (2017) as shown in **Error! Reference source not found.**.

Table 5-1 Criteria for determining significance of effect, based on (EPA, 2017) guidelines

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

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

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

Integrity

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

Conservation status

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

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

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

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

The conservation of a species is favourable when:

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

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

5.4.4.4 Incorporation of Mitigation

Section 5.6 of this EIAR assesses the potential effects of the proposed development to ensure that all effects on sensitive ecological receptors are adequately addressed. Where significant effects on sensitive

ecological receptors are predicted, mitigation is incorporated into the project design or layout to address such impacts. The implemented mitigation measures avoid or reduce or offset potential significant residual effects, post mitigation.

5.5 Establishing the Ecological Baseline

5.5.1 Desk Study

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

5.5.1.1 Baseline Hydrology

Regionally the proposed site is mapped to be located in the Ballynamanagh River surface water catchment within Hydrometric Area 30 of the Western River Basin District. The Ballynamanagh River flows to the south of Oranmore, but due to the lack of surface water features (stream/rivers) between the quarry site and Oranmore, there are no surface water connections between the site and the Ballynamanagh River. The overall lack of surface water features in the Ballynamanagh River catchment is due to the groundwater dominated hydrolology of the area (this is discussed further below). A regional hydrology map is shown as Figure 7.1, Chapter 7 of the EIAR.

Site Drainage and Water Quality

The Biotic Index of Water Quality (BIWQ) was developed in Ireland by the Environmental Protection Agency (EPA). Q-values are assigned using a combination of habitat characteristics and structure of the macro-invertebrate community within the waterbody. Individual macro-invertebrate families are classified according to their sensitivity to organic pollution and the Q-value is assessed based primarily on their relative abundance within a sample. There are no surface water features in the area of the site.

Regional and Local Hydrogeology

Groundwater flow in highly permeable karstified limestones is of a regional scale. Flow path lengths can be up to a several kilometres. Regional groundwater gradients in the area of Galway will be towards the coast and estuaries. Studies show that groundwater flow directions in the region of the site are to the west / southwest, with groundwater discharging to littoral and intertidal springs at the head of the main estuaries such as the Clarinbridge River estuary (Drew and Daly, 1993).

Hydrological Connectivity to Designated sites

As discussed in Section 7.3.12 and Figure 7.5, Chapter 7 of the EIAR, the only designated sites that are likely to be hydrologically connected (by groundwater only) to the proposed quarry development is the Galway Bay Complex SAC and Inner Galway Bay SPA. There are unlikely to be groundwater connections to Lough Corrib SAC, Kiltullagh Turlough pNHA or Cregganna Marsh NHA.

5.5.1.2 Designated Sites

5.5.1.2.1 *Identification of the Designated Sites within the Likely Zone of Influence of the Proposed Development*

The potential for the proposed development to impact on sites that are designated for nature conservation was considered in this Ecological Impact Assessment.

Special Areas of Conservation (SACs) and Special Protection Areas for Birds (SPAs) are designated under the EU Habitats Directive and EU Birds Directive, respectively and are collectively known as 'European Sites'. The potential for significant effects and/or adverse impacts on the integrity of European Sites is fully assessed in the AA Screening Report and Natura Impact Statement that accompanies this application. As per EPA draft Guidance 2017, *"a biodiversity section of an EIAR, should not repeat the detailed assessment of potential effects on European sites contained in a Natura Impact Statement"* but should *"incorporate their key findings as available and appropriate"*. Section 5.8 of this EIAR provides a summary of the key assessment findings with regard to European Designated Sites.

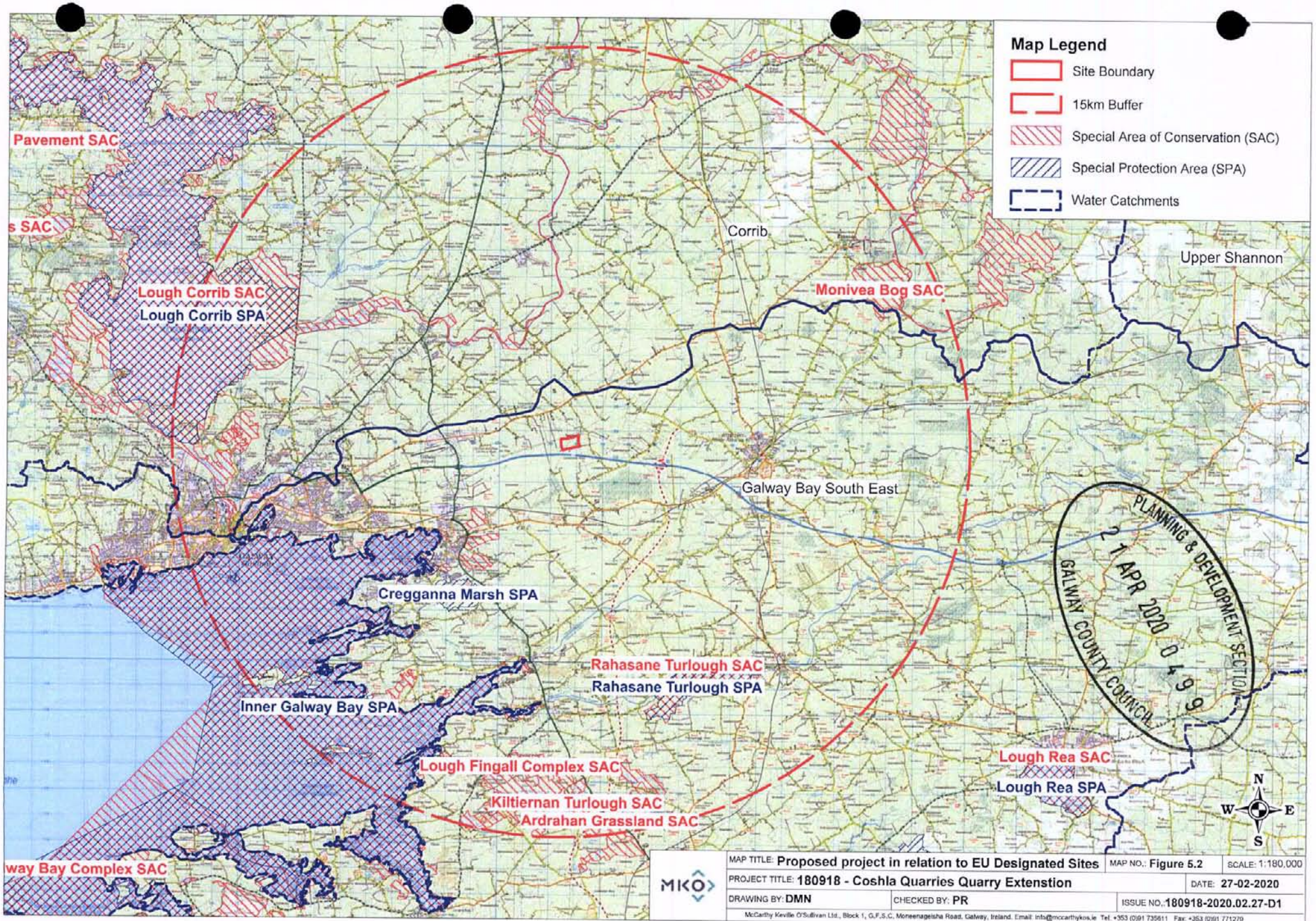
Natural Heritage Areas (NHAs) are designated under Section 18 the Wildlife (Amendment) Act 2000 and their management and protection is provided for by this legislation and planning policy. The potential for effects on these designated sites is fully considered in this EcIA.

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

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

- Initially the most up to date GIS spatial datasets for European and Nationally designated sites and water catchments were downloaded from the NPWS website (www.npws.ie) and the EPA website (www.epa.ie) on the 28/02/2020. The datasets were utilised to identify Designated Sites which could feasibly be affected by the proposed development.
- All designated sites within a distance of 15km surrounding the development site were identified. In addition, the potential for connectivity with European or Nationally designated sites at distances of greater than 15km from the proposed development was also considered in this initial assessment.
- A map of all the European Sites within 15km is provided in Figure 5.2 with all Nationally designated sites shown in Figure 5.3.
- Table 5-2 provides details of all relevant Nationally designated sites as identified in the preceding steps and assesses which are within the likely Zone of Impact. All European Designated Sites are fully described and assessed in the Screening for Appropriate Assessment and Natura Impact Statement reports submitted as part of this planning application.
- The designation features of these sites, as per the NPWS website (www.npws.ie), were consulted and reviewed at the time of preparing this report 28/02/2020.

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



MAP TITLE: **Proposed project in relation to EU Designated Sites** | MAP NO.: **Figure 5.2** | SCALE: 1:180,000

PROJECT TITLE: **180918 - Coshla Quarries Quarry Extenstion** | DATE: **27-02-2020**

DRAWING BY: **DMN** | CHECKED BY: **PR** | ISSUE NO.: **180918-2020.02.27-D1**

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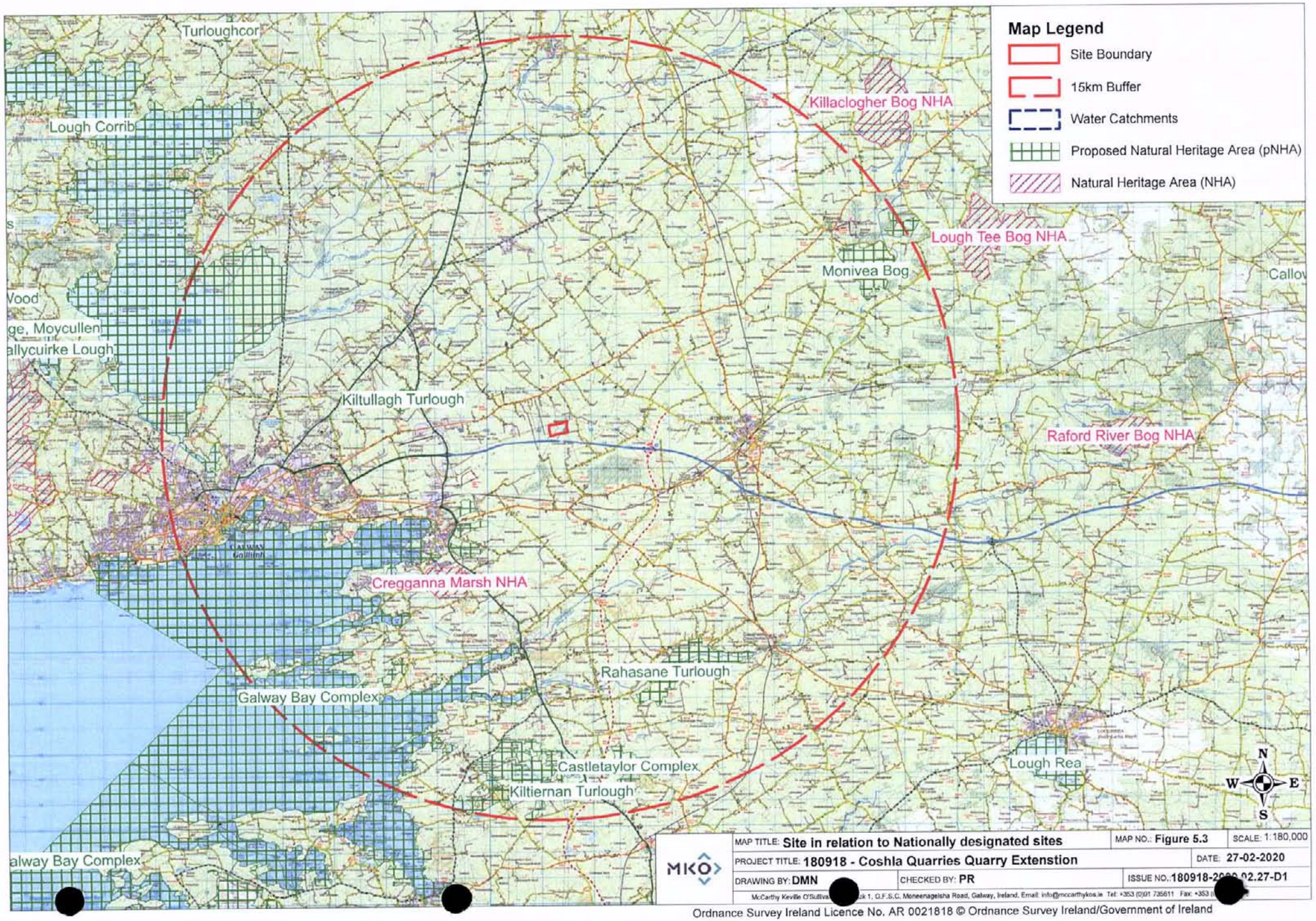

MAP TITLE: **Site in relation to Nationally designated sites**	MAP NO.: **Figure 5.3**	SCALE: 1:180,000
PROJECT TITLE: **180918 - Coshla Quarries Quarry Extenstion**		DATE: **27-02-2020**
DRAWING BY: **DMN**	CHECKED BY: **PR**	ISSUE NO.: **180918-2020.02.27-D1**

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Table 5-2 Identification of Nationally designated sites within the Likely Zone of Impact

Designated Site	Distance from Proposed Development (km)	Likely Zone of Impact Determination
Natural Heritage Areas		
Cregganna Marsh NHA [000253]	6.2km	As described in Section 7.3.12, Chapter 7 of the EIAR, no surface or ground water connectivity has been identified between the quarry site and Creganna Marsh NHA. The designated site is not within the Likely Zone of Impact.
Proposed Natural Heritage Area (pNHA)		
Galway Bay Complex	3.9km	As described in Section 7.3.12, Chapter 7 of the EIAR, the only nationally designated sites that are likely to be hydrologically connected (by groundwater only) to the proposed quarry development is the Galway Bay Complex pNHA. For a precautionary perspective, this pNHA has been assessed as within the Likely Zone of Impact. As this pNHA is designated as part of the Galway Bay Complex SAC, the assessment of potential impacts is considered under impacts on European designated sites.
Kiltullagh Turlough	5.3km	As described in Section 7.3.12, Chapter 7 of the EIAR, these sites are in a separate hydrological catchment. No potential for impact on these sites has been identified and it is not within the Zone of likely Impact.
Rahasane Turlough	9.4km	
Lough Corrib	11km	
Lough Fingall Complex	11.8km	
Castletaylor Complex	12.2km	
Monivea Bog	12.3km	
Kiltiernan Turlough	13.5km	
Tiaquin Bog	14.3km	
Special Area of Conservation (SAC)		
Galway Bay Complex SAC (000268)	3.9	As described in Section 7.3.12, Chapter 7 of the EIAR, the only European designated sites that are likely to be hydrologically connected (by groundwater only) to the proposed quarry development is the Galway Bay Complex SAC and Inner Galway Bat SPA. For a precautionary perspective, this SAC has been assessed as within the Likely Zone of Impact.
Lough Corrib SAC (000297)	3.9	As described in Section 7.3.12, Chapter 7 of the EIAR, these sites are in a separate hydrological catchment. No potential for

		impact on these sites has been identified and it is not within the Zone of likely Impact.
Rahasane Turlough SAC (000322)	9.4	As described in Section 7.3.12, Chapter 7 of the EIAR, these sites are in a separate hydrological catchment. No potential for impact on these sites has been identified and it is not within the Zone of likely Impact.
Lough Fingall Complex SAC (000606)	11.8	As described in Section 7.3.12, Chapter 7 of the EIAR, these sites are in a separate hydrological catchment. No potential for impact on these sites has been identified and it is not within the Zone of likely Impact.
Castletaylor Complex SAC (000242)	12.2	As described in Section 7.3.12, Chapter 7 of the EIAR, these sites are in a separate hydrological catchment. No potential for impact on these sites has been identified and it is not within the Zone of likely Impact.
Monivea Bog SAC (002352)	12.3	As described in Section 7.3.12, Chapter 7 of the EIAR, these sites are in a separate hydrological catchment. No potential for impact on these sites has been identified and it is not within the Zone of likely Impact.
Kiltiernan Turlough SAC (001285)	13.5	As described in Section 7.3.12, Chapter 7 of the EIAR, these sites are in a separate hydrological catchment. No potential for impact on these sites has been identified and it is not within the Zone of likely Impact.
Ardrahan Grassland SAC (002244)	14.2	As described in Section 7.3.12, Chapter 7 of the EIAR, these sites are in a separate hydrological catchment. No potential for impact on these sites has been identified and it is not within the Zone of likely Impact.
Special Protection Area (SPA)		
Inner Galway Bay SPA (004031)	5.7	As described in Section 7.3.12, Chapter 7 of the EIAR, the only EU designated sites that are likely to be hydrologically connected (by groundwater only) to the proposed quarry development are the Galway Bay Complex SAC and Inner Galway Bay SPA. From a precautionary perspective, this SPA has been assessed as within the Likely Zone of Impact. The site is not within the core foraging range of any of the SCI species for which the SPA has been designated (SHN, 2016).
Creganna Marsh SPA (004142)	6.2	As described in Section 7.3.12, Chapter 7 of the EIAR, these sites are in a separate hydrological catchment. No potential for impact on these sites has been identified and the propose quarry expansion is not within the Zone of likely Impact. The site is not within the core foraging range of the SCI

		species for which the SPA has been designated (SHN, 2016).
Rahasane Turlough SPA (004089)	9.4	As described in Section 7.3.12, Chapter 7 of the EIAR, these sites are in a separate hydrological catchment. No potential for impact on these sites has been identified and the propose quarry expansion is not within the Zone of likely Impact. The site is not within the core foraging range of the SCI species for which the SPA has been designated (SHN, 2016).
Lough Corrib SPA (004042)		As described in Section 7.3.12, Chapter 7 of the EIAR, these sites are in a separate hydrological catchment. No potential for impact on these sites has been identified and the propose quarry expansion is not within the Zone of likely Impact. The site is not within the core foraging range of the SCI species for which the SPA has been designated (SHN, 2016).

As described in Table 5.2 above, no nationally designated site were identified as occurring within the likely Zone of Impact of the proposed development.

5.5.1.3 NPWS Article 17 Reporting

A review of the Irish Reports for Article 17 of the Habitats Directive (92/42/EEC), including the Heath, Bogs and Mires, Irish Semi-Natural Grassland Survey datasets, National Survey of Native Woodlands and Ancient and Long Established Woodland datasets were conducted prior to undertaking the multi-disciplinary walkover survey. Available NPWS datasets were downloaded and overlain on the proposed development study area. None of the NPWS GIS datasets contain polygon or point data within the EIAR Study Area.

5.5.1.4 Vascular plants

A search was made in the New Atlas of the British and Irish Flora (Preston *et al*, 2002) to investigate whether any rare or unusual plant species listed under Annex I of the EU Habitats Directive, The Irish Red Data Book, 1, Vascular Plants (Curtis, 1988) or the Flora (Protection) Order (1999, as amended 2015) had been recorded in the relevant 10km squares in which the study site is situated (M42). Each hectad contains 100 whole one kilometre squares containing terrestrial habitats. Species of conservation concern are given in Table 5-3.

Table 5-3 Species listed designated under the Flora Protection Order or the Irish Red Data Book within Hectad M42

Common Name	Scientific Name	Status
Shepard's needles	*Scandix pectin-veneris*	RL – Regionally Extinct (RE)
Field gromwell	*Lithospermum arvense*	RL - Critically Endangered (CR)
Small white orchid	*Pseudorchis albida*	RL – Vulnerable (VU)
Wood bitter-vetch	*Vicia orobus*	RL – Vulnerable (VU)
Greater knapweed	*Centaurea scabiosa*	RL – Near Threatened (NT)
Frog orchid	*Coeloglossum viride*	RL – Near Threatened (NT)
Dwarf spurge	*Euphorbia exigua*	RL – Near Threatened (NT)

Spring gentian	*Gentiana verna*	RL – Near Threatened (NT)
Autumn gentian	*Gentianella amarella*	RL – Near Threatened (NT)
Field gentian	*Gentianella campestris*	RL – Near Threatened (NT)
Corn marigold	*Chrysanthemum segetum*	RL – Near Threatened (NT)
Autumn lady's-tresses	*Spiranthes spiralis*	RL – Near Threatened (NT)
Green field-speedwell	*Veronica agrestis*	RL – Near Threatened (NT)

5.5.1.5 Bryophytes

A search of the NPWS online data map for bryophytes (NPWS, 2020) was also undertaken with no protected bryophytes recorded within or adjacent to the proposed development site.

5.5.1.6 National Biodiversity Data Centre (NBDC) Records

A search of the National Biodiversity Data Centre (NBDC) website was conducted prior to the commencement of site surveys, on the 12/02/2020. This helped to inform survey effort and provide a baseline of likely species composition in the area. Records of protected fauna recorded from hectad M42 are provided in Table 5-4.

Table 5-4 NBDC records for species of conservation interest in hectad M42

Common name	Scientific name
Hedgehog	*Erinaceus europaeus*
Red squirrel	*Sciurus vulgaris*
Badger	*Meles meles*
Otter	*Lutra lutra*
Pine marten	*Martes martes*
Common frog	*Rana temporaria*
Brown long-eared bat	*Plecotus auritus*
Daubenton's bat	*Myotis daubentonii*
Lesser horseshoe bat	*Rhinolophus hipposideros*
Leisler's bat	*Nyctalus leisleri*
Natterer's bat	*Myotis nattereri*
Pipistrelle sp.	*Pipistrellus pipistrellus sensu lato*
Soprano pipistrelle	*Pipistrellus pygmaeus*
Wood bitter-vetch	*Vicia orobus*

5.5.1.7 Bat Records

A search of the Bat Conservation Ireland (BCI) Database for all bat records for the area within and surrounding the proposed development site was conducted on the 24th October 2019. The BCI database can be searched in relation to identified Roosts, Survey Transects and Other Observations. Searches can be conducted for refined areas e.g. 1km buffer of a specific location or for wider areas including hectads and entire grid squares. Roost data details identified roosts and bat species recorded utilising the roost sites. Transect survey data include results of the BCI Car Based Bat Monitoring Scheme, All Ireland Daubenton's Bat Waterways Survey and additional surveys completed by private organisations and individuals.

A search of a 1km buffer from the proposed development site yielded no results for bat species records. A search of a 10km buffer from the proposed development site resulted in 10 roost records and along with 2 transects and 26 ad-hoc searches for bats. These roosts contained brown long eared bats (*Plecotus auritus*), lesser horseshoe bat (*Rhinolophus hipposideros*), Daubenton's bat (*Myotis daubentonii*), Natterer's bat (Myotis nattereri), common pipistrelle (*Pipistrellus pipistrellus*), soprano pipistrelle (*Pipistrellus pygmaeus*) and Leisler's bat (*Nyctalus leisleri*). Two transect results returned records for Daubenton's bat (*Myotis daubentonii*), Leisler's bat (*Nyctalus leisleri*), common pipistrelle (*Pipistrellus pipistrellus*) and soprano pipistrelle (*Pipistrellus pygmaeus*).

The information gathered in the desk study provides a baseline understanding of bat species in the area and indicates that the region has been previously surveyed for bats. The records identify the wider area of the proposed development as being used by foraging and commuting bat species.

5.5.1.8 NPWS Records

National Parks and Wildlife Service (NPWS) online records were searched to see if any rare or protected species of flora or fauna have been recorded from hectad M42. An data request was also sent to the NPWS scientific data unit requesting records from the Rare and Protected Species Database. A response was received on the 21 December 2018. Table 5-5 lists all rare and protected species records obtained from NPWS scientific data unit.

Table 5-5 NPWS records for rare and protected species

Common name	Scientific name	Designation/ Status
Freshwater crayfish	*Austropotamobius pallipes*	Annex II, V, WA
Marsh fritillary	*Euphydryas aurinia*	Annex II
Irish hare	*Lepus timidus*	Annex V, WA
Red squirrel	*Sciurus vulgaris*	WA
Wood bitter-vetch	*Vicia orobus*	RL – Vulnerable (VU)
Small-white orchid	*Pseudorchis alba*	RL – Vulnerable (VU)
Green-winged orchid	*Orchis morio*	RL – Vulnerable (VU)
Smooth brome	*Bromus racemosus*	RL – Near Threatened (NT)

FPO = Flora Protection Order; RL = Red List, VU = Vulnerable.

In addition to the records provided above, the scientific data unit recommended consultation with regional NPWS staff to provide further information on the likelihood of breeding peregrine falcon at the site. Following consultation with local NPWS, records received on the 10th March 2020 identify the following:

- The quarry was occupied by peregrine falcon in 2015. However, they did not breed that year.
- The pair did breed successfully in 2016 and have been present at the site consistently since 2015 (I O'Sullivan 2020, personal communication, 10 March *Coshla quarry peregrine falcons*).

5.5.1.9 Freshwater Pearl Mussel (*Margaritifera margaritifera*)

The NPWS *Margaritifera* Sensitive Area map (Version 8, 2017) was consulted during the desk study. There is no surface water connectivity between the proposed development site and any *Margaritifera* catchment. The nearest *Margaritifera* Sensitive Area is located to the west of Galway city, the 'Knock' catchment, identified as a Catchments of other extant populations. There is therefore no potential for any connectivity between the proposed development and any *Margaritifera* Sensitive Area.

5.5.1.10 Invasive Species

The NBDC database also contains records of invasive species identified within the relevant hectad. Records of 'high impact' invasive species for hectad M42 are provided in Table 5-6.

Table 5-6 NBDC records for invasive species

Common Name	Scientific Name
American mink	*Mustela vison*

Regulations 49 and 50 of the European Communities (Birds and Natural Habitats) Regulations 2011 (S.I. 477 of 2011) include legislative measures to deal with the introduction, dispersal, dealing in and keeping of non-native species.

5.5.1.11 Conclusions of the Desktop Study

The desktop study has provided information about the existing environment in Hectad M42, within which the proposed development site is located. The site is situated within the Carrowmoneash (Oranmore) sub catchment. As discussed in Section 7.3.12, Chapter 7 of the EIAR, the proposed development is likely to be hydrologically connected (by groundwater only) to both Galway Bay Complex SAC and Inner Galway Bay SPA.

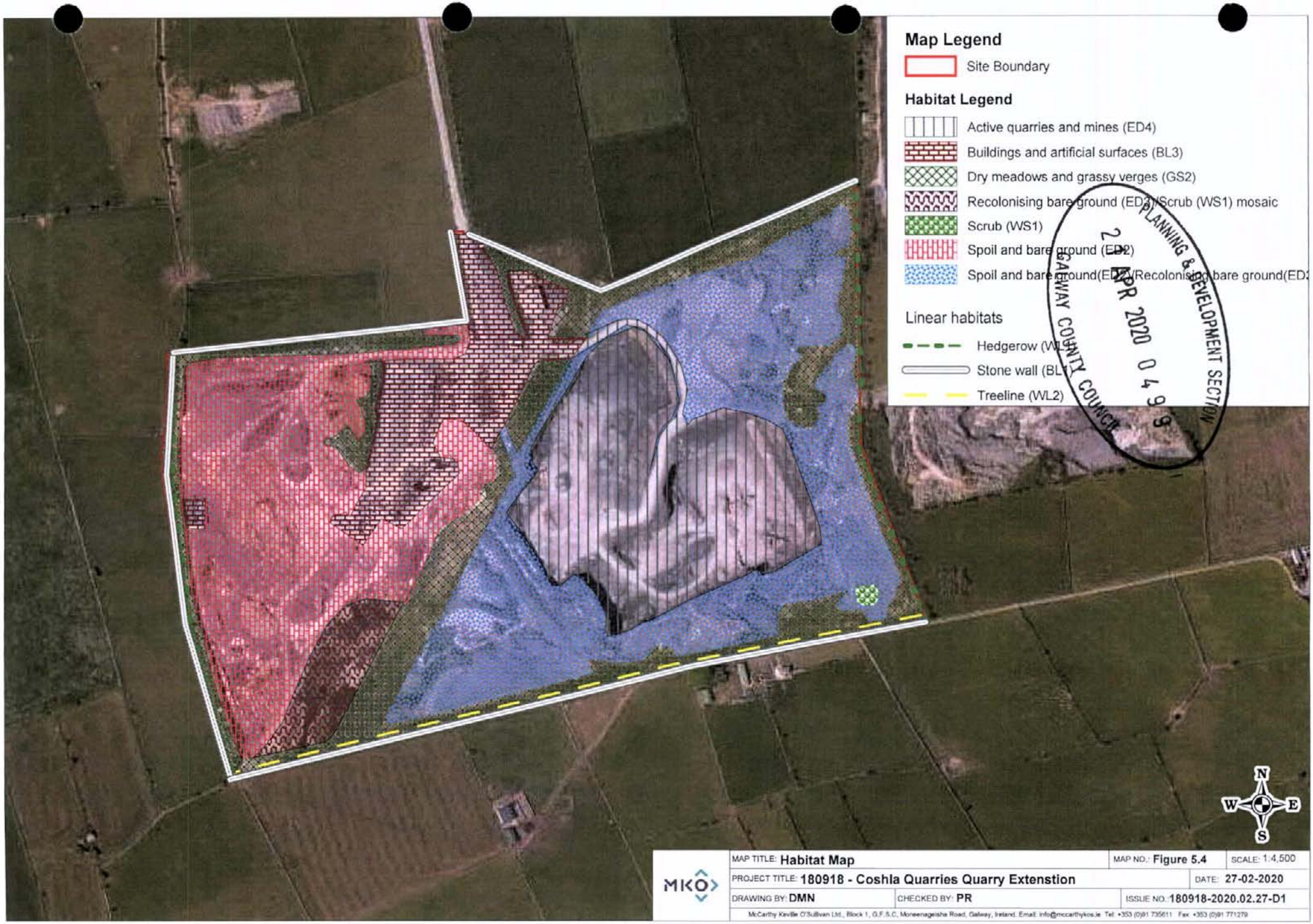
The desk study identified that a variety of protected faunal species are known to occur within the study area, including bats, freshwater white-clawed crayfish and badger. A review of bat roost records for the area did not identify any roosts within or immediately adjacent to the proposed development. The mammal species recorded during the desk study informed the survey methodologies undertaken during the site visit.

The desk study also provided useful information to inform the ecological surveys undertaken on site as well as the identification or exclusion of pathways for potential impact on sensitive ecological receptors.

5.5.2 Ecological Walkover Survey Results

5.5.2.1 Description of Habitats and Flora within the Ecological Survey Area

The habitats on the site of the proposed development were the subject of a detailed survey and assessment. This habitat mapping and assessment was undertaken following '*A Guide to Habitats in Ireland*' (Fossitt, 2000). A habitat map is provided in Figure 5.4.



The majority of the eastern portion of the site currently consists of an active quarry void which is categorised as ***Active quarries and mines (ED4)*** with areas of ***Spoil and Bare Ground (ED2)*** and ***Recolonising bare ground (ED3)***, see Plate 5.1. Within the existing quarry void, an area of open water exists, resulting from surface water ingress. This has been categorised as ***Other artificial lakes and ponds (FL8)*** and macrophyte or fringe vegetation was not recorded from the surface water features during the site visits. Much of the immediate surrounding habitat, within the proposed expansion areas, has been subject to some level of ground disturbance associated with overburden stripping and other quarrying activities. These areas form a mosaic of ***Spoil and bare ground (ED2), Recolonising bare ground (ED3)*** and areas of remnant rank grassland catagorised as ***Dry meadows and grassy verges (GS2)***, see Plates 5.2 and 5.3. These areas of disturbed habitats have not been mapped in detail as they are highly modified and of low ecological value.

The small fragmented areas of dry meadows and grassy verges surround the existing quarry void comprise species such as creeping bent-grass (*Agrostis stolonifera*), glaucous sedge (*Carex flacca*), common sedge (*Carex nigra*), crested dogs-tail grass (*Cynosurus cristatus*), red fescue (*Festuca rubra*), dandelion (*Taraxacum officinale* agg.), dock (*Rumex* spp.), creeping thistle (*Cirsium arvense*), white clover (*Trifolium repens*), creeping buttercup (*Ranunculus repens*), bramble (*Rubus fruticosus*), rose (*Rosa* spp.), *Brassica* spp., wild carrot (*Daucus carota*), nettle (*Urtica dioica*), ribwort plantain (*Plantago lanceolata*), cock's foot grass (*Dactylis glomerata*), rosebay willow-herb (*Chamaenerion angustifolium*) and scattered gorse (*Ulex europaeus*) scrub (WS1) (see Plate 5.3). Marsh thistle (*Cirsium palustre*), jointed rush (*Juncus 5-20ulpes5-20te5-20s*), pointed spear-moss (*Calliergonella 5-20ulpes5-20te*) and bulrush (*Typha latifolia*) were recorded in areas of grassland with a wet influence.

The site boundary is mainly demarcated by a low ***Stone wall (BL1)***, see Plate 5.4, and some ***Hedgerows (WL1)***, see Plate 5.5. Hedgerows occurring along the eastern boundary of the site, predominantly comprise of hawthorn, bramble and ivy. Scattered trees, mainly hawthorn, occur along the stone wall to the west of the site forming a week/'gappy' hedgerow. A new ***Treeline (WL2)*** has been planting along an existing spoil berm which forms the southern boundary of the site (see Plate 5.6). A number of areas of scrub, dominated by gorse, also occur within the site boundary, predominantly along the southern boundary of the site (see Plate 5.7). A number of trees, predominantly comprising of hawthorn, also occur, scattered along the stone wall boundaries.

The north-western portion of the site comprises of large areas of ***Buildings and artificial surfaces (BL3)*** including the site access road, site office (comprising of toilet, shower, canteen and staff room), staff and visitor car park, machinery shed, concrete batching plants, concrete products storage area, loading silo/hoppers, wash down area, weighbridge and truck wheel wash. An example of the buildings and artificial surfaces is shown in Plate 5.8. Much of the west and southwest of the site comprises of spoil and bare ground and recolonising bare ground due to the nature of the operations on site.

No watercourses were recorded within or immediately adjacent to the site of the proposed development.

No invasive species, listed on the Third Schedule of the S.I. No. 477/2011 – European Communities (Birds and Natural Habitats) Regulations 2011, were recorded within the study area. The only non-native invasive species recorded on site include butterfly bush (*Buddleja davidii*) and *Cotoneaster dammeri*. Although invasive species, these are not listed on the Third Schedule.

No botanical species protected under the Flora (protection) Order (1999, as amended 2015) were recorded during the survey.

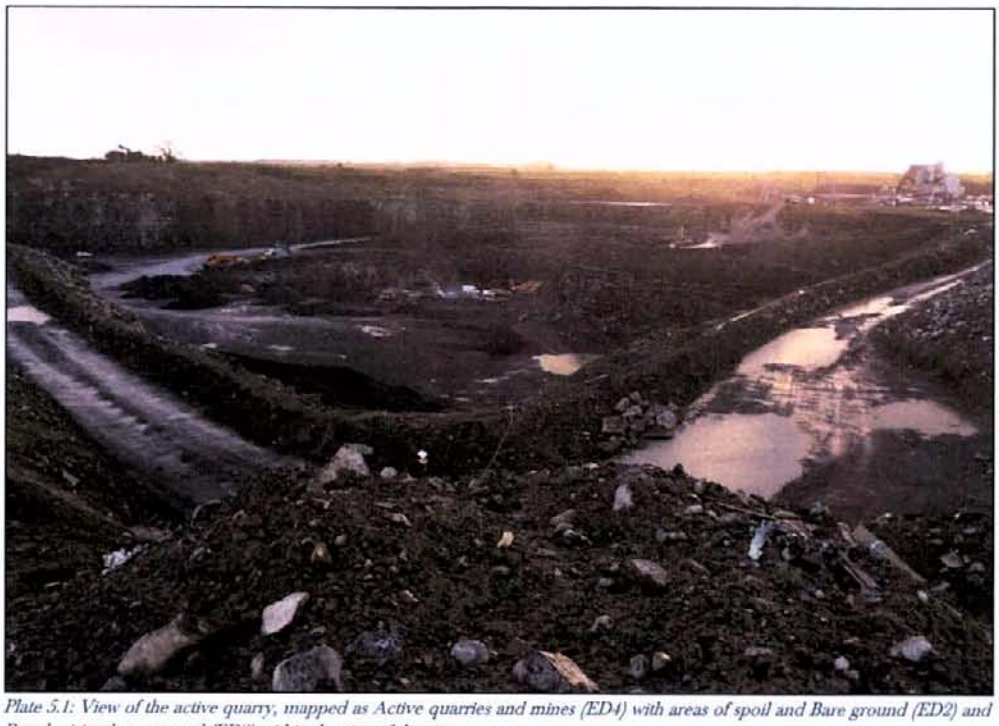


Plate 5.1: View of the active quarry, mapped as Active quarries and mines (ED4) with areas of spoil and Bare ground (ED2) and Recolonising bare ground (ED3) within the east of the site.

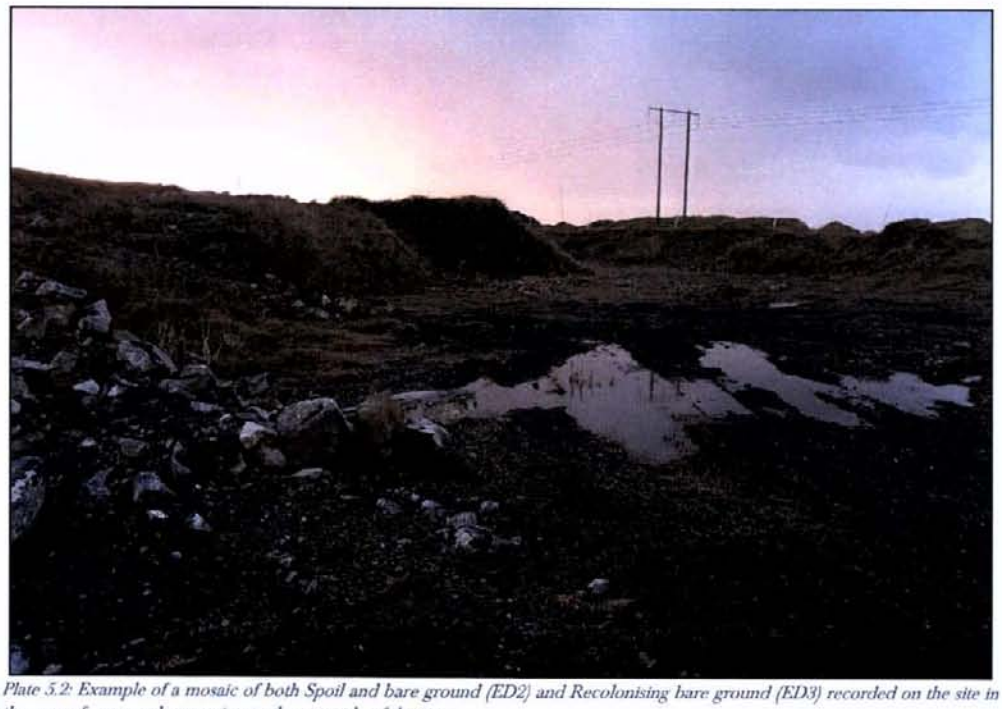


Plate 5.2: Example of a mosaic of both Spoil and bare ground (ED2) and Recolonising bare ground (ED3) recorded on the site in the area of proposed expansion to the east side of the site.

Plate 5.3: Example of small area of Dry meadows and grassy verges (GS2) within the proposed expansion area to the south-east of the site, including a small area of scrub (WS1) dominated by bramble.

Plate 5.4: Example of stone wall (BL1) occurring along the site boundary, including scattered hawthorn trees (left).

Plate 5.5: Example of hedgerow habitat (WL1) occurring along the eastern boundary of the site, dominated by hawthorn.

Plate 5.6: Example of planted treeline on vegetated berm along the southern site boundary.

Plate 5.7: Example of gorse scrub (WS1) occurring within the site close to the southern boundary.

Plate 5.8 – Example of buildings and artificial surfaces (BL3) within the north-west of the site.

5.5.2.2 Significance of Habitats

Ecological evaluation follows a methodology that is set out in Chapter 3 of the '*Guidelines for Assessment of Ecological Impacts of National Roads Schemes*' (NRA, 2009). The habitats within and adjacent to the development site were evaluated in accordance with the criteria developed by the NRA (2009b), which classifies sites in terms of their ecological importance, *i.e.* '*international importance*',

'*national importance*', '*county importance*', '*local importance (higher value)*' or '*local importance (lower value)*'.

Due to the modified nature of the site, habitats are of limited ecological importance. ***Active quarries and mines (ED4)***, ***Buildings and artificial surfaces (BL3)***, ***Spoil and bare ground (ED2)***, ***Recolonising bare ground (ED3)*** and ***Stone Wall (BL1)*** were classed as being of *Local importance (Lower value)* given that they do not support a significant habitat for flora and fauna.

The area of ***Other artificial lakes and ponds (FL8)*** has been categorised as of *Local Importance (Lower value)* due to the steep sides of the quarry void, lack of a drawdown zone and lack of lack of fringing vegetation offers poor supporting habitat for faunal species.

Dry meadows and grassy verges (GS1) has been categorised as being of *Local Importance (lower value)* as although it is semi-natural in nature and of some local biodiversity value, it is highly fragmented due to the historic quarrying activities and has a dense grass dominated sward.

Although the ***Scrub (WS1)*** habitat recorded on site is of some importance to local wildlife due, to its fragmented nature and small area within a highly modified environment, the areas identified on site have been assessed as of *local importance (lower value)*.

Both **hedgerows (WL1)** and the immature **treeline (WL2)** have been classified as of *Local Importance* (higher value) as they provide some connectivity to the wider landscape, suitable commuting and foraging habitat for a variety of faunal species in the area.

There are no Annex I habitats listed under the EU Habitats Directive present within the Proposed Development site boundary. No botanical species protected under the Flora (protection) Order (1999, as amended 2015), listed in the EU Habitats Directive (92/43/EEC), or listed in the Irish Red Data Books were recorded on the site and no suitable habitat occurs within the site. All species recorded are common in the Irish landscape.

5.5.2.3 Fauna

5.5.2.3.1 *Birds*

A number of common bird species were recorded within or immediately adjacent to the site on the 30th November 2018 and the 05 March 2020 (see Table 7.4.2). A peregrine falcon (*Falco pergrinus*) was recorded flying over the site on the November visit. As the steep quarry walls provide suitable habitat for the species, a dedicated peregrine falcon survey was undertaken on the 05 March 2020 to further assess the usage of the site by the species. Although not observed during the March 2020 visit, recent signs (splashing beneath regularly used perches) was recorded. In addition, quarry staff had reported seeing individuals in recent weeks. Peregrine falcons are protected under Annex I of the Birds Directive. All other bird species recorded during the site visit were common birds that are typical of the habitats on the site and adjacent lands.

As described in Section, 5.5.1.8, consultation with National Parks and Wildlife Service (NPWS) found that peregrine falcon is known to have bred on a north facing ledge within the quarry each year since 2015 (I O'Brien 2020, pers. comm., 4 March). Such north, north-east or east facing ledges are known to be preferred by peregrine falcon as they prevent possible overheating of the eggs and newly hatched young (Ratcliffe 1995[3]).

The majority of the site is dominated by an active quarry and is highly disturbed by anthropogenic activities. This site does not provide a significant area of habitat for wintering wildfowl due to the highly modified quarry void, lack of suitable aquatic features and high degree of ongoing human disturbance.

[3] *Ratcliffe, D A 1995 The Peregrine Falcon. Second Edition. T and A D Poyser, London*

With the exception of small areas of scrub, small patches of fragmented rank grassland, hedgerows and treelines, the site provides low quality habitat for local bird species generally.

Table 5-7 NPWS records for rare and protected species

Common name	Scientific name	Conservation Status (BoCCI)
Pied wagtail	*Motacilla alba*	Green
Peregrine falcon	*Falco peregrinus*	Green
Hooded crow	*Corvus cornix*	Green
Robin	*Erithacus rubecula*	Amber
Blackbird	*Turdus merula*	Green
Rook	*Corvus frugilegus*	Green
Jackdaw	*Corvus monedula*	Green
Magpie	*Pica pica*	Green
Meadow pipit	*Anthus pratensis*	Red
Linnet	*Carduelis cannabina*	Amber
Blue tit	*Parus caeruleus*	Green
Starling	*Sturnus vulgaris*	Amber

5.5.2.3.2 Mammals

Badger

Evidence of badger was recorded within a small area of fragmented rank grassland within the southwest on the site, including; prints, tracks and hairs stuck on a barbed wire fence. No badger setts were recorded within the site. However, the species is likely to have a sett in the wider area.

Bat species

No suitable bat roosting habitat was recorded within the site due to the absence of any old buildings or mature trees. All site offices comprise of portacabins and were assessed as not suitable for roosting bats during the site visits. The site is surrounded by agricultural fields, most of which comprise of improved agricultural grassland. Tree cover in the surrounding area is sparse, with a small number of trees, predominantly hawthorn occurring along stone walls. Hedgerows, an immature treeline and stone walls that form the site boundary provide connectivity the wider area for a variety of bat species locally and have been assessed as of *low*[4] to *moderate*[5] value.

5.5.2.3.3 Other fauna species

A scat (droppings) was recorded on site, suggesting possible evidence of pine marten within the site. However, no pine marten dens were recorded within the site.

[4] *Habitat that could be used by small numbers of commuting bats such as a gappy hedgerow*
[5] *Continuous habitat connected to the wider landscape that could be used by bats for commuting such as linear features or river*

There are no watercourses within or adjacent to the site, therefore no suitable habitat for otter or other protected, aquatic species exists within the area. Species such as pygmy shrew (*Sorex minutus*) and fox (*Vulpes 5-27ulpes*) are likely to occur in the area, at least on occasion. These species have widespread and favourable ranges in Ireland and suitable habitats are widespread in the area. Impacts on species of conservation concern are not anticipated.

In general, given the highly modified and bare nature of much of the habitats on site, limited suitable habitat occurs on site for protected faunal species. No evidence of populations of species such as Irish hare or pine marten being significant at more than a local level was recorded. No signs of any additional protected fauna were recorded within the study area during the field survey.

No evidence of common frog or smooth newt were recorded and the steep sides of the artificial pond within the quarry void lack fringing vegetation and thus poor supporting habitat for these species.

5.5.2.4 Significance of Fauna

5.5.2.4.1 *Birds*

Peregrine falcon was recorded within the quarry and is known to breed within the quarry in recent years. Peregrine falcon was the only species recorded within the site listed under Annex I of the EU Birds Directive. Peregrine falcon has been assessed as a species of low conservation concern (green listed[6]) in Ireland. However, the species is likely to have a low population at a county level and as such is valued as being of *County* Importance (TII, 2009). The actual number of nest sites known across counties Galway and Clare is not yet published (following a National survey in 2017), however, current estimates suggest that 60-70 nest sites occur in the region (Arup, 2018[7]).

None of the remaining birds recorded within the development site are listed under Annex I of the EU Birds Directive and have been assessed as of *Local importance (higher value)*. However, as the small areas of scrub habitat on site will require removal during the operational phase, associated with the stripping of the overburden, this could impact on local breeding bird species if undertaken during the nesting bird season. This is assessed in Section 5.6.2 of the EIAR.

5.5.2.4.2 *Badger*

Badger is known to occur in the area as described in Section 5.5.1. As signs of the species was recorded within an area of rank grassland along the site boundary the species has been assessed as of *Local importance (higher value)*.

5.5.2.4.3 *Bats*

Although no suitable roosting structures were identified within the site of the proposed development, the linear habitats including hedgerows and treelines surrounding the site are likely to be utilised by local bat species of *Local Importance (higher value)* for commuting and foraging. All bat species in Ireland are protected under both national legislation – (Wildlife Act, 1976, as amended in 2017) and European legislation – (Habitats Directive (92/43/EEC).

5.5.2.4.4 *Other fauna*

No evidence of populations of species such as Irish hare or pine marten being significant at more than a *local importance (lower value)* was recorded.

[6] *Colhoun, K. & S. Cummins. 2013. Birds of Conservation Concern in Ireland 2014-2019. Irish Birds 9, 523-544.*
[7] *Arup, 2018, N6 Galway City Ring Road - Environmental Impact Assessment Report: Biodiversity*

5.5.2.5 Identification of Key Ecological Receptors

Table 5-8 lists all identified receptors and assigns them an ecological importance in accordance with the Guidelines for Assessment of Ecological Impacts of National Road Schemes (NRA, 2009). This table also provides the rationale for this determination and identifies the habitats that are Key Ecological Receptors. These ecological receptors are considered in Section 6.7 of this report and mitigation/ measures will be incorporated into the proposed development where required, to avoid potential significant impacts on the features.

Table 5-8 Key Ecological Receptors identified during the assessment

Ecological feature or species	Reason for inclusion as a KER	KER
Designated sites	As described in Section 7.3.12, Chapter 7 of the EIAR, the only European designated sites that are likely to be hydrologically connected (by groundwater only) to the proposed quarry development is the Galway Bay Complex SAC and Inner Galway Bay SPA. From a precautionary perspective, this SAC has been assessed as within the Likely Zone of Impact. Impact on EU Designated Sites is further assessed in the Natura Impact Statement submitted as part of the planning application documentation.	Yes
Active quarries and mines (ED4)	As the quarry is operational and subject to continuous alteration, this feature is of low ecological value and is thus not considered further in this report.	No
Spoil and bare ground (ED2)	This feature is of low ecological value and is thus not considered further in this report as the quarry will remain operational and subject to continuous alteration.	No
Buildings and artificial surfaces (BL3)	This feature is of low ecological value and is thus not considered further in this report as the quarry will remain operational and subject to continuous alteration.	No
Stone walls (BL1)	This feature is of low ecological value and is thus not considered further in this report as the quarry will remain operational and subject to continuous alteration. In addition, this feature will not be lost to the proposed development.	No
Other artificial lakes and ponds (FL8)	This feature is not of any ecological value and is thus not considered further in this report as the quarry will remain operational and subject to continuous alteration.	No
Dry meadows and grassy verges (GS2)	Although the habitat is of some importance to local wildlife due to its seminatural status and species assemblage, the areas identified on site are not subject to any formal management and are highly fragmented due to the historic and ongoing quarrying activities.	No
Scrub (WS1)	Although the ***Scrub (WS1)*** habitat recorded on site is of some importance to local wildlife due, to its fragmented nature and small area within a highly modified environment, the areas identified on site have been assessed as of *local importance (lower value).*	No
Bats	No bat roost or suitable structures for the species were identified within the proposed development site boundary. Potentially suitable foraging and commuting habitat for bats, hedgerows and treelines, was identified within the wider area. There will be no loss of hedgerow habitat associated with	No

Ecological feature or species	Reason for inclusion as a KER	KER
	the proposed excavation area and there will therefore be no significant negative impact on bat species at any geographic scale associated with the proposed project. Bats are thus not subject to further assessment.	
Peregrine falcon	Breeding peregrine falcon have been identified at the quarry. This species has been identified as of *County Importance* (NRA, 2009). From a precautionary perspective this species has been identified for further assessment.	Yes
Badger	Signs of badger were recorded within the study area. However, no badger sett was identified within the site. Potential for direct impacts as a result of the proposed development are not predicted. Potential for disturbance/displacement to badger has not predicted due to the absence of any sett and the nature of the proposed development (expansion of an existing quarry void).	No
Additional protected fauna	No signs or records of additional protected faunal species was recorded within the proposed development area.	No

5.6 Ecological Impact Assessment

5.6.1 Do-Nothing Effect

If the proposed development were not to proceed, the site would continue to be managed under the requirements of its current planning permission, as described in Section 2.1 of the EIAR, until such time as the quarry exhausted the materials within its current permitted extraction boundary. The project would then likely cease operation.

5.6.2 Impacts During Operational Phase

The proposed development has the potential to result in habitat loss and disturbance related impacts on faunal species that were recorded on the site but were not included as KERs. No significant effects on non-KER faunal or habitats recorded within the site is anticipated at any geographic scale as a result of the proposed development. It should be noted that no significant habitat for badger or other non-KER faunal species was recorded within the footprint of the proposed quarry expansion.

Given the highly modified nature of the habitats recorded within the site of the proposed expansion, comprising of highly modified habitats of low ecological value due to quarrying activities, there are limited areas of suitable vegetation cover that provide nesting habitat for other common and widespread bird species. However, the proposed development will require some scrub clearance. If scrub clearance is undertaken during the bird nesting season, it could lead to the destruction or disturbance of active nests locally. In order to avoid direct impact on nesting birds, site clearance/removal of the overburden will be undertaken outside of the nesting bird season (1st March – 31st August) to ensure compliance with the Wildlife Act. If vegetation clearance is required during the nesting bird season, this will be preceded by a nesting bird survey and all clearance works supervised by an appropriately qualified ecologist.

There will be no loss of existing hedgerows or treelines associated with the proposed development. .

5.6.2.1 Assessment of Impact on Peregrine Falcon

Table 5.10. Assessment of impacts on birds associated with the construction phase of the proposed project.

Description of Effect	**Habitat Loss/fragmentation** The expansion of the quarry has the potential to result in the loss of a known peregrine falcon nest site in the absence of mitigation.
	Disturbance/Displacement The operational phase of the proposed project has the potential to cause disturbance to breeding peregrine falcon, potentially leading to avoidance of the area.
Characterisation of unmitigated effect	**Habitat Loss/fragmentation** Peregrine falcon are known to utilise a ledge at the top of the existing south facing quarry wall, created by quarrying activities, see Figure 5.5, confidential Appendix 5.1. The loss of a known peregrine falcon nest ledge constitutes a likely permanent moderate negative effect in the absence of mitigation, as species opportunistically utilises suitable artificial ledges created as a result of quarrying activities. The expansion of the quarry may result in the creation of alternative nest ledges.
	Disturbance/Displacement Potential disturbance/displacement to peregrine falcon is considered to be a short-term slight negative effect in the absence of mitigation as the species is known to become habituated to quarrying activities.
Assessment of Significance prior to mitigation	**Habitat Loss** The loss of a known peregrine falcon nest ledge to the proposed quarry expansion has been assessed as a *permanent moderate negative effect* in the absence of mitigation as, although the current nest ledge would be lost to the proposed expansion, it is likely the alternative nest ledges would be created/occupied as part of the historic and ongoing quarrying activities. This is likely to be significant at a local geographic scale.
	Disturbance/Displacement The proposed operations are not considered to be significantly different from the existing ongoing activities and as such will not significantly affect peregrine falcon in terms of disturbance. Peregrine falcon are known to opportunistically use quarries as breeding sites and studies have shown that they become habituated to ongoing quarry activities (Ruddock and Whitfield, 2007[8], Ratcliffe, 1993[9]). Disturbance to peregrine falcon associated with the proposed expansion of the quarry is assessed as a *short-term, not significant effect* and is not considered to be significant at any geographic scale[5,6].
Mitigation	**Habitat Loss** In order to avoid the loss of a known breeding falcon nest ledge within the site, known to be occupied since 2016, the proposed extraction area has been designed to avoid the loss of this nest ledge, see Figure 5.5, confidential Appendix 5.1[10].
	Disturbance/Displacement Quarry nesting peregrine falcons have been observed to ignored frequent rock blasting within the quarry (Ratcliffe, 1993). In order to protect nesting peregrine falcon, there will be

[8] *Ruddock, M. & Whitfield, D.P. 2007: A Review of Disturbance Distances in Selected Bird Species. Report from Natural Research (Projects) Ltd to Scottish Natural Heritage. – Scottish Natural Heritage, Battleby, UK.*
[9] *Ratcliffe, D. 1993. The Peregrine Falcon. 2nd Edition. Poyser, London*
[10] *Following best practice, the exact location of protected species breeding sites is not maid publicly available.*

	no blasting along the southern boundary of the quarry, either side of the known peregrine falcon nest ledge, while active and until young have fledged. Holthuijzen *et al.* (1990)[11] recommended a minimum protective buffer distance between nest and blast site of 125 m.
Residual Effect following Mitigation	**Habitat Loss** Following the incorporation of mitigation listed above, the avoidance of the known peregrine falcon nest ledge incorporated into the design of the proposed project, habitat loss is not considered to be significant at any geographic scale.
	Disturbance/Displacement Following the implementation of the mitigation as described above, there will be no significant residual effect at any geographic scale on breeding peregrine falcon as a result of the continued expansion of the quarry.

5.7 Impacts on Designated Sites

As discussed in Section 7.3.12 and Figure 7.5, Chapter 7 of the EIAR, the only designated sites that are likely to be hydrologically connected (by groundwater only) to the proposed quarry development are the Galway Bay Complex SAC, Inner Galway Bay SPA and Galway Bay Complex pNHA, all located within Galway bay, approximately 3.9km to the west of the site. The hydrology chapter also states that there are unlikely to be groundwater connections to Lough Corrib SAC, Kiltullagh Turlough pNHA or Cregganna Marsh NHA.

5.7.1 Impacts on European Designated sites

Potential impacts on European Designated Sites (SACs and SPAs) are assessed within a separate Screening for Appropriate Assessment report and Natura Impact Statement. The NIS states that:

> *"it can be objectively concluded that the Proposed Development, individually or in combination with other plans or projects, will not adversely affect the integrity of any European Site".*

5.7.2 Impacts on Nationally Designated sites

As discussed in Section 7.3.12 and Figure 7.5, Chapter 7 of the EIAR, the only designated site that is likely to be hydrologically connected (by groundwater only) to the proposed quarry development is the Galway Bay Complex pNHA. All nationally designated sites were considered in this assessment. Any pNHAs or NHAs that were also designated as SACs/SPAs have been fully assessed under that designation within a Natura Impact Statement (NIS), submitted as part of the planning application documentation. There was no identified pathway for effect on any Nationally designated site that was not also designated as a European Site.

5.8 Decommissioning phase

Following completion of the proposed excavation works, some areas will be allowed to naturally fill with water. In raised areas, a thin layers of soil and overburden shall be spread over the quarry floor, in targeted locations, and allowed to natural re-vegetate, thereby enhancing the habitat diversity within the

[11] *Holthuijzen, A.M.A., Eastland, W.G., Ansell, A.R., Kochert, M.N., Williams, R.D. & Young, L.S. (1990). Effects of blasting on behaviour and productivity of nesting Prairie falcons. Wildlife Society Bulletin, 18, 270-281.*

proposed study area. Overburden will also be spread on the safety benches and allowed to revegetate naturally. Targeted planting and seeding with native plant species will be used in accordance with the Quarry Restoration Plan (Appendix 3-1) that was previously prepared and approved for the quarry.

5.9 Cumulative impact

The proposed development was considered in combination with other plans and projects in the area that could result in cumulative impacts on European Sites, Nationally designated sites and protected species. This included a review of online Planning Registers and served to identify past and future plans and projects, their activities and their predicted environmental effects.

5.9.1 Assessment of Plans

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

- Galway County Development Plan 2015-2021
- Variation No.1 to the County Development Plan 2015 - 2021
- The Regional Planning Guidelines for the West 2010-2022
- National Biodiversity Action Plan 2017-2021
- Draft Galway County Heritage and Biodiversity Plan 2017-2022

The review focused on policies and objectives that relate to designated sites for nature conservation, biodiversity and protected species. Policies and objectives relating to the conservation of peatlands and sustainable land use were also reviewed, particularly where the policies relate to the preservation of surface water quality. An overview of the search results with regard to plans is provided in Table 5.9.

Table 5-9 Assessment of Plans

Plans	Key Policies and Objectives directly related to European Sites and Biodiversity in the Zone of Influence	Assessment of development compliance with policy
Galway County Development Plan 2015-2021	**Policy NHB 1 – Natural Heritage and Biodiversity** It is the policy of Galway County Council to support the protection, conservation and enhancement of natural heritage and biodiversity, including the protection of the integrity of European sites, that form part of the Natura 2000 network, the protection of Natural Heritage Areas, proposed Natural Heritage Areas Ramsar Sites, Nature Reserves, Wild Fowl Sanctuaries and Conamara National Park (and other designated sites including any future designations) and the promotion of the development of a green/ecological network within the plan area, in order to support ecological functioning and connectivity, create opportunities in suitable locations for active and passive recreation and to structure and provide visual relief from the built environment.	The surveys undertaken in the preparation of this application have demonstrated that the proposed Development will not adversely affect the Qualifying Interests/Special Conservation Interests associated with any National or EU Designated Site. There will be no adverse effects on sensitive aquatic receptors as a result of deterioration in water quality. The proposed development has been designed to avoid any effect on surface or ground water outside the site and this is demonstrated within this EIAR.
	Objective NHB 1 – Protected Habitats and Species Support the protection of habitats and species listed in the Annexes to and/or covered by the *EU Habitats Directive (92/43/EEC) (as amended)* and the *Birds Directive (2009/147/EC)*, and regularly occurring-migratory birds and their habitats and species protected under the *Wildlife Acts 1976-2000* and the *Flora Protection Order*.	A peregrine falcon nest ledge was identified within the quarry site and avoidance and mitigation measures have been incorporated into the proposed project design for the avoidance of impact on the species. No significant habitat for other protected species was recorded within or in the vicinity of the development site.
	Objective NHB 2 – Biodiversity and Ecological Networks Support the protection and enhancement of biodiversity and ecological connectivity within the plan area, including woodlands, trees, hedgerows, semi-natural grasslands, rivers, streams, natural springs, wetlands, stonewalls, geological and geo-morphological systems, other landscape features and associated wildlife where these form part of the ecological network and/or may be considered as ecological corridors or stepping stones in the context of *Article 10* of the *Habitats Directive*.	There will be no loss of hedgerows or tree lines on the site due to the nature of the proposed project (continued vertical extraction of material from an existing quarry). There will be no deterioration in water quality due to the proposal. All drainage proposals for the development will be consistent with SUDs principles and best practice SUDs drainage design as described in Section 3.5 of the EIAR.
Variation No.1 to the County Development Plan 2015 - 2021	**Objective DS 6 – Natura 2000 Network and Habitats Directive Assessment** Protect European sites that form part of the Natura 2000 network (Including Special Protection Areas and Special Areas of Conservation) in accordance with the requirements in the EU Habitats Directive (92/43/EEC), EU Birds Directive (2009/147/EC), the Planning and Development (Amendment) Act 2010, the European Communities (Birds and Natural Habitats) Regulations 2011(SI No.477 of 2011) (and any subsequent amendments or updated legislation) and having due regard to the	The proposed project has been subject to a separate Natura Impact Statement (NIS), submitted as part of the planning application documentation. The proposed development will not adversely affect the Qualifying Interests/Special Conservation Interests associated with any EU Designated Site.

Plans	Key Policies and Objectives directly related to European Sites and Biodiversity in the Zone of Influence	Assessment of development compliance with policy
	guidance in the Appropriate Assessment Guidelines 2010 (and any updated or subsequent guidance). A plan or project (e.g. proposed development) within the plan area will only be authorised after the competent authority (Galway County Council) has ascertained, based on scientific evidence, Screening for Appropriate Assessment, and/or a Habitats Directive Assessment where necessary, that: a) The plan or project will not give rise to significant adverse direct, indirect or secondary effects on the integrity of any European site (either individually or in combination with other plans or projects); or b) The plan or project will have significant adverse effects on the integrity of any European site (that does not host a priority natural habitat type/and or a priority species) but there are no alternative solutions and the plan or project must nevertheless be carried out for imperative reasons of overriding public interest, including those of a social or economic nature. In this case, it will be a requirement to follow procedures set out in legislation and agree and undertake all compensatory measures necessary to ensure the protection of the overall coherence of Natura 2000; or c) The plan or project will have a significant adverse effect on the integrity of any European site (that hosts a natural habitat type and/or a priority species) but there are no alternative solutions and the plan or project must nevertheless be carried out for imperative reasons for overriding public interest, restricted to reasons of human health or public safety, to beneficial consequences of primary importance for the environment or, further to an opinion from the Commission, to other imperative reasons of overriding public interest. In this case, it will be a requirement to follow procedures set out in legislation and agree and undertake all compensatory measures necessary to ensure the protection of the overall coherence of Natura 2000.	There will be no adverse effects on sensitive aquatic receptors listed as QIs/SCI, as a result of deterioration in water quality.
	Objective DS 10 – Impacts of Developments on Protected Sites Have regard to any impacts of development on or near existing and proposed Natural Heritage Areas, Special Protection Areas and Special Areas of Conservation, Nature Reserves, Ramsar Sites, Wildfowl Sanctuaries, Salmonoid Waters, Refuges for Flora and Fauna, Conamara National Park, shellfish waters, freshwater pearl mussel catchments and any other designated sites including future designations.	The proposed development will not adversely affect the Qualifying Interests/Special Conservation Interests associated with any EU Designated Site, as described above in relation to NHB 1.

Plans	Key Policies and Objectives directly related to European Sites and Biodiversity in the Zone of Influence	Assessment of development compliance with policy
The Regional Planning Guidelines for the West 2010-2022	**EAP13**: To support the protection of Natural Heritage Areas, Special Protection Areas, Special Areas of Conservation, Nature Reserves, Ramsar Sites (Wetlands), Wildfowl Sanctuaries, National Parks, Nature Reserves and the biodiversity designated under the Habitats Directive, Birds Directive, Wildlife Act, Flora Protection Order and other designated or future designated sites.	The proposed development will not adversely affect the Qualifying Interests/Special Conservation Interests associated with any EU Designated Site, protected habitats or species, as described in relation to NHB1 above.
	EAO18: Support the achievement of favourable conservation status of Annex I habitats, Annex II species, Annex I bird species and other regularly occurring migratory bird species and their habitats in the region.	
National Biodiversity Action Plan 2017-2021	Target 6.2 - Sufficiency, coherence, connectivity, and resilience of the protected areas network substantially enhanced by 2020.	The proposed development will not impact on connectivity within the wider area. There are no watercourses within the proposed development site that could be used as a commuting corridor. There will be no deterioration in water quality, or impact on aquatic habitats associated with the proposal.
Draft Galway County Heritage and Biodiversity Plan 2017-2022	Ensure biodiversity and natural heritage are considered at earliest stages in the development of new plans and strategy documents. Promote the integration of biodiversity into work plans and developments at earliest (design) stage of projects.	There will be no loss of hedgerow, treelined or other ecological features of interest during the operational phase of the proposed project.

5.9.2 Assessment of Projects

As described in Section 2.5.2 of the EIAR, relevant projects have been assessed in-combination with the proposed quarry expansion and include planning applications in the wider area. These have not been repeated here to reduce the duplication of information within this EIAR. However, they have been fully considered in this assessment in terms of their potential for impact on biodiversity.

5.9.3 Assessment of Cumulative Effects

The residual operational and decommissioning impacts of the proposed development are considered cumulatively with other plans and projects as described above. Particular focus has been placed on those plans and projects that are in closest proximity to the proposed development and those that could be potentially affected via downstream surface water.

The proposed development will not result in a significant loss of vegetated habitats, being predominantly restricted to the existing active quarry.

The potential for the proposed development to contribute to a cumulative effect on water quality was considered in this chapter and also in Chapter 7 of this EIAR. No watercourses were recorded within or adjacent to the site boundary during the site visit. As described in Section 3,5 of the EIAR, the proposed development includes a range of measures that are in place to prevent any water pollution or hydrological effects outside the development footprint. The implementation of these measures ensures that there is no potential for significant cumulative effects on any downstream receptors, whether the proposed development is considered on its own or in combination with other plans or projects.

No significant residual effects as a result of the proposed development in relation to disturbance, displacement or mortality of faunal species has been identified. Therefore, there is no potential for the proposed development to contribute to any cumulative effect in this regard.

The proposed development will not result in any significant residual effects on biodiversity and will not contribute to any cumulative effect when considered in combination with other plans and projects.

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

5.10 Conclusion

The proposed quarry activities are largely confined to habitats of Local importance (lower value), predominantly existing areas of Active quarries and mines (ED4), Spoil and bare ground (ED2), Recolonising bare ground (ED3) and Dry meadows and grassy verges (GS2). There will be no loss of habitats identified as of local importance (higher value), such as hedgerows or treelines. In addition, approximately 1,350 metres of linear landscape features/hedgerow has been incorporated into the proposed project design in the form of vegetated berms. Such measures will have a positive impact/biodiversity net gain for wildlife in the wider area, particularly commuting and foraging bat species.

Potential negative effects on peregrine falcon have been mitigated through the avoidance of the known nest ledge, used since 2016, and the undertaking of blasting within a 125m radius of the nest ledge outside of the peregrine falcon nesting season. As such, the residual effects on peregrine falcon have been assessed as not significant at any local geographic scale, subject to the proper operation of the proposed development as specified in this EIAR.

Taking the above information into consideration and having regard to the precautionary principle, it is considered that the proposed development will not result in the loss of habitats and species conservation and will not have any significant impacts on the ecology of the wider area.

Provided that the development is operated in accordance with the design and best practice that is described within this application, significant impacts on biodiversity are not anticipated at any geographic scale.


PLANNING & DEVELOPMENT SECTION
21 APR 2020 0499
GALWAY COUNTY COUNCIL

6. LAND, SOILS AND GEOLOGY

6.1 Introduction

6.1.1 Background and Objectives

Hydro-Environmental Services (HES) was engaged by McCarthy Keville O'Sullivan (MKO), acting on behalf of Coshla Quarries Ltd, to carry out an assessment of the likely effects of the proposed continuation of bedrock extraction at Coshla Quarry, Cashla near Athenry Co. Galway on the Land, Soil and Geological environment.

This Land, Soil and Geology chapter provides a baseline assessment of the environmental setting of the quarry and local area and discusses the potential likely effects that the proposed continuation of rock extraction will have. Where required, appropriate mitigation measures to limit any identified significant effects to land, soils and geology are recommended.

6.1.2 Statement of Authority

This section of the EIAR has been completed by David Broderick and Michael Gill of Hydro-Environmental Services.

Hydro-Environmental Services (HES) are a specialist hydrological, hydrogeological and environmental practice which delivers a range of water and environmental management consultancy services to the private and public sectors across Ireland and Northern Ireland. HES was established in 2005, and our office is located in Dungarvan, County Waterford. Our core areas of expertise and experience include upland hydrology and windfarm drainage design. We routinely complete impact assessments for hydrology and hydrogeology for a large variety of project types.

David Broderick is a hydrogeologist with over 14 years' experience in both the public and private sectors. Having spent two years working in the Geological Survey of Ireland working mainly on groundwater and source protection studies David moved into the private sector. David has a strong background in groundwater resource assessment and hydrogeological/hydrological investigations in relation to developments such as quarries and wind farms. David has completed numerous geological and hydrogeological assessments for input into EIARs for a range of quarry, wind farm and commercial developments.

Michael Gill is an Environmental Engineer, Hydrologist and Hydrogeologist with 18 years' environmental consultancy experience in Ireland. Michael has a degree in Civil and Environmental Engineering, a MSc in Engineering hydrology from TCD and a MSc in Applied Hydrogeology from Newcastle University. He has completed numerous (60+) hydrological and hydrogeological assessments relating to bedrock quarries and sand and gravel pits.

6.1.3 Relevant Legislation

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

- S.I. No. 349 of 1989: European Communities (Environmental Impact Assessment) Regulations, and subsequent Amendments (S.I. No. 84 of 1995, S.I. No. 352 of 1998, S.I. No. 93 of 1999, S.I. No. 450 of 2000 and S.I. No. 538 of 2001), S.I. No. 30 of 2000, the Planning and Development Act, and S.I. 600 of 2001 Planning and Development Regulations and subsequent Amendments. These instruments implement EU Directive

85/373/EEC and subsequent amendments, on the assessment of the effects of certain public and private projects on the environment;
- Directives 2011/92/EU and 2014/52/EU on the assessment of the effects of certain public and private projects on the environment, including Circular Letter PL 1/2017: Implementation of Directive 2014/52/EU on the effects of certain public and private projects on the environment (EIA Directive);
- Planning and Development Act, 2000, as amended;
- S.I. No 296 of 2018: S.I. No. 296 of 2018: European Union (Planning and Development) (Environmental Impact Assessment) Regulations 2018 which transposes the provisions of Directive 2014/52/EU into Irish law; and,
- The Heritage Act 1995, as amended.

6.1.4 Relevant Guidance

The Land, Soils and Geology chapter of this EIAR is carried out in accordance with guidance contained in the following documents:

- Environmental Protection Agency (2017): Draft Guidelines on the Information to be contained in Environmental Impact Assessment Reports;
- Environmental Protection Agency (2015): Draft - Advice Notes on Current Practice (in the preparation of Environmental Impact Statements;
- Environmental Protection Agency (2015): Draft – Revised Guidelines on the Information to be contained in Environmental Impact Statements;
- Environmental Protection Agency (2003): Advice Notes on Current Practice (in the Preparation on Environmental Impact Statements);
- Environmental Protection Agency (2002): Guidelines on the information to be contained in Environmental Impact Statements);
- Institute of Geologists Ireland (2013): Guidelines for the Preparation of Soils, Geology and Hydrogeology Chapters of Environmental Impact Statements;
- National Roads Authority (2008): Guidelines on Procedures for Assessment and Treatment of Geology, Hydrology and Hydrogeology for National Road Schemes;
- Guidelines for Planning Authorities and An Bord Pleanála on carrying out Environmental Impact Assessment (DoHPLG, 2018); and,
- Guidance on the preparation of the EIA Report (Directive 2011/92/EU as amended by 2014/52/EU), (European Union, 2017).

6.2 Schedule of Works

6.2.1 Desk Study

A desk study of the quarry site and the surrounding study area was completed in advance of undertaking the initial walkover survey and follow up site investigations. The desk study involved collecting all the relevant geological data for the proposed development study area. This included consultation with the following:

- Environmental Protection Agency database (www.epa.ie);
- Geological Survey of Ireland - Groundwater Database (www.gsi.ie);
- Bedrock Geology 1:100,000 Scale Map Series, Sheet 14 (Geology of Galway Bay), Geological Survey of Ireland (GSI, 2003);
- Geological Survey of Ireland – 1:25,000 Field Mapping Sheets; and,
- General Soil Map of Ireland 2nd edition (www.epa.ie).

6.2.2 Baseline Mapping and Investigations

Geological mapping and site investigations were undertaken by HES between 21st November 2018 and 28th March 2019. In summary, site investigations to assess the Land, Soil and Geology section of the EIAR included the following:

- An initial walkover survey to assess the ground conditions and layout of the quarry site including walkover surveys of adjacent land;
- Logging of exposed subsoil profiles and existing bedrock quarry side walls;
- Mineral subsoils were logged according to BS: 5930:2015 Code of Practice for Ground Investigations; and,
- Investigation drilling (18 no. exploration holes) to assess bedrock hydrogeological conditions in the proposed quarry continuation area.

Previous investigations at the site included the drilling of 5 no. boreholes (BH1-BH5) by Patrick Briody in July 2007 (refer to Appendix 6.1). Four of the 5 no. boreholes are still in-situ and are used as groundwater monitoring wells (BH1 – BH4).

6.2.3 Impact Assessment Methodology

Using information from the desk study and data from the site investigation, an assessment of the importance of the soil and geological environment within the study area is assessed using the criteria set out in Table 6.1 (NRA, 2008).

Table 6-1 Estimation of Importance of Soil and Geology Criteria (NRA, 2008).

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

Importance	Criteria	Typical Example
	local scale. Volume of peat and/or soft organic soil underlying site is moderate on a local scale.	fertility soils. Small existing quarry or pit. Sub-economic extractable mineral Resource.
Low	Attribute has a low quality, significance or value on a local scale. Degree or extent of soil contamination is minor on a local scale. Volume of peat and/or soft organic soil underlying site is small on a local scale.	Large historical and/or recent site for construction and demolition wastes. Small historical and/or recent landfill site for construction and demolition wastes. Poorly drained and/or low fertility soils. Uneconomically extractable mineral Resource.

The guideline criteria (EPA, 2017) for the assessment of likely significant effects require that likely effects are described with respect to their extent, magnitude, type (i.e. negative, positive or neutral) probability, duration, frequency, reversibility, and transfrontier nature (if applicable). The descriptors used in this environmental impact assessment report are those set out in the EPA 2017 Glossary of effects as shown in Chapter 1 of this EIAR. In addition, the two impact characteristics proximity and probability are described for each impact and these are defined in **Table 6-2**.

In order to provide an understanding of this descriptive system in terms of the geological/hydrological environment, elements of this system of description of effects are related to examples of potential likely significant effects on the geology and morphology of the existing environment, as listed in **Table 6-3**.

Table 6-2: Additional Impact Characteristics.

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

Table 6-3: Impact descriptors related to the receiving environment.

Impact Characteristics		Potential Hydrological Impacts
Quality	Significance	
Negative only	Profound	Widespread permanent impact on: › The extent or morphology of a cSAC. › Regionally important aquifers. › Extents of floodplains.

Impact Characteristics		Potential Hydrological Impacts
Quality	Significance	
		Mitigation measures are unlikely to remove such impacts.
Positive or Negative	Significant	Local or widespread time-dependent impacts on: › The extent or morphology of a cSAC / ecologically important area. › A regionally important hydrogeological feature (or widespread effects to minor hydrogeological features). › Extent of floodplains. Widespread permanent impacts on the extent or morphology of an NHA/ecologically important area. Mitigation measures (to design) will reduce but not completely remove the impact – residual impacts will occur.
Positive or Negative	Moderate	Local time-dependent impacts on: › The extent or morphology of a cSAC / NHA / ecologically important area. › A minor hydrogeological feature. › Extent of floodplains. Mitigation measures can mitigate the impact OR residual impacts occur, but these are consistent with existing or emerging trends.
Positive, Negative or Neutral	Slight	Local perceptible time-dependent impacts not requiring mitigation.
Neutral	Imperceptible	No impacts, or impacts which are beneath levels of perception, within normal bounds of variation, or within the bounds of measurement or forecasting error.

6.3 Existing Environment

6.3.1 Site Description and Topography

The quarry site is situated just north of the M6 Motorway in the townland of Cashla, which is located approximately 7 kilometres (km) to the west-northwest of Athenry, Co. Galway. The application site has an area of 27.7 hectares (ha). The quarry is currently operational.

The topography of the local area is undulating with the local ground elevation being between 20 and 40m OD (Ordnance Datum). The overall slope is to the southwest towards Oranmore Bay. The natural ground elevation of the quarry landholding varies between approximately 20 and 32m OD.

The quarry has been worked extensively in the past, and the site includes a large excavated area (quarry floor) on the eastern half of the landholding which has a lower bench level at -5m OD and two upper benches at approximately 5 and 13.5m OD. The middle bench (i.e. at 5m OD) has the largest footprint area. The ground elevation surrounding the extraction area is between 20 – 24m OD.

Quarry workings which include a weighbridge, wheelwash, office prefab buildings, maintenance workshop, concrete batching plant, block yard, storage buildings, processing infrastructure, stockpiling areas, settlement pond, batching plant wash water lagoon, soakaway area (for quarry dewatering discharge) and ancillary plant / infrastructure are located on the east and north of the site. Access to the site is via a local road which runs to the north of the site.

The proposed extraction expansion area is located on the eastern half of the landholding and comprises an area of approximately 6.7ha. A significant portion of the proposed expansion area is stripped of subsoil down to the top of bedrock and current ground elevations is at approximately 25m OD. The stripped subsoil is temporarily mounded on the north-western section of the continuation area.

Landuse in the surrounding area is largely agricultural with scattered rural pattern of residential dwellings along the local roads to the north and east of the site. A 110kV electrical ESB substation is located immediately to the northeast of the site and overhead power lines pass through the quarry landholding.

6.3.2 Soils and Subsoils

The published soils map (www.epa.ie) for the area shows that the mapped soil type in the area of the quarry site is deep well drained mineral soil which comprises mainly grey Brown podzolics and brown earths. Much of the soils at the site have been removed due placement of made ground and/or quarry extraction.

Based on the GSI subsoils map (www.gsi.ie), limestone tills are the dominant subsoil type in the area of the quarry and wider area. A local subsoil geology map is shown as Figure 6.1.

The majority of subsoils at the quarry landholding have been removed due to past quarry workings. A large quantity of this removed subsoil has been used to create berms along the boundaries of the quarry landholding.

Based on drilling logs for 5 no. monitoring wells drilled in July 2007 (BH1 – BH5), overburden depths at the site typically varied between 0 and 12.5m with the subsoil been described mainly as GRAVEL with some SAND and CLAY layers. The deepest overburden was recorded at BH2 on the south-eastern corner of the site. The locations of the monitoring wells are shown on Figure 6.2. The drilling logs are attached as Appendix 6.1.

Exposed natural subsoils profiles (limestone tills) along the north-eastern boundary of the landholding indicate that overburden depths at the proposed continuation were approximately 5m deep.

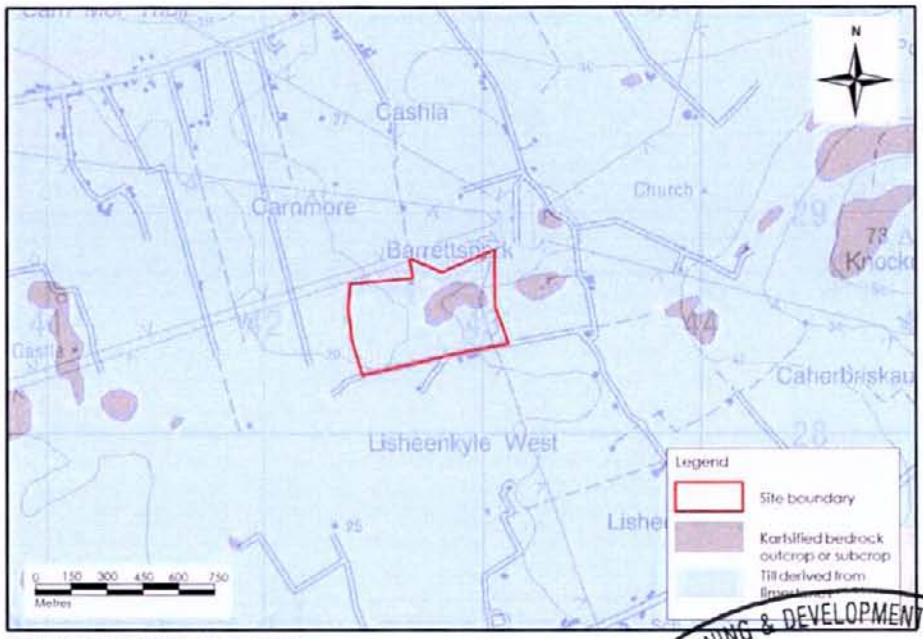


Figure 6-1 Local Subsoil Geology Map

6.3.3 Bedrock Geology

The underlying bedrock strata at the development site is mapped as the Burren Formation which is a Pure Bedded Limestone. This formation is typified by pale-grey packstones and wackestones, but also contains intervals of dark cherty limestones, often associated with oolitic grainstones. A local bedrock geology map is shown as Figure 6.2.

This bedrock type is susceptible to karstification and evidence of this was found during the investigation drilling undertaken in 2007 which is described further below. There are no mapped bedrock faults or geological contacts in the area of the site.

As stated above 5 no. boreholes were drilled at the site in July 2007. These wells were drilled at the corners of the site (BH1-BH4) and one at the northern boundary (BH5) and a commentary of the logs is provided below. The borehole locations are shown on Figure 6.2.

BH1 was drilled on the north-eastern corner of the site (G.L. 28.7m OD). Competent grey LIMESTONE was encountered between 3.75mbgl (24.95m OD) and 93.7mbgl (-65m OD) with only a small fracture been encountered at 43.7mbgl (-15m OD). LIMESTONE with calcite chips was then encountered between 93.7mbgl (-65m OD) and 112.5mbgl (-83.8m OD), and then LIMESTONE with sand and calcite down to the base of the hole at 143.7mbgl (-115m OD). The sand and calcite at the lower section of the hole is likely as a result of dolomitisation.

BH2 is located at the south-eastern corner of the site (G.L. 32m OD). After a thin weathered layer (0.3m) below the top of rock at 12.5mbgl (19.5m OD) competent grey LIMESTONE was encountered until a weathered zone was met at 43.7mbgl (-11.7m OD). The rock between 43.7mbgl (-11.7m OD) on 50mbgl (-18m OD) was weathered with brown clay (likely to be clay infilled fractures which is characteristic karstified limestone). Between 50mbgl (-18m OD) and 56.3mbgl (-24.3m OD) the rock was more competent but with more calcite. The remainder of the hole between 56.3mbgl (-24.3m OD) and 104.7mbgl (-72.7m OD) was competent grey LIMESTONE.

BH3 is located at a ground elevation of 19.3m OD on the north-western corner of the site. The top of rock between 2.5mbgl (16.8m OD) and 6.2mbgl (13.1mOD) was weathered. Competent LIMESTONE

was met below this until broken rock between 50mbgl (-30.7m OD) and 53.12mbgl (-33.8m OD). The rock below this until the end of the hole at 103mbgl (-83.7m OD) was very competent LIMESTONE.

BH4 was drilled on the south-western corner of the site (G.L. 21.6m OD). Competent LIMESTONE was met between 8.1mbgl (13.5m OD) and 15.6mbgl (6m OD); and then broken rock with clay down to 18.7mbgl (2.9m OD) which are likely to be clay infilled fractures. Another band of competent LIMESTONE was met between 18.7mbgl (2.9m OD) and 31.2mbgl (-9.6m OD) was then followed by broken rock/fractures with clay down to 43.7mbgl (-22.1m OD). The LIMESTONE between 43.7mbgl (-22.1m OD) and the end of the hole at 103mbgl (-81.4m OD) was largely competent with some more weathered rock/fractures with clay at 56.2mbgl (-34.6m OD) and again at 87.5mbgl (-66m OD).

BH5 is located close to the northern boundary of the site near the site entrance (G.L. 23.15m OD). After a weathered bedrock layer starting at 0.62mbgl (22.5m OD), competent LIMESTONE was met down to 25mbgl (-1.85m OD) where 0.6m of CLAY was encountered. Below the CLAY (likely to be a clay filled cavity or fracture) more competent LIMESTONE was met down to 43.7mbgl (-20.5m OD) below which the rock became weathered again until 56mbgl (-32.8m OD). The remainder of the hole down to 100mbgl (-76.85m OD) was competent LIMESTONE.

In summary, the drilling indicates that the upper limestone (i.e. from ground level down to a depth of between approximately -2 to -10m OD) is very competent rock apart from a thin weathered layer at the surface. This is consistent with the bedrock observed in the exposed side walls of the existing quarry. This upper shallow weathered layer is particularly noted in the northern walls of the main middle bench (floor level 5m OD) where the main groundwater inflows to the quarry occur.

Below approximately -2 to -10m OD some weathered rock with clay filled fractures and cavities (with groundwater inflows) were encountered in all boreholes. This bedrock weathering is likely as a result of karstification and also possible dolomitisation in the deeper bedrock below the existing quarry. The current quarry (final floor at -5m OD) is extracting from a layer of very competent limestone with no significant visible weathering or fracturing.

To determine whether the upper competent limestone layer extends east into the proposed continuation area, a total of 18 no. 100mm investigation holes were drilled in the rock proposed for extraction (i.e. holes were drilled down to -5m OD). Apart from some shallow weathering (non-karstic) in the upper 2-3m of rock, the rock in all holes was dry, hard and competent with all holes returning fine rock chips and dust during drilling. The locations of the investigation holes are shown on Figure 6.3 and drilling logs are shown in Appendix 6.2.

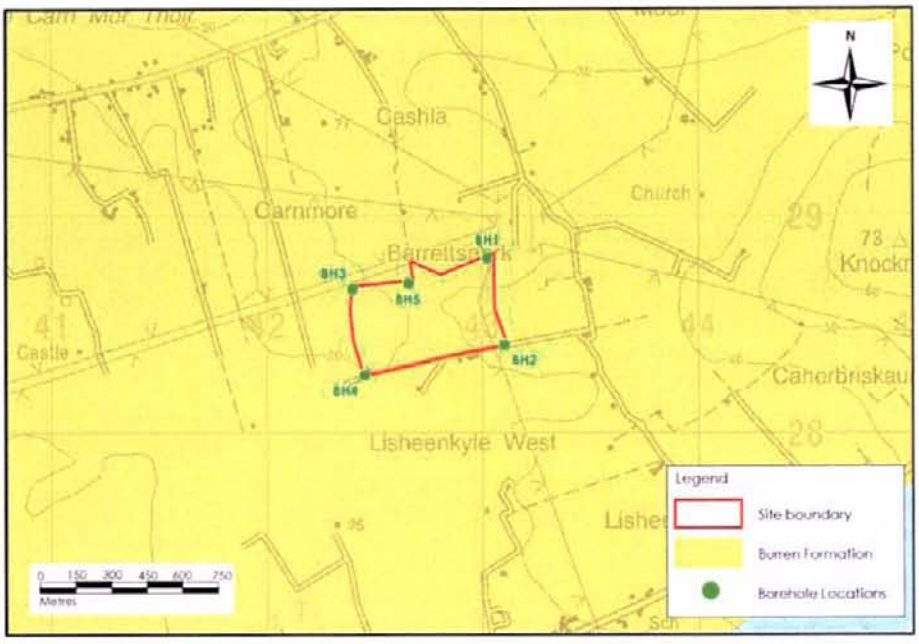


Figure 6-2 Bedrock Geology Map

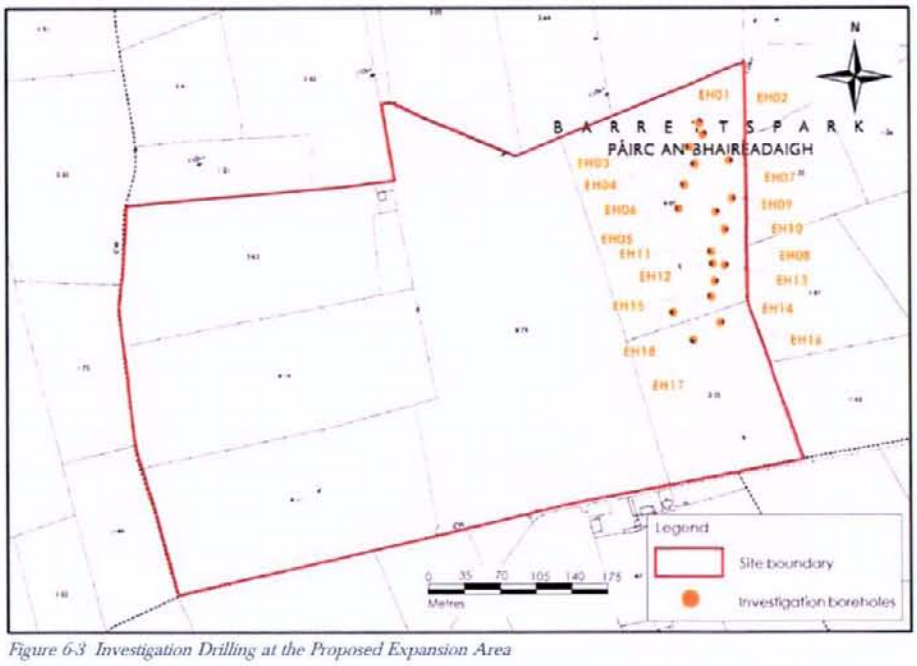


Figure 6-3 Investigation Drilling at the Proposed Expansion Area

6.3.4 Geological Heritage and Designated Sites

The quarry site is not located within or adjacent to any designated site (i.e. Special Area of Conservation (SAC), Natural Heritage Area (NHA) etc). The closest designated sites to the quarry site are the Galway Bay Complex SAC and Lough Corrib SAC, both of which exists approximately 4km from the quarry site. A local designated site map is shown as Figure 6.4.

No geological heritage sites are mapped within 8km of the proposed development site.

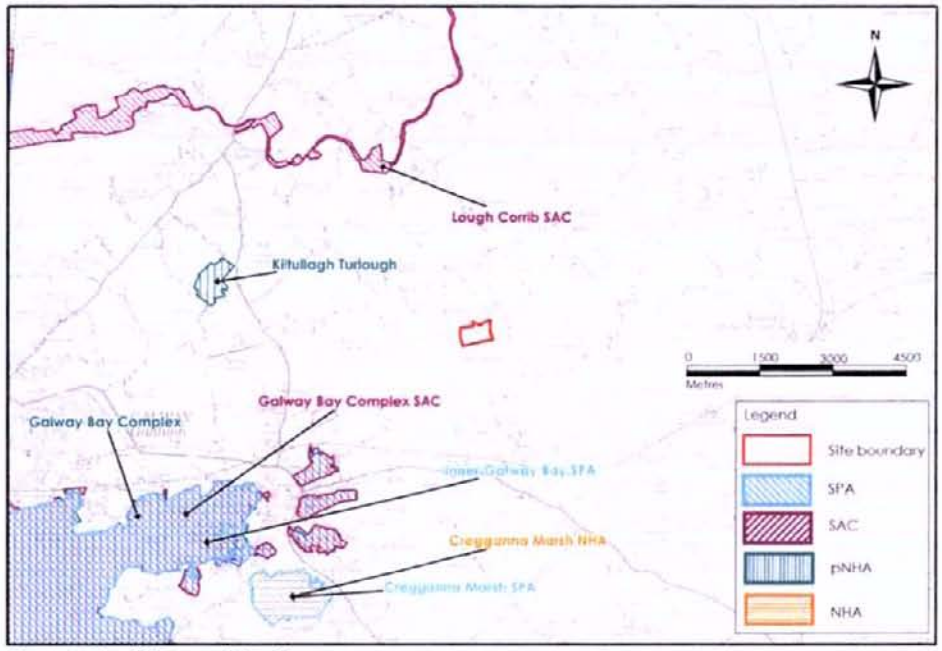


Figure 6-4 Local Designated Sites Map

6.3.5 Soil Contamination

There are no known areas of soil contamination on the site. During the site walkovers or investigations, no areas of particular contamination concern were identified.

According to the EPA online mapping (http://gis.epa.ie/EPAMaps), there are no licenced waste facilities on or within the immediate environs of the site.

There are no historic mines at or in the immediate vicinity of the site that could potentially have contaminated tailings.

6.3.6 Economic Geology

The GSI Online Minerals Database accessed via the Public Data Viewer has several existing pits and quarries mapped in the area. None of these are located within the proposed development landholding.

The GSI online Aggregate Potential Mapping Database shows that the site is in an area mapped as being mainly of having High to Very High crushed rock aggregate potential.

6.3.7 Geological Resource Importance

The bedrock at the site could be classified as "High to Very High" importance. The bedrock could be used on a "economic" scale for construction purposes. Refer to Table 6.1 for criteria.

6.4 Likely, Significant Effects of the Proposed Development

6.4.1 Characteristics of the Proposed Development

Development proposals include the extraction of approximately 1,500,000m^3 of rock from the proposed extraction expansion area. The proposed final floor level of the continuation area will be -5m OD (same as the current lower floor level).

The overlying subsoils will be fully removed and temporarily stored adjacent to the existing berms which run along the boundaries of the landholding. The volume of subsoils to be removed from the continuation area is approximately 20,000m^3.

The proposed quarry continuation and expansion will include the following site related infrastructure which is similar to that used historically at the site:

- Site office which also includes toilet and shower, canteen and staff room;
- Machinery shed
- 2 no. concrete batching plants
- 2 no Loading silo/hopper
- 1 no. Wash down area
- 1 no. Mobile tracked excavator
- 2 no. Loading Shovels
- 2 no. crushers
- 3 no. screeners
- Wheel wash

An automated full-underbody truck wash is installed near the site entrance in a position that required all trucks entering and exiting the quarry area to pass through it. The truck wash is powered by electricity, and can be switched on and off as required. The truck wash is shown on Figure 3.1.

It is not proposed to alter the existing infrastructure at the site or introduce any new methods of extraction or new types of plant items. The proposed development is intended to allow for the future use of the limestone resource using the existing site infrastructure, plant items and the methods used as part of the development of the quarry.

6.4.2 "Do Nothing" Scenario

If the proposed quarry continuation and extension does not go ahead, the quarry will operate in accordance with the current planning permission and related planning conditions (Planning Ref:09/1958) until the planning permission has expired in March 2021.

6.4.3 Potential Extraction Phase Impacts

6.4.3.1 Excavation of Soil and Bedrock

As stated in Section 6.4.1 above, the proposed continuation and extension will involve the extraction of approximately 1,500,000m^3 of limestone rock.

In order to quarry the rock, approximately 20,000m^3 of subsoils will be removed and stored as berms and then ultimately used in the restoration of the site post extraction.

Mechanism: Extraction/excavation.

Receptor: Land, soil and bedrock

Pre-mitigation Likely Impact: Negative, irreversible, moderate, direct, likely, permanent effect on land, soil and bedrock.

Mitigation Measures:

Quarrying and removal of land, soils and bedrock will result in a direct impact on the local lands and geological environment, albeit this is an acceptable and unavoidable part of the quarry development. These impacts will be localised (i.e. only at the point of quarrying) and will be mostly mitigated through the adoption of a suitable restoration plan for the quarry once quarrying activities have substantially finished. The soil which will be removed and the rock to be quarried at the site are not notable from a geological heritage or ecological point of view.

The stripped subsoils will be used to form a berm along the boundary and for the ultimate restoration of the site.

Residual Effect:

The implementation of a restoration plan following the completion of quarrying operations will result in a residual **Negative, irreversible, slight, direct, likely, permanent effect** on land, soil and bedrock.

Significance of Effects:

Based on the analysis above, **no significant effects** on land, soils and geology are anticipated.

6.4.3.2 Contamination of Soils and Bedrock by Accidental Spills and Leaks

Excavation of rock at the site will be completed using plant and machinery. Such machinery are powered by diesel engines and operated using hydraulics. Unless managed carefully such plant and machinery have the potential to leak hydraulic oils or cause fuel leaks during refuelling operations.

Receptor: Land, soil and bedrock

Pathway: Soil and bedrock pore space

Pre-mitigation Impact: Negative, reversible, slight, direct / indirect, unlikely, long term effect on land, soil and bedrock.

Mitigation Measures:

The following mitigation is proposed:

- All plant and machinery will be serviced before being mobilised to site;
- Refuelling will be completed in a controlled manner using drip trays (bunded container trays) at all times;
- Fuel containers will be stored within a secondary containment system, e.g. bunds for static tanks or a drip tray for mobile stores;
- Containers and bunding for storage of hydrocarbons and chemicals will have a holding capacity of 110% of the volume to be stored;
- Fuel and oil stores including tanks and drums will be regularly inspected for leaks and signs of damage;

- Drip-trays will be used for fixed or mobile plant such as pumps and generators in order to retain oil leaks and spills;
- Only designated trained operators will be authorised to refuel plant on site;
- Procedures and contingency plans will be set up to deal with emergency accidents or spills; and,
- An emergency spill kit with oil boom, absorbers etc. will be kept on-site for use in the event of an accidental spill.

Residual Effect:

The implementation of the mitigation measures discussed above will result in residual **Negative, reversible, imperceptible, direct / indirect, unlikely, long term effect** on land, soils and bedrock in terms of contamination from accidental spills and leaks.

Significance of Effects:

Based on the analysis above there will be **no significant effects** on land, soils and geology.

6.4.4 Human Health Effects

Potential health effects in relation to soils and geology mainly occur due to direct and indirect (dust) contact with contaminated soil. However, as stated in Section 6.4.3.2 there will be best practice controls in place to ensure any potential sources of contamination on the site will be managed appropriately. Also, the site will not be open to the public and therefore direct contact is unlikely. Dust suppression is carried out at the quarry.

Hydrocarbons, in the form of fuels and oils, will be used on-site during quarrying. However, the volumes will be small in the context of the scale of the project and will be handled in accordance with best practice mitigation measures. The potential residual impacts associated with soil and geology contamination and subsequent health effects are negligible.

6.4.5 Cumulative Soil and Geological Effects

The other land use activities in the area are existing farming operations, residential land uses, light engineering and the ESB substation.

Due to the lack of significant residual impacts from the development that would affect the wider geological environment, there will be no significant cumulative impacts to land, soil and geology resulting from this project, and other local existing developments, projects and plans. All impacts on soils and geology relating to the proposed project will be localised and within the development footprint.


PLANNING & DEVELOPMENT SECTION
21 APR 2020 0499
GALWAY COUNTY COUNCIL

7. HYDROLOGY AND HYDROGEOLOGY

7.1 Introduction

7.1.1 Background and Objectives

Hydro-Environmental Services (HES) was engaged by McCarthy Keville O'Sullivan (MKO), on behalf of Coshla Quarries Ltd, to carry out an environmental assessment of the potential likely effects of the proposed expansion of extraction at Coshla Quarry at Cashla near Athenry, Co. Galway on water aspects (hydrology and hydrogeology) of the receiving environment:

The objectives of the assessment are:

- Produce a baseline study of the existing water environment (surface water and groundwater) in the area of the development;
- Identify any likely effects of the proposed extraction expansion on surface water and groundwater during the construction phase, operational phase and decommissioning phase of the development;
- Identify mitigation measures to avoid, remediate or reduce likely significant negative effects and,
- Assess whether there are any likely significant residual effects and cumulative effects of the proposed expansion and other local developments.

7.1.2 Statement of Authority

This section of the EIAR has been completed by David Broderick and Michael Gill of Hydro-Environmental Services.

Hydro-Environmental Services (HES) are a specialist hydrological, hydrogeological and environmental practice which delivers a range of water and environmental management consultancy services to the private and public sectors across Ireland and Northern Ireland. HES was established in 2005, and our office is located in Dungarvan, County Waterford. Our core areas of expertise and experience include upland hydrology and windfarm drainage design. We routinely complete impact assessments for hydrology and hydrogeology for a large variety of project types.

David Broderick is a hydrogeologist with over 14 years' experience in both the public and private sectors. Having spent two years working in the Geological Survey of Ireland working mainly on groundwater and source protection studies David moved into the private sector. David has a strong background in groundwater resource assessment and hydrogeological/hydrological investigations in relation to developments such as quarries and wind farms. David has completed numerous geological and hydrogeological assessments for input into EIARs for a range of quarry, wind farm and commercial developments.

Michael Gill is an Environmental Engineer, Hydrologist and Hydrogeologist with 18 years' environmental consultancy experience in Ireland. Michael has a degree in Civil and Environmental Engineering, a MSc in Engineering hydrology from TCD and a MSc in Applied Hydrogeology from Newcastle University. He has completed numerous (60+) hydrological and hydrogeological assessments relating to bedrock quarries and sand and gravel pits.

7.1.3 Relevant Legislation

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

The Hydrology and Hydrogeology Chapter of the EIAR is carried out in accordance with best practice and is cognisant of the follow Irish legislation:

- Planning and Development Acts 2000-2017;
- Planning and Development Regulations, 2001 (as amended);
- S.I. No 296 of 2018: S.I. No. 296 of 2018: European Union (Planning and Development) (Environmental Impact Assessment) Regulations 2018 which transposes the provisions of Directive 2014/52/EU into Irish Law;
- S.I. No. 94 of 1997: European Communities (Natural Habitats) Regulations, resulting from EU Directives 92/43/EEC on the conservation of natural habitats and of wild fauna and flora (the Habitats Directive) and 79/409/EEC on the conservation of wild birds (the Birds Directive);
- S.I. No. 293 of 1988: Quality of Salmon Water Regulations, resulting from EU Directive 78/659/EEC on the Quality of Fresh Waters Needing Protection or Improvement in order to Support Fish Life;
- S.I. No. 272 of 2009: European Communities Environmental Objectives (Surface Waters) Regulations 2009 and S.I. No. 722 of 2003 European Communities (Water Policy) Regulations which implement EU Water Framework Directive (2000/60/EC) and provide for implementation of 'daughter' Groundwater Directive (2006/118/EC). Since 2000 water management in the EU has been directed by the Water Framework Directive (WFD). The key objectives of the WFD are that all water bodies in member states achieve (or retain) at least 'good' status by 2015. Water bodies comprise both surface and groundwater bodies, and the achievement of 'Good' status for these depends also on the achievement of 'good' status by dependent ecosystems. Phases of characterisation, risk assessment, monitoring and the design of programmes of measures to achieve the objectives of the WFD have either been completed or are ongoing. In 2015 it will fully replace a number of existing water related directives, which are successively being repealed, while implementation of other Directives (such as the Habitats Directive 92/43/EEC) will form part of the achievement of implementation of the objectives of the WFD;
- S.I. No. 41 of 1999: Protection of Groundwater Regulations, resulting from EU Directive 80/68/EEC on the protection of groundwater against pollution caused by certain dangerous substances (the Groundwater Directive);
- S.I. No. 249 of 1989: Quality of Surface Water Intended for Abstraction (Drinking Water), resulting from EU Directive 75/440/EEC concerning the quality required of surface water intended for the abstraction of drinking water in the Member States (repealed by 2000/60/EC in 2007);
- S.I. No. 439 of 2000: Quality of Water intended for Human Consumption Regulations and S.I. No. 278 of 2007 European Communities (Drinking Water No. 2) Regulations, arising from EU Directive 98/83/EC on the quality of water intended for human consumption (the Drinking Water Directive) and WFD 2000/60/EC (the Water Framework Directive);
- S.I. No. 272 of 2009: European Communities Environmental Objectives (Surface Waters) Regulations 2009;
- S.I. No. 9 of 2010: European Communities Environmental Objectives (Groundwater) Regulations 2010; and,
- S.I. No. 296 of 2009: European Communities Environmental Objectives (Freshwater Pearl Mussel) Regulations 2009.

7.1.4 Relevant Guidance

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

- Environmental Protection Agency (May 2017): Draft Guidelines on the Information to be Contained in Environmental Impact Assessment Reports;
- Environmental Protection Agency (September 2015): Draft - Advice Notes on Current Practice (in the preparation on Environmental Impact Statements);
- Environmental Protection Agency (September 2015): Draft – Revised Guidelines on the Information to be Contained in Environmental Impact Statements;
- Environmental Protection Agency (2003): Advice Notes on Current Practice (in the preparation on Environmental Impact Statements);
- Environmental Protection Agency (2002): Guidelines on the Information to be Contained in Environmental Impact Statements;
- Institute of Geologists Ireland (2013): Guidelines for Preparation of Soils, Geology & Hydrogeology Chapters in Environmental Impact Statements;
- National Roads Authority (2005): Guidelines on Procedures for Assessment and Treatment of Geology, Hydrology and Hydrogeology for National Road Schemes;
- CIRIA 2006: Control of Water Pollution from Construction Sites - Guidance for Consultants and Contractors. CIRIA C532. London, 2006;
- Department of the Environment, Heritage and Local Government; Quarries and Ancillary Activities – Guidance for Authorities (April 2014);
- Environmental Protection Agency (2006): Environmental Management in the Extractive Industry (Non-Scheduled Minerals; and,
- Department of Housing, Planning and Local Government (2018): Guidelines for Planning Authorities and An Bord Pleanála on carrying out Environmental Impact Assessment; and,
- European Union (2017):Guidance on the preparation of the EIA Report (Directive 2011/92/EU as amended by 2014/52/EU).

7.2 Schedule of Works

7.2.1 Desk Study

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

- Environmental Protection Agency database (www.epa.ie);
- Geological Survey of Ireland - Groundwater Database (www.gsi.ie);
- Met Eireann Meteorological Databases (www.met.ie);
- National Parks & Wildlife Services Public Map Viewer (www.npws.ie);
- Water Framework Directive Map Viewer (www.catchments.ie);
- Bedrock Geology 1:100,000 Scale Map Series, Sheet 14 (Geology of Galway Bay); Geological Survey of Ireland (GSI, 2003);
- Geological Survey of Ireland - Groundwater Body Characterisation Reports;
- OPW Indicative Flood Maps (www.floodmaps.ie);
- Environmental Protection Agency – "Hydrotool" Map Viewer (www.epa.ie);
- CFRAM Preliminary Flood Risk Assessment (PFRA) maps (www.cfram.ie); and,
- Department of Environment, Community and Local Government on-line mapping viewer (www.myplan.ie).

7.2.2 Baseline Mapping and Investigations

Walkover surveys, site investigations and groundwater monitoring were undertaken by HES between 21st November 2018 and 28th March 2019. In summary, site investigations to address the Hydrology and Hydrogeology section of the EIAR included the following:

- Walkover surveys and hydrological mapping of the site and the surrounding area were undertaken whereby water flow directions and drainage patterns were recorded;
- A preliminary assessment of flood risk was completed for the locality of the site;
- Logging of exposed subsoil profiles and existing quarry walls;
- Mineral subsoils were logged according to BS: 5930:2015 Code of practice for ground investigations;
- Installation of pressure transducers (data loggers) in the 4 no. on-site monitoring wells for continuous groundwater level monitoring;
- Groundwater sampling (4 no. monitoring wells);
- Investigation drilling (18 no. exploration holes) to assess bedrock hydrological conditions in the proposed expansion area; and,
- Field hydrochemistry measurements (electrical conductivity, pH and temperature).

7.2.3 Impact Assessment Methodology

Please refer to Chapter 1 of the EIAR for details on the impact assessment methodology (EPA, 2002, 2003, 2015 and 2017). In addition to the above methodology, the sensitivity of the water environment receptors was assessed on completion of the desk study and baseline study. Levels of sensitivity which are defined in Table 7.1 are then used to assess the potential effects that the proposed development may have on the local baseline water environment (i.e. water receptors).

Table 7-1 Receptor Sensitivity Criteria (Adapted from www.sepa.org.uk)

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

7.3 Existing Environment

7.3.1 Site Description and Topography

The quarry site is situated just north of the M6 Motorway in the townland of Cashla, which is located approximately 7km to the west-northwest of Athenry, Co. Galway. The application site has an area of 27.7ha. The quarry is currently operational.

The topography of the local area is undulating with the local ground elevation being between 20 and 40m OD (Ordnance Datum). The overall slope is to the southwest towards Oranmore Bay. The natural ground elevation of the quarry landholding varies between approximately 20 and 32m OD (Ordnance Datum).

The quarry has been worked extensively in the past, and the site includes a large excavated area (quarry floor) on the eastern half of the landholding which has a lower bench level at

-5m OD and two upper benches at approximately 5 and 13.5m OD. The middle bench (i.e. at 5m OD) has the largest footprint area. The ground elevation surrounding the extraction area is between 20 – 24m OD.

Quarry workings which include a weighbridge, wheelwash, office prefab buildings, maintenance workshop, concrete batching plant, block yard, storage buildings, processing infrastructure, stockpiling areas, settlement pond, oil interceptor batching plant wash water lagoon, soakaway area (for quarry dewatering discharge) and ancillary plant / infrastructure are located on the east and north of the site. Access to the site is via a local road which runs to the north of the site.

A bored well (PW1) of unknown depth is located on the north-eastern corner of the site which is used as an office supply and as a top-up for aggregate washing at the screening plant during dry periods and for production. Domestic wastewater is discharged to ground via a percolation which is located west of the weighbridge.

The proposed extraction expansion area is located on the far east of the landholding and comprises an area of approximately 6.7ha. A significant portion of the proposed expansion area is stripped of subsoil down to the top of bedrock which is at approximately 25m OD. The stripped subsoil is temporarily mounded on the north-western section of the expansion area.

Landuse in the surrounding area is largely agricultural with scattered rural pattern of residential dwellings along the local roads to the north and east of the site. A 110 Kv electrical ESB substation is located immediately to the northeast of the site and overhead power lines pass through the quarry landholding.

7.3.2 Water Balance

Long term rainfall and evaporation data was sourced from Met Éireann. The 30-year annual average rainfall (AAR) recorded at Athenry (Attymon), 15km east of the site, are presented in Table 7.2 below.

Table 7-2 Local Average long-term Rainfall Data (mm)

Station		X-Coord		Y-Coord		Ht (MAOD)		Opened		Closed		
Athenry		122200		166500		81		1943		1990		
Jan	Feb	Mar	Apr	May	Jun	July	Aug	Sept	Oct	Nov	Dec	Total

Station		X-Coord		Y-Coord		Ht (MAOD)		Opened		Closed		
Athenry		122200		166500		81		1943		1990		
106.2	80.8	84.9	72.6	76.6	79.4	84.6	100.9	93.5	118.4	109.9	114.5	1122.3

The closest synoptic station where the average potential evapotranspiration (PE) is recorded is at Shannon Airport, approximately 68km southwest of the site. The long-term average PE for this station is 409mm/yr. This value is used as a best estimate of the site PE. Actual Evaporation (AE) at the site is estimated as 389mm/year (which is 0.95 PE).

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

Effective Rainfall = AAR – AE

= 1,122mm/year – 389mm/year

ER = 733mm/year

Based on groundwater recharge coefficient estimates from the GSI, an estimate of 60% recharge is taken for the area of the site as an overall average. This value is for "Till overlain by well drained soil" with an "High" vulnerability rating. The lack of surface water courses in the wider area would suggest the recharge coefficient is likely to much higher (this is discussed further below).

Therefore, annual average conservative recharge and runoff rates for the site are estimated to be 440mm/year and 293mm/year respectively.

7.3.3 Regional and Local Hydrology

Regionally the proposed site is mapped to be located in the Ballynamanagh River surface water catchment within Hydrometric Area 30 of the Western River Basin District.

The Ballynamanagh River flows to the south of Oranmore, but due to the lack of surface water features (stream/rivers) between the quarry site and Oranmore, there are no surface water connections between the site and the Ballynamanagh River. The overall lack of surface water features in the Ballynamanagh River catchment is due to the groundwater dominated hydrolology of the area (this is discussed further below).

A regional hydrology map is shown as Figure 7.1

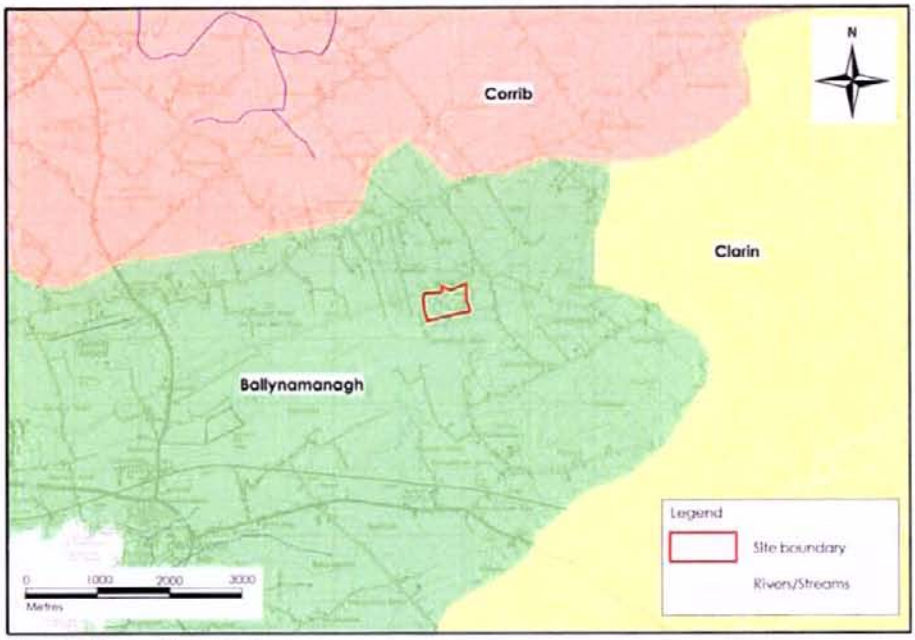


Figure 7-1 Regional Hydrology Map

7.3.4 Site Drainage

There are no natural surface water features within the quarry site itself or nearby. All effective rainfall (rainfall that does not evaporate) that lands on the extraction area gathers in sumps on the quarry floor benches. There is a large sump located on the southern end of the middle bench and a smaller sump located on the floor of the lower bench. Surface water from both sumps is then pumped vertically up to a concrete settlement pond which drains via an oil interceptor to a large soakaway located on the west of the site for discharge to ground.

Discharge of water (trade effluent) to the soakaway is carried out under a Discharge Licence (W/469/13) which limits the volumetric discharge to 360m3/day. Based on average pumping volumes provided by the quarry operator, the average daily pumping rate since December 2018 (month the flowmeter was first installed) was approximately 142m3/day.

Surface water runoff from the area of the batching plant and concrete block yard drains to a staged precast concrete settlement tank which is located adjacent to the batching plant. The settlement tank is a close system as water is recycled for cement production. During dry periods, the tank is topped up from the on-site well (PW1).

7.3.5 Flood Risk Identification

OPW's indicative river and coastal flood map (www.floodmaps.ie), Preliminary Flood Risk Assessment (PFRA) maps[1] (www.cfram.ie), Department of Environment, Community and Local Government on-line planning mapping (www.myplan.ie) and historical mapping (i.e. 6" & 25" base maps) were consulted to identify those local areas as being at risk of flooding.

Due to the lack of surface water features in the area there is no risk of fluvial flooding at the quarry. Based on the PFRA mapping pluvial flooding is also not an issue.

OPW's Flood Hazard map was consulted to identify those areas as being at risk of flooding (see Figure 7.2 below). Recurring flood events are mapped in the area Carnmore which is located 1.3km to the northwest of the site. Flooding appears to be caused by heavy rain and surface water ponding in localized hollows.

Aerial photographs taken in November 2009 and submitted to OPW by a member of the public, shows significant flooding at Carnmore, Co. Galway. Houses were damaged and the R339 was blocked for some weeks. The area affected by the surface water ponding did not extend as far south as the site.

There is no text on local available historical 6" or 25" mapping for the proposed site that identify areas that are "prone to flooding" within the site boundary, or adjacent land.

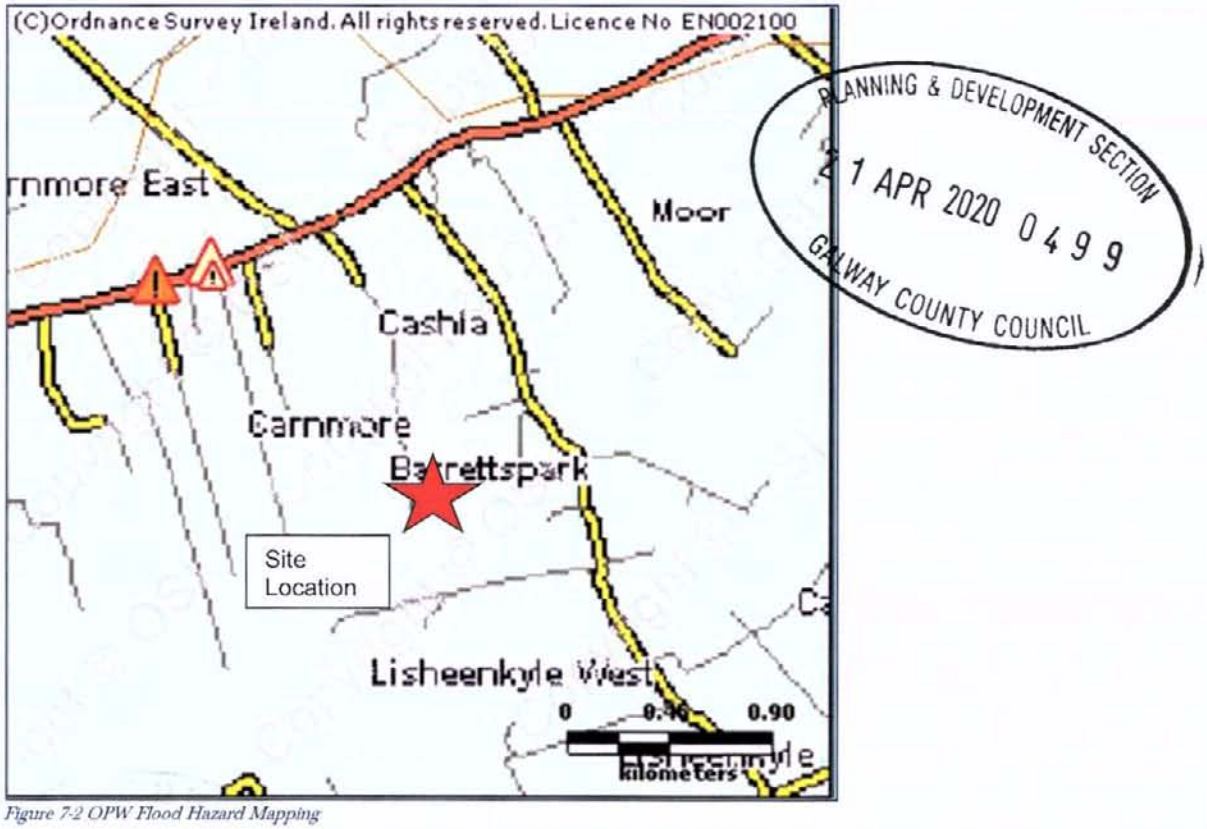


Figure 7-2 OPW Flood Hazard Mapping

[1] *Where complete the Catchment Flood Risk Assessment and Management (CFRAM) OPW Flood Risk Assessment Maps are now the primary reference for flood risk planning in Ireland and supersede the Preliminary Flood Risk Assessment Maps (PFRA) maps. CFRAM mapping are not currently available for the area of the proposed site and therefore the PFRA mapping was consulted.*

7.3.6 Surface Water Quality

There are no surface water features in the area of the site. The closest surface water feature to the site is the Carrowmoneash River which flows through Oranmore and discharges into Oranmore Bay. There is no EPA surface water quality monitoring data available for the Carrowmoneash River or the Ballynamanagh River.

7.3.7 Quarry Discharge Water Quality

A summary of quarry discharge water quality data provided by the quarry operator for 2019 is shown in Table 7.3 below. The parameters shown below along with the monitoring frequencies are specified in the Discharge Licence (W/469/13). There was no exceedance with respect the discharge limits.

Table 7-3 Summary of Discharge Quality Monitoring for 2019

Parameter	Monitoring frequency	DL Limit (mg/L)	Maximum (mg/L)	Minimum (mg/L)	Average (mg/L)	Exceedances (No.)
BOD (mg/l)	Quarterly	25	1.3	0.1	0.47	0
COD (mg/l)		100	<15	<15	<15	0
Nitrate (mg/l No3)		50	26	5	15.2	0
pH (pH units)		6 to 9	8.09	7.8	7.9	0
DRO's (mg/l)	Bi-annually	-	<0.01	<0.01	<0.01	0
PRO's (mg/L)		-	<0.01	<0.01	<0.01	0
TPH (mg/L)		1	<0.01	<0.01	<0.01	0

7.3.8 Regional and Local Hydrogeology

The underlying bedrock strata at the quarry site and in this region in general is mapped as the Burren Formation which is a Pure Bedded Limestone. This formation is typified by pale-grey packstones and wackestones, but also contains intervals of dark cherty limestones, often associated with oolitic grainstones. The Burren Formation is classified by the GSI (www.gsi.ie) as a Regionally Important Karstified Aquifer with conduit groundwater flow characteristics. A local bedrock aquifer map is shown below as Figure 7.3

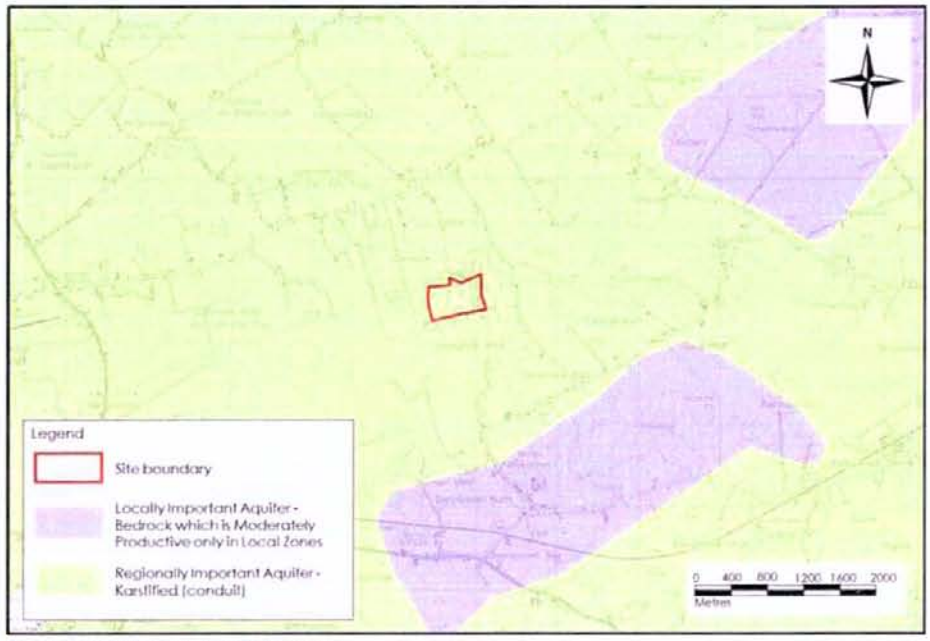


Figure 7-3 GSI Bedrock Aquifer Mapping

The pure bedded limestones are generally devoid of intergranular permeability. Groundwater flows through fissures, faults, joints and bedding planes. In pure bedded limestones these openings are often enlarged by karstification which significantly enhances the permeability of the rock. Karstification can also be accentuated along structural features such as fold axes and faults (GSI, 2014).

Groundwater flow through karst areas is often determined by discrete conduits, actual flow directions will not necessarily be perpendicular to the assumed water table contours, as shown by several tracing studies (Drew and Daly, 1993). The tracer tests show that groundwater can flow across surface water catchment divides and beneath surface water channels. Flow velocities can be rapid and variable, both spatially and temporally. Rapid groundwater flow velocities indicate that a large proportion of groundwater flow occurs in enlarged conduit systems.

Groundwater flow in highly permeable karstified limestones is of a regional scale. Flow path lengths can be up to a several kilometres. Regional groundwater gradients in the area of Galway will be towards the coast and estuaries.

Studies show (such as Drew and Daly, 1993) that groundwater flow directions in the region of the site are to the west / southwest, with groundwater discharging to littoral and intertidal springs at the head of the main estuaries such as the Clarinbridge River estuary (refer to Figure 7.4 below).

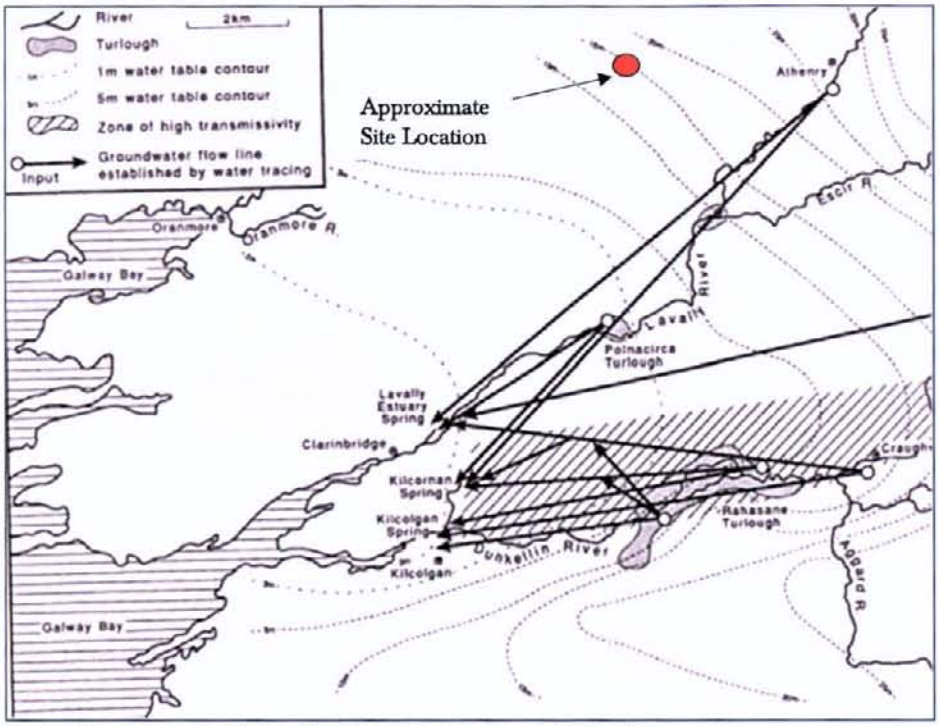


Figure 7-4 Groundwater Gradients and flow lines (taken from Drew and Daly, 1993)

Most groundwater flows in an epikarstic layer a couple of metres thick and in a zone of interconnected solutionally-enlarged fissures and conduits that extends approximately 35m below this. Deeper inflows can occur in areas associated with faults or dolomitisation. Significant fracturing occurs at 8-14 m above sea level and at 15-35 m below sea level (Drew and Daly, 1993).

The bedrock exposed at the quarry site fits the description of Burren Formation, but the quarry walls expose a dark limestone indicating possible impurities such as chert or mud/clays. This possibly explains the reasons why there is no epikarstic layer evident at the quarry and a general absence of karstified / weathered rock on the quarry walls. The limestone bedrock in which the current quarry is operating is not solutionally enhanced or karstified and is overall a very dry quarry in terms of groundwater inflows.

However, based on investigation drilling in 2007, there is evidence that there is some karstification in the deeper bedrock strata below the current quarry floor. Five boreholes were drilled at the site in July 2007. These wells were drilled at the four corners of the site (BH1-BH4) and one at the northern boundary (BH5) and a detailed commentary of the logs is provided in the Land, Soils and Geology Chapter (Chapter 6). The borehole locations are shown on Figure 7.5 below. Refer to Appendix 6.1 of the Land, Soils and Geology Chapter for drilling logs.

In summary, the drilling indicates that the upper limestone (i.e. from ground level down to a depth of between approximately -2 to -10m OD) is very competent rock apart from a thin weathered layer at the surface (not epikarst just general weathering). This is consistent with the bedrock observed in the walls of the existing quarry. This shallow weathered layer is particularly noted in the northern walls of the main middle bench (floor level 5m OD) where the main groundwater inflows to the quarry occur.

Below approximately -2 to -10m OD some weathered rock with clay filled fractures and cavities (with groundwater inflows) were encountered in all boreholes. This bedrock weathering is likely as a result of karstification and also possible dolomitisation in the deeper bedrock below the existing quarry. The current quarry (final floor at -5m OD) is extracting from a layer of very competent limestone with no significant visible weathering, fracturing or evidence of karstification.

Table 7.4 below shows an analysis of groundwater inflows versus depth recorded by the driller during the 2007 borehole drilling. No significant groundwater strikes were recorded above -8m OD due to the competent, unweathered nature of the limestone.

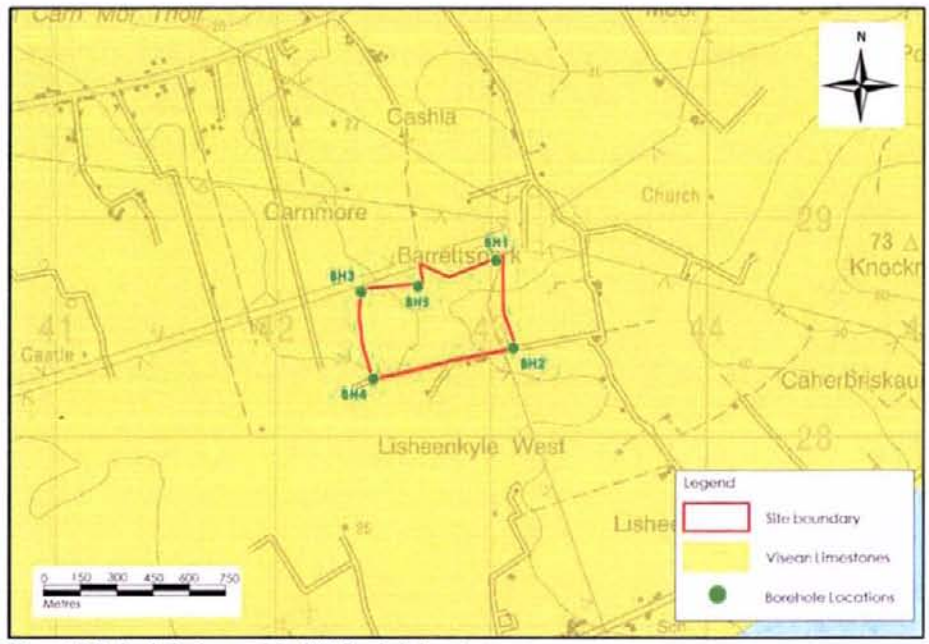


Figure 7-5 Bedrock Geology and the 2007 Borehole Locations

Table 7-4 Borehole Groundwater Inflows versus Depth

BH ID	Inflow Depth (mbgl)	Inflow Depth (m OD)	Estimated Inflow* (gph)
BH1	42.68	-13.98	300
	91.46	-62.76	500
	109.76	-81.06	200
BH2	42.68	-10.68	400
	91.46	-59.46	100
BH3	48.78	-29.43	20
BH4	30.49	-8.89	400
	36.59	-14.99	100
	54.88	-33.28	200
	85.37	-63.77	100

BH5	45	-21.85	40
	57.6	-34.4	50

**Estimated by driller – gallons per hour*

Continuous groundwater level monitoring in BH1 to BH4 was undertaken between November 2018 and March 2019 using pressure transducers (data loggers). The groundwater level plots for this period are shown as Figure 7.7 below.

The groundwater levels in the boreholes varied between approximately 7 and 17m OD during this period. The groundwater levels in BH1 dropped as low as 3.5m OD, but this is due to pumping of PW1 (water supply well) which is located adjacent to BH1. The measured groundwater levels would suggest that the current quarry operation is only having a very small effect on local groundwater levels and this would be consistent with the hydrogeological conditions that the current quarry is operating in (i.e. competent, unweathered, low permeability limestone).

Aside from rainfall recharge (or lack of), the groundwater level variations shown in Figure 7.7 are likely to be influenced by quarry operations such as dewatering (particularly BH1 and B2 as they are located closest to the void, groundwater abstraction from PW1 (most notable in BH1) and quarry discharge to ground at the soakaway (to which BH4 is closest). In relation to BH4, during wet periods (i.e. peaks in the graph), the groundwater level in BH4 is normally the highest of all the wells and this is likely due to infiltration (artificial recharge) of quarry discharge at the soakaway which increases the groundwater level locally. During dryer periods (troughs in graph), the groundwater level in BH4 is lower and closer to its natural level.

As explained above, groundwater inflows to the boreholes are from fractures networks below the current quarry and therefore the groundwater levels shown in Figure 7.6 are likely to be representative of the groundwater level pressures below the quarry and not shallow groundwater inflows which currently enter the quarry along and over the top bedrock (this is discussed more below).

Based on the groundwater level monitoring, the quarry is operating below the groundwater table (refer to the current bench levels on Figure 7.6). More specifically it is operating below the potentiometric groundwater level of the fractures below the quarry. However, due to the competent, low permeability nature of the limestone in which the quarry is operating, there are no significant groundwater inflows from the underlying fracture network through the base or sides of the quarry.

Groundwater inflows to the existing quarry are limited to shallow flows along the top of the north-eastern wall / corner of the middle bench. The inflows are at about 21 – 22m OD.

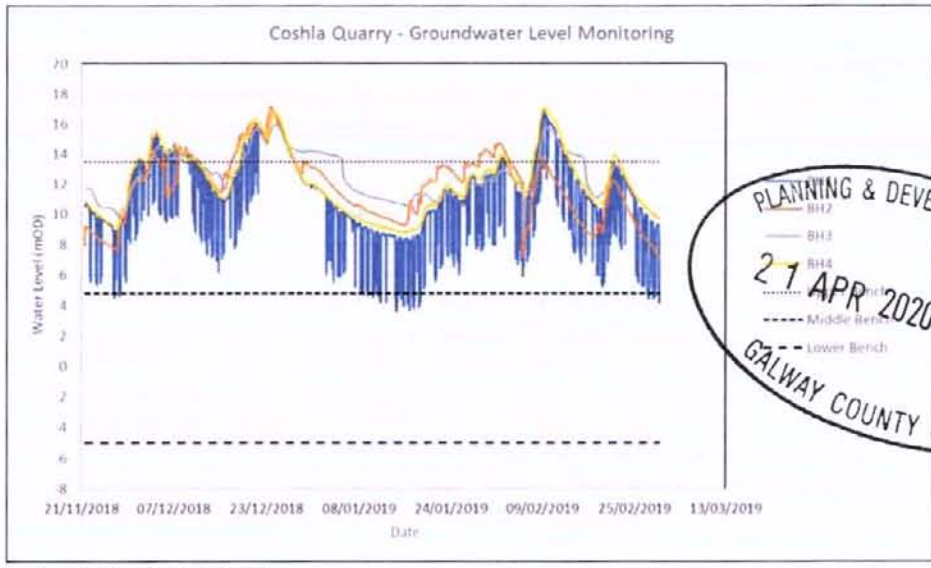


Figure 7-6 Groundwater Level Plots

To determine whether the upper competent limestone layer extends east into the proposed expansion area, a total of 18 no. 100mm investigation holes were drilled in the rock proposed for extraction (i.e. holes were drilled down to -5m OD). Apart from some shallow weathering (non-karstic) in the upper 2-3m of rock, the rock in all holes was dry, hard and competent with all holes returning fine rock chips and dust during drilling. The groundwater levels measured in the boreholes were typically <3m below ground level (groundwater level of approximately 22m OD) which is consistent with the level of the current inflows to the quarry.

The locations of the investigation holes are shown on Figure 7.7 below and drilling logs are shown in Appendix 6.2 of the Land, Soils and Geology Chapter (Chapter 6).

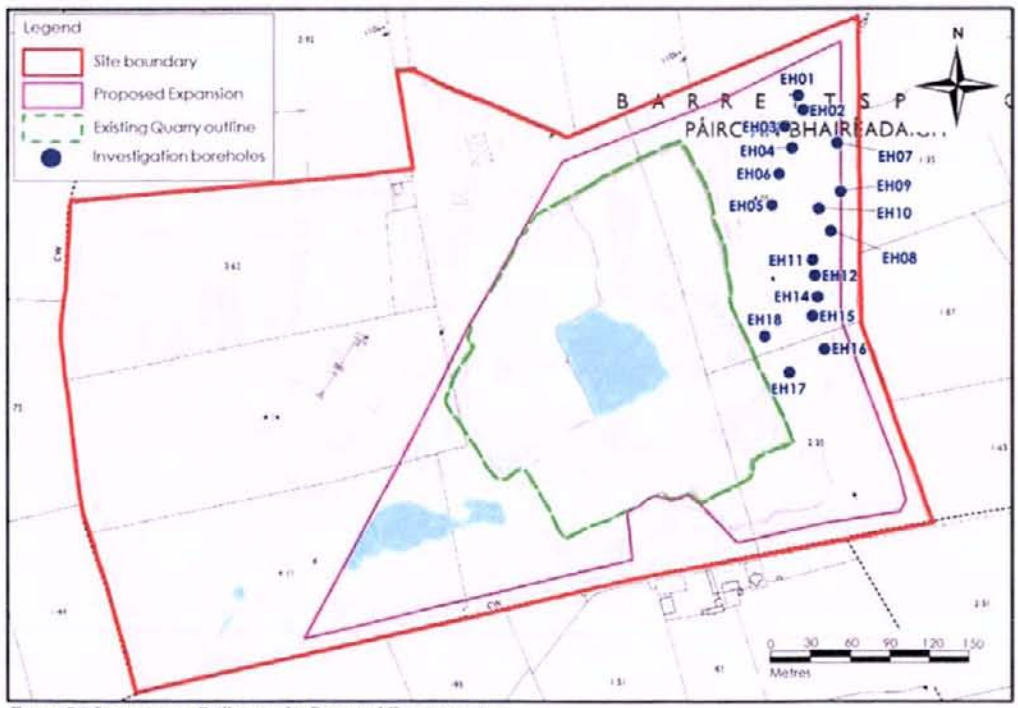


Figure 7-7 Investigation Drilling in the Proposed Expansion Area

7.3.9 Groundwater Vulnerability

The vulnerability of the aquifer underlying the site is classified as predominately "Extreme - High" by the GSI (www.gsi.ie). This suggests that the bedrock is at or close to the surface, which is consistent with site observations.

7.3.10 Groundwater Quality

As part of the discharge license groundwater quality monitoring is required to be undertaken on a quarterly basis for pH, electrical conductivity, suspended solids and nitrite (NO_2). The results for 2019 provided by the operator are shown in Table 7.5 below.

There are no discharge limits set for groundwater quality. The results provided below appear to be typical of limestone aquifer with all values (where applicable) complying with drinking water regulation (S.I. 122 of 2014) and groundwater regulation values (S.I. 9 of 2010).

Table 7.5 Discharge License Groundwater Quality Monitoring

Borehole ID	Date	Electrical Conductivity (µs/cm)	Nitrite (as NO2)	pH	TSS (mg/L)
1	05/02/2019	783	<0.05	7.4	<10
	05/06/2019	767	<0.05	7.4	17
	03/09/2019	773	<0.05	7.3	6
	25/10/2019	650	<0.05	6.9	20
2	05/02/2019	510	<0.05	7.6	<10
	05/06/2019	402	<0.05	7.8	13
	03/09/2019	482	<0.05	7.6	7
	25/10/2019	528	<0.05	7.4	16
3	05/02/2019	676	<0.05	7.4	<5
	05/06/2019	557	<0.05	7.6	<10
	03/09/2019	534	<0.05	7.4	8
	25/10/2019	488	<0.05	7.3	7
4	05/02/2019	603	<0.05	7.7	<10
	05/06/2019	618	<0.05	8.0	14
	03/09/2019	586	<0.05	7.4	<5
	25/10/2019	781	<0.05		

As part of this assessment sampling of the on-site boreholes (BH1, BH2 and BH4) was carried out by HES on 22nd November 2018. The samples were analysis for a wider range of parameters than what is required for the discharge license monitoring. The results of the sampling of are shown in Table 1 which is attached as Appendix 7.1. In terms of borehole location with respect to groundwater flow direction, BH1 and BH2 are located up-gradient of the quarry and BH4 is located down-gradient.

There were two incidences where both the drinking water regulation value (S.I. 122 of 2014) and groundwater regulation value (S.I. 9 of 2010) was exceeded and this was for Nickel in BH1 and BH4. The concentration was notably higher in BH1 (158µg/l) which is located immediately down-gradient of the ESB substation. The concentration in BH4 which is down-gradient to both the ESB substation and the quarry was 21.8 µg/l.

Nitrate (N03) in BH4 which was reported at 40.3mg/l exceeded the groundwater regulation value of 37.5mg/l.

7.3.11 Water Framework Directive Status and Risk Result

Local Groundwater Body (GWB) and Surface water Body (SWB) status and risk result information is available for view from (www.catchments.ie).

There is no WFD Status for the Ballynamanagh River or the Carrowmoneash River. However, there is a Risk Result and for the Carrowmoneash River this is reported to be "At Risk". The risk result for the Ballynamanagh River is under review. However, as stated above there is no surface water connection between the quarry site and these watercourses.

The Clarinbridge GWB (WE: IE_WE_G_0008) underlies the proposed quarry site. It is assigned 'Good Status'[2] , (www.wfdireland.ie), this applies to both quantitative status and chemical status with a risk result of At Risk.

7.3.12 Designated Sites

Designated sites include National Heritage Areas (NHAs), proposed National Heritage Areas (pNHAs), Special Areas of Conservation (SACs), candidate Special Areas of Conservation (cSAC) and Special Protection Areas (SPAs). A designated site map for the area of the proposed development is shown as Figure 7.8.

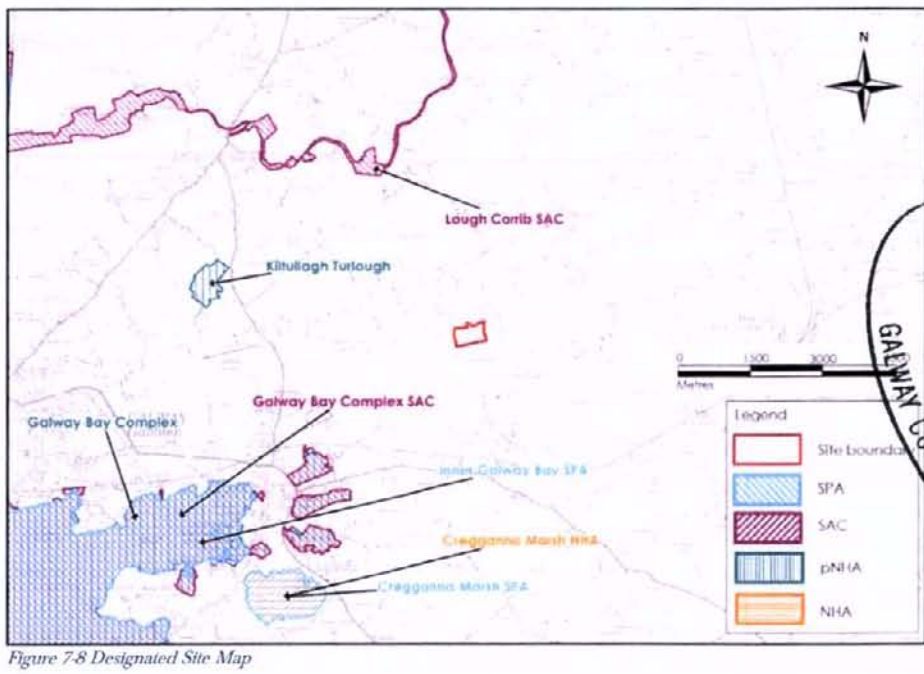


Figure 7-8 Designated Site Map

Designated sites with 5 – 10km of the site include Lough Corrib SAC, Galway Bay Complex SAC, Kiltullagh Turlough pNHA and Cregganna Marsh NHA. There are no surface water connections between the quarry site and any of these designated sites.

Based on an assumed groundwater flow direction in this area (refer to Figure 7.4 above), groundwater flow from the area of the quarry site is likely to only discharge into Galway Bay and the Galway Bay

[2] *'Status' means the condition of the water in the waterbody. It is defined by its chemical status and its ecological status, whichever is worse. Waters are ranked in one of 5 classes: High, Good, Moderate, Poor and Bad (WFD, 2010).*

Complex SAC. There are unlikely to be groundwater connections to Lough Corrib SAC, Kiltullagh Turlough pNHA or Cregganna Marsh NHA.

7.3.13 Local Water Supplies

There are no groundwater protection zones for public water supplies or group water schemes in the area of the site.

A search of the Geological Survey of Ireland (GSI) well database (www.gsi.ie) indicated that there are no wells within 600m of the site. The closet well (1421NWW038) which is used for domestic purposes is located just over 600m to the north of the site, which is not located down-gradient of the site.

Most of the houses in this area are served by the public watermain.

7.3.14 Receptor Sensitivity

Due to the competent and low permeability nature of the rock in the proposed expansion area, no significant impacts on local groundwater levels are expected. Groundwater quality will be the main sensitive receptor in respect of oil/fuel potential leaks and spills and quarry discharge.

The primary risk to groundwater at the site would be from hydrocarbon spillage. This is a common potential impact on all construction sites (such as road works and industrial sites). These potential contamination sources will be continued to be carefully managed at the site during the expansion phase of the development and mitigation measures are proposed within the EIAR to deal with these potential minor impacts.

Based on criteria set out in Table 7.1 groundwater at the site can be classed as Very Sensitive to pollution because the pure limestones are classified as a Regionally Important Aquifer (Rkc). However, based on the site investigations and observations, it appears that the local limestone bedrock at the quarry has relatively low permeability with very little or no fracturing that would offer preferential groundwater flowpaths for potential contaminants.

Any contaminants which may be accidently released on-site, particularly in the excavation area, are more likely to enter groundwater via the quarry discharge to ground. Discharge quality monitoring to date shows that the discharge water quality is good with no reported exceedances on the discharge license MAC.

7.4 Potential Impacts of the Proposed Development

7.4.1 Characteristics of the Proposed Development

Development proposals include the extraction of approximately 1,500,000m^3 of rock down to an elevation of approximately -5m OD (from a maximum of 25m OD). The quarry is operating below the local groundwater table, but due to the competent and low permeability nature of the rock, groundwater inflows are very small. Investigations show that there will be no significant increase in groundwater inflows as a result of the proposed expansion of the quarry.

It is proposed that the rock will be removed using blasting (explosives) and excavators with rock breakers.

7.4.2 "Do Nothing" Scenario

If the proposed quarry expansion does not go ahead, the quarry will operate in accordance with the current planning permission and related planning conditions (Planning Ref:09/1958) until the planning permission has expired in March 2021.

7.4.3 Potential Extraction Phase Impacts

7.4.3.1 Impacts on Local Groundwater Levels

The current quarry and the proposed expansion area exist below the local groundwater table (refer to Figure 7.6 above). As with the existing quarry, dewatering will be required to maintain the floor of the proposed expansion area dry. This has the potential to further impact on local groundwater levels away from the site.

However, as discussed above, the measured groundwater levels at the quarry would suggest that the current quarry operation is having only a very small effect on local groundwater levels and this would be consistent with the hydrogeological conditions that the current quarry is operating in (i.e. competent, unweathered, low permeability limestone).

Receptor: Groundwater levels

Pathway: Groundwater flowpaths

Pre-mitigation Impact: Negative, slight, indirect, likely, long term effect on groundwater levels.

Impact Assessment / Mitigation Measures:

The current quarry (final floor at -5m OD) is extracting from a layer of very competent limestone with no significant visible weathering, fracturing or evidence of karstification. Consequently, groundwater inflows to the current quarry are low (on average are less than 142m3/day). Groundwater inflows to the existing quarry are limited to shallow flows along the top of the north-eastern wall / corner of the middle bench. The inflows are at about 21 – 22m OD.

Site investigations in the proposed expansion area indicate similar hydrogeological conditions and therefore significantly increased groundwater inflows are not expected. Consequently, significant effects on groundwater levels as a result of the proposed expansion are not expected. No mitigation is required. Groundwater level monitoring will continue as per the existing discharge licence.

Residual Effect:

Negative, slight, indirect, likely, long term effect on groundwater levels.

Significance of Effects:

Based on the analysis above, the proposed development will have **no significant effects** on local groundwater quality or supplies are expected.

7.4.3.2 Groundwater Quality Impacts from use of Explosives (i.e. Nitrogen Compounds)

Common explosives used at quarry sites, such as Ammonium Nitrate, often contain large percentages of N (nitrogen) compounds. It has been found that small percentages of N compounds remain as

residual coating on the rock following blasting. This has the potential to be dissolved when it comes into contact with water. The study that is most referenced was completed by Environment Canada in 1988 (Ferguson & Leask, 1988)[3].

Due to the small scale of the proposed quarry, no significant impacts in respect of explosive use are expected.

Receptor: Groundwater

Pathway; Quarry discharge to ground

Pre-mitigation Impact: Negative, reversible, imperceptible, indirect, likely, long term effect on groundwater quality.

Assessment:

The Environment Canada study outlines a procedure for determining the residual N compounds for various mine site types. The stepwise procedure used in the 1988 study for predicting aqueous concentrations of N species, as outlined by Morin & Hutt (2009)4 is:

- Calculate the annual leached nitrogen loading (kg/year) for the entire site based upon annual explosive mass usage and residual N fraction associated with explosive type;
- Separate the leached nitrogen loading among quarry components (e.g. entering surface water, remaining on extracted rock etc.);
- Separate the into loadings of N compounds (Nitrate, Nitrite and Ammonia); and,
- Calculate the flow concentration.

The concentrations of N species in discharge water from the proposed development at Glenmore are calculated using this procedure. This is presented in Table 7.5 below. The highest residual is for nitrate (99%), and upper limit of the range is used in all cases to determine the concentration of N species in pumped water. The calculation also assumes that 100% of residual N is dissolved in drainage waters discharged from the quarry. Therefore this N mass enters the receiving water and could potentially impact water quality, i.e. 'status'.

Having used conservative values in this approach the resulting N species concentrations are small, and below all relevant EQS values for surface water. There is no exceedence of any EQS value for N species.

No mitigation is required in respect of explosives and groundwater quality impacts.

Ferguson, K.D., and Leask, S.M. (1988). The Export of Nutrients from Surface Coal Mines, Environment Canada Regional Program Report 87-12, *dated March, 1988, 127 p.*

Morin, K.A. & Hutt, M.N. (2009). Mine Water Leaching of Nitrogen Species from Explosives Residues. *Minesite Drainage Assessment Group.*

Table 7-6 Potential N Compounds in Quarry Discharge from Explosives

EXPLOSIVE MASS BALANCE			
Quarry Extension Area	8.5		ha
Quarry Depth	30		m
Losses	0.1		
Extraction Volume	1,500,000.00		m3
Explosive Mass required per m3	0.4		kg/m3
Explosive Mass	600000		kg
Quarry Life (years)	20		years
Explosive mass per year	30000		kg/year
NITROGEN MASS BALANCE			
% Explosive mass as Ammonium Nitrate	0.94		
% Ammonium Nitrate as N	0.35		
Mass of N	9870		kg
Residual Fraction	0.06		
Residual N	592.2		kg
N COMPOUNDS			
Residual NO3 (75-99%)	0.99	586.278	kg/year
Residual NH4 (0.5 - 24%)	0.24	142.128	kg/year
Residual NO2 (0-6%)	0.06	35.532	kg/year
WATER BALANCE			
Average Annual Rainfall (SAAR)	1122		mm/year
Runoff Coefficient	0.4		
Quarry Catchment Area	10.5		ha
Average Annual Discharge	473040		m3/year
Average Daily Quarry Discharge	1296		m3/day
NITROGEN COMPOUND CONCENTRATIONS			
Residual NO3	0.00123938		mg/L
Residual NH4	0.00030046		mg/L
Residual NO2	7.5114E-05		mg/L

Residual Effect:

Negative, reversible, imperceptible, indirect, likely, short term effect on groundwater quality.

Significance of Effects:

No significant effects on surface water quality are expected.

7.4.3.3 Groundwater Contamination from Oil / Fuel Spills and Leaks

Excavation of rock at the site will be completed using large plant and machinery. Such machinery are powered by diesel engines and operated using hydraulics. Unless managed carefully such plant and machinery have the potential to leak hydraulic oils or cause fuel leaks during refuelling operations.

Quarry discharge and groundwater quality monitoring carried out to date has not detected the presence of hydrocarbons.

Receptor: Groundwater

Pathway: Groundwater flowpaths

Pre-mitigation Impact: Negative, reversible, imperceptible, indirect, likely, long term effect on groundwater quality.

Mitigation Measures:

The following control measures are already carried out at the quarry and will be in place for the proposed expansion.

- All plant and machinery will be serviced before being mobilised to site;
- Refuelling will be completed in a controlled manner using drip trays (bunded container trays) at all times;
- Fuel containers will be stored within a secondary containment system, e.g. bunds for static tanks or a drip tray for mobile stores;
- Containers and bunding for storage of hydrocarbons and chemicals will have a holding capacity of 110% of the volume to be stored;
- Fuel and oil stores including tanks and drums will be regularly inspected for leaks and signs of damage;
- Drip-trays will be used for fixed or mobile plant such as pumps and generators in order to retain oil leaks and spills;
- Only designated trained operators will be authorised to refuel plant on site;
- Procedures and contingency plans will be set up to deal with emergency accidents or spills;
- An emergency spill kit with oil boom, absorbers etc. will be kept on-site for use in the event of an accidental spill; and,
- All water currently pumped from the quarry is directed through an existing full retention oil interceptor prior to discharge to ground and will be the case during the proposed expansion.

Residual Effect:

The use of heavy machinery in the quarrying process carries the risk hydrocarbon leaks that could negatively effect groundwater The implementation of the mitigation measures discussed above will

reduce residual effects to a **Negative, reversible, imperceptible, indirect, unlikely, long term** effect on groundwater quality.

Significance of Effects:

Based on the analysis above, the proposed development will have **no significant effects** on groundwater quality are expected.

7.4.3.4 Groundwater Quality Impacts on Local Wells

As discussed in Section 7.5.13 above, there is 1 no. private well located to the north at a distance of approximately 600m. All local houses appear to be on the public water mains.

Receptor: Local wells (existing or future)

Pathway: Groundwater flowpaths

Pre-mitigation Impact: Negative, imperceptible, indirect, unlikely, long term effect on groundwater wells.

Impact Assessment / Mitigation Measures:

Groundwater level and groundwater quality monitoring carried out to date suggest that the quarry is having **no significant effect** on groundwater levels or groundwater quality.

No mitigation other than those already been carried out (i.e. for oils and fuels) is required.

Residual Effect:

No residual effects on local groundwater quality or supplies are expected.

Significance of Effects:

Based on the analysis above, the proposed development will have **no significant effects** on local groundwater quality or supplies are expected.

7.4.3.5 Hydrological Impacts on Local Designated Sites

As discussed in Section 7.5.12 above, the only designated site that is likely to be hydrologically connected (by groundwater only) to the proposed quarry development is the Galway Bay Complex SAC. Due to the fact that the Galway Bay Complex is a coastal habitat that exists approximately 5km downstream of the quarry, no significant effects are expected.

Receptor: Downstream designated sites

Pathway: Groundwater flowpaths

Pre-mitigation Impact: Negative, reversible, imperceptible, indirect, unlikely, long term effect on the cSAC.

Impact Assessment / Mitigation Measures:

Mitigation measures during use of hydrocarbons/chemicals on-site are dealt with in Section 7.4.3.3 above.

Quarry discharge and groundwater quality monitoring indicates that the quarry development is having no significant impacts on water quality. Any groundwater lost from the aquifer by quarry dewatering is replaced by discharging back to ground (neutral effect on groundwater balance).

Residual Effect:

The implementation of hydrocarbon/chemical spill prevention measures, use of oil interceptors, and the discharge of any groundwater lost from the aquifer by quarry dewatering is replaced by discharging back to ground will eliminate potential negative effects on downstream designated site. Therefore, **no residual effects** on downstream designated sites are anticipated.

Significance of Effects:

Based on the analysis above, the proposed development will have **no significant effects** downstream designated sites

7.4.4 Human Health Effects

Potential health effects arise mainly through the potential for groundwater contamination and impacts on local wells. Hydrocarbons, in the form of fuels and oils, will be used on-site during quarrying.

However, as stated in Section 7.6.3.2 above there are already best practice controls in place to ensure any potential sources of contamination on the site are managed appropriately. The potential residual impacts associated with groundwater contamination and subsequent health effects are negligible.

Discharge quality monitoring to date show all measured parameters to be below the discharge licence MAC and drinking water standard limits where applicable. Based on this analysis the proposed development will have **no significant effects** on human health.

7.4.5 Cumulative Hydrological Effects

Due to the lack of other quarry developments in the area and the fact that the proposed development requires minimal groundwater dewatering and quarry discharge, no significant hydrogeological cumulative effects are likely.

8. AIR AND CLIMATE

8.1 Introduction

MKO prepared the Air & Climate section of this Environmental Impact Assessment Report (EIAR) for the proposed development at Coshla Quarry, Co. Galway.

This Chapter examines the effect of the proposed development (i.e. proposed quarry extension) on air and climate. Where required, appropriate mitigation measures to limit any identified significant impacts to air and climate are recommended.

8.1.1 Statement of Authority

This chapter of the EIAR was prepared by Michael Watson and Thomas Blackwell. Michael Watson completed an MA in Environmental Management at NUI, Maynooth in 1999. He is a professional geologist (PGeo) and full member of IEMA (MIEMA) as well as a Chartered Environmentalist (CEnv). Michael joined McCarthy Keville O'Sullivan Ltd. in 2014 having gained over 15 years' experience in a Cork-based environmental & hydrogeological consultancy firm. Thomas Blackwell is a Senior Environmentalist with MKO with over 15 years of progressive experience in environmental consulting. Thomas holds a BA (Hons) in Geography from Trinity College Dublin and a M.Sc. in Environmental Resource Management from University College Dublin. Prior to taking up his position with MKO in August 2019, Thomas worked as a Senior Environmental Scientist with HDR, Inc. in the United States and held previous posts with private consulting firms in both the USA and Ireland.

8.2 Air

8.2.1 Background

The quarry is located in a rural area, approximately 9 kilometres to the west of Athenry and 6 kilometres to the northeast of Oranmore, Co. Galway. The primary land-use in the vicinity of the site comprises a mix of agricultural land and rural housing. An ESB substation is located to the northeast of the quarry. C & F Tooling is located approximately 400 metres to the northeast of the quarry.

Due to the general character of the surrounding environment, air quality sampling was deemed to be unnecessary for this Environmental Impact Assessment Report (EIAR).

8.2.2 Air Quality Standards

In 1996, the Air Quality Framework Directive (96/62/EC) was published. This Directive was transposed into Irish law by the Environmental Protection Agency Act 1992 (Ambient Air Quality Assessment and Management) Regulations 1999. The Directive was followed by four Daughter Directives, which set out limit values for specific pollutants:

- The first Daughter Directive (1999/30/EC) deals with sulphur dioxide, oxides of nitrogen, particulate matter and lead.
- The second Daughter Directive (2000/69/EC) addresses carbon monoxide and benzene. The first two Daughter Directives were transposed into Irish law by the Air Quality Standards Regulations 2002 (SI No. 271 of 2002).

- A third Daughter Directive, Council Directive (2002/3/EC) relating to ozone was published in 2002 and was transposed into Irish law by the Ozone in Ambient Air Regulations 2004 (SI No. 53 of 2004).
- The fourth Daughter Directive, published in 2007, deals with polyaromatic hydrocarbons (PAHs), arsenic, nickel, cadmium and mercury in ambient air.

The Air Quality Framework Directive and the first three Daughter Directives have been replaced by the Clean Air for Europe (CAFE) Directive (Directive 2008/50/EC on ambient air quality), which encompasses the following elements:

- The merging of most of the existing legislation into a single Directive (except for the Fourth Daughter Directive) with no change to existing air quality objectives.
- New air quality objectives for PM2.5 (fine particles) including the limit value and exposure concentration reduction target.
- The possibility to discount natural sources of pollution when assessing compliance against limit values.
- The possibility for time extensions of three years (for particulate matter PM10) or up to five years (nitrogen dioxide, benzene) for complying with limit values, based on conditions and the assessment by the European Commission.

Table 8.1 below sets out the limit values of the CAFE Directive, as derived from the Air Quality Framework Daughter Directives. Limit values are presented in micrograms per cubic metre (µg/m3) and parts per billion (ppb). The notation PM10 is used to describe particulate matter or particles of ten micrometres or less in aerodynamic diameter. PM2.5 represents particles measuring less than 2.5 micrometres in aerodynamic diameter.

The CAFE Directive was transposed into Irish legislation by the Air Quality Standards Regulations 2011 (S.I. No. 180 of 2011). These Regulations supersede the Air Quality Standards Regulations 2002 (S.I. No. 271 of 2002), the Ozone in Ambient Air Regulations 2004 (S.I. No. 53 of 2004) and the Ambient Air Quality Assessment and Management Regulations 1999 (S.I. No. 33 of 1999).

Table 8.1 Limit values of Directive 2008/50/EC, 1999/30/EC and 2000/69/EC (Source: EPA)

Pollutant	Limit Value Objective	Averaging Period	Limit Value (µg/m3)	Limit Value (ppb)	Basis of Application of Limit Value	Attainment Date
Sulphur dioxide (SO_2)	Protection of Human Health	1 hour	350	132	Not to be exceeded more than 24 times in a calendar year	1st Jan 2005
Sulphur dioxide (SO_2)	Protection of human health	24 hours	125	47	Not to be exceeded more than 3 times in a calendar year	1st Jan 2005

Pollutant	Limit Value Objective	Averaging Period	Limit Value (µg/m3)	Limit Value (ppb)	Basis of Application of Limit Value	Attainment Date
Sulphur dioxide (SO_2)	Upper assessment threshold for the protection of Human Health	24 hours	75	28	Not to be exceeded more than 3 times in a calendar year	1st Jan 2005
Sulphur dioxide (SO_2)	Lower assessment threshold for the protection of human health	24 hours	50	19	Not to be exceeded more than 3 times in a calendar year	1st Jan 2005
Sulphur dioxide (SO_2)	Protection of vegetation	Calendar year	20	7.5	Annual mean	19th Jul 2001
Sulphur dioxide (SO_2)	Protection of vegetation	1st Oct to 31st Mar	20	7.5	Winter mean	19th Jul 2001
Nitrogen dioxide (NO_2)	Protection of human health	1 hour	200	105	Not to be exceeded more than 18 times in a calendar year	1st Jan 2010
Nitrogen dioxide (NO_2)	Protection of human health	Calendar year	40	21	Annual mean	1st Jan 2010
Nitrogen dioxide (NO_2)	Upper assessment threshold for the protection of human health	1 hour	140	73	Not to be exceeded more than 18 times in a calendar year	1st Jan 2010
Nitrogen dioxide (NO_2)	Lower assessment threshold for the protection	1 hour	100	52	Not to be exceeded more than 18 times in	1st Jan 2010

Pollutant	Limit Value Objective	Averaging Period	Limit Value (µg/m3)	Limit Value (ppb)	Basis of Application of Limit Value	Attainment Date
	of human health				a calendar year	
Nitrogen monoxide (NO) and nitrogen dioxide (NO_2)	Protection of ecosystems	Calendar year	30	16	Annual mean	19th Jul 2001
Particulate matter 10 (PM_{10})	Protection of human health	24 hours	50	-	Not to be exceeded more than 35 times in a calendar year	1st Jan 2005
Particulate matter 10 (PM_{10})	Upper assessment threshold for the protection of human health	24 hours	30	-	Not to be exceeded more than 7 times in a calendar year	Based on the indicative limit values for 1 January 2010
Particulate matter 10 (PM_{10})	Lower assessment threshold for the protection of human health	24 hours	20	-	Not to be exceeded more than 7 times in a calendar year	Based on the indicative limit values for 1 January 2010
Particulate matter 2.5 ($PM_{2.5}$)	Protection of human health	Calendar year	40	-	Annual mean	1st Jan 2005
Particulate matter 2.5 ($PM_{2.5}$) Stage 1	Protection of human health	Calendar year	25	-	Annual mean	1st Jan 2015
Particulate matter 2.5 ($PM_{2.5}$) Stage 2	Protection of human health	Calendar year	20	-	Annual mean	1st Jan 2020

Pollutant	Limit Value Objective	Averaging Period	Limit Value (µg/m3)	Limit Value (ppb)	Basis of Application of Limit Value	Attainment Date
Lead (Pb)	Protection of human health	Calendar year	0.5	-	Annual mean	1st Jan 2005
Carbon Monoxide (CO)	Protection of human health	8 hours	10,000	8,620	-	1st Jan 2005
Benzene (C_6H_6)	Protection of human health	Calendar Year	5	1.5	-	1st Jan 2010

The Ozone Daughter Directive 2002/3/EC is different from the other Daughter Directives in that it sets target values and long-term objectives for ozone rather than limit values. Table 8.2 presents the limit and target values for ozone.

Table 8.2 Target values for Ozone Defined in Directive 2008/50/EC

Objective	Parameter	Target Value for 2010	Target Value for 2020
Protection of human health	Maximum daily 8 hour mean	120 mg/m^3 not to be exceeded more than 25 days per calendar year averaged over 3 years	120 mg/m^3
Protection of vegetation	AOT40 calculated from 1 hour values from May to July	18,000 mg/m^3.h averaged over 5 years	6,000 mg/m^3.h
Information Threshold	1 hour average	180 mg/m^3	-
Alert Threshold	1 hour average	240 mg/m^3	-

AOT40 is a measure of the overall exposure of plants to ozone. It is the sum of the excess hourly concentrations greater than 80 g/m3 and is expressed as g/m3 hours.

8.2.2.1 Air Quality and Health

The World Health Organisation (WHO) estimates show that more than 400,000 premature deaths are attributable to poor air quality in Europe annually. In Ireland, the number of premature deaths attributable to air pollution is estimated at 1,510 people, with fine particulate matter (PM2.5) being predominantly responsible for the majority of the estimated premature deaths. These emissions, along with others including nitrogen oxides (NOx) and sulphur oxides (Sox) are produced during fossil-fuel based electricity generation in various amounts, depending on the fuel and technology used. Whilst there is the potential of such emissions to be generated from quarrying operations, a number of mitigation measures will be implemented at this site to reduce the impact from dust and vehicle emissions, which are discussed in Sections 8.4.3 below.

8.2.3 Air Quality Zones

The Environmental Protection Agency (EPA) has designated four Air Quality Zones for Ireland:

- Zone A: Dublin City and environs
- Zone B: Cork City and environs
- Zone C: 16 urban areas with population greater than 15,000
- Zone D: Remainder of the country.

These zones were defined to meet the criteria for air quality monitoring, assessment and management described in the Framework Directive and Daughter Directives. The site of the proposed development lies within Zone D, which represents rural areas located away from large population centres.

8.2.4 Existing Air Quality

The air quality in the vicinity of the proposed development site is typical of that of rural areas in the West of Ireland, i.e. Zone D. Prevailing south-westerly winds carry clean, unpolluted air from the Atlantic Ocean onto the Irish mainland.

The EPA publishes Air Monitoring Station Reports for monitoring locations in all four Air Quality Zones. The ambient air quality monitoring carried out closest to the Proposed Development site is at Galway City, located approximately 16 kilometres southwest of the Proposed Development site. EPA air quality data is available for Galway City in the report *'Ambient Air Monitoring in Galway City 13th March 2001 to 23rd October 2001'*, as detailed below. More recent data (2015) is available for Particulate Matter (PM10) at the Galway City monitoring station. This monitoring location lies within Zone C. Lower measurement values for all air quality parameters would be expected for the Proposed Development site as it lies in a rural location, within Zone D.

8.2.4.1 Sulphur Dioxide (SO_2)

Sulphur dioxide data for the 2001 monitoring period in Galway City is presented in Table 8.3. Neither the hourly limit value nor lower assessment threshold set out in the CAFE Directive were exceeded during the monitoring period. The mean hourly value of 10.0 $\mu g/m^3$ exceeded the lower assessment threshold for the protection of ecosystems but not the upper assessment threshold. The report states however that this threshold may not be relevant to monitoring in an urban environment. It would be expected that SO_2 values at the proposed development site (Zone D) would be significantly lower than those recorded at the Galway City monitoring site (Zone C).

Table 8.3 Sulphur Dioxide Data Galway City March to October 2001

Parameter	Measurement
No. of measured values	3,672
Percentage Coverage	68.6%
Maximum hourly value	87.8 $\mu g/m^3$
98 percentile for hourly values	42.3 $\mu g/m^3$
Mean hourly value	10.0 $\mu g/m^3$

8.2.4.2 Particulate Matter (PM_{10})

Sources of particulate matter include vehicle exhaust emissions, soil and road surfaces, construction works and industrial emissions. Particulate matter (PM_{10}) data for the 2015 monitoring period in Galway City is presented in Table 8.4. The twenty-four-hour limit value for the protection of human health (50 µg/m^3) was exceeded twice during the measurement period. The mean of the daily values during the measurement period is below the annual limit value for the protection of human health (40 µg/m3). It would be expected that PM_{10} values at the proposed development site (Zone D) would be significantly lower than those recorded at the Galway City monitoring site (Zone C).

Table 8.4 Particulate Matter (PM_{10}) Data Galway City in 2015

Parameter	Measurement
No. of measured values	365
Percentage Coverage	279
Maximum daily value	76.4%
98 percentile for daily values	59.1 µg/m3
Mean daily value	35.7 µg/m3

8.2.4.3 Nitrogen Dioxide (NO_2)

Nitrogen dioxide and oxides of nitrogen data for the 2001 monitoring period in Galway City is presented in Table 8.5. The hourly limit value was not exceeded during the measurement period. One hourly mean NO_2 value was above the lower assessment threshold. The CAFE Directive stipulates that this threshold should not be exceeded more than 18 times in a calendar year. The mean hourly NO_2 value during the measurement period was below the annual lower assessment threshold for the protection of human health, which is 26 µg/m^3. It would be expected that NO_2 and NO_x values at the proposed development site (Zone D) would be significantly lower than those recorded at the Galway City monitoring site (Zone C).

Table 8.5 Nitrogen Dioxide and Oxides of Nitrogen Data Galway City March to October 2001

Parameter	Measurement
No. of measured values	4,531
Percentage Coverage	84.6%
Maximum hourly value (NO_2)	120.7 µg/m^3
98 percentile for hourly values (NO_2)	50.5 µg/m^3
Mean hourly value (NO_2)	19.9 µg/m^3
Mean hourly value (NO_x)	34.8 µg/m^3

8.2.4.4 Carbon Monoxide (CO)

Carbon monoxide data for the 2001 monitoring period in Galway City is presented in Table 8.6. The mean hourly concentration of carbon monoxide recorded was 0.5 mg/m^3. The carbon monoxide limit value for the protection of human health is 10 mg/m^3. On no occasions were values in excess of the 10 mg/m^3 limit value set out in the CAFE Directive recorded.

Table 8.6 Carbon Monoxide Data Galway City March to October 2001

Parameter	Measurement
No. of hours	5,356
No. of measured values	4,533
Percentage Coverage	84.6%
Maximum hourly value	2.8 mg/m^3
98 percentile for hourly values	1.3 mg/m^3
Mean hourly value	0.5 mg/m^3
Maximum 8-hour mean	1.6 mg/m^3
98 percentile for 8-hour mean	1.1 mg/m^3

8.2.4.5 Ozone (O_3)

Ozone data for the Mace Head Atmospheric Research Station in Carna, Co. Galway, located approximately 100 kilometres west of the site, for 2018 is presented in Table 8.7. The maximum daily eight-hour mean limit of 120 µg/m^3 was exceeded on five occasions. The legislation stipulates that this limit should not be exceeded on more than 25 days. The site of the proposed development, situated approximately 100 kilometres from the monitoring site, can be expected to be similar to the monitoring site in terms of ozone.

Table 8.7 Summary statistics for rolling 8 hr O_3 concentrations in 2018: Mace Head

Parameter	Measurement
Annual Mean	75 µg/m^3
Median	76 µg/m^3
% Data Capture	99%
No. of days > 120	5 days
Maximum 8-hour value	148 µg/m^3

8.2.5 Dust Generation

8.2.5.1 Background

The extent of dust generation at any site depends on the type of activity undertaken, the location, the nature of the dust, i.e. soil, sand, etc., and the weather. In addition, dust dispersion is influenced by external factors such as wind speed and direction and/or, periods of dry weather.

There are no statutory limits for dust deposition in Ireland. However, EPA guidance suggests that a deposition of 10 mg/m^2/hour can generally be considered as posing a soiling nuisance. This equates to 240 mg/m^2/day. The EPA recommends a maximum daily deposition level of 350 mg/m^2/day when measured according to the TA Luft Standard 2002. Furthermore, Condition 13(a) of the current planning permission for the quarry requires that maximum daily deposition levels do not exceed 350 mg/m^2/day.

8.2.5.2 Receiving Environment

There are 3 no. houses located within 500m of the proposed quarry site. The closest occupied dwelling is located approximately 20 metres from the southern site boundary. Dust monitoring locations have been established on the perimeter of the quarry site.

8.2.5.3 Dust Monitoring

As required by Condition 13 (b) of ABP's 2011 Grant of Permission for the existing quarry, a monthly survey and monitoring programme of dust and particulate emissions has been established and continues to be in operation. A total of 5 no. dust monitoring locations have been established around the perimeter of the quarry site. Samples are collected monthly and sent to BHP Laboratories (a INAB accredited laboratory) for analysis.

8.2.5.3.1 *Methodology*

Dust Deposition Rate is normally measured by gravimetrically determining the mass of particulates and dust deposited over a specified surface area over a period of one month (30 days +/- 2 days). The results are expressed as dust deposition rate in mass per unit area per day (mg/m^2/day).

Total dust deposition was measured at the site using Bergerhoff gauges, as specified in the German Engineering Institute Standard VDI 2119 entitled *'Measurement of Dustfall Using the Bergerhoff Instrument (Standard Method)'*. Samples are collected at five fixed locations at the quarry (D1, D2, D3, D4, and D5, as shown on Figure 8.1) D1 is located in the northeast corner of the site beside the gate at the site exit road. D2 is located along the southern boundary of the site close to the south eastern corner. D3 is located in the northwest corner of the site. D4 is located in the southwest corner of the site whilst D5 is was located along the northern boundary of the site close to the truck wash area.

Map Legend

Site Boundary

Dust Monitoring Locat

PLANNING & DEVELOPMENT SECTION
21 APR 2020 0499
GALWAY COUNTY COUNCIL

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Microsoft product screen shots reprinted w[illegible]mission from Microsoft Corporation

Drawing Title
Dust Monitoring Locations

Project Title
Coshla Quarry Extension

Drawn By	Checked By
TJB	MW
Project No.	Drawing No.
180918	Figure 8.1
Scale	Date
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8.2.5.3.2 Results

The results of the 2018 dust monitoring programme at Coshla Quarry are summarised in Table 8.8 below.

Table 8.8 Results of 2018 Dust Monitoring Programme

Average Daily Dust Deposition per Monitoring Location(mg/m²/day)					
Month	**D1**	**D2**	**D3**	**D4**	**D5**
January	156	212	151	143	157
February	167	219	163	168	184
March	102	Smashed	135	91	205
April	53	57	63	62	262
May	58	96	106	53	152
June	23	176	153	395	520
July	117	179	83	241	2031*
August	227	114	91	148	871
September	121	746*	311	723	169
October	379	207	208	266	338
November	160	73	111	34	346
December	88	96	145	82	257
Taking All Results and Normal					
Average	138	198	143	201	458
Excluding Clear Outlier – Suspected Tampering					
Average	138	198	143	201	315

** Outlier – Suspected Tampering*

The annual environmental audit report issued on February 28th, 2019, and provided to Galway County Council, summarized the results of the 2018 dust monitoring programme. The environmental audit reported the following:

"Overall, ignoring obvious single outlier this year (>1,000), and including the high D2 once-off result, the averages for each location are well within specification, albeit that D5 is above 300. However, it does support a finding that when an outlier occurs, some human factor is at play.

As previously recommended, attention must be given on a monthly basis to evidence of tampering ...".

A copy of the annual environmental audit report is included as Appendix 8-1 of this EIAR.

8.2.6 Likely Significant Air Quality Impacts of the Proposed Development and Associated Mitigation Measures

8.2.6.1 Characteristics of the Proposed Development

The proposed development allows for the continuation of quarrying and processing activities at the site and the extension of the existing quarry extraction area into lands to the east, north, and south of the current extraction area. The proposed extension area measures approximately 6.7 hectares and will bring the total extraction area up to 12.7 hectares. The quarrying methods that will be employed in the extension areas will be a continuation of those that have been used in the existing quarry. It is not proposed to construct any new buildings or other infrastructure or introduce any new plant items or processes as part of this application.

8.2.6.2 "Do-Nothing" Scenario

If the proposed development were not to proceed, there would be no change to existing air quality conditions in the area. There would be no potential for minor emissions to occur as a result of the operational phase of the proposed development.

8.2.6.3 Operational Phase Impacts and Mitigation Measures

8.2.6.3.1 *General Air Quality*

The extraction of rock from the site will require the use of machinery and plant, thereby giving risk to exhaust emissions. This is likely to have a medium-term, slight negative effect, which will be reduced through the use of the best practices mitigation measures as presented below.

Mitigation

- All construction vehicles and plant will be maintained in good operational order while onsite, thereby minimising any emissions that arise.
- When stationary, delivery and on-site vehicles will be required to turn off engines.
- Users of the site will be required to ensure that all plant and vehicles are suitably maintained to ensure that emissions of engine generated pollutants is kept to a minimum.

Residual Impact

The implementation of the mitigation measures described above will reduce the residual impacts on air quality to a **Long Term, Imperceptible, Negative Impact**

Significance of Effects

Based on the assessment above there will be **no significant effects**.

8.2.6.3.2 *Dust Emissions*

Dust can be generated from many on-site activities such as overburden removal, rock extraction, crushing and screening. The extent of dust generation will depend on the type of activity undertaken, the location, the nature of the dust, i.e. rock, soil, overburden, etc and the weather. In addition, dust dispersion is influenced by external factors such as wind speed and direction and/or, periods of dry weather. Traffic movements also have the potential to generate dust. Pre-mitigation, these effects will have a long term moderate negative effect.

The following mitigation measures will however be implemented at the site,

Mitigation

- Overburden will be progressively removed from the working area in advance of extraction.
- Crushing of rock will continue to occur at a bench level lower than the general quarry ground level, thus limiting the potential for fugitive dust emissions from the quarry site.
- Permanent berms will be placed around the perimeter of the site and planted with native species to mitigate against potential impacts of dust on residential receptors.
- Road surfaces from the site entrance to the working area of the site will continue to be paved.
- The roads adjacent the site will be regularly inspected by the Site Manager for cleanliness and cleaned as necessary.
- Water spraying of conveyors, stockpiles and roads will be carried out when necessary to reduce the production of dust.
- Water bowser movements will be carefully monitored to avoid, insofar as reasonably possible, increased runoff.
- The transport of material, which has significant potential to cause dust, will be undertaken in tarpaulin-covered vehicles.
- All plant and materials vehicles shall be stored in dedicated areas (on site).
- All plant and machinery will be maintained in good operational order while onsite.

Residual Impact

The existing dust monitoring programme has shown that the existing operations including the extraction and ancillary activities are generally not generating dust deposition above unacceptable levels and the nearest sensitive receptors. There have been some outlier results that are suspected to be the result of tampering with the monitoring equipment (See Environmental Audit in Appendix 8-1 of this EIAR). Based on the analysis above the proposed development is likely to have a **Long-term, Occasional, Imperceptible, Negative effect**.

Significance of Effects

Based on the assessment above there will be **no significant effects.**

8.2.6.3.3 *Dust Monitoring*

It is proposed that dust deposition monitoring using the Bergerhoff Method, be carried out in line with the existing monitoring requirements for the quarry operation.

8.2.6.3.4 *Health Effects*

Whilst the operational phases of the proposed quarry are likely to lead to increases in dust and vehicle emissions, the implementation of the mitigation measures discussed above, and good management practices can prevent or minimise potential effects off-site. Good management practice consists of good site design and layout, adopting appropriate working methods, choosing the right equipment and ensuring that the workforce understands the company's responsibilities and is familiar with good working practice and dust suppression techniques. The potential for health effects are considered imperceptible as the potential for both exhaust and dust emissions will be limited and controlled through site layout design and mitigation measures.

Residual Impact

long-term, Imperceptible, Negative Impact

Significance of Effects

Based on the assessment above there will be **no significant effects** on health

8.2.7 Cumulative Impact

Potential cumulative effects on air quality between the proposed quarry development and other developments in the vicinity were also considered as part of this assessment. It is noted that the other land use activities in the area are manufacturing, farming operations and residential land uses.

8.2.7.1 General Air Quality

Farming and operation of the proposed quarry will require plant items which consume fossil fuels and therefore will lead to a minor level of air emissions cumulatively. Construction activity at the proposed battery storage facility and at the quarry reclamation project site will also require plant items which consume fossil fuels and therefore will lead to a minor level of air emissions cumulatively. The consented quarry in-fill development adjacent to the site will also require plant items which consume fossil fuels and therefore will lead to a minor level of air emissions cumulatively. These activities will result in short term, imperceptible, negative effects on air quality. With the implementation of the mitigation measures discussed in Section 8.1.6 above, the cumulative impacts arising from the operational phase of the proposed quarry and other and other local existing developments, projects and plans are likely to be medium-term, negative, imperceptible effects.

8.2.7.2 Dust Emissions

Dust emissions from the other land use activities in the area are likely to be negligible. The consented quarry in-fill development adjacent to the site has the potential to result in minor dust emissions over the short-term. The potential for dust emissions from the proposed quarry exist but the residual effects will be imperceptible given the proposed mitigation measures in Sections 8.1.6 above. It is therefore considered that there is unlikely to be cumulative effects arising from the quarry development and other local existing developments, projects and plans.

8.3 Climate

8.3.1 Climate Change and Greenhouse Gases

Climate change is one of the most challenging global issues facing us today and is primarily the result of increased levels of greenhouse gases in the atmosphere. These greenhouse gases come primarily from the combustion of fossil fuels in energy use. Changing climate patterns are thought to increase the frequency of extreme weather conditions such as storms, floods and droughts. In addition, warmer weather trends can place pressure on animals and plants that cannot adapt to a rapidly changing environment. Moving away from our reliance on coal, oil and other fossil fuel-driven power plants is essential to reduce emissions of greenhouse gases and combat climate change.

8.3.1.1 Greenhouse Gas Emission Targets

Ireland is a Party to the Kyoto Protocol, which is an international agreement that sets limitations and reduction targets for greenhouse gases for developed countries. It is a protocol to the United Nations Framework for the Convention on Climate Change. The Kyoto Protocol came into effect in 2005, as a result of which, emission reduction targets agreed by developed countries, including Ireland, are now binding.

Under the Kyoto Protocol, the EU agreed to achieve a significant reduction in total greenhouse gas emissions in the period 2008 to 2012. Ireland's contribution to the EU commitment for the period 2008 – 2012 was to limit its greenhouse gas emissions to no more than 13% above 1990 levels.

8.3.1.1.1 Doha Amendment to the Kyoto Protocol

In Doha, Qatar, on 8th December 2012, the "Doha Amendment to the Kyoto Protocol" was adopted. The amendment includes:

- New commitments for Annex I Parties to the Kyoto Protocol who agreed to take on commitments in a second commitment period from 1 January 2013 to 31 December 2020;
- A revised list of greenhouse gases (GHG) to be reported on by Parties in the second commitment period; and
- Amendments to several articles of the Kyoto Protocol which specifically referenced issues pertaining to the first commitment period and which needed to be updated for the second commitment period.

During the first commitment period, 37 industrialised countries and the European Community committed to reduce GHG emissions to an average of five percent against 1990 levels. During the second commitment period, Parties committed to reduce GHG emissions by at least 18 percent below 1990 levels in the eight-year period from 2013 to 2020; however, the composition of Parties in the second commitment period is different from the first.

Under the protocol, countries must meet their targets primarily through national measures, although market based mechanisms (such as international emissions trading can also be utilised).

8.3.1.1.2 COP21 Paris Agreement

COP21 was the 21st session of the Conference of the Parties (COP) to the United Nations Convention. Every year since 1995, the COP has gathered the 196 Parties (195 countries and the European Union) that have ratified the Convention in a different country, to evaluate its implementation and negotiate new commitments. COP21 was organised by the United Nations in Paris and held from 30th November to 12th December 2015.

COP21 closed on 12th December 2015 with the adoption of the first international climate agreement (concluded by 195 countries and applicable to all). The twelve-page text, made up of a preamble and 29 articles, provides for a limitation of the temperature rise to below 2°C above pre-industrial levels and even to tend towards 1.5°C. It is flexible and takes into account the needs and capacities of each country. It is balanced as regards adaptation and mitigation, and durable, with a periodical ratcheting-up of ambitions.

8.3.1.1.3 Emissions Projections

In 2016, the EPA published an update on Ireland's Greenhouse Gas Emission Projections to 2020. Ireland's target is to achieve a 20% reduction of non-Emissions Trading Scheme (non-ETS) sector emissions, i.e. agriculture, transport, residential, commercial, non-energy intensive industry and waste, on 2005 levels, with annual binding limits set for each year over the period 2013 – 2020.

Greenhouse gas emissions are projected to 2020 using two scenarios; 'With Measures' and 'With Additional Measures'. The 'With Measures' scenario assumes that no additional policies and measures, beyond those already in place by the end of 2014 are implemented. The 'With Additional Measures' scenario assumes implementation of the 'With Measures' scenario in addition to full achievement of Government renewable and energy efficiency targets for 2020, as set out in the National Renewable Energy Action Plan and the National Energy Efficiency Action Plan.

The EPA Emission Projections Update notes the following key trends:

- Ireland's non-Emissions Trading Scheme (ETS) emissions are projected to be 6% and 11% below 2005 levels in 2020 under the 'With Measures' and 'With Additional Measures' scenarios, respectively. The target for Ireland is a 20% reduction.
- Ireland is projected to exceed its annual binding limits in 2016 and 2017 under both scenarios, 'With Measures' and 'With Additional Measures'.
- Over the period 2013 – 2020, Ireland is projected to cumulatively exceed its compliance obligations by 12 Mt CO2 (metric tonnes of Carbon Dioxide) equivalent under the 'With Measures' scenario and 3 Mt CO2 equivalent under the 'With Additional Measures' scenario.

The EPA report states that *"Failure to meet 2020 renewable and energy efficiency targets will result in Ireland's emission levels moving even further from its emission reduction targets"*. The report also concludes:

- The latest projections estimate that by 2020 non-ETS emissions will be at best 11% below 2005 levels compared to the 20% reduction target. Emission trends from agriculture and transport are key determinants in meeting targets, however emissions from both sectors are projected to increase in the period to 2020.
- It is clear that Ireland faces significant challenges in meeting emission reduction targets for 2020 and beyond. ('Greenhouse Gas Emission Projections to 2020 – An Update', EPA, 2016).

8.3.1.1.4 Progress to Date

The 'Europe 2020 Strategy' is the EU's agenda for growth and jobs for the current decade. The Europe 2020 Strategy targets on climate change and energy include:

- Reducing greenhouse gas (GHG) emissions by at least 20% compared with 1990 levels;
- Increasing the share of renewable energy in final energy consumption to 20%; and
- Moving towards a 20% increase in energy efficiency.

Further details on the Europe 2020 Strategy are included in Section 2.2.3.3 of this EIAR in Chapter 2: Background to the Proposed Development. Regarding progress on targets, the 'Europe 2020 indicators – climate change and energy' report provides a summary of recent statistics on climate change and energy in the EU.

In 2014, EU greenhouse gas emissions, including emissions from international aviation and indirect carbon dioxide (CO2) emissions, were down by 23% when compared with 1990 levels. However, regarding the progress of individual Member States, and Ireland in particular, the Europe 2020 indicators include the following statements:

- 24 countries are on track to meet their GHG targets, except Austria, Belgium, **Ireland** and Luxembourg.
- Luxembourg emitted the most GHG per capita in the EU in 2014 ... followed by Estonia, Ireland, the Czech Republic and the Netherlands.
- In 2014, France, the Netherlands, the United Kingdom and Ireland were farthest from reaching their national targets.

While the EU as a whole is projected to exceed it's 2020 target of reducing GHG emissions by 20%, Ireland is currently one of the countries projected to miss its national targets.

8.3.2 Climate and Weather in the Existing Environment

County Galway has a temperate oceanic climate, resulting in mild winters and cool summers. The prevailing wind direction is between south and west which bring moist air and frequent rain. According to Met Éireann, the average number of wet days per year in the west of Ireland is 225. The wettest months are December and January and April is usually the driest. July is the warmest month with an average temperature of 15.7° Celsius. The Met Éireann weather station at Shannon, County Clare is the nearest weather and climate monitoring station to the subject site, located approximately 47km southwest of the site. Meteorological data recorded at Shannon over the 30-year period from 1981-2010 is shown in Table 8.9 overleaf. The wettest months are October and December, and April is the driest. July is the warmest month with a mean daily temperature of 16.4° Celsius.

Rainfall and wind speed data was also available for the Athenry monitoring station which is located approximately 40km northwest of the site.

8.3.2.1 Wind

The wind field characteristics of the area are important climatological elements in examining the potential for the generation of fugitive dust emissions from the site. Fugitive dust emissions from a surface occur if the winds are sufficiently strong and turbulent and the surface is dry and loose, together causing re-suspension of particulate matter from the ground. A wind speed at ground level in excess of about five metres per second is considered to be the threshold above which re-suspension of fine sized material from an exposed surface may occur. The surface needs to have a relatively low moisture content for this type of dust emission to take place and any wetting either by rainfall or sprayers, will greatly reduce the potential of fugitive dust emissions. The mean annual wind speed at the station, in Athenry, is 3.6 metres per second.

8.3.2.2 Rainfall

Long term rainfall data was also obtained from the monitoring station at Athenry. The 18-year annual average rainfall for Athenry is 1,152mm/yr. This is considered to be high when compared to the annual average rainfall for Dublin (Merrion Square) which recorded annual average rainfall of 730 mm/yr over the same period. This will be due to Galway's oceanic position on the Atlantic seaboard.

Table 8.9 Data from Met Éireann Weather Station, Shannon, Co. Clare 1981 to 2010

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Year
TEMPERATURE (degrees Celsius)													
Mean daily max	8.8	9.2	11.1	13.3	16.0	18.3	19.8	19.6	17.7	14.3	11.1	9.0	14.0
Mean daily min	3.2	3.2	4.5	5.7	8.2	10.9	12.9	12.7	10.8	8.2	5.5	3.6	7.4
Mean temperature	6.0	6.2	7.8	9.5	12.1	14.6	16.4	16.2	14.2	11.2	8.3	6.3	10.7
Absolute max.	14.8	15.5	18.3	23.5	27.2	30.2	30.6	29.8	26.1	22.3	17.6	15.3	30.6
Absolute min.	-2.4	0.9	3.5	5.4	8.0	11.8	13.8	13.0	11.1	7.0	0.8	-6.0	-6.0
Mean num. of days with air frost	11.8	12.3	11.7	13.0	15.3	17.8	19.4	19.3	17.8	16.3	13.4	12.9	19.4
Mean num. of days with ground frost	-11.2	-5.5	-5.8	-2.3	0.2	3.6	6.7	4.4	1.7	-2.0	-6.6	-11.4	-11.4
RELATIVE HUMIDITY (%)													
Mean at 0900UTC	13.7	12.6	11.0	8.3	3.3	0.3	0.0	0.1	1.2	3.8	9.5	12.5	76.3
Mean at 1500UTC													
SUNSHINE (Hours)													
Mean daily duration	80.5	74.6	70.5	64.4	63.3	65.1	68.0	68.2	69.2	75.2	80.5	83.1	71.9
Greatest daily duration													
Mean no. of days with no sun	1.6	2.3	3.2	5.1	5.8	5.2	4.5	4.5	3.9	2.9	2.0	1.4	3.5
RAINFALL (mm)													

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Year
Mean monthly total	102.3	76.2	78.7	59.2	64.8	69.8	65.9	82.0	75.6	104.9	94.1	104.0	977.6
Greatest daily total	38.2	29.4	28.1	40.2	25.0	40.6	39.5	51.0	52.3	36.9	26.9	41.2	52.3
Mean num. of days with >= 0.2mm	20	16	19	16	16	15	16	18	16	20	20	19	211
Mean num. of days with >= 1.0mm	16	12	14	11	12	11	12	13	12	16	15	15	159
Mean num. of days with >= 5.0mm	8	5	5	4	4	4	4	5	4	7	6	7	63
WIND (knots)													
Mean monthly speed	10.3	10.2	10.0	9.0	8.9	8.5	8.5	8.2	8.4	9.2	9.1	9.4	9.1
Max. gust	75	80	65	62	59	51	52	55	62	71	66	83	83
Max. mean 10-minute speed	52	46	44	40	37	37	38	35	40	47	41	57	57
Mean num. of days with gales	1.7	0.9	0.8	0.3	0.2	0.1	0.0	0.1	0.1	0.6	0.7	1.2	6.7
WEATHER (Mean No. of Days With:)													
Snow or sleet	2.3	2.3	1.4	0.5	0.0	0.0	0.0	0.0	0.0	0.0	0.1	1.3	8.0
Snow lying at 0900UT	0.6	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.9
Hail	3.6	3.3	3.4	2.2	1.2	0.1	0.1	0.1	0.3	0.9	1.1	2.4	18.6
Thunder	0.9	0.5	0.4	0.3	0.5	0.5	0.8	0.4	0.2	0.4	0.4	0.5	5.7
Fog	3.3	2.0	2.1	1.9	1.5	1.4	1.4	2.0	2.9	2.9	3.9	4.2	29.6

8.3.3 Potential Climate Impacts and Associated Mitigation Measures

8.3.3.1 'Do-Nothing' Effect

If the proposed development were not to proceed, there would be no change to existing climate conditions in the area.

8.3.3.2 Operational Phase

The use of machinery during the operation of the quarry may result in the emission of greenhouse gases. Operations such as the transport of equipment and materials as well as rock breaking are typical examples of machinery use. This impact is considered to be negligible given the insignificant quantity of greenhouse gases that are emitted if any over the 'Do Nothing' scenario.

8.3.3.3 Reinstatement Phase

The proposed quarry will be reinstated with extracted layers of soil and overburden to allow natural re-vegetation to occur. This is expected to have a permanent moderate positive impact.

8.3.3.4 Cumulative Impact

The operation of the quarry and farming operations in the vicinity of the site, and the construction of the projects identified in Section 2.4 of this EIAR, will require plant items which consume fossil fuels and therefore will lead to a minor emission of greenhouse gases cumulatively. However, given the small-scale farming operations, short term construction projects, and proposed mitigation measures for the quarry development, the cumulative impacts are likely to be negligible.

8.3.3.5 Mitigation Measures

As the proposed quarry will have no negative impacts on climate, mitigation measures are not proposed other than all construction machinery and plant will be maintained in good operational order while on-site and damping down of the operational areas will be carried out to reduce dust emissions, minimising any emissions that are likely to arise.

8.3.3.6 Residual Impact

There will be a **permanent, negligible impact** on climate associated with the proposed project.

8.3.3.7 Significance of Effects

Based on the analysis above there will be **no significant effects** on climate associated with the development.

9. NOISE AND VIBRATION

9.1 Introduction

This chapter describes the potential noise and vibration impact of the proposed development. The construction and operational phases have been assessed. The restoration phase will not have any noise sources and so this is scoped out of this assessment.

9.1.1 Statement of Authority

This chapter of the EIAR has been prepared by the following staff of AWN Consulting Ltd:

Mike Simms

Mike Simms (Senior Acoustic Consultant) holds a BE and MEngSc in Mechanical Engineering, and is a member of the Institute of Acoustics and of the Institution of Engineering and Technology. Mike has worked in the field of acoustics for over 19 years. He has extensive experience in all aspects of environmental surveying, noise modelling and impact assessment for various sectors including, wind energy, industrial, commercial and residential.

9.1.2 The Proposed Development

Coshla Quarry at Barretspark near Athenry, Co Galway has operated since 2007. It is proposed to extend the existing quarry horizontally to the east, north and south of the existing extraction area It is also proposed to maintain landscape bunding up to 3 metres in height in selected areas around the site, which will also act as a barrier to noise propagation from the site. A detailed description of the proposed development is provided in Chapter 4 of this EIAR.

9.2 Methodology

The scope and methodology of this noise and vibration assessment was defined by the most relevant best practice and guidance documents. These primarily included:

- EPA Environmental Management Guidelines (2006): Environmental Management in the Extractive Industry (Non-Scheduled Activities);
- IEMA Guidelines for Environmental Noise Impact Assessment, 2014;
- ISO 1996 – Acoustics Description, Measurement and Assessment of Environmental Noise, Part 1 (2016) & Part 2 (2017);
- BS 5228: 2009 & A1 2014 – Code of Practice for Noise and Vibration Control on Construction and Open Sites – Part 1: Noise;
- BS 5228: 2009 & A1 2014 – Code of Practice for Noise and Vibration Control on Construction and Open Sites – Part 2: Vibration; and
- EPA (2016) Guidance Note for Noise: Licence Applications, Surveys and Assessments in Relation to Scheduled Activities (NG4).
- Draft Guidelines on the information to be contained in Environmental Impact Assessment Reports, August 2017.

In general, the following methodology was followed:

- Measurement of baseline noise information and identification of nearest Noise Sensitive Receptors NSR's.
- Identification of existing and proposed noise sources.
- Prediction of the likely impact on the nearest noise sensitive receptors for the proposed phases.
- Rating of the predicted impact and comparison against relevant assessment criteria and,
- Recommendation of mitigation measures if required.

This outline methodology is described in more detail in the following sections.

9.2.1 Baseline Noise Survey

The quarry will operate during daytime hours only. Baseline noise monitoring was carried out during representative daytime periods at selected noise sensitive receptors in proximity to the development. A description of measurement locations and the measured results are described in more detail in Section 9.3.

9.2.1.1 Measurement Locations

Three measurement locations were selected in order to obtain a representative baseline noise levels at noise sensitive locations, in this case houses, in the vicinity of the quarry extraction area. A figure showing the locations (Figure 9-1) and a table describing the measurement locations are provided below.

Table 9.1 Noise Monitoring Locations

Location Reference	Description
NML 1	At the entrance to the curtilage of a house located at a distance of approx. 360m due east from the south-east corner of the site.
NML 2	Adjacent to a house on a local road, at a distance of 880m northwest of the entrance to Coshla Qaurry
NML 3	At the edge of a local road near houses on Lisheenkyle East. Noise measurements were carried out here in an attempt to reduce the influence of noise from the M6 motorway.

In addition to the above as a condition of planning, quarterly operational noise monitoring is undertaken at selected locations in proximity to the quarry. These locations are referenced as A, D and E in Figure 9-1.

Figure 9-1 Noise Monitoring Locations NML1, NML2 and NML2 and IPC Monitoring Locations A, D, and E

9.2.1.2 Survey Periods

An attended noise survey was undertaken to obtain typical baseline noise levels at noise sensitive locations surrounding the site on the 10th December 2018. Measurements were carried out on a cyclical basis with measurement durations of 15 minutes over three rotations.

9.2.1.3 Instrumentation and Setup

The measurements were made using a Brüel & Kjaer type 2250 Light Logging integrating Sound Level Meter. This instrument is a Class 1 instrument in accordance with IEC 651 regulations. The Time Weighting used was Fast and the Frequency Weighting was A-weighted as per IEC 651.

The instrument was calibrated with a Brüel & Kjaer Type 4231 calibrator prior to and after the measurement period. The microphone was protected using a proprietary Brüel and Kjær windshield. The sound level meter was mounted on a tripod approximately 1.5 metres above ground level and at least 3 metres away from any reflective surfaces.

Factory calibration certificates for the noise level meter and acoustic calibrator, detailing equipment serial numbers are presented in Appendix 9.1 of this report. A glossary of noise related terms is presented in Appendix 9.2. The survey results were noted onto a Survey Record Sheet immediately following each sample and were also saved to the instrument memory for later analysis. Survey personnel noted the primary sources contributing to noise build-up during the survey.

9.2.1.4 Measurement Parameters

Several parameters were measured in order to interpret the noise levels. These included the following;

- L_{Aeq} This is the equivalent continuous A weighted sound pressure level. It is an average of the total sound energy (noise) measured over a specified time period.
- L_{A90} Noise level exceeded for 90% of measurement period (steady underlying noise level).
- L_{A10} Noise level exceeded for 10 % of measurement period. It is typically a descriptor of traffic noise.
- L_{Amax} Maximum A weighted noise level measured.
- L_{Amin} Minimum A weighted noise level measured.

The "A" suffix denotes that the sound levels have been "A-weighted" in order to account for the non-linear nature of human hearing. The "F" suffix denotes that the parameter has been measured with 'Fast' time-weighting applied. All sound levels in this report are expressed in terms of decibels (dB) relative to $2x10^{-5}$ Pascal (pa).

9.2.1.5 Meteorological Conditions

Meteorological conditions were dry, mild with light winds not exceeding 5 meters per second (ms-1) at any time during the survey. A hand-held anemometer and temperature probe were used to determine wind speed and temperature during each reading.

9.2.2 Assessment Criteria

9.2.2.1 Construction Phase

There are no mandatory noise limits for construction noise in Ireland. Account must be taken of the technical feasibility of the proposed project, and the trade-off between the noise level, and the duration of the noise exposure when setting criteria for construction noise. The following guidance was consulted:

- Construction noise: National Roads Authority "Guidelines for the Treatment of Noise and Vibration in National Road Schemes, October 2004" (NRA Noise Guidelines).
- BS 5228-1&2:2009 & A1 2014 Parts 1 & 2, Code of Practice for noise and vibration control construction and open sites.
- EPA Environmental Management Guidelines (2006): Environmental Management in the Extractive Industry (Non-Scheduled Activities);

These noise limit thresholds adopted for the purpose of this assessment are outlined BS5228 and presented in Table 9.2.

Table 9.2 Threshold of Significant effect at Dwellings

Assessment category and threshold Value Period (LAeq)	Threshold value in decibels (dB)		
	Category A	Category B	Category C
Night-time (23.00 – 07.00)	45	50	55
Evening and Weekends	55*	60	65
Daytime (07.00 – 19.00) and Saturdays (07.00-13.00)	65	70	75

Category A: threshold values to use when ambient noise levels (when rounded to the nearest 5 dB) are less than these values.
Category B: threshold values to use when ambient noise levels (when rounded to the nearest 5 dB) are the same as Category A values.
Category C: threshold values to use when ambient noise levels (when rounded to the nearest 5 dB) are greater than Category A values.

The table can be used as follows: for the appropriate period (night, evening/weekends or day), the ambient noise level is determined and rounded to the nearest 5 dB. This is then compared with the total noise level, including construction. If the total noise level exceeds the appropriate category value, then a significant effect is deemed to occur. Given the location of the proposed berms and the existing quarry operational noise, it is considered appropriate to adopt the L_{Aeq} noise limit threshold value of 65dB(A).

It should be noted that temporary works associated with the construction of earth berms and other 'construction' elements will be permitted to generate noise levels typically 10 to 15dB(A) above the standard operational noise limit due to their temporary nature and overall benefit gained by the works. This is acknowledged in the EPA Environmental Management Guidelines (2006): *Environmental Management in the Extractive Industry* where it states:

> *It is also appropriate to permit higher noise ELV's (Environmental Limit Values) for short-term temporary activities such as construction of screening bunds, etc., where these activities will result in a considerable environmental benefit.*

9.2.2.2 Construction Phase – Vibration

There is no published Irish guidance relating to vibration during construction activities. Common practice in Ireland has been to use guidance from internationally recognised standards. Vibration standards come in two varieties: those dealing with human comfort and those dealing with cosmetic or structural damage to buildings. In both instances, the magnitude of vibration is expressed in terms of Peak Particle Velocity (PPV) in millimetres per second (mm/s).

The National Roads Authority recommends that vibration from road construction activities be limited to the values set out in Table 9.3 in order to ensure that there is no potential for vibration damage during construction. These values have been derived through consideration of the various standards discussed above; compliance with this guidance should ensure that there is little to no risk of even cosmetic damage to buildings.

Table 9.3 Allowable vibration in order to minimise the risk of building damage

Allowable vibration velocity (Peak Particle Velocity) at the closest part of any sensitive property to the source of vibration, at a frequency of		
Less than 10Hz	10 to 50 Hz	50 to 100Hz (and above)
8 mm/s	12.5 mm/s	20 mm/s

Vibration is perceptible at around 0.5mm/s and may become disturbing or annoying at higher magnitudes in the case of nominally continuous sources of vibration such as traffic. However, higher levels of vibration are typically tolerated for single events or events of short duration.

No significant vibration is anticipated from the construction of the landscape berms and concrete batching plant.

9.2.2.3 Extraction Phase – Noise

The EPA document notes the following in relation to recommended Emission Limit Values (ELV's) for quarry sites:

In relation to quarry developments and ancillary activities, it is recommended that noise from the activities on site shall not exceed the following ELV's at the nearest noise sensitive receptor.

Daytime	(08:00hrs to 20:00hrs)	55dB $L_{Aeq,(1\ hour)}$
Night-time	(20:00hrs to 08:00hrs)	45dB $L_{Aeq,\ (1\ hour)}$

This document also states that *95% of all noise levels shall comply with the specified limit value(s). No noise level shall exceed the limit value by more than 2 dBA.*

This Guidance acknowledges the variability of operational intensity from time to time.

The existing facility operates under a grant of planning from An Bord Pleanála and Condition 14 of planning permission relates to noise and states the following:

During the operational phase of the proposed development, the noise level from within the boundaries of the site measured at noise sensitive locations in the vicinity, shall not exceed

(a) *an L_{AT} value of 55 dB(A) during 0800 and 1800 hours. The T value shall be one hour*

(b) *an L_{AeqT} value of 45 dB(A) at any other time. The T value shall be 15 minutes. Night time emissions shall have no tonal component.*

Reason: In the interest of residential amenities.

This limit is in line with that set out in EPA Guidelines. There are no current or proposed night-time operations for the development.

9.2.2.4 Additional Vehicular Activity on Public Roads

There are no specific guidelines or limits relating to traffic related sources along the local or surrounding roads. Given that traffic from the development will make use of existing roads already carrying traffic volumes, it is appropriate to assess the calculated change in traffic noise levels that will arises as a result of vehicular movements associated with the proposed development. To assist with the interpretation of the noise associated with additional vehicular traffic on public roads, it is proposed to adopt guidance from the UK document Design Manual for Roads and Bridges[1] (DMRB).

Table 9.4 taken from Section 3.54 of DMRB presents guidance as to the likely impact associated with any long-term change in the traffic noise level (dB $L_{A10,18hr}$) at a noise sensitive receiver. Table 9.5 shows how the significance is determined.

Table 9.4 Likely Impacts Associated with Change in Traffic Noise Level (Source DMRB, 2019)

Long Term Noise Change dB $L_{A10,18hr}$	Long Term Magnitude
0	No Change
0.1 – 3.0	Negligible
3.0 – 4.9	Minor
5.0 – 9.9	Moderate
≥10	Major

Table 9.5 Initial Assessment of operational noise significance (Source DMRB, 2019)

Significance	Short term magnitude of change
Significant	Major
Significant	Moderate
Not significant	Minor
Not significant	Negligible

The DMRB guidance outlined above will be used to assess the predicted increases in traffic levels on public roads associated with the proposed development and comment on the likely impacts.

9.2.2.5 Vibration

Currently, blasting is undertaken periodically at the site within the extraction area. This practice will continue for the proposed extraction phases. Blasting has the potential to generate ground and air borne vibrations, measured as peak particle velocity and air overpressure. Both are managed by setting vibration limits designed to minimise nuisance and prevent structural damage.

9.2.2.5.1 *Peak Particle Velocity*

Peak Particle Velocity is defined as a measure of the velocity of vibration displacement in terms of millimetres per second (mm/s).

Under the quarry's current permission, a vibration limit of 12mm/s PPV at the nearest sensitive building applies to blasting. This limit is in line with that set out in the DoEHLG and EPA Guidelines.

[1] *Design Manual for Roads and Bridges, LA 111 Noise and Vibration Revision 1,* Highways England, 2020

9.2.2.5.2 *Air Overpressure*

Air overpressure (AOP) is the pressure wave in the atmosphere produced by the detonation of explosives. This consists of both audible (noise) and inaudible (concussion) energy. It is generally expressed as dB (Lin).

Under the quarry's current permission, an AOP limit of 125dB Lin at the nearest sensitive building applies to blasting. This limit is in line with that set out in in the DoEHLG and EPA Guidelines.

9.3 Existing Environment

The site is an operational quarry in the townland of Barrettspark, Co Galway. It is bounded to the north, south and east by agricultural land. The R339 road runs east-west at a distance of 1.2 km from the northern boundary. The M6 motorway runs east-west at a distance of approximately 165m from the southern boundary. A smaller quarry operation lies to the east with agricultural land beyond.

Depending on the measurement location, the existing noise environment of the general area is dominated by the traffic on the M6, traffic on the local road network, agricultural plant and machinery working the land and the operation of the Coshla quarry.

The house at the southern boundary of the site has been unoccupied for a number of years is not considered noise-sensitive in this assessment. The house is not currently in a habitable condition.

9.3.1 Results of Baseline Survey

The results of the baseline noise survey are described in the following sections.

9.3.1.1 Noise Monitoring Location 1 (NML 1)

Table 9.6 presents a summary of the baseline noise levels measured at NML 1.

Table 9.6 Noise Survey Results at NML 1

Start Time	Duration minutes	Measured Noise Levels [dB re. 2x10-5 Pa]			
		LAeq	LAmax	LA10	LA90
11:48	15	49	60	51	47
13:07		51	63	53	50
14:09		53	70	54	51

The dominant source of noise survey the survey periods was traffic on the M6 motorway. The quarry was in full operation during each of the measurement periods. Other audible noise sources included occasional local traffic movements, bird song and dogs barking.

The measured noise level ranged from 49 to 53 dB(A). The background noise level ranged from 47 to 51dB(A). Activity at the quarry generally not did not contribute to the noise levels at this location, though a small number of impulsive noises originating from a point west of the quarry were audible.

9.3.1.2 Noise Monitoring Location 2 (NML 2)

Table 9.7 presents a summary of the baseline noise levels measured at NML 2.

Table 9.7 Noise Survey Results at NML 2

Start Time	Duration minutes	Measured Noise Levels [dB re. 2x10-5 Pa]			
		LAeq	LAmax	LA10	LA90
12:11	15	47	67	48	45
13:28		47	58	48	46
14:30		47	60	48	46

Activity within the quarry, including a siren sound was audible but traffic on the M6 motorway was the dominant source of noise. HGV movements to and from the quarry were also audible, along with local vehicle movements.

The total noise level measures were of the order of 47dB(A) and the under lying background noise level ranged from 45 to 56dB(A).

9.3.1.3 Noise Monitoring Location 3 (NML 3)

Table 9.8 presents a summary of the baseline noise levels measured at NML 3.

Table 9.8 Noise Survey Results at NML 3

Start Time	Duration minutes	Measured Noise Levels [dB re. 2x10-5 Pa]			
		LAeq	LAmax	LA10	LA90
12:48	15	63	87	59	41
13:50		66	88	64	43
14:52		68	93	65	43

This location was positioned near a larger group of houses along a local road, at a distance of approximately 850m from the M6 motorway. Audible noise sources include traffic noise from west of the measurement position, birdsong, dogs barking, local vehicle movements and aircraft movements. A degree of noise from the M6 was audible.

The total noise level measured ranged from 63 to 68 dB(A) and the under lying background noise level ranged from 41 to 43 dB(A).

9.3.2 Historical Compliance Noise Surveys

BHP Ltd has been commissioned by Coshla Quarries Ltd to undertake quarterly noise surveys at their quarry facility at Coshla, Co. Galway. The relevant conditions of planning permission for the facility place a daytime noise limit of 55dB(A) at the nearest sensitive receptors. Noise monitoring is required for a period of 15 minutes at each of these locations on a quarterly basis.

Results of previous surveys have been provided by Coshla Quarries Ltd for information purposed and the results of a selection of historic surveys (Q3 2016 to Q2 2018) are presented in Table 9.9.

Table 9.9 Summary of Previous Compliance Noise Survey Results

Location	Measured Noise Levels [dB re. 2x10-5 Pa]															
	2016 Q3		2016 Q4		2017 Q1		2017 Q2		2017 Q3		2017 Q4		2018-Q1		2018-Q2	
	LAeq	L90	LAeq	L90	LAeq	L90	LAeq	L90	LAeq	L90	LAeq	L90	LAeq	L90	LAeq	L90
A	45	43	46	44	51	47	50	47	44	40	43	48	52	46	50	42
D	51	39	54	47	51	47	51	44	50	43	53	45	52	47	50	43
E	42	36	41	46	44	41	50	34	38	34	38	32	45	42	45	34

Observations documented in the compliance reports identify background traffic and quarry noise as significant contributors to the noise levels at Location A. At Locations B and C activity at the quarry was audible to a lesser degree. HGV movements to and from the site were noted.

There is some variability across the measured noise levels. This reflects the variability of noise emissions from the site. The discussion within all compliance reports prepared for the development for the previous four years has concluded that the quarry was operating within the relevant daytime noise criterion of 55 dB $L_{Aeq,1\text{-}hour}$. No measured or audible tonal content was reported at any location.

9.4 Predicted Impacts

This section describes and assesses the potential noise and vibration impact from the operation of the proposed development. The main noise sources associated with the proposed extraction activities are identified and their impact at the nearest residential properties is assessed. The noise emission values are compared against existing noise levels and the noise limit criteria as described in Section 9.2.2.3.

9.4.1 Construction Phase Noise

9.4.1.1 Landscape Bunds

The proposed development includes construction of landscape bunding at along the southern, eastern and northern boundaries of the extended quarry area, to provide visual and acoustic screening. This will typically involve heavy earth moving machinery such as a track machine and/or a back-hoe loader and material transport trucks. Noise levels from such machinery operating simultaneously is typically 81dB(A) at 10m, which extrapolates out to 50dB(A) at 360m which is the closest distance between a berm and dwelling. This is a worst-case scenario, as it assumes direct line of site to the receiver over

hard ground and that all plant will be in operation simultaneously for 100% of the time, which would not be the case as all plant items will not operate continuously over a full working day. Therefore, predicted typical construction noise levels are unlikely to exceed the threshold values set out in Table 9.2.

9.4.1.2 Existing Quarry Machinery

As the proposed development is to continue extracting at the same quarry pit, there is no proposal to construct additional batching plant, conveyors or silos. Therefore, there is no environmental noise impact due to the construction of quarry machinery.

9.4.1.3 Significance of Effects

The expected construction phase noise effects at the nearest NSR's to the site are summarised as follows:

Negative Quality, Not Significant and of Temporary Duration.

9.4.2 Construction Vibration

Significant vibrations are not expected from the types of equipment to be used, i.e. backhoe loader and/ or track machine and dumper. There will be no significant vibration associated with the construction and activities.

9.4.2.1 Significance of Effects

The expected construction phase vibration effects at the nearest NSR's to the site are summarised as follows:

Neutral Quality, Imperceptible and of Temporary Duration.

9.4.3 Operational Phase Noise

The main sources of noise are extraction, processing of rock through crushing and screening on the quarry floor, the transport of material along the haul routes, the processing of stone at the concrete batching plant and then the export of product off site.

Processing plant and mobile equipment will be located close to the working face of the quarry when used within the site. The existing primary crushing and screening plant will be at the quarry floor.

Potential noise impacts are associated with the following:

- Drilling and blasting of rock;
- Breaking of oversize rock;
- Crushing plant;
- Screening of crushed rock into various aggregate sizes;
- Stockpiling of product,
- Loading of product and transport off-site;
- Additional traffic along public roads
- Concrete making (batching plant)

Quarry activities are assessed as on-site activities and off-site activities. The on-site activities generally refer to the processing of extracted rock with the quarry bounds and off-site activities refers to the

transport of processed product to customers. Both activities are assessed separately in the following sections.

9.4.3.1 On-Site Activities

Over the course of the different excavation phases, the location of on-site activities will vary resulting in a range of noise levels at the nearest noise sensitive locations around the site. At the start of each extraction area, noise levels are expected to be highest. As the excavation area is extracted further towards the quarry floor, the activities will be further shielded from adjacent properties by the quarry face. Therefore, the existing scenario has the highest noise emission levels at NSL's. Therefore, the operation of plant items in the proposed extraction area will typically result in predicted noise emissions lower than or equal to those associated with existing quarry operations.

The plant items and machinery expected at proposed for the concrete batching plant are as follows:

- Dump Trucks;
- Feed Hopper;
- Conveyors;
- Concrete Mixer Unit; and
- Concrete Trucks (Loading of product and transport off-site).

In order to assess the potential noise impacts associated with the proposed phases within the Planning Application Area, a noise model of the site has been developed. The model has been developed using DGMR acoustic modelling software (iNoise, version 2019). This is a quality-assured acoustic modelling package for computing noise levels in the vicinity of different types of noise sources. For the quarry model, the calculation standard used is the ISO 9613 (1996) Standard *Acoustics: Attenuation of Sound during Propagation Outdoors.* Part 2: *General Method of Calculation.*

The model takes account of the various factors affecting the propagation of sound in accordance with the standard, including:

- The magnitude of the noise source in terms of sound power;
- The distance between the source and receiver;
- The presence of obstacles such as screens or barriers in the propagation path;
- The presence of reflecting surfaces;
- The hardness of the ground between the source and receiver;
- The attenuation due to atmospheric absorption; Meteorological effects such as wind gradient, temperature gradient and humidity (these have significant impact at distances greater than approximately 400m).

Source data for operating quarry plant items have been obtained from on-site measurements and BS 5228: Part 1(Noise). This document provides sound power data per octave band which can be used for individual source items. Table 9.10 summaries the noise source data used in the model with all source data is corrected to 10m. The dominant noise sources identified on site were used for modelling purposes.

Table 9.10 Noise Source Data used for Noise Model

Site Activity	Noise Level at 10m [dB(A)]	Source Reference data
Concrete Batching Plant	78	BS5228 D6.10
2 Loading silo/hopper	69	BS5228 C10.22
Excavator Mounted Rock Breaker	93	BS5228 C9.11
Loaders	85	BS5228 C9.23
Transformer	39	Bies&Hansen, 10.16[2]
Crushers (2 no.)	90	BS5228 C9.14
Screeners (3 no)	81	BS5228 C10.14
HGV Movement[1]	79	BS5228 C2.30
Dozer[1]	79	BS5228 C2.11
Tracked Excavator[1]	71	BS5228 C2.21

1 These noise sources have been added to the Barretstown Park quarry in-fill site (19/325) to the east of the Coshla Quarry Site

The modelling of quarry noise emissions is complex. There are fixed and mobile noise sources. The intensity of quarry operations can vary depending on demand. There are varying contours, elevations and landform screening across the site. There are numerous buildings of varying height which can act as barriers to the propagation of sound in some directions. Stockpiles of sand, gravel and stone which can also act as barriers to noise propagation shift and move over time.

The model takes account of the 'on-time' of equipment over a typical operational day, as a worst case assessment, each item of equipment operating on the quarry floor is assumed to be operational for 80% of the working day, with the exception of breaker which is assumed to operate for 50% of the on-time.

For the concrete batching facility, the noise model assumed an on-time of 100% for fixed plant with 12 dumps trucks feeding into the hopper per hour and 24 HGV trips to and from site per hour.

A noise model for the proposed development has been developed using OS mapping, ground contour data and source data. A total of 16 noise sensitive receptor (NSR) locations have been modelled. These are illustrated in Figure 9-2. These NSR's represent the closest noise sensitive receptors to the extraction area and are residential dwellings.

[2] *Bies, Hansen and Howard: Engineering Noise Control, 5th Ed, 2018.*

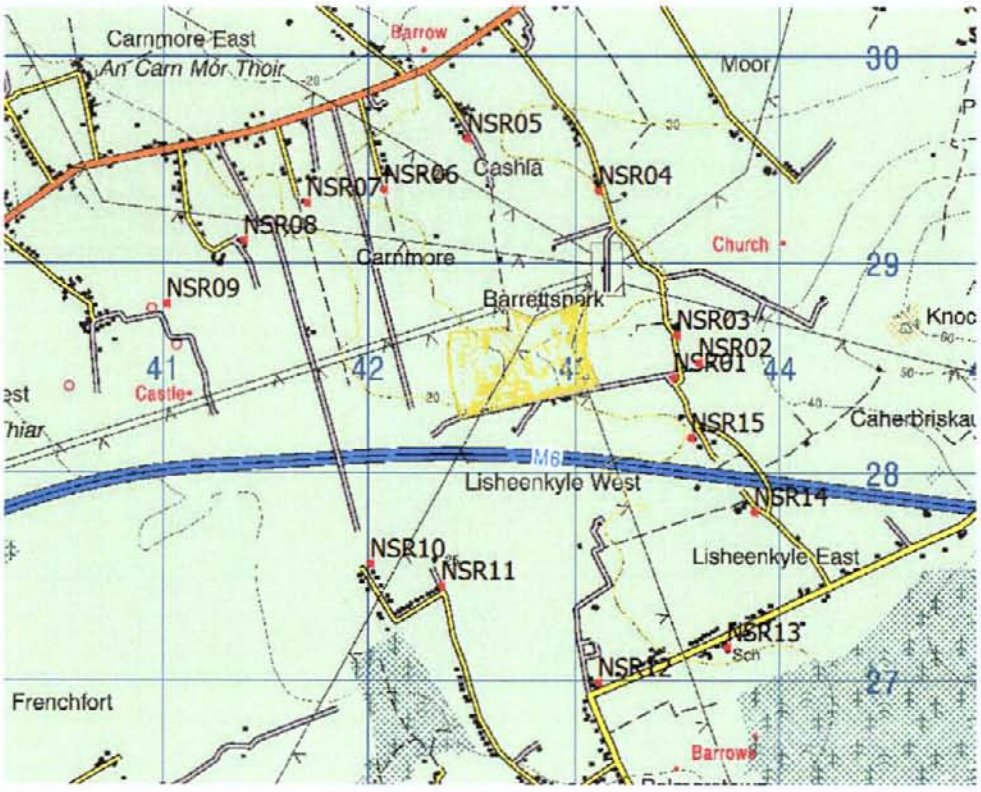

Figure 9-2 Modelled Noise Sensitive Receptors

9.4.3.1.1 Results

The results of the noise propagation models are presented in the following Section. Equipment modelled on the quarry floor include a tracked semi mobile crushing and screening plant, drill rig, excavator mounted rock breaker and front shovel loader.

The model has included for the proposed landscaping berms to be incorporated into the site design for the future extraction phases. These will include landscaped berms at selected locations north west, north and northeast of the extraction area perimeter. These will be formed prior to any proposed extraction works occurring in this area. The berms have been modelled at a height of 3m above ground level. Please refer to Chapter 3 of the EIAR for further details on the proposed boundary treatments.

A noise contour plot calculated to a height of 1.5m is presented in Appendix 9-3.
The specific noise levels calculated at the nearest noise sensitive locations for each of the assessed phases are summarised in Table 9.11. The results are calculated to a height of 1.5 m.

Table 9.11 Calculated noise levels for future operating scenarios

Location	Predicted Daytime Noise Levels from proposed Extraction Activities [dB $L_{Aeq, T}$]
NSR 1	50
NSR 2	50
NSR 3	50
NSR 4	49
NSR 5	44
NSR 6	43
NSR 7	43
NSR 8	42
NSR 9	42
NSR 10	45
NSR 11	46
NSR 12	38
NSR 13	42
NSR 14	44
NSR 15	48

On review of the modelling results presented in Table 9.11, the operational noise levels associated with the proposed extraction works as part of this planning application are within the operation noise criterion of 55 dB L_{Aeq} at all NSR's.

Note that these noise predictions include the cumulative operational noise of the neighbouring site, which has applied for planning permission for use as a quarry reclamation site.

A discussion on best practice noise mitigation measures and practices to prevent negative noise impacts at the NSR's are included in Section 9.6.

9.4.3.1.2 Significance of Effects

The expected operational phase noise effects at the nearest NSR's to the site are summarised as follows:

Negative Quality, Not Significant and of Long-Term Duration.

9.4.3.2 Off Site Activities (Traffic)

There will be additional traffic along public roads as a result of the proposed development. Please refer to Chapter 12 for full details in relation the traffic assessments prepared for the development. Based on traffic flow values presented therein for the Existing Development and Proposed Development scenarios, the changes in traffic noise levels have been calculated for the opening year 2020 and the design year 2040 and are shown in Table 9.12

Table 9.12 Predicted changes in traffic noise level

Year	Time Period	Road Link	Change in traffic flow (%)	Change in noise level, dB(A)
2021	AM peak hour	R338 (east)	1%	0.1
		L7109 (to quarry)	7%	0.3
		R338 (west)	0%	0.0
	PM peak hour	R338 (east)	2%	0.1
		L7109 (to quarry)	12%	0.5
		R338 (west)	2%	0.1
2036	AM peak hour	R338 (east)	2%	0.1
		L7109 (to quarry)	9%	0.4
		R338 (west)	1%	0.0
	PM peak hour	R338 (east)	3%	0.1
		L7109 (to quarry)	16%	0.6
		R338 (west)	2%	0.1

9.4.3.2.1 *Significance of Effects*

The expected noise and noise effects in relation to off-site activities can be summarised as follows:

Negative quality, Negligible and of Long-Term duration.

9.4.4 Vibration

As part of the continuation operations, blasting will be undertaken periodically at the site within the proposed extraction areas. As noted in Section 9.2.2.5 the existing quarry has been significantly quarried historically using blast techniques. There is no change proposed to the current blasting procedure associated with the proposed continuation operations and future extraction. In line with the current best practice operations and conditions of planning at the site, all blasts will be designed to ensure the PPV limit of 12mm/s and AOP of 125dB Lin is not exceeded at the nearest sensitive dwellings.

9.4.4.1 Significance of Effects

The expected operational phase vibration effects at the nearest NSRs to the site are summarised as follows:

Negative quality, Slight and of Brief duration.

9.5 Mitigation Measures

9.5.1 Construction Phase Noise

Typical construction noise thresholds are not expected to be exceeded therefore no specific mitigation measures are proposed. However, best practice in accordance with BS 5228 should be adhered to.

9.5.2 Construction Phase Vibration

There will be no significant vibrations from the construction of the landscape berms, therefore no mitigation measures are required.

9.5.3 Operational Phase Noise

This noise impact assessment has been carried out using worst case scenario assumptions. As mentioned earlier the noise emissions from the quarry will vary depending on the intensity of quarry operations and there will be times when the noise emissions predicted herein will be lower. The construction of an earth berm on the south, east and northern sides of the excavation area will serve to reduce noise emissions to the surrounding area.

The calculated noise levels at the nearest noise sensitive locations to the quarry for the two phases do not exceed the recommended operational criterion adopted for the quarry. Notwithstanding this, best practice noise mitigation measures will form part of site management practices to ensure noise from on-site operations do not cause a noise nuisance at the nearest NSR, the following measures are recommended:

- Regular maintenance of items of plant to ensure that they are operating efficiently;
- Location of noisy items of plant at the lowest part of the working quarry floor and as close to the quarry face as possible to provide optimum noise screening;
- Design of internal haul roads with as low a gradient as possible to minimise excessive revving of vehicle engines travelling on-site.
- Regular maintenance of haul routes to avoid potholes and uneven surfaces;
- Avoiding unnecessary revving of engines, reducing speed of vehicle movement and keeping lorry tailgates closed where possible;
- All mobile equipment is throttled down or switched off when not in use;
- Use of rubber linings in chutes, dumpers, transfer points etc. to reduce the noise of rock falling on metal surfaces;
- Using simple baffles around washing drums, rubber mats around screening and crushing plants;
- Enclosing pumps, covering conveyors, cladding the plant and keeping noise control hoods closed when machines are in use;
- Within the constraints of efficient production, limiting the use of particularly noisy plant, limiting the number of items in use at any one time, starting plants one-by-one and switching off when not in use, and;
- Pointing directional noise away from sensitive areas where possible.

9.5.4 Operational Phase Vibration

Review of historical vibration monitoring during blasting operations has confirmed that the relevant vibration limits applied for this activity can be complied with. As noted above, ongoing blasts will be designed to ensure these limits are not exceeded for future blasts. In line with best practice measures, the following will form part of the blast design process:

- Laser profiling will be conducted to establish an accurate geometry of the quarry face, thereby enabling the optimum burden and spacing to be applied for the blast;
- Ensure that the optimum blast ratio is maintained and the maximum amount of explosive on any one delay, the 'maximum instantaneous charge' is optimised so that the ground vibration levels are kept below those specified;
- Explosive charges are properly and adequately confined by using a sufficient quality of aggregates for stemming;
- No blasting is carried out at weekends or public holidays;
- All blasts are measured (ground vibration & air overpressure) in the area of at least two sensitive receptors to ensure compliance with the appropriate limits;
- Notice of all blasts given to local residents prior to the blast taking place;
- Continue to adapt the monitoring requirements during blasting in line with existing conditions.
- All monitoring equipment calibrated regularly to ensure that peak particle velocity and air overpressure generated from each blast is accurately measured; and,
- Blasting is carried out by professionally trained blast engineers.

9.6 Residual Impacts

The residual extraction phase impacts associated with the proposed extraction works are not predicted to increase above existing noise and vibration levels.

The expected noise and vibration effects for the operational phase can be summarised as follows:

Negative quality, Not Significant and of Long-Term duration.

9.7 Cumulative Impacts

The baseline noise survey measured existing noise levels at noise sensitive locations, in this case houses, in the vicinity of the quarry extraction area. This survey included noise generated by existing businesses and activities in the vicinity of the quarry. Therefore, noise from existing activities is considered cumulatively throughout this chapter. Likewise, anticipated noise generated by the proposed Barrettspark Quarry In-Fill project are considered cumulatively throughout the chapter.

Construction activity at the proposed battery storage facility will also require plant items which will generate some additional noise. These activities will result in short term, slight, negative effects on noise. There will be no significant cumulative effects between the proposed development and the construction phase of the proposed battery storage facility.

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10. LANDSCAPE AND VISUAL

10.1 Introduction

This chapter of the Environmental Impact Assessment Report (EIAR) addresses the potential landscape and visual impacts of the subject quarry extension at Coshla, Co. Galway. Coshla Quarries Limited is applying to Galway County Council for planning permission for an extension to the existing quarry and all associated site works including landscaping arrangements at Barrettspark, Athenry, Co. Galway.

The emphasis in this chapter is on the likely significant effects of the proposal. It covers the assessment methodology, a description of the subject development and the existing landscape as well as landscape policy and relevant guidance. It includes a description of Galway County Council's landscape policy and the landscape in which the subject development site is located.

The landscape in this area is described in terms of its existing character, which includes a description of landform, landcover, and landscape sensitivity to change. The potential effects of both landscape and visual terms are then assessed.

10.1.1 Statement of Authority

This section of the EIAR has been prepared by Audrey Williams and assisted by Joanna Mole. Audrey Williams is a Graduate Landscape Architect and Landscape and Visual Impact Assessment Specialist with McCarthy Keville O'Sullivan Ltd. with two years professional working experience in both private and educational teaching practices from Canada and Sweden. Before taking up her position with MKO, Audrey was a landscape architecture research assistant and course leader at the Swedish University of Agricultural Sciences in Sweden, and a landscape technician with HKLA in Canada.

Joanna Mole, is a Landscape and Visual Impact Assessment Specialist and Chartered Landscape Architect with McCarthy Keville O'Sullivan Ltd. with over 15 years of experience in both private practice and local authorities. Joanna holds a BSc (Hons) in Landscape Design and Plant Science from Sheffield University, a Postgraduate Diploma in Landscape Architecture from Leeds Beckett University and a MSc in Renewable Energy Systems Technology from Loughborough University. Joanna holds a chartered membership of the British Landscape Institute since 1998 and has been an examiner for the British Landscape Institute professional practice exam.

10.1.2 Subject Development and Site Description

The project site comprises approximately 27.5 hectares of land located within the townland of Barretstown Park, approximately 6.5 kilometres to the west of Athenry. The site consists of an existing, operational quarry with associated infrastructure. The subject quarry extension is on lands to the north, south and east of the existing quarry and the additional extraction area amounts to approximately 8.5 hectares. All of the subject extension area is within the same landholding boundary.

The historical development of the quarry site has resulted in the majority of the site management infrastructure being located in the west and north of the site, close to the entrance to the site, with the main quarrying and rock extraction occurring in the eastern side of the site. Quarrying and rock extraction has progressively moved further south and east from where it originally commenced. The large quarry floor area is used for the storage of quarried and graded aggregates in preparation for their sale and transport off-site.

The subject development also includes the development of a 5m wide earth berm around the north, south and eastern perimeter of the site which will provide a noise barrier and visual screen for residents to the north, south and east of the site. The berms will be constructed using overburden (soils & subsoils) removed from the subject extraction areas prior to the extraction of the quarry, as detailed in Chapter 3 of this report.

The subject quarry operations will include the following site related infrastructure which is similar to that used historically at the site:

- Site office which also includes toilet and shower, canteen and staff room;
- Machinery shed
- 2 no. concrete batching plants
- 2 no Loading silo/hopper
- 1 no. Wash down area
- 1 no. Mobile tracked excavator
- 2 no. Loading Shovels
- 2 no. crushers
- 3 no. screeners
- Wheel wash

It is not proposed to alter the existing infrastructure at the site or introduce any new methods of extraction or new types of plant items. The proposed development is intended to allow for the future use of the limestone resource using the existing site infrastructure, plant items and the methods used as part of the development of the quarry.

It is anticipated that the extraction within the quarry will take place over a 25-year period.

10.2 Methodology and Assessment Criteria

10.2.1 Guidelines

This section broadly outlines the methodology used to undertake the landscape and visual impact assessment of the subject extraction development, and the guidance used in the preparation of each section. There are four main sections to this assessment:

- Outline of guidance and methodology followed.
- Baseline – existing landscape, including policy, existing landscape character and sensitivity.
- Nature and visibility of the subject development.
- Assessment of potential impacts.

In 2000, the Department of the Environment and Local Government (DoELHG) published 'Landscape and Landscape Assessment: Consultation Draft of Guidelines for Planning Authorities', which recommended that all local authorities adopt a standardised approach to landscape assessment for incorporation into development plans and consideration as part of the planning process. This document remains in Draft.

Ireland signed and ratified the European Landscape Convention (ELC) in 2002. This introduced a pan-European concept that centres on the quality of landscape protection, management and planning. The Department of Arts, Heritage and the Gaeltacht has published a National Landscape Strategy for Ireland in 2015. The strategy aims to ensure compliance with the ELC and contains six main objectives, including undertaking a National Landscape Character Assessment and developing landscape policies.

Certain sections of this EIAR have been based on the landscape character assessment guidelines presented in the DoELHG document outlined above, but the landscape and visual impact assessment was carried out with reference to the Guidelines for Landscape and Visual Impact Assessment (GLVIA) published in the UK by the Landscape Institute/Institute of Environmental Management and Assessment, in 2013. A range of other guidelines were also consulted during the preparation of this landscape and visual impact assessment, which include:

- Guidelines for Landscape and Visual Impact Assessment (The Landscape Institute/Institute of Environmental Management and Assessment, UK, 2013).
- Photography and photomontage in landscape and visual impact assessment (Landscape Institute Advice Note 01/11, 2011).

- EPA Guidelines on the information to be contained on Environmental Impact Statements (EPA 2002).
- EPA Advice Notes on Current Practice in the preparation of Environmental Impact Statements (EPA, 2003).
- Draft Guidelines on the Information to be Contained in Environmental Impact Assessment Reports' (EPA, August 2017).
- Galway County Development Plan 2015-2021 (Galway County Council, 2015).

10.2.2 Baseline Landscape and Visual Information

As part of this assessment, an initial desk study was undertaken which identified relevant policies and guidelines, both at national and local level. This includes policies on landscape and landscape character, designated landscapes, and protected views. The site and study area are described in terms of landscape character types as identified in 'Landscape and Landscape Assessment: Consultation Draft of Guidelines for Planning Authorities' (DoELHG, 2000), while the surrounding landscape within 3 kilometres of the site is described with reference to landscape character as well as other landscape designations contained in the Galway County Council Development Plan. In addition, a field visit was undertaken to assess the landscape character and elements both on the site itself and in the wider landscape.

10.2.2.1 Scope and Definition of Landscape and Visual Impact (LVIA) Study Area

For the purposes of this EIAR, where the 'subject development site' or 'the site' is referred to in the LVIA, this relates to the primary study area for the subject development, as delineated in red on the EIAR figures (maps). The subject development site is discussed in some detail in terms of its landscape character.

However, the landscape and visual baseline mapping and viewpoint selection are based on a wider study area, consisting of all the area within 1 kilometre from the development site boundary. This area for which the baseline maps and viewpoint locations are produced and is referred to as the Landscape and Visual Impacts (LVIA) Study Area or 'study area'.

10.2.3 Assessing Potential Impacts

Clearly documented methods based on the GLVIA guidelines are used to arrive at an assessment. As part of these, landscape and visual sensitivity is considered balanced with the magnitude of the effect to assess the significance of likely landscape and visual effects.

10.2.4 Assessing Landscape Effects

The potential landscape effects of the subject development are informed by the nature of the proposal, a desk study and site visits. The methodology uses qualitative methods to arrive at an assessment which is based on the Landscape and Landscape Assessment (2000) guidelines as well as the GLVIA (2013). Landscape and Visual Impact Assessment, though related, can be described separately. Descriptions below are based on the GLVIA (2013).

10.2.4.1 Landscape Effects

This can be described as changes which affect the landscape as a resource. This includes how the proposal will affect the elements that make up the landscape, the aesthetic and perceptual aspects, and its landscape character. Landscape effects also relate to changes in the structure of the landscape. Under the GLVIA (2013), the assessment of likely significant effects on landscape receptors includes a judgement on both the sensitivity of the receptor as well as magnitude of the change.

10.2.4.2 Assessing Landscape Sensitivity

Landscape Sensitivity, which is described in the GLVIA (2013) as a combination of the landscape's susceptibility to change as well as the value attached to the landscape, is defined in Table 10-1 below. Susceptibility to change can be described as the ability of the landscape receptor (either the overall character or quality of the landscape, or a particular landscape feature), to accommodate the subject development without undue consequences for the maintenance of the baseline (existing) landscape situation, and/or the achievements of landscape planning policies and strategies. Landscape value is a combination of values which are assessed in the landscape baseline, combining any formal landscape designations with the criteria included in Table 10-1 below.

Table 10.1 Assessing Landscape Sensitivity

Susceptibility of landscape to change	Description and example criteria
High	Landscapes where the overall landscape character or condition is highly susceptible to change and where the landscape receptor has a low ability to accommodate the subject development without undue consequences for the maintenance of the landscape character and achieving planning policies/strategies. Other susceptible landscapes include those or areas with highly distinctive landscape features and clear cultural associations. Landscapes and landcover which shows low evidence of human influence can be more susceptible.
Medium	Landscapes where the overall landscape character has a moderate ability to accommodate the subject development without undue consequences for the maintenance of the landscape character and the achievement of planning policies/strategies. These landscapes may have locally distinctive landscape features and have local cultural or heritage associations. These landscapes tend to have some clear evidence of human influence and include land uses which result in variation and changes to the landcover.
Low	Landscapes where the overall landscape character has a strong ability to accommodate the subject development without undue consequences to the maintenance of its landscape character or the achievement of planning policies/strategies. This includes landscapes where human influence is clearly evident, there are not distinctive landscape features, cultural or heritage associations and land uses subject this landscape to a high level of change.
Value attached to Landscape elements	**Description and example criteria**
High	Landscapes which are designated as high value in the development plan or areas designated at a national or international level.
Medium	Landscapes where value is not formally designated but are of value as good examples of high quality, intact landscapes and are areas deemed to be of relatively high scenic quality. Landscapes that contain some rare elements, include areas which are wild or have a sense of naturalness, strong cultural associations or which have recreational value.
Low	Landscapes which are not formally designated and considered as modified. Areas which do not have particularly scenic qualities, do not include rare elements or landscape features and do not have strongly evident cultural or heritage associations.

10.2.4.3 Assessing Magnitude of Change

This is then combined with the magnitude of the effects as outlined in Table 10-2 below, which is a combination of the visual presence - size and scale - of the change, the extent of the area to be affected, and the duration and reversibility of the effect. Significance is then calculated by combining the magnitude and sensitivity judgements.

Table 10.2 Assessing Magnitude of Landscape Effects

Magnitude of Change	Description
High	Major loss or alteration of key landscape elements with an effect on the overall landscape character, resulting in a high degree of change to the aesthetics of the landscape. Changes will be evident over a wide geographical area.
Medium	Some loss or alteration of landscape elements resulting in some change to landscape character and aesthetics. This includes landscapes where there is a moderate effect on the overall landscape character but does not affect key characteristics.
Low	Minor loss of or change to landscape elements. These changes do not affect the overall landscape character or key elements. Changes to the overall aesthetics of the landscapes are low and limited in their geographical extent.

10.2.5 Assessing Visual Effects

Visual effects relate to changes in views and visual amenity of the surroundings of individuals or groups of people. These may result from changes in content and character of views as a result in changes to the landscape. The significance of the effect on visual receptors is a combination of the sensitivity of the receptor as well as the magnitude of the change.

The assessment of visual effects is based on views shown in the viewpoints as well as actual visibility from other locations.

It should be noted that in assessing visual effects, there are different types of visual effects:

- *Visual obstruction: This occurs when there is an impact on a view which blocks the view.*
- *Visual intrusion: This occurs when there is an impact on a view, but which does not block the view.*

Due to the nature of the development only visual intrusion is anticipated.

10.2.5.1 Assessing Magnitude and Sensitivity

Visual receptor sensitivity, as defined in **Error! Reference source not found.**, depends on the occupation o r activity of the observers as well as the extent to which the attention is focused on views and visual amenity, according to the GLVIA Guidelines (2013). Value of the visual receptor is a combination of values assessed in the landscape baseline, combining any formal landscape designations with the criteria such as those included in Table 10-1. This is then combined with the magnitude of the effect, see **Error! R eference source not found.**, which is a combination of scale of the change, the extent of the area to be affected and the duration and reversibility of the effect.

The assessment of the likely significant visual effect for each viewpoint is based on the criteria mentioned above and methodology described below.

Table 10.3 Assessing Visual Receptor Sensitivity

Susceptibility of visual receptor	Description and example criteria
High	These include viewers at designated views or landscapes. Viewers such as residents which are focussed to a large extent on the development due to location in close proximity; viewers at well-known heritage or popular tourist or recreational areas, viewers along scenic or tourist routes
Medium	These include viewers who may have some susceptibility to a change in view, such as those from views which are not designated but may have local recreational uses or those travelling along routes or at view which are considered moderately scenic.
Low	These include viewers engaged in activities where the focus is not on the landscape or view. These including those travelling along a busy route, viewers at work or engaged in sport not related to views or experience of the landscape.
Value attached to Landscape elements	**Description and example criteria**
High	Protected views from designated landscapes of national or international importance and views indicated on tourist/cultural publications. Also, views considered of high scenic quality, naturalness, tranquillity or include rare elements in the view.
Medium	Views which are not designated, but which include panoramic views or views judged to be of some scenic quality demonstrating some sense of naturalness, tranquillity or containing some rare element in the view.
Low	Views which are not designated, and which are not judged to be panoramic views, of particular scenic quality as described above. These are views which have no distinctive features.

Table 10.4 Assessing Magnitude of Visual Effects

Magnitude of Change	Description
High	Instances where the subject development results in a large-scale change of the view and its composition or contrasts significantly with its surroundings. This includes viewpoints where the proposed development is fully or almost fully visible over a large proportion of the view or is at close proximity to the viewer. The effects are long term or permanent and have a low level of reversibility.
Medium	Viewpoints where the subject development results in a moderate level of change of the view and or contrasts moderately with its surroundings. This includes viewpoints where the development is partially visible over a medium proportion of the view and which are not in close proximity to the development.
Low	Viewpoints where the subject development results in a low level of change in the view and its composition or contrasts insignificantly with its surroundings. This includes viewpoints where the development is partially or barely visible and over a small proportion of the view and includes viewpoints at a distance from the subject development.

10.2.5.2 Viewpoint (Photo Locations)

The identification of viewpoint locations is an important step in the process of visual impact assessment. The photo locations were selected following guidance contained in the Guidelines for Landscape and Visual Impact Assessment' (GLVIA Guidelines 2013). The selection of photo locations is designed to give a representative range of views of the subject development.

10.2.5.3 Viewpoint Assessment

Table 3.3 in Section 3.7 of the Draft Guidelines on the Information to be Contained in Environmental Impact Assessment Reports', (EPA, August 2017), reproduced here as Table 10-5 below, shows the standard definitions, which have been used for the determination of effects in this Landscape and Visual Impact Assessment Chapter. Values will be ascribed visual effects in viewpoints arising from the subject development in terms of quality, significance and duration in line with the EPA guidance, while extent, probability and type will form part of the viewpoint descriptions.

Table 10.5 Impact Classification Terminology (EPA, 2017)

Impact Characteristic	Term	Description
Quality	Positive	A change which improves the quality of the environment.
	Neutral	No effects or effects that are imperceptible, within normal bounds of variation or within the margin of forecasting error.
	Negative	A change which reduces the quality of the environment.
Significance	Imperceptible	An effect capable of measurement but without significant consequences.
	Not Significant	An effect which causes noticeable changes in the character of the environment but without significant consequences.
	Slight	An effect which causes noticeable changes in the character of the environment without affecting its sensitivities.
	Moderate	An effect that alters the character of the environment in a manner consistent with existing and emerging trends.
	Significant	An effect, which by its character, magnitude, duration or intensity alters a sensitive aspect of the environment.
	Very Significant	An effect which, by its character, magnitude, duration or intensity significantly alters most of a sensitive aspect of the environment.
	Profound	An effect which obliterates sensitive characteristics.
Duration and Frequency	Momentary Effects	Effects lasting from seconds to minutes.
	Brief Effects	Effects lasting less than a day.
	Temporary Effects	Effects lasting less than a year.
	Short-term	Effects lasting one to seven years.

Impact Characteristic	Term	Description
	Medium-term	Effects lasting seven to fifteen years.
	Long-term	Effects lasting fifteen to sixty years.
	Permanent	Effects lasting over sixty years.
	Reversible Effects	Effects that can be undone.
	Frequency	Describe how often the effect will occur. (once, rarely, occasionally, frequently, constantly – or hourly, daily, weekly, monthly, annually)
	Irreversible	When the character, distinctiveness, diversity, or reproductive capacity of an environment is permanently lost.
	Residual	Degree of environmental change that will occur after the proposed mitigation measures have taken effect.
	Synergistic	Where the resultant effect is of greater significance than the sum of its constituents.
	'Worst Case'	The effects arising from a development in the case where mitigation measures substantially fail.

10.3 Landscape Baseline: Landscape Policy Context

Coshla Quarry is situated in Co. Galway. The project site comprises approximately 27.5 hectares of land located within the townland of Barretstown Park, approximately 6.5 kilometres to the west of Athenry. The site consists of an existing, operational quarry with associated infrastructure.

One of the first stages of carrying out a Landscape and Visual Impact Assessment is to establish the baseline landscape and visual conditions. An initial desk study was undertaken to identify relevant Galway County Council policies on landscape and landscape character, designated landscapes and views and prospects. A description of the County Galway Development Plan will be reviewed in this chapter.

10.3.1 Galway County Development Plan 2015-2021

10.3.1.1 Landscape Policies and Objectives

The Galway County Development Plan 2015-2021 sets out an overall strategy for the proper planning and sustainable development of the administrative area of Galway County Council.

Policy LCM1 ***Preservation of Landscape Character***

Preserve and enhance the character of the landscape where, and to the extent that, in the opinion of the Planning Authority, the proper planning and sustainable development of the area requires it, including the preservation and enhancement, where possible of views and prospects and the amenities of places and features of natural beauty or interest.

Objective LCM 1 Landscape Sensitivity Classification

The Planning Authority shall have regard to the Landscape Sensitivity Classification of sites in the consideration of any significant development

proposals and, where necessary, require a Landscape/Visual Impact Assessment to accompany such proposals. This shall be balanced against the need to develop key strategic infrastructure to meet the strategic aims of the Plan.

Objective LCM 2 Landscape Sensitivity Ratings

Consideration of Landscape Sensitivity Ratings shall be an important factor in determining development uses in areas of the County. In areas of high Landscape sensitivity, the design and the choice of location of subject development in the landscape will also be critical considerations.

Objective LCM 3 Open/Unfenced Landscape

Preserve the status of traditionally open/unfenced landscape. The merits of each case will be considered in light of landscape Sensitivity Ratings and views of amenity importance.

10.3.1.2 Landscape Character Assessment

The Landscape and Landscape Character Assessment for County Galway, published by Galway County Council in 2002, divides the county into 25 distinct Landscape Character Areas (LCAs). The subject site is located within LCA 3: East Central Galway (Athenry, Ballinasloe to Portumna). The relevant section of the Landscape Character Assessment describes the East Central Galway LCA are as follows:

> *'The landscape is flat, coarse grassland, occasional clumps of coniferous forestry between 1-3 km2 in size, fields defined principally by stone walls. There are no areas of particular scenic value although the stone walls are quite distinct.'*

As part of the landscape assessment a landscape value was assigned to each LCA. These in turn were based on cultural, socio-economic and environmental landscape values. For LCA 3, in which the subject development site is located, a landscape value of low was assigned, as seen in Figure 10-1.

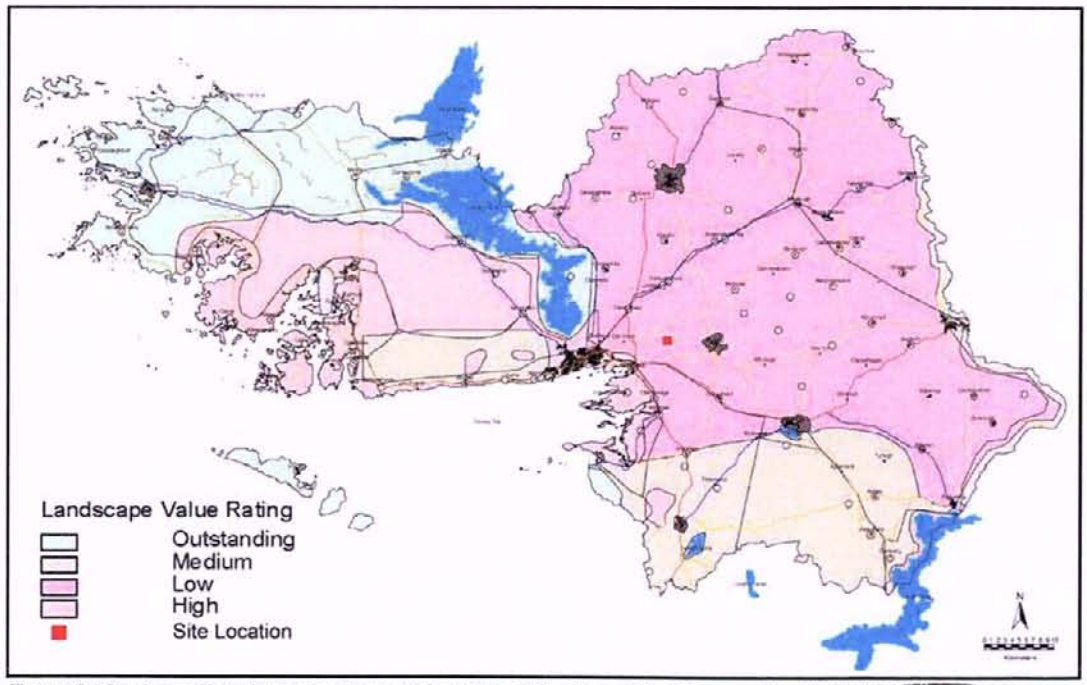


Figure 10-1 Landscape Value Rating for County Galway (from Galway County Development Plan 2015-2021)

Recommendations are made in The Landscape and Landscape Character Assessment for County Galway. Recommendation 3.8 for LCA 3 is listed below:

3.7 *The landscape is flat therefor height restrictions should apply to the built development to avoid long distant visual intrusion.*

3.8 *Development is prohibited in the areas (primarily bogs) that carry a nature designation. Development in the class 1 area should be either set close to existing medium sized blocks of forestry or screened by either new commercial forestry or mixed deciduous woodland, both of which are present in this area.*

3.9 *Due to the rural nature of the area scattered development, which cannot be screened by forestry should be of natural stone or rendered finish of a colour that is sympathetic to the colours of the landscape. Stonewalls are a distinct element of the character of this area and should be constructed to match traditional style around new development.*

10.3.1.3 Landscape Sensitivity Rating

The sensitivity of a landscape to development and therefore to change varies according to its character and to the importance which is attached to any combination of landscape values. The Landscape Sensitivity and Character Areas Map (LCM2) as set out in the current Galway County Development Plan classifies the sensitivity of landscape areas according to the following classification:

- Class 1 – Low
- Class 2 – Moderate
- Class 3 – High
- Class 4 – Special
- Class 5 – Unique

The landscape sensitivity of the study area is designated as Class 1 – Low by the Landscape and Landscape Character Assessment for County Galway, as shown in Figure 10-2.

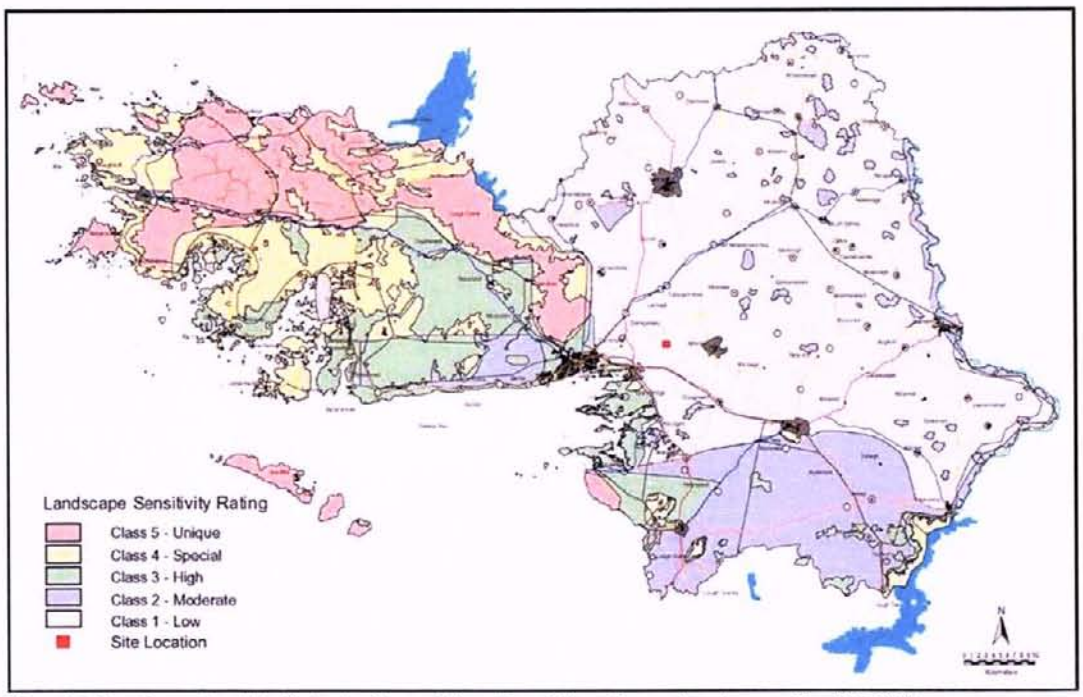


Figure 10-2 Landscape Sensitivity Rating for County Galway (from Galway County Development Plan 2015-2021).

10.3.1.4 Focal Points and Views

The Galway County Council Landscape and Landscape Character Assessment lists 122 focal points and views within the county in Map FPV1 of the development plan and includes the following objective:

Objective FPV 1 Development Management

Preserve the focal points and views as listed in Map FPV1 from development that in the view of the Planning Authority would negatively impact on said focal points and views.

Map FPV1 does not specify in detail the exact locations of the views or their focus and is of a general nature. Descriptions accompanying the views/focal points are also general. Figure 10-3 below outlines the scenic views within a 5km and 10km boundary around the subject site, as well as the wider landscape.

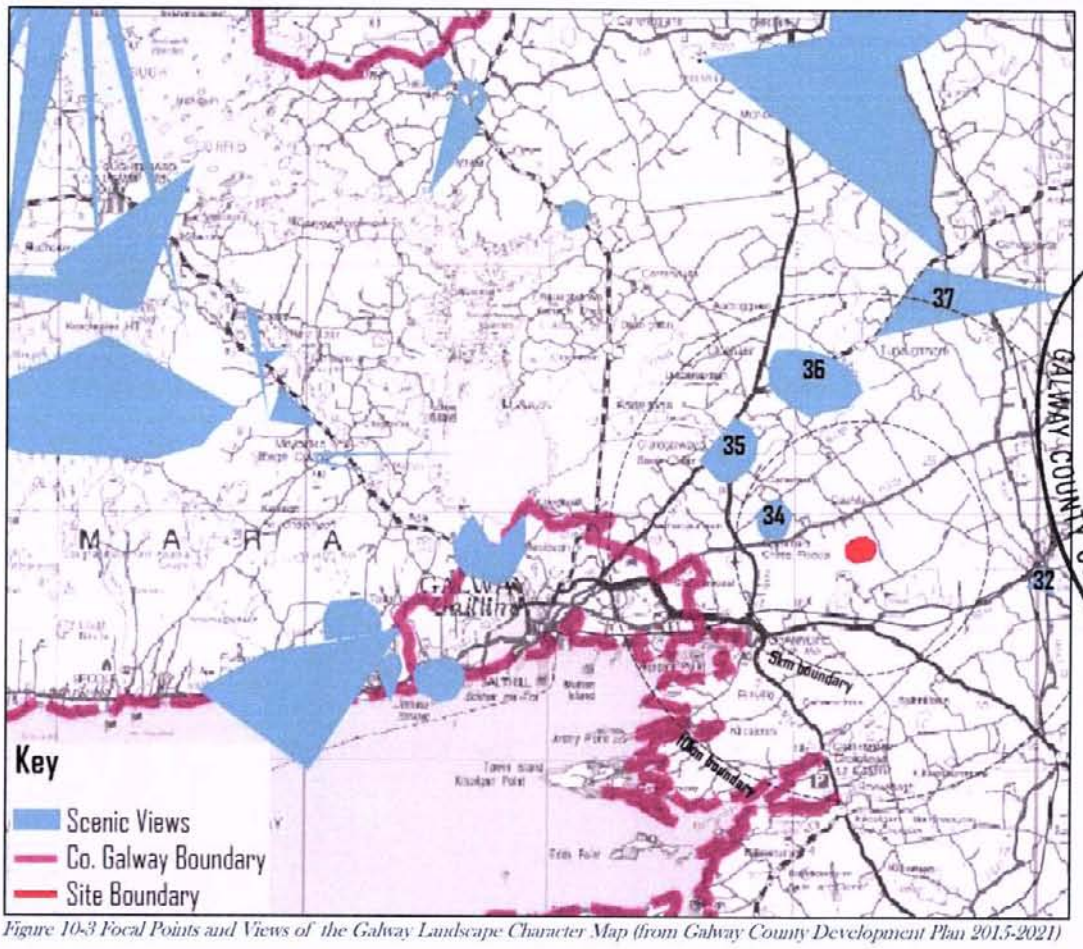


Figure 10-3 Focal Points and Views of the Galway Landscape Character Map (from Galway County Development Plan 2015-2021)

A 10 km study boundary was used in this assessment to identify the key landscape features in close proximity to the site boundary. 1 No. scenic viewpoint was identified within the 5km boundary from the site, and 4 No. scenic viewpoint locations within the 10km boundary.

There are no designated focal points or views pertaining to the subject site. The nearest viewpoint is listed as View No. 34 - Reservoir located north of the R339 northeast of Galway, as illustrated in Figure 10-3. This view lies approximately 3.3 kilometres west of the site. The subject development site will not be visible from this location due to screening by landform and vegetation. The next closest view is View No. 36 - Church ruins south of the N63 approximately 5.6 kilometres north of the site. From here also the subject development will not be seen. Table 10-6 below outlines the scenic viewpoints and their locations within a 10 km boundary to the site.

Table 10.6 Scenic Viewpoints and Locations (Galway County Development Plan 2015-2021)

Viewpoint Number	Viewpoint Name	Distance from Site
32	Heritage centre located to the east of Athenry	7.2 km
34	Reservoir located north of the R339 northeast of Galway	3.3 km
35	Church and cemetery ruins at Baile Chläir	6.5 km

Viewpoint Number	Viewpoint Name	Distance from Site
36	Church ruins south of the N63	5.6 km
37	Castle at Monivea	14.4 km

10.3.1.5 Walking Routes, Cycleways and Tourism Trails

Objective RA6 in the Development Plan notes the following:
Prohibit the intrusion of development along public walking routes and public rights of way, particularly those in scenic areas, the seacoast and along inland waterways.

The following trails and cycleways are the closest to the site:

Monivea Historical Trail

This 1.5-kilometre walk within Monivea Demesne follows tarred road, forest road and path in a loop. It is approximately 13 kilometres north-east at its nearest point to the development site and there is no visibility of the development anticipated from any part of this trail.

Monivea Mass Track Trail

This 1.8-kilometre Coillte Recreation Trail follows tarred road and forest tracks in a loop. It is approximately 12.7 kilometres north-east at its nearest point to the development site and there is no visibility of the development anticipated from any part of this trail.

10.3.1.6 Landscape Policies pertaining to Quarry development

The Galway County Development Plan 2015-2021 has set out the following objective with regards to quarrying and landscape:

Objective EQ 2 – Management of Aggregate Extraction
The Council shall require the following in relation to the management of authorised aggregate extraction

a) *All quarries shall comply with the requirements of the EU Habitats Directive, the Planning and Development (Amendment) Act 2010 and by the guidance as contained within the DoEHLG Quarries and Ancillary Facilities Guidelines 2004, the EPA Guidelines 'Environmental Management in the Extractive Industry: Non Scheduled Minerals 2006 (including any updated/superseding documents) and to DM Standard 37 of this Development Plan;*
b) *Require development proposals on or in the proximity of quarry sites, to carry out appropriate investigations into the nature and extent of old quarries (where applicable). Such proposals shall also investigate the nature and extent of soil and groundwater contamination and the risks associated with site development works together with appropriate mitigation;*
c) *Have regard to the Landscape Character Assessment of the County and its recommendations including the provision of special recognition to the Esker areas as referenced in Galway County Council Galway's Living Landscapes – Part 1: Eskers;*
d) *Ensure that any quarry activity has minimal adverse impact on the road network;*
e) *Ensure that the extraction of minerals or aggregates does not adversely impact on residential or environmental amenity;*
f) *Protect all known un-worked deposits from development that might limit their scope for extraction.*

10.4 Landscape Character of the Subject Site

10.4.1 Topography

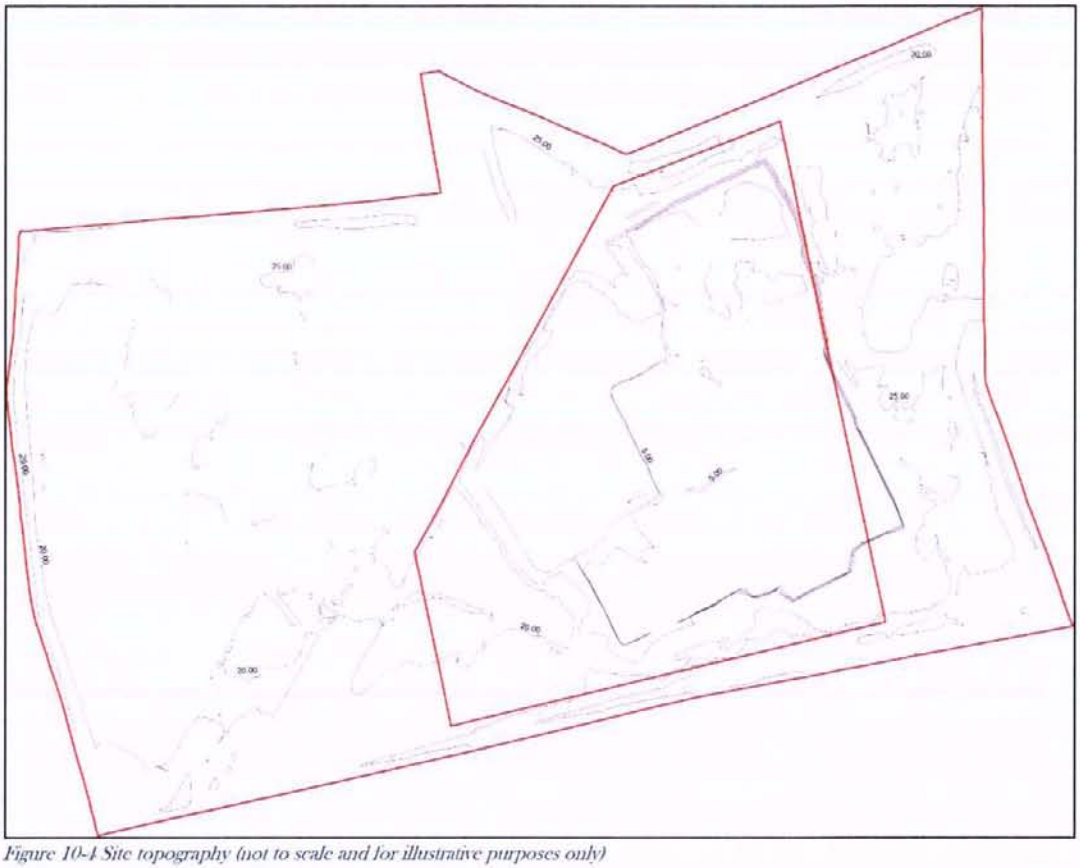


Figure 10-4 Site topography (not to scale and for illustrative purposes only)

The topography of the subject site is relatively flat along the boundaries at the highest point being 25 meters above Ordnance Datum (OD). In the northeast and southeast corners of the site, the site slopes down, in some places very steeply, to an elevation of 5 meters (OD), as seen in Figure 10-4 above.

10.4.2 Land-cover

Landcover is the term used to describe the combinations of vegetation and land-use that cover the land surface. It comprises the more detailed constituent parts of the landscape and encompasses both natural and man-made features.

Plate 10.1 Existing vegetation on the eastern boundary of the quarry.

The landscape immediately surrounding the quarry is mainly agricultural. Plate 10-1 above, shows a small woodland on the eastern boundary of the site. Beyond that, is the existing battery storage unit on the northeast corner of the site. The battery storage unit has current planning permission.

Plate 10.2 View from within the quarry looking west towards the surrounding landscape.

The landscape surrounding the quarry is mainly agricultural. Plate10-2 above shows the surrounding landscape extent of the quarry. Much of the surrounding landscape from the quarry is industrial and agricultural. Apart from the field pattern, there are also one-off houses and farm buildings dotted around the area.

Plate 10.3 Surrounding landscape showing the existing battery storage unit on the northeast corner of the site.

The wider landscape generally comprises improved or semi improved agricultural land, bordered by stone walls similar to that recorded on site. The C&F Tooling plant is visible from the access track to the site, seen in Plate 10.4 below, adding further significant industrial elements to the landscape.

Plate 10.4 C & F Tooling complex to the north east of the site

10.4.3 Land-use and drainage

The depth of excavation and current quarry floor level has not intercepted the water table, and therefore only small amounts rainfall runoff has to be managed within the quarry area. The majority of rainfall percolates to ground via the quarry floor. Excess runoff is directed to a sump, located in the centre of the quarry floor, into which all water from the working area of the quarry drains and will continue to drain from the subject extension area. Sight drainage is further discussed in Section 3.5.1 of this report.

10.5 Landscape Value

To determine the landscape sensitivity, and ultimately the likely significance of the effects, assessments of landscape value for the subject development site and wider (LVIA) study area were assessed. Landscape value includes designations such as scenic views and sensitivity designations found in development plans, as well as values which are attached to undesignated landscapes. A number of criteria were developed to assess the landscape values of the study area. These, combined with susceptibility, contribute to the assessment of landscape sensitivity.

Table 10.7 Features of Landscape Value

Feature	Description
Landscape Designations	There are no landscape designations on the site itself. As part of its landscape assessment Galway County Development Plan has assigned landscape value and landscape sensitivity, the value of the area that the subject development site is in is classed as low and the sensitivity is also low. There is one focal point and view within approximately 3.3 kilometres west of the site boundary, however the subject development will have no visual effect on this view.
Landscape Quality/Condition	This refers to the physical state of the landscape and the condition of individual elements. The landscape is regarded as modified by man in terms of agriculture use. Stone walls on site are in a poor condition. There are no other landscape elements on site that are noteworthy.
Aesthetic Qualities	Views from the site are generally short-distance, with some medium-distance views to the east. In general, the site is characterised by common agricultural field patterns and undistinguished aesthetically from the wider landscape. Adjacent industrial land uses decrease the aesthetic quality of the area.
Wildness/naturalness	There is no sense of wildness or naturalness on the site due to the agricultural use and surrounding industrial infrastructure.
Rarity/Conservation Interests	See the Chapter 5 of this EIAR for further details.
Cultural Meaning/Associations	No cultural associations were found in relation to the site. See the Archaeological and Cultural Heritage Assessment for details.
Recreation Value	The site itself is privately owned and not used for recreation. The closest amenity trail is the Monivea Mass Track Trail approx. 12.7 km north-east from the site boundary.

The dominant landscape characteristics of this area and indeed the site are the field patterns as defined by the tree lines. These field patterns and hedgerows are not considered unique from a landscape perspective and have been produced by manmade interventions in the landscape therefore, the susceptibility of the landscape to change is deemed low.

Neither are there any rare landscape features on site or cultural or heritage associations on site. The site is considered modified due to its agricultural use and many other very similar examples of its kind exist in

the wider landscape. On the grounds of these points and taking the landscape policies and Landscape Character Assessment from the county development plan into account, the landscape value is considered low.

10.6 Views and Visual Receptors

10.6.1 Views towards the Site

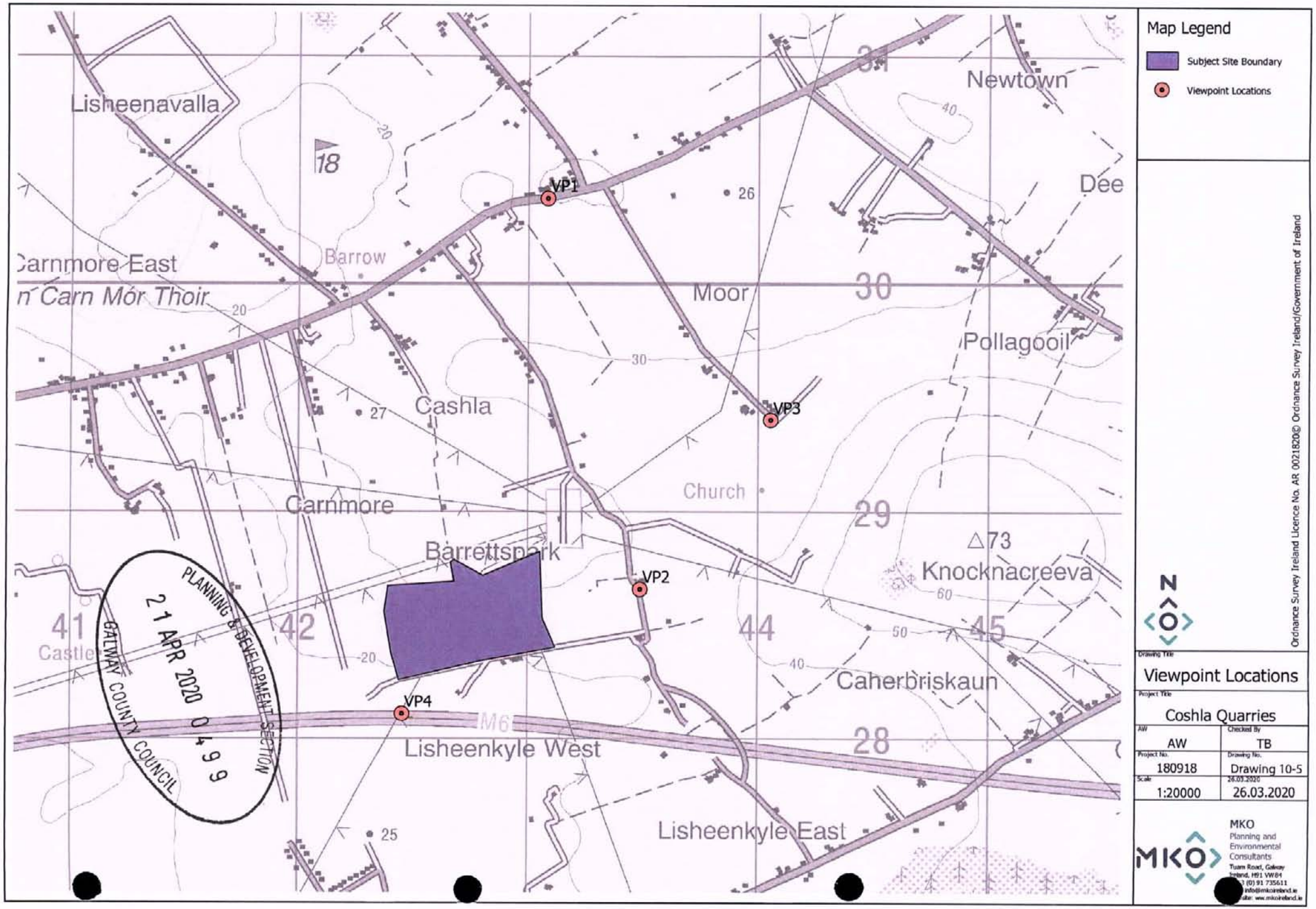
Beyond viewpoint selection, visibility from the local road network was also appraised during the site visit. All the local roads in the immediate vicinity of the site were assessed including the L7109, L3102, L71117 and L71102 as well as parts of the R339 regional route within the 5 km study area.

During the site visit in November 2018, it became apparent that visibility could be excluded from the vast majority of the study area due to the presence of hedgerows, tree lines and buildings, both immediately adjacent to roads and in the intervening landscape, but also due to local changes in topography which obscure views. Visibility was excluded from the west, south and north. Actual visibility could not be categorically established on site; hence, viewpoints were chosen on anticipated potential visibility and these are listed in Table 10.8 below.

Plate 10.5 View of eatern existing berm from adjacent field to the west.

Plate 10-6 above shows the existing eastern berm adjacent to the field in the west, where the battery storage unit can be seen in the background. The battery storage unit has already undergone planning permission.

10.7 Viewpoint Locations and Descriptions



Map Legend

- Subject Site Boundary
- Viewpoint Locations

Drawing Title: Viewpoint Locations

Project Title: Coshla Quarries

AW	Checked By
AW	TB
Project No.	Drawing No.
180918	Drawing 10-5
Scale	26.03.2020
1:20000	26.03.2020

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Table 10.8 Viewpoints

Viewpoint	Description	Grid Ref.
1	View from regional road R339 in the townland of Cashla, approximately 1.6 km north of the site boundary.	E143,101 N230,381
2	View from the L7109 local road in the townland of Cashla, approximately 0.4 km east of the site boundary.	E143,482 N228,673
3	View from local access road in the townland of Moor, approximately 1.0 km north-east of the site boundary.	E144,071 N229,392
4	View from the M6 motorway, approximately 0.2 km southeast from the site boundary.	E142,465 N228,108

10.7.1 Viewpoint 1

Plate 10.6 Viewpoint 1 Existing View

Plate 10.7 Viewpoint 1 Proposed View

Table 10.9 Viewpoint 1

Viewpoint 1- Cashla	
Viewpoint Description & Details	› View from regional road R339 in the townland of Cashla, approximately 1.6 km north of the site boundary. › Grid Reference: E143,101 N230,381
Visual Receptor(s) & Sensitivity	Egans Bar and Lounge - Medium Motorised Traffic-Low

Viewpoint 1- Cashla	
Description of 'Do Nothing Scenario'	An overgrown stone wall with a grassed roadside verge can be seen in this view. Beyond this there are a series of level arable and pastoral fields separated predominantly by stone wall, but also hedgerows. Individual trees and tree lines are sparsely scattered around the landscape, with denser tree cover on the skyline. Vertical elements such as electricity poles and street lighting poles are scattered across the background of this view.
Sensitivity of Visual Receptor(s)	**Medium -** Includes viewers from road users and visitors to Egan's Bar.
Magnitude of Change	No Change.
Significance of Effect	No Effect.
Mitigation Factors	› The intervening distance of the quarry is 1.6km from this location. › The subject development is completely screened by the existing tree line in the background and foreground of the view.
Residual Effect (incl. mitigating factors)	No Effect.

10.7.2 Viewpoint 2

Plate 10.8 Viewpoint 2 Existing View

Plate 10.9 Viewpoint 2 Proposed View

Table 10.10 Viewpoint 2

Viewpoint 2 Cashla	
Viewpoint Description & Details	› View from the L7109 local road in the townland of Cashla, approximately 0.4 km east of the site boundary. › Grid Reference: E143,482 N228,673
Visual Receptor(s) & Sensitivity	Residents-Medium Motorised Traffic-Medium
Description of 'Do Nothing Scenario'	This view, taken adjacent to a residence and farm buildings, looks across the L7109 and adjacent stone wall to a pastoral field. In the foreground is an overgrown stone wall separating the overgrown field beyond from the road. A small deciduous woodland can be seen at the far end of the field with mature trees to the right and semi-mature trees to the left. To the right of the image the on sight electricity substation can be seen surrounded by semi-mature deciduous and coniferous trees. Overhead powerlines and pylons can also be seen fanning out form the substation. There are some limited views to distant hills. The character of the view is a mixture of rural agricultural and industrial.
Sensitivity of Visual Receptor(s)	**Medium -** Includes viewers from adjacent residential properties as well as road users.
Magnitude of Change	No Change.
Significance of Effect	No Effect.
Mitigation Factors	› The intervening distance is (c0.2 km) from this view. › The subject development is completely screened by the deciduous tree line.
Residual Effect (incl. mitigating factors)	No Effect.

10.7.3 Viewpoint 3

Plate 10.10 Viewpoint 3 Existing View

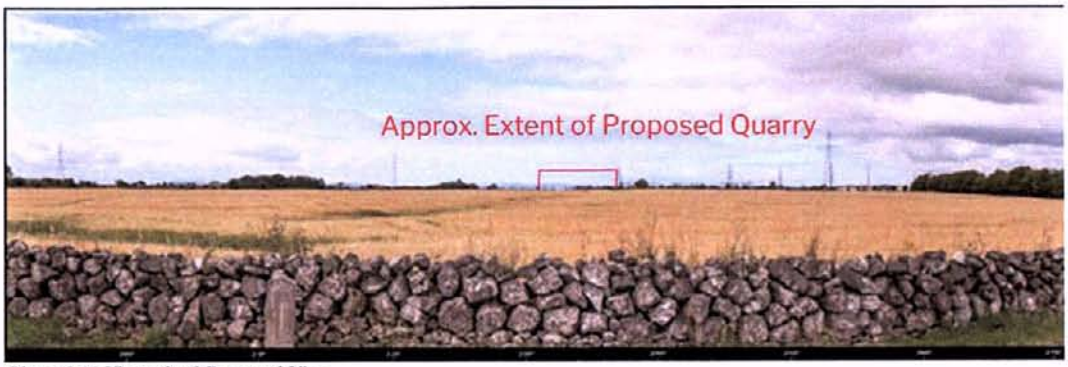


Plate 10.11 Viewpoint 3 Proposed View

Table 10.11 Viewpoint 3

Viewpoint 2 – Moor	
Viewpoint Description & Details	› View from local access road in the townland of Moor, approximately 1.0 km north-east of the site boundary › Grid Reference: E144,071 N229,392
Visual Receptor(s) & Sensitivity	Residents- Medium Motorised Traffic- Low
Description of 'Do Nothing Scenario'	This view was taken in front of a row of residential properties facing the subject development. A large arable field stretches into the distance beyond a stone wall. There are stands of trees as well as individual trees seen on the near horizon, which are interspersed with parts of the electricity pylons, a wind turbine, farm buildings and houses as well as C & F Tooling to the right of the image. There are distant views to the hills of the Burren on the far horizon. This open expansive view is a good representation of the predominant views created by the flatness of the wider landscape within this study area.
Sensitivity of Visual Receptor(s)	**High -** Includes viewers from the adjacent residential properties as well as local traffic.
Magnitude of Change	No Change.
Significance of Effect	No Effect.
Mitigation Factors	› The intervening distance is (c1.00 km) from this location. › The subject development is significantly screened from the existing tree line in the background of this view.
Residual Effect (incl. mitigating factors)	No Effect.

10.7.4 Viewpoint 4

Plate 10.12 Viewpoint 4 Existing View

Plate 10.13 Viewpoint 4 Proposed View

Table 10.12 Viewpoint 4

Viewpoint 4	
Viewpoint Description & Details	› View from the M6 motorway, approximately 0.2 km southeast from the site boundary. › Grid Reference: E142,465 W228,108
Visual Receptor(s) & Sensitivity	Residents-Low Motorised Traffic-Low
Description of 'Do Nothing Scenario'	This view was taken adjacent to the M6 motorway. In the foreground is a wooden fence line separating the road from the existing quarry in the midground. The shrub line that sits adjacent to the fence along the road partially conceals the quarry in the midground of the view. There are distant views of the electricity pylons. The character of the view is a mixture of industrial and rural agriculture.
Sensitivity of Visual Receptor(s)	**Low** Includes viewers include local road users.
Magnitude of Change	No Change.
Significance of Effect	No Effect.
Mitigation Factors	› The intervening distance is approximately (c0.2 km) from this view. › The subject development is somewhat screened by the existing shrub line.
Residual Effect (incl. mitigating factors)	No Effect.

10.8 Likely and Significant Effects and Associated Mitigation Measures

10.8.1 'Do-Nothing' Scenario

In the 'Do-Nothing' Scenario, if the subject quarry expansion were not to proceed, the current planning permission for the existing quarry would expire in 2021. The quarry would cease to operate from that time and the site reclamation plan would be implemented. This would result in the decommissioning and closure of the concrete batching plant, including the removal of machinery and buildings, and the deconstruction and removal of the quarry.

10.9 Extraction Phase Effects

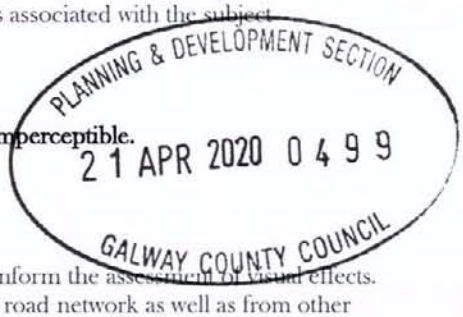
10.9.1 Predicted Landscape Effects

During the desktop study, landscape designations set out in the Galway County Council Development Plan 2015-2021 in the form of focal points and views, shown in Figure 10-3 above, as well as landscape value and sensitivity (see Figures 10-1 and 10-2), were identified within 5 kilometres of the subject development site. It was established that both landscape value and sensitivity were classed as low and that no landscape designations applied to the development site. There was one focal point and view within the 5 kilometres of the study area, however, the subject development will not be visible from this designation. Furthermore, there were neither any rare landscape features or cultural or heritage associations identified on site.

The dominant landscape characteristics of this area and indeed the site are the field patterns as defined by stone walls and hedgerows. The changes to the physical landscape, as a result of the subject development will be very minor in nature. The subject development has been designed to fit with that of the existing industrial landscape type of the quarry into the surrounding agricultural landscape. Therefore, changes to the landscape are insignificant and will be in keeping with landscape policies LCM 1 and 2 and landscape objectives LCM 1 and 2. Additional landscape effects arising from the subject quarry extension will include noise and dust from blasting and associated activities, as well as the construction of the earth berms along the northern, eastern and southern boundaries of the site.

Residual Impact

Based on the assessment above it is considered that this is a **Long-term, Imperceptible, Negative** landscape impact. There have been no residual landscape effects associated with the subject development.



Assessment of the Effects

Overall, the potential landscape impact is considered **Low and Imperceptible.**

10.9.2 Predicted Visual Effects

The desktop study, site visit and subject development layout all inform the assessment of visual effects. During the site visit, views towards the site from the surrounding road network as well as from other amenity routes were assessed. Visibility of the subject development site could be excluded from the west of the study area, due to topography as well as the presence of hedgerows, tree lines and buildings, both immediately adjacent to roads and in the intervening landscape. Actual visibility was difficult to established, hence, viewpoints were chosen on anticipated potential visibility.

Four viewpoints, see Table 10-8, were selected from the M6 motorway as well as on local and regional roads surrounding the site to represent different orientations, elevations and contexts. The assessment of visual receptor sensitivity was classed differently for each viewpoint, i.e. Low, Medium and High. In Viewpoints 1, 2 and 3 where the visual receptor sensitivity was classed as Medium and High there will be no visibility of the subject quarry extension. Viewpoint 4 is taken adjacent to the M6 motorway, where

road users will be travelling at distances of speeds close to the speed limit of 120kmph, therefore no adjacent residential visual receptors are foreseen from this location.

Residual Impact

Based on the assessment above it is considered that this is a **Long-term, Imperceptible, Neutral-Negative** visual impact. There have been no residual visual effects associated with the subject development.

Assessment of the Effects

Overall, the potential visual impact is considered as **Low and Imperceptible.**

10.10 Decommissioning Phase

The decommissioning phase of the subject quarry extension would include the closure of the concrete batching plant and the removal of machinery and buildings, resulting in the deconstruction and removal of the quarry. A Quarry Restoration Plan was developed and approved as part of the current planning permission for the quarry. A copy of the restoration plan is included in Appendix 3-1 of this EIAR. The application proposes to implement the existing restoration plan during the decommissioning phase of the project.

10.11 Cumulative Landscape and Visual Effect Assessment

The cumulative effect assessment includes the subject extension development in addition to the existing Coshla Quarry and its associated infrastructure.

In consideration on the industrial elements in the adjacent landscape highlighted in section x the cumulative landscape and visual effects arising from the extension development will be minor.

11. ARCHAEOLOGY AND CULTURAL HERITAGE

11.1 Introduction

This Environmental Impact Assessment Report (hereafter EIAR) was prepared by Tobar Archaeological Services. It presents the results of an archaeological, architectural and cultural heritage impact assessment for a proposed quarry extension at Barrettspark townland, Athenry, County Galway. This assessment will be submitted as part of the EIAR with the planning application for the proposed development.

The existing quarry (including proposed extension area) site encompasses a portion of the townland of Barrettspark and measures approximately 500m E/W by 400m N/S.

The purpose of this report is to assess the potential impacts of the proposed quarry extension on the surrounding archaeological, architectural and cultural heritage landscape. The assessment is based on both a desktop review of the available cultural heritage and archaeological data and field survey of the study area. The report amalgamates desk-based research and the results of field survey to identify areas of archaeological/architectural/cultural significance or potential, likely to be impacted by the proposed development. An assessment of potential impacts is presented, and a number of mitigation measures are recommended where appropriate. The visual impact of the proposed development on newly discovered monuments/sites of significance as well as known recorded monuments and architectural heritage is also assessed.

11.2 Planning Background

This EIAR will accompany the planning application for the proposed development. Previous EIS reports (2006 and 2009) were reviewed as part of this assessment as they would have included the results of archaeological field assessment prior to the existing quarry and also any details regarding any required archaeological testing and monitoring during construction.

11.3 Proposed Development

The proposed development comprises the extension of the existing quarry into lands to the east, north, and south of the current extraction area. The proposed extension area measures approximately 6.7 hectares and will bring the total extraction area up to 12.7 hectares. The quarrying methods that will be employed in the extension areas will be a continuation of those that have been used in the existing quarry. It is not proposed to construct any new buildings or other infrastructure or introduce any new plant items or processes as part of this application.

A photographic record of the site is presented in Section 11.17 below.

11.4 Project Team and Qualifications

Miriam Carroll and Annette Quinn are the directors of Tobar Archaeological Services and both graduated from University College Cork in 1998 with a Masters degree in Methods and Techniques in Irish Archaeology. Both directors are licensed by the Department of Culture, Heritage and the Gaeltacht to carry out excavations and are members of the Institute of Archaeologists of Ireland. Annette Quinn and Miriam Carroll have been working in the field of archaeology since 1994 and have undertaken numerous projects for both the private and public sectors including excavations, site assessments (EIS/EIA/ER) and surveys.

11.5 Statutory Context

11.5.1 Current Legislation

Archaeological monuments are safeguarded through national and international policy, which is designed to secure the protection of the cultural heritage resource. This is undertaken in accordance with the provisions of the European Convention on the Protection of the Archaeological Heritage (Valletta Convention). This was ratified by Ireland in 1997.

Both the National Monuments Acts 1930 to 2004 and relevant provisions of the Cultural Institutions Act 1997 are the primary means of ensuring protection of archaeological monuments, the latter of which includes all man-made structures of whatever form or date. There are a number of provisions under the National Monuments Acts which ensure protection of the archaeological resource. These include the Register of Historic Monuments (1997 Act) which means that any interference to a monument is illegal under that Act. All registered monuments are included on the Record of Monuments and Places (RMP).

The Record of Monuments and Places (RMP) was established under Section 12 (1) of the National Monuments (Amendment) Act 1994 and consists of a list of known archaeological monuments and accompanying maps. The Record of Monuments and Places affords some protection to the monuments entered therein. Section 12 (3) of the 1994 Amendment Act states that any person proposing to carry out work at or in relation to a recorded monument must give notice in writing to the Minister (Environment, Heritage and Local Government) and shall not commence the work for a period of two months after having given the notice. All proposed works, therefore, within or around any archaeological monument are subject to statutory protection and legislation (National Monuments Acts 1930-2004).

Under the Heritage Act (1995) architectural heritage is defined to include *'all structures, buildings, traditional and designed, and groups of buildings including street-scapes and urban vistas, which are of historical, archaeological, artistic, engineering, scientific, social or technical interest, together with their setting, attendant grounds, fixtures, fittings and contents...'*. A heritage building is also defined to include *'any building, or part thereof, which is of significance because of its intrinsic architectural or artistic quality or its setting or because of its association with the commercial, cultural, economic, industrial, military, political, social or religious history of the place where it is situated or of the country or generally'*.

11.5.2 Granada Convention

The Council of Europe, in Article 2 of the 1985 Convention for the Protection of the Architectural Heritage of Europe (Granada Convention), states that *'for the purpose of precise identification of the monuments, groups of structures and sites to be protected, each member State will undertake to maintain inventories of that architectural heritage'*. The Granada Convention emphasises the importance of inventories in underpinning conservation policies.

The NIAH was established in 1990 to fulfil Ireland's obligations under the Granada Convention, through the establishment and maintenance of a central record, documenting and evaluating the architectural heritage of Ireland. Article 1 of the Granada Convention establishes the parameters of this work by defining *'architectural heritage'* under three broad categories of Monument, Groups of Buildings, and Sites:

- **Monument:** all buildings and structures of conspicuous historical, archaeological, artistic, scientific, social or technical interest, including their fixtures and fittings;

- **Group of buildings**: homogeneous groups of urban or rural buildings conspicuous for their historical, archaeological, artistic, scientific, social or technical interest, which are sufficiently coherent to form topographically definable units;
- **Sites:** the combined works of man and nature, being areas which are partially built upon and sufficiently distinctive and homogenous to be topographically definable, and are of conspicuous historical, archaeological, artistic, scientific, social or technical interest.

The Council of Europe's definition of architectural heritage allows for the inclusion of structures, groups of structures and sites which are considered to be of significance in their own right, or which are of significance in their local context and environment. The NIAH believes it is important to consider the architectural heritage as encompassing a wide variety of structures and sites as diverse as post boxes, grand country houses, mill complexes and vernacular farmhouses.

11.5.3 Galway County Development Plan 2015-2021

11.5.3.1 Architectural Heritage Policies and Objectives

Policy AH 1 – Architectural Heritage

Protect the architectural heritage of County Galway which is a unique and special resource.

Policy AH 2 – Traditional Skills

Maintain a database of traditional building skills, and promote training and awareness of the use of appropriate materials and skills within the Local Authority, community groups and owners and occupiers of traditionally built structures.

Objective AH 1 – Legislative Context

Ensure the protection of the architectural heritage of County Galway which is a unique and special resource, in particular by implementing the legislative provisions of the Planning and Development Act, 2000 (as amended) in relation to architectural heritage and the policy guidance contained in the Architectural Heritage Protection Guidelines 2011 (and any updated/superseding document).

Objective AH 2 – Protected Structures (Refer to Appendix V)

Ensure the protection and sympathetic enhancement of structures included and proposed for inclusion in the Record of Protected Structures (RPS) that are of special architectural, historical, archaeological, artistic, cultural, scientific, social or technical interest, together with the integrity of their character and setting.

Objective AH 3 – Architectural Conservation Area (Refer to Appendix III)

Protect, conserve and enhance the essential character of any Architectural Conservation Area (ACA) through the appropriate management and control of the design, location and layout of new development, alterations or extensions to existing structures, surviving historic plots and street patterns and/or modifications to the character or setting of the Architectural Conservation Area. The identification of areas of special interest may be considered during the lifetime of the plan in either urban or rural settings. (See Map AH1)

Objective AH 4 – Works Relating to Protected Structures and Architectural Conservation Areas

Ensure that any development, modifications, alterations, or extensions materially affecting the character of a protected structure, or a structure adjoining a protected structure, or a structure within or adjacent

to an Architectural Conservation Area (ACA), is sited and designed appropriately and is not detrimental to the character or setting of the protected structure or of the ACA. This will include the following:

a) Works materially affecting the character of a protected structure or the exterior of a building/ structure within an ACA will require planning permission;

b) Any works carried out to a protected structure or the exterior of a building/structure within an ACA shall be in accordance with best conservation practice and use sustainable and appropriate materials.

Works within the ACA shall ensure the conservation of traditional features and building elements that contribute to the character of the area. New proposals shall have appropriate regard to scale, plot, form, mass, design, materials, colours and function.

Objective AH 5 – Demolition

Prohibit development proposals, either in whole or in part, for the demolition of protected structures, save in exceptional circumstances, or the demolition of a structure within an Architectural Conservation Area that contributes to the special character of the area.

Objective AH 6 – Vernacular Architecture

Recognise the importance of the contribution of vernacular architecture to the character of a place and ensure the protection, retention and appropriate revitalisation and use of the vernacular built heritage, including structures that contribute to landscape and streetscape character and resist the demolition of these structures.

Objective AH 7 – Local Place Names Protect local place names as an important part of the cultural heritage and unique character of an area. Support the use of appropriate names for new developments that reflect the character and heritage of the area and that contribute to the local distinctiveness of a place.

Objective AH 8 – Energy Efficiency and Traditionally Built Structures Ensure that measures to upgrade the energy efficiency of protected structures and traditionally built historic structures are sensitive to traditional construction methods and use appropriate materials and do not have a detrimental impact on the material, aesthetic or visual character of the building.

Objective AH 9 – Local Landscape and Place Assessment To support proposals from local communities including Tidy Town Committees, Chambers of Commerce and residents groups in analysing the character of their place and promoting its regeneration for their own use and enjoyment and that of visitors to the area.

Objective AH 10 – Designed Landscapes Identify and evaluate the surviving historic designed landscapes in the County and promote the conservation of their essential character, both built and natural.

Objective AH 11 – Custodianship Promote an inter-disciplinary approach demonstrating best practice with regard to the custodianship of protected structures, recorded monuments and elements of built heritage.

11.5.3.2 Archaeological Heritage Policies

Policy ARC 1 – Legislative Context

It is the policy of Galway County Council to support and promote the conservation and appropriate management and enhancement of the County's archaeological heritage within the plan area. Galway

County Council will ensure the implementation of the legislative, statutory and policy provisions relevant to the conservation of the archaeological heritage.

Policy ARC 2 – Archaeological Sites

Seek to promote awareness of and access to archaeological sites in the County where appropriate.

Policy ARC 3 – Consultation

Consult with the National Monuments Service of the Department of Arts, Heritage and the Gaeltacht in relation to proposed developments adjoining archaeological sites.

Policy ARC 4 – Management of Archaeological Sites and Monuments

Support the preservation, conservation and management of archaeological sites and monuments, together with the settings of these monuments.

Policy ARC 5 – Archaeological Heritage

Ensure the protection and sympathetic enhancement of archaeological heritage in the plan area, in particular by implementing the relevant provisions of the Planning and Development Act, 2000 (as amended), The National Monuments Act, 1930 (as amended), and The National Policy on Town Defences, 2008 (Department of the Environment, Heritage and Local Government).

Policy ARC 6 – Archaeological Landscapes

To facilitate where possible the identification of important archaeological landscapes in the County.

Archaeological Heritage Objectives

Objective ARC 1 – Protection of Archaeological Sites

Protect archaeological sites and monuments their settings and visual amenity and archaeological objects and underwater archaeological sites that are listed in the Record of Monuments and Places, in the ownership/guardianship of the State, or that are subject of Preservation Orders or have been registered in the Register of Historic Monuments and seek to protect important archaeological landscapes.

Objective ARC 2 – Development Management

All planning applications for new development, redevelopment, any ground works, refurbishment, and restoration, etc. within areas of archaeological potential or within close proximity to Recorded Monuments or within the historic towns of County Galway (Ardrahan, Athenry, Dunmore, Eyrecourt, Loughrea and Tuam) will take account of the archaeological heritage of the area and the need for archaeological mitigation.

Objective ARC 3 – Protection of New Archaeological Sites

Protect and preserve archaeological sites, which have been identified subsequent to the publication of the Record of Monuments and Places.

Objective ARC 4 – Burial Grounds

Protect the burial grounds, identified in the Record of Monuments and Places, in co-operation with the National Monuments Service of the Department of Arts, Heritage and the Gaeltacht. Encourage the local community to manage burial grounds in accordance with best conservation and heritage principles.

Objective ARC 5 – Battlefield Sites

Protect the Battle of Aughrim site and other battlefield sites and their settings. Refer all planning applications within the battlefield sites and their environs to the National Monuments Service of the Department of Arts, Heritage and the Gaeltacht for their consideration.

Objective ARC 6 – Underwater Archaeological Sites

To protect and preserve the underwater archaeological sites in rivers, lakes, intertidal and sub-tidal locations.

Objective ARC 7 – Recorded Monuments

Ensure that any development in the immediate vicinity of a Recorded Monument is sensitively designed and sited and does not detract from the monument or its visual amenity.

World Heritage Sites

A Tentative List is an inventory of those properties which a country intends to consider for nomination to the World Heritage List. The new Tentative List was approved by the Minister for Arts, Heritage and the Gaeltacht and submitted to UNESCO in March 2010. The nomination of any property from the new Tentative List for inscription on the World Heritage List will only take place after consultation with the relevant stakeholders, interested parties and local communities. Two sites in County Galway have been included on the Tentative List, namely, the Western Stone Forts and the Burren.

Objective WH 1 – Tentative World Heritage Sites

Protect the Outstanding Universal Value of the tentative World Heritage Sites in County Galway namely the Western Stone Forts and the Burren that are included in the UNESCO Tentative List, Ireland 2010 and engage with other national and international initiatives which promote the special built, natural and cultural heritage of places in the County.

11.6 Site Location and Topography

The proposed development site is located in the townland of Barrettspark, *c.* 6.5km west of Athenry and 6km NE of Oranmore, County Galway. The M6 motorway extends E/W c. 140m to the south of the site. The proposed development area comprises an existing quarry which is largely already stripped of topsoil and partially quarried. The site is bound to the east and west by green fields, to the north-east by an Eirgrid substation and to the north and south by agricultural farmland, mainly pasture. Access to the proposed development site is currently gained from the north via a private quarry road from the public road to the east. In general, the surrounding land consists of agricultural farmland now much industrialised by the construction of the substation and associated overhead lines as well as the existing quarry.

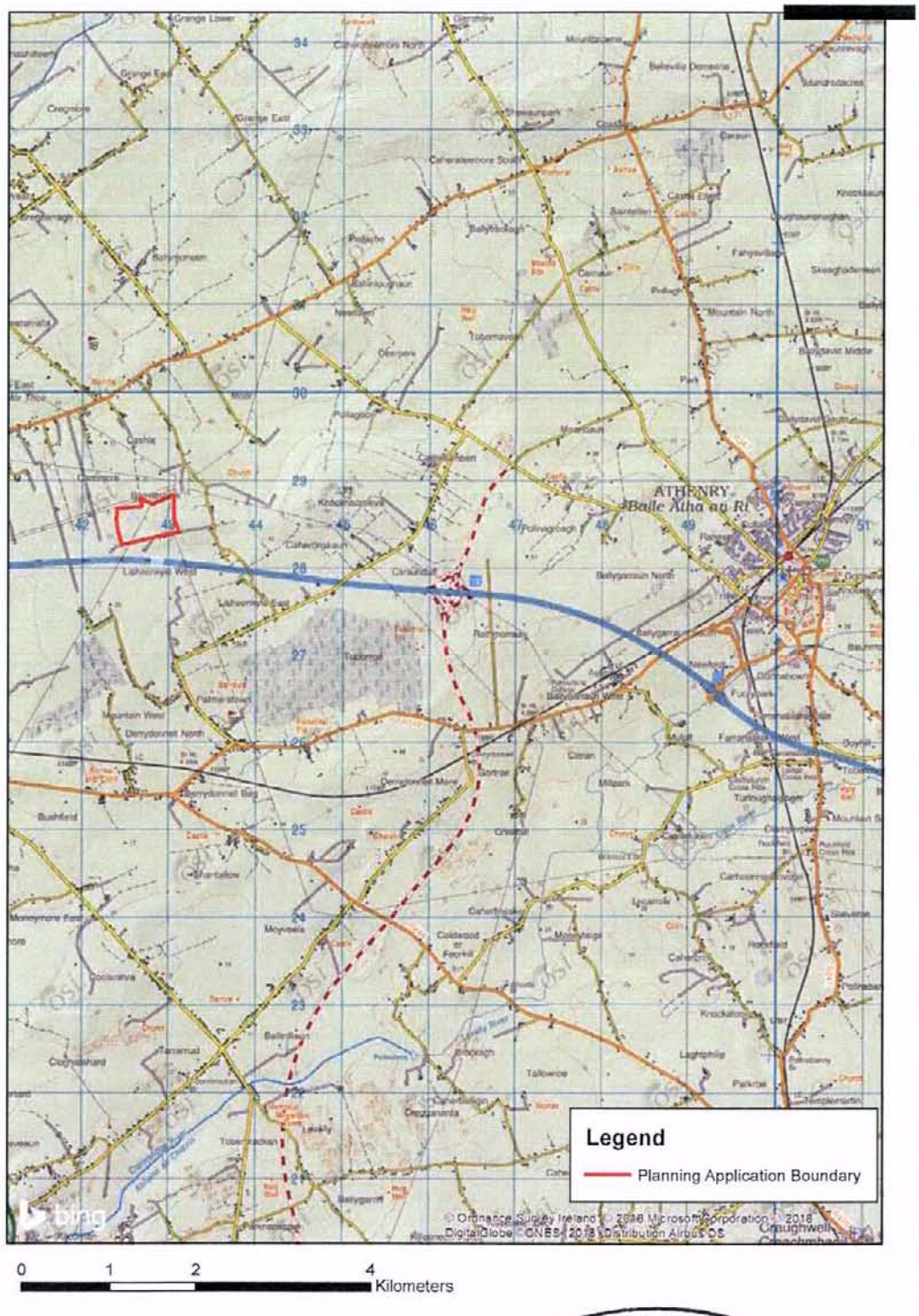


Figure 11-1: Site location map.

Figure 11-2: Site layout

11.7 Methodology

The assessment of the archaeology, architecture and cultural heritage of the proposed development area included desk-based research as well as field inspection. A desk-based study of the proposed development site was undertaken in order to assess the archaeological, architectural and cultural heritage potential of the area and to identify constraints or features of archaeological/cultural heritage significance within or near to the proposed development site. Field survey of the study area was undertaken on 28th November 2018 to determine if previously unrecorded archaeological/architectural or cultural heritage features were located in the area of the proposed development and to assess any potential impacts on known or previously unrecorded sites or monuments within the study area.

11.7.1 Significance of Impacts

The Revised Guidelines on the Information to be contained in Environmental Impact Statements Draft September 2015 was used in order to categorise impacts and the significance of same.

11.7.2 Types of Impact

Direct impacts arise where an archaeological heritage feature or site is physically located within the footprint of the proposed development whereby the removal of part, or all of the feature or site is thus required.

Indirect impacts may arise as a result of subsurface works undertaken outside the footprint of the development, secondary environmental change such as a reduction in water levels and visual impacts.

Cumulative Impacts arise when the addition of many impacts create a large more significant impact.

Residual Impacts are the degree of environmental changes that will occur after the proposed mitigation measures have been implemented.

11.7.3 Significance of Effects

Imperceptible An effect capable of measurement but without noticeable consequences
Not significant An effect which causes noticeable changes in the character of the environment but without noticeable consequences
Slight Effects An effect which causes noticeable changes in the character of the environment without affecting its sensitivities.
Moderate Effects An effect that alters the character of the environment in a manner that is consistent with existing and emerging trends.
Significant Effects

An effect which, by its character, magnitude, duration or intensity alters a sensitive aspect of the environment.
Very Significant An effect which, by its character, magnitude, duration or intensity significantly alters the majority of a sensitive aspect of the environment.
Profound Effects An effect which obliterates sensitive characteristics

11.7.4 Desktop Assessment

A primary cartographic source and base-line data source for the archaeological assessment was the consultation of the Sites and Monuments Record (SMR) and Record of Monuments and Places (RMP) for Galway. All known recorded archaeological monuments are indicated on 6-inch Ordnance Survey (OS) maps and are listed in the aforementioned records. The 1st (1840s) and 2nd (1900s) edition OS maps for the area were also consulted as were aerial photographs.

The primary source and base-line data for the architectural assessment was the consultation of the Record of Protected Structures and the National Heritage of Architectural Heritage for County Galway. Consultation of the historic mapping and field work assisted in the recording of previously unknown architectural heritage feature deemed to be of significance.

The following sources were consulted for this assessment:

- The Record of Monuments and Places (RMP)
- First edition Ordnance Survey maps (OSI.ie)
- Second edition Ordnance Survey maps (OSI.ie)
- Third edition Ordnance Survey Map (Record of Monuments and Places for County Galway)
- Aerial photographs (copyright of Ordnance Survey Ireland (OSI.ie)
- Database of Irish Excavation Reports
- Galway County Development Plan 2015-2021
- National Inventory of Architectural Heritage (NIAH)
- Landed Estates Database (NUI Galway)

11.7.4.1 Record of Monuments and Places

A primary cartographic source and base-line data for the assessment was the consultation of the Sites and Monuments Record (SMR) and Record of Monuments and Places (RMP) for County Galway. All known recorded archaeological monuments are indicated on 6-inch Ordnance Survey (OS) maps and are listed in these records. The SMR/RMP is not a complete record of all monuments as newly discovered sites may not appear in the list or accompanying maps. In conjunction with the consultation of the SMR and RMP the electronic database of recorded monuments (www.webgis.archaeology.ie/historicenvironment) was also consulted.

11.7.4.2 Cartographic Sources and Aerial Photography

The 1st (1840s) edition and 2nd (1900s) edition OS maps for the area were consulted, where available, as was OSI aerial photography on OSI.ie.

11.7.4.3 Archaeological Inventory Series

Further information on archaeological sites may be obtained in the published County Archaeological Inventory series prepared by the Department of Culture, Heritage and the Gaeltacht. The archaeological inventories present summarised information on sites listed in the SMR/RMP and include detail such as the size and location of particular monuments as well as any associated folklore or local information pertaining to each site. The inventories, however, do not account for all sites or items of cultural heritage interest which are as yet undiscovered.

11.7.4.4 County Development Plan

The County Development Plan for Galway (2015-21) was consulted for the schedule of buildings (Record of Protected Structures) and items of cultural, historical or archaeological interest which may be affected by the proposed development. The townlands within and surrounding the study area were entered into the list of protected structures in the development plan to assess the proximity and potential impact of the proposed development on such structures. The digital dataset for the RPS is available through ArcGIS Online and was therefore added to the GIS mapping for the proposed development in order to assess potential impacts to same. The development plan also outlines policies and objectives relating to the protection of the archaeological and architectural heritage of County Galway.

11.7.4.5 Database of Irish Excavation Reports

The database of Irish excavations contains annual summary accounts of all excavations carried out under license. The database is available online at www.excavations.ie and includes excavations from 1985 to 2018. This database was consulted as part of the desktop research for this assessment to establish if any archaeological excavations had been carried out within or near to the proposed development area.

11.7.4.6 National Inventory of Architectural Heritage (NIAH)

This source lists some of the architecturally significant buildings and items of cultural heritage and is compiled on a county by county basis by the Department of Culture, Heritage and the Gaeltacht. The NIAH database was consulted for all townlands within and adjacent to the study area. The NIAH survey for Galway has been published and was downloaded on to the base mapping for the proposed development (www.buildingsofireland.ie). The National Inventory of Architectural Heritage (NIAH) is a state initiative under the administration of the former Department of Arts, Heritage and the Gaeltacht and established on a statutory basis under the provisions of the Architectural Heritage (National Inventory) and Historic Monuments (Miscellaneous Provisions) Act 1999.

The purpose of the NIAH is to identify, record, and evaluate the post-1700 architectural heritage of Ireland, uniformly and consistently as an aid in the protection and conservation of the built heritage. NIAH surveys provide the basis for the recommendations of the Minister for the Department of Culture, Heritage and the Gaeltacht to the planning authorities for the inclusion of particular structures in their Record of Protected Structures (RPS). The published surveys are a source of information on the selected structures for relevant planning authorities. They are also a research and educational resource. It is hoped that the work of the NIAH will increase public awareness and appreciation of Ireland's architectural heritage.

11.7.5 Geographical Information Systems

GIS is a computer database which captures, stores, analyses, manages and presents data that is linked to location. GIS is geographic information systems which includes mapping software and its application with remote sensing, land surveying, aerial photography, mathematics, photogrammetry, geography and tools that can be implemented with GIS software. A geographic information system (GIS) was used to manage the datasets relevant to the archaeological and architectural heritage assessment and for the creation of all the maps in this section of the report. This involved the overlaying of the relevant archaeological and architectural datasets on georeferenced aerial photographs and road maps (ESRI), where available. The integration of this spatial information allows for the accurate measurement of distances of a proposed development from archaeological and cultural heritage sites and the extraction of information on 'monument types' from the datasets. Areas of archaeological or architectural sensitivity may then be highlighted in order to mitigate the potential negative effects of the development on archaeological, architectural and cultural heritage.

11.7.6 Field Inspection

The study area was surveyed by Tobar Archaeological Services in November 2018. The inspection consisted of a walk-over examination of the proposed development area. The site was accessed in good weather conditions. The site description and photographic record is presented in Appendix 11-1 of this EIAR.

11.7.6.1 Limitations Associated with Fieldwork

No limitations were encountered during field survey.

11.8 Existing Environment

11.8.1 Archaeological Heritage

For the purposes of this report, archaeological heritage can include, where relevant;

- UNESCO World Heritage Sites
- National Monuments (Ownership, Guardianship and Preservation Orders)
- Recorded archaeological monuments listed in the RMP/SMR
- Newly discovered archaeological sites

Those elements of the archaeological heritage listed above by virtue of their distance from the application site are scoped out of the assessment.

11.8.1.1 UNESCO World Heritage Sites

Neither the Western Stone Forts nor the Burren (WHS Tentative list) are located within proximity to the site therefore impacts in this regard will not occur.

11.8.1.2 National Monuments

The term 'national monument' as defined in Section 2 of the National Monuments Act (1930) means a monument 'the preservation of which is a matter of national importance by reason of the historical, architectural, traditional, artistic or archaeological interest attaching thereto'. National monuments in State care include those which are in the ownership or guardianship of the Minister for **Culture,**

Heritage and the Gaeltacht. Section 5 of the National Monuments Act (1930) allows owners of other national monuments to appoint the Minister for the **Culture, Heritage and the Gaeltacht** or the relevant local authority as guardian of such monuments, subject to their consent. This means in effect that while the property of such a monument remains vested in the owner, its maintenance and upkeep are the responsibility of the State. Monuments are also protected by Preservation Orders, also National Monuments.

As these monuments are categorised as being of National Importance, monuments within 10km of the site were assessed for potential impacts on visual setting. Five National Monuments in State Care (Nat. Mon. Nos 72, 609, 165, 406, 164 and 642) occur within 10km of the proposed quarry extension. Given the distances of the monuments from the proposed development site and the low-profile nature of the quarry site (sub-surface works), potential impacts on visual setting will be imperceptible. Furthermore, the monuments, with the exception of Roscam Ecclesiastical site and the Kilcornan settlement cluster (NM 642), are located in urban settings, settings which do not extend beyond the limits of the towns. The monuments are shown below in Figure 11-3 and listed in Table 11-1.

Table 11-1: National Monuments within 10km of the site boundary

NAT MON/PRES ORDER NO.	ITM E	ITM N	NAME	RMP NO.	TOWNLAND	DISTANCE (M)
165	537103	733371	Religious house - Franciscan friars	GA070-035001	BAILE CHLÁIR	5503
609	533441	725966	Castle - tower house	GA094-023	MERLINPARK	7974
72	534327	724219	Ecclesiastical Site	GA094-072002	ROSCAM	7786
406	550383	728020	Castle - Anglo-Norman masonry castle	GA084-001006	ATHENRY	5187
164	550373	727809	Religious house - Dominican friars	GA084-001014	ATHENRY	5201
642	552461	729458	Settlement cluster	GA084-086	KILCORNAN (Kilconnell By.)	9400

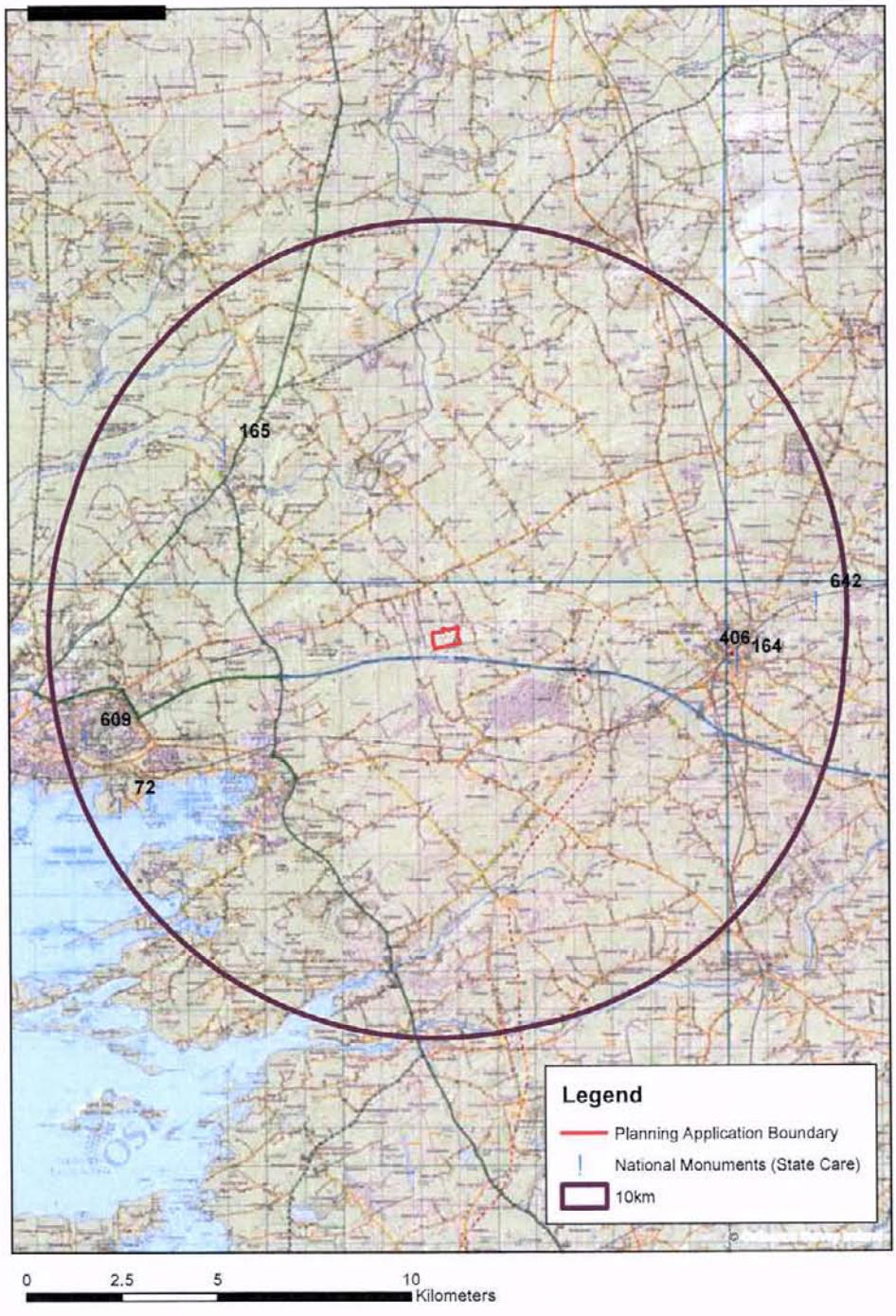


Figure 11-3: National Monuments within 10km of the proposed development site.

11.8.1.21 NM165 Religious house - Franciscan friars GA070-035001

This monument was taken into Guardianship under the National Monuments Acts 1930 to 1914 - National Monument 165. In flat farmland on N bank of the River Clare; it was associated with the medieval borough of Claregalway (GA070-107). This Franciscan friary was already in existence c. 1252 and probably built by 'John de Cogan I' (Gwynn and Hadcock 1970, 245-6). The well-preserved standing remains, now a Nat. Mon., consist of a nave and chancel church (E-W; L c. 43m, Wth c. 6.7m) of 13th-15th- date with a later N aisle, tower and N transept, probably additions of 15th-C date. The W gable, now fallen but still extant in 1792, contained a pointed arch doorway with a traceried window above (Cochrane 1901, 332). The N aisle of the nave was separated from it by four pointed arches. Six clearstorey windows are visible in S wall below which are a number of tomb-niches. The tower is of three storeys. The transept was used as an RC chapel until the 19th C and was still roofed c. 1900. The chancel is lit by six pairs of 13th-C lancet windows in opposing side walls and by a large 15th-C traceried window in E gable. The latter replaced an original triple-lancet E window, the sills and jambs of which are still partly visible (ibid., 324-5). The S wall of the chancel is graced by a piscina, aumbry and sedilia and N wall by a canopied tomb niche of the de Burgos. Immediately to S lies the cloister garth and substantial sections of the domestic ranges, the fabric of the latter showing much evidence of alterations. Further S are the remains of the 'garderobes' and a watermill (ibid., 332). The graveyard is interesting for the several tombstones bearing occupational symbols. (Mooney 1956, passim; Harbison 1975, 88)

The above description is derived from the published 'Archaeological Inventory of County Galway Vol. II - North Galway'. Compiled by Olive Alcock, Kathy de hÓra and Paul Gosling (Dublin: Stationery Office, 1999).

11.8.1.22 NM609 Castle - tower house GA094-023

This monument was taken into Ownership under the National Monuments Acts 1930 to 1914 - National Monument 609. On a short rise in the former demesne of Merlin Park House. This Nat. Mon., known as 'Doughiske Castle' until the mid-18th C, was in existence in 1574 when it was in the possession of Stephan Lynch (Nolan 1901, 113). It consists of a well-preserved four-storey rectangular tower (L 8.95m, Wth 7.85m) over a basement. A doorway, centrally placed in E wall, gives access, via a lobby, to ground floor, to spiral stairs in SE corner and to basement stairs in NE. There are subsidiary chambers and latrines to S of the main rooms on ground and 1st floors and an intramural passage in same position on 2nd floor. Stone vaults exist between basement/ground floor and 2nd/3rd floors. Fireplaces occur in N wall of the basement, 2nd, and 3rd floors. Two small chambers (one concealed) occupy the thickness of the vault between the 2nd/3rd floors. The gabled roof contained a garret and had wall-walks with machicolations at parapet level on N, S and W walls. Apart from the horizontal gun slits on ground floor, all the windows are either single or double lights with ogival heads. A sheela-na-gig (GA094-023001-) figure is carved onto the spandrel of a single-light ogee-headed window on 2nd floor of S wall. A later extension adjoined at E, where traces of a high pitched roofline, a doorway inserted off the spiral stairs and a raised platform indicate a former two-storeyed building, possibly of 17th-C date. (Athy 1914, 146-52; O'Flanagan 1927a, Vol. 1, 330)

The above description is derived from the published 'Archaeological Inventory of County Galway Vol. I - West Galway'. Compiled by Paul Gosling (Dublin: Stationery Office, 1993).

11.8.1.23 NM72 Ecclesiastical Site GA094-072002

On a S-facing slope in pastureland on the NE shore of Galway Bay, commanding panoramic views across the bay to the S and the Burren uplands to the SW. This early ecclesiastical settlement is associated with St Odran, a brother of St Ciarán of Clonmacnoise (Gwynn and Hadcock 1970, 402).The ecclesiastical enclosure (N-S 200m, E-W 190m), defined by a massive drystone wall (av. H 1.5m; Wth c. 2m), is roughly D-shaped in plan and is very well preserved. Most of the enclosing wall

has been raised over the years by the addition of field-clearance rubble on top of it. At E a modern entrance is possibly on the site of the original one. A collapsed triangular-headed sheep-gap was noted to the S of it in 1984 (SMR file). The following features are located within the interior: a round tower (GA094-072004-), a church (GA094-072001-), a separate graveyard (GA094-072003-) within which are an early Christian cross-slab (GA094-072012-), a possible leacht (GA094-072013-), a holed stone (GA094-072007-), two multiple bullauns (GA094-072008- and GA094-072009-) and medieval graveslabs (GA094-072005-, GA094-072006- and GA094-072011-). The bullauns were regarded locally as holy wells (Fahey 1901a, 229) but were marked on OS 6-inch maps as 'Penitential Station'. Numerous architectural fragments (GA094-071014-) are scattered throughout the graveyard, including a number of bowtell mouldings, possibly from a window or doorway, suggesting that there may have been another church located within it. Another early Christian cross-slab GA094-072015-) was recorded by Higgins (1992, 209-12). (Frazer 1896, 162; Athy 1914, 163-4; Harbison 1975, 99)

The above description is derived from the published 'Archaeological Inventory of County Galway Vol. I - West Galway'. Compiled by Paul Gosling (Dublin: Stationery Office, 1993). In certain instances the entries have been revised and updated in the light of recent research.

11.8.1.2.4 *NM406Castle - Anglo-Norman masonry castle GA084-001006*

The monument was taken into Ownership under the National Monuments Acts 1930 to 1914 - National Monument 406.

11.8.1.2.5 *NM164 Religious house - Dominican friars GA084-001014*

The monument was taken into Ownership under the National Monuments Acts 1930 to 1914 - National Monument 164.

11.8.1.2.6 *NM642 GA084-086 Settlement cluster at KILCORNAN (Kilconnell By.)*

The monument was taken into Ownership under the National Monuments Acts 1930 to 1914 - National Monument 642.In poorly drained grassland, bounded at E and W by two streams. Aerial reconnaissance in July 1970 (CUCAP BDN 73) revealed a well-preserved deserted village covering an area c. 300m NE-SW by 275m NW-SE. It consists of eight rectangular plots, situated on either side of a narrow grass-covered 'street'. This runs E-W through the 'village' and can be traced for a considerable distance to NW and SE. Each plot contains one or two houses, some with internal divisions. The 1st ed. of OS 6-inch map shows three roofed buildings in this area along with a section of the roadway. This and its regular layout, when coupled with the absence of a church, castle or other diagnostic features, suggest that it is of 17th/18th-C date. Furthermore, the area is also known locally as 'the sixteen tenants'.

The above description is derived from the published 'Archaeological Inventory of County Galway Vol. II - North Galway'. Compiled by Olive Alcock, Kathy de hÓra and Paul Gosling (Dublin: Stationery Office, 1999). Date of upload: 05 August 2010

11.8.1.3 Recorded Archaeological Monuments located within study area boundary

No recorded monuments are located within the application site boundary. Furthermore, none were noted during the assessment undertaken as part of the 2006 and the 2009 EIS reports.

11.8.1.4 Recorded Archaeological Monuments within 2km of the proposed development site

Thirty-five (35) recorded monuments are located within 2km of the proposed quarry extension (and existing) and were considered for purposes of assessing potential impact on setting in the wider landscape (Table 11-2). A total of 3 monuments are located within 1km of the proposed quarry site boundary with none located nearer than 800m. The remaining monuments are located in excess of 1km from the proposed development site boundary.

Table 11-2: RMPs located within 2km of application site

ID	SMRS	ITM_E	ITM_N	CLASSDESC	TLAND_NAME	Distance (m)
1	GA083-008—	542113	728068	Enclosure	CARNMORE,AN CARN MÓR THIAR,PALMERSTOWN	718
2	GA083-027—	542557	729512	Quarry	CASHLA (Aughrim ED)	820
3	GA083-007—	541897	729151	Redundant record	CARNMORE	962
4	GA083-060001-	543975	729116	Religious house - unclassified	MOOR (Clare By.)	1150
5	GA083-060002-	543976	729114	Graveyard	MOOR (Clare By.)	1150
6	GA083-060003-	543976	729114	Ecclesiastical enclosure	MOOR (Clare By.)	1150
7	GA083-060004-	544000	729107	Well	MOOR (Clare By.)	1171
8	GA083-059—	543661	729641	Ringfort - unclassified	MOOR (Clare By.)	1180
9	GA083-026—	542836	730024	Enclosure	CASHLA (Aughrim ED)	1268
10	GA083-049001-	543340	727152	Children's burial ground	LISHEENKYLE WEST	1358
11	GA083-049002-	543340	727152	Ringfort - unclassified	LISHEENKYLE WEST	1358
12	GA083-002—	544229	729066	Designed landscape feature	CAHERBRISKAUN,MOOR (Clare By.)	1379
13	GA083-047—	542229	730057	Barrow - unclassified	LISHEENAVALLA	1452

14	GA083-021—	541093	728402	Castle - unclassified	AN CARN MÓR THIAR	1582
15	GA083-020—	541032	728642	Enclosure	AN CARN MÓR THIAR	1641
16	GA083-078—	541483	727327	Megalithic structure	FRENCHFORT	1677
17	GA083-023—	540954	728658	House - indeterminate date	AN CARN MÓR THIAR	1720
18	GA083-019—	540904	728798	Enclosure	AN CARN MÓR THIAR	1785
19	GA083-079—	540889	728213	Concentric enclosure	AN CARN MÓR THIAR	1809
20	GA083-079001-	540832	728168	Field system	AN CARN MÓR THIAR	1874
21	GA083-075—	543296	726539	Barrow - unclassified	PALMERSTOWN	1939
22	GA083-080—	540760	728153	Enclosure	AN CARN MÓR THIAR	1947
23	GA083-080001-	540760	728153	Hut site	AN CARN MÓR THIAR	1947
24	GA083-066—	543415	726525	Barrow - ring-barrow	PALMERSTOWN	1980
25	GA083-067—	543627	726583	Barrow - bowl-barrow	PALMERSTOWN	1991
26	GA083-068—	543310	726472	Barrow - ring-barrow	PALMERSTOWN	2007
27	GA083-077—	540907	727568	Barrow - ring-barrow	FRENCHFORT	2010
28	GA083-045—	544851	729201	Ringfort - cashel	KNOCKNACREEVA	2013
29	GA083-074—	543217	726441	Barrow - ring-barrow	PALMERSTOWN	2019
30	GA083-003—	544937	728051	Ringfort - cashel	CAHERBRISKAUN	2023
31	GA083-071—	540667	728002	Ringfort - cashel	AN CARN MÓR THIAR	2072

32	GA083-022—	540520	728436	Ringfort - rath	AN CARN MÓR THIAR	2152
33	GA083-044—	544981	729339	Enclosure	KNOCKNACREEVA	2177
34	GA083-058—	544495	730299	Country house	MOOR (Clare By.)	2233
35	GA083-028001-	542007	731186	Souterrain	CASHLA (Lisheenavalla ED)	2580

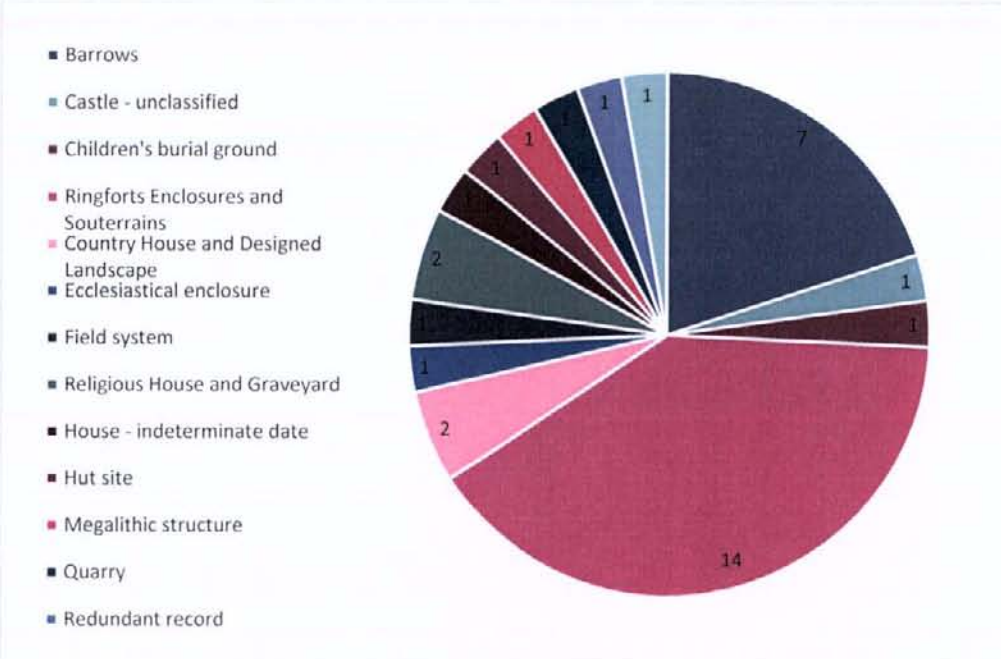


Figure 4: Chart showing monument types within 2km of the proposed quarry extension

The Prehistoric Period

Only two monument types within 2km may be attributed to the Prehistoric period – barrows and a megalithic structure. Barrows are funerary in nature and contain and/or cover burials. Excavated examples have been dated to the Bronze and Iron Ages (c. 2400 BC - AD 400). Ring barrows are a circular or oval raised area (generally up to 1m above the external ground level or level with it) enclosed by fosse(s) and outer bank(s), with or without an entrance. These are part of the Bronze/Iron Age burial tradition (c. 2400 BC - AD 400). Megalithic structures are a construction of large stones of 'megalithic' proportions which, though comparable in certain respects with megalithic tombs, cannot be classified as any other known archaeological monument type on present evidence. These may date from the prehistoric period onwards.

Early Medieval Period

At least 14 monuments within 2km of the proposed development site, comprise enclosures / ringforts and a souterrain and constitute the largest group of monuments within 2km. Ringforts and enclosures are the most numerous archaeological monuments in the Irish landscape. They consist of a circular or

roughly circular area enclosed by an earthen bank formed by material thrown up from the digging of a concentric ditch on its outside. Ringforts are usually enclosed by a single bank (univallate) while bivallate or trivallate ringforts, i.e. those enclosed by double or triple rings of banks, are less common. The number of banks and ditches enclosing these monuments are considered to reflect the status of the site, rather than the strengthening of its defences. Sites enclosed by stone-built banks are known as cashels. Archaeological excavation has shown that the majority of ringforts functioned as enclosed farmsteads, built during the Early Christian period (5th – 9th century A.D.). Excavation within the interior of the monuments has traced the remains of circular and rectangular dwelling houses as well as smaller huts probably used to stall animals. The enclosing earthworks would also have protected domestic livestock from natural predators such as wolves and foxes.

Monuments with religious associations

The ecclesiastical site at Moor contains 4 monuments with religious associations including an enclosure, graveyard, well and religious house. The religious house is described as follows:

Within an early ecclesiastical enclosure (GA083-060003-). Marked on 1st ed. of OS 6-inch map as a roofed rectangular building (c. 15m by c. 5m), aligned NW-SE. All that survives are overgrown fragments (Wth 0.36m, H c. 2m max.) of W (L 7.3m) and S (L 3.8m) walls. These probably represent the last traces of a large rectangular building (E-W c. 15m, N-S >7.3m). No architectural features are visible. The interior is occupied by a 19th-C burial vault of the Lambert family. (Gwynn and Hadcock 1970, 367). These monuments are c. 1.2m from the quarry site.

Another monument with religious association comprises a children's burial ground (GA083-049001) at Lisheenkyle West townland over 1km from the quarry site. A children's burial ground comprises an area of unconsecrated ground for the interment of unbaptised or stillborn children, often known under various Irish names: Cillín, Caldragh, Ceallúnach or Calluragh. The graves were generally marked by simple, low, upright stones or slabs almost invariably without any inscription or other carving. This burial practice may be medieval in origin and continued in Ireland until the 1960s.

The Medieval Period

One monument dating to the medieval period comprises an unclassified castle (GA083-021) located in An Carn Mor Thiar townland 1.5km from the proposed development site. This is marked as '*Cloghmoyle Castle in ruins*' on both the 1st and 2nd edition historic maps.

Designed Landscape Features

A designed landscape feature (GA083-002) in Moor townland is located just over 1.3km to the proposed development site.

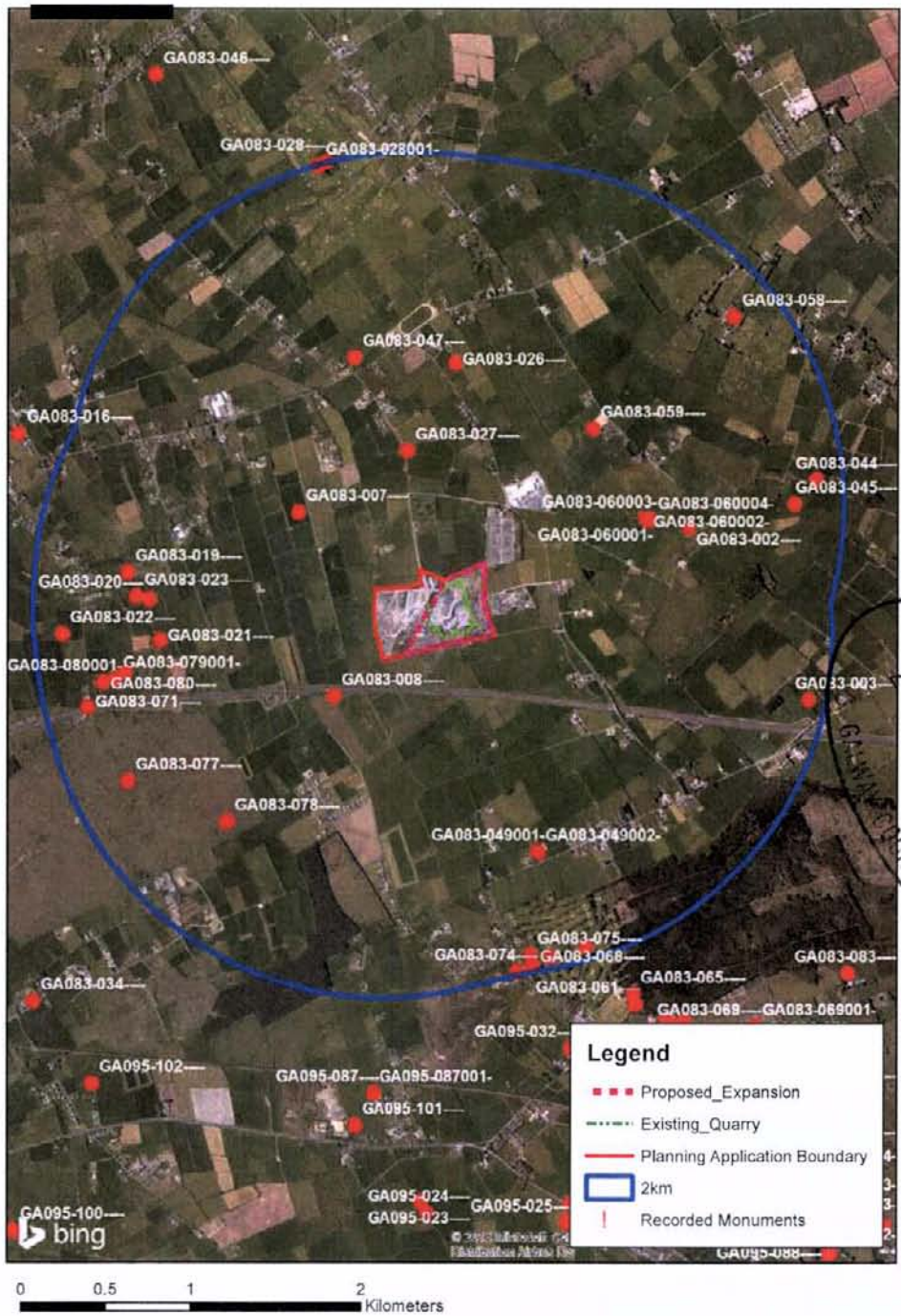


Figure 11-5: RMPs within 2km of the proposed quarry extension

11.8.1.5 New potential archaeology recorded within study area boundary

All areas proposed for development were examined by a walk-over survey. The potential discovery of new monuments is negated by the fact that the site is largely occupied by an existing quarry the extension of which is limited to its surrounds. Previous field assessment did not result in the discovery of any new monuments within the site. One linear feature was noted within the proposed quarry (2006 EIS) and this was subject to archaeological investigation at a later stage. The results of the investigation demonstrated that the feature was natural in origin. The field assessment shows that the ground within the expansion areas have been reduced to natural strata.

11.8.1.6 Archaeological excavations undertaken within vicinity of study area boundary

The database of excavations undertaken in Ireland (www.excavations.ie) was checked for those carried out within or in close proximity to the proposed development area. A number of licensed archaeological excavations were undertaken in the townland of Barrettspark, none of which produced any archaeological finds (see below). One such example was archaeological monitoring and testing of the existing quarry itself. Numerous schemes which required archaeological intervention were undertaken within proximity to the proposed development site. These included the N6 Galway–Ballinasloe road scheme, the Cashla substation site and associated overhead line as well as the Tuam Water Supply Scheme and associated pipeline which traversed some townlands adjacent to the proposed site.

11.8.1.6.1 *Existing Quarry Site*

The existing quarry was subject to archaeological testing of a linear feature and the results of archaeological monitoring of topsoil removal within the site. None of the above resulted in the discovery of any new features (see below).

2007:590 - Barrettspark, Galway
County: Galway Site name: Barrettspark
Sites and Monuments Record No.: N/A Licence number: 07E0960
Author: Fiona Rooney, Arch Consultancy Ltd, Ballydavid South, Athenry, Galway.
Site type: No archaeological significance
ITM: E 542520m, N 728819m
Latitude, Longitude (decimal degrees): 53.306536, -8.862437

An assessment of the proposed development recommended pre-development testing in one area of possible archaeological significance and monitoring of topsoil-stripping throughout the remainder of the development site. The proposed development consisted of 13.5ha of land at Barrettspark, Cashla, Co. Galway, to facilitate a stone quarry. Monitoring undertaken in August 2007 revealed no features of archaeological significance. Pre-development testing was concentrated in one area in the south-west of the development, where a possible linear bank was noted. Four trenches excavated through this area revealed that the bank was natural in origin and consisted of a natural ledge surrounded by gravel and outcropping bedrock. No archaeological layers or features were uncovered in the course of the testing.

11.8.1.6.2 *Other Investigations*

2010:312 - Various townlands, Galway

County: Galway Site name: Various townlands
Sites and Monuments Record No.: N/A Licence number: 10E0038
Author: Richard Jennings, Kilkenny Archaeology, 1 The Spires, Dean Street, Kilkenny.
Site type: Monitoring
ITM: E 543035m, N 728717m
Latitude, Longitude (decimal degrees): 53.305675, -8.854694

Monitoring was requested of two 110kV ESB overhead power lines linking Cashla 220kV substation, which is located c. 12km east of Galway city, with the existing Dalton–Galway 110kV line at Barravilla and Baile Chlair near Claregalway. A total of 33 angle masts and 85 pole sets were excavated along the route, which predominately crossed fields of lush green pasture. The footings of all the angle masts and a small sample of pole sets were required to be monitored. There were four footings per angle mast with each being 3.3m2 or 2.3m2 in shape depending upon the type of angle mast used.

The route is approximately 22km long and can be divided into three areas: Barrettspark to Lisheenavalla (mast/pole numbers 1–16); Lisheenavalla to Barravilla (mast/pole numbers 17–81); Lisheenavalla to Baile Chlair (mast/pole numbers 82–118).

Barretspark to Lisheenavalla (numbers 1–16)

This 2.9km section of the route, which crossed townlands Barrettspark, Moor, Cashla, and Lisheenavalla, was made up entirely of angle masts because two lines were being carried from the Cashla 220kV substation to Lisheenavalla. Nothing of archaeological potential was identified in the angle mast footings. The topsoil at these masts was usually a dark-brown sandy silt or clayey silt up to 0.4m deep while the subsoil was a light-grey sandy gravel.

A previously unrecorded ring-barrow was identified in the centre of the same field as angle mast 15 in Lisheenavalla, about 40m to the south-west of the mast. The barrow is not shown on the first- and second-edition OS mapping but is visible on 1995 and later aerial photographs. A gas pipeline which also passes through the field can be seen to kink around the barrow on the 2005 aerial photograph. The barrow measures 14m east–west x 16m. It comprises a small low mound 9.5m x 11.5m defined by a 1.5m-wide ditch with a 3m-wide low surrounding bank. The top of the bank is 0.3m above the interior area. A possible second monument lies c. 60m south-east of the barrow in the same field. It is covered in long grass and may simply be a pond that measures 6m east–west x 7m with an interior depth of 0.6m, but its proximity to the barrow raises the possibility that it is also archaeological. The field in which the barrow is located is low and flat and there are good views in all directions.

An unusual stone structure was identified to the west of angle mast 6 in Cashla. It measured 4m north–south x 4.5m x 2.7m high and is depicted on the second- but not the first-edition OS map. It was built above the intersection of four field boundaries. It resembles an elaborate crossing point with four sets of stone steps leading up to a viewing platform or watchtower.

Lisheenavalla to Barravilla (numbers 17–81)

The two lines split at Lisheenavalla and headed north-east to Barravilla and south-west to Baile Chlair. The single line heading to Barravilla ran from Lisheenavalla into Cregcarragh and Ballymoneen before turning north in Grange East. It then crossed into Coolaran, where it met the River Clare. The line crossed the river into Cahernashilleeny. It ran west through Lackagh Beg and north-west into Cnoc Tua Mor and Knockdoebeg West. From there it crossed the main Galway–Gort road and continued west through An Caran Carraghy, Carheeny, Baunmore and Barravilla, where it joined the existing Dalton–Galway 110kv line.

Nine angle masts (22, 24, 31, 42, 52, 54, 62, 75 and 81) and nine pole sets located on either side of the River Clare (38–41 and 43–47) in an area described as having moderate to high archaeological potential in the EIS were monitored in these townlands. Nothing of archaeological potential was

discovered. The topsoil composition varied in the areas. It was c. 0.4m deep near the river and c. 0.1–0.2m elsewhere. The subsoil was typically a sticky grey clay.

Lisheenavalla to Baile Chlair (numbers 82–118)

The single line heading from Lisheenavalla to Baile Chlair crossed into Islandmore and An Chathair Laith, where it turned north-west into Gort an tSleibe, whose northern border is adjacent to the River Clare. The line crossed the river into Na Croisíní and ran north-west through Cill Torrog, Cinn Uisce and into Baile Chlair, where it joined up with the existing Dalton–Galway 110kv line.

Monitoring of eight angle masts (82, 88, 92, 96, 98, 113, 116 and 118) and a small sample of pole sets in these townlands yielded no archaeological remains. Topsoil varied in composition and was on average 0.4m deep. Subsoil was typically a pale greyish/yellow sandy gravel.

2005:566 - CAHERBRISKAUN, Galway
County: Galway Site name: CAHERBRISKAUN
Sites and Monuments Record No.: N/A Licence number: A024/1.9
Author: Bruce Sutton and John Lehane, Valerie J. Keeley Ltd, Brehon House, Kilkenny Road, Castlecomer, Co. Kilkenny.
Site type: Testing
ITM: E 544939m, N 727868m
Latitude, Longitude (decimal degrees): 53.298247, -8.825979

Machine testing was undertaken as part of Contract 1 of the N6 Galway–Ballinasloe road scheme (Phase 1 testing) to ascertain the date and extent of the remains of pre-famine structures and an associated field system that is to be partially destroyed during the course of the construction of the dual carriageway. The testing aimed to examine several geophysical anomalies that corresponded well with structures shown on OS mapping. Work on site revealed no physical remains of these structures nor cultivation patterns. No further work is proposed at the site.

The work was commissioned by Galway County Council National Roads Design Office and sponsored by the National Roads Authority. RPS-MCOS Ltd acted as principal consultants for the scheme.

2006:833 - Palmerstown, Galway
County: Galway Site name: Palmerstown
Sites and Monuments Record No.: GA083–069, GA083–070 Licence number: 06E1130
Author: Galway, Unit 10, Kilkerrin Park, Liosbain Industrial Estate, Galway.
Site type: Sites of fulachta fiadh
ITM: E 543266m, N 726540m
Latitude, Longitude (decimal degrees): 53.286132, -8.850841

Excavations in Palmerstown, Athenry, Co. Galway, took place on 27 November 2006. A request for testing was made by the Department of the Environment, Heritage and Local Government in order to establish the nature and extent of any surviving archaeological remains after unauthorised works had taken place in the vicinity of GA083–069 and GA083–070. The field in which the two sites have been recorded has been ploughed and a number of parallel drains have also been inserted in order to reclaim the land. The ploughing revealed that the ground is composed of peat with occasional bands of decayed limestone bedrock.

Prior to testing, a field inspection designed to recover disturbed artefactual material located in the ploughed topsoil was undertaken. A walk-over survey across the target area was conducted on a 2m-wide grid spacing. An area measuring 50m by 100m centred on the national grid coordinates for the two recorded fulachta fiadh was delimited and 25 transects, 100m in length, were walked. Nothing of

any archaeological significance was noted during the survey and no artefactual remains were uncovered.

A large tracked excavator fitted with a 1.5m-wide toothless bucket was employed to open ten trenches across the recorded locations of the two fulachta fiadh. The location of the monuments was identified with a Garmin handheld global positioning system with an accuracy of 65m. The monuments were recorded in 1992 as mounds with average dimensions of 10m by 5m. The testing did not identify any surviving trace of either of the two monuments.

2000:0375 - CARNMORE WEST, Galway
County: Galway Site name: CARNMORE WEST
Sites and Monuments Record No.: N/A Licence number: 00E0478
Author: Deirdre Murphy, Archaeological Consultancy Services Ltd, 15 Trinity Street, Drogheda, Co. Louth.

Site type: No archaeological significance
ITM: E 629794m, N 638507m
Latitude, Longitude (decimal degrees): 52.497152, -7.561222
A programme of pre-development test excavation was conducted at two locations within the Tuam Regional Water Supply Scheme, Stage 3: the site of a proposed reservoir and over part of a wayleave that runs in proximity to a cashel, SMR 83:12. The excavations followed from recommendations made to Galway County Council by ASU Ltd.

Within the reservoir site four sites of archaeological potential were investigated following clearance of heavy vegetation cover. The sites had been interpreted as a stone bank, a possible clearance cairn and two possible stone hut sites. The reservoir site measured c. 138m north–south x 76m. The potential sites were within the north-west corner of the development area. The excavation revealed the sites to be stone stockpiles resulting from quarrying of the limestone outcrop on or near which they were located. A deposit of lime was found under one of the sites (the proposed clearance cairn), indicating that the production of lime took place nearby, although a limekiln was not identified. It was recommended that the construction of the reservoir be archaeologically monitored in the event of evidence being uncovered that may date the use of the quarry. The use of lime as a fertilizer was relatively widespread in the 18th and 19th centuries. Medieval examples of limekilns are less well known, but there are limekilns from medieval urban contexts in Dublin and Drogheda.

Four test-trenches were excavated over part of the wayleave, which passes 56m to the north of the cashel. Originally the line of the wayleave passed within 30m of the monument, and testing had been recommended. The excavation did not uncover deposits or finds of archaeological significance. A simple stratigraphic sequence of topsoil overlying natural was identified. Topsoil finds included sherds of crockery, clay pipe fragments and glass. A large clearance cairn close to part of the wayleave indicated that intensive modern agricultural reclamation had taken place in at least one of the fields in which test-trenches had been placed. While the test excavations did not uncover archaeologically significant material, it was recommended that topsoil-stripping in the area be subject to archaeological monitoring within the overall monitoring programme for the scheme.
Nóra Bermingham, Archaeological Consultancy Services Ltd, 15 Trinity Street, Drogheda, Co. Louth.

375A. CARNMORE WEST
Monitoring
229850 138460 and 229859 139105
00E0478
This licence was first issued to Nóra Bermingham on 13 July 2000 and was transferred to Deirdre Murphy on 23 August 2000.

Monitoring was conducted during topsoil-stripping as part of the Tuam Regional Water Supply Scheme, Stage 3, in the areas of the proposed reservoir, the proposed pipeline to Claregalway and Oranmore, and the proposed scour/overflow main. The monitoring revealed that the topsoil extended

to a depth of c. 0.3m and directly overlay the natural limestone bedrock. A number of 19th–20th-century finds were recovered from the topsoil, and no archaeological deposits or features were exposed. No further work is required.

Monitoring was also conducted during the excavation of three engineering test-pits in Claregalway village. Trench 1 was excavated in proximity to Claregalway Castle and revealed a thick layer of post-medieval mortar and stone below the tarmac roadway. Two 19th-century stone walls belonging to an earlier stone bridge were also exposed. Trenches 2 and 3 revealed the boulder clay at a depth of 0.4m below the tarmac roadway. No finds were recovered, and no archaeological deposits or features were exposed. Further archaeological monitoring will be conducted during the construction of the pipeline through Claregalway village.

2005:572 - CARNMORE WEST, Galway
County: Galway Site name: CARNMORE WEST
Sites and Monuments Record No.: N/A Licence number: A024/1.7
Author: Bruce Sutton, Valerie J. Keeley Ltd, Brehon House, Kilkenny Road, Castlecomer, Co. Kilkenny.
Site type: Testing
ITM: E 540781m, N 728011m
Latitude, Longitude (decimal degrees): 53.299081, -8.888377
Hand testing was undertaken as part of Contract 1 of the N6 Galway–Ballinasloe road scheme (Phase 1 testing). The site was initially identified during the EIS as a field system, well and roadway. In total, 90m2 of test-trenches were opened across the site to test various features. The features identified included a small circular stone structure, a rectangular stone structure, an animal well, a field system and a large circular enclosure with associated annexe. No evidence was uncovered for a roadway. All archaeological material located within the area under CPO is to be excavated as part of Phase 2 archaeological works.
The work was commissioned by Galway County Council National Roads Design Office and sponsored by the National Roads Authority. RPS-MCOS Ltd acted as principal consultants for the scheme.

2005:573 - CARNMORE WEST, Galway
County: Galway Site name: CARNMORE WEST
Sites and Monuments Record No.: N/A Licence number: A024/1.8
Author: Bruce Sutton, Valerie J. Keeley Ltd, Brehon House, Kilkenny Road, Castlecomer, Co. Kilkenny.
Site type: Testing
ITM: E 542091m, N 728091m
Latitude, Longitude (decimal degrees): 53.299942, -8.868742
Machine testing was undertaken as part of Contract 1 of the N6 Galway–Ballinasloe road scheme (Phase 1 testing). The site was identified initially as the remains of a ploughed-out enclosure (SMR 83:8). It is marked on the first-edition OS map. An area of 2400m2 was machine-stripped around the location of the possible enclosure, with a further 1600m of machine trenches positioned to locate any additional features. Nothing of an archaeological nature was identified during Phase 1 testing works. No further work is proposed at the site.
The work was commissioned by Galway County Council National Roads Design Office and sponsored by the National Roads Authority. RPS-MCOS Ltd acted as principal consultants for the scheme.

2006:767 - Carnmore West, Galway
County: Galway Site name: Carnmore West
Sites and Monuments Record No.: - Licence number: E002436
Author: Bruce Sutton, for Valerie J. Keeley Ltd, Brehon House, Kilkenny Road, Castlecomer, Co. Kilkenny.
Site type: Cashel, souterrain and multi-phase kiln
ITM: E 540781m, N 728011m
Latitude, Longitude (decimal degrees): 53.299076, -8.888384

Excavation was carried out as part of Phase 2 of the proposed N6 Galway to Ballinasloe scheme, Contract 1 (Doughiska to Ballygarraun South), on behalf of Galway County Council and funded by the NRA under the national development plan 2000–2006. The scheme number for the project was A024. The sub-scheme number for Carnmore West was A024/6.

The site was identified by the writer during Phase 1 test-trenching and was identified as a stone-built enclosure with associated annexe, barrow, rectangular structure and animal well. It was recommended that all areas uncovered during testing should be fully excavated. Two additional enclosures were visible c. 150m to the north, off the line of the road scheme. The excavated enclosure is located at the junction of three townlands, Carnmore West, Glennasaul and Frenchfort.

During Phase 2 excavation works the site was divided into a number of areas.

Area A comprised a large cashel, roughly 55m in diameter, with associated sub-oval annexe measuring 50m east–west by 45m. Only the southern two-thirds of the cashel lay within the area under CPO; the remainder was to be preserved in situ. The cashel walls were constructed using two rows of large limestone blocks with a rubble core. The outer face contained large stones with a more regular facing than the interior. Along the eastern side of the cashel there were three rows of large limestones with two separate cores. Two walls extended into the cashel interior from the east and west sides and may have represented access on to the walls or have been the remains of demolished buildings. An entrance from the annexe into the cashel was visible on the south-east side. Two post-holes were cut into bedrock at the entrance and a small uneven cobbled surface was recorded.

There were very few features excavated in the cashel interior. These included a small number of randomly distributed pits and post-holes. At the extreme northern edge of the excavation a pit-drop entrance to a souterrain was uncovered, with possible steps along the eastern side. This entrance had entirely silted up and a horse skeleton was excavated close to the top of the fill, suggesting it was a much more recent addition. Adjacent to the entrance a square-cut hearth was cut into bedrock. The souterrain extended to the north and was therefore not excavated, as it lay beyond the area under CPO. The souterrain was cut through the earth and the underlying bedrock. The passageway was unrestricted, with a maximum height of roughly 2m. The walls were of drystone construction overlying cut bedrock. In some places clay had been used as a crude mortaring element in the walls. The ceiling was corbelled, with lintels measuring up to 3m in length. The passageway extended for roughly 15m before taking a right turn into a dead end with no apparent chamber. A possible bench was located at the rear of the passage. The souterrain is to be backfilled with a suitable material to prevent collapse from the passage of heavy traffic.

The annexe extended to the south of the cashel. It was constructed from two rows of limestone blocks with a rubble core. A small entrance was located on the western side at the annexe and cashel wall junction, although this would only have been wide enough for people or possibly cattle. The eastern portion of the annexe wall had been removed, suggesting that any larger entrance (if present) would have been located here.

Area B was located roughly 30m to the west of the annexe in Area A. It consisted of two keyhole/dumbbell-shaped kilns that had been truncated by a large L-shaped kiln. This later kiln had a drystone-built drying chamber and the flue was constructed with lintels and uprights of limestone. The remains of a circular structure were located around the later L-shaped kiln, with an entrance visible on the eastern side, adjacent to the firing chamber. The wall construction was similar to the annexe, with two rows of limestone and a rubble core. The structure measured 6.5m by 7m. No internal features, apart from the kilns, were evident in the structure interior, suggesting it was not roofed.

Area C comprised a U-shaped drystone-built, structure 12m by 9m, with an entrance on the southern side. Only a single course of the wall remained, with the stone possibly being robbed to make the drystone field walls of the surrounding landscape, as there was very little collapsed material. Only one feature was evident in the area, a large pit or natural feature filled with a dark-blue/grey alluvial clay, completely foreign to the surrounding silty sand natural and limestone bedrock. Specialist analysis is being undertaken to determine the deposition method of this material. The area is initially interpreted as the remains of an early animal well.

A second, much larger, animal well was located in Area D. This was cut into bedrock to a depth of 4.5m. A ramp led down to a concrete trough, which easily retained water. The presence of concrete in its construction gave the feature a 20th-century date and was therefore non-archaeological.

Area E contained collapsed field walls that extended across the site and into the area to the north and south. This field system seemed to link the three enclosures in the area but also seemed to be associated with a ridge and furrow system. The ridge and furrow respected modern field boundaries, suggesting a later date than the excavated cashel. At present it is uncertain as to when the field system dates.

Area F comprised a test-trenching area that was to be undertaken during Phase 2 at the eastern end of site A024/6. Nothing of an archaeological nature was uncovered during the testing.

11.8.1.7 Topographical Files of the National Museum of Ireland

The database of archaeological finds spots listed in the Topographical Files of the National Museum of Ireland was consulted on www.heritagemaps.ie as part of this assessment. No finds are located within the proposed development site or for Barrettspark townland. The nearest recorded find spot is in Carnemore East 2.7km to the north-west of the proposed development site.

National Museum: Polished Stone Axehead

Name	1971:922
Object Type	Polished Stone Axehead
ITM	540758 730149

11.8.2 Architectural and Cultural Heritage

For the purposes of this report, architectural heritage includes known (documented) and newly recorded features, if present, including the following:

- Record of Protected Structures (RPS)
- NIAH structures
- NIAH Garden Surveys
- Any other structures / features noted during field assessment
- Cultural heritage items (tangible assets) likely to be impacted by the proposed development

11.8.2.1 Record of Protected Structures

The dataset for the record of protected structures for County Galway is available on ArcGIS online and was downloaded onto the base mapping for the proposed development. The list of RPS structures in the Galway County Development Plan (2014-2020) was also consulted.

No Protected Structures are located on or within the immediate vicinity of the proposed development site. No protected structures are located within 2km and the nearest structure is located 3.5km to the southwest in Frenchfort townland. The existing and proposed extension will not result in any direct or indirect impacts.

11.8.2.2 NIAH

No NIAH structures are located on or within the immediate vicinity of the proposed quarry extension site. Protected structures are largely based on the NIAH and therefore many architectural heritage structures are listed on both resources. No impacts on setting will therefore occur.

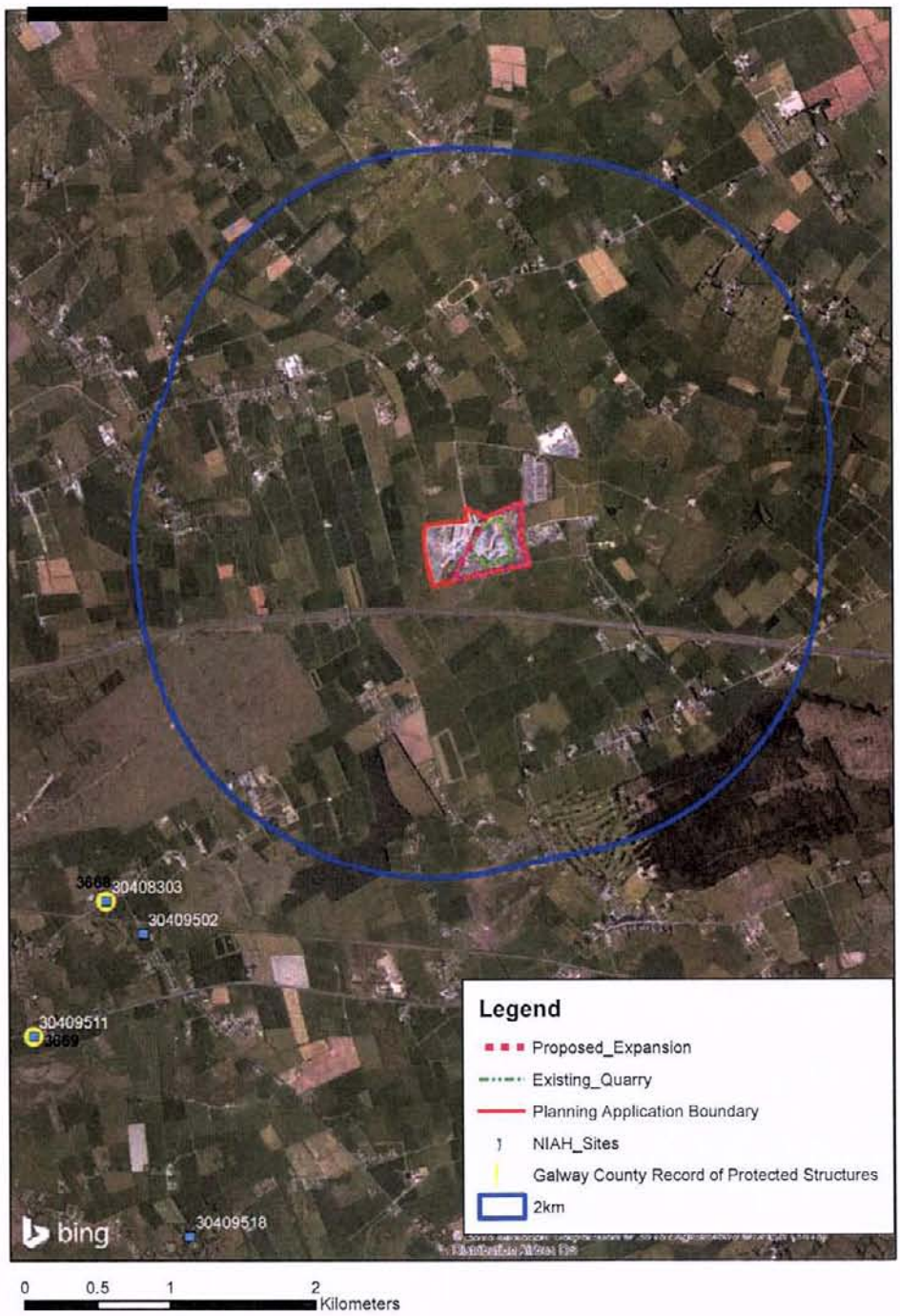


Figure 11-6: RPS and NIAH structures in relation to proposed development site.

11.8.2.3 NIAH Garden Survey

Galway contains many Historic Parks, Gardens and Demesnes, which are characteristic of a particular period of settlement in the county. Demesne is a term dating back to the Anglo Norman period for lands retained by the Lord of the Manor for his own use and occupation. The gardens tended to be formally laid out over large tracts of land radiating out from the principal residence and its gardens and walled gardens to include parkland, farmland, woodlands and additional properties such as farm outbuildings, stables, gate lodges and follies. Therefore, a strong relationship exists between the main house and the surrounding lands.

The objective of the garden survey is to begin a process of understanding the extent of Ireland's historic gardens and designed landscape. Sites were identified using the 1st edition Ordnance Survey maps. These were compared with current aerial photography to assess the level of survival and change. This assessment is not an indication of a site's heritage importance. Fieldwork is now in progress to compile more accurate data and site assessments. The results will be added to the NIAH website as this work progresses.

Various factors have contributed to many of the significant changes that have occurred. Changes in aesthetic values and the development and expansion of our cities and towns have played a part. But the most significant are a direct result of 150 years of history, particularly changes in land ownership arising from the Encumbered Estates Act 1849 to the Land Acts of the late nineteenth and early twentieth centuries.

One such gardens is located 2km from the proposed development site (NIAH Garden ID GA-46-M-444303 Moor Park). The feature rich index of the site is 1 and the survey notes that '*the Main features are unrecognisable - peripheral features visible and that houses with associated drives have been constructed on this site.*'

There are no NIAH or protected structures associated with this garden.