Remedial Environmental Impact Statement

Existing Quarry at Shannapheasteen, Co. Galway

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Table of Contents

NON-TECHNICAL SUMMARY

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Introduction

Stephen Larkin and Connemara Granite Teo. intend to apply to An Bord Pleanala for substitute consent for an existing quarry at Shannapheasteen, Casla, Co. Galway. McCarthy Keville O'Sullivan Ltd. has been appointed as Environmental Consultants on this project and has been commissioned to complete a Remedial Environmental Impact Assessment (REIA) and prepare a Remedial Environmental Impact Statement (REIS).

This application for substitute consent seeks to regularise the on-going quarry operation and document the environmental impact that has occurred, if any, since the quarry was established. It is required as a result of The Planning & Development (Amendment) Act 2010. This REIS will accompany the application for substitute consent to be sent to be submitted to An Bord Pleanála.

The current owners and operators of the quarry purchased the quarry in 2010 after forming the applicant company to extract and supply the local Connemara granite as a high-quality building material.

The historical quarry that is the subject of this REIS is a granite dimension stone quarry. Although bulk aggregates had been extracted from the site in the past for the production of dimension stone used for civil engineering purposes, the recent operation has involved the production of specialist dimension stone that is used as building stone for stone wall construction, the cladding and facades of buildings, and for use in the manufacture of garden features, headstones, fireplaces.

The quarry is a small-scale, self-contained operation. The majority of the 8.71 hectare substitute consent application area has been subject to some works associated with the historical quarrying activities undertaken on-site. The majority of the more intensive quarrying activity has taken place in the southern area of the site, where a 0.25 hectare quarry pit and rock face has been developed, which extends to a depth approximately six metres below the surrounding land. Other areas of the site to the north and east of the quarry pit were also previously worked by the former operators of the quarry, and were disturbed during the recovery of aggregates. Some of the remaining unworked and undisturbed areas of the site are used in the management of drainage water on-site.

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. Connemara Granite Teo supplies Connemara granite from the quarry to serve the local, domestic and international markets.

This Remedial Environmental Impact Statement (REIS) will compare historical conditions of the site prior to site activity taking place with its post-activity current condition and will document any impacts the quarry may have had on the surrounding environment during its lifetime. Once the effects of the development are established,

mitigation measures can be put in place, if required, to ensure that the environment is protected before any further potential impacts can occur. Remedial actions will be proposed to mitigate any impacts that may have occurred as a result of the quarry operation.

Background to the Proposed Development

The site of the development is located in the townland of Shannapheasteen, approximately 8.6 kilometres northeast of the village of Casla, Co. Galway. The Grid Reference co-ordinates for the approximate centre of the site are E103,770 N232,830. Where the 'site' is referred to in this Remedial Environmental Impact Statement (REIS), this refers to the Study Area considered for the purposes of this REIS. The REIS study area measures 9.828 hectares. The application site boundary for the purposes of the substitute consent application is smaller than the Study Area, measuring 8.71 hectares. The application site and REIS study area are all contained within a landholding in the control of the applicant, which measures 10.14 hectares.

The site is accessed via a local road west of the site which connects Oughterard approximately 14 kilometres northeast of the site with the R336 Regional Road approximately ten kilometres southwest of the site.

The subject site has an elevation of approximately 80 metres O.D. A river borders the site all along its southwestern boundary. This watercourse is a tributary to the Casla River which drains into Casla Bay further west. Approximately two hectares of the study area lies within a site that has been designated for its conservation significance. The southern boundaries of the study area lie within Connemara Bog Complex cSAC and Connemara Bog Complex SPA. The designated area comprises of a buffer strip along the river, which varies between 20 and 30m and is estimated at 0.9ha. In addition there is an area of one hectare at the south east corner of the site which was also included in the SAC designation presumably because it was an undeveloped area of active Blanket Bog. Slightly less of this area (approximately 0.7 hectares) is included in the SPA

The section 261A Assessment of the subject quarry carried out by Galway County Council determined the quarry commenced operation before 1st October 1964, and that the requirements of the section 216 registration process (carried out in 2005 – 2007) have been fulfilled in relation to this quarry.

There has been one previous planning application lodged on the subject site, Pl. Ref. 10/702 which sought permission for additional facilities and buildings ancillary to the ongoing quarrying operation. This application was withdrawn.

The operations on site underwent the Section 261 registration process (under the reference QY83) in 2005, which culminated in April 2007 with determination of the Planning Authority to impose 16 no. conditions to the ongoing site operations. On site activities have been subject to control by these conditions since 2007. The conditions imposed relate to various elements of the operation including, opening hours, noise levels, dust regulation fuel storage, drainage, and provision of signage/traffic.

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. Whilst the construction industry has suffered a severe

downturn in recent years, it is acknowledged that the current low level of activity is unlikely to persist and that there is a sustained level of demand for aggregates required to support economic and social development.

There is no national planning policy or strategy in Ireland for construction aggregates or dimension stone. The Regional Planning Guidelines for the West 2010-2022 (RPGs) recognise that the extractive industry is a valuable resource, both for construction and for employment. Similar to the RPGs, the Galway County Development Plan 2009-2015 (GCDP) notes the particular economic value of the extraction industry and the inherent need for the industry to support construction.

A scoping report, providing details of the application site and the proposed development, was prepared by McCarthy Keville O'Sullivan Ltd. and circulated on 5th November 2012 to statutory and non-statutory agencies, NGOs and other relevant parties and requested the comments of the relevant personnel/bodies in their respective capacities as consultees with regards to the REIA process.

Description of the Proposed Development

The historical quarry that is the subject of this REIS is a granite dimension stone quarry. Although bulk aggregates had been extracted from the site in the past for the production of dimension stone used for civil engineering purposes, the recent operation has involved the production of specialist dimension stone that is used as building stone for stone wall construction, the cladding and facades of buildings, and for use in the manufacture of garden features, headstones, fireplaces. The quarry supplied local, domestic and international markets.

The majority of the 8.71 hectare substitute consent application area has been subject to some works associated with the historical quarrying activities undertaken on-site. The site entrance road enters the site roughly parallel to the southern boundary. The majority of the more intensive quarrying activity has taken place in the southern area of the site, where a 0.25 hectare quarry pit and rock face has been developed, which extends to a depth approximately six metres below the surrounding land.

An area measuring 4.5 hectares has been subject to some works associated with the historical quarrying activities undertaken on-site. The quarrying and extraction of rock has taken place over an area of approximately 1.5 hectares. The remaining 3 hectares of worked area has been subject to soil and overburden removal or storage, or forms part of processing or general access areas of the site. Outside of the main extraction area, to the north and east an area measuring approximately 1 hectare was previously disturbed during the less-intensive recovery of aggregates. Work in these areas was primarily undertaken in the search for loose rock and subsoils that were used for local road building and maintenance. Some of the remaining unworked and undisturbed areas of the site are used in the management of drainage water on-site, as described in further detail below.

Given the low intensity and small scale of operations on the site, there is no formal management area for controlling site operations. Vehicle parking is managed on an informal basis using hardcore areas adjacent to the site roadways. The site owners and company directors operate the quarry, one of whom lives in the house immediately to the west of the quarry boundary. A small site hut made up of a mobile cabin provides shelter and a small storage space. Such quarry management activities are usually from the homes of the individual operators and owners.

Prior to any rock being extracted on-site, it is always necessary to first remove the overburden from the working area by means of mechanical excavator. In the recent past, rock has been extracted primarily by means of drilling and fracturing using a 'plug and feather' method. The fractured sections of rock are broken down further, into more manageable sizes and further processed to meet market demand. Stone from the extraction area is transported to an outdoor processing area consisting of a self-fabricated conveyor and stone guillotine. Stone is loaded onto the conveyor by an excavator, and the conveyor feeds the stone onto the guillotine table. The product of the processing operation is typically bagged for transportation off-site, or is sometimes loaded on pallets or directly onto trucks depending on the size and intended use.

The depth of excavation and current quarry floor level has not intercepted the water table, and therefore only precipitation and site runoff has to be managed within the quarry area. This is achieved by means of a sump, located in the northern portion of the main extraction area, into which most of the water from the disturbed area of the quarry drains. Water draining to the sump is allowed to settle for long periods of time, before being pumped periodically up to a filtration area where water is distributed evenly over a large, well-vegetated area of peatland as diffuse overland flow. The discharged water disperses through the vegetation which acts as a further vegetation or polishing filter, where it is largely reconverted to groundwater through infiltration of the peat. Protection is afforded to the adjacent Shannapheasteen River from potentially silt-laden run off from the exposed quarry area by means of a silt fence.

There is no water supply to the quarry. There are no toilet or washing facilities on the quarry site. There is no wastewater generated on-site, and therefore no requirement for a wastewater treatment system.

Wherever possible, vehicles are refueled off-site. For heavier plant and machinery that is based on-site, a limited amount of refueling has to take place on site. On-site refueling of machinery is carried out using a mobile double skinned fuel bowser or tanker.

A site reinstatement programme was initiated in 2010 as part of an Environmental Management Plan prepared for the site by Aster Environmental Consultants. The plan was prepared and implementation commenced following a series of meetings involving the National Parks and Wildlife Service and Inland Fisheries Ireland representatives. Site reinstatement commenced with a view to vegetating exposed areas, planting the surfaces of overburden and topsoil mounds, progressively restoring worked-out areas (where practical) and limiting the areas of topsoil/overburden stripping exposed at any one time. This process and programme of measures is ongoing.

In the course of preparing this REIS, a number of improvements were identified by the various professionals that visited the quarry site in the course of undertaking their various assessment and field surveys. These include works to improve sight lines for vehicles exiting the quarry site, improvements to the drainage management on the site, the installation of drainage swales down-gradient from the exposed and disturbed areas of the quarry, the repair of the existing silt fence and installation of a second similar fence to provide further protection to the river, and finally, the installation of a bund or fence to prevent accidents involving personnel or machinery or vehicles getting to close to the quarry face and potentially falling into the main excavation area.

Human Beings

Section 4 of the REIS discusses the key issues affected by human beings and the impacts of the existing development on them. The key issues examined in this section of the REIS include population, employment, land-use, tourism and health and safety. Information regarding human beings and general socio-economic data were sourced from the Central Statistics Office, Galway County Development Plan 2009 – 2015 and from the most recent census, the Census of Ireland 2011 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 Remedial Environmental Impact Assessment, ED level data was used wherever possible.

The Human Beings Study Area involved the site where the quarry lies primarily within; Sailearna ED. The Camas ED, Kilcummin ED, Cill Chuimín ED, Oughterard ED, Cill Aithnín ED were included due to their proximity to the site. The Human Beings Study Area has a combined population of 6,887 persons and comprises a total land area of 40,765 hectares or 407.65 square kilometres (Source: CSO Census of the Population 2011). The information at this level was analysed and compared to the same information at national and county level.

The impacts of the subject development on human beings have been positive for the Human Beings Study Area. The direct effect of a sound infrastructure has increased investment in the region, and increased accessibility and facilities to the area. The effects of which reverberate throughout all facets of the local community in the form of increased growth and development and attraction for tourists. No negative impacts are anticipated and therefore no mitigation measures are considered to be required.

Flora and Fauna

Six sites designated for international conservation importance are within a fifteen kilometre radius of the study area. The nearest are the Connemara Bog Complex cSAC and Connemara Bog Complex SPA and both these Natura 2000 sites overlap the quarry to the south and south west. Approximately 20% of the area of the site of the proposed development, lies within the Natura 2000 network. The designated area includes a 20-30m buffer along the river bordering the site to the south east and a triangle to the southern most part of the site.

Site visits were made over a 4 year period from 2010 to 2013 and spanned all four seasons. Survey work was carried out by Marie Louise Heffernan (CEnv., MIEEM) and river invertebrate work by Dr Stephen McCormack (Phd, MIEEM). The study area covers 10.1 hectares and eight habitats are present within it. Approximately 20% of the study area is lowland blanket bog and wet heath. These habitats correspond to the Annex I Habitats 'Blanket Bogs (*if active)' (Natura 2000 Code 7130) and 'North Atlantic Wet Heath with Erica tetralix' (Natura 2000 Code 4010) and 'depressions on peat substrates of the Rhynchosporion' (Natura 2000 Code 7150). The remainder of the site shows evidence of past quarrying activities with more than 32% of the study area is classified as exposed bare rock and recolonising bare ground. Approximately 35% of the study area is taken up by cutover bog.

Merlin and Golden Plover are known in low concentration from the wider area. Both are listed in Annex I of the EU Birds Directive (CEC, 1979). Red grouse is also known

from the area. This is a bird listed in the in the BoCCI (Lynas et al., 2007) Red List. No evidence of these birds using the site was noted either by sightings, from droppings or field signs. The river bordering the site is within the designated sites and is included due to its importance for Salmon an Annex I species. Otter, an Annex I species, are known from the area and most probably use this river as part of there foraging range.

The Quarry was opened in the 1930's and over the years some habitat has been permanently lost. The area most recently quarried is well managed with an ecological management plan in place to address revegetation of spoil heaps, to protect the Natura 2000 land within the quarry as well as manage water on site with a view to protection of salmon and otter habitat. The river was sampled for invertebrates to look at water quality and the results show that the same suite of invertebrates are found both upstream and downstream of the quarry thus indicating no negative ecological impact on the river. Ongoing management at this site is considered essential to ensure that the progress in remediation of the quarry continues.

Soils and Geology

The geology and soils of the site were surveyed by means of a field visit to the site and surrounding area and through a desk study of literature and information pertinent to the area.

The subject site is underlain by Shannapheasteen Granite.

Blanket Peat is the predominant subsoil type within the site boundary, followed by granite dominated Till (which is predominantly shallow soils derived from non-calcareous rock or gravels with a peaty surface horizon.

The soils underlying the site of the subject site belong to Association 24 of the General Soil Map of Ireland, which occupies 5.14% of Ireland and occurs widely along the western seaboard, especially in Galway and west Mayo, Connemara, Cork, Donegal and to a lesser extent in Kerry.

If the quarrying activity had not commenced on these lands, the lands would have continued to be managed as cutover bog and heath. No excavations or quarrying activity would have taken place on the subject site and any likely impacts would not have occurred.

Quarrying of aggregate material, by definition, requires the excavation and removal of rock material, thereby giving rise to a permanent loss of some bedrock resource within the quarry footprint. This cannot be undone.

The final floor of the quarry has a final floor level of 61metres O.D. The bedrock material that has been extracted is of very low intrinsic value, and is widespread through the area and this part of the county. Therefore, although the removal of the rock has resulted in an impact, that impact could only be said to be neutral to slight at worst, given the low value of the resource.

The nature of the development undertaken to date entails the removal and storage of soil and overburden, subsequent drilling and removal of rock. There has been, therefore, a direct and irreversible impact on existing rock within the quarry site. The

quarry has not had any impact on the geological aspects of the environment outside the footprint of the quarry.

The existing 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.

Contamination of soil may occur where any pollutants such as surface water from the facility or hydrocarbons from refueling operations enter the soil through the ground surface. The significance of the impact would be dependent on the quantity and duration of any spill or leak. There is no evidence of any soil contamination having occurred as a result of the historical quarrying operations on-site.

Hydrology and Hydrogeology

Hydro Environmental Ltd was commissioned by McCarthy Keville O'Sullivan Ltd. to prepare a Remedial Environmental Impact Statement (EIS) Hydrology and Hydrogeology section for an existing granite quarry in the townland of Shannapheasteen near Costelleo in Galway which requires permission under the substitute consent process. The quarry site visit was carried out April 22nd 2013.

The site is located 8.7km northeast of Costelloe village, Co. Galway in South Connemara (Figure 1) (11km, via road from the junction with the R336 near Rossaveel). It lies along the eastern side of the local road between Rossaveel and Oughterard and is approximately 480m southeast to northwest and 200m northeast to southwest, covering 10.1 hectares (Figure 2). The site lies on the south-western slope of Shannapheasteen Hill with the ground elevation across the site falling from 82mOD in the east to 65mOD in the west. A pond in the quarry excavation has an approximate minimum invert of 61.0mOD.

Shannapheasteen Stream flows along the western and southern boundary of the study area. The stream, which is designated as salmonid and lies with the Connemara Bog Complex SAC, drains to the Casla River system. Glenicmurrin Lough, which lies less then 4km downstream of the study area, is the raw water source for the Costelloe Regional Water Supply Scheme.

Subsoils in the area are Blanket Peat and Granite till with bedrock outcrops frequent throughout the area.

The Silurian – Devonian bedrock underlying the site has been mapped by the GSI as Caledonian Shannapheasteen Granite (GaSn) (Aphyic fine grained granite). This bedrock is classified as a Poor Aquifer - Bedrock which is Generally Unproductive except for Local Zones (Pl) and groundwater is regarded as having an extreme vulnerability. Domestic Water supply in the area is from bored wells which have generally low yields and surface water sources

The overall impact of the quarry development at Shannapheasteen on Hydrology and Hydrogeology is assessed to be minor to imperceptible. Additional mitigations are currently being implemented at the quarry which will ensure the hydrology of the adjacent sensitive Connemara Bog Complex cSAC remains unaltered and that the adjacent sensitive watercourse which is a salmonid River and source to the Costelloe (Casla) Regional Water Supply Scheme remaions protected from potential pollution sources related to the quarrying activities.

There are no in combination and cumulative impacts in respect to Soils, Ecology, Socio Economic, Air and Noise, Cultural Heritage and Archaeology

The quarry development does not impact on any European designated site (Connemara Bog Complex).

Air and Climate

The quarry is located in a rural area, approximately 27 kilometres west of Galway City. Due to the general character of the surrounding environment, air quality sampling was deemed to be unnecessary for this Remedial Environmental Impact Assessment (REIA). Land-use in the vicinity of the site includes peat-cutting, coniferous forestry and low-intensity pastoral agriculture.

The Environmental Protection Agency (EPA) has designated four Air Quality Zones for Ireland. The quarry site lies within Zone D, which represents rural areas located away from large population centres. The air quality in the vicinity of the quarry 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.

County Galway has a temperate oceanic climate, resulting in mild winters and cool summers. The prevailing southwesterly winds 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 Claremorris, County Mayo is the nearest weather and climate monitoring station to the subject site, located approximately 56 kilometres northeast of the site.

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)'*. Currently in Ireland there are no statutory limits for total dust deposition. The EPA however, recommends a maximum level of 350 mg/m^2/day of dust deposition when measured according to TA Luft standard, which includes both soluble and insoluble matter (i.e. EPA compliance monitoring is based on the TA Luft Method). The dust levels measured at the monitoring locations D1, D2 and D3 during March/April of 2013 were well below the 350 mg/m^2/day limit value.

If the quarrying activity had not commenced on these lands, they would have continued to be managed as agricultural lands. No excavations or quarrying activity would have taken place on the subject site and any likely impacts would not have occurred.

The use of machinery during the operation of the quarry results in the emission of air particulates. This impact is considered to be slight given the insignificant quantity of particulates that are emitted.

The use of machinery during the operation of the quarry resulted in the emission of air particulates. This impact is considered to be slight given the insignificant quantity of particulates that are emitted.

The removal of carbon fixing vegetation on site during the operation of the quarry is considered a slight negative impact.

Dust levels will have increased slightly higher than those found in rural areas. The operation of machinery and the excavation of soil and rock will increase dust levels in the area of the site.

Noise and Vibration

AWN Consulting Limited has been commissioned by McCarthy Keville O'Sullivan to conduct a noise assessment in support of an application for substitute consent for an existing quarry at Shannapheasteen, Costello, Co. Galway. Chapter 9 assesses the likely noise and vibration impact of the quarry activity during its period of peak production.

An environmental noise survey was conducted in accordance with ISO 1996: 1982: Acoustics – Description and measurement of environmental noise. Based on the results of the noise survey and relevant guidance from published documents an assessment of the noise levels associated with historical quarry activity has been conducted.

Comment has been presented in relation to the worst-case historical noise levels in light of guidance derived from the Department of the Environment, Heritage and Local Government (DoEHLG) publication Quarries and Ancillary Activities - Guidelines for Planning Authorities.

It has been demonstrated that the worst-case noise levels associated with quarry activity were within the DoEHLG criterion of 55dB LAeq,1hr at all of the nearest noise sensitive locations. The quarry did not operate at night.

It is concluded that during peak operations the quarry is not expected to have had any significant noise and vibration impact on the nearest sensitive location; and no mitigation measures are required.

Landscape

The landscape section of the REIS addresses the landscape and visual impacts of the existing quarry. It includes a description of Galway County Council landscape policy and examines the quarry site's landscape values and sensitivity. The landscape of the area is described in terms of its character, which includes a description of the physical, visual and image units. The visual impact assessment of the existing quarry encompasses the use of photography and visibility mapping.

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 Landscape Character Area 10: East Connemara Mountains (Moycullen, Recess to Glinsk). The landscape sensitivity of the majority of the site is designated as Class 3 (High) on a scale of 1 to 5 by the Landscape Character Assessment of County Galway, where Class 1 is Low and Class 5 is Unique. The Galway County Council Landscape and Landscape Character Assessment lists 122 focal points and views within the county. There are no designated focal points or views pertaining to the subject site. The nearest viewpoint is that listed as View No. 85, towards the hill at Keeraunnagark North, which lies approximately five kilometres east of Costelloe.

The sensitivity of a landscape to development and therefore to change varies according to its character and to the importance that is attached to any combination of landscape values. The quality of the landscape in this area can be described as modified, with few features not having been affected by some anthropogenic influence, in particular peat extraction but also the existing presence of the quarry itself. The area surrounding the quarry development site has been modified by the interaction of man with the natural environment, primarily in the form of rock and peat extraction, but to a lesser extent by commercial forestry plantations further to the north and east. The subject site is distinctive from the adjoining lands in terms of the quarrying activity that has taken place.

The subject site forms part of a working landscape, not a pristine wilderness. Turf cutting has been carried out at the site for many years, resulting in degradation of the peat habitat. If the quarrying activity had not commenced on these lands, they would have continued to be managed as cutover bog and heathlands.

The East Connemara Mountains are distinctive features in the local landscape in south Connemara, and although the site is on the foothills of those mountains, the views towards the higher mountainous lands are limited from the site and its immediate surrounds. The site is not part of, or adjacent to gardens, parks, demesnes or historical designed landscapes. The quarry site does not have detrimental impact on the landscape in the surrounding environment, although it has slightly changed the existing landscape character. The subject site does not form part of a Landscape Conservation Area. The development does not adversely impact on any area designated as visually important/sensitive by Galway County Council.

The profile of the land visible has not altered significantly and from most locations along the adjacent local road the site, only partially visible and at a distance, appears intact and almost untouched. The view of the quarry is not a significantly detracting feature when in the view.

Restoration of the worked-out disturbed areas of the site outside the main quarry pit has already commenced and will continue into the future.

Cultural Heritage

This report, prepared by Michael Tierney, Archaeological Consultant, assesses the impact of the existing development on the archaeological and architectural heritage of the site and surrounding area. A desk study and a site walkover survey were undertaken as part of this assessment.

No known cultural heritage features were identified to be situated within the site, however, the large-scale nature of the works means that previously unrecorded archaeological features may be impacted, even in a marginal area like this.

It is recommended that the topsoil stripping phase of quarrying be archaeologically monitored. In the event of archaeological features being identified work should cease in their immediate vicinity and an assessment undertaken regarding the nature and extent of the archaeological remains found.

Traffic and Transportation

An assessment of the traffic impact of an existing quarry located on the Shannapheasteen Road, County Galway, was undertaken. The site generates

between 2 and 8 HGV trips daily onto the local network with deliveries to various destinations in the west of Ireland.

Traffic flows on the surrounding road network are relatively light, even when taking into account the rural nature of the local infrastructure, and the surround roads and junctions operate within capacity with the quarry in place.

While the existing access junction on to the local Shannapheasteen Road appears to operate safely the existing visibility is restricted and local improvements are recommended for consideration.

Based on this assessment it is considered that the traffic generated by the existing quarry in on the Shannapheasteen Road is accommodated on the local highway network. It is recommended that local improvements are made to the existing access junction to improve visibility.

Interaction of the Foregoing

The REIS identifies the potential environmental impacts that may have occurred as a result of the existing quarry in terms of Human Beings, Flora and Fauna, Soils and Geology, Hydrology and Hydrogeology, Air and Climate, Landscape, Cultural Heritage and Traffic. However, for any development with the potential for significant environmental impact there is also the potential for interaction amongst these impacts. The result of interactive impacts may either exacerbate the magnitude of the impact or ameliorate it.

A matrix is included in the REIS to identify interactions between the various aspects of the environment already assessed in the REIS. The potential for interaction of impacts has been assessed as part of the Impact Assessment process. While the work on all parts of the REIS were not carried out by McCarthy Keville O'Sullivan Ltd., the entire project and all the work of all sub-consultants was managed and coordinated by the company. This Remedial Environmental Impact Statement was edited and collated by McCarthy Keville O'Sullivan Ltd. as an integrated report of findings from the impact assessment process, rather than a collection of individual assessments carried out in isolation, and impacts that potentially interact have been discussed in the individual chapters of the REIS above.

Where any potential interactive negative impacts have been identified, appropriate mitigation has been included in the relevant sections of the REIS.

1 INTRODUCTION

1.1 Introduction

Stephen Larkin and Connemara Granite intend to apply to An Bord Pleanala for substitute consent for an existing quarry at Shannapheasteen, Casla, Co. Galway. McCarthy Keville O'Sullivan Ltd. has been appointed as Environmental Consultants on this project and has been commissioned to complete a Remedial Environmental Impact Assessment (REIA) and prepare a Remedial Environmental Impact Statement (REIS) that fulfils the requirements set out by the Environmental Protection Agency (EPA) in the *'Guidelines on the Information to be contained in Environmental Impact Statements'* and Schedule 6 of the Planning and Development Regulations 2001, as amended, relating to the information to be contained in an Environmental Impact Statement (EIS). Reference has also been had to the *'Guidelines for Planning Authorities and An Bord Pleanála on carrying out Environmental Impact Assessment: Draft for Consultation'* published by the Department of the Environment, Community and Local Government in July 2012.

This application for substitute consent seeks to regularise the on-going quarry operation and document the environmental impact that has occurred, if any, since the quarry was established. It is required as a result of The Planning & Development (Amendment) Act 2010. The Planning & Development (Amendment) Act 2010 amends previous legislative provisions with respect to quarries and in particular, registration under Section 261 of the Planning & Development Act 2000. Each Planning Authority is required to examine all quarries in their administrative areas and determine whether the quarry was previously assessed in accordance with the requirements of the EIA Directive and the Habitats Directive. Arising from the assessment by the planning authority the subject quarry is required to apply for substitute consent to An Bord Pleanala. This REIS will accompany the application for substitute consent to be sent to be submitted to An Bord Pleanála.

1.2 The Applicant

The applicant in the case of the current application for substitute consent is the current operators of the quarry, Connemara Granite Teo. and Stephen Larkin. The current owners and operators of the quarry purchased the quarry in 2010 after forming the applicant company to extract and supply the local Connemara granite as a high-quality building material.

The current owners and applicants only took possession of the site from its former owners in 2010. The previous owners worked the site for decades, extracting stone for many purposes including the production of dimension stone for civil engineering.

1.3 Brief Description of the Development

The historical quarry that is the subject of this REIS is a granite dimension stone quarry. Although bulk aggregates had been extracted from the site in the past for the production of dimension stone used for civil engineering purposes, the recent operation has involved the production of specialist dimension stone that is used as building stone for stone wall construction, the cladding and facades of buildings, and for use in the manufacture of garden features, headstones, fireplaces.

The quarry is a small-scale, self-contained operation. The majority of the 8.71 hectare substitute consent application area has been subject to some works associated with the historical quarrying activities undertaken on-site. The site entrance road enters the site roughly parallel to the southern boundary. The majority of the more intensive quarrying

activity has taken place in the southern area of the site, where a 0.25 hectare quarry pit and rock face has been developed, which extends to a depth approximately six metres below the surrounding land. Other areas of the site to the north and east of the quarry pit were also previously worked by the former operators of the quarry, and were disturbed during the recovery of aggregates. Some of the remaining unworked and undisturbed areas of the site are used in the management of drainage water on-site.

1.4 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. Connemara Granite Teo supplies Connemara granite from the quarry to serve the local, domestic and international markets.

1.5 Purpose and Scope of the REIS

This Remedial Environmental Impact Statement (REIS) will compare historical conditions of the site prior to site activity taking place with its post-activity current condition and will document any impacts the quarry may have had on the surrounding environment during its lifetime. Once the effects of the development are established, mitigation measures can be put in place, if required, to ensure that the environment is protected before any further potential impacts can occur. Remedial actions will be proposed to mitigate any impacts that may have occurred as a result of the quarry operation.

1.6 Structure and Content of the REIS

1.6.1 General Structure

The information to be contained in an REIS will follow the same guidelines required for an EIS document as specified in Schedule 6 of the Planning and Development Regulations, 2001. The REIS for the development will use the grouped structure method to describe the pre-operation environment, the post-operation or existing environment, the impacts the development has or has not made and the mitigation measures, if required, to prevent these from further occurring. Background information relating to the development, scoping and consultation undertaken and a description of the development will be presented in separate sections. The grouped format sections will describe the impacts of the development in terms of Human Beings, Flora and Fauna, Soils and Geology, Water, Air, Noise And Climate, Landscape, Cultural Heritage and Material Assets such as Traffic And Transportation, along with the interaction of the foregoing. The REIS will also include a Non-Technical Summary, which is a condensed and easily comprehensible version of the REIS document. The Non-Technical Summary will be a concise statement of the significant findings and recommended actions resulting from the REIA.

The REIS will identify impacts that may have occurred from the development under each of the environmental headings listed above. The impacts will be described using standard, best practice terms, as detailed in Section 1.6.2 below. In consultation with the project design team, appropriate mitigation measures will be proposed in the REIS to reduce, remedy or eliminate the impacts identified.

1.6.2 Use of Standards

Industry-wide best practice methodologies and standards will be identified and used as part of assessing the impact of assessments as appropriate. As stated in the *'Guidelines on the Information to be contained in Environmental Impact Statements'* (EPA, 2002), an assessment of the likely impacts of a development is a statutory requirement of the REIA process. The statutory criteria for the presentation of the characteristics of potential impacts requires that potential significant impacts are described with to the extent, magnitude, complexity, probability, duration, frequency, reversibility and transfrontier nature (if applicable) of the impact.

The classification of impacts in the REIS will follow the definitions provided in the Glossary of Impacts contained in the following guidance documents produced by the Environmental Protection Agency (EPA).

- Advice Notes on Current Practice in the Preparation of Environmental Impact Statements (EPA, 2003)
- Guidelines on the Information to be contained in Environmental Impact Statements (EPA, 2002)

Standard definitions are provided in these documents, which permit the evaluation and classification of the quality, significance, duration and type of impacts associated with a development on the receiving environment. The use of pre-existing standardised terms for the classification of impacts will ensure that the REIA employs a systematic approach, which can be replicated across all disciplines covered in the REIS, as advised in *'Guidelines on the Information to be contained in Environmental Impact Statements'* (EPA, 2002). The consistent application of terminology throughout the REIS will facilitate the assessment of the development on the receiving environment. Table 1.1 reproduces the glossary of impacts as published in the EPA guidance documents referred to above.

Table 1.1 Impact Classification Terminology (EPA, 2002/3)

Impact Characteristic		Description
Quality	Positive	A change which improves the quality of the environment
	Neutral	A change which does not affect the quality of the environment
	Negative	A change which reduces the quality of the environment
Significance	Imperceptible	An impact capable of measurement but without noticeable consequences
	Slight	An impact which causes noticeable changes in the character of the environment without affecting its sensitivities
	Moderate	An impact that alters the character of the environment in a manner consistent with existing and emerging trends
	Significant	An impact, which by its character, magnitude, duration or intensity alters a sensitive aspect of the environment
	Profound	An impact which obliterates sensitive characteristics
Duration	Short-term	Impact lasting one to seven years
	Medium-term	Impact lasting seven to fifteen years

Impact Characteristic		Description
	Long-term	Impact lasting fifteen to sixty years
	Permanent	Impact lasting over sixty years
	Temporary	Impact lasting for one year or less
Type	Cumulative	The addition of many small impacts to create one larger, more significant impact
	'Do Nothing'	The environment as it would be in the future should no development of any kind be carried out
	Indeterminable	When the full consequences of a change in the environment cannot be described
	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 mitigation measures have taken effect
	Synergistic	Where the resultant impact is of greater significance than the sum of its constituents
	'Worst Case'	The impacts arising from a development in the case where mitigation measures substantially fail.

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

1.7 Project Team

Table 1.2 below details the companies and staff that were responsible for completion of the REIA:

Table 1.2 Companies and staff responsible for REIA completion

Consultants	Principal Staff Involved in Project	REIS Input
McCarthy Keville O' Sullivan Ltd. Block 1,GFSC, Moneenageisha Road, Galway	Brian Keville Pat Roberts Mark Whittaker Noriana Kennedy Lorraine Meehan	REIA Project Managers, Co-ordination and editing of REIS, Scoping and consultation, REIS Sections 1, 2, 3, 4, 6, 8, 10 and 13
Hydro Environmental Services Ltd. 2 St Mary's Road, Galway	Tony Cawley	Hydrological and Hydrogeological Consultants; REIS Section 7: Hydrology & Hydrogeology
Alan Lipscombe Traffic and Transport Consultants Claran, Headford, Co. Galway	Alan Lipscombe	Traffic Engineering; REIS Section 12: Traffic
Aster Environmental Consultants Ltd. Rusheenduff, Renvyle,	Marie Louise Heffernan	REIS Section 5

Consultants	Principal Staff Involved in Project	REIS Input
Co. Galway		
Michael Tierney Kilnaborris House Kilnaborris, Banagher, Co. Offaly	Michael Tierney	Archaeologist; REIS Section 11: Cultural Heritage
AWN Consulting Ltd. The Tecpro Building Clonshaugh Business & Technology Park, Dublin 17	Stephen Smyth	REIS Section 9: Noise Impact Assessment

2 BACKGROUND TO THE DEVELOPMENT

2.1 Site of the Development

2.1.1 Site Location

The site of the development is located in the townland of Shannapheasteen, approximately 8.6 kilometres northeast of the village of Casla, Co. Galway. The Grid Reference co-ordinates for the approximate centre of the site are E103,770 N232,830. Site location maps are presented in Figures 2.1 and 2.2. and an aerial photograph of the site are it currently exists is presented in Figure 2.3.

Where the 'site' is referred to in this Remedial Environmental Impact Statement (REIS), this refers to the Study Area considered for the purposes of this REIS. The REIS study area measures 9.828 hectares. The application site boundary for the purposes of the substitute consent application is smaller than the Study Area, measuring 8.71 hectares. The application site and REIS study area are all contained within a landholding in the control of the applicant, which measures 10.14 hectares.

2.1.2 Site Access

The site is accessed via a local road west of the site which connects Oughterard approximately 14 kilometres northeast of the site with the R336 Regional Road approximately ten kilometres southwest of the site.

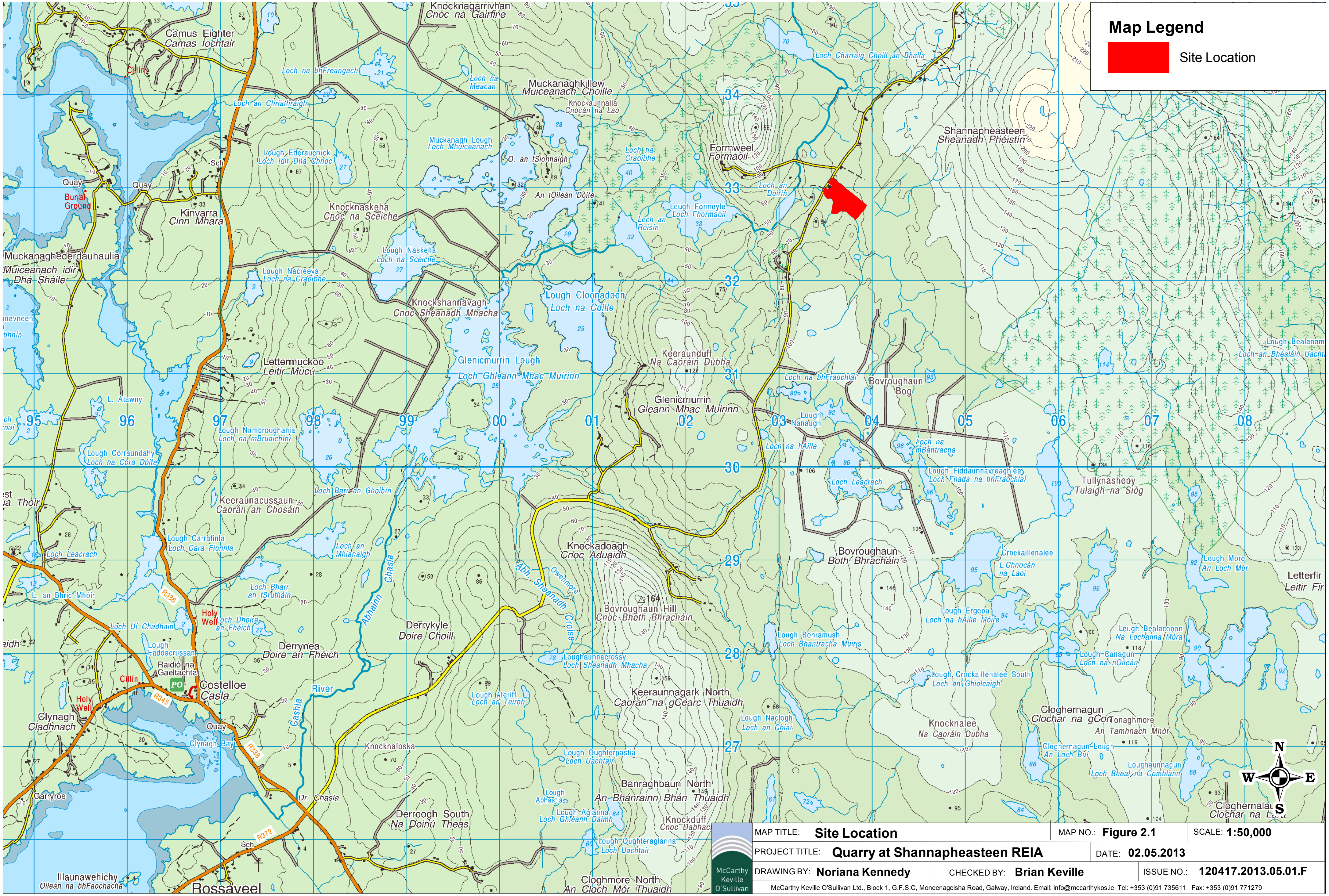
2.1.3 Physical Characteristics of Site and Surrounding Lands

The subject site is located within the 'East Connemara Mountains (Moycullen, Recess to Glinsk)' Landscape Character Area (LCA). This LCA is described in the Galway County Council Landscape Character Assessment as *'largely mountainous with slopes covered with coniferous forestry. The lower areas comprise rocky out crops and areas of rough grassland around the many small loughs and turloughs. The landscape is scenic although not remarkable'.* Lakes and peat habitats form the primary landcover in this area. Large conifer plantations are located to the east and northeast of the site, and are visible from the site. Patches of pasture, transitional woodland scrub, grassland and heaths occupy smaller areas with this LCA.

The subject site has an elevation of approximately 80 metres O.D. Hillier topography occurs to the north and northeast of the site with significant peaks at Lackadunna (317 metres O.D), Lettercraffoe (276 metres O.D), Knockwaumnamoe (239 metres O.D), (Shannapheasteen (220 metres O.D) and Cloughermore (208 metres O.D.) The topography of the land is generally lower directly west of the site. The highest point in the vicinity of the site is Shannawona which has a peak of 346 metres O.D. The topography west of the subject site is undulating, with elevations ranging from approximately 20 metres O.D. to 100 metres O.D. as it descends to the coastline further east.

The coastline around Casla is indented with several small bays and inlets. Casla Bay lies southwest of the subject site. A river borders the site all along its southwestern boundary. This watercourse is a tributary to the Casla River which drains into Casla Bay further west.

There are several lakes and watercourses located within this area. Loch an Doirin, Lough Formoyle, Lough an Hoisin, Loch na Craoibhe, Muckanagh Lough, Lough



MAP TITLE:	Site Location	MAP NO.:	Figure 2.1	SCALE:	1:50,000
PROJECT TITLE:	Quarry at Shannapheasteen REIA			DATE:	02.05.2013
DRAWING BY:	Noriana Kennedy	CHECKED BY:	Brian Keville	ISSUE NO.:	120417.2013.05.01.F

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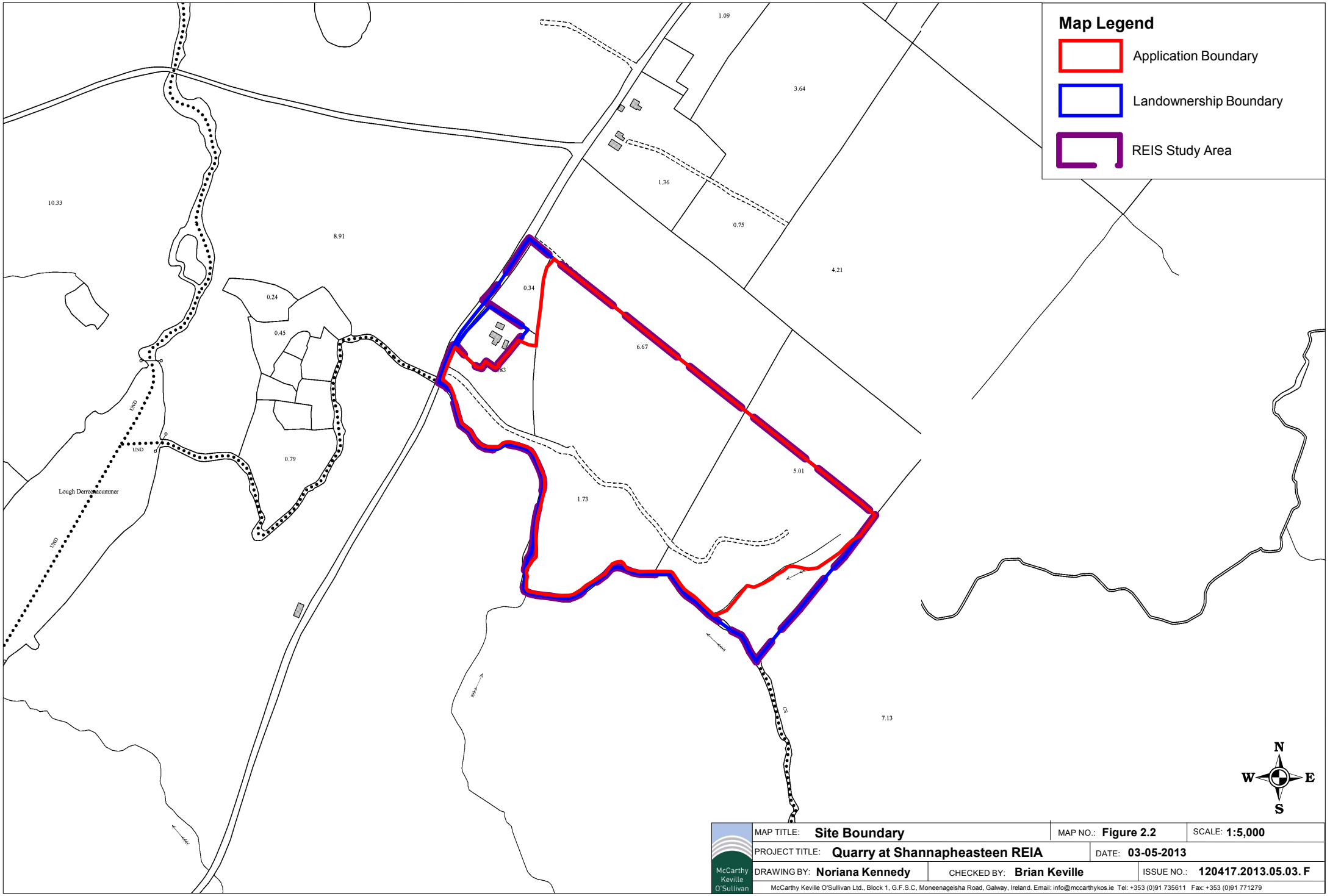

MAP TITLE: **Site Boundary**		MAP NO.: **Figure 2.2**	SCALE: **1:5,000**
PROJECT TITLE: **Quarry at Shannapheasteen REIA**		DATE: **03-05-2013**	
DRAWING BY: **Noriana Kennedy**	CHECKED BY: **Brian Keville**	ISSUE NO.: **120417.2013.05.03. F**	

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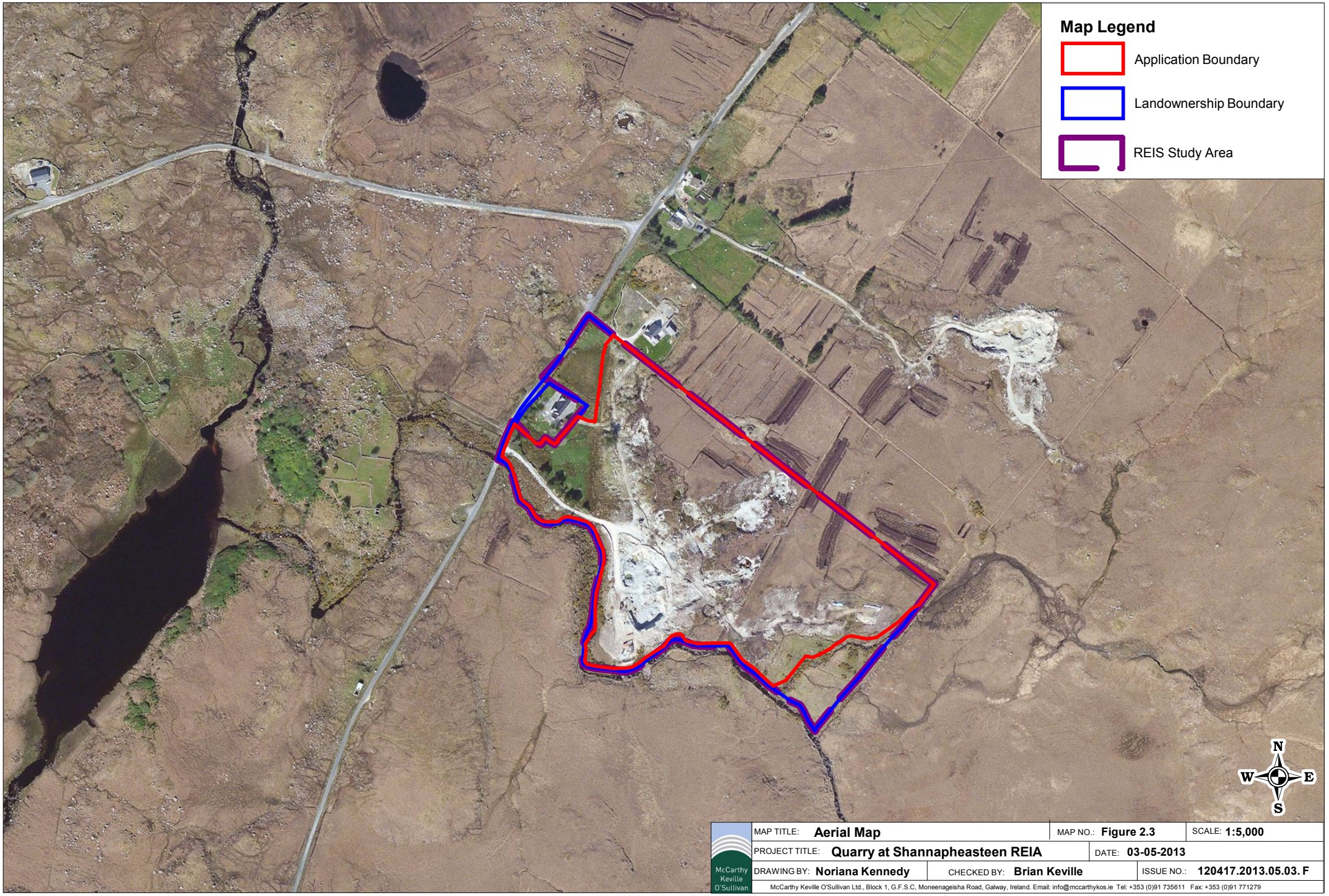

MAP TITLE: **Aerial Map**	MAP NO.: **Figure 2.3**	SCALE: **1:5,000**	
PROJECT TITLE: **Quarry at Shannapheasteen REIA**	DATE: **03-05-2013**		
DRAWING BY: **Noriana Kennedy**	CHECKED BY: **Brian Keville**	ISSUE NO.: **120417.2013.05.03. F**	

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Cloonadoon, Glenicmurrin Lough, Lough Naskeha, Lough Nambroughharia and Lough Ederaucruck all lie within eight kilometres west of the subject site.

Approximately two hectares of the study area lies within a site that has been designated for its conservation significance. The southern boundaries of the study area lie within Connemara Bog Complex cSAC and Connemara Bog Complex SPA. The designated area comprises of a buffer strip along the river, which varies between 20 and 30m and is estimated at 0.9ha. In addition there is an area of one hectare at the south east corner of the site which was also included in the SAC designation presumably because it was an undeveloped area of active Blanket Bog. Slightly less of this area (approximately 0.7 hectares) is included in the SPA

2.1.4 Planning History

The section 261A Assessment of the subject quarry carried out by Galway County Council has determined the following:

- The quarry commenced operation before 1st October 1964, and that
- The requirements of the section 216 registration process (carried out in 2005 – 2007) have been fulfilled in relation to this quarry

There has been one previous planning application lodged on the subject site, Pl. Ref. 10/702 which sought permission for additional facilities and buildings ancillary to the ongoing quarrying operation. This application was withdrawn.

The operations on site underwent the section 261 registration process (under the reference QY83) in 2005, which culminated in April 2007 with determination of the Planning Authority to impose 16 no. conditions to the ongoing site operations. On site activities have been subject to control by these conditions since 2007. The conditions imposed relate to various elements of the operation including, opening hours, noise levels, dust regulation fuel storage, drainage, and provision of signage/traffic.

The operators have adhered to the planning requirements arising from the previous registration process in continuing their established quarrying activities on site. They have now been notified under the new legislation (Section 261A of the Planning and Development Act 2000 as amended), that they must undertake the substitute consent process with a remedial Environmental Impact Statement and a remedial Natura Impact Statement. It must be noted that the operators have adhered to the requirements of the planning legislation throughout and the need to undertake the substitute consent process now arises solely from a change in the legislative framework and does not suggest any wrong-doing by the operators in terms of the established operations on site or impacts arising on the environment.

2.2 Strategic Planning Context

2.2.1 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. Whilst the construction industry has suffered a severe downturn in recent years, it is acknowledged that the current low level of activity is unlikely to persist and that there is a sustained level of demand for aggregates required to support economic and social development.

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.

2.2.2 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 County Development Plans.

2.2.2.1 The Regional Planning Guidelines for the West 2010-2022

The Regional Planning Guidelines for the West 2010-2022 (RPGs) recognise that the extractive industry is a valuable resource, both for construction and for employment. They also acknowledge the potential environmental impacts of the industry. In this regard, they specifically state that "*local production of aggregate which is suitable for local use can lessen the impact on road infrastructure*".

The RPGs include the following policy for the extractive industry:

> *Policy EDP51:*
> *Support the sustainable development of the extractive industry in the West Region as a rural enterprise. Developments of this nature must follow EIA and Habitats Directive Assessment procedures, minimise all environmental impacts and be rehabilitated to an appropriate land use which ensures positive impacts for biodiversity. Developments shall be assessed and/or carried out in accordance with relevant national legislation and DoEHLG, NPWS and EPA Guidelines. "*

2.2.2.2 Galway County Development Plan 2009-2015

Similar to the RPGs, the Galway County Development Plan 2009-2015 (GCDP) notes the particular economic value of the extraction industry and the inherent need for the industry to support construction. The GCDP acknowledges that Galway has extensive deposits of stone and other minerals and that "*the winning and processing of these materials are key factors in the economic life of the County*".

The GCDP includes the following policies for the extraction industry:

> *Policy ED16:*
> *Facilitate the extraction of stone and mineral material from authorised sites having regard to its location in the landscape sensitivity rating.*

Policy ED17:
Restrict development in the neighbourhood of existing extractive sites or sites which have obvious resource potential, and so avoid conflict in development activities.

Policy ED18:
Control all new operations and carefully evaluate all proposed developments to ensure that the visual or other environmental impacts of such works will not materially injure the amenities of the area.

Policy ED19:
The Planning Authority shall be favourably disposed towards planning applications for the use of temporary borrow pits for aggregates or materials that are located adjacent to or adjoining major public roads or infrastructure projects serving the county where the need to haul along public roads is eliminated. All normal planning considerations shall apply.

DM Standard 35: Extractive Development:
The extraction of sand, gravel, stone, etc. is fundamental to the continuing economic and physical development of the county. It is desirable that such materials would be sourced close to the location of new development to minimise the need for long haul routes and potential interference with traffic flows and amenity."

2.3 Scoping and Consultation

2.3.1 Scoping Document

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 (EIS) or Remedial Environmental Impact Assessment (REIA). 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 REIA and Remedial Environmental Impact Statement (REIS) and the specific standards of information they require. Consultees are invited to contribute to the REIA by suggesting baseline data, survey techniques and potential impacts that should be considered as part of the REIA process and in the preparation of the REIS. Comprehensive and timely scoping helps ensure that the REIA refers to all relevant aspects of the existing development and its effects on the environment.

A scoping report, providing details of the application site and the proposed development, was prepared by McCarthy Keville O'Sullivan Ltd. and circulated on 5th November 2012 to the agencies, NGOs and other relevant parties listed in Table 2.1. McCarthy Keville O'Sullivan Ltd. requested the comments of the relevant personnel/bodies in their respective capacities as consultees with regards to the REIA process.

2.3.2 Scoping Responses

Table 2.1 lists the responses received to the scoping document circulated on 5th November 2012. Copies of all scoping responses received by 30th April 2013 are included in Appendix 1 of this REIS. The recommendations of the consultees have informed the REIA process and the contents of the REIS. 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 Table 2.1.

Table 2.1 Scoping Consultees

No.	Consultee	Response
1	BirdWatch Ireland	No response
2	An Taisce	Response received 8th Nov 2012
3	Department of Arts, Heritage and the Gaeltacht	Response received 11th Nov 2012
4	Department of Agriculture, Food and the Marine	Response received 8th Nov 2012
5	Galway County Council – Planning Department	No response
6	Galway County Council – Environment Department	No response
7	Galway County Council – Roads & Transportation Section	No response
8	Galway County Council – Water Services	Response received 20th Nov 2012
9	Geological Survey of Ireland	Response received 26th Nov 2012
10	Health Service Executive	Response received 21st Nov 2012
11	Inland Fisheries Ireland – Western Division	No response
12	Irish Wildlife Trust	No response
13	National Roads Authority	Response received 9th Nov 2012
14	Office of Public Works	No response
15	The Heritage Council	No response
16	Western Regional Authority	No response
17	Western RBD Project Office	No response

2.3.2.1 An Taisce

A brief response from An Taisce was received. The planning history of the site is set out in this chapter of the REIS.

2.3.2.2 Department of Arts, Heritage and the Gaeltacht

The scoping response of the Department of Arts, Heritage and the Gaeltacht (DAHG) stated that in the case of a live or post-decision development, the DAHG may, in accordance with the statutory provisions, correspond only with the relevant planning authority, or with An Bord Pleanála in the event of an appeal. The response also stated that as the determinations regarding quarries have already been made by the Planning Authorities and will be adjudicated on by An Bord Pleanála, the Department is not in a position to offer observations at this time.

2.3.2.3 Department of Agriculture, Food and the Marine

The scoping response of the Department of Agriculture, Food and the Marine suggested that the likely impact, if any, on agriculture/agricultural activities since the quarry was developed in the locality be considered as part of the Remedial Environmental Impact Assessment.

2.3.2.4 Galway County Council – Water Services

The scoping response of Galway County Council Water Services advised that the quarry is located close to Glenicmurrin Lough, which is the source of the proposed

Costello Regional Water Supply Scheme. The impacts of the quarry operation on Glenicmurrin Lough and its catchment area should be examined.

2.3.2.5 Geological Survey of Ireland

The scoping response of the GSI stated that no site of geological importance has been identified in the GSI database within the perimeter of the quarry. The closest site of geological heritage interest lies approximately five kilometres north of the quarry and is unlikely to be affected by the activity.

2.3.2.6 Health Service Executive

The scoping response of the HSE recommended that as part of the noise report a daytime level and background nighttime noise level are identified.

2.3.2.7 National Roads Authority

The scoping response of the NRA referred to the general best practice guidelines that should be consulted in carrying out the Remedial Environmental Impact Assessment. The response of the NRA notes that it is not in a position to engage directly with planning applicants.

3 DESCRIPTION OF THE DEVELOPMENT

3.1 Introduction

The historical quarry that is the subject of this REIS is a granite dimension stone quarry. Although bulk aggregates had been extracted from the site in the past for the production of dimension stone used for civil engineering purposes, the recent operation has involved the production of specialist dimension stone that is used as building stone for stone wall construction, the cladding and facades of buildings, and for use in the manufacture of garden features, headstones, fireplaces. The quarry supplied local, domestic and international markets.

The quarry is a small-scale, self-contained operation. This section of the REIS describes in full, the quarry as it currently exists.

3.2 Current Site Description

3.2.1 Site Layout

The majority of the 8.71 hectare substitute consent application area has been subject to some works associated with the historical quarrying activities undertaken on-site. The southern boundary of the quarry site is formed by the Shannapheasteen River. The western boundary is formed by a private residential dwelling belonging to one of the applicants. The northern (northeastern) boundary also adjoins lands within the control of the applicants but does not form part of the quarry site. The site entrance road enters the site roughly parallel to the southern boundary. The majority of the more intensive quarrying activity has taken place in the southern area of the site, where a 0.25 hectare quarry pit and rock face has been developed, which extends to a depth approximately six metres below the surrounding land.

Other areas of the site to the north and east of the quarry pit were also previously worked by the former operators of the quarry, and were disturbed during the recovery of aggregates. Work in these areas was primarily undertaken in the search for loose rock and subsoils that were used for local road building and maintenance. The previously disturbed areas north of the quarry pit have not been worked recently, but have been the subject of a restoration and management programme undertaken in consultation with the National Parks and Wildlife Service and Inland Fisheries Ireland.

Some of the remaining unworked and undisturbed areas of the site are used in the management of drainage water on-site, as described in further detail below.

The site layout is shown in Figure 3.1 below and also as part of the application drawings included in Appendix 2 of the REIS.

3.2.2 Site Entrance

The quarry site is accessed from the west via a junction with the L1201 local road in the townland of Shannapheasteen. The site entrance has a wide alignment easily capable of accommodating a truck entering or exiting the site. The quarry entrance roadway leading from the junction with the public road into the working area is unmettled, made up of compacted hardcore. A security gate at the site entrance prevents unauthorized entry when the site is not operational.

PROPOSED WORKS & MEASURES

NEW APPLICATION BOUNDARY OUTLINED IN RED

BOUNDARY OUTLINED IN RED
TOTAL AREA: 8.708 Hectares

Figure 3.1

N

Road Sign to indicate quarry ahead, sign erect approx 150m from quarry entrance.

120m Sight Lines to inner roadway verge.

Applicants Home House.

QUARRY SITE ENTRANCE

Site Notice erected on Existing Site Access Gate.

Photo 1-F Access Road Haul Road

RUNN-OFF INTERCEPTOR DRAIN

120m Sight Lines to inner roadway verge.

Photo 1-G Quarry Entrance

EXISTING STONE WALL WITH ERECTED GATE.

SITE SECTION A - A

SITE SECTION B - B

225mm DISCHARGE PIPE FROM QUARRY BOTTOM TO NORTHERN PART OF SITE VIA PUMP STATION, WATER NATURALLY FINDS ITS COURSE BACK TOWARDS QUARRY.

Access Gate.

Photo 1-E Water Discharge Pipe from quarry floor.

SAFETY BARRIER AROUND QUARRY

EXISTING RIVER FLOWING WEST

MAIN QUARRIED SECTION TO DATE HIGHLIGHTED.

EXISTING QUARRY FACE HIGHLIGHTED IN GREEN, SEE ATTACHED SITE SECTION FOR GREATER DETAIL.

SAFETY BARRIER AROUND QUARRY

EXISTING RIVER FLOWING WEST

Fencing 1.2m in height with a terram screening 0.6m in height following the perimeter of the Quarry Boundary. 2no fences

EXISTING RIVER FLOWING WEST

Photo 1-A Terram Fencing

Fencing 1.2m in height with a terram screening 0.6m in height following the perimeter of the Quarry Boundary.2 no fences

SITE SECTION B - B

Existing Site Office(Portacabin)(See Supporting Photos)

Photo 1-C,D Site Office

Photo 1-B Work Area

Concrete Hardstand Area where the Stone cutting machinery is mounted.(See supporting Photos)

10m x 3m x 1m SILT TRAPS TO COLLECT ANY EXCESS SILT ARISING FROM THE POLISHED WATER BEING PUMPED FROM THE QUARRY.

225mm DISCHARGE PIPE

VEGATATION FILTER

SITE SECTION A - A

RUNN-OFF INTERCEPTOR DRAIN

Fencing 1.2m in height with a terram screening 0.6m in height following the perimeter of the Quarry Boundary.2 no fences

SITE SECTION A - A

DRAWING NOTES:

APPENDIX (1)

Photo 1-F Access Road Haul Road

Photo 1-G Quarry Entrance

DRAWING NOTES:

APPENDIX (1)

Photo 1-A Terram Fencing

Photo 1-B Work Area

Photo 1-C,D Site Office

Photo 1-C,D Site Office

Photo 1-E Water Discharge Pipe from quarry floor.

1. ALL STRUCTURAL WORKS TO BE CARRIED OUT IN ACCORDANCE WITH BONDED STRUCTURAL ENGINEERS DESIGN.
2. ALL WORKS TO BE CARRIED OUT IN ACCORDANCE WITH 1997 BUILDING REGULATIONS AND ANY SUBSEQUENT REVISIONS THEREAFTER.
3. THIS DRAWING IS FOR PLANNING PERMISSION PURPOSES ONLY.
4. DO NOT SCALE FROM THIS DRAWING.
5. ALL DIMENSIONS TO BE CHECKED ON SITE.

SCALE: 1:500 AO	TITLE: SITE LAYOUT
DATE: 01.05.2013	DWG NO: 08-13 DWG.
PREPARED BY: P O RAGHALLAIGH	CHECKED BY: P. O RAGHALLAIGH

PROJECT:

QUARRY AT SHANNAPHEASTEEN REIA
APPLICANT MR. STIOFÁN Ó LORCÁIN

CLIENT: Stiofán Ó Lorcáin

PROFE
ARCHITECTURAL DESIGN & PLANNING CONSULTANTS
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Plate 3.1 Quarry entrance road

3.2.3 Extraction Areas

An area measuring 4.5 hectares has been subject to some works associated with the historical quarrying activities undertaken on-site. The quarrying and extraction of rock has taken place over an area of approximately 1.5 hectares. The remaining 3 hectares of worked area has been subject to soil and overburden removal or storage, or forms part of processing or general access areas of the site.

The main rock area in which intensive quarrying activity has taken place in the southern area of the site, where a 0.25 hectare quarry pit and rock face has been developed, which extends to a depth approximately six metres below the surrounding land, as shown in Plate 3.2 below.

Section drawings showing the current ground profiles throughout the quarry site are shown in the application drawings included as Appendix 2 of this REIS.

Plate 3.2 Main extraction area

Outside of the main extraction area, to the north and east an area measuring approximately 1 hectare was previously disturbed during the less-intensive recovery of aggregates. Work in these areas was primarily undertaken in the search for loose rock and subsoils that were used for local road building and maintenance.

Plate 3.3 Disturbed areas where historical extraction operations were less intensive

Some of the remaining unworked and undisturbed areas of the site are used in the management of drainage water on-site, as described in further detail below.

3.2.4 Quarry Management

Given the low intensity and small scale of operations on the site, there is no formal management area for controlling site operations. Vehicle parking is managed on an informal basis using hardcore areas adjacent to the site roadways. The site owners and company directors operate the quarry, one of whom lives in the house immediately to the west of the quarry boundary.

A small site hut made up of a mobile cabin provides shelter and a small storage space. There are no formal office activities undertaken on the site due to the small scale of operation. Such quarry management activities are usually from the homes of the individual operators and owners.

3.3 Description of Quarry Operations

3.3.1 Overburden Removal

Prior to any rock being extracted on-site, it is always necessary to first remove the overburden from the working area. This was typically done more recently by means of mechanical excavator, where the overburden was stripped and stockpiled around the edges of the extraction area. The majority of this overburden material remains in place, available for reuse in site restoration, and is shown on the existing layout drawing of the site included in Appendix 2 of this REIS.

3.3.2 Rock Extraction

In the recent past, rock has extracted primarily by means drilling and fracturing using a 'plug and feather' method. In the past, previous operators did blast on-site for the production of large volumes from the main extraction area. Given the more specialist products produced by the current quarry operators and current applicants, blasting would not be an appropriate rock extraction method and therefore has not been used in the recent past.

The plug and feather method of rock extraction involves drilling a row of holes into the bedrock, set back from the vertical quarry face. A pair of feathers, or semi circular cross-section rods are then inserted into the drilled holes, and a plug or steel wedge is inserted between each pair of feathers. The plugs are hammered into the feathers in succession until the rock fractures. The fractured sections of rock are broken down further, into more manageable sizes and further processed to meet market demand.

3.3.3 Processing

Stone from the extraction area is transported to an outdoor processing area consisting of a self-fabricated conveyor and stone guillotine. Stone is loaded onto the conveyor by an excavator, and the conveyor feeds the stone onto the guillotine table. The guillotine uses hydraulic pressure to fracture the rock into dimension stone suitable for the facing or cladding of buildings, or whatever end use is envisaged for the material. The processing of the stone to meet market demands and specifications is a time-consuming and labour intensive operation requiring considerable skill and craft.

The product of the processing operation is typically bagged for transportation off-site, or is sometimes loaded on pallets or directly onto trucks depending on the size and intended use.

Plate 3.4 Conveyor feeding stone guillotine

Plate 3.5 Bagged stone ready for transport

The processing equipment used on site is rudimentary but effective and fit for purpose. The outdoor setting and the fact the equipment is not covered or sheltered, does not impact on the operational efficiency of the operation.

3.4 Other Site Details

3.4.1 Site Drainage

The depth of excavation and current quarry floor level has not intercepted the water table, and therefore only precipitation and site runoff has to be managed within the quarry area. This is achieved by means of a sump, located in the northern portion of the main extraction area, into which most of the water from the disturbed area of the quarry drains. Water draining to the sump is allowed to settle for long periods of time, before being pumped periodically up to a filtration area where water is distributed evenly over a large, well-vegetated area of peatland as diffuse overland flow. The discharged water disperses through the vegetation which acts as a further vegetation or polishing filter, where it is largely reconverted to groundwater through infiltration of the peat.

Plate 3.6 Sump in base of extraction area

Plate 3.7 Hose running from extraction area to vegetation polishing filter

Protection is afforded to the adjacent Shannapheasteen River from potentially silt-laden run off from the exposed quarry area by means of a silt fence.

Plate 3.8 Silt fence embedded in ground and attached to wooden stakes to protect river

3.4.2 Water Supply

There is no water supply to the quarry. Water is sourced from the adjacent house owned by one of the quarry owners and operators as required.

3.4.3 Toilet Facilities & Wastewater Management

There are no toilet or washing facilities on the quarry site. Facilities in the operators own private houses are used at during lunch or breaks in the working day, and the adjacent private house owned by one of the quarry owners and operators can also be used as required.

There is no wastewater generated on-site, and therefore no requirement for a wastewater treatment system.

3.4.4 Refueling

Wherever possible, vehicles are refueled off-site. This will be the case for regular, road-going vehicles. However, for heavier plant and machinery that is based on-site, a limited amount of refueling has to take place on site. On-site refueling of machinery is carried out using a mobile double skinned fuel bowser or tanker. The fuel bowser, a double-axel custom-built refueling trailer is re-filled off site, and is towed around the site by a 4x4 jeep to where machinery is located. Only designated trained and competent operatives are authorised to refuel plant on site.

3.5 Site Reinstatement

A site reinstatement programme was initiated in 2010 as part of an Environmental Management Plan (Appendix 6 of this REIS) prepared for the site by Aster Environmental Consultants. The plan was prepared and implementation commenced

following a series of meetings involving the National Parks and Wildlife Service and Inland Fisheries Ireland representatives.

Site reinstatement commenced with a view to vegetating exposed areas, planting the surfaces of overburden and topsoil mounds, progressively restoring worked-out areas (where practical) and limiting the areas of topsoil/overburden stripping exposed at any one time. This process and programme of measures is ongoing.

The plan for the continued consolidation and revegetation spoil heaps aims to reduce their surface area to limit their capacity to potentially cause pollution. Depressions in existing recolonised spoil heaps are to be filled. Vegetation that has colonised this loose ground is valuable in stablising this material. Before any movement of earth is undertaken the vegetation should be removed and put to one side. After consolidation of material this vegetation should be used as a covering to help the long term restoration of these areas. Vegetation cover will protect from run off in the long term.

Throughout much of this quarry the spoil heaps are mainly of daub and small rocks. There is little soil cover to facilitate revegetation. Soil has been and will have to continue to be imported to enable vegetation to establish. This work must be carried out in dry weather so as to reduce the risk of pollution to the river. Reseeding may be carried out where required.

Full details of the site reinstatement proposals are outlined in the Environmental Management Plan included in Appendix 6 of this REIS.

3.6 Site Improvements

In the course of preparing this REIS, a number of improvements were identified by the various professionals that visited the quarry site in the course of undertaking their various assessment and field surveys. These improvements as outlined below, can be implemented to further improve operations on the site.

3.6.1 Site Entrance

To improve sight lines for vehicles exiting the quarry site, improvements could be undertaken to increase visibility in both directions. The extent of the required works is outlined in Section 12 of this REIS. The proposed works would involve the clearance of vegetation and trees. These works can be undertaken should they be deemed necessary during consideration of the application.

3.6.2 Stone Filter and Vegetation Filter

The drainage water pumped from the sump in the main excavation area could be discharged to a more formal stone filter to provide further filtration of the discharge water. The existing hole would be connected to perforated drainage pipe extended out at a level gradient across an area of well-vegetated intact bog habitat. The perforated drainage pipe will allow water to seep from the pipe along its full length, thereby dissipating the water along an 80 meter linear stretch. The small-size gravel on which the perforated pipe would rest further dissipated the water, before it reaches the vegetated surface of the bog habitat, where it will flow by gravity over the surface of the bog. The works to the stone filter and vegetation filter will be undertaken during consideration of the application.

3.6.3 Drainage Swales

Drainage swales are to be installed down-gradient from the exposed and disturbed previously worked areas of the quarry, to collect any runoff water and direct it into

the sump in the main excavation area, from where it will be pumped to the vegetation filter area.

3.6.4 Silt Fencing

The existing silt fence that runs parallel to the Shannapheasteen river is to be repaired where required, and supplemented with a second fence to provide further protection to the river.

3.6.5 Safety Bunding/Railing

The existing quarry face is not protected, and should be afforded some protection in the form or a bund or fence to prevent accidents involving personnel or machinery or vehicles getting to close to the quarry face and potentially falling into the main excavation area.

4 HUMAN BEINGS

4.1 Introduction

This section of the Remedial Environmental Impact Statement (REIS) describes the potential impacts of the proposed development on human beings and has been completed in accordance with the guidance set out by the Environmental Protection Agency in '*Guidelines on Information to be contained in Environmental Impact Statements*' (EPA, 2000).

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. Ultimately, all the impacts of a development impinge on human beings, directly and indirectly, positively and negatively. The key issues examined in this section of the REIS include population, employment and economic activity and land-use.

4.2 Methodology

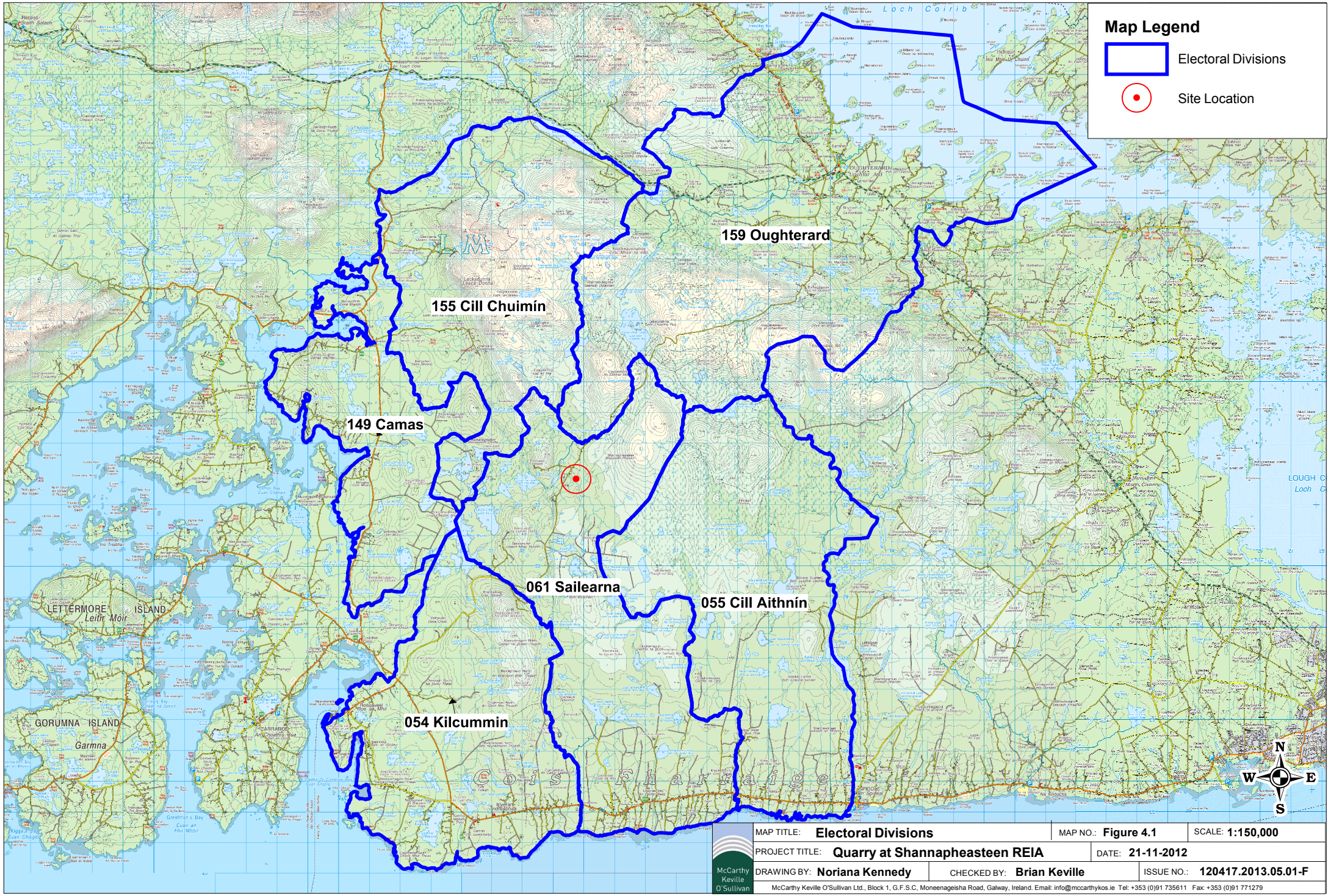
Information regarding human beings and general socio-economic data were sourced from the Central Statistics Office (CSO) and the Galway County Development Plan 2009 – 2015. The study included an examination of the population and employment characteristics of the area. This information was sourced from the most recent census, the Census of Ireland 2011 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 Remedial Environmental Impact Assessment, 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 Study Area information can be compared. Where data from the 2011 Census was not yet available, data from the 2006 Census has been used.

The site of the subject development is located in the townland of Shannapheasteen, Casla, County Galway approximately 11 kilometres southwest of Oughterard village and 8.6 kilometres northeast of the village of Costelloe (Casla).

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

- Camas ED
- Kilcummin ED
- Cill Chuimín ED
- Oughterard ED
- Cill Aithnín ED



MAP TITLE: **Electoral Divisions**		MAP NO.: **Figure 4.1**	SCALE: **1:150,000**
PROJECT TITLE: **Quarry at Shannapheasteen REIA**			DATE: **21-11-2012**
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The Human Beings Study Area is shown in Figure 4.1. The Human Beings Study Area has a combined population of 6,887 persons and comprises a total land area of 40,765 hectares or 407.65 square kilometres (Source: CSO Census of the Population 2011).

4.3 Receiving Environment

4.3.1 Population

4.3.1.1 Population Trends

The population of Ireland saw a rapid decline in the mid 19th century due to famine and emigration, leaving the country with half its pre-famine population (6,528,799) at the beginning of the 20th century (3,221,823). The early 1960s saw the lowest recorded population figure of 2,818,314 in 1961 but since then the population of the State has increased gradually to 4,239,848 in 2006 and 4,588,252 in 2011, figures not recorded since the 1880s. Since the recession in Ireland the overall growth in population has slowed due to emigration. The population of Ireland increased by 21 per cent in the five years between the 1996 and the 2011 censes, which equates to an approximate four per cent growth per annum.

Population statistics for the State, County Galway and the Human Beings Study Area have been obtained from the Central Statistics Office (CSO) and are presented in Table 4.1. Table 4.2 shows the rate of population increase that occurred between each year.

Table 4.1 Population Statistics 1996 – 2011 (Source: CSO)

Area	Population			
	1996	2002	2006	2011
State	3,626,087	3,917,203	4,239,848	4,588,252
Co. Galway	131,613	143,245	159,256	175,124
Study Area	5723	6306	6665	6887

Table 4.2 Population Change 1996 – 2011

Area	% Population Change			
	1996 - 2002	2002 - 2006	2006-2011	1996-2011 (Total)
State	8.0%	8.2%	7.6%	21.0%
Co. Galway	8.8%	11.2%	9.1%	24.8%
Study Area	9.2%	5.4%	3.2%	16.9%

The Census data presented here shows that over the fifteen-year period from 1996 to 2011, the rate of population increase within the Human Beings Study Area has been significantly lower than that recorded at State and County level. When the Human Beings Study Area data is examined in closer detail, it shows that between 1996 and 2011 populations in the majority of the E.D's studied had lesser increases in population than in the State and County. Overall, from 1996 to 2011, the population of the Human Beings Study Area increased by only 16.9%, which is significantly lower than the overall figure of 24.8% population increase recorded for County Galway. During this period, the population of Camas, Cill Chuimín and Kilcummin EDs decreased rather than increased.

Of the six EDs that make up the Human Beings Study Area, Oughterard ED is the most populous, with a population of 2563 persons recorded during the 2011 Census, followed by Sailearna ED where the subject site with located with 1362 persons. Cill Chuimín is the least populous, with 122 persons recorded during 2011.

4.3.1.2 Population Density

The population densities recorded within the State, County Galway and the Human Beings Study Area during 2011 are shown in Table 4.3.

Table 4.3 Population Density in 2011 (Source: CSO)

Area	Population Density (Persons per square kilometre)
State	65.4
County Galway	28.5
Study Area	16.9

The population density of the Human Beings Study Area recorded during the 2011 Census was 5.9 persons per square kilometre. This figure is significantly lower than the national figure of 65.4 persons per square kilometre and the figure of 28.5 persons per square kilometre recorded for County Galway.

The population densities recorded across the Human Beings Study Area EDs are very low in comparison to the figures for the State and County. The population density of Kilcummin ED, is 23.9 persons per square kilometre. Oughterard ED, which contains has a population density of 21.9 persons per square kilometre. ED of Sailearna, where the subject site is located, similarly has a population density of 21.2 persons per square kilometre. Cill Aithnín ED is lower with a population density of 14.3 persons per square kilometre. Camas E.D has a low population density of 10 persons per square kilometre. Cill Chuimín ED has the lowest population density of 2.7 persons per square kilometre.

These figures are demonstrative of the low population levels outside the established settlements of this part of Galway where farming and forestry are a dominant landuse.

4.3.1.3 Household Statistics

The number of households and average household size recorded within the State and County Galway during the 1996, 2002, 2006, 2011 Censuses are shown in Table 4.4. Data for 1996 relating to the number of households at ED level was unavailable at the time of completing this assessment.

Table 4.4 Population Density in 2011 (Source: CSO)

		State	Co. Galway	Study Area
1996	No. of Households	1,127,318	38,849	Unavailable at ED level
	Average Size (Persons)	3.2	3.4	
2002	No. of Households	38,849	45,253	2074
	Average Size (Persons)	3.4	3.1	3.0
2006	No. of Households	1,469,521	53,308	2308
	Average Size (Persons)	2.8	2.9	2.9
2011	No. of Households	1,654,208	60,952	2510
	Average Size (Persons)	2.7	2.8	2.7

In general, the figures in Table 4.4 show that while the number of households at State, County and Human Beings Study Area level continues to increase from year to year, the average number of people per household has decreased, i.e. there are more households but less people per house.

Average household size recorded within the Human Beings Study Area during the 2002, 2006 and 2011 Censuses is generally in line with that observed at national and county level.

4.3.1.4 Age Structure

Table 4.5 and Figure 4.2 show the percentage of the population within the different age groups as defined by the Central Statistics Office during the 2011 Census.

Table 4.5 Population per Age Category in 2011 (Source:CSO)

Area	Age Category				
	0 - 15	15 - 24	25 - 44	45 - 64	65 +
State	22.6%	11.4%	31.6%	22.7%	11.7%
Co. Galway	24.0%	10.0%	29.3%	24.1%	12.6%
Study Area	20.2%	12.2%	27.1%	26.7%	13.6%

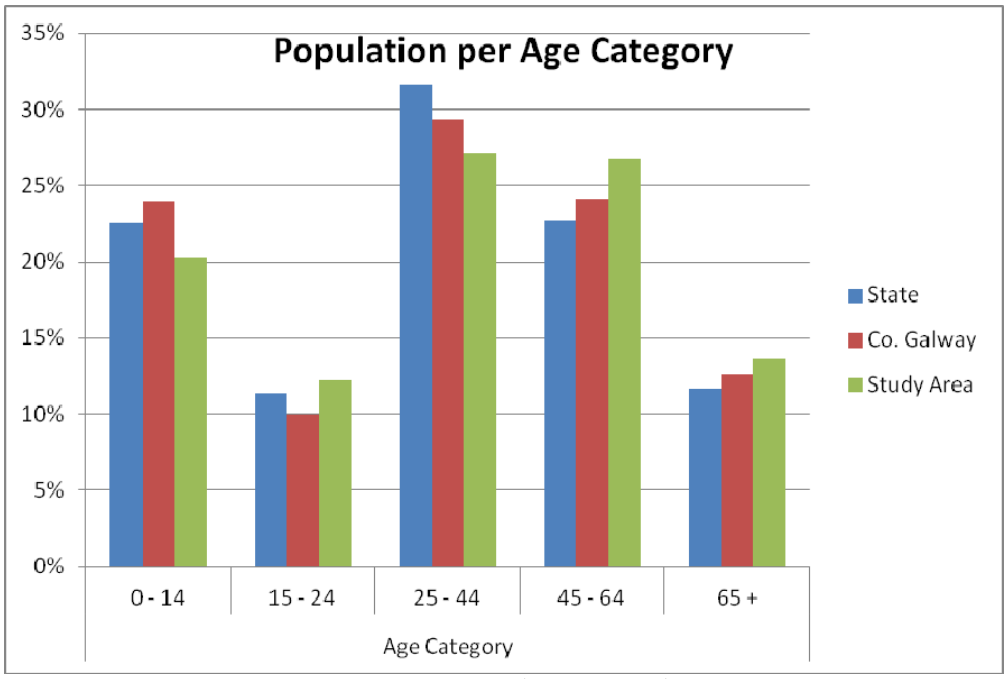


Figure 4.2 Population per Age Category in 2011 (Source: CSO)

The data presented in Figure 4.2 shows that the highest proportion of the Human Beings Study Area population is within the 25-44 age category. This is perhaps indicative of the movement of young people away from the area for employment and third-level education. In terms of the remaining age categories, the figures recorded at Human Beings Study Area level are generally similar to those recorded for County Galway. The 25-44 age category typically includes first-time homebuyers and those with young families. The proportion of this age category living within the Human Beings Study Area is lower than that recorded for the State and County Galway. The proportion of the 45-64 and 65+ age categories are significantly higher than that recorded for the State and County Galway. The proportion of 0-14 age category is slightly less than that for the State and County. The proportion of 15-24 age category recorded for the Human Beings Study Area is slightly higher than the State and County figures.

4.3.2 Employment

4.3.2.1 Economic Status

The labour force consists of those who are able to work, i.e. those who are aged 15+, out of full-time education and not performing duties that prevent them from working. In 2002, there were 1,800,933 persons in the labour force in Ireland. In 2006, this figure had increased to 2,109,498. In 2011 this figure increased to 2,232,203.

Table 4.6 shows the percentage of the total population aged 15+ who were in the labour force at State, County and Human Beings Study Area level during the 2011 Census. This figure is further broken down into the percentages that were at work, seeking first time employment or unemployed. It also shows the percentage of the total population aged 15+ who were not in the labour force, i.e. those who were students, retired, unable to work or performing home duties.

Table 4.6 Population per Age Category in 2011 (Source: CSO)

	Status	State	County Galway	Study Area
% of total population aged 15+ who are **in** the labour force		61.9	62.4	59.0
% of which are:	At work	80.9	81.8	75.4
	First time job seeker	1.5	1.4	1.3
	Unemployed	17.5	16.7	23.3
% of total population aged 15+ who are **not** in the labour force		38.1	37.6	
% of population which are:	Student	29.7	27.8	29.2
	Home duties	24.7	26.3	24.8
	Retired	33.3	33.7	35.2
	Unable to work	11.4	11.3	9.9
	Other	0.1	0.9	1.0

During the 2011 Census, over 80.9% of those recorded as being in the labour force at State and 81.9% at County level were in employment. The level of employment recorded within the Human Beings Study Area was lower at 75.4%.

Of those who were not in the labour force during the 2011 Census, the highest percentage of the Human Beings Study Area population were retired. This category also contains the largest proportion of those who were not in the labour force, at both State and County level. The percentage of population categorised as Home Duties and not being able to be part of the labour force was level at Human Beings Study Area, State and County level. Similarly, the percentage of those within the Human Beings Study Area who were categorised as Students was in line with the national and county figures. A lower percentage of the Human Beings Study Area population was categorised as being unable to work, compared to the State and County figures.

4.3.2.2 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 4.3 shows the percentages of those employed in each socio-economic group in the State, County Galway and the Human Beings Study Area during 2011.

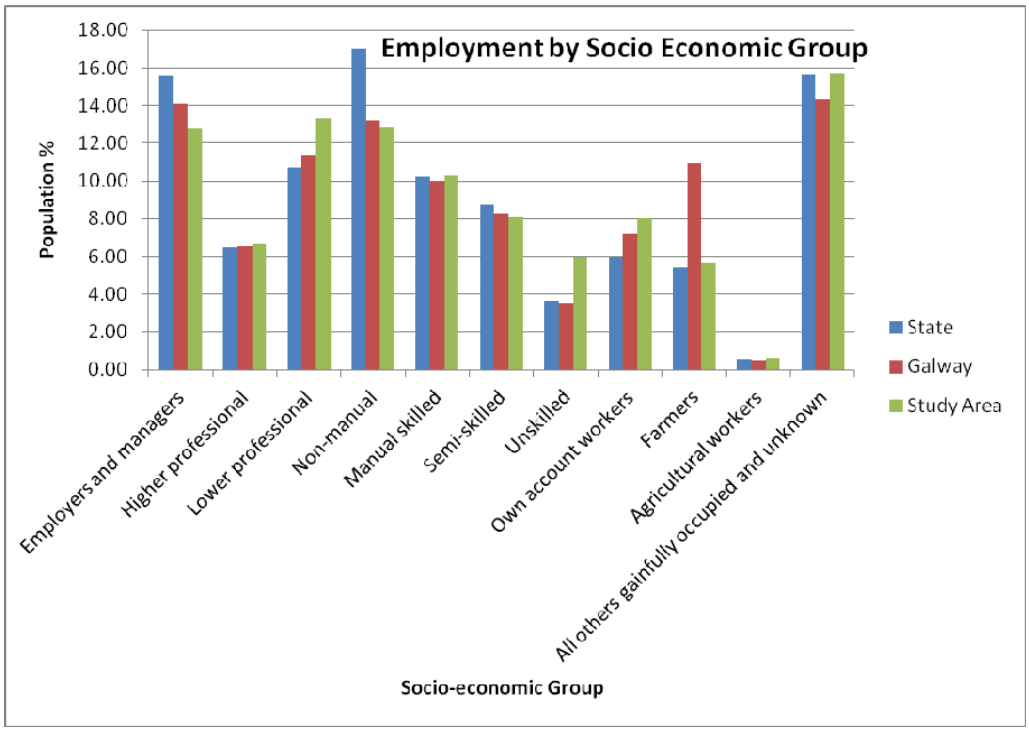


Figure 4.3 Employment by Socio-Economic Group in 2011 (Source: CSO)

The highest levels of employment within the Human Beings Study Area were recorded in the Lower Professional category. The Human Beings Study Area levels of employment within the Employers and managers, Higher Professional, Non-manual Categories, Manual Skilled, Semi-skilled and Agricultural Workers were in line with those for the State and County Galway. Those recorded within the Unskilled, Own Account Workers and Lower Professional were slightly higher than for those in the State and County.

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 4.3.

4.3.2.3 Unemployment

In 2011, a total of 390,677 people were recorded as unemployed in Ireland, 17.5 percent of the total population aged 15 and over. Within the Human Beings Study Area in 2011 total of 755 people were recorded as unemployed. This was 14 percent of the total population aged 15 and over.

4.3.3 Land-use

The total area of farmland within the Human Beings Study Area measures 9986 hectares or 24.5% of the Human Beings Study Area, according to the CSO Census of Agriculture. There are 542 farms located within the Human Beings Study Area and farming employs 387 people as shown in Table 4.7. The majority of farms within the

Human Beings Study Area are family-owned and run. Rough grazing accounts for the largest proportion of farmland, followed by pasture.

Table 4.7 Farm Size and Classification within the Human Beings Study Area in 2000 (Source: CSO)

Characteristic	Value (ha)
Size of Human Beings Study Area	40,765
Farmland as % of Human Beings Study Area	24.5%
Total Number of Farms in Human Beings Study Area	542
No. of Farmers and Agricultural Workers	387
Total Area Farmed	9986
Total Pasture	2877
Total Silage	512
Rough Grazing	6064
Total Hay	445
Total Crops, Fruit & Horticulture	44

Average farm size within the Human Beings Study Area is 18.42 hectares. This average farm size for County Galway measures 24.51 hectares.

The existing development site was previously used for peat and rough grazing.

4.3.4 Tourism

Tourism is one of the major contributors to the national economy and is a significant source of full time and seasonal employment in the County, both overseas and domestic tourism. Total tourism revenue in Ireland was estimated to be worth €3.9 billion in 2011 this represents a marginal growth of 1% on the previous year.

The majority of listed tourist attractions on the Discover Ireland website are located in fishing village of Oughterard approximately ten kilometres northeast of the site.

4.3.5 Health and Safety

The operation of heavy machinery in the form of an excavator, stone guillotine and haulage trucks pose a potential health and safety risk to the staff of the quarry development present onsite.

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

The presence and operation of heavy machinery at the subject site poses a potential risk to humans that may trespass onto the site.

The presence of excavation faces and open quarried edges will pose a potential risk to the staff of the quarry, members of the public who may enter the site and humans that may trespass onto the site.

4.4 Likely and Significant Impacts and Associated Mitigation Measures

4.4.1 'Do-Nothing' Scenario

If the quarrying activity had not commenced on these lands, the lands would have continued to be used for rough grazing or managed as cutover bog. No excavations or quarrying activity would have taken place on the subject site and any likely impacts would not have occurred.

In effect almost all sections of the REIS refer to the impact (direct or indirect) of the development on human beings. It is worth noting that these sections (e.g. traffic, noise and vibration, water etc.) also deal with the impacts of certain aspects of the subject site on human beings.

4.4.1.1 Population

4.4.1.1.1 Long Term Moderate Positive Impact

The impacts of the subject development on employment have been positive for the Human Beings Study Area. The positive impacts on employment have resulted in the positive impacts on the population around the site by securing jobs in the local region. No negative impacts are anticipated and therefore no mitigation measures are considered to be required.

4.4.1.2 Employment

4.4.1.2.1 Long Term Moderate Positive Impact

The subject quarry resulted in the creation of three permanent positions in the area. Those employed at the quarry were from the local community so any increased revenue from this employment returns directly to the local community. No negative impacts are anticipated and therefore no mitigation measures are considered to be required.

4.4.1.3 Land-use

4.4.1.3.1 Neutral Impact

The development of a quarry on the site has resulted in a change of land-use. The former land-use would have been turf cutting and rough grazing.

At ten hectares in area, the change in the land-use of this area is insignificant in the context of the local and wider area, with resultant long term neutral impact on land-use.

The REIS study area of the subject site occupies less than 0.02 % of the Human Beings Study Area site defined for this REIA. Other land-uses within the wider area, such as forestry and agriculture, have been unaffected by quarry operation.

4.4.1.4 Tourism

4.4.1.4.1 Short Term Slight Negative Impact

Dust and noise pollution associated with the subject site may reduce the quality of the area surrounding the site and its potential for tourism. However, there are existing dust and noise control systems in place. A full assessment of Dust and Noise is included in Chapter 8 of this REIS.

4.4.1.5 Health and Safety

4.4.1.5.1 Neutral Impact

A health and safety statement is in place and adhered to in the case of all operations and meets the quarry operations obligation under all relevant health and safety legislation. On the basis that the quarry procedures are followed in line with the site Health and Safety Statement there should no impact on human health and safety.

5 FLORA AND FAUNA

5.1 Introduction

This section of the Remedial EIS is based on published literature and field visits that were made to the site by ecologists working for Aster Environmental Consultants. Visits were made during October 2010, as well as during July 2012, March and April 2013.

The survey work was carried out by Marie Louise Heffernan (M.Sc., MIEEM), ecologist and environmental consultant. The adjacent river was surveyed by entemologist Dr Stephen McCormack (PhD, MIEEM) to assess Q values.

The habitats were classified initially from aerial photographs and subsequently ground-truthed at the site. The flora was surveyed through direct observation on-site. Fauna were surveyed through direct observation of bird and mammal species or of their signs and calls. Habitat suitability was also assessed for the likely occurrence of other species, which would not be present due to seasonal factors.

5.2 Methodology and Limitations

The habitats, flora and fauna of the site were assessed by means of a desk study of literature pertinent to the site and surrounding area and by field surveys of the site including a survey of habitats and general observation work.

Seasonal factors that affect distribution patterns and habits of species were taken into account when conducting the surveys and the potential of the site to support certain populations (in particular those of conservation importance that may not have been recorded during the field survey due to their seasonal absence or cryptic nature) was assessed.

Habitats were initially mapped using the most recent available aerial photographs from the year 2010. The site was systematically and thoroughly walked in a ground-truthing exercise, where the habitats on the site were assessed, classified and sketched on to field maps. This dedicated habitat mapping exercise was carried out on the 12th of April 2013 and was also informed by previous visits to the study area.

5.3 Published Information

5.3.1 Background to Designated Sites

With the introduction of the EU Habitats Directive (92/43/EEC) which was transposed into Irish law as the Natural Habitats Regulations, 1997, the European Union formally recognised the significance of protecting rare and endangered species of flora and fauna and also, more importantly, their habitats. Member states were directed to provide lists of sites for designation.

5.3.1.1 Natural Heritage Areas and Proposed Natural Heritage Areas

Natural Heritage Areas (NHAs) are sites that were designated for the protection of flora, fauna, habitats and geological sites of national importance. Management of NHAs is guided by planning policy and the Wildlife (Amendment) Act 2000. It was from these NHAs that the most important sites were selected for international designation as SACs and SPAs.

Proposed NHAs (pNHAs) were published on a non-statutory basis in 1995, but have not since been statutorily proposed or designated. These sites are of significance for wildlife and habitats. Site Synopses are not currently available for pNHAs.

5.3.1.2 Special Areas of Conservation and Special Protection Areas

There are two types of EU site designation, the Special Area of Conservation (SAC) and the Special Protection Area (SPA). SACs are designated for the conservation of flora, fauna and habitats of European importance and SPAs for the conservation of bird species and habitats of European importance. These sites form part of 'Natura 2000' a network of protected areas throughout the European Union.

Annex I of the Habitats Directive lists certain habitats that must be given protection. Certain habitats are deemed 'priority' and have greater protection. Irish habitats include raised bogs, active blanket bogs, turloughs, heaths, lakes and rivers. Annex II of the directive lists species whose habitats must be protected and includes Lesser Horseshoe Bat, Otter, Salmon and White-clawed Crayfish.

5.3.2 Sources of Information

The following sections detail the sources of published material that were consulted as part of the desk study for the purposes of the Environmental Impact Assessment. These included the synopses of sites designated for their conservation importance compiled by the National Parks and Wildlife Service (NPWS) of the Department of Arts, Heritage and the Gaeltacht (DoAHG), bird and plant distribution atlases and other research publications.

5.3.2.1 Designated Areas

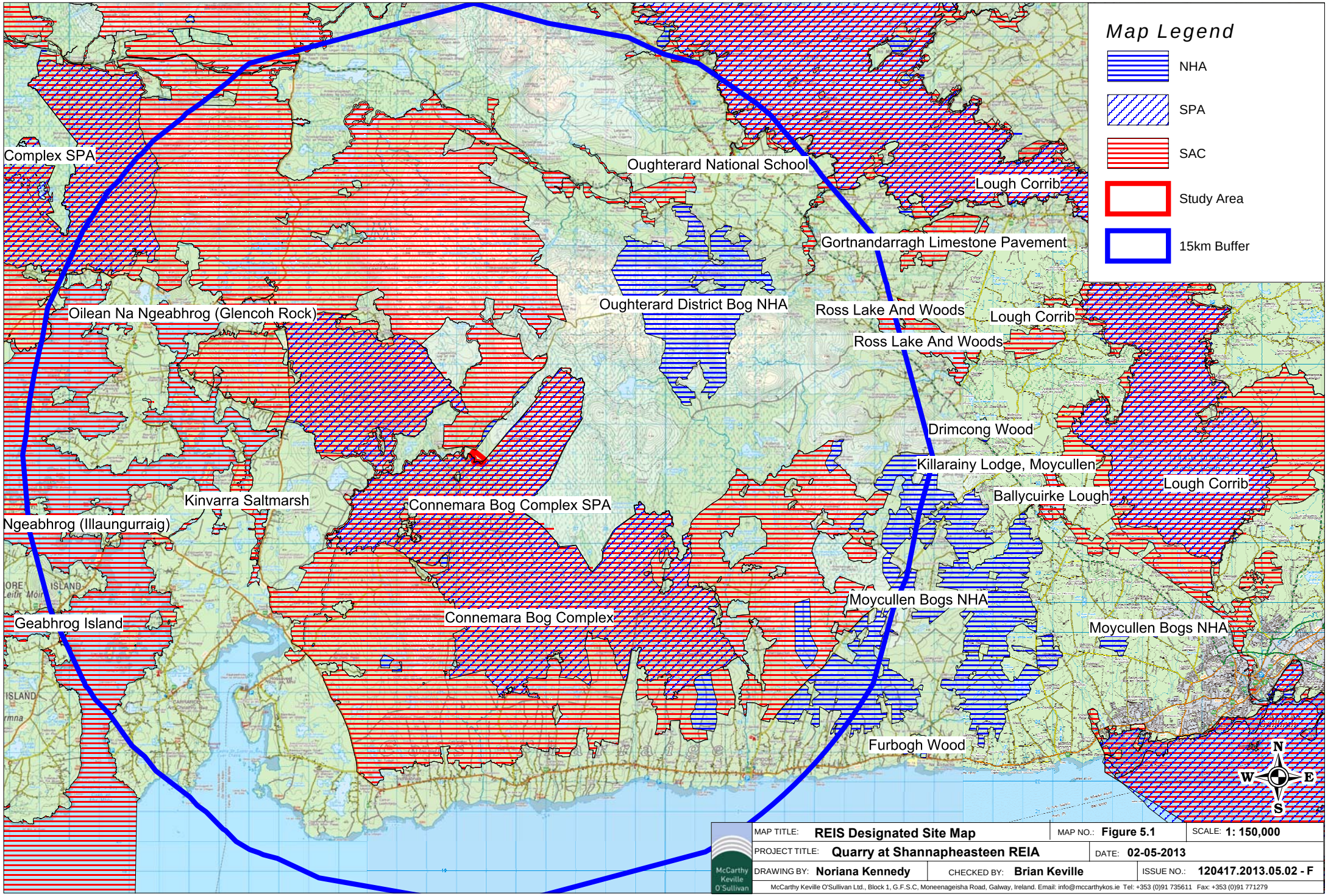
Table 5.1 (below) shows the sites designated for their conservation importance that are within a radius of fifteen kilometres of the study area.

Table 5.1 Designated sites in the vicinity of the Study Area

Site Name	Designation	Code	Distance from study area
Connemara Bog Complex	cSAC	002034	Borders western and southern boundaries of site with approximately 2 ha within study area
Connemara Bog Complex	pNHA	002034	Borders western and southern boundaries of site.
Connemara Bog Complex	SPA	004181	Borders western and southern boundaries of site. Part of Quarry area within the SPA (0.7 ha)
Kilkeran Bay and Islands	cSAC	002111	6.5 km south west
Lough Corrib	cSAC	000297	12.8 kilometres north-east
Maamturk Mountains	SAC	002008	14.5 km north

The relationship of the site of the quarry to these designated sites is shown in Figure 5.1, below. In addition, the NPWS site synopses for these designated sites. These are shown in full as Appendix 3 to this report.

Approximately two hectares of the study area lies within a site that has been designated for its conservation significance. The southern boundaries of the study area lie within Connemara Bog Complex cSAC and Connemara Bog Complex SPA. The designated area comprises of a buffer strip along the river, which varies between 20 and 30 metres and is estimated at 0.9 hectares. This is in line with the NPWS



MAP TITLE: **REIS Designated Site Map**		MAP NO.: **Figure 5.1**	SCALE: **1: 150,000**
PROJECT TITLE: **Quarry at Shannapheasteen REIA**		DATE: **02-05-2013**	
DRAWING BY: **Noriana Kennedy**	CHECKED BY: **Brian Keville**	ISSUE NO.: **120417.2013.05.02 - F**	

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policy for protection of salmonid waters. In addition there is an area of 1ha at the south east corner of the site which was also included in the SAC designation presumably because it was an undeveloped area of active Blanket Bog. Slightly less of this area (approximately 0.7 hectares) is included in the SPA.

The National Parks and Wildlife Service publish synopses of the information on areas designated for their conservation importance. The following paragraphs are based on the site synopsis for the Connemara Bog Complex cSAC (Site Code 002034) and the Connemara Bog Complex SPA (Site Code 004181).

The Connemara Bog Complex is a large SAC encompassing the majority of the south Connemara lowlands. The most extensive habitat in the area is lowland Atlantic blanket bog, but there are also areas of heath, woodland, lakes, rivers and streams.

Nine plant species legally protected by the Flora Protection Order of 1999 occur within the SAC: Forked Spleenwort (*Asplenium septentrionale*), Parsley Fern (*Cryptogramma crispa*), Bog Hair-grass (*Deschampsia setacea*), Slender Cottongrass (*Eriophorum gracile*), Bog Orchid (*Hammarbya paludosa*), Slender Naiad (*Najas flexilis*), Heath Cudweed (*Gnaphalium sylvaticum*), Pillwort (*Pilularia globulifera*) and Pale Dog Violet (*Viola lactea*). The Dorset Heath (*Erica ciliaris*), Mackay's Heath (*Erica mackiana*) and Green-winged Orchid (*Orchis morio*) occur here also. All twelve of these plants are listed as rare or threatened in the Irish Red Data Book and the Slender Naiad is listed in Annex II of the EU Habitats Directive.

The Arctic Charr (*Salvelinus alpinus*) occurs in several of the lakes within the SAC; this species is mentioned in the Irish Red Data Book as being threatened.

Otter (*Lutra lutra*) and Irish Hare (*Lepus timidus hibernicus*) are recorded from this SAC. Both of these mammals are listed in the Irish Red Data Book and Otter is also listed on Annex II of the EU Habitats Directive.

Finally, Frog (*Rana temporaria*) and Marsh Fritillary (*Euphydryas aurinia*) are known to be present within the SAC. The former is listed on Annex V and the latter on Annex II of the EU Habitats Directive.

The site is a Special Protection Area (SPA) under the E.U. Birds Directive, of special conservation interest for the following species: Cormorant, Merlin, Golden Plover and Common Gull. Lough Scannive, located within Roundstone Bog, supports a nationally important breeding population of Cormorant (160 breeding pairs in 2001). Other breeding birds using the site include Merlin and Golden Plover. A partial survey in 2009 recorded 8 pairs of Merlin at various locations throughout the site; 15 breeding locations for this species were recorded at the site in an earlier survey undertaken in 1985/86. A survey of upland birds in 2004 recorded 27 pairs of Golden Plover within the site. The numerous lakes scattered throughout the site provide suitable breeding locations for Common Gull (45 pairs in 2000); a survey in 2010 recorded 40 pairs of this species at the site. The site is also utilised by a wintering population of Greenland White-fronted Goose; small flocks of up to 30 birds have been recorded at various locations within the site.

A Natura Impact Statement has been prepared to examine the likely effects of the quarry, both alone and in combination with other projects, on the conservation objectives of Natura 2000 sites (i.e. SACs and SPAs) within a 15 kilometre radius of the quarry site and considers whether any possible impacts on the conservation

objectives of these Natura 2000 sites can be characterised as significant. This is presented as a separate document.

The Natura Impact Statement has been prepared in accordance with the European Commission guidance document Assessment of Plans and Projects Significantly affecting Natura 2000 Sites: Methodological Guidance on the provisions of Article 6(3) and 6(4) of the Habitats Directive 92/43/EEC (EC, 2001) and the Department of the Environment's Guidance on the Appropriate Assessment of Plans and Projects in Ireland (December 2009). It is presented as Appendix 4 to this report.

5.3.2.2 New Flora Atlas

A search was made in the New Atlas of the British & Irish Flora (Preston et al., 2002) to establish if any rare or unusual plant species had been recorded in the ten kilometre by ten kilometre square (or hectad) M03 during the 1987 – 1999 atlas survey carried out by the Botanical Society of the British Isles (BSBI). The study area is located entirely within hectad M03.

Square M03 includes 100 whole or part one kilometre squares containing terrestrial habitats. Since the study area covers just under ten hectares, it follows that there will be a number of habitats, and thus many plant species, that were recorded in M03 during the atlas survey that are not likely to be found at the site. The search included the vascular plants that are listed in Annex II of the EU Habitats Directive and/or in the Flora (Protection) Order of 1999.

No species listed in Annex II of the Habitats Directive or in the Flora Protection Order (1999) are shown in the atlas for square M03. In addition, none of the plants listed in the 'The Irish Red Data Book. 1. Vascular Plants' (Curtis and McGough, 1988) mentioned in the NPWS synopsis for the Connemara Bog Complex cSAC were recorded in square M03 during the atlas survey.

5.3.2.3 Bird Atlases

The principal published sources of information regarding the distribution of breeding birds in Ireland are 'The Atlas of Breeding Birds in Britain and Ireland' (Sharrock, 1976) and 'The New Atlas of Breeding Birds in Britain and Ireland: 1988-1991' (Gibbons et al., 1993). Similarly, 'The Atlas of Wintering Birds in Britain and Ireland' (Lack, 1986) is the most comprehensive work on wintering birds in Ireland.

These atlases show data for breeding and wintering birds respectively in individual 10 km by 10 km squares (also known as hectads). Table 5.2 shows those species found in the relevant hectad, M03, which are recorded in the breeding birds atlases and are also protected under the EU Birds Directive or mentioned on the Birds of Conservation Concern in Ireland (BoCCI) red list. Birds listed under Annex I are offered special protection by the EU Birds Directive. Those listed on the BoCCI red list meet one or more of the following criteria:

- The Irish breeding population or range has declined by more than 50% in the last 25 years.
- The Irish breeding population has undergone significant decline since 1800.
- They are of global conservation concern.

It should be remembered that breeding was not proven in all instances where birds were recorded during the breeding atlas surveys, but also that the absence of a record does not necessarily imply that the species was absent from that square.

Table 5.2 Breeding Bird Atlas Data (hectad M03)

Common Name	Scientific Name	Breeding Atlas 68-72	Breeding Atlas 88-91	Conservation Status
Merlin	*Falco columbarius*	-	✓	BD
Corncrake	*Crex crex*	✓	-	BD, RL
Red Grouse	*Lagopus lagopus*	-	✓	RL
Yellowhammer	*Emberiza citrinella*	✓	-	RL
Lapwing	*Vanellus vanellus*	-	✓	RL
Golden Plover	*Pluvialis apricaria*	-	✓	BD, RL
Curlew	*Numenius arquata*	-	✓	RL
Black-headed Gull	*Larus ridibundus*	-	✓	RL
Herring Gull	*Larus argentatus*	✓	-	RL

BD = EU Birds Directive Annex I
RL = BoCCI Red List
- = not recorded.

Three species listed in Annex I of the EU Birds Directive have been recorded within the relevant ten-kilometre square during surveys for past breeding bird atlases: Merlin, Corncrake, and Golden Plover.

Corncrake distribution has declined dramatically throughout Ireland in recent times. The decline of this species is largely attributed to earlier cutting of grass, which is associated with modern farming practices. This bird breeds in damp hay meadows (with tall grasses) and wet marshland. According to the BirdWatch Ireland/RSPB Corncrake Census Survey carried out in 1993 there has been an 80% decline in the population since the last atlas survey in 88-91. The current populations are best represented as having three centres: Donegal Islands, (where they are most numerous), Mayo & Galway Islands and the Shannon Callows. The population in 2012 was estimated at 137pairs. Corncrakes are highly unlikely to occur at this site for both reasons of distribution and habitat.

In summer, Merlin are associated with bogland habitats, both upland and lowland. During winter, birds often migrate to the coast, although males may stay at their breeding territories. Nesting occurs in old crows nests in trees (close to the edge of forestry plantations adjoining open moorland, or in bog woodland, or single/small clumps of trees), on vegetated lake islands, on the ground in heather and on isolated boulders and rock crags. Breeding is known in the Connemara Bog Complex SPA to the south of the site. However none were recorded during survey for the assessment of the quarry.

Golden Plover is a wader species that breeds on heath and bogland in both lowland and upland situations. The numbers of breeding pairs in Ireland are not many and the population is vastly increased during winter by birds from the continent. Breeding Golden Plover are present within the Connemara Bog Complex SAC, in areas to the west of the site of the quarry that have been designated as the Connemara Bog Complex SPA. Small numbers of Golden Plover are present, during winter and on passage, in areas of blanket bog to the south, west and east of the study area, so there is some potential for small groups of this species to fly over the site of the quarry.

The following birds that have been recorded in hectad M03 during past breeding bird atlas surveys and are listed on the BoCCI Red List, but not in Annex I of the EU Birds Directive: Lapwing, Curlew, Black-headed Gull, Red Grouse and Yellowhammer.

Lapwing breed in areas with short vegetation or bare ground in wet grassland, machair, dune slacks, ploughed arable land, or occasionally heath and bog. This species, is a very conspicuous inhabitant of open habitats. Curlew breed in a variety of habitats including bogs, arable fields and maritime grassland. The habitats recorded in the quarry are generally unsuitable for either species. Yellowhammer are found in some parts of Connemara. They are usually associated with hedgerows and scrub, habitats that are not present but in small quantities at the site of the quarry.

Black-headed Gull is a species that breeds on islands, both offshore and in lakes like Lough Corrib, seven kilometres north-east of the site. There are no potential breeding sites for this species within or near to the quarried area.

Red Grouse are widely but thinly distributed in Connemara. They are known from the lowland blanket bog and heath immediately to the south and west of the study area. The species is the most likely of all the rare species listed to use the general area as the habitat is generally suitable beyond the quarry boundary. No specific grouse survey was undertaken as the habitat on site was generally unsuitable for this species.

Table 5.3 presents those species found in the relevant hectad, M03, which are recorded in the most recent wintering birds atlas and are also protected under the EU Birds Directive or mentioned on the Birds of Conservation Concern in Ireland (BoCCI) red list.

Table 5.3 Wintering Bird Atlas Data (hectad M03)

Common Name	Scientific Name	Wintering Atlas 81-84	Conservation Status
Whooper Swan	*Cygnus cygnus*	✓	BD

One species listed on Annex I of the EU Birds Directive are recorded as wintering in M03: Whooper Swan. Whooper Swans use a variety of habitats from lakes and ponds to agricultural land, turloughs and intertidal areas where they graze on grass and winter cereals. The habitat on site is unsuitable for this species.

No Greenland White-fronted Goose were recorded in M03 during the first or second breeding bird atlas surveys. However, it is worth mentioning that there are two small flocks that still exist in the region. One flock winters in the Connemara Bog Complex cSAC/SPA Concentrated further south east at Tullynasleeog and Glenachmurach approximately ten kilometres away. This flock has declined in numbers and there have been no recent records close to the site of the quarry.

5.3.2.4 Other Records/Published Data

Records kept by the British Bryological Society (BBS) show that 95 species of bryophytes (23 liverworts and 72 mosses) have been recorded in hectad M03. This list does not include any of the 18 species of bryophytes listed in the Flora (Protection) Order (one of which is also listed in Annex II of the EU Habitats Directive).

Records held by the Conchological Society of Great Britain and Ireland (CSGBI), the NPWS and from the EPA River Biologists' data show that just one species of non-

marine mollusk, Wandering Snail (*Radix balthica*) have been recorded in M03. This mollusk is not of conservation concern.

Records held by Biodiversity Ireland (Distribution Atlas of Butterflies in Ireland 1979 (An Foras Forbartha) showed that 6 of the 35 species of butterfly regularly found in Ireland have been recorded in hectad M03. None found are Threatened (Endangered or Vulnerable) species and nor are they Near Threatened species included in 'Ireland Red List No. 4 – Butterflies' (Regan et al., 2010).

Thirteen of the 24 species of odonates (dragonflies and damselflies) regularly found in Ireland have been recorded in hectad M03 (Nelson and Thompson, 2004). None of the species recorded is included in the group of five species listed as Endangered, Vulnerable or Near Threatened in 'Ireland Red List No.6: Damselflies & Dragonflies (Odonata)' (Nelson et al., 2011).

5.4 Flora in the Existing Environment

5.4.1 Habitats Present

Habitats present on the site of the quarry were classified according to the guidelines set out in 'A Guide to Habitats in Ireland' (Fossitt, 2000). The habitats present are shown (overlain by the footprint of the quarry) in a Habitat Map, Figure 5.2, below. The habitats recorded at the site of the quarry are listed below in Table 5.5. The habitat names are followed by their corresponding habitat reference code (in brackets) and information on the respective areas of each habitat present are also listed.

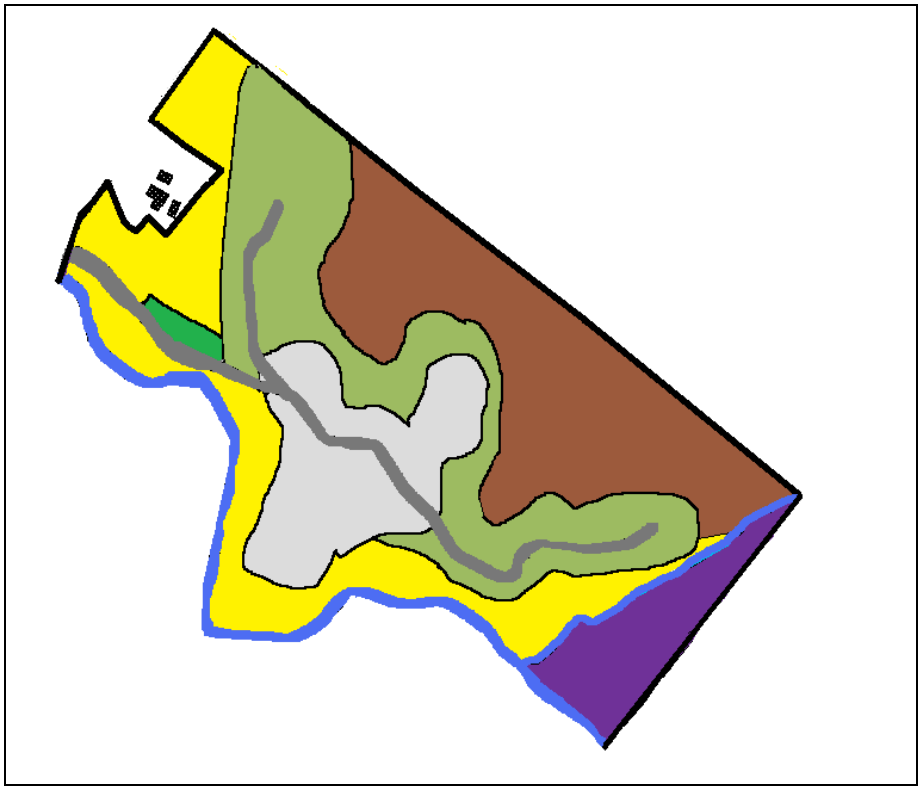


Figure 5.2 Habitat Map

Quarried area

Recolonising bare Ground

Cutover Bog

Blanket Bog

Heath dominated by rushes

Roads

River

Treeline

Table 5.5 Habitats at Shannapheasteen Quarry, Co. Galway

Habitat	Area	Hectares	Area %
Cutover bog PB4	Active turf cutting	3.6	35%
Spoil and Bare Ground (ED2)/Recolonising bare ground (ED 3)	Forestry tracks	2.5	25%
Wet Heath	Dominated by Rushes	2.0	20%
Active quarries and mines ED4	Worked area of quarry bare exposed granite	0.7	7%
Lowland blanket bog PB3	SAC area	1.0	10%
Eroding/upland rivers (FW1)	600m in length 4-6m wide	0.2	2%
Treeline (WL2)	Conifers and Rhododendron	0.1	1%
Total		10.1	100

The study area covers 10.1 hectares and is situated 9.7 kilometres north east of Rossaveal village.

Cutover bog PB4

The area to the north of the quarry is cutover. The area is characterised by vertical face banks the actual active area is estimated at 200m2 and is in three separate areas. All have been recently cut. In places standing water is present. Part of this area is uncut but has been subjected to drainage. This area is used as a soakaway for water containing low levels of sediment pumped up from the quarry base through a pump with a petrol interceptor.

The vegetation is similar to that of Lowland Blanket bog (PB4) as described below except generally the habitat is drier due to the drainage works.

Plate 5.1 Cut over Bog within the study area

Lowland blanket bog PB3

The land to the south east corner forms part of the Connemara Bog Complex SAC and SPA. It is active blanket bog continous with the adjacent commonage. The vegetation consisted of Purple Moor-grass (*Molinia caerulea*), Black Bog-rush (*Schoenus nigricans*) with Heathers Ling (*Calluna vulgaris*) and Cross leaved heath (*Erica tetralix*). Broadleaved herbs noted included Lousewort (*Pedicularis sylvatica*) and Bog-myrtle (*Myrica gale*) may be locally abundant. Bod Asphodel (*Narthecium ossifragum*) typical of low nutrient bogs was noted as was Sphagnum mosses and the lichen Cladonia.

Plate 5.2 Blanket Bog within SAC in southern section of the study area

Wet Heath HH3

The blanket Bog grades into wet heath which is dominated by Purple moorgrass and Rushes (*Juncus spp.*) around the excluded house and at the stream edge. Gorse (*Ulex spp.*) is abundant on the riverbanks.

Plate 5.3.Wet heath at edge of River

Active Quarries and Mines ED4

This is a granite quarry which has been operational since the 1930s this classification is used for all active rock or sediment quarries and mines, or parts of these, where levels of disturbance are so high that there is no vegetation present. Some recent spoil heaps that are not colonised are also included here.

Plate 5.4 Active Quarry

Spoil and Bare Ground ED2/ Recolonising Bare Ground ED3

This category includes heaps of spoil and rubble resulting from years of quarrying on site. Recently these heaps have been consolidated under the 2011 to 2015 management plan and they are currently in the process of becoming revegetated. Most of the recolonisation is by Rushes (*Juncus spp.*), Thistles (*Cirsium palustre*) and Plantain (*Plantago*), Also considered in this category are the roads within the site that are largely unvegetated because they are regularly driven over or maintained.

Plate 5.5 Unmetalled road showing central unvegetated area and revegetating spoil heaps at edge

Eroding/Upland Rivers (FW1)

Two small streams cross the study area and empty into the unnamed river flowing west into Lough Dereenancunner, which may be described as a dystrophic lake. They have been classified as eroding/upland rivers (FW1). A typical example is shown in Plate 5.10, below. The aquatic vegetation of the peaty streams was abundant and they were bordered by Gorse (*Ulex spp*) Plants that were recorded in or by them included: Bulbous Rush (*Juncus bulbosus*) and Bog Pondweed (*Potamogeton polgonifolius*). There were some very narrow man-made ditches within the study area that had been excavated to drain the bog area. These ditches were neither mapped nor classified as drainage ditches (FW4) because they did not permanently contain water.

Plate 5.6 River (eroding/upland river) adjacent to study area

Treelines WL2

There is a small area of conifers on site between the excluded house and the main quarry area. A small amount of bramble (*Rubus fructicosus agg.*) and Rhododendron were seen in this vicinity. A Rhododendron dominated hedge lines the road.

Habitats Surrounding the Study Area

The land surrounding the study area is covered with a mosaic of lowland blanket bog (PB3) and wet heath (HH3).

5.4.2 Species Present

A full list of the vascular plant species recorded during the site visits is presented in Appendix 5 to this report. None of the species recorded are listed in Annex II of the EU Habitats Directive or the Flora (Protection) Order (1999). None are considered to be of particular conservation importance.

5.4.3 Character of Habitats

The study area contains a small number of habitats as outlined above. The area is part of a rural working landscape. The land use in the catchment includes turbary, extensive horse, cattle and sheep grazing and areas of forestry plantation. The western side of the study area borders the local road connecting Oughterard to Rossaveal, although traffic is not visible or audible to any extent from the majority of the site.

5.4.4 Significance of Habitats

Most of the site (more than 60%) is impacted on by past quarrying. The only habitat of ecological significance is the river bordering the site and the small area of blanket bog to the south west of the site.

The study area lies within an unnamed river catchment, which drains into Lough Dereenacununer and eventually into Lough Fermoyle. This river lies within the Owenboliska-Cashla-Screeb-Coastal catchment (Hydrometric Area 31).Atlantic Salmon, a species listed in Annex II of the EU Habitats Directive, is known to be present in this river bordering the study area according to information received from Inland Fisheries Ireland, Galway..

- Salmon (Salmo salar) [1106] is among the qualifying Interests of the Connemara Bog Complex SAC.

Another species Otter (Lutra lutra) [1355] is assumed to use this area as part of their foraging area. Although no evidence of this species was recorded on site the habitat is suitable. According to Bailey and Rochford (2006) otters are commonly found throughout the western region and were present at 70.16% of sites surveyed in 2004/5 survey.

As mentioned in Section 5.3.2.1, above, the site is bordered by the Connemara Bog Complex cSAC and SPA. Both of these areas were designated primarily for blanket bog and heath habitats and associated avifauna. Blanket Bog and Wet Heath, habitats listed in Annex I of the EU Habitats Directive are present within the study area.

- Blanket bog (*active only) [7130]
- Northern Atlantic wet heaths with *Erica tetralix* [7130]

In addition, Lough Dereenancunner, which may be described as an dystrophic lake is located downstream of the study area.

- Natural dystrophic lakes and ponds [3160]

Therefore the main significance of the habitats are the area of blanket bog and some sections of Wet Heath that are included to the south west of the site and the adjacent river. Both of these habitats lie within the designated area.

5.5 Fauna in the Existing Environment

5.5.1 Birds

No specific Bird survey work was carried out on this site given the nature of the compromised habitats. However, during the course of fieldwork observations of birds were made on site.

5.5.1.1.1 Results

The numbers and diversity of birds recorded during the surveys were both low, as would be expected at a quarry site surrounded by exposed blanket bog, cutover bog and heath with little habitat diversity. The species recorded are listed in the table below.

Table 5.7 Bird species recorded within the site during d w2010-2013 fieldwork work

Common Name	Scientific Name	Location
Kestrel	*Falco tinnunculus*	FO
Snipe	*Gallinago gallinago*	BB
Woodpigeon	*Columba palumbus*	FO
Skylark	*Alauda arvensis*	FO
Swallow	*Hirundo rustica*	FO

Common Name	Scientific Name	Location
Meadow Pipit	*Anthus pratensis*	BB
Grey Wagtail	*Motacilla cinerea*	R
Robin	*Erithacus rubecula*	T
Blackbird	*Turdus merula*	T
Wren	*Troglodytes troglodytes*	T
Magpie	*Pica pica*	FO
Hooded Crow	*Corvus cornix*	FO
Chaffinch	*Fringilla coelebs*	T

FO – Flying over, BB – Blanket Bog, R. River, T-Treeline/scrub

5.5.2 Mammals

During site visits in March and April 2013 tracks and/or droppings of mammals were searched for. Fox (*Vulpes vulpes*) scats were noted at the site. These are the most common large mammals to be found in the bog and heath habitats that surround the study area. No evidence of Badger (*Meles meles*) activity was recorded at the study area being bog or disturbed habitat the area is generally unsuitable for badgers though the area close to the house at roadside with hedging may be used by this species.

Searches were made for Otter (*Lutra lutra*) along the river banks including above and below the quarried area. No holts, couches, slides, droppings or tracks were noted but the habitat is suitable for this species and it is probable that Otter use this area for foraging. The river is edges by gorse and bramble and although Otter holt sites are usually at lakeshores or river banks, they can sometimes be sited a short distance from a waterbody in thick cover (usually under Bramble scrub).

Other mammal species that may potentially be present, at least on occasion, include Pygmy Shrew (*Sorex minutus*), Brown Rat (*Rattus norveigicus*), Woodmouse (*Apodemus sylvaticus*), Mink (*Neovison vison*) and Stoat (*Mustela erminea*). Mink is an alien invasive species in Ireland.

5.5.3 Fish, Amphibians and Reptiles

Common Frog (*Rana temporaria*) was recorded within the study area and breeds in the temporary pools. Common Lizard (*Zootoca vivipara*) was not recorded at the study area, but are likely to be may be present as there are many permanent open areas at the site to allow lizards to bask in the sun. The river is known as a Salmon river (Inland fisheries, pers. comm.).

5.5.4 Invertebrates

Kick sampling for aquatic macroinvertebrates was conducted for the determination of Q values. Fourteen different species of macrointervertebrate were identified as is seen below (Table 5.8).

Table 5.8 Taxa recorded at each sampling point at Shannapheasteen Quarry

	Sensitivity Group	Sample 1 Downstream	Sample 2 At Quarry	Sample 3 Upstream main channel	Sample 4 Upstream tributary
Grid Reference of Sampling Points		**M0345832964**	**M0358132761**	**M0382532739**	**M0380532674**
Plecoptera (Stoneflies)					
Amphinemura sulcicollis	A	Common	-	-	-
Leuctra hippopus	B	Common	Common	Common	Common
Isoperla grammatica	A	Common	Common	Common	Common
Chloroperla torrentium	A	Common	Common	Common	Common
Ephemeroptera (Mayflies)					
Baetis sp.	B/C	-	-	Present	-
Trichoptera (Caddisflies)					
Polycentropus sp. larva	C	Common	Common	Common	Common
Hydropsyche spp. larva	C	Common	Common	Common	Common
Hirudinae (Leeches)					
Glossiphonia sp.	D	-	Present	-	-
Oligochaetes (worms)					
Lumbricidae	-	Present	-	Present	Present
Enchytraeidae	-	Present	Present	Present	Present
Diptera (Two-winged flies)					
Chironomidae larva	C/D	-	-	Present	-
Simulidae larva	C	Present	-	Present	-
Coleoptera (Beetles)					
Gyrinus sp. - larvae	C	Present	Present		
Hydracarina (Water mites)	C	Present	Present		
Odonata (Dragonflies)					
Calopteryx sp.	B	-	-	-	Present
Vegetation					
Filamentous algae	-	Abundant	Abundant	Abundant	Present
Macrophytes	-	-	*Juncus bulbosus*	*Juncus bulbosus*	-
			Potamogeton sp.		
Q Value		4-5	4-5	4-5	4-5

Interpretation
This river was surveyed for Q values to investigate ecological quality. Q values are used as ecological indicators of river health and are on a scale of 1 to 5 with 1 being polluted waters and 5 pristine. The Q values both above and below the quarry were all rated 4-5 with a similar suite of species found upstream and downstream. This indicates that no negative impact from the quarry was detected ecologically in the river on the basis of the ecological information gained from the kick sample.

Positive aspects of the water quality assessment are the apparently clean substrate without significant siltation, the predominance of stoneflies which are a sensitive indicator group, and the scarcity of pollution tolerant taxa in kick samples. The presence of four stonefly species indicates very good water quality at the site and is a qualifying criterion for a Q5 rating.

Negative aspects of the water quality assessment were the abundance of filamentous algae over much of the substrate of the stream, the virtual absence of mayflies, and the abundance of caseless caddis flies larvae. The scarcity of mayflies in the stream could be a contributing factor to abundant algal growth as mayfly nymphs are often the most abundant taxa grazing on benthic algae. Typically Q5 stream support a diverse macroinvertebrate fauna including some species of mayflies.

The caseless caddis flies which are regarded as tolerant of organic pollution were the second most abundant macroinvertebrate group present and were numerous at all sampling points. The main taxa were Hydrophysche and Polycentropus species which are regarded as relatively tolerant of organic pollution.

These observations indicate that the stream fauna is in somewhat less than pristine although still very good condition. Possible reasons for this are impacts from forestry and peat cutting upstream in the catchment.

Downstream of the quarry the macroinvertebrate community is very similar to upstream with no apparent impact on the stream macroinvertebrate community. The downstream sampling point produced all four stonefly species indicating that there is no significant impact on stream quality immediately downstream of the quarry.

5.5.5 Birds of Conservation Importance That Potentially Use the Study Area

Golden Plover (*Pluvialis apricaria*)
Golden Plover is listed as an Annex I species in EU Birds Directive (CEC, 1979), as a vulnerable species in the Irish Red Data Book (Whilde, 1993) and is on the Birds of Conservation Concern in Ireland (BoCCI) Red List (Lynas et al., 2007), although the latter listing applies only to breeding birds, not wintering individuals.

The breeding range of this species is confined to the uplands and peatlands of the northwest and west of Ireland (Gibbons, et al. 1993). Resident plover are found in small flocks on mountains and bogs, until autumn when numbers increase dramatically with the arrival of migrant birds from Northern Europe and Iceland, most of which winter here. Their decline is probably a relatively recent phenomenon and may be in part due to the large scale planting of conifers in many upland areas (Sharrock, 1976) as well as the intensification of agriculture in wintering areas. Golden Plover are known breeders in parts of the Connemara Bog Complex SPA to the west of the site of the quarry. There is some potential for small numbers of Golden Plover to fly over the site during winter and during passage periods, although this species would never use quarry for feeding or nesting. The small areas of

Blanket bog and Cutover bog have some nesting and foraging potential for this species.

Merlin (*Falco columbarius*)
Merlin is listed as an Annex I species in the EU Birds Directive, as a rare species in the Irish Red Data Book and is in the BoCCI Amber List.

Many of the Irish breeding sites of this small falcon in Ireland are situated in the disused nests of crows in trees in conifer plantations, particularly where they border bog and moorland, the Merlin's favoured summer hunting habitat. Another favoured nesting habitat is on vegetated islands in lakes. Nesting occurs less frequently on the ground in heather clumps or on rocky outcrops. There is considerable local migration and during winter Merlin are found at lower levels in coastal or marshy habitats, although there is some evidence that males stay at their territories over winter.

The species is a known breeder in the area. None were seen during any of the field surveys.

Merlin is listed as an Annex I species in the EU Birds Directive, as an endangered species in the Irish Red Data Book (although numbers have increased significantly in the 18 years since this was written) and is in the BoCCI Amber List.

Red Grouse (*Lagopus lagopus*)
Red Grouse is included in the Birds of Conservation Concern in Ireland (BoCCI) Red List. The criteria for inclusion on the BoCCI Red List are presented in Section 1.3.2.3.

Red Grouse were not recorded at the study area during any of the survey work. This species uses areas of bog and heath that have stands of heather of different ages. Grouse are thinly distributed in the large areas of blanket bog and wet heath that borders the southern and western sides of the study area. The habitat on site is generally disturbed and only the small area (one hectare) of blanket bog to the south east of the site would have any potential value for this species.

5.5.6 Significance of the Fauna

Of all the faunal species that are potentially present in the vicinity of the quarry, those that are among the qualifying interesets of the Connemara Bog Complex SAC and SPA and are listed on Annex II of the Habitats Directive and Annex I of the Birds Directive are of the highest ecological significance.

Atlantic Salmon is known to be present in the river that surrounds the site to the west and it is likely that Otter are also present in this area though no signs of this species were recorded during the surveys undertaken.

All indications are that Golden Plover does not breed near to the site, although small numbers of this species are to likely to be present in the wider area in winter and during spring and autumn migration periods. Grouse are present in the general area as are Merlin.

There are no indications that this quarry is of any particular significance for any of the species of conservation importance associated with the area.

5.6 Likely and Significant Impacts on Flora and Fauna and Associated Mitigation Measures

As this is a remedial EIS the approach will be to look at the historical impacts and current operational impacts and to seek to identify remedial mitigation where possible.

5.6.1 Do Nothing Scenario – As if the quarry never existed

It is not possible to determine the true nature of the habitats that were present on the site over 80 years ago so an indication of the likely circumstances can be estimated by looking at the surrounding habitats. If the quarry had never existed, it is likely that the Blanket Bog and Heath Habitats that prevail in the surrounding area would have been retained on the site and may have been subject to turf cutting or low level agriculture.

5.6.2 Impacts on Flora and Fauna

5.6.2.1 Historical Impacts

5.6.2.1.1 Impacts on Sites Designated for Nature Conservation

The site of the quarry is bordered by the Connemara Bog Complex cSAC to the south, east and west. This Natura 2000 site was proposed for designation in 1997. The Connemara Bog Complex SPA overlaps the quarry too, though to a lesser extent. This was proposed for designation in 2011. The Quarry commenced operation in the 1930's many years before designation. In line with NPWS guidelines the active quarry area was excluded from the designated area.

The quarry boundary encompasses a small area (2ha) of designated ground adjacent to the river that lies to the south. This includes a buffer of 20 to 30 metres on the river and approximately one hectare of Blanket bog included to the south west of the site.

No impacts on the Hectare of Blanket Bog at the southern of the quarrying operations on the blanket bog within the SAC/SPA at the south eastern corner of the quarry site were identified during the site surveys. In places the area within the SAC alongside the river had been impacted by quarrying activity in the form of accumulations of rock and spoil but no impacts on the sensitive river habitats were recorded as a result of the quarrying operations.

5.6.2.1.2 Historical Impacts on Flora and Habitats

Permanent Significant Negative Impact

Areas of habitat within the footprint of the quarry are shown in Figure 5.2 and are described in Section 5.4.1 (above) and Appendix 4.

The development footprint comprises a total of approximately 10.1 hectares. Approximately 0.7 hectares is the exposed rock which has been subjected to rock extraction for the past 80 years. The remainder is 2.5 hectares of "recolonising bare ground" or former spoil heaps, which are now re-vegetating. Approximately one hectare of blanket bog which is largely intact and undisturbed.

The now exposed quarry presumably would have been covered with shallow heath which would most probably have been removed to enable quarrying. Loss of this area of heath to enable quarrying is permanent negative impact and is considered to be significant.

Such a loss of habitat would have a negative impact on associated flora as well. It is not possible to quantify such past loss of habitat or of flora.

5.6.2.1.3 Historical Impacts on Fauna

Permanent Significant Negative Impact
Loss of habitat during the initial quarry construction are likely to have resulted in displacement of the birds and mammals (e.g. Otter) associated with the area.

Long Term Moderate Negative Impact
The quarry over its lifetime would have involved not only loss of habitats but disturbance through blasting and rock breaking. Disturbance of the fauna in the area would have taken place intermittently over a long period of time. Given the wide availability of suitable habitat for the birds and mammals associated with the Connemara Bog Complex which is 49,228 hectares in size it is anticipated that such displacement of fauna could be accommodated.

5.6.2.2 Impacts During Operational Phase

5.6.2.2.1 Impacts on Flora and Habitats

Permanent Negligible Negative Impact
The quarry has the potential to cause additional siltation and sedimentation in the adjacent river. The large area of unvegetated impermeable rock surfaces could potentially cause increased surface water runoff rates and could potentially lead, during extreme weather conditions, to erosion in local watercourses and thus to negative impacts to downstream habitats, flora and fauna by means of habitat loss or siltation. Siltation in a salmonid system could potentially be very damaging as silt and sediment could block the interstitial spaces thus making the river unsuitable for spawning fish.

In addition, partially vegetated spoil heaps on site can lead to sedimentation reaching the adjacent river in wet weather conditions.

Although, there is potential to have a negative impact on the river no negative impact was noted as the Q value of 4/5 was noted above and below the quarry and no other signs of the quarry having impacted on the river were recorded.

Mitigation
Mitigation is already in place to address the potential impacts of the quarry on the river. In 2010 a five year management plan was drawn up in consultation with the NPWS and Inland Fisheries Ireland and is included as Appendix 6.

The Management plan is attached and its main recommendations are:

- Revegetation of spoil heaps
- Increased water management
- Actions to protect the river (Berm building and Terram Screening)
- The ecological management plan has objectives to protect the river and has zoned the area of SAC as a non intervention area for protection. The plan was agreed in 2010 with the owners, National Parks and Wildlife Service and the Inland Fisheries (a copy is attached)
- A compliance check in July 2012 indicated that the management plan is fully operational and the objectives of this plan are being met.

A management plan compliance report was prepared in August 2012 and it was noted that the management strategies for Shannapheasteen Quarry as specified under the five year management plan are currently being implemented. It is estimated that 70-80%of the actions specified in were complete or underway at the site inspection July 2012. Progress is ongoing and all actions are expected to be completed well ahead of the 2015 target.

It is essential that water management at this site continues, in order to protect the quality of the adjacent river. The recent studies have revealed no indication that the quarry has impacted significantly on the river. In addition, upon cessation of quarrying operations it is essential that a management plan is put in place to avoid pollution of the adjacent river as water management on site is dependent on on-going intervention by the owners.

5.6.2.2.2 Impacts on Fauna

Long Term Slight Negative Impact
The main impact on Fauna during quarry operation is due to noise disturbance. The noise results from working of the stone, which is extracted through the use of expanding plugs. No blasting occurs. The quarry in recent years specialised in fine stone work and so the main noise would be generated during shaping of the stone. A further source of noise disturbance results from trucks entering and leaving the site.

The study area and development site form part of a working landscape where forestry and farming operations occur on an ongoing basis.

Mitigation
Noise disturbance is minimal due to the lack of use of explosives. The noise level would be consistent with an active quarry. No mitigation is proposed.

Long-term Moderate Negative Impact
The main fauna of importance associated with this site are linked to the adjacent river (Otters, salmonids and freshwater invertebrates). There is also the potential of pollution from oil or fuel waste. However, no indication that the quarry has impacted significantly on the river revealed by the recent studies undertaken.

Mitigation
The 5 year management plan 2011 to 2015 specifically addresses the issues of pollution from oil and fuel under the Connemara Teo. waste management policy. There are water management strategies in place, which include pumping all the sediment laden water to a percolation area for filtration before entering the river. This management plan is presented in Appendix 6.

5.6.3 Cumulative Impacts

The cumulative impact of this development is the impact of this project in combination with other plans or projects. Historically many small quarries were opened on a piecemeal basis some were just small borrow pits other supplied larger amounts of crushed or worked stone.

With regard to the Shannapheasteen Quarry, it is considered that the scale and nature of the works, and the absence of direct impacts on Annex I habitats allows for the implementation of effective mitigations through an existing current management plan in order to avoid environmental impacts

Therefore, in the absence of impacts arising from this project in the future, there will be no potential for further cumulative impacts arising in combination with any other plans or proposals which would be of ecological significance.

6 GEOLOGY AND SOILS

6.1 Introduction

6.1.1 Methodology and Limitations

The geology and soils of the site were surveyed by means of a field visit to the site and surrounding area and through a desk study of literature and information pertinent to the area. A field visit to the site was carried out by staff from McCarthy Keville O'Sullivan Ltd. on the 13th April 2013 for the purposes of assessing the soils and geology of the site.

6.1.2 Published Material

A desk study of the site of the existing development and the surrounding area was undertaken with regard to soils and geology. Baseline information on soils and geology was gathered through the analysis of previously published literature and material relevant to the Galway Connemara area. This involved collecting all relevant geological data for the site. This following sources were consulted:

- Environmental Protection Agency database (www.epa.ie);
- Geological Survey of Ireland - National Draft Bedrock Aquifer map;
- Geological Survey of Ireland - Groundwater Database (www.gsi.ie);
- Bedrock Geology 1:100,000 Scale Map Series, Sheet 14 (Geology of Galway Bay). Geological Survey of Ireland (GSI, 2004);
- Geological Survey of Ireland – 1:25,000 Field Mapping Sheets;
- General Soil Map of Ireland 2nd edition (Gardiner & Radford, 1980);
- Ordinance Survey of Ireland – Discovery Series and 1:50,000 maps; and,
- Ordnance Survey of Ireland – aerial photographs;

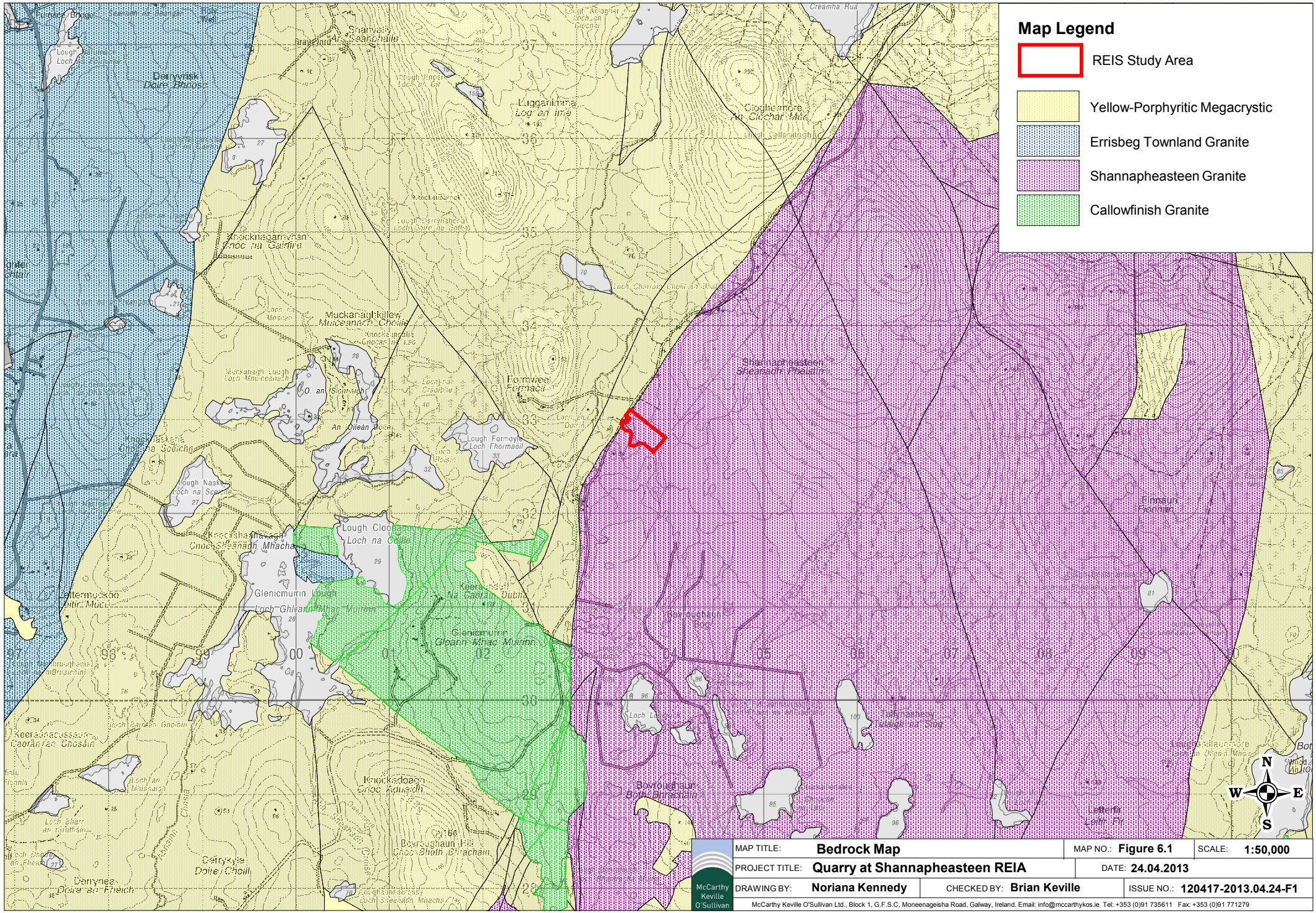
6.2 Geology

6.2.1 Bedrock Geology

The site of the subject site is underlain by Shannapheasteen Granite. This aphyric (0.5 to 1.5mm) granite is composed of quartz, oligoclase, K-feldspar and minor biotite, with or without muscovite, apatite, magnetite, zircon and rarely titanite, together with secondary alteration minerals. It does not contain hornblende. It forms a major body in the centre of the Central block. Veins of Shannapheasteen Granite inject the Megacrystic Porphyritic Granite, particularly along the northern margin of the former. There are innumerable xenoliths of megacrystic-Porphyritic Granite in the Shannapheasteen Granite. It is apparent that the Megacrystic-Porphyritic Granite was solid and jointed before the Shannapheasteen Granite intruded.

There is a much closer spaced jointing than in the Megacrystic-Porphyritic Granite and this has facilitated weathering and ice-plucking , resulting in poor exposure, and so the Shannapheasteen granite is only newly recognised.

Felsic and very fine-grained facies intrude the Shannpheasteen Granite and there are aplopegmatite and almandine-spessartine aplites crossing the granite. Some of these late veins seem to grade into felsitic dykes (e.g. east of Lough Bonramush at (M030281) but such dykes and porphyry dykes also cross the Shannapheasteen Granite. A map of the bedrock geology in the area of the site is provided in Figure 6.1. Plate 6.1 and 6.2 show photographs of the excavated bedrock taken at the quarry site.



MAP TITLE: **Bedrock Map**		MAP NO.: **Figure 6.1**	SCALE: **1:50,000**
PROJECT TITLE: **Quarry at Shannapheasteen REIA**		DATE: **24.04.2013**	
DRAWING BY: **Noriana Kennedy**	CHECKED BY: **Brian Keville**	ISSUE NO.: **120417-2013.04.24-F1**	

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Plate 6.1 Exposed Shannapheasteen Granite bedrock at the subject quarry site

Plate 6.2 Exposed Shannapheasteen Granite bedrock at the subject quarry site

6.2.2 Subsoils

Figure 6.2 shows the subsoil categories found at the subject site in accordance with the Soil and Subsoil Mapping Project produced by Teagasc in 2006. Blanket Peat is shown to be the predominant subsoil type within the site boundary (87%). Peat is a post-glacial deposit, consisting mostly of vegetation which has only partially decomposed. This vegetation fills and compacts in marshes, ponds and other lakes carved out and left by Quaternary ice sheets. Thus, in Ireland, peat usually overlies badly drained glaciolacustrine silts and clays. In the last few centuries, much of Ireland's peat has been cut away for burning as solid fuel.

To a lesser extent the predominant subsoil category within the subject area is Granite dominated Till (13%) which is predominantly shallow soils derived from non-calcareous rock or gravels with a peaty surface horizon. The principal depositional agent of tills are glacial ice, but gravity and, in some cases, water, also play a part. Tills are often overconsolidated, or tightly packed, unsorted, unbedded, possessing many different particle and clast (stone) sizes, and commonly have sharp, angular clasts. Tills are often termed 'boulder clays' by engineers. Grain size of the matrix, or the texture of the till, is important, as this determines permeability, which is important for soil development processes. Tills may be described as gravelly till, sandy till, silty till or clayey till however the Teagasc (2006) mapping project excludes this. Tills are often called 'boulder clay' by engineers.

Table 6.2 Soils and Subsoils underlaying subject site EPA 2006

Subsoil Code	Subsoil	IFS Code	IFS Soil Description	Included Great Soil Groups	% of Site
TGr	Granite Till	43	AminSRPT	Podzols(Peaty)	13
BktPt	Blanket Peat	63	Blanket Peat	Blanket Peat	87

6.2.3 Soils

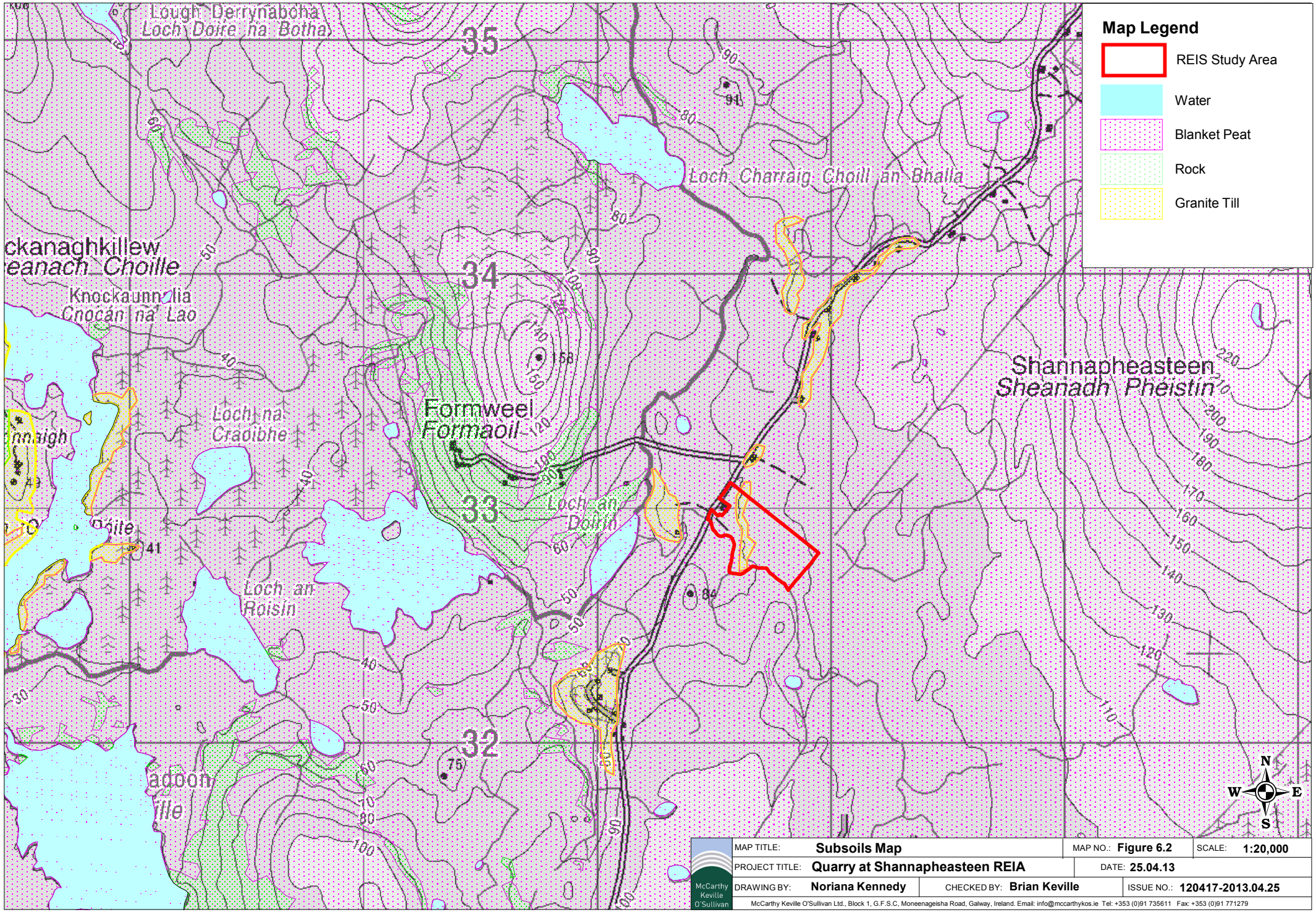
6.2.3.1 Soil Associations

The soils underlying the site of the subject site belong to Association 24 of the General Soil Map of Ireland. A soil association is defined as a cartographic unit, consisting of two or more soils, usually formed from the same type of parent material and associated on the landscape in a particular pattern.

Soil Association 24 occupies 5.14% of Ireland. It occurs widely along the western seaboard, especially in Galway and west Mayo, Connemara, Cork, Donegal and to a lesser extent in Kerry. It occurs mainly below the 150 metre contour on topography that varies from flat lowland to rolling hill. Rainfall is greater than 1,250 millimetres and black bog rush (*Schoenus nigricans*) is a major component in its vegetation. Molinia caerulea (purple moor grass), (*Campylopus atrovirens* and *Pleurozia purpurea*) are other important components.

The profile is similar to that of the high level type but because it occurs on flatter topography it has a greater average dept, usually about three metres. In some places it can reach depth so five to six metres.

At present, these Peats show relatively little man modification. However, with increasing forestry planting this situation is changing. In the Connemara area of west Galway large granite boulders are widespread through this association. Organic soils of this type are extremely wet and acid and have very low permeabilities. Peat depths



MAP TITLE: **Subsoils Map**		MAP NO.: **Figure 6.2**	SCALE: **1:20,000**
PROJECT TITLE: **Quarry at Shannapheasteen REIA**		DATE: **25.04.13**	
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vary according to the underlying topography from less than one metres to greater than six metres.

The very limited suitability of this soil is similar to the high level type except that slopes are not as steep and altitudes not as high. As in the high level blanket bog it has been estimated that 25 percent of this type is cut-over mainly for fuel.

6.3 Likely and Significant Impacts on Soils and Geology and Associated Mitigation Measures

6.3.1 Do-Nothing Impact

If the quarrying activity had not commenced on these lands, the lands would have continued to be managed as cutover bog and heath. No excavations or quarrying activity would have taken place on the subject site and any likely impacts would not have occurred.

6.3.1.1 Bedrock Geology

6.3.1.1.1 Permanent Neutral-Slight Negative Impact

Quarrying of aggregate material, by definition, requires the excavation and removal of rock material, thereby giving rise to a permanent loss of some bedrock resource within the quarry footprint. This cannot be undone. The final floor of the quarry has a final floor level of 61metres O.D. The bedrock material that has been extracted is of very low intrinsic value, and is widespread through the area and this part of the county. Therefore, although the removal of the rock has resulted in an impact, that impact could only be said to be neutral to slight at worst, given the low value of the resource.

The nature of the development undertaken to date entails the removal and storage of soil and overburden, subsequent drilling and removal of rock. There has been, therefore, a direct and irreversible impact on existing rock within the quarry site. To date since the quarry opened, there has been roughly 18,000 metres cubed of soil and stone material removed from the quarry, however this is very difficult to assess with any degree of certainty. The extraction area is approximately over 0.3 hectares. The quarry has not had any impact on the geological aspects of the environment outside the footprint of the quarry.

Mitigation
No mitigation proposed.

6.3.1.1.2 Permanent Significant Positive Impact

The existing 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.

6.3.1.2 Soils and Subsoils

6.3.1.2.1 Permanent Slight Negative Impact

The nature of the development undertaken to date entails the removal and storage of soils and overburden, subsequent drilling and removal of rock. There has been, therefore, a direct and irreversible impact on existing soils and subsoil within the quarry site. To date since the quarry opened, there has been approximately 18,000 metres cubed of soil and stone material removed from the quarry site. The extraction

area is approximately 0.3 hectares. The quarry has not had any impact on the soils and geology of the environment outside the footprint of the quarry.

Mitigation
No mitigation proposed.

6.3.1.3 Neutral Impact

Contamination of soil may occur where any pollutants such as surface water from the facility or hydrocarbons from refueling operations enter the soil through the ground surface. The significance of the impact would be dependent on the quantity and duration of any spill or leak. There is no evidence of any soil contamination having occurred as a result of the historical quarrying operations on-site.

Mitigation
If quarrying activities are to be undertaken on the site in the future, it is recommended that a dedicated bunded area be provided for the storage of fuels and other potentially polluting materials.

7 HYDROLOGY AND HYDROGEOLOGY

7.1 Introduction

7.1.1 Scope of Work

Hydro Environmental Ltd was commissioned by McCarthy Keville O'Sullivan Ltd. on behalf of Mr. Stephen Larkin to prepare a Remedial Environmental Impact Statement (EIS) Soils, Hydrology and Hydrogeology section for Ballinakill Quarries in the townland of Shannapheasteen Costelloe, County Galway, which requires permission under the substitute consent process.

7.1.2 Site Description

The site is located 8.7km northeast of Costelloe village, Co. Galway in South Connemara (11km, via road from the junction with the R336 near Rossaveel). It lies along the eastern side of the local road between Rossaveel and Oughterard and is approximately 480m southeast to northwest and 200m northeast to southwest, covering 10.1 hectares. The site lies on the south-western slope of Shannapheasteen Hill with the ground elevation across the site falling from 82mOD in the east to 65mOD in the west. A pond in the quarry excavation has an approximate minimum invert of 61.0mOD.

There are residential dwellings located adjacent to the road within 0.2km of the site boundary.

The site is referenced in the Galway County Council planning system as Quarry 83.

The quarrying operation commenced at Shannapheasteen in 1930s extracting duab material, loose boulders and stone for bog roads, houses and bridges. Blue granite is now the principal product from the quarry.

7.1.3 Existing Development

Shannapheasteen 'Blue' Granite is quarried at the site. Currently there is a temporary office building and stone cutting plant located at the south west corner of the site. As the quarry operator lives immediately north of the quarry entrance there is currently no facilities (i.e. no toilets / wastewater treatment facilities), no drinking water supply, no canteen) at the quarry site.

The site comprises of access and haul roads, an open cut rock quarry in the southwestern area and a number of small excavation sites throughout the eastern area of the site. The remainder of the site is peat bog land. The Shannapheasteen Stream forms the western / southern boundary of the study area. A silt fence is located along much of the river bank boundary of the quarry. In 2010 Mr. Larkin proposed to upgrade the quarry facilities (Planning Application Ref: 10/702) including the following:

- A weigh bridge
- An office / canteen / store building with a water supply from a borehole to the north of the site and serviced by 'Kingspan Envirocare p6 Treatment Plant with a proposed raised polishing filter,

- Wheel wash, haul and site road drainage system with a petrol interceptor and grit inceptor which drains to the ponds within the quarry. The wheel wash will be supplied with water from the quarry ponds via a pump.
- Engineered soakaway for office building rainwater drainage.
- Quarry stone crush and screening plant and associated facilities with water supplied from the quarry ponds via a pump.

7.1.4 Methodology

7.1.4.1 Data Sources

This study involved a comprehensive desk study review of relevant published and unpublished reports on the geology, surface water hydrology and groundwater hydrogeology of the region. The main relevant documentation sources included publications and website mapping from the Geological Survey of Ireland (GSI), Environmental Protection Agency (EPA), Office of Public Works (OPW), National Parks & Wildlife Service (NPWS) and Galway County Council.

7.1.4.2 Field Surveys

A site walkover was carried out by Hydro Environmental Ltd on the 18th April 2013 to examine the hydrology and hydrogeology characteristics of the site.

7.1.5 Environmental Issues and Planning Guidelines

7.1.5.1 Impact Assessment

There is a wide range of potential environmental effects caused by quarries which need to be considered. Such impacts may arise during the development stage (e.g. earth stripping operations) or may endure throughout the life of the quarry, possibly over several decades. The impact can be permanent, even after closure and decommissioning, unless carefully planned rehabilitation is undertaken. Ancillary developments, such as concrete manufacturing and stone processing, also may have significant impacts which need to be addressed, so that the cumulative effects from the site might be assessed (DEHLG, 2004).

7.1.5.2 Planning Issues

The Planning & Development (Amendment) Act 2010 amends previous legislative provisions with respect to quarries and in particular, registration under Section 261 of the Planning & Development Act 2000. Each Planning Authority has examined all quarries in their administrative areas and determine whether the quarry was previously assessed in accordance with the requirements of the EIA Directive and the Habitats Directive. Each Planning Authority has had a statutory period of 9 months from the 15th November 2011 to complete its determination and notify quarry owners/operators of the position. Planning Authorities have now completed their assessments of any identified quarry operations within their various jurisdictions and have issued letters stating their findings to operators/owners. The Planning Authorities have now determined if substitute consent is required or, indeed, whether a particular quarry is eligible for the substitute consent process. Those quarries that have planning issues arising from the determination under Section 261A and do not qualify for the substitute consent facility, will face planning enforcement procedures. These new regulatory provisions therefore have far reaching implications for the quarry industry and, indeed, for developments generally, as the retention route is no longer available in many cases following a European Court of Justice judgement.

Some quarries, although "regularised" under previous legislation, will be required to undergo a further planning process (the substitute consent procedure), while others for which there is no evidence of authorisation / permission being in place or which have not undergone the registration process will be notified that the Planning Authority intends to take enforcement proceedings to cease unauthorised activities. The new legislation is extremely complex and the opportunity to apply for permission under the substitute consent process, where required, is a one-off. Being directed to undertake the substitute consent procedure represents the most beneficial outcome at this stage of the process for any quarry operation that has not previously undergone the Environmental Impact Assessment or Natura Impact Assessment processes. Notwithstanding this, it must be noted that ultimately a refusal of permission remains a possibility in the determination of any substitute consent application.

The substitute consent process differs from standard planning procedures in that the application will have to be supported by either a Remedial Environmental Impact Statement or a Remedial Natura Impact Statement or both documents. Substitute consent applications are made directly to An Bord Pleanála and the stated timeframe for the submission of such an application is 12 weeks from the date of notification from the Planning Authority unless an additional period of time is agreed with the Bord. The timeframe allowed for the preparation of the application and associated documentation required for the substitute consent procedure is extremely tight and it is therefore imperative that all operators issued with such notifications take professional advice as soon as possible.

Prior to the Planning & Development (Amendment) Act 2010 various planning guidelines were in place including the Planning and Development Act, 2000 that contains both mandatory and discretionary development plan objectives. Mandatory objectives (section 10) of most relevance to quarries include:

- The conservation and protection of the environment including, in particular, the archaeological and natural heritage and the conservation and protection of European sites and any other sites (such as Natural Heritage Areas - NHAs) which may be prescribed;
- The preservation of 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 of views and prospects and the amenities of places and features of natural beauty or interest.

Relevant discretionary objectives in the First Schedule of the Act include:

- Regulating, promoting or controlling the exploitation of natural resources;
- Protecting and preserving the quality of the environment, including the prevention, limitation, elimination, abatement or reduction of environmental pollution and the protection of waters, groundwater, the seashore and the atmosphere;
- Securing the reduction or prevention of noise emissions or vibrations;
- Preventing, remedying or removing injury to amenities arising from the ruinous or neglected condition of any structure or from the objectionable or neglected condition of any land.

Section 261 of the Planning and Development Act, 2000 introduces a new system of once-off registration for all quarries. The system gives a 'snapshot' of the current use

of land for quarrying and where necessary permits the introduction of new or modified controls on the operation of certain quarries.

7.2 Existing Environment

7.2.1 Health and Safety

7.2.1.1 Radon

Radon is a naturally occurring radioactive gas which originates from the decay of uranium in rocks and soils. It is colourless, odourless and tasteless and can only be measured using special equipment. When radon surfaces in the open air, it is quickly diluted to harmless concentrations, but when it enters an enclosed space, such as a house or other building, it can sometimes accumulate to unacceptably high concentrations (Radiological Protection Institute of Ireland (RPII) website).

A "high radon area" is one in which more than 10% of houses are predicted to have radon levels in excess of a 200 Bq/m^3 reference level. A national survey of radon in Irish dwellings was conducted between 1992 and 1999 by the RPII. The map for County Galway identifies >20% of the houses within the Shannapheasteen area as being above the reference level, as shown in Figure 7.1.

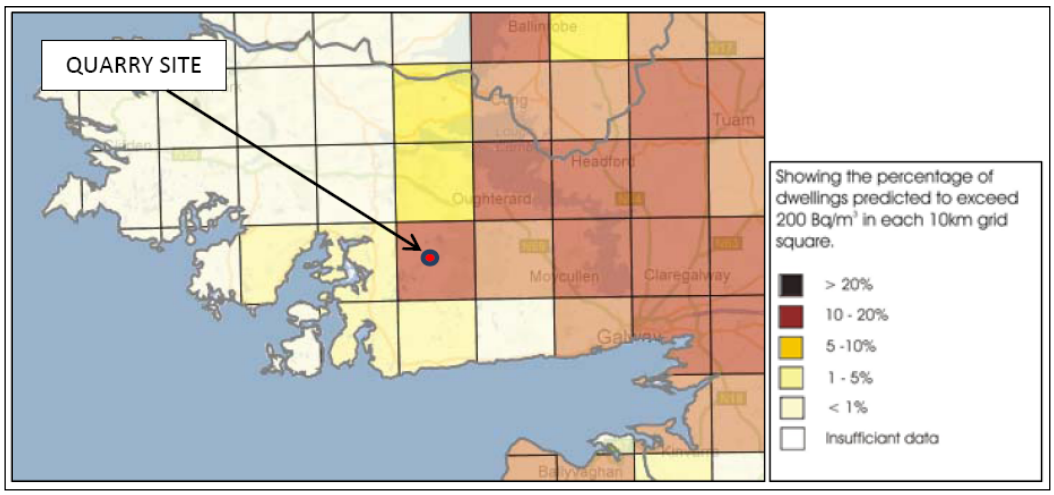


Figure 7.1 Radon Levels for West County Galway

7.2.1.2 Ground Stability

There are no health and safety issues relating to ground stability conditions currently associated with the quarry, however there may be potential issues during all phases of the proposed project, as is the nature of a quarry development.

The quarry is located in an area of granite bedrock, with overlying granite till (gravels and cobbles) and blanket peat bog. There may be localised ground stability issues associated with excavation of the overburden and the bedrock.

7.2.2 Geomorphology and Landscape

7.2.2.1 Regional Topography

The quarry and surrounding area is located in a hilly region containing many large lakes and rivers. The site is located on the south-western slopes of Shannapheasteen hill (top level of 236mOD) which lies in a range of low hills that stretches between

Maam Cross and Barna, in typical characteristic South Connemara landscape. Costelloe Bay is located less than 9km south west of the quarry.

7.2.2.2 Karst

The study area is not considered to be karstic and is underlain by granite bedrock.

7.2.2.3 Land Use

The quarry site is located in an area of open Blanket Peat bog land with outcropping granite. There are isolated residential properties located to the west and northwest of the quarry adjacent to the local road. Two other granite / gravel quarries are located close to the Shannapheasteen quarry site, one located (Quarry 179) 200m to the north and the other located at Bovroughan (Quarry 82) 3.5km south of the site. The adjacent lands are considered uncultivated and very rough and generally not suitable for agriculture other than sheep raring. Peat cutting is practiced in the vicinity.

7.2.2.4 National Heritage

The County Galway Heritage Plan 2009-2014 states that 'A fundamental objective of the Heritage Plan is to increase awareness, appreciation and enjoyment of our rich heritage resource.'

The NPWS is responsible for the designation and protection of Natural Heritage Areas (NHAs), Special Areas of Conservation (SACs) and Special Protection Areas (SPAs). The GSI works in association with the NPWS to include sites of geological heritage, which are shown in Figure 7.2.

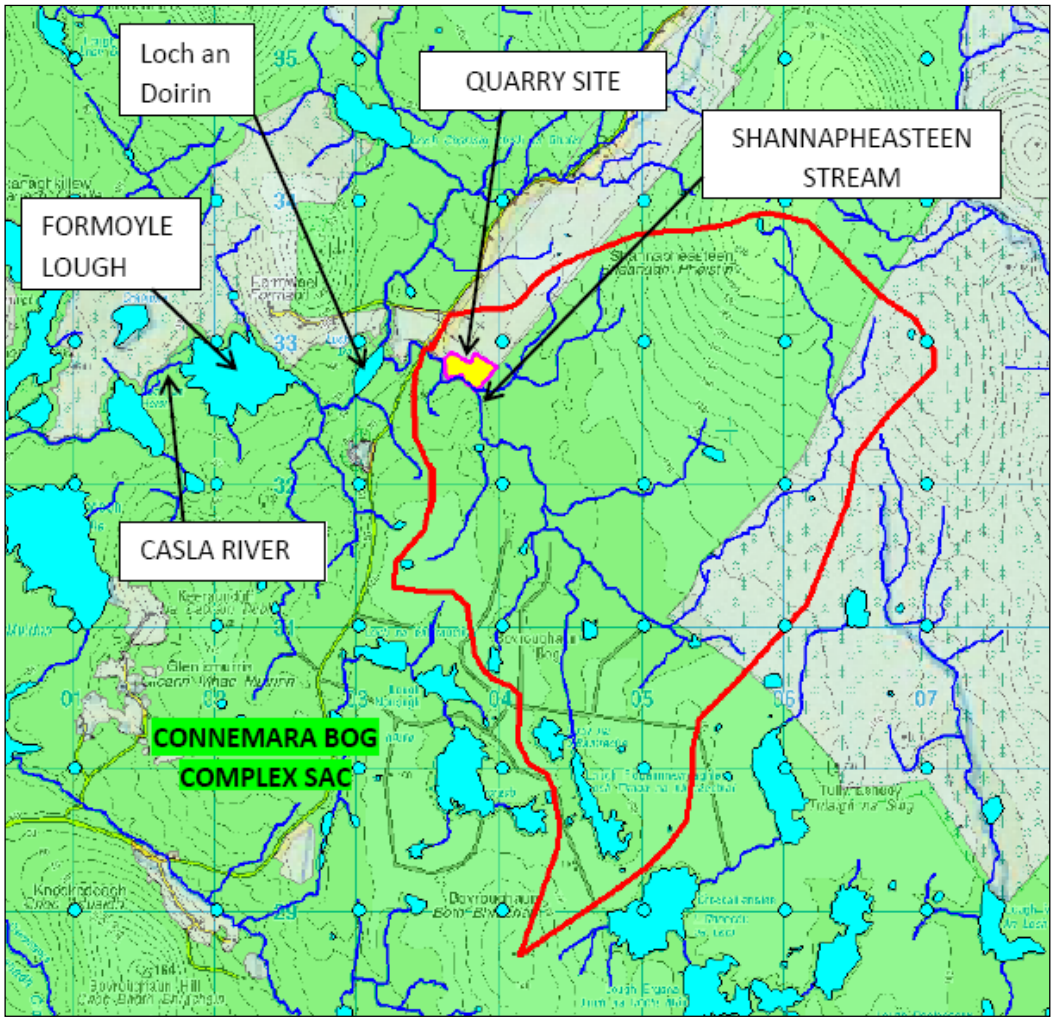


Figure 7.2 Quarry Location, Adjacent Watercourse Catchment Area and Connemara Bog Complex SAC

SACs

The EU Habitats Directive (92/43/EEC) lists certain habitats and species that must be protected. Ireland introduced the European Communities (Natural Habitats) Regulations 1997 (S.I. No. 94/1997) to give effect to SACs under Irish Law. Any development in or near an SAC should avoid any significant adverse impact on the features for which the site has been designated or proposed for designation.

The western / southern boundary and the south east corner of the quarry are located in the Connemara Bog Complex SAC (002034).

SPAs

These are areas of importance for birds (and often are also important for other types of wildlife). The EU Birds Directive (79/409/EEC) requires designation of SPAs for listed rare and vulnerable species, regularly occurring migratory species and wetlands, especially those of international importance, which attract large numbers of migratory birds each year. Any development in or near an SPA should avoid any significant adverse impact on the features for which the site has been designated. SPAs were given effect in Irish Law mainly under the Conservation of Wild Birds Regulations 1985 (SI. 291 of 1985).

The western / southern boundary and the south east area of the quarry are located in the Connemara Bog Complex SPA (004181).

NHAs

The Wildlife (Amendment) Act 2000 provides for the designation and conservation of NHAs. These are sites that support elements of our natural heritage which are unique, or of outstanding importance at the national level. Any development in or near a NHA should avoid any significant adverse impact on the features for which the site has been designated.

The Shannapheasteen quarry, although not directly located in, is immediately surrounded by the Connemara Bog Complex pNHA (002034).

Geological Sites

There is a statutory requirement placed on Local Authorities to have due regard for conservation of geological heritage features under the Planning and Development Act 2000, Planning and Development Regulations 2001, The Heritage Act 1995 and the Wildlife (Amendment) Act 2000.

7.2.3 Hydrology

7.2.3.1 Regional Meteorology

The nearest synoptic weather station to the site is at Mace Head near Carna to the west. The Met Éireann recent mean monthly values from 2012 up to March 2013 are shown in Table 7.1.

Table 7.1 Total Rainfall (millimetres)

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
2013	172.7	44.5	55.3	0.0	-	-	-	-	-	-	-	-	-
2012	91.0	52.6	58.5	42.7	64.8	119.6	108.1	105.4	61.7	74.5	133.7	127.4	1040.0
Mean	138.6	98.0	106.4	76.6	81.7	82.4	84.3	117.8	112.3	144.9	150.8	146.2	1340.0

The mean annual rainfall at Shannapheasteen is relatively high (as is the nature of Connemara) and is estimated at 1528mm. The mean annual potential evaporation (PE) for Galway is estimated to vary from approximately 400 to 450 mm, and actual evaporation estimated at about 95% of PE.

Table 7.2 sets out the rainfall depth storm duration return period for the Shannapheasteen area.

Table 7.2 Rainfall Depth Storm Duration to Return Period

Storm Duration, hours	Return Period, years								
	2yr	5yr	10yr	20yr	30yr	50yr	100yr	150yr	200yr
0.25	7.4	9.7	11.3	13.1	14.3	15.8	18.2	19.8	20.9
0.5	9.8	12.7	14.8	17.1	18.5	20.5	23.5	25.4	26.8
1	12.9	16.7	19.4	22.3	24.1	26.6	30.3	32.7	34.5
2	17.2	22	25.4	29.1	31.4	34.5	39.1	42.1	44.4
3	20.2	25.8	29.8	34	36.6	40.2	45.5	48.9	51.5
4	22.7	29	33.3	38	40.9	44.8	50.7	54.5	57.3
6	26.8	34	39.1	44.5	47.8	52.3	59	63.3	66.6
9	31.6	40	45.9	52	55.9	61.1	68.8	73.7	77.4
12	35.6	44.9	51.4	58.2	62.5	68.2	76.7	82.1	86.2
18	42	52.7	60.3	68.2	73.1	79.7	89.5	95.7	100.4

Storm Duration, hours	Return Period, years								
	2yr	5yr	10yr	20yr	30yr	50yr	100yr	150yr	200yr
24	47.2	59.2	67.5	76.3	81.7	89	99.8	106.7	111.8
48	57.9	70.8	79.6	88.8	94.4	101.8	112.8	119.6	124.8
72	67.5	81.3	90.7	100.3	106.1	113.9	125.2	132.2	137.5
96	76.3	91	100.9	110.9	117	125.1	136.8	144.1	149.4
144	92.7	108.9	119.7	130.6	137.2	145.8	158.3	166	171.6
192	108	125.6	137.2	148.8	155.8	165	178.1	186.2	192.2
240	122.6	141.4	153.8	166.1	173.5	183.1	196.9	205.3	211.6
288	136.7	156.7	169.7	182.6	190.4	200.5	214.8	223.6	230.1
384	164	186	200.3	214.3	222.7	233.6	249	258.5	265.3
480	190.5	214.4	229.7	244.7	253.7	265.3	281.6	291.6	298.9
600	222.9	248.8	265.3	281.5	291.1	303.5	320.9	331.4	339.1

The wind direction in South Connemara is predominantly westerly to south westerly.

7.2.3.2 Surface Water Features

Shannapheasteen Quarry lies in the Casla River drainage catchment in South Connemara. A watercourse, referred to in this study as Shannapheasteen Stream, flows close the southern boundary of the quarry before turning to flow along the western boundary in northerly direction. The stream then turns to flow northwestwards and crosses under the Rosseveal to Oughterard local road and meanders in westwards direction to ultimately outfall to Loch an Doirin (3.2ha) approximately 0.4km west of the quarry boundary. The lowest elevation of the quarry is approximately 67mOD while Loch an Doirín lies below the 50mOD contour. The catchment area of the stream upstream of the local road is 10.3km2. The overall Casla River catchment area is estimated at 77.8km2 while the river catchment area upstream of Loch an Doirin, including Shannapheasteen Stream, is 36.2km2, as shown in Figure 7.3. Downstream of Loch an Doirin the River Casla flows into three large lakes namely Lough Formoyle (29.4ha), Loch an Roisin (10.8ha) and Glenicmurrin Lough (162.3ha), before discharging to Casla Bay at Casla 12km downstream of the quarry site.

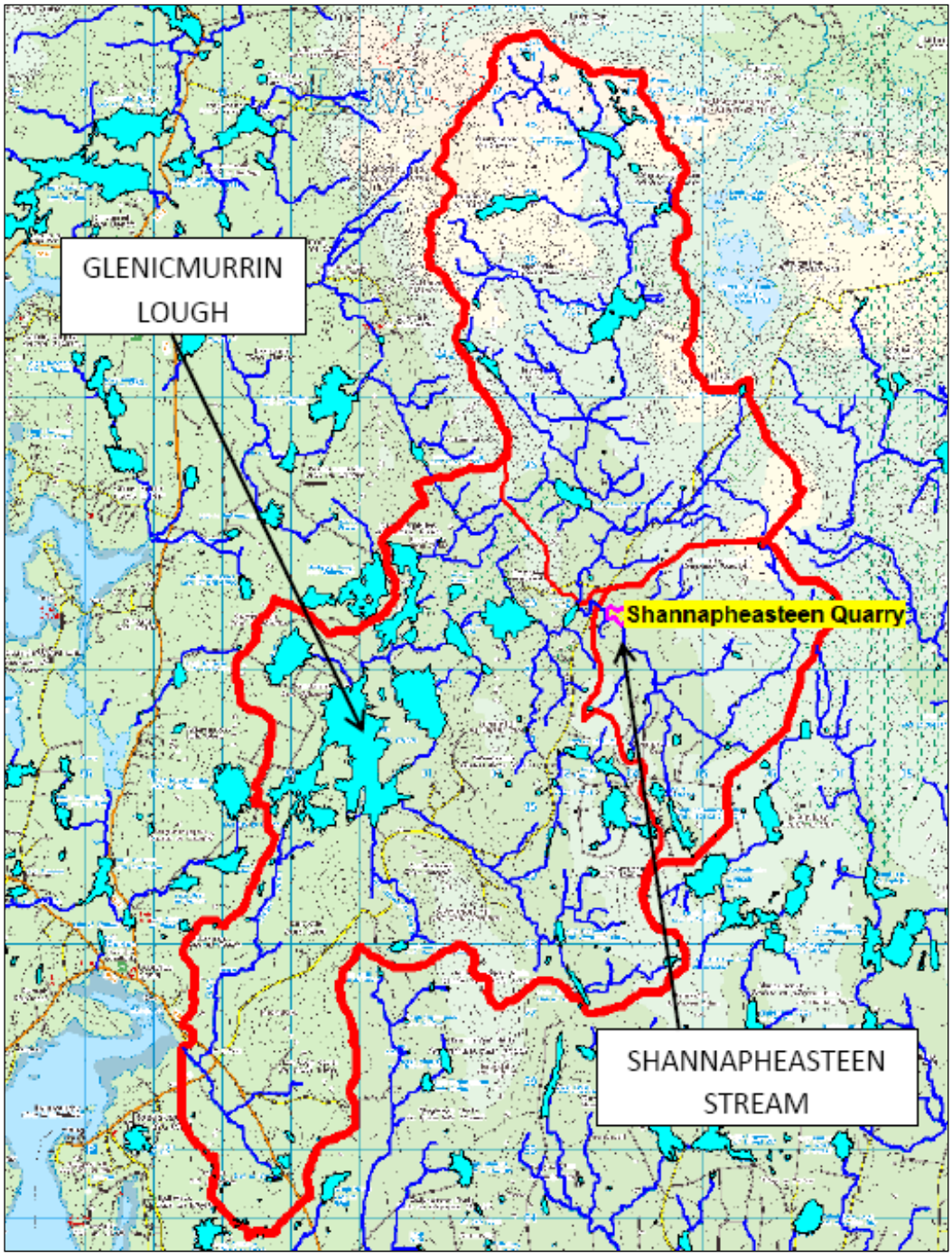


Figure 7.3 Casla River Catchment

The mean annual average rainfall for the catchment is circa 1500mm per annum. The mean annual flood flow in stream adjacent to the site is estimated at approximately 3.9cumec while the 95%ile flow rate is estimated at less than 0.05 cumec.

Shannapheasteen stream and Casla River are designated as salmonid waters. The quarry lies immediately adjacent to the Connemara Bog Complex SAC. The adjacent and downstream watercourses and lakes lie within the SAC and are understood to be a qualifying feature of the SAC.

7.2.3.3 Water Quality

The stream and the receiving waters water quality, while not monitored under the Water Framework Directive (WFD), are expected to be good to high. The Casla River, at Casla Bridge, is considered of high quality status with a Q rating of Q4-5 or Q5.

7.2.3.4 Flood Mapping

The site lies immediately adjacent the Shannapheasteen Stream. The stream channel is steep and cascades along the southern boundary before flattening out along the western boundary and crossing under the local road via a twin span concrete slab bridge with a pier in the channel. The OPW preliminary flood risk assessment mapping, as shown in Figure 7.4, correctly shows that the quarry excavation itself, whose bottom level lies several metres below the stream channel bed level , in the absence of appropriate drainage, would be at pluvial flood risk. The access road is low lying relative to the river channel and is probably at a medium flood risk.

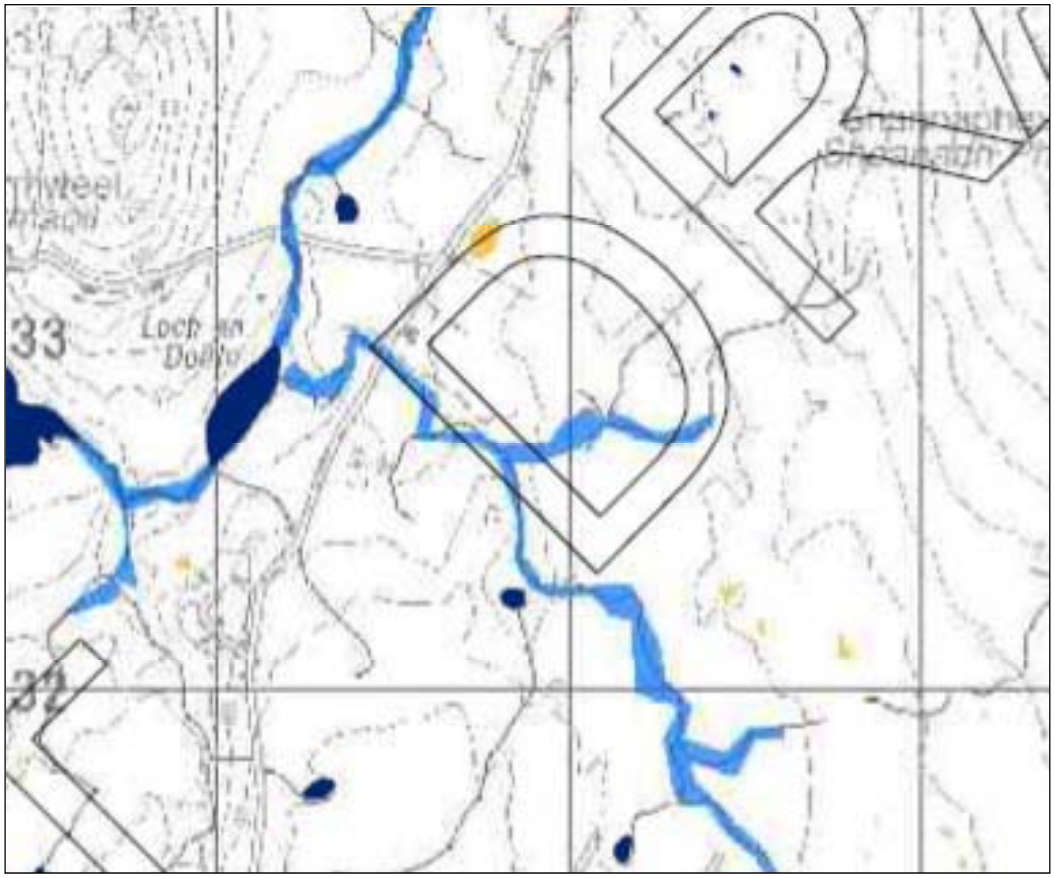


Figure 7.4 PFRA Mapping

7.2.4 Quaternary Geology

7.2.4.1 Soil Cover

Soil cover adjacent to the quarry has been mapped by Teagasc and presented on the EPA website, as shown in Figure 7.5, and are classified as Blanket Peat Bog (BktPt) and Podzols Peaty (AminSRPT). The depth of 'topsoil' overlying the bedrock ranges 0m to 3m, and a site walkover identified areas of bedrock outcrop.

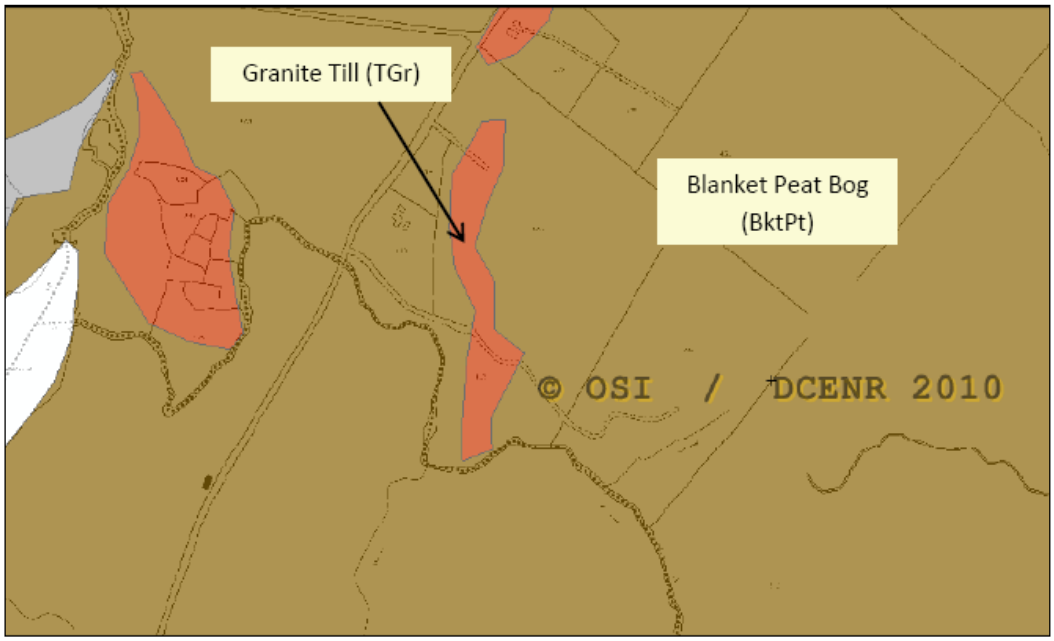


Figure 7.5 Soils

7.2.4.2 Subsoil Description

Subsoils mapped by Teagasc are present on the GSI and EPA websites. Blanket Peat (BktPt) and Granite Till (TGr) is mapped at surface underlying the site.

7.2.4.3 Soil Permeability

The Winter Rainfall Acceptance Potential (WRAP) soil runoff classification for the river catchment is reported to be low in general with areas of high runoff in the uppermost extents of the catchment.

No percolation site data was available for this study; however the soils are likely to be poorly drained with a thin to no cover on the site. Ponding with little or no percolation to the underlying bedrock aquifer is expected at the quarry. Some percolation to the weathered layer between the Blanket Peat and Bedrock may be possible.

Diffuse recharge occurs via rainfall percolating through the subsoil and rock outcrops. Due to the low permeability of much of the subsoil (blanket peat) and the aquifers, a high proportion of the available recharge will discharge to the streams. In addition, the steep slopes in the mountainous areas promote surface runoff.

7.2.5 Bedrock Geology

7.2.5.1 Bedrock Description

The Silurian – Devonian bedrock underlying the site has been mapped by the GSI as Caledonian Shannapheasteen Granite (GaSn) (Aphyic fine grained granite), as shown in Figures 7.6 and 7.7.

The bedrock in the quarry is reported to 'blue granite stone that is formed in beds of 1m deep and this made it easier to extract than most quarries in Connemara.

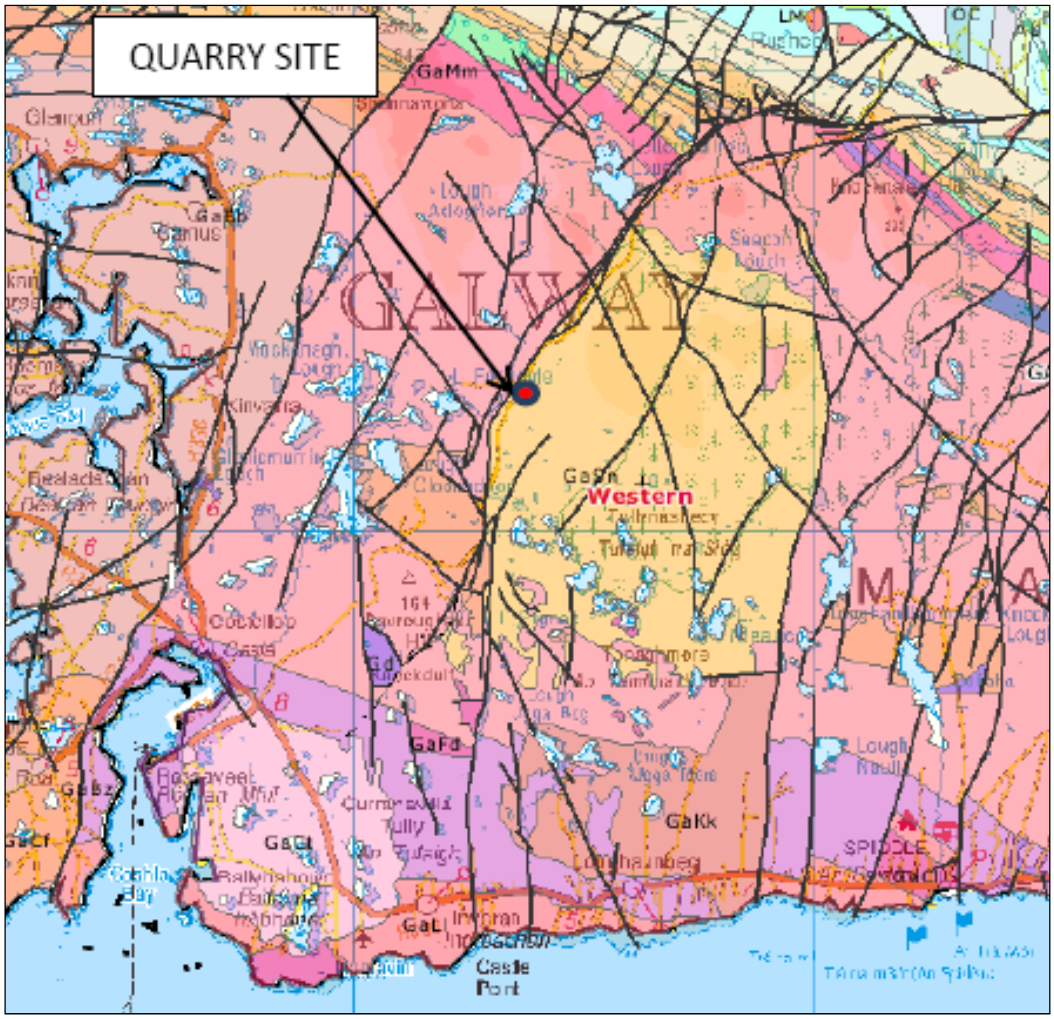


Figure 7.6 Bedrock Geology of South Connemara (GSI)

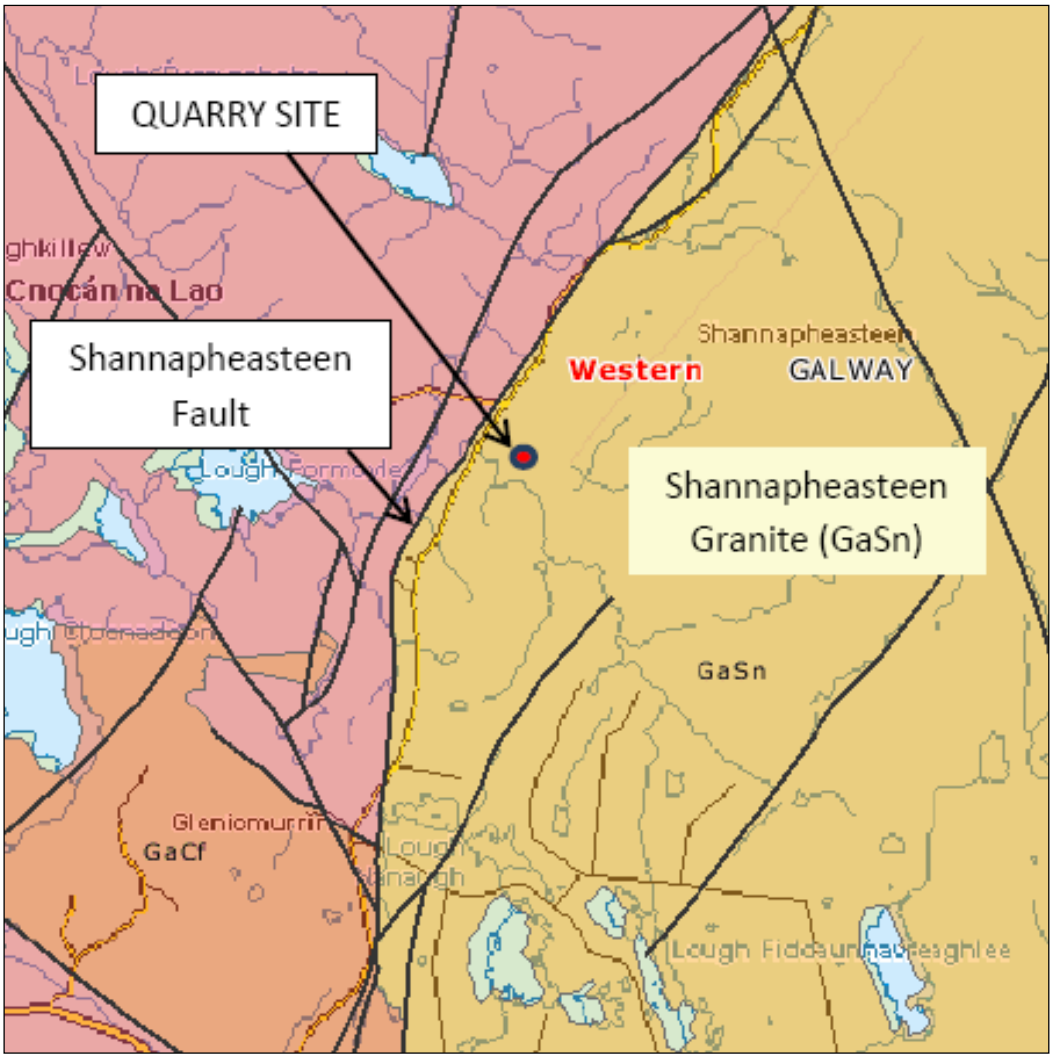


Figure 7.7 Bedrock Geology of South Connemara (GSI)

7.2.5.2 Structural Geology

Several fault lines are mapped in the study area. The local road adjacent to the site corresponds closely with the main fault in the area (Shannapheasteen Fault) which is the boundary between Shannapheasteen Granite (east) and Porphyritic – Megacrystic Granite (GaMp) (west) geological formations.

Dyke / Sill formations have been mapped to the south of the study area.

7.2.5.3 Karst Features

There are no Karst features in the study area.

7.2.5.4 Mineral Resources

The main mineral resources in the region are granite and granite aggregate, with two small quarrying operations noted in the area. Peat is also harvested in the region with a high density of cut-over bog and forestry.

7.2.6 Hydrogeology

7.2.6.1 Aquifer Types

The GSI has produced a classification of aquifers based on the value of the groundwater resource and the hydrogeological characteristics (DELG/EPA/GSI, 1999). There are three main types of aquifer subdivided into eight categories:

- Regionally Important (R) Aquifers:
  - Karstified aquifers (Rk)
  - Fissured bedrock aquifers (Rf)
  - Extensive sand / gravel aquifers (Rg)
- Locally Important (L) Aquifers: Sand / gravel (Lg)
  - Bedrock which is generally moderately productive (Lm)
  - Bedrock which is moderately productive only in local zones (Ll)
- Poor (P) Aquifers:
  - Bedrock which is generally unproductive except for local zones (Pl)
  - Bedrock which is generally unproductive (Pu)

7.2.6.2 Aquifer Characteristics

The quarry lies within the Spiddal Ground Water Body (GWB). The Silurian- Devonian bedrock underlying the quarry has been mapped by the GSI as Shannapheasteen Granite).

This unit is classified as a Poor Aquifer - Bedrock which is Generally Unproductive except for Local Zones (Pl), as shown in Figure 7.8.

Well yields in the area would be expected to low, unreliable and associated with faults and geological dykes formations with the source being surface water based.

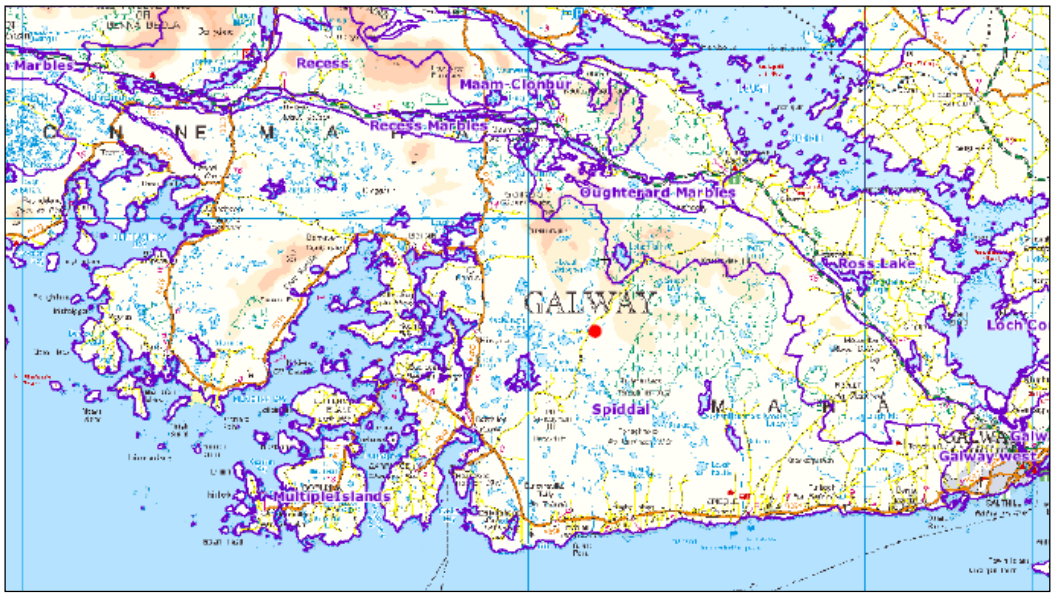


Figure 7.8 Spiddal Groundwater Body

7.2.6.3 Groundwater Flow, Levels and Fluctuations and Quality

Due to the low permeability of much of the subsoil (blanket peat) and the aquifers, a high proportion of the available recharge will discharge to the streams. In addition, the steep slopes in the mountainous areas promote surface runoff.

Most groundwater flux is likely to be in the uppermost part of the aquifer; comprising a broken and weathered zone typically less than 3m thick. No fault line has been identified passing through the quarry which could form a possible groundwater pathway from the site to adjacent watercourses.

The Water Framework Directive (WFD) database reports that the groundwater quality in the Spiddal GWB is good.

The quarry office and toilet are to be supplied from a bored well which is located to the north of site. A pump test undertaken on 20th November 2010 at the borehole is reported to have had an average pumping rate of 39.0 gallons/hour (177 litres / hr, max 4.25m^3/day). The pump rate was reported to have been similar to that recorded during testing undertaken in October 2010. The pump test was reported to have 'no impact' on water levels in the borehole. A 'spring' adjacent to the borehole was noted during the test to have flowed constantly. The borehole records are included in the appendices.

The borehole water quality was tested by Complete Laboratory Solutions (CLS) in October 2010 and the quality was reported to be good. The test results are presented in Table 7.3.

Table 7.3 Borehole Water Quality Results

Lab No.	Sample Description	Test	Result	Units
283448	Well No. 1 Water	Clostridium Perfringens in Water	0	cfu/100ml
		E coli (Filtration)	0	cfu/100ml
		Enterococci	0	cfu/100ml
		Total Coliforms (Filtration)	0	cfu/100ml

The borehole supply would be expected to be associated with the Shannapheasteen geological fault which is shown on GSI mapping to lie close to the local road where two bedrock formations (both granite) interface.

7.2.6.4 Vulnerability Mapping

The GSI guidelines given in their Groundwater Protection Schemes (DELG/EPA/GSI, 1999) can be combined with site investigation data (geological and hydrogeological characteristics) to obtain appropriate groundwater vulnerability ratings for any particular area. Table 7.4 outlines these geological and hydrogeological characteristics, primarily dependant on the permeability and depth of the overburden.

Table 7.4 Hydrogeological Conditions

Vulnerability Rating	Hydrogeological Conditions				
	Subsoil Permeability (Type) and Thickness			Unsaturated Zone	Karst Features
	High permeability (sand/gravel)	Moderate permeability (e.g. Sandy subsoil)	Low permeability (e.g. Clayey subsoil, clay, peat)	(Sand/gravel aquifers only)	(< 30m radius)
Extreme (E)	0 – 3.0m	0 – 3.0m	0 – 3.0m	0 – 3.0m	n/a
High (H)	> 3.0m	3.0 – 10.0m	3.0 – 5.0m	> 3.0m	n/a
Moderate (M)	n/a	> 10.0m	5.0 – 10.0m	n/a	n/a
Low (L)	n/a	n/a	> 10.0m	n/a	n/a
Notes:	(1) n/a = not applicable. (2) Precise permeability values cannot be given at present. (3) Release point of contaminants is assumed to be 1-2m below ground surface.				

Combining the hydrological conditions and the aquifer type, it is possible to produce a vulnerability rating matrix, as shown in Table 7.5.

Table 7.5 Vulnerability Rating Matrix

Vulnerability Rating	Resource Protection Zones					
	Locally Important Aquifers (L)		Locally Important Aquifers (L)		Poor Aquifers (P)	
	Rk	Rf/Rg	Lm/Lg	Ll	Pl	Pu
Extreme (E)	Rk/E	Rf/E	Lm/E	Ll/E	Pl/E	Pu/E
High (H)	Rk/H	Rf/H	Lm/H	Ll/H	Pl/H	Pu/H
Moderate (M)	Rk/M	Rf/M	Lm/M	Ll/M	Pl/M	Pu/M
Low (L)	Rk/L	Rf/L	Lm/L	Ll/L	Pl/L	Pu/L

The quarry site and surrounding area has been mapped by the GSI as having a high to extreme vulnerability with rock near to surface, as shown in Figure 7.9. This classification is supported by the site inspections of the quarry and surrounding landscape where bedrock outcrops frequently and overburden depths are less than 3m.

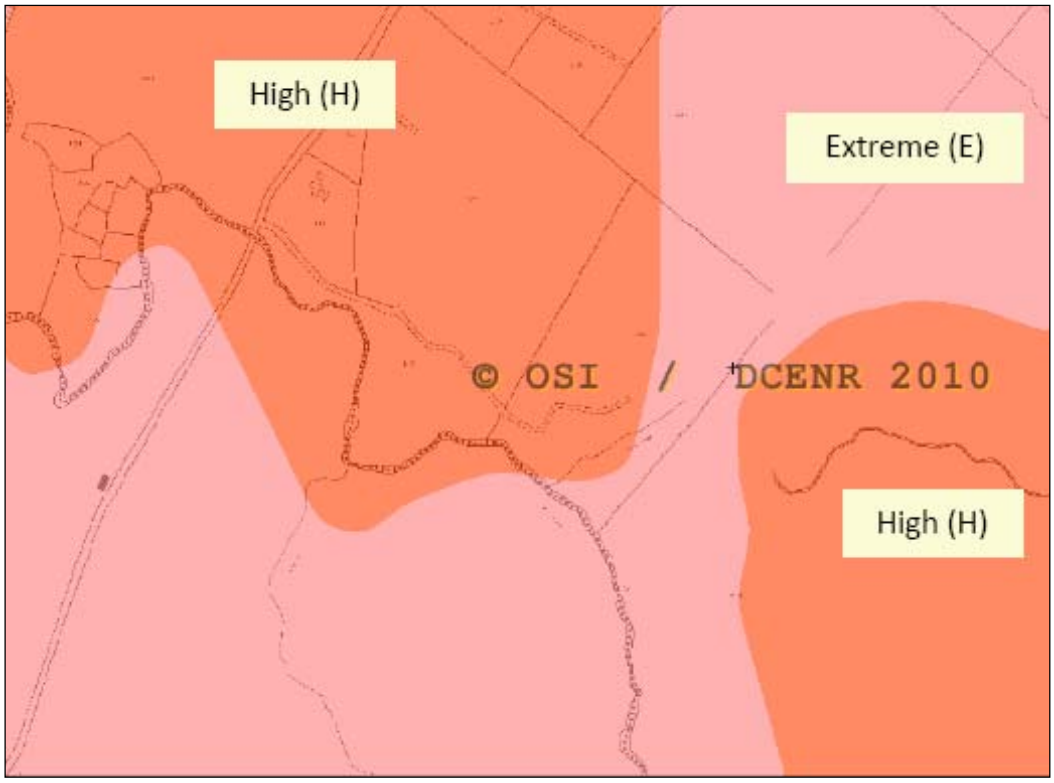


Figure 7.9 Groundwater Aquifer Vulnerability

7.2.6.5 Water Framework Directive

Groundwater resources are protected through the Local Government (Water Pollution) Acts, 1977 and 1990, at national level, and through the EU Groundwater Directive (80/68/EEC). These regulations control the discharge of specified substances to groundwater (EPA, 2006).

The groundwater aquifer underlying the site and surrounding area is also protected under the Water Framework Directive and the aquifer is not expected to achieve good status by the 2015 deadline, pending further investigation.

7.2.6.6 Groundwater Protection Schemes

The GSI has prepared groundwater protection plans for a number of counties including County Galway. These plans classify aquifers and aquifer vulnerability on a county basis and County Galway has incorporated this information into its County Development Plan.

Quarry developments by their nature remove topsoil and overburden materials within the extraction area and these activities may change aquifer recharge characteristics and increase the aquifer vulnerability. Depending on the depth of the quarry relative to the surrounding groundwater regime, groundwater control or dewatering measures may also have to be incorporated into quarry operations. The impact of these activities, if any, on the groundwater resource can be mitigated by appropriate quarry planning and design, together with the operational practices (EPA, 2006).

The quarry does not lie in a groundwater source protection area. It should be noted, however, that the nearby Shannapheasteen fault may act as a localised groundwater aquifer for private borehole wells in the vicinity of the study area. The fault line aquifer may also discharge to the Casla River system via springs.

Costelloe (Casla) Regional Water Supply Scheme sources its raw water from Glenicmurrin Lough, which is located in the Casla River system, less than 4km downstream of Shannapheasteen Quarry. The quarry therefore lies within the source protection area of the regional supply scheme.

7.2.6.7 Water Supply Schemes

Water supply in the study area is expected to be primarily surface water based however borehole wells supplies associated with the possible Shannapheasteen fault localised aquifer may also exist in the area. (Note: the proposed office building will be supplied from a borehole located to the north of the quarry.

Table 7.6 Water Supply

Quarry Name	Shannapheasteen Quarry, Casla, Co. Galway. Ref:120417
Easting	103780
Northing	232792
Elevation	70 to 80mOD
Hydrology	
Adjacent Watercourse	Shannapheasteen Stream
Catchment Area	To road crossing downstream of Quarry, 10.5km2. Hilly peat bog land with forestry along the east end of catchment. Shannapheasteen Hill (220m). Includes two large lakes Loch na Bantracha and Loch Fhada na bhFreochlaí
Receiving Waters	Loch an Doirin and Casla River including Lough Formoyle, Loch an Roisin and Glenicmurrin Lough
Main Catchment	Casla River and Casla Bay
SAAR at Quarry	1528mm
Soil Type (WRAP)	Mostly Type 2 with Type 5 on hillslope
Flood Risk	Low. Pluvial shown in the quarry itself.
WFD: Water Quality in Adjacent Watercourse	Shannapheasteen Stream Status: Not monitored (Expected to be good to high) Score: 2a Expected to achieve good status River Water Quality: No information
WFD: Water Quality in Receiving Waters	Casla River Status: Not monitored (Expected to be good to high) Score: River 2a Expected to achieve good status River Water Quality: At Casla Bridge Q4-5, Q5 High Status Loch an Roisin and Formoyle Lough Status: Not monitored (Expected to be good to high) Score: 2b strongly expected to achieve good status Glenicmurrin Lough Status: Not monitored (Expected to be good to high) Score: 2a Expected to achieve good status Lake Water Quality: No information (Probably High)
Hydrogeology	
Soil Type	BktPt (Blanket Peat Bog) and AminSRPT (Podzols Peaty)
Subsoil Type	TGr (Granite Till)
Bedrock	Shannapheasteen Granite Aphyric fine grained granite
Vulnerability	High to Extreme
Groundwater Body	Spiddal GWB
Aquifer Code	Pl
Aquifer Description	Poor Aquifer - Bedrock which is Generally Unproductive except for Local Zones

WFD Groundwater Quality	Status: Good Score: 2a - Expected to achieve good status Quality: TBC
Water Supply	Lies within the Costelloe (Casla) Regional Water Supply Scheme Source Protection Area.
Adjacent Wells	The site is to be sourced by a poor yielding well located to the north
Protected / Designated Areas	
cSAC	Site lies immediately adjacent to the Connemara Bog Complex SAC. The receiving waters are in the SAC. (002034)
NHA	N/A
pNHA	Connemara Bog Complex pNHA
SPA	Connemara Bog Complex SPA
Shellfish Area	TBC
Salmonid Waters	The Casla River and the Shannapeasteen Stream are designated as salmonid

In the immediate area of Ballynakill a number of domestic boreholes are present drilled to depths of 30 to 50 metres. The well yield from these supplies are generally low to moderate yield. A small group supply supplying a number of households adjacent to the Quarry has a borehole source close to the Ballynakill Stream and approximately 350 metres from the Western Quarry Boundary.

7.2.7 Site Photographs

Views of the quarry site are presented in Plates 7.1 to 7.8.

Plate 7.1 Existing Temporary Office and Stone Cutting Plant

Plate 7.2 Quarry Haul road, pit and dewatering pumps

Plate 7.3-A Existing Silt Fence between Shannapheasteen Stream and the quarry haul roads

Plate 7.3-B Existing Silt Fence between Shannapheasteen Stream and the quarry haul roads

Plate 7.4 Quarry Access Road

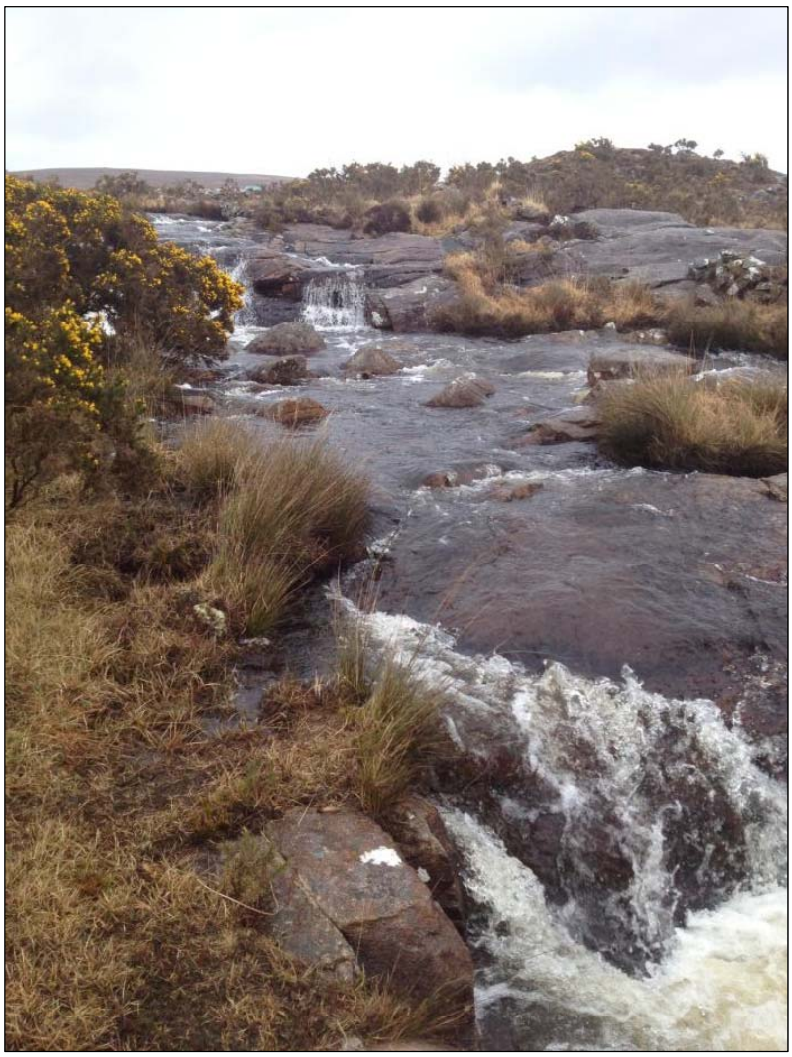


Plate 7.5 Shannapheasteen Stream upstream of the quarry works

7.3 Potential Impacts

7.3.1 Surface Water

7.3.1.1 Quantitative Impacts

The Shannapheasteen stream / Casla River system is located immediately adjacent the quarry's southern and western boundary and therefore, in the absence of appropriate mitigation measures the quarry development could have a significant impact on the quality of the watercourse.

Surface water flows may be affected by quarrying activities. Excavation below the groundwater table may lead to dewatering of nearby watercourses, and discharges to surface water features from dewatering of the quarry floor could increase flows in the river. Given the impervious nature of the Bedrock and its poor aquifer characteristics the quarry development does not result in significant dewatering requirement with the pit water primarily entering as surface runoff and direct rainfall and possibly interflow at the soil rock interface.

There is no abstraction of water from the Casla River system for any on-site quarry activities.

It is proposed to provide a minimum buffer of 10m between the quarry works and the adjacent Shannapheasteen Stream. It is proposed to upgrade the existing silt fence to a double silt fence within the buffer zone. The erection of double silt fencing of the quarry from the Shannapheasteen Stream may at certain low-lying section just fall within the flood zone of the Shannapheasteen Stream. The impact of this on flood flow conveyance and flood levels within the Shannapheasteen Stream will be negligible given the steep cascading gradient of the river past the site.

Therefore the impact of the quarry operation on flows and water levels in the adjacent Shannapheasteen Stream will be locally minor to imperceptible.

No new cut off drains or interceptor drains are proposed at the quarry. Runoff from the quarry works area drains to the quarry ponds while other drains in the study area discharge to the adjacent stream. Surface water arising from Dewatering of the quarry ponds is diffused by over land flow to open ground uphill of the quarry pit and drains to a linear drain all if which are located within the site area. It is proposed to install a check dam upstream of the outfall of the linear drain to the adjacent stream outside the floodplain. This minor modification will allow the linear drain to be adapted as a shallow wetland which will further improve water quality and attenuate flows before discharging to Shannapheasteen Stream, refer to Engineering drawings of the quarry site layout.

As there will be no interference to local drains (i.e. no interceptor drains or cut-off drains) the existing hydrological regime of the adjacent Blanket Peat Bog (Connemara Bog Complex SAC) will not be impacted.

7.3.1.2 Qualitative Impacts

Surface water features may be impacted by contamination from site runoff if not managed appropriately. The Shannapheasteen Stream which is part of the Casla River system is located immediately adjacent to the quarry site boundary and in the absence of appropriate site management measures, the quarry could have a significant impact on surface water quality to this important receiving watercourse which is salmonid and a supply source to Costelloe Regional Supply Scheme (intake c. 4km downstream).

Impact of Quarry Works Area Runoff

The Proposed Quarry Pit is circa 0.5 ha. The quarry works areas, which is drained to the quarry pit, is 0.9 ha (including the pit) in area and has a potential average daily surface runoff rate of approximately 26 m3/day. A large sump area is provided in the quarry pit to store and settle sediment and intermittent pumping of this stored runoff water is required to prevent flooding of the quarry over time.

Quarry runoff water from the works area has the potential to impact if directly discharged to receiving waters. All soiled water runoff from Quarry Works area will be controlled and directed to the quarry sump pond for settlement and storage. This stored water will be used for dust management on the site. The excess will have to be pumped intermittently at a controlled rate to the north where it will undergo filtering and natural vegetative treatment before reaching the watercourse.

A double silt fence and a minimum of 10m buffer will be provided between the quarry works area and the Shannapheasteen Stream and Connemara Bog Complex SAC. This double silt fence will be regularly inspected and maintained. The silt fence will intercept sediments arising from the site runoff which is not drained to the quarry pit

and will therefore prevent an impact on the sensitive adjacent Connemara Bog complex cSAC lands and watercourse.

Given the poor aquifer nature of the underlying groundwater body the quarry would not be expected to act as an effective pathway for contaminants to reach surface watercourses via spring discharges and stream baseflow. The nearby Shannapheasteen fault may act a localised aquifer and discharge to the Casla River system via springs.

Once the overlying soil has been removed, the increase in surface area of exposed bedrock during development will increase the surface water flow rate to the quarry's drainage network.

Impact of Fuel Oils
The contamination risk to adjacent surface waters from the quarry activities (i.e. spillage of fuel oils) is rated as low given that no direct discharge to surface water occurs, groundwater flow is negligible and that all runoff from the quarry works has to be pumped in a controlled manner out of the quarry pit sump to an engineered disposal area and thus allowing an opportunity in the event of serious spillage to contain the spillage on site and mobilise clean-up operation. Limited polluting activities take place at the quarry and good protocols are in place to minimise the opportunity for contamination including no storage of fuels and chemicals on site and refuelling only of the permanent quarry machinery using a mobile double skinned fuel bowser. Fuel absorbent material and pads are available on the site. Only designated trained and competent operatives are authorised to refuel plant on site. Mobile measures such as drip trays and fuel absorbent mats are used during refueling operations.

Impact of Wastewater
The effluent from the toilets has a potential to pose a pollution risk to the groundwater and surface runoff if it is not adequately stored and disposed of. Portaloo toilet facilities on the site are intended to be used with off-site disposal of the waste by licensed and approved contractor. Drinking water supply for the offices is bottled water and therefore is not at risk of contamination from the quarry activities.

7.3.2 Groundwater

7.3.2.1 Quantitative Impacts

Considering the bedrock aquifer status at the quarry site of a locally important aquifer supporting low well yields than any potential drawdown on the water table could negatively impact local groundwater supplies.

Depending on the proposed excavation depths of the development (currently at a maximum depth of 61.0mOD) there may be a very localised impact on the surrounding groundwater table. The site evidence shows that the quarry pit level is well above the local groundwater table with no seepage flows evident either in the quarry face or upwelling through the quarry base. Any borehole wells and springs in the area would be expected to be associated with the Shannapheasteen fault localised aquifer which will not be impacted by the quarry development.

The quarry utilises a combination of different sources of water for supplying the offices and the dust management requirement which include the sprinklers, wetting

of aggregate and the wheel wash. These sources are a low yielding borehole located to the north of the quarry and the storm water stored in the quarry pond. The quarry is self-sufficient and does not require to source additional water.

7.3.2.2 Qualitative Impacts

With the removal of the 'protective' soil covering, the bedrock aquifer will be extremely vulnerable to contamination from surface runoff off hard-standing, or any spillages that occur on site (i.e. bedrock completely exposed). Possible contaminants will include hydrocarbons from machinery and fuel storage tanks, domestic effluent associated with the septic tank / waste water treatment plant and soiled water from the processing of the quarry's rock.

Due to the poor nature of the underlying bedrock aquifer and its distance from the possible Shannapheasteen fault localised aquifer the quarry works will not impact on groundwater table nor draw contaminants from surrounding lands to the possible localised aquifer.

The following 'Source-Pathway-Target' model summarises the potential contamination sources ('hazards') which may result from the development, the potential pathways for contamination, and the aquifer and groundwater sources ('targets') which might be contaminated.

Hazards

- Effluent disposal to a septic tank / wastewater treatment plant;
- Storage of fuel hydrocarbons in tanks; and
- Areas where spillages or leakages might occur (e.g. refuelling areas, loading bays),
- Soiled surface water from stone processing works.

Pathways

- Contaminants will move downwards through the soil and bedrock to the groundwater table, and then down gradient with the groundwater flow away from the quarry.
- Attenuation and dilution are unlikely to occur en route.
- Regular visual inspection will give timely warning of any contamination.
- The use of monitoring points would be unlikely to be adequate to detect migration of contaminants.

Targets

- Aquifer underlying the site;
- Shannapheasteen fault localised aquifer;
- Groundwater supply wells and boreholes down-gradient of the development.

The underlying bedrock is impervious granite and a poor bedrock aquifer resulting in no significant groundwater inflow to the quarry with the principal source of runoff water being direct Rainfall. Pumping requirements for the quarry pit is reported as not being significant.

Limited polluting activities take place at the quarry and good protocols are in place to minimise the opportunity for contamination including no storage of fuels and chemicals on site and refuelling only of the permanent quarry machinery using a mobile double skinned fuel bowser. Fuel absorbent material and pads are available on the site. Only designated trained and competent operatives are authorised to

refuel plant on site. Mobile measures such as drip trays and fuel absorbent mats are used during refueling operations.

The effluent from the toilets has a potential to pose a pollution risk to the groundwater and surface runoff if it is not adequately stored and disposed of. Portaloo toilet facilities on the site are intended to be used with off-site disposal of the waste by licensed and approved contractor. Drinking water supply for the offices is bottled water and therefore is not at risk of contamination from the quarry activities.

7.4 Mitigation Measures

7.4.1 Introduction

The following mitigation measure are proposed and intended to be carried out in the immediate short term period.

1. An engineered double silt fence is to be placed between the quarry works area and adjacent Shannapheasteen stream and SAC. A minimum of 10m is to be provided between the stream bank and the silt fencing to allow for maintenance works and an undisturbed buffer zone for protection. The double silt fence will regularly routinely inspected and maintained as necessary.
2. Pumping of Quarry runoff water from sump pond will only take place when turbidity levels are low.
3. The excavation works need to be rationalised and any disused sections of the quarry are to be reinstated and reseeded.
4. A bund / safety rail to be constructed around the quarry excavations.
5. The quarry works area surface water runoff will continue to be stored in the quarry pit / pond and pumped northwards for even disposal as sheet flow. The overland / sheet flow will pass through a stone filter blanket and across vegetated strip, through silt fences before reaching a small drain that discharges to the Shannapheasteen Stream. This receiving drain is to be converted into a linear wetland by installing a small check dam and silt fence at its outlet near its river confluence and outside the streams floodplain.
6. No fuel or chemical storage will be undertaken on site.
7. On-site refueling of machinery will be carried out using a mobile double skinned fuel bowser. Fuel absorbent material and pads in the event of any accidental spillages will be present at refueling.
8. A wheel wash facility will be provided at the entrance to the site.
9. Toilets facilities will be Portaloo facilities only from a licensed waste contractor

7.4.2 Surface Water

7.4.2.1 Surface Water Runoff

It is proposed to increase the sump / pond volume and area available for storage of surface runoff in the quarry pit. This will increase the availability of water for quarry use and will also provide increased capacity for storm water storage and settlement time and reduce the volume of soiled water.

Regular maintenance of the sump pond will be carried out involving the removal of silt and the provision of surface intake for pumping. The extracted silt from the sump pond will be appropriately disposed of.

The quarry works area surface water runoff will continue to be stored in the quarry pit / pond and pumped northwards for even disposal as sheet flow. The overland / sheet flow will pass through a stone filter blanket and across vegetated strip, through silt fences before reaching a small drain that discharges to the Shannapheasteen Stream. This receiving drain is to be converted into a linear wetland by installing a small check dam and silt fence at its outlet near its river confluence and outside the streams floodplain.

Regular inspection of this pumped quarry outlet should be carried out to ensure that the silt fence is intact and operational and that the flow is evenly spread as opposed to being concentrated.

7.4.3 Groundwater

7.4.3.1 Reducing Potential Impact on Water Quality

The existing control measures on site are appropriate to mitigate any negative impact on groundwater water quality arising from the quarry works.

Wherever possible, vehicles will be refueled off-site. This will be the case for regular, road-going vehicles. On-site refueling of Quarry machinery will be carried out using a mobile double skinned fuel bowser. The fuel bowser, a double-axel custom-built refueling trailer will be re-filled off site. Fuel absorbent material and pads in the event of any accidental spillages will be present at refueling. The fuel bowser will be parked on a level area away from bedrock fissures, borehole supply and storm sump pond.

Only designated trained and competent operatives will be authorised to refuel plant on site. Mobile measures such as drip trays and fuel absorbent mats will be used during all refueling operations.

7.4.4 Restoration and Aftercare

All extractive sites shall be subject to rehabilitation and landscaping programmes in phase with the extraction.

Restoration is a process that will enable the worked-out quarry to be used for its original purpose (such as agriculture) or adapted for a new use (such as amenity). Restoration includes design, initial landscaping works, soil spreading, final landform construction and aftercare.

Aftercare is the work done after the replacement of the soil and includes fertilising, planting, construction of pathways, vegetation maintenance and an ongoing longterm commitment to the restored land.

For successful restoration, steps should be taken at every stage, from design through operation to decommissioning of the facility, to ensure that restoration is integrated into the process.

If the excavated area will be below the groundwater table, a landscaped pond or lake may be possible.

7.5 Residual Impacts

7.5.1 Surface Water

There is no significant residual impact on surface water hydrology as a result of the current quarry operation at Shannapheasteen.

7.5.2 Groundwater

There is no significant residual impact on hydrogeology as a result of the current quarry operation at Shannapheasteen.

7.5.3 Conclusion

The overall impact of the quarry development at Shannapheasteen on Hydrology and Hydrogeology is assessed to be minor to imperceptible. Additional mitigations are currently being implemented at the quarry which will ensure the hydrology of the adjacent sensitive Connemara Bog Complex cSAC remains unaltered and that the adjacent sensitive watercourse which is a salmonid River and source to the Costelloe (Casla) Regional Water Supply Scheme remains protected from potential pollution sources related to the quarrying activities.

8 AIR AND CLIMATE

8.1 Air

8.1.1 Background

The quarry is located in a rural area, approximately 27 kilometres west of Galway City. Due to the general character of the surrounding environment, air quality sampling was deemed to be unnecessary for this Remedial Environmental Impact Assessment (REIA). Land-use in the vicinity of the site includes peat-cutting, coniferous forestry and low-intensity pastoral agriculture.

8.1.2 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 $PM_{2.5}$ (fine particles) including the limit value and exposure concentration reduction target.
- The possibility to discount natural sources of pollution when assessing compliance against limit values.
- The possibility for time extensions of three years (for particulate matter PM_{10}) 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 ($\mu g/m^3$) and parts per billion (ppb). The notation PM_{10} is used to describe particulate matter or particles of ten micrometres or less in aerodynamic diameter. $PM_{2.5}$ represents particles measuring less than 2.5 micrometres in aerodynamic diameter.

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 ($\mu g/m^3$)	Limit Value (ppb)	Basis of Application of Limit Value	Attainment Date
Sulphur dioxide (SO_2)	Protection of Human Health	1 hour	350	132	Not to be exceeded more than 24 times in a calendar year	1st Jan 2005
Sulphur dioxide (SO_2)	Protection of human health	24 hours	125	47	Not to be exceeded more than 3 times in a calendar year	1st Jan 2005
Sulphur dioxide (SO_2)	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 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 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
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 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	AOT_{40} 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	-

AOT_{40} is a measure of the overall exposure of plants to ozone. It is the sum of the excess hourly concentrations greater than 80 $\mu g/m^3$ and is expressed as $\mu g/m^3$ hours.

8.1.3 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, including Galway City
- 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 quarry site lies within Zone D, which represents rural areas located away from large population centres.

The ambient air quality monitoring carried out closest to the subject site is at the Bodkin Roundabout in Galway City. This monitoring location lies within Zone C however, which comprises urban areas with populations greater than 15,000. Within Zone D, the monitoring station located closest to the development site is the Mace Head Atmospheric Research Station, which lies near Carna, approximately 26 kilometres west of the site. Mace Head is exposed to the North Atlantic Ocean and there is no nearby industrial activity to influence measurements at the station. Mace Head conditions would therefore be more representative of the subject site area than Galway City.

8.1.4 Existing Air Quality

The air quality in the vicinity of the quarry 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. Limited data is available for Mace Head. More extensive 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. Where data is available for Mace Head, this too is

presented below. Regarding the Galway City data, lower measurement values would be expected for the subject site as it lies in a rural location, within Zone D.

8.1.4.1 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 Directive 1999/EC/30 were exceeded during the monitoring period. The mean hourly value of 10.0 µg/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.

Table 8.3 Sulphur Dioxide Data Galway City March to October 2001

Parameter	Measurement
No. of hours	5,356
No. of measured values	3,672
Percentage Coverage	68.6%
Maximum hourly value	87.8 µg/m^3
98 percentile for hourly values	42.3 µg/m^3
Mean hourly value	10.0 µg/m^3
Maximum 24-hour mean	31.1 µg/m^3
98 percentile for 24-hour mean	27.7 µg/m^3

8.1.4.2 Particulate Matter (PM_{10})

Particulate matter (PM_{10}) data for the 2001 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 not exceeded during the measurement period. The upper assessment threshold was exceeded on 32 days and the lower assessment threshold was exceeded on 96 days. Directive 1999/30/EC stipulates that these assessment thresholds should not be exceeded more than seven times in a calendar year. The mean of the daily values during the measurement period is below the annual limit value for the protection of human health (40 µg/m^3).

Table 8.4 Particulate Matter (PM10) Data Galway City March to October 2001

Parameter	Measurement
No. of days	223
No. of measured values	187
Percentage Coverage	83.8%
Maximum daily value	49.9 µg/m^3
98 percentile for daily values	45.8 µg/m^3
Mean daily value	22.1 µg/m^3

8.1.4.3 Ozone (O_3)

Ozone data for the Mace Head Atmospheric Research Station for 2008 is presented in Table 8.5. The maximum daily eight-hour mean limit of 120 µg/m^3 was exceeded on three days. The legislation stipulates that this limit should not be exceeded on more than 25 days.

Table 8.5 Summary statistics for rolling 8-hr O_3 concentrations in 2008: Mace Head

Parameter	Value
Annual Mean	77 µg/m^3
Median	77 µg/m^3
% Data Capture	100%
No. of days > 120	3 days
Maximum 8-hour value	132 µg/m^3

8.1.4.4 Nitrogen Dioxide (NO_2)

Nitrogen dioxide and oxides of nitrogen data for the 2001 monitoring period in Galway City is presented in Table 8.6. The hourly limit value was not exceeded during the measurement period. One hourly mean NO_2 value was above the lower assessment threshold. Directive 1999/30/EC 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.

Table 8.6 Nitrogen Dioxide and Oxides of Nitrogen Data Galway City March to October 2001

Parameter	Measurement
No. of hours	5,356
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 NO_2

8.1.4.5 Carbon Monoxide (CO)

Carbon monoxide data for the 2001 monitoring period in Galway City is presented in Table 8.7. 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 limit value set out in Directives 2000/69/EC or 2008/69/EC recorded.

Table 8.7 Carbon Monoxide Data Galway City March to October 2001

Hourly Values	Result
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 Climate

8.2.1 Climate Change and Greenhouse Gases

Although climate change is thought to be a natural process, the rate at which the climate is changing has been accelerated rapidly by human activities. Climate change is one of the most challenging global issues facing us today and is primarily the result

of increased levels of greenhouse gases in the atmosphere. These greenhouse gases come primarily from the combustion of fossil fuels in energy use. Changing climate patterns are thought to increase the frequency of extreme weather conditions such as storms, floods and droughts. In addition, warmer weather trends can place pressure on animals and plants that cannot adapt to a rapidly changing environment. Moving away from our reliance on coal, oil and other fossil fuel driven power plants is essential in order to reduce emissions of greenhouse gases and combat climate change.

8.2.1.1 The Kyoto Protocol

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 and beyond. Ireland's greenhouse gas emissions in non-Emissions Trading Scheme (ETS) sectors, i.e. transport, agriculture, heating in buildings, waste and small industry) are required to be 20% below 2005 levels by 2020. The SEAI 2012 Report '*Energy in Ireland 1990 – 2011'* states that energy-related CO_2 emissions in 2011 in sectors not included in EU emissions trading (non-ETS) in 2011 were 16% below 2005 levels. Ireland's target is to achieve a 20% reduction in total non-ETS GHG emissions by 2020.

8.2.2 Climate and Weather in the Existing Environment

County Galway has a temperate oceanic climate, resulting in mild winters and cool summers. The prevailing southwesterly winds 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 Claremorris, County Mayo is the nearest weather and climate monitoring station to the subject site, located approximately 56 kilometres northeast of the site. Meteorological data recorded at Claremorris over the 30-year period from 1961-1990 is shown in Table 8.8 overleaf.

8.2.2.1 Wind

The windfield 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 mean monthly wind speed at the closest synoptic weather station to the subject site in Shannpheasteen is 8.8 metres per second. 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.

8.2.2.2 Rainfall

Precipitation data from closest synoptic weather station to the subject site in Clare indicates a mean annual total of about 1,136 mm. Average annual rainfall at the at Claremorris Weather Station is higher in comparison to an average annual rainfall of 732 mm at Dublin Airport in the east of the country, which has the lowest annual average countrywide over the same period. This is due to its oceanic position on the Atlantic seaboard.

Table 8.8 Data from Met Éireann Weather Station, Claremorris, County Mayo 1961 to 1990

	Monthly and Annual Mean and Extreme Values												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	**Year**
TEMPERATURE (degrees Celsius)													
Mean daily max.	7.2	7.6	9.6	12	14.5	17	18.4	18.2	16.1	13.2	9.5	7.9	12.6
Mean daily min.	1.4	1.3	2.3	3.3	5.5	8.2	10.2	9.8	8.1	6.3	3	2.3	5.1
Mean	4.3	4.5	5.9	7.6	10	12.6	14.3	14	12.1	9.8	6.2	5.1	8.9
Absolute max.	13.1	13.3	20.1	22.3	25.1	29.8	30.5	27.2	23.3	19.9	15.4	14.3	30.5
Absolute min.	-11.7	-17.1	-8	-5.5	-3.1	-0.4	0.6	1.1	-1.2	-4	-5.3	-8.3	-17.1
Mean no. of days with air frost	9.7	8.9	6.8	3.9	0.8	0	0	0	0	1.1	6.1	8.3	45.6
Mean no. of days with ground frost	16	14.9	13.2	11.5	5.9	1	0.2	0.3	2	4.4	13.1	14.5	97
RELATIVE HUMIDITY (%)													
Mean at 0900UTC	91	91	88	84	80	81	84	87	89	92	92	92	88
Mean at 1500UTC	86	79	74	69	68	72	73	75	77	81	85	88	77
SUNSHINE (hours)													
Mean daily duration	1.45	2.11	2.87	4.4	5.08	4.64	3.79	3.81	3.1	2.39	1.81	1.11	3.05
Greatest daily duration	7.8	9.2	11.7	13.7	15.1	15.6	14.8	13.7	12.3	10.1	8.6	7	15.6
Mean no. of days with no sun	11	8	6	3	2	2	3	3	4	6	9	12	69
RAINFALL (mm)													
Mean monthly total	121.1	82.9	95.8	61.7	77.5	71.7	63.4	96.9	104.2	125.9	111.8	123.5	1136.4
Greatest daily total	33.1	27.9	27.5	19.8	42	74.6	38.8	55	41.6	59.5	49.2	41	74.6
Mean no. of days with >= 0.2mm	22	17	21	17	18	16	17	19	19	22	21	22	230
Mean no. of days with >= 1.0mm	18	14	17	12	14	12	11	14	15	17	17	17	178
Mean no. of days with >= 5.0mm	9	6	7	4	6	4	4	6	7	8	8	8	78
WIND (knots)													
Mean monthly speed	10	10	10.2	8.7	8.3	7.9	7.5	7.3	8	9	8.7	9.7	8.8
Max. gust	96	85	74	57	62	54	66	54	91	70	70	79	96
Max. mean 10-minute speed	59	48	45	36	41	36	39	33	60	46	40	51	60
Mean no. of days with gales	1.2	0.9	1	0.1	0.1	0.1	0	0	0.2	0.4	0.5	0.7	5.2
WEATHER (mean no. of days with:)													
Snow or sleet	6.5	5.4	4.7	1.9	0.3	0	0	0	0	0.1	1.7	3.5	24.1
Snow lying at 0900 UTC	2.6	1.4	0.7	0.2	0	0	0	0	0	0	0.3	1.1	6.3
Hail	4.2	3.3	5.7	3.6	1.9	0.4	0	0	0.7	1	3	2.7	26.5
Thunder	0.4	0.2	0.2	0.3	0.5	0.9	0.9	0.4	0.2	0.4	0.3	0.5	5.1
Fog	4.4	2.7	1.9	2.4	1.7	2.3	2.3	4.1	4.1	4.6	3.6	3.7	37.9

8.3 Dust

Dust levels in small urban and rural atmospheres can be influenced by local activities such as land cultivation and vehicle movements on unsealed access-ways. There are no national or European Union air quality standards with which these levels of dust deposition can be compared. However, the EPA's *'Environmental Guidelines for Environmental Management in the Extractive Industry (Non-scheduled Materials)'* suggests a figure of 350 mg/m^2/day (as measured using Bergerhoff type dust deposit gauges as per German Standard Method for determination of dust deposition rate, *VDI 2129.)* is commonly applied to ensure that no nuisance effects will result from specified waste management activities.

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).

For the purposes of assessing the potential for unacceptable soiling of property arising from dust emissions, a figure of 350 mg/m^2/day (as measured using Bergerhoff type dust deposit gauges as per German Standard Method for determination of dust deposition rate, VDI 2119) is recommended.

The VDI 2119 standard specifies that the dust deposition measurement period should be of one month duration 30 +/- 2 days. This guideline limit value of 350 mg/m^2/day is obtained from the commonly applied German TA Luft Air Quality Standard emission limit value, which was established to protect against damage or impairments to property or amenities and it, is to this standard that the results of this survey have been assessed.

8.3.1 Methodology

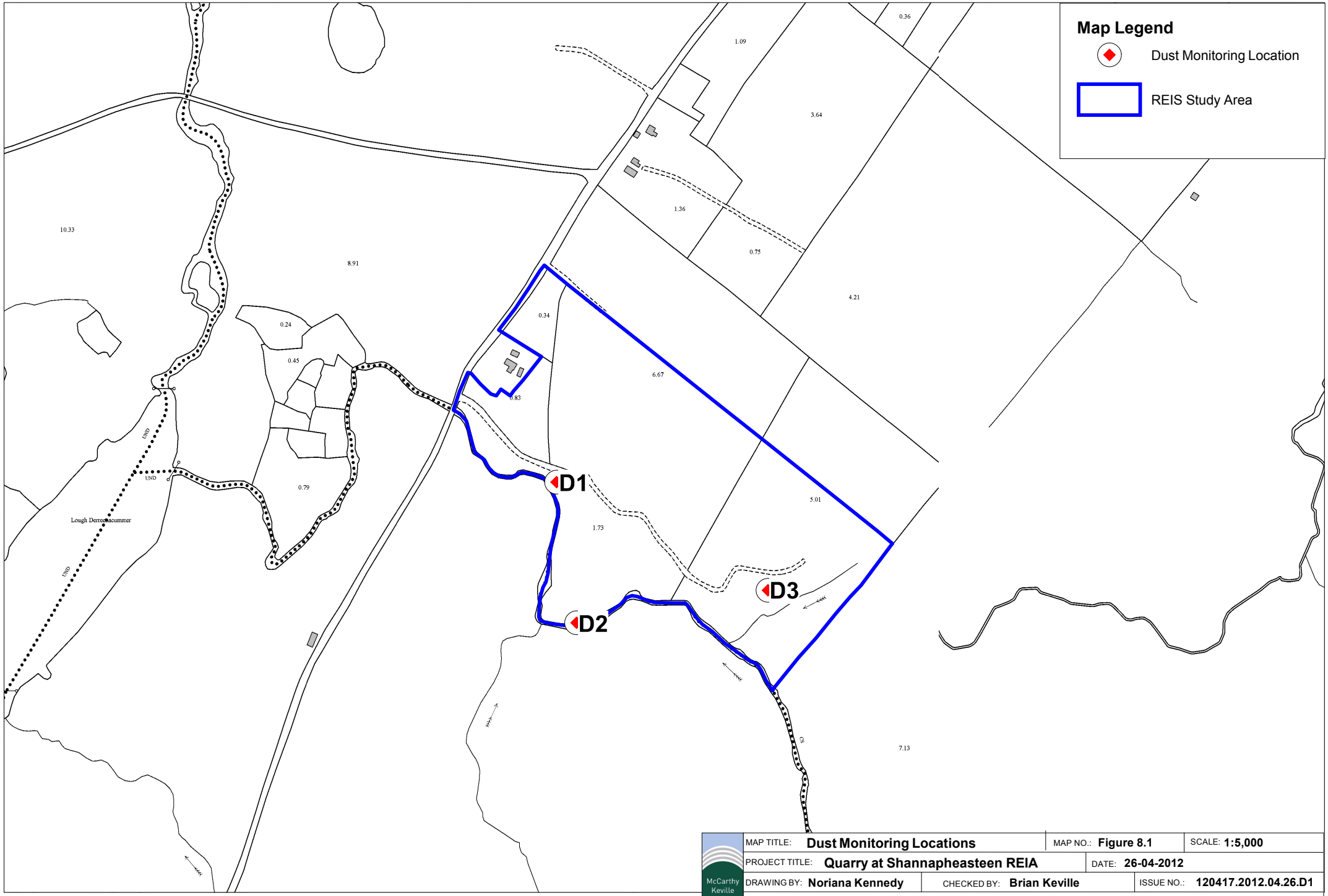
Total dust deposition was measured at the site using Bergerhoff gauges, as specified in the German Engineering Institute Standard VDI 2119 entitled *'Measurement of Dustfall Using the Bergerhoff Instrument (Standard Method)'*. Samples were collected at three fixed locations at the quarry: D1, D2 and D3, as shown on Figure 8.1, over a 28-day sample period between March 18th 2013 and April 15th 2013.

8.3.2 Monitoring Locations

The purpose of dust sampling is to assess the total depositional dust impact in the vicinity of the site. D1 was located along the site entrance road adjacent to the northern boundary of the operations area. D2 was located along the southern boundary of the site that borders the nearby watercourse. D3 was located along the eastern boundary of site operations. The glass jars containing the dust samples were submitted to Complete Laboratory Solutions, Rosmuck, Co. Galway, an accredited test house for analysis (see Appendix 7 for laboratory analyses certificate).

8.3.3 Weather

Met Eireann's weather report March-April 2013 shows winds that were mainly light to moderate and occasionally fresh. Unsettled weather continued with periods of rain and showers, sometimes heavy, with precipitation falling as snow or sleet at times. Otherwise dry, with long sunshine durations, but remained cold. Gale force winds were also recorded.



MAP TITLE: **Dust Monitoring Locations**		MAP NO.: **Figure 8.1**	SCALE: **1:5,000**
PROJECT TITLE: **Quarry at Shannapheasteen REIA**		DATE: **26-04-2012**	
DRAWING BY: **Noriana Kennedy**	CHECKED BY: **Brian Keville**	ISSUE NO.: **120417.2012.04.26.D1**	

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8.3.4 Total Dust Deposition Results

The results of dust monitoring are shown in Table 8.9.

Table 8.9 Average Ambient Total Dust Deposition Concentrations March/April 2013

Date	Monitoring Location	Monitoring Location Grid Reference	Average depositional dust (mg/m²/day
18th Mar 2013 to 15th Apr 2013 (28 days)	D1	N103,587 E232,872	104
18th Mar 2013 to 15th Apr 2013 (28 days)	D2	N103,608, E232,720	208
18th Mar 2013 to 15th Apr 2013 (28 days)	D3	N130,815 E232,755	67
Limit Value			350

8.3.5 Interpretation of Results

Currently in Ireland there are no statutory limits for total dust deposition. The EPA however, recommends a maximum level of 350 mg/m²/day of dust deposition when measured according to TA Luft standard, which includes both soluble and insoluble matter (i.e. EPA compliance monitoring is based on the TA Luft Method). The values presented in Table 8.9 show that total depositional dust levels measured at monitoring locations D1, D2 and D3 during March/April of 2013 were well below the 350 mg/m²/day limit value.

8.4 Likely and Significant Impacts and Associated Mitigation Measures

8.4.1 'Do-Nothing' Scenario

If the quarrying activity had not commenced on these lands, they would have continued to be managed as agricultural lands. No excavations or quarrying activity would have taken place on the subject site and any likely impacts would not have occurred.

8.4.1.1 Air

8.4.1.1.1 Short Term Slight Negative Impact

The use of machinery during the operation of the quarry results in the emission of air particulates. Operations such as the transport of equipment and materials as well as drilling are typical examples of machinery use. This impact is considered to be slight given the insignificant quantity of particulates that are emitted.

Mitigation

All construction machinery have been maintained in good operational order while on-site, minimising any emissions that are likely to arise.

8.4.1.2 Climate

8.4.1.2.1 Short Term Slight Negative Impact

The use of machinery during the operation of the quarry resulted in the emission of air particulates. Operations such as the transport of equipment and materials as well as drilling are typical examples of machinery use. This impact is considered to be slight given the insignificant quantity of particulates that are emitted.

Mitigation
All construction machinery have been maintained in good operational order while on-site, minimising any emissions that are likely to arise.

8.4.1.2.2 Short Term Slight Negative Impact

The removal of carbon fixing vegetation on site during the operation of the quarry is considered a slight negative impact.

Mitigation
The area of the subject site is approximately ten hectares and is an insignificant size to consider with regard to the loss of carbon fixing vegetation. The reduction in carbon fixing vegetation would be negligible to the surrounding areas. As the impact is only very slight no mitigation has been proposed.

8.4.1.3 Dust

8.4.1.4 Short Term Moderate Impact

Dust levels will have increased slightly higher than those found in rural areas. The operation of machinery and the excavation of soil and rock will increase dust levels in the area of the site.

The background dust level is of the order of 67-208 mg/m^2/day at present. The acceptable limit is 350 mg/m^2/day when measured using the TA Luft methods. International experience has shown that once the level is kept below 350 mg/m^2/day no significant nuisance is caused and complaints are unlikely. The dust levels required to have an impact on human health are significantly higher than this.

8.4.1.5 Mitigation

All construction machinery has been maintained in good operational order while on-site, minimising any emissions that was likely to arise. Dry construction materials are regularly covered when not in use to prevent point source air pollution. Road surfaces from the site entrance to the working area of the site are paved. Water spraying of conveyors, stockpiles and roads is carried out when necessary to reduce the production of dust. Whenever vehicles leave the site, loads are covered where possible. Regular cleaning of public roads in the vicinity of the entrance takes place to ensure nuisance dust is avoided.

9 NOISE AND VIBRATION

9.1 Introduction

This section of the Remedial Environmental Impact Statement (REIS) evaluates the impacts and remedial measures, if required, for the existing quarry at Shannapheasteen, Co. Galway in terms of Noise and Vibration as defined in the *'Advice Notes on Current Practice in the Preparation of Environmental Impact Statements'* (EPA, 2003).

9.2 Noise and Vibration Standards

In developing the noise and vibration assessment for this project, consideration has been given to the following guidance documents where appropriate:

- Planning Conditions imposed under Section 261 of the Planning and Development Act by Galway County Council (P.A. Reg. Ref. QY83);
- *'Environmental Management in the Extractive Industry'* (EPA 2004);
- *'Quarries and Ancillary Activities - Guidelines for Planning Authorities'* (DoEHLG, 2004);
- *'ISO 1996:2007 - Acoustics Description, assessment and measurement of environmental noise'*;
- *'BS 5228:2009 - Code of practice for noise and vibration control on construction and open sites - Part 1: Noise'*;
- *'BS 5228:2009 - Code of practice for noise and vibration control on construction and open sites - Part 2: Vibration'*; and
- *'BS 6472:2008 - Guide to evaluation of human exposure to vibration in buildings. Vibration sources other than blasting'*.

9.3 Noise and Vibration Standard Conditions

9.3.1 Noise Criterion

Operations at the quarry are carried out in compliance with Condition No. 2 (P.A. Reg. Ref. QY83) which was imposed under Section 261 of the Planning and Development Act 2000, and which states:

> *"The noise levels at the nearest sensitive receptor (existing residence) in the vicinity of the quarry, shall not exceed a LAeq (1 hour) of 55 dB(A) between 0800 and 1800 and a LAeq (15mins) of 45 dB(A) between 1800 and 0800."*

In summary the noise emissions from the site shall not give rise to sound pressure levels ($L_{Aeq,T}$) measured at the nearest noise sensitive location (NSL), which exceed the limit value(s).

- Daytime (08:00hrs to 18:00hrs): 55 dB $L_{Aeq,1hr}$[1]
- Night-time (18:00hrs to 08:00hrs: 45 dB $L_{Aeq,15min}$

It is understood that the quarry does not operate during night-time hours.

[1] Defined as being the "A-weighted" equivalent continuous sound level which, when maintained for one second, contains the same quantity of sound energy as the actual time varying level of one event.

9.3.2 Vibration Criterion

9.3.2.1 Vibration During Blasting

Blasting operations are carried out in compliance with Condition No. 6 (P.A. Reg. Ref. QY83) which was imposed under Section 261 of the Planning and Development Act 2000, and which states:

- *Ground vibration arising from any blast carried out on site shall not exceed a peak particle velocity of 12 mm/s in any of three mutually octagonal planes at the threshold of any house in the vicinity of the site.*
- *The air overpressure arising from the blasts shall not exceed 125 dB (lin) max peak with a 95% confidence limit when measured outside the nearest house to the blast.*

These criteria have been adopted from Section 3.5 of the EPA Environmental Management Guidelines November 2003.

9.3.2.2 Vibration During General Operations

BS 7385, 1993 states that there should typically be no cosmetic damage if transient vibration does not exceed 15 mm/s at low frequencies rising to 20 mm/s at 15 Hz and 50 mm/s at 40 Hz and above. These guidelines relate to relatively modern buildings and should be reduced to 50% or less for more critical buildings.

BS 5228-2, 2009 recommends that, for soundly constructed residential property and similar structures that are generally in good repair, a threshold for minor or cosmetic (i.e. non-structural) damage should be taken as a peak component particle velocity (in frequency range of predominant pulse) of 15 mm/s at 4 Hz increasing to 20 mm/s at 15 Hz and 50 mm/s at 40 Hz and above. Below these values, minor damage is unlikely. Where continuous vibration is such as to give rise to dynamic magnification due to resonance, the guide values may need to be reduced by up to 50%. BS 5288-2, 2009 also comments that important buildings which are difficult to repair might require special consideration on a case by case basis.

Table 9.1 indicates the maximum PPV values, below which transient vibration should not cause cosmetic damage buildings.

Table 9.1 Peak particle velocities (PPV in mm/s) below which transient vibration should not cause cosmetic building damage (*BS 7385, 1993* & *BS 5228-2, 2009*)

Type of structure	Frequency of vibration	
	4 Hz to 15 Hz	15 Hz and above
Residential or light commercial buildings	15 mm/s at 4 Hz increasing to 20mm/s at 15 Hz	20 mm/s at 15 Hz increasing to 50mm/s at 40 Hz and above

Table 9.2 indicates the maximum PPV values as recommended by the EPA 2004 guidance document.

Table 9.2 Operational peak particle velocities (PPV in mm/s) limit for quarry activities (EPA, 2004)

Type of structure	Frequency of vibration
	Less than 40Hz
Noise sensitive receptor	12 mm/s, measured in any of the three mutually orthogonal directions at the receiving location

9.4 Methodology

The impact of the quarry has been determined in the following sections by comparing the predicted noise and vibration levels for activities occurring during the peak year of extraction to the adopted noise and vibration criteria.

9.5 Receiving Environment

The nearest sensitive location to the quarry is the residential dwelling located adjacent to the quarry entrance. This dwelling was built by the applicant in 2007 and has not been occupied to date. The next nearest dwelling that was occupied prior to 2007 is located to the north of the quarry at a distance of approximately 300 metres from the quarry floor. In general, the existing noise climate is typical of a rural location.

An environmental noise survey was conducted in order to quantify the noise environment without quarry activity. The survey was conducted in general accordance with ISO 1996: 2007: *'Acoustics – Description, measurement and assessment of environmental noise'*. Specific details are set out below.

9.5.1 Dates and Times of Survey

For the purpose of this assessment, daytime is taken to be between 07:00hrs and 19:00hrs, whilst night-time is between 19:00hrs and 07:00hrs. It is understood that the quarry, operates during daytime hours only and as such a night-time survey is not required.

The survey was conducted on 5th April 2013 between 12:35hrs and 14:00hrs. The survey period was selected in order to provide a typical snapshot of the background noise climate during the normal operating hours for the quarry. The quarry was not in operation during the survey period; however, the operator did carry out some activities in order to simulate the noise-generating activity typical to the site.

9.5.2 Personnel and Instrumentation

Stephen Smyth of AWN Consulting Ltd. conducted the noise level measurements.

The noise measurements were performed using a Brüel & Kjær Type 2260 Sound Level Analyzer. Before and after the survey the measurement apparatus was check calibrated using a Brüel & Kjær Type 4231 Sound Level Calibrator.

9.5.3 Measurement Locations

One measurement location was selected; as described below and shown on Figure 9.1. Location 1 is located along the northern boundary of the site, in the vicinity of the nearest sensitive location at the entrance to the quarry.

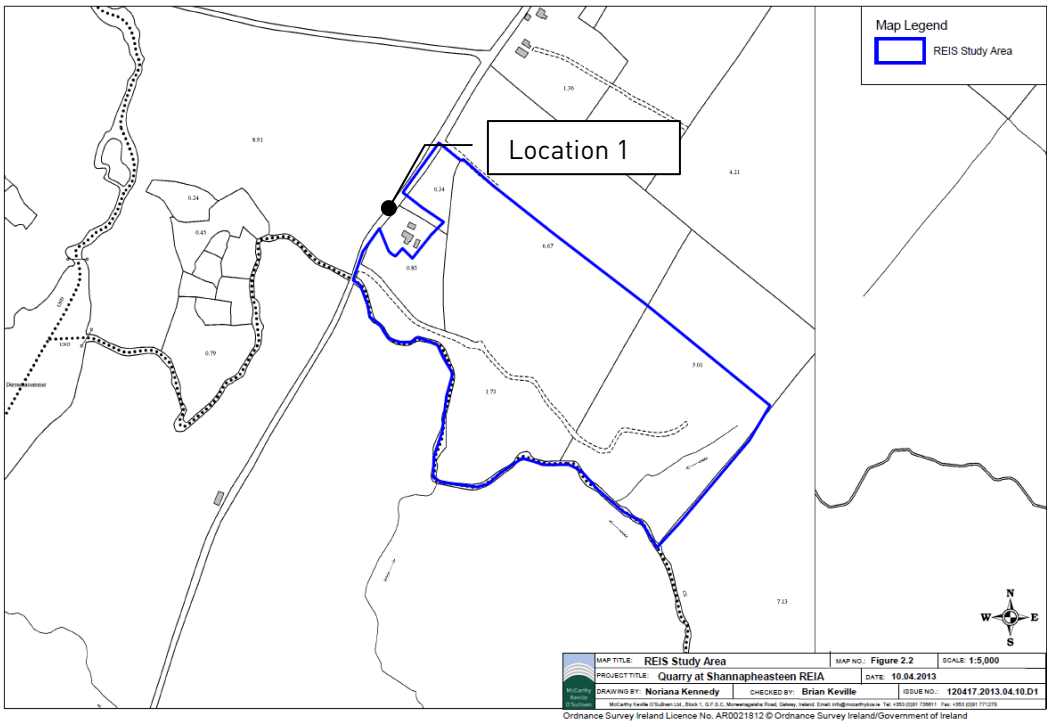


Figure 9.1 Survey Location

9.5.4 Noise Survey Methodology

Sample periods for the noise measurements were 15 minutes. The results were noted onto a Survey Record Sheet immediately following each sample, and were also saved to the instrument memory for later analysis if required. Survey personnel noted the primary noise sources contributing to noise build-up.

9.5.5 Weather

The weather during the survey period was dry and bright with winds of less than one metre per second and temperatures of the order of 6°C.

9.5.6 Noise Measurement Parameters

The noise survey results are presented in terms of the following five parameters:

L_{Aeq} is the equivalent continuous sound level. It is a type of average and is used to describe a fluctuating noise in terms of a single noise level over the sample period. It is typically used as a descriptor for ambient noise.

L_{Amax} is the instantaneous maximum sound level measured during the sample period.

L_{Amin} is the instantaneous minimum sound level measured during the sample period.

L_{A10} is the sound level that is exceeded for 10% of the sample period. It is typically used as a descriptor for traffic noise.

L_{A90} is the sound level that is exceeded for 90% of the sample period. It is typically used as a descriptor for background noise.

The "A" suffix denotes the fact that the sound levels have been "A-weighted" in order to account for the non-linear nature of human hearing. All sound levels in this report are expressed in terms of decibels (dB) relative to $2x10^{-5}$ Pa.

9.5.7 Survey Results and Discussion

9.5.7.1 Location 1

The survey results for Location 1 are given in Table 9.3 below.

Table 9.3 Summary of Noise Measurements from Location 1

Period	Time (hrs)	Measured Noise Levels (dB re. 2x10-5 Pa)				
		L_{Aeq}	L_{Amax}	L_{Amin}	L_{A10}	L_{A90}
Baseline	12:35 – 12:50	49	69	28	47	31
	13:17 – 13:32	48	70	25	47	27
	13:32 – 13:47	52	77	30	48	35
	13:47 – 14:00	44	66	30	44	34

During the baseline measurements, the main noise source observed at this location was very occasional road traffic movements. Other sources noted were birdsong, distant dog barking and water flow in a nearby stream. Noise levels were in the range of 44 dB to 52 dB L_{Aeq} and in the range of 27 dB to 35 dB L_{A90}.

No significant sources of vibration were noted at this location.

9.6 Assessment of Impacts

The quarry is a stone quarry which extracts and cuts stone to be used as paving, block stone, building stone etc. For the purposes of this assessment it has been assumed that in a worst-case year the quarry operated continuously between the hours of 8am and 5pm, this has been used in order to conservatively estimate the impact of the quarry in the surrounding environment, under "worst case" operating conditions.

In terms of the detailed operation of the quarry, no blasting has occurred in the recent past, however, it may have been used historically to extract the material. The stone is extracted manually by drilling to split the stone and using an excavator to leverage the rock from the quarry face. The loose stone is then moved to be cut by way of a hydraulic guillotine. After cutting, the material is either transported off site via a HGV or stored on-site.

For the purposes of the noise assessment, the impact is assessed over a worst-case hour period. During the peak period or operation on the quarry, it is estimated there was a maximum of one truck movement in and out of the site per hour. Therefore, for the purpose of the assessment a conservative estimate of two truck movements (i.e. one in and one out) per hour has been used.

9.6.1 Noise Impact

The following operations are noise generating sources or activities at the Shannapheasteen quarry:

- Site activity, including;
  - extraction of material, including rock breaking;
  - excavator movements on site, and;
- Movement of HGVs along paved public roads;
- movement of HGVs along unpaved site roads, and;
- Blasting noise and vibration.

9.6.1.1 Site Activity

Measurements of noise emissions associated with on-site activities were measured during the noise survey. This included the noise emissions from the generator operating on site and the guillotine while operating.

Additional activity that was not occurring during measurement but which did occur in the past was rock breaking, rock drilling and crushing/screening. However, it is possible to predict typical noise levels from these activities using guidance set out in British Standard BS 5228 – 1: 2009: *Code of Practice for Noise and Vibration Control on Construction and Open Sites: Noise*.

In this instance, the nearest noise-sensitive location to the site is located to the north at a distance of the order of 200 metres. For a worst-case assessment it is assumed that equipment within the quarry was operating in the centre of the quarry site as this is where the material has been removed to date.

Table 9.4 outlines the noise levels associated with typical construction noise sources assessed in this instance as sound pressure levels from BS 5228 – 1: 2009.

Table 9.4 Construction Noise Levels Used for Prediction Model

Item (BS 5228 Ref.)	dB LAeq at 10m
Excavator Mounted Rock Breaker (C9 12)	85
Tracked Crusher (C9 14)	90
Tracked Mobile Drilling (C9 4)	87
Generator (Measured by AWN)	67
Guillotine (Measured by AWN)	80

For the purposes of presenting a robust assessment, it has been assumed that all items of plant listed in Table 9.4 operated simultaneously and continuously during working hours. Taking the noise levels in Table 9.4 and correcting them for attenuation due to the distance to the nearest noise sensitive locations (approximately 200 metres to the north) and also correcting for the shielding offered by the quarry walls and earth berms the predicted noise level at the nearest noise sensitive location is 53 dB $L_{Aeq,T}$.

9.6.1.2 HGV Movements on Public Roads

In terms of the additional traffic on local roads generated as a result of HGV movements to and from the quarry the following comment is presented. At its peak, the operation of the quarry generated one HGV movements in and out and a very small number of staff movements along the local road network over a typical peak hour period. Considering that in order to increase traffic noise levels by 1 dB traffic volumes would need to increase by the order of 25% it is considered that these additional traffic movements introduced onto the local road network during peak operation of the quarry would not have resulted in a significant noise impact.

9.6.1.3 HGV Movements on Site Roads

It remains to show that HGV movements along the site access road are also within the commonly adopted criterion.

The potential noise impact of vehicles accessing the quarry is assessed through consideration of the cumulative noise level associated with a series of individual events. The noise level associated with an event of short duration, such as a vehicle

drive-by, may be expressed in terms of its Sound Exposure Level (L_{Ax}). The SEL can be used to calculate the contribution of an event or series of events to the overall noise level in a given period. The appropriate formula is as follows.

$$L_{Aeq,\,T} = L_{Ax} + 10\log_{10}(N) - 10\log_{10}(T) - 20\log_{10}(r_2/r_1) - S \text{ dB}$$

Where:

$L_{Aeq,\,T}$ is the equivalent continuous sound level over the time period T (s);
L_{Ax} is the "A-weighted" Sound Exposure Level of the event under consideration (dB);
N is the number of events over the course of time period T.
r_2 is the distance from the edge of the entrance road to the facade of nearest property
r_1 is the distance from vehicle to the point of original measurement
S is the attenuation due to screening

The mean value of Sound Exposure Level for a HGV at low speeds is of the order of 87 dB LA_x at a distance of five metres from the edge of the road. This figure is based on a series of measurements conducted under controlled conditions. A 5 dB penalty has been included to account for the unfinished nature of the site access road.

In this instance, the nearest noise sensitive locations to the quarry access road are the residential properties at the entrance of the site at a distance of approximately 30 metres.

As discussed previously, for the purposes of calculations a worst-case scenario of two HGV movements in any one-hour period during the daytime is used. The predicted daytime noise level at the nearest noise sensitive locations is calculated as 39 dB $L_{Aeq,1hr}$.

9.6.1.4 Blasting Noise

No blasting has taken place on site in the recent past. However, a limited degree of blasting did take place historically to remove overburden and expose the rock.

Blasting noise is assessed using the air overpressure parameter. Air overpressure is energy transmitted from the blast site within the atmosphere in the form of pressure waves. As such a wave passes a given position, the pressure of the air at this point rises very rapidly to a value above the ambient pressure, and then falls more slowly to a value below, before returning to the ambient value after a series of oscillations. The maximum excess pressure in this wave is known as the peak air overpressure. This value can be measured in terms of pounds per square inch or, more usually, in terms of dB (Lin).

These pressure waves will consist of energy over a wide range of frequencies, some of which are audible and known as sound waves or noise, but most of the energy is inaudible at frequencies of less than 20 Hz.

Air overpressure is transmitted through the atmosphere in a similar manner to sound waves. Thus, meteorological conditions, such as wind speed and direction, temperature, cloud cover and humidity will affect the intensity of the air overpressure value experienced at a distance from the blast site.

With no historical monitoring data available for the blasting that took place it is not possible to accurately assess the level of impact that was generated. However, we can make reference to published studies on blasting in order to draw some conclusion. Routine open-pit blasting operations in the UK regularly generate air overpressures up to a magnitude of 120 dB (Lin) (measured with a 2.0 Hz High Pass system), with levels in excess of 125 dB (Lin) being relatively rare[2]. Damage levels are rarely approached let alone exceeded. EPA Guidance[3] indicates acceptable limits for air overpressure should not exceed 125dB (Lin) Peak Value.

Taking the above into consideration along with the fact that blasting has not occurred on site recently, any noise impact due to blasting is likely to have been short term in nature and there is no residual impact remaining.

9.6.2 Vibration Impact

Historically the site activity with the greatest potential for causing a vibration impact was blasting. No monitoring data is available for vibration levels during the historical blasts. The level of vibration that would have been generated depends upon the distance to the nearest sensitive locations, the maximum instantaneous charge weight of explosive, the delay sequencing and the geological nature and structure between the blast location and the receiver. Without monitoring data it is impossible to accurately determine the magnitude of vibration during the infrequent blasts, however, in the absence of local complaints of vibration induced damage to property it is considered likely that the vibration levels were below the recommended criteria as discussed in Section 9.3.2.

Of the current site activities there is the potential for the generation of some vibration due to HGV movements along the unfinished site access road, however considering the slow speeds (necessitated by the unfinished nature of the road) it is not expected that a significant vibration impact would have occurred. In addition, rock breaking activity could also generate some vibration, however, give the distance from the quarry floor to the nearest dwellings is approximately 200 metres the likelihood of any perceptible vibration due to rock breaking is negligible.

9.7 Mitigation Measures

The site layout itself provides a significant degree of natural acoustic screening to the nearest residential dwellings.

At peak operations the quarry is not expected to have had any significant noise and vibration impact on the nearest sensitive location; therefore no mitigation measures are required.

[2] Wilton, T.J., Institute of Quarrying Transactions, '*Air Overpressure from Blasting*'.
[3] EPA Environmental Management Guidelines November 2003. Section 3.5

10 LANDSCAPE

10.1 Introduction

This section of the Remedial Environmental Impact Statement (REIS) addresses the landscape and visual impacts of the existing quarry. It includes a description of Galway County Council landscape policy and examines the quarry sites' landscape value and sensitivity. The landscape of the area is described in terms of its character, which includes a description of the physical, visual and image units. The visual impact assessment of the existing quarry encompasses the use of photomontages and visibility mapping.

The only available, quasi-official document providing guidance on landscape at a national level is *'Outstanding Landscapes'*, published by An Foras Forbartha in 1976. In 2000, the then Department of the Environment and Local Government built on this document by producing *'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 section of the REIS has been broadly based on these guidelines.

The *'Guidelines for Landscape and Visual Impact Assessment'* (The Landscape Institute/Institute of Environmental Management & Assessment, UK, 2003), was an important reference source in carrying out the landscape and visual impact assessment of the existing development.

10.2 Landscape Policy

This section of the REIS refers to the objectives of Galway County Council with regards to protection of the landscape and the siting of developments. It refers to both the Galway County Development Plan 2009 – 2015 and the Landscape Character Assessment of County Galway.

10.2.1 Galway County Development Plan 2009 – 2015

10.2.1.1 Landscape Policies and Objectives

The Galway County Development Plan 2009 – 2015 sets out an overall strategy for the proper planning and sustainable development of County Galway. The policies and objectives of Galway County Council with regards to Landscape Conservation and Management are set out in Section 9.4.2 of the Plan, and include the following:

Policy HL93 The 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 proposed development in the landscape will also be critical considerations.

Policy HL94 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. This shall be balanced against the need to develop key strategic infrastructure to meet the strategic aims of the Plan.

Policy HL95 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.

Policy HL96 The Planning Authority shall prepare a detailed scheme of listed views for protection in addition to the views and prospects included in Map HL2 (Focal Points/Views) of the County Development Plan, within two years of adoption of the Plan.

Policy HL97 Review the views and prospects set out on Map HL2 (Focal Points/Views) to provide greater clarity and guidance with respect to important views and prospects to be retained.

Objective HL44 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 significant proposals.

Objective HL45 Development that would have a detrimental effect on listed views and prospects will generally not be permitted.

10.2.2 Landscape Character Assessment of County Galway

10.2.2.1 Landscape Character Areas

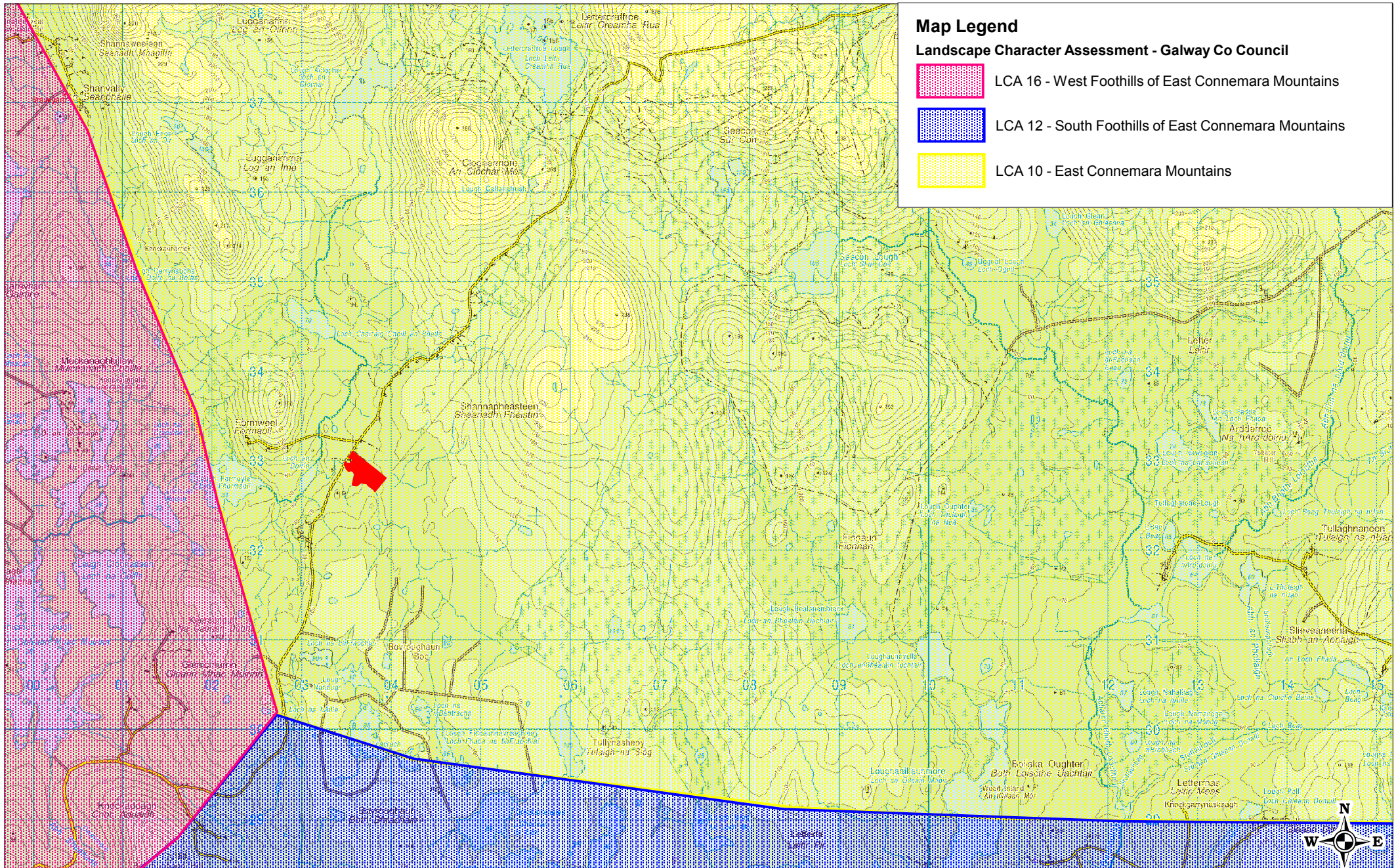
The Landscape and Landscape Character Assessment for County Galway, published by Galway County Council in 2002, divides the county into 25 distinct Landscape Character Areas (LCAs). The subject site is located within Landscape Character Area 10: East Connemara Mountains (Moycullen, Recess to Glinsk) as shown in Figure 10.1. This LCA is described in the Galway County Council Landscape Character Assessment as follows:

"The landscape is largely mountainous with slopes covered with coniferous forestry. The lower areas comprise rocky out crops and areas of rough grassland around the many small loughs and turloughs. The landscape is scenic although not remarkable."

10.2.2.2 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 Map as set out in the 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



MAP TITLE: **Landscape Character Area**		MAP NO. **Figure. 10.1**	SCALE: **1:55,000**
PROJECT TITLE: **Shannapheasteen, Casla, Co Galway**			DATE: **29-04-2013**
DRAWING BY: **Noriana Kennedy**	CHECKED BY: **Brian Keville**		ISSUE NO. **120417-2013.04.29**

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As shown in Figure 10.2, the landscape sensitivity of the majority of the site is designated as Class 3 (High) on a scale of 1 to 5 by the Landscape Character Assessment of County Galway, where Class 1 is Low and Class 5 is Unique.

10.2.2.3 Focal Points and Views

The Galway County Council Landscape and Landscape Character Assessment lists 122 focal points and views within the county. There are no designated focal points or views pertaining to the subject site. The nearest viewpoint is that listed as View No. 85, towards the hill at Keeraunnagark North, which lies approximately five kilometres east of Costelloe. It is a policy of Galway County Council under the current County Development Plan to carry out a review of the views and prospects set out in the previous Plan, as stated in Section 10.2.2.1 above.

10.3 Landscape Character

Landscape character refers to the distinct and recognisable pattern of elements that occurs consistently in a particular type of landscape, and how people perceive this. It reflects particular combinations of geology, landform, soils, vegetation, land use and human settlement, and creates the particular sense of place found in different areas. The identification of landscape character comprises the identification of the physical, visual and image units.

10.3.1 Physical Unit

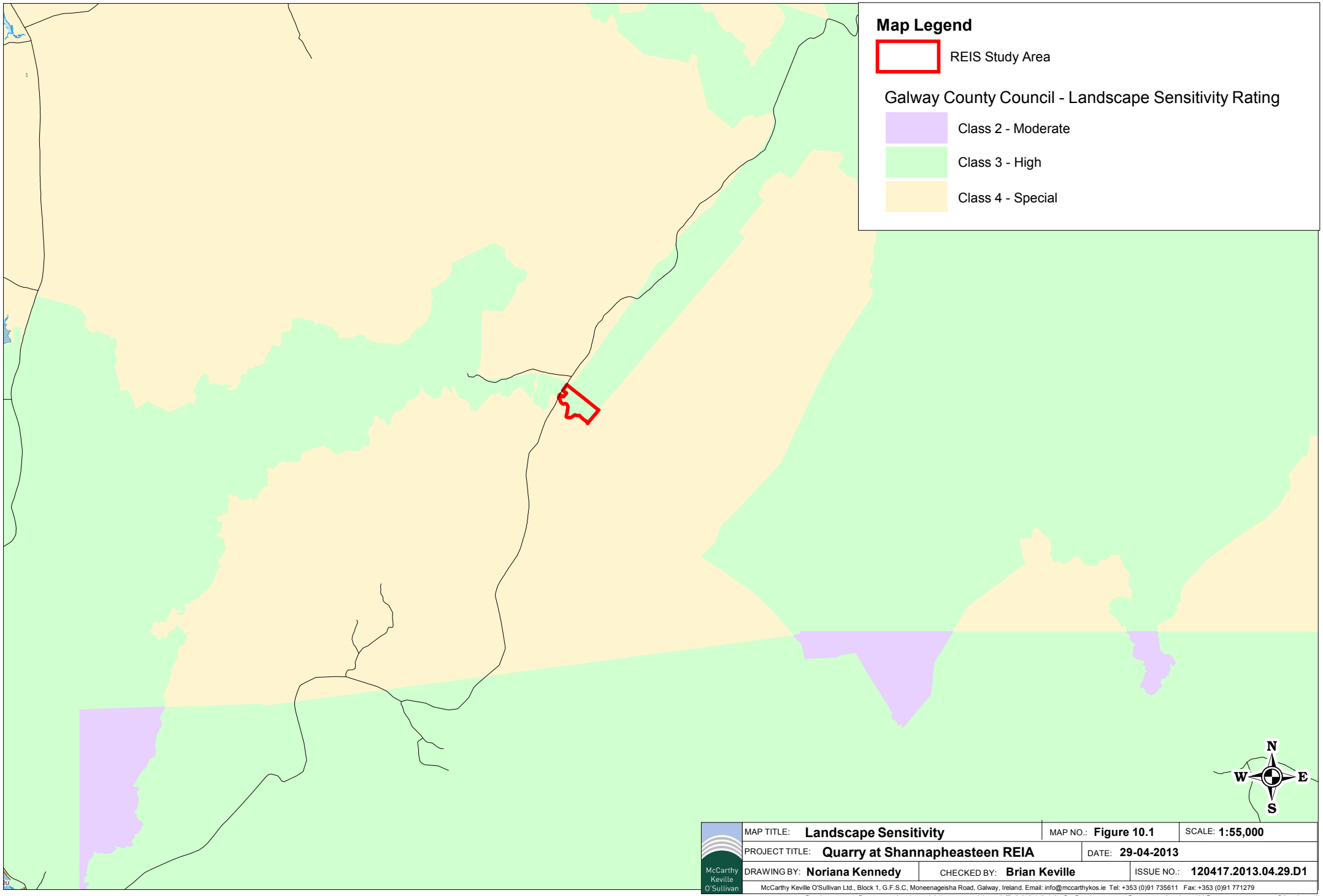
The topography, vegetation and anthropological features on the land surface in an area combine to set limits on the amount of the landscape that can be seen at any one time. These physical restrictions form individual areas or units, known as physical units, whose character can be defined by aspect, slope, scale and size. A physical unit is generally delineated by topographical boundaries and is defined by landform and landcover.

The physical unit in which the subject site is located is shown on Figure 10.3. This landscape unit comprises the mountainous lands east of Camus and Casla Bay and north of Galway Bay and the R336 regional road which travels in an east west direction from Galway City to Rossaveal in south Connemara. The village of Oughterard and Lough Corrib lies to the northeast outside the physical unit boundary. Landcover within this physical unit comprises mountainous areas, peatland interspersed with rocky granite outcrops, forestry, lakes and watercourses. Smaller areas are occupied by pockets of pasture, transitional woodland scrub, grassland and heaths. The landscape unit encompasses very few populated settlements. The area is traversed by the local road which travels in a southwest northeast direction from Oughterard to Casla.

The topography of this physical unit is undulating to mountainous, with several hills interspersed through the landscape particularly to the northeast of the physical unit. The highest point in the vicinity of the site is Shannawona which has a peak of 346 metres O.D.

10.3.1.1 Landform

Present-day landscapes owe their form to the geological materials from which they were carved. Landform is the term used to describe the spatial and formal arrangement of landscape components as a natural product of geological and geomorphologic processes in the past, and refers primarily to topography and drainage.



MAP TITLE: **Landscape Sensitivity**	MAP NO.: **Figure 10.1**	SCALE: **1:55,000**	
PROJECT TITLE: **Quarry at Shannapheasteen REIA**	DATE: **29-04-2013**		
DRAWING BY: **Noriana Kennedy**	CHECKED BY: **Brian Keville**	ISSUE NO.: **120417.2013.04.29.D1**	

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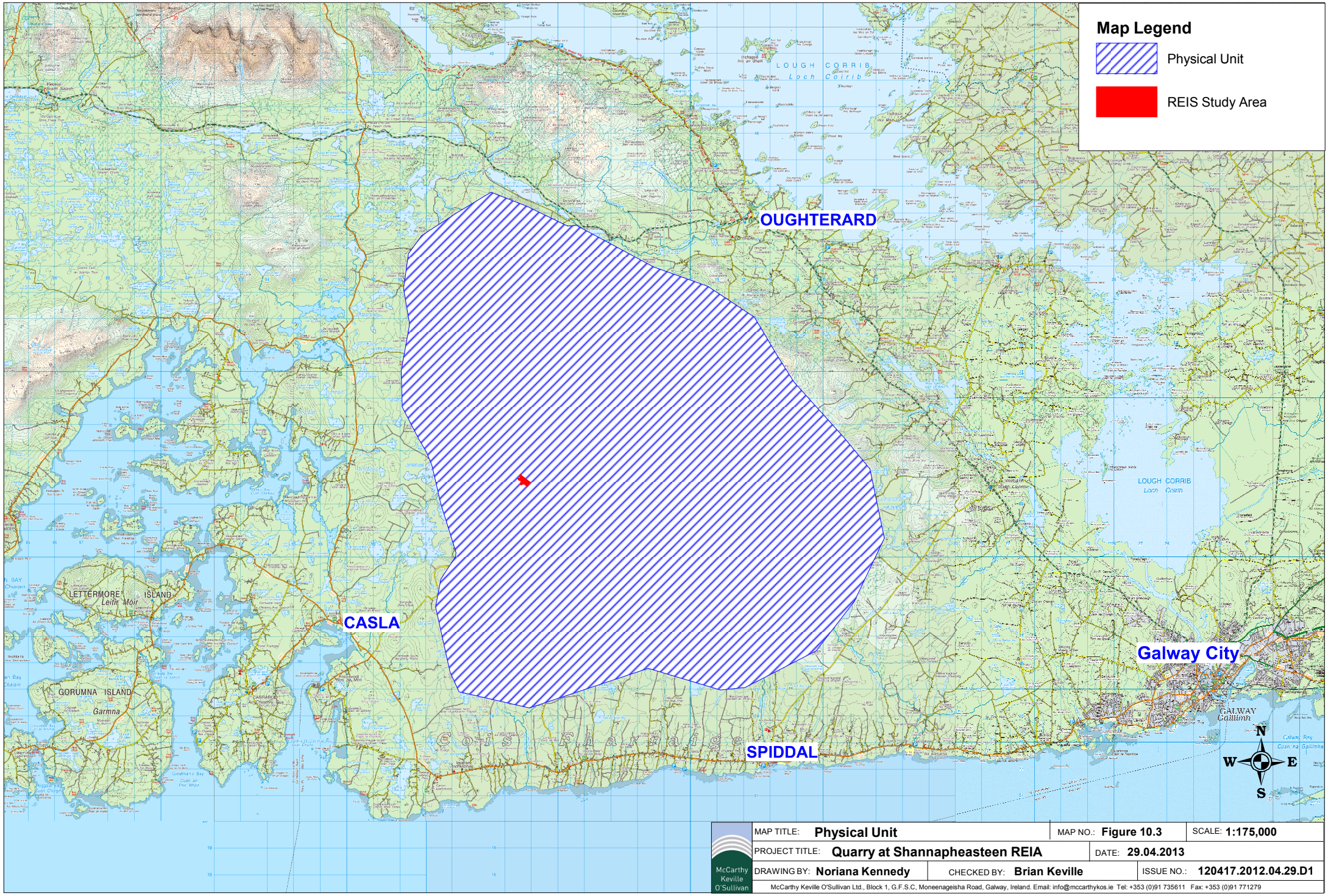

MAP TITLE: **Physical Unit**	MAP NO.: **Figure 10.3**	SCALE: **1:175,000**	
PROJECT TITLE: **Quarry at Shannapheasteen REIA**	DATE: **29.04.2013**		
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10.3.1.1.1 Topography

The subject site has an elevation of approximately 80 metres O.D. Hillier topography occurs to the north and northeast of the site with significant peaks at Lackadunna (317 metres O.D), Lettercraffoe (276 metres O.D), Knockwaumnamoe (239 metres O.D), (Shannapheasteen (220 metres O.D) and Cloughermore (208 metres O.D.) The topography of the land is generally lower directly west of the site. The highest point in the vicinity of the site is Shannawona which has a peak of 346 metres O.D. The topography west of the subject site is undulating, with elevations ranging from approximately 20 metres O.D. to 100 metres O.D. as it descends to the coastline further east.

10.3.1.1.2 Drainage

The *'Geology of Galway Bay'* booklet (GSI, 2004) states that the granite rocks of Connemara coastal area are characterised by a low fissure permeability. They are classed as poor aquifers, which are generally unproductive. Most groundwater in these areas moves in the upper fractured zone and more permeable beds of limited extent. The flow is generally in localised systems with little continuity between them. The low storage in these strata is usually balanced by the higher rainfall on uplands.

The coastline around Casla is indented with several small bays and inlets. Casla Bay lies southwest of the subject site. A river borders the site all along its southwestern boundary. This watercourse is a tributary to the Casla River which drains into Casla Bay further west.

There are several lakes and watercourses located within this area. Loch an Doirin, Lough Formoyle, Lough an Hoisin, Loch na Craoibhe, Muckanagh Lough, Lough Cloonadoon, Glenicmurrin Lough, Lough Naskeha, Lough Nambroughharia and Lough Ederaucruck all lie within eight kilometres west of the subject site.

10.3.1.2 Landcover

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. Landcover on the subject site is comprised of recolonising bareground (where quarry works have taken place), cutover bog, lowland blanket bog and wet and dry heath.

Cutover bog occurs mainly in the northeastern section of the site. This part of the site encompasses areas that have been cut in the past and are now re-vegetated, and areas where turf-cutting is still being carried out.

Plate 10.1 shows the view of the subject site from the adjacent local road. This photograph shows an area of heath in the foreground with pockets of gorse. A rocky outcrop is visible within this view, as are the treelines that line the entrance road. The bare recolonising ground of the quarry is also visible.

10.1 Heath, rock outcrops and recolonising bare ground on the quarry site

Plates 10.2 shows the view of the site from the adjacent local road with heath and rocky outcrops in the foreground. The exposed rock of the quarry site can slightly be seen in the mid ground. The view presented in Plate 10.2 shows the rolling topography of the lands to the northeast of the subject site.

Plate 10.2 Heath, rock outcrops and recolonising bareground on subject site and hillier topography in background.

Plate 10.3 Entrance road to quarry site

Plate 10.3 shows the view along an existing entrance road to the subject site. The roadway is bordered by treelines to the northeast and pockets of gorse and rushes located in the heath area to the southwest.

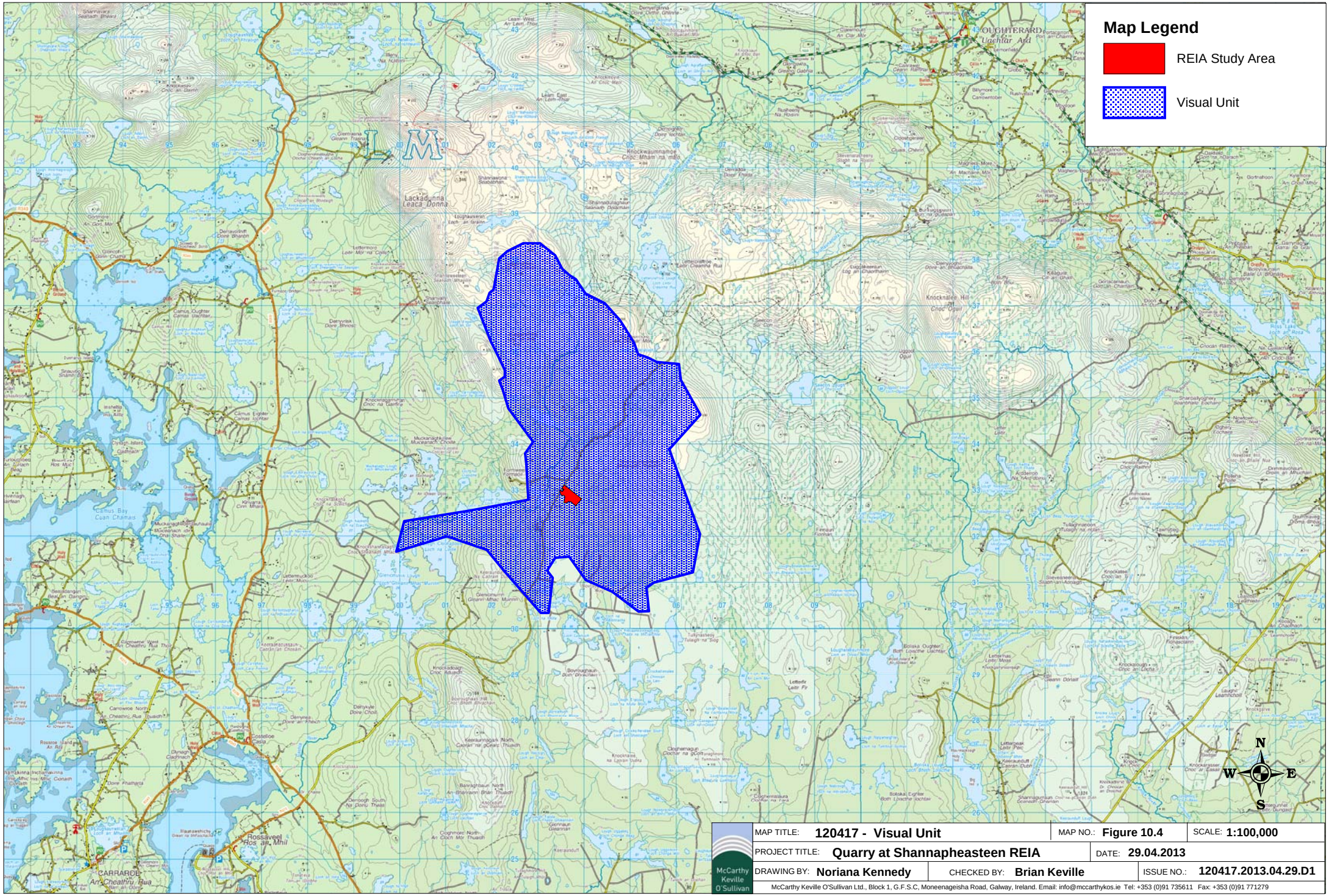
10.3.2 Visual Unit

A visual landscape unit is defined by spatial enclosure and pattern, i.e. by landform and landcover. The limits of the views that are available from a particular area are therefore determined by the physical landscape, such as topographical and vegetation boundaries. The visual unit of the subject site is shown in Figure 10.4.

Broad sweeping views are available to the north from the subject site towards the hills of Lugganaffrin, Lugganimma, Cloghermore. To the east of the site the hilly topography in Shannapheasteen encloses the view. The views to the west extend as far as the hill of Formweel less than a kilometre away and then open up further south with slight views of Lough Formoyle and Lough an Roisin 1.5 kilometres away. To the southwest the hill at Keeraunduff limits the view. Further south the hills of Bovroughan Bog and Tullanasheoy are seen on the horizon. To the southwest the views of the forested hills in Shannapheasteen dominate the horizon. Views from the site comprise mainly of open hilly unenclosed bogland, heathlands with patches of gorse and rushes, tracts of commercial forestry and very few settlements.

10.3.3 Image Unit

An image unit is a feature that acts as a major focal point within the landscape. Such features contribute to the creation of a strong identity or sense of place. The landscape of this area, as a whole, is intrinsic to the character of this part of County Galway. However there is no one single feature or image unit that contributes specifically to the identity of the area.



MAP TITLE: **120417 - Visual Unit**		MAP NO.: **Figure 10.4**	SCALE: **1:100,000**
PROJECT TITLE: **Quarry at Shannapheasteen REIA**		DATE: **29.04.2013**	
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10.4 Landscape Sensitivity

The sensitivity of a landscape to development and therefore to change varies according to its character and to the importance that is attached to any combination of landscape values. The sensitivity of a landscape is derived from consideration of designations such as Special Protection Areas (SPAs), Special Areas of Conservation (SACs), Natural Heritage Areas (NHAs) and National Parks, from information such as tourist maps, guidebooks and brochures, and from the evaluation of indicators such as uniqueness, popularity, distinctiveness, and quality of the elements of the area.

An assessment of landscape sensitivity in the vicinity of the existing development site was carried out during site visits April 2013. The methodology for this assessment was based on that set out in the Department of the Environment and Local Government (DoELG) guidance document *'Landscape and Landscape Assessment – Consultation Draft of Guidelines for Planning Authorities'* (2000). This document recommends an assessment of landscape sensitivity based on an evaluation of individual features, such as the quality, integrity, etc. The results of the assessment are presented in Table 10.1.

Table 10.1 Features of Landscape Sensitivity

Feature	Description
Quality	The quality of the landscape in this area can be described as modified, with few features not having been affected by some anthropogenic influence, in particular peat extraction but also the existing presence of the quarry itself. Overall, the level of built development that has taken place within the wider landscape is relatively low.
Integrity	The area surrounding the quarry development site has been modified by the interaction of man with the natural environment, primarily in the form of rock and peat extraction, but to a lesser extent by commercial forestry plantations further to the north and east. In the context of the wider landscape, extensive areas to the west and northeast of the site have been planted with coniferous forestry. The land-uses of peat extraction and forestry are inherent to the character of this area, which is an active rural landscape. The quarry site itself has been altered with the excavation of stone and bare recolonising bare ground now a feature.
Distinctiveness	The subject site is distinctive from the adjoining lands in terms of the quarrying activity that has taken place. Rock extraction has taken place predominantly to the southwest of the REIS Study area. Rock has been left exposed and this section of the site. To the northeast of the site lands have been degraded through years of turf cutting by hand and by machine, leaving this area of the site clearly distinctive from the surrounding lands. The northwestern area of the REIS Study area surrounds a residential property. Within the wider landscape, landcover comprises a mix of cutover and blanket bog, heath, coniferous forestry and low-intensity agriculture, land-uses that are typical in this part of County Galway.
Popularity	A sense of popularity is created where landscape features are widely recognised or appreciated. The subject site is not currently used for tourist or recreational activities, and there is no sense of popularity pertaining specifically to the site. In the context of the wider area however, the Connemara landscape, in which the site is located, is recognised and appreciated by both locals and tourists as a key feature in attracting people to this part of Galway.
Rarity	Approximately 3.3 hectares of the Connemara Bog Complex SPA and 3.5 hectares of the Connemara Bog Complex cSAC are located within the southern site boundary of the quarry site. The Connemara Bog Complex Proposed Natural Heritage Area (pNHA) is located south of the site, within 300 metres at the nearest point.

Feature	Description
Cultural Meaning	A sense of cultural meaning arises where a site or features within a site are deemed to explain, represent or inspire cultural values. The landscape and cultural heritage of Connemara are strongly interlinked. Turf cutting, which is carried out on the development site, is a traditional land use that provides a link to the past. There are no recorded sites or monuments within the site.
Sense of Public Ownership & Social Importance	A sense of public ownership arises due to ease of accessibility, visibility or a widely shared meaning. The quarry site is visible from the surrounding area but is not immediately distinct from the adjoining lands, due to the general absence of boundaries such as hedgerows, stone walls or fences. The site is small in comparison to the vast landscape surrounding it.

10.5 Landscape and Site Context

This section of the REIS describes the views of the surrounding landscape that are available from the development site. It also describes the existing views towards the site from the surrounding area, with particular reference to the views from roads, houses, and areas of amenity value.

10.5.1 Views From the Site

Views to the north from the existing site primarily comprise areas of blanket and cutover peat, heath and interspersed with occasional houses. The hilly topography to the north and northeast of the site is visible from much of the site. Lugganaffrin, Lugganimma, Cloghermore can be seen. To the east of the site the hilly topography in Shannapheasteen encloses the view. Views west are of the hills of Formweel and Kerraunduff with slight views of nearby lakes. The view from the existing site towards the south has broad sweeping views of the undulating hills of Bovroughan Bog.

10.5.2 Views Towards the Site

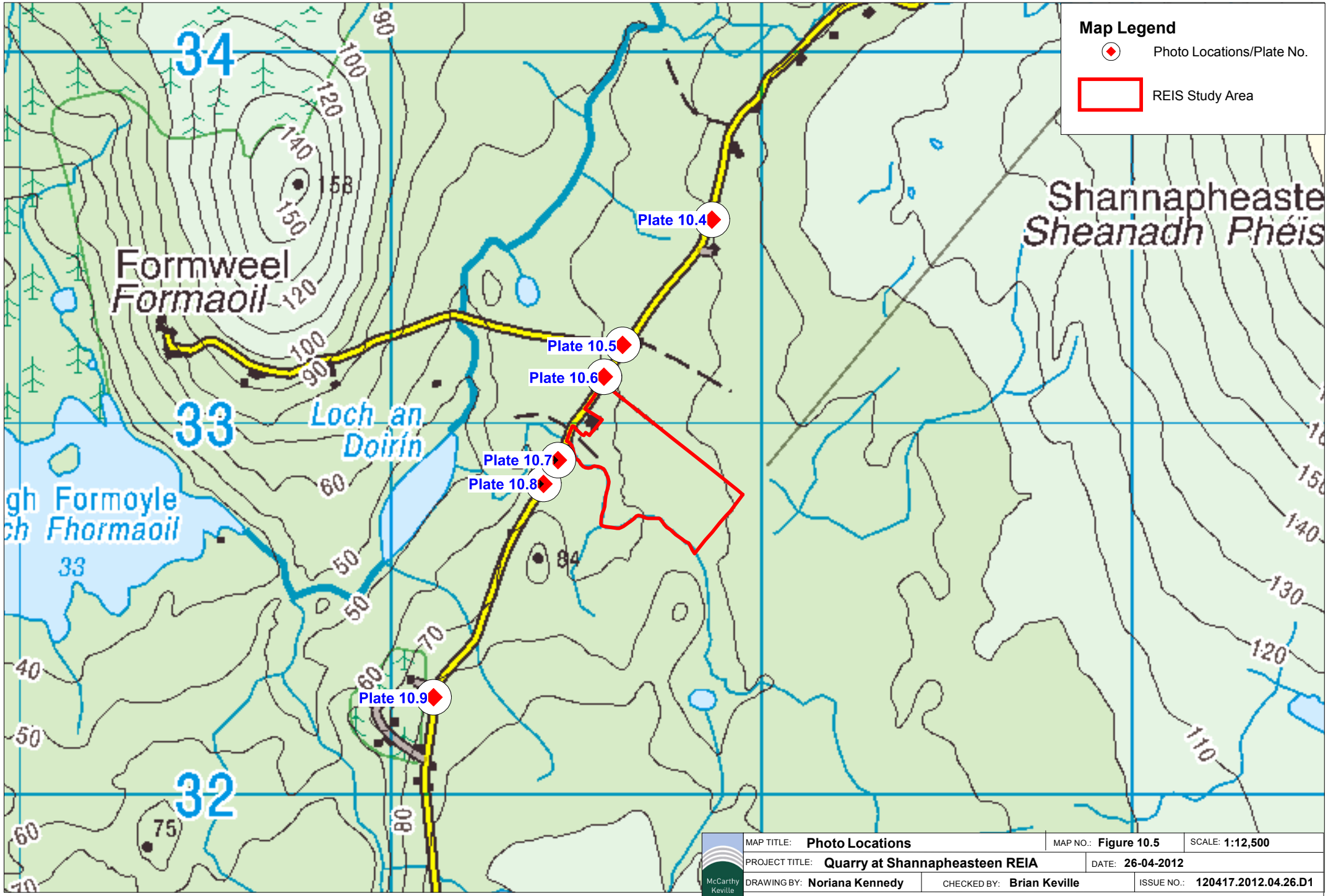
The site of the development is accessed via the local road which travels in the northeast southwest direction directly northwest of the site. The site is intermittently visible for approximately one kilometre along this route, although much of the site interior is screened from view by the elevated topography and vegetation on the southern and northern sides of the site. Figure 10.5 shows the photo locations chosen for this portion of this assessment and described and presented below.

The photograph in Plate 10.4 shows a view towards the subject site from the L1201 local road, 530 metres northeast of the REIS study area site boundary. The quarry site is screened from view entirely by the treelines, hedgerows, buildings and topography of the intervening lands.

The photograph in Plate 10.5 shows the view towards the site 120 metres from the REIS study area site boundary, also on the L1201. The quarry site is not visible from the road at this photo location. Again, the treelines, hedgerows, buildings and topography of the intervening lands screen the quarry from view.

The photograph in Plate 10.6 shows the view from the L1201 local road towards the site 20 metres from the REIS study area site boundary. The photograph was taken through a gap in a roadside hedgerow over a gateway. From here exposed stone from within the quarry can partially be seen. Treelines, vegetation, buildings and topography screen the majority of the quarry site out of view.

The photograph in Plate 10.7 was taken from the local road 60 metres west of the REIS study area site boundary on the L1201. The quarry site is most visible from this



location. In the photo the entrance road can be seen lined with coniferous trees. The exposed stone from the quarry site is visible to the right of this. The topography of the intervening lands northwest of the site screens the rest of quarry site out of view.

Plate 10.8 shows a photograph taken from the local road 140 metres west of the REIS study area site boundary. Again the exposed stone and gravel from within the quarry site is partially visible. The topography of the intervening lands northwest of the site screens the rest of quarry site out of view.

Plate 10.9 shows a photograph towards the subject quarry site 650 metres south of the quarry site on the L1201 local road. At this distance the quarry is somewhat visible. The exposed rock within the quarry site is partially visible where the intervening topography does not rise to screen it from view. The majority of the quarry workings are not visible from this location.

Plate 10.4 The view towards the subject site from local road, 530 metres north of the REIS study area site boundary.

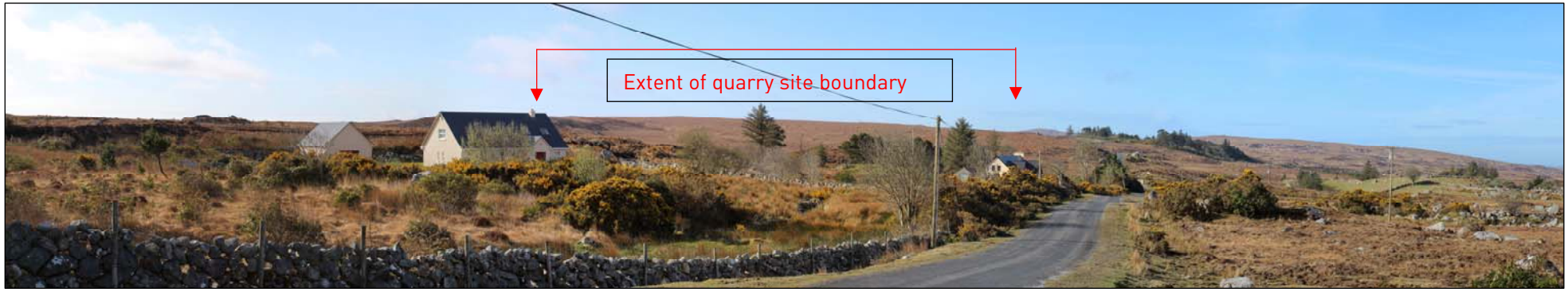


Plate 10.5 The view towards the subject site 120 metres north of the REIS study area site boundary.

Plate 10.6 View from the local road towards the subject site 20 metres north of the REIS study area site boundary.

Plate 10.7 View from the local road 60 metres west of the site

Plate 10.8 View from the local road 140 metres southwest of the site

Plate 10.9 View from the local road 650 metres southwest of the site

10.6 Likely and Significant Impacts and Associated Mitigation Measures

10.6.1 'Do-Nothing' Scenario

The subject site forms part of a working landscape, not a pristine wilderness. Turf cutting has been carried out at the site for many years, resulting in degradation of the peat habitat. If the quarrying activity had not commenced on these lands, they would have continued to be managed as cutover bog and heathlands. No excavations or quarrying activity would have taken place on the subject site and any likely impacts would not have occurred. Views towards the site and site visibility within the wider landscape would remain as they were.

10.6.1.1 Impacts on Landscape

The landscape is in the area classed as being of High Sensitivity by the Galway County Development Plan. It is located in Landscape Character Area 10: East Connemara Mountains (Moycullen, Recess to Glinsk). The East Connemara Mountains are distinctive features in the local landscape in south Connemara, and although the site is on the foothills of those mountains, the views towards the higher mountainous lands are limited from the site and its immediate surrounds. The site is not part of, or adjacent to gardens, parks, demesnes or historical designed landcapes. The quarry site does not have detrimental impact on the landscape in the surrounding environment, although it has slightly changed the existing landscape character. The subject site does not form part of a Landscape Conservation Area. The development does not adversely impact on any area designated as visually important/sensitive by Galway County Council.

10.6.1.1.1 Long Term Slight Negative Impact

As shown in Plates 10.4 - 10.9, the subject site is partially visible from a 1.5 kilometre stretch of the L1201 local road northwest of the site. The minimal views of the quarry site from these areas have a very slight impact on the character of the landscape. The landscape character, topography and landcover has slightly changed, but only on an very localised level. The site is not significantly visible from the surrounding area to impact on the landscape quality of the surrounding lands. The quarry footprint is minor in comparison to the vast scale of the landscape physical unit.

The profile of the land visible has not altered significantly and from most locations along the adjacent local road the site, only partially visible and at a distance, appears intact and almost untouched. The view of the quarry is not a significantly detracting feature when in the view.

Mitigation

Restoration of the worked-out disturbed areas of the site outside the main quarry pit has already commenced and will continue into the future. As extraction ceases in the quarry pit itself, it too will be progressively reinstated. Restoration areas will also include reinstatement of peaty substrate to allow for recolonisation with vegetation.

Treelines and vegetation located along the northeastern site boundary restrict view of the site. In particular the undulating topography of the intervening lands serves to screen the view of the quarry from view. Although there is an area of quarry dug out, the restricted visibility of the site by intervening topography and vegetation ensures that the development has not significantly changed the character of the local

landscape. The retention of treelines along the boundaries of the site means that the loss is not apparent from the outside.

The photographs presented in Section 10.5.2 show that the design of the existing site infrastructure and arrangement keeps their visibility to a minimum. The design of the quarry keeps all machinery and plant equipment down from the existing profile, in the lower section of the quarry, leaving the higher land in the intervening lands of the site to screen the quarry from view.

11 CULTURAL HERITAGE

11.1 Introduction

This Cultural Heritage report has been commissioned as part of the Remedial Environmental Impact Statement (REIS) to be submitted to An Bord Pleanála with the application for substitute consent by Connemara Granite Teo., Shannapheasteen, Co. Galway.

11.2 Methodology

This report, prepared by Michael Tierney, Archaeological Consultant, assesses the impact of the existing development on the archaeological and architectural heritage of the site and surrounding area. A desk study and a site walkover survey were undertaken as part of this assessment.

The following sources were consulted as part of the desk study:

- Record of Protected Structures in Galway County Council Development Plan 2009-2015;
- Record of monuments and places;
- Topographical files of the National Museum of Ireland;
- Previous archaeological work in the area from the Excavations Bulletin;
- Available cartographic resources;
- Available aerial photographs;
- Local history and archaeological journals.

The site was visited on 5th April 2013. All of the development area was assessed.

Site location maps are presented in Chapter 2 of this EIS.

11.3 Desk Study

11.3.1 Record of Protected Structures

Consultation of the Galway County Council Development Plan 2009-2015 showed that there are no protected structures located within the development area or in the surrounding area.

11.3.2 Record of Monuments and Places (RMP)

There are no recorded monuments located in or around the quarry site. The nearest RMP site is GA079-002, a holy well located almost two kilometres to the west of the quarry, as listed in Table 11.1.

Table 11.1 RMP Sites Located Around the Quarry

RMP Number	Description
GA079-001	Redundant record
GA079-002	Ritual site-holy well

The lack of known archaeological sites compared to most of the rest of the Irish landscape is explained by fact that the land is marginal from the point of view of human habitation and is dominated by upland blanket bog. The nearest concentrations of archaeological sites occur almost ten kilometres from the quarry.

Previously unrecorded archaeological features may still be present but it is concluded that there is a low potential for this occurring.

The sites listed in Table 11.1 are shown on Figure 11.1. The most remarkable thing about the known record in the area is the lack of archaeological sites. There is no evidence that previously unrecorded archaeological features have been impacted by the development, and no known archaeological features or sites have been impacted.

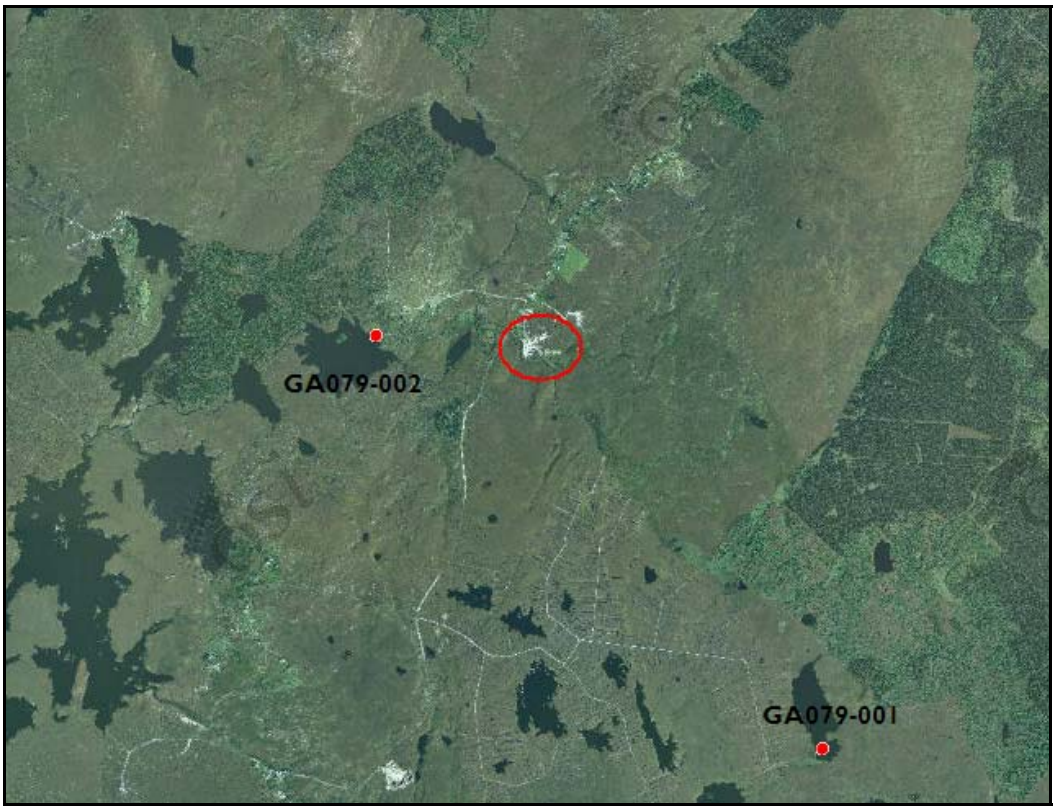


Figure 11.1 Sites recorded on Record of Monuments and Places

The quarry is shown in the centre of the aerial photograph in Figure 11.1. The landscape is dominated by upland blanket bog and it is notable from an archaeological point of view because of the lack of RMP sites in the area. The nearest feature is a holy well (RMP Reference No. GA079-002), located approximately 1.75 kilometres west of the quarry. Site GA079-001 to the southeast of the quarry is a redundant record of no archaeological significance.

11.3.3 Topographical Files of the National Museum of Ireland

There is no record of any artefacts being found in Shannapheasteen, or any of the townlands surrounding the development, in the archive of the National Museum of Ireland. The topographical files for the townlands of Buuroughaun, Cloghermore, Finnaun, Formweel, Glenimurrin, and Seecon were checked as part of the process of characterising the archaeological landscape in which the quarry is located.

11.3.4 Previous Archaeological Work

There have been no archaeological excavations carried out within the development area as recorded on the Excavations.ie database. This database lists and describes licensed archaeological excavations carried out with the permission of the National Monuments Service and the National Museum of Ireland. The database was checked

with reference to the townlands of Shannapheasteen, Buuroughaun, Cloghermore, Finnaun, Formweel, Glenimurrin, and Seecon.

There have been no excavations in the surrounding area except at Glenicmurrin townland, located three kilometres to the southwest, where an underwater archaeological assessment found nothing of archaeological significance.

11.3.5 Cartographic Sources

The marginal nature of the land is reflected in the Ordnance Survey maps from the 19th century, as shown in Figures 11.2 and 11.3. No archaeological features are recorded and the most interesting feature is that the road that the quarry is located on is only half-built in Figure 11.2.

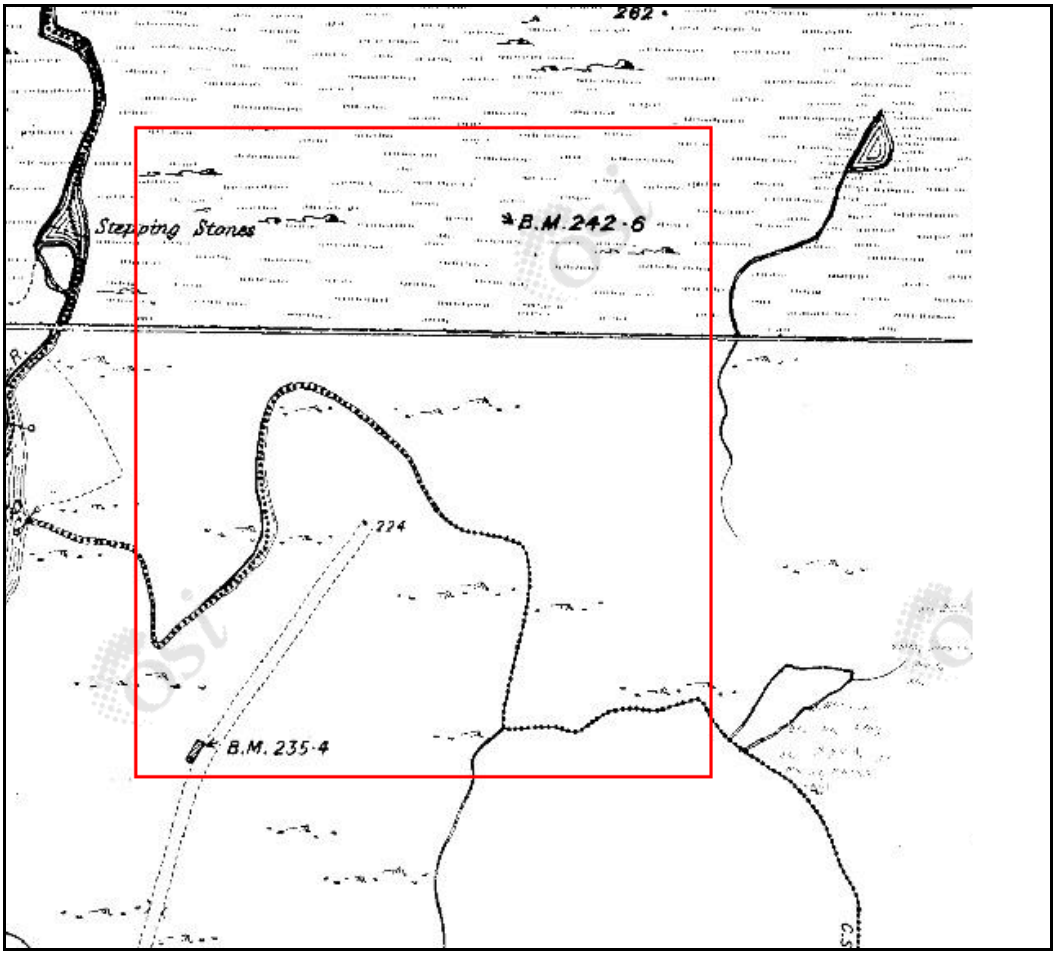


Figure 11.2 Six-inch Cassini map showing the road next to the quarry site does not yet reach Shannapheasteen (www.osi.ie © Government of Ireland). The linear feature coming from the south eventually turned into the road next to the quarry.

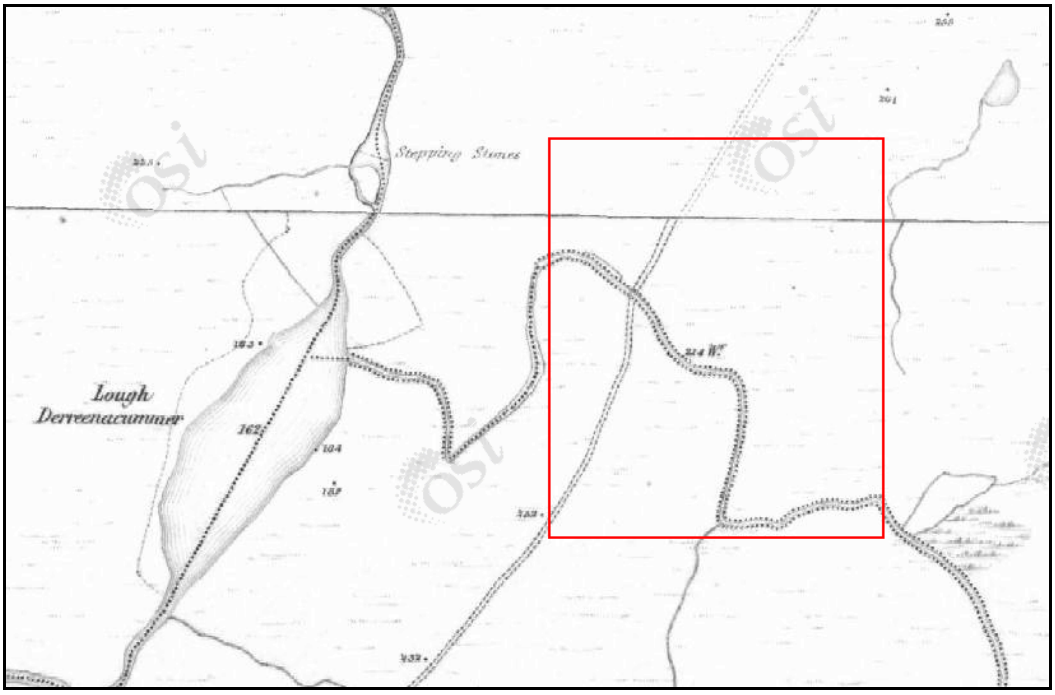


Figure 11.3 25-inch OS map showing the site as surveyed in the late 19th century (www.osi.ie © Government of Ireland)

11.3.6 Aerial Photographs

No new archaeological features were identified on aerial photographs of the site. Photographs were consulted from 2005, 2000 and 1995 on www.osi.ie.

11.3.7 Local History and Archaeological Journals

No references were found to Shannapheasteen or surrounding townlands within local history journals or online resources.

11.4 Site Walkover Survey

The site survey was carried out after the first phase of the desk study was completed without any potential impacts being identified, apart from the fact that the development is large in scale. No cultural heritage impacts were identified within the quarry extraction area during the site visit. The site is described below with reference to four separate areas, Areas 1 to 4, as shown on Figure 11.4.

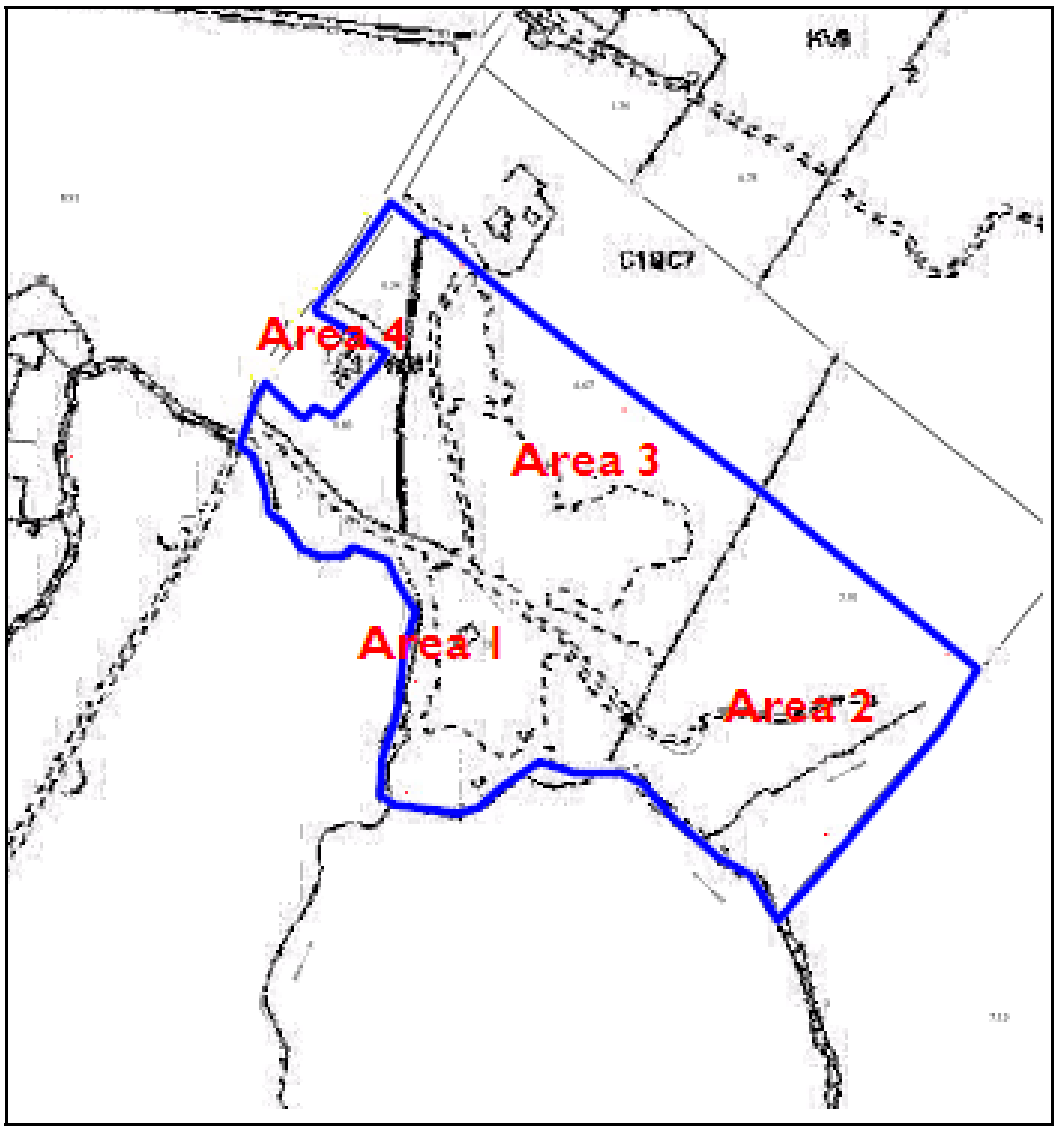


Figure 11.4 Site Survey Areas

11.4.1 Area 1

Area1 is the southern part of the quarry site comprising a mixture of pasture and blanket bog, as shown in Plates 11.1 and 11.2. No cultural heritage features were found in this area. Plate 11.3 presents a view of the quarry located in Area 1, as viewed from the south.

Plate 11.1 Area 1 as viewed from the road along the western boundary of the development

Plate 11.2 Area 1 between the western boundary and the access road

Plate 11.3 Quarry as seen from south

11.4.2 Area 2

Area 2 is located on the eastern end of the site and comprises mainly blanket bog, as shown in Plate 11.4. No archaeological features were identified within this Area.

Plate11.4 Area 2 from the south, showing disturbance of blanket bog caused by drainage works. The peat visible in sections varies in depth from 0.4 metres to over 2.0 metres.

11.4.3 Area 3

Area 3 is located along the northern side of the development and is made up of blanket bog some of which has been cut away to harvest turf, as shown in Plate 11.5.

Plate 11.5 Lands on North side of the quarry site

11.4.4 Area 4

Area 4 comprises two fields along the road front of the development. One field was full of reeds, as shown in Plate 11.6 and the other a mixture and reeds and grass/pasture, as shown in Plate 11.7. No cultural heritage features were identified within this Area.

Plate 11.6 Reed covered field on northwest boundary of the development, next to the road

Plate 11.7 Area 4 next to quarry entrance and road along the northwest boundary of the site

11.5 Potential Impacts

No known cultural heritage features have been or will be impacted by the quarry. However, the large-scale nature of the works means that previously unrecorded archaeological features may be impacted, even in a marginal area like this.

Ms. Catherine Desmond, archaeologist with the National Monuments Service (NMS) was consulted regarding impacts that are identified during the remedial EIS process, on 8th April 2012. Ms. Desmond was the person responsible for large-scale infrastructural projects in the NMS, including quarries until the end of March 2013. No replacement has since been appointed to this position. Ms. Desmond stated by telephone that the NMS required that in cases where impacts have been identified during remedial EIS assessments, mitigation measures should include a record being taken of what archaeological features remain and that recommendations be made regarding their future preservation. This is in line with current practice in relation to all archaeological impact assessments.

11.6 Mitigation Measures

It is recommended that the topsoil stripping phase of quarrying be archaeologically monitored. In the event of archaeological features being identified work should cease in their immediate vicinity and an assessment undertaken regarding the nature and extent of the archaeological remains found. The subsequent report should include recommendations regarding appropriate mitigation measures that could include preservation in-situ or preservation by record.

12 TRAFFIC AND TRANSPORT

12.1 Introduction

12.1.1 Purpose of Section

The purpose of this Traffic and Transport Statement is to assess the retrospective traffic impact of the existing quarry on the surrounding road network at Shannapheasteen, County Galway.

The assessment is based on information provided by McCarthy Keville O'Sullivan (Planning Consultants) and Mr J & S Larkin (quarry operator and Client), together with observations and short period traffic counts undertaken by Alan Lipscombe, the author of this statement.

12.1.2 Method and Section Structure

A review of the development content and the levels of traffic currently generated by the existing quarry (discussed further in Section (?), were compared against the threshold criteria set out in Section 2 of the Traffic and Transport Assessment Guidelines, published by the National Roads Authority (NRA) in September 2007. This comparison suggests that the scale of the existing development does not require a full Traffic and Transport Assessment (TTA) as the key threshold criteria are not exceeded. Some of the key criteria that require a full TTA are as follows;

- Traffic to/from the development exceeds 10% of the traffic flow on the adjoining road – the maximum increase due to the quarry is 3%, as set out in Section 12.4).
- 100 trips in and out combined during the peak hour – the quarry has a maximum of 16 movements per day and approximately 2 during the peak hour.
- Industrial development of 5,000m^2 – this criterion is difficult to apply to a quarry as most of the activity is outside.
- The development may generate traffic, particularly heavy vehicles in a residential area. The local traffic route does not pass through any residential areas.

The following traffic statement, however, covers most of the subject headings required in a TTA with the remainder of the section set out as follows;

- A review of background information, including a review of the existing network and accident history (Section 12.2 - Receiving Environment),
- A review of the existing development including an assessment of the volumes of traffic generated by the quarry (Section 12.3 – Existing Development),
- An assessment of the existing traffic volumes on the local highway network and the impact of the traffic generated by the quarry (Section 12.4 – Existing Traffic Flows and Traffic Impact of Quarry)

The key findings of the assessment are summarised in the concluding paragraph of Section 12.4.

12.2 Receiving Environment

12.2.1 Location and Network Summary

The existing quarry is situated on the Shannapheasteen Road which is a local road that connects both the port of Rossaveel and the village of Costelloe, located in the R336 Galway Bay coast road, with Oughterard, located on the N59 approximately 25 kilometres north west of Galway city. The Quarry is approximately 9 kilometres north east of Costelloe and is and is situated on the eastern side of the road, as shown in Figure 2.1 (produced by McCarthy Keville O'Sullivan) of this REIS.

While it is understood that materials produced by the quarry are distributed over a fairly large catchment the impact of the traffic will become less noticeable as you travel away from the site and the traffic generated by the quarry becomes more dispersed. The Shannapheasteen Road in the immediate vicinity of the quarry and the R336 are therefore adopted as the study area over which to determine the past and existing traffic impact of the quarry.

In the proximity of the junction with the Shannapheasteen Road the R336 is a good quality regional road typically with a speed limit of 80 kmph and a carriageway width of 7.0, as shown in Plates 12.1 and 12.2. The junction between the R336 and the Shannapheasteen Road takes the form of a standard priority junction with the local Shannapheasteen Road forming the minor arm at the junction. The geometry at this junction is adequate to accommodate all vehicle types and visibility is good for both traffic turning right onto the Shannapheasteen Road and for traffic turning left and right onto the R336.

Plate 12.1 The R336 / Shannapheasteen Road junction – visibility to the northwest (right) from the Shannapheasteen Road along the R336

Plate 12.2 The R336 / Shannapheasteen Road junction – visibility to the southeast (left) from the Shannapheasteen Road along the R336

The condition of the Shannapheasteen Road varies between the junction with the R336 and the access to the quarry, as shown in Plates 12.3 to 12.5. The road is typically unmarked and has a varying carriageway width averaging at approximately 4.0 metres.

Plate 12.3 The R336 / Shannapheasteen Road junction – looking northeast along Shannapheasteen Road

Plate 12.4 The R336 / Shannapheasteen Road

Plate 12.5 The R336 / Shannapheasteen Road

The access to the quarry is located within the default 80kph zone. The tarred surface on the Shannapheasteen Road is approximately 3.3 metres adjacent to the access which comprises of a compressed gravel road. The mouth of the access is relatively wide (15 metres) to provide for the larger vehicles that typically access the site.

Sight distance requirements for regional roads are set out in DM Standard 18 of the Galway County Development Plan 2009 – 2015, which states that both forward visibility for traffic accessing the site and visibility splays for traffic exiting the quarry should be 120 metres with the latter taken from a distance of 2.4 metres set back from the carriageway edge to the nearside carriageway edge.

The most recent advice with respect to sight lines is set out in TD 41/42 – 11 Geometric Design of Major/Minor Priority Junction and Vehicular Access to National

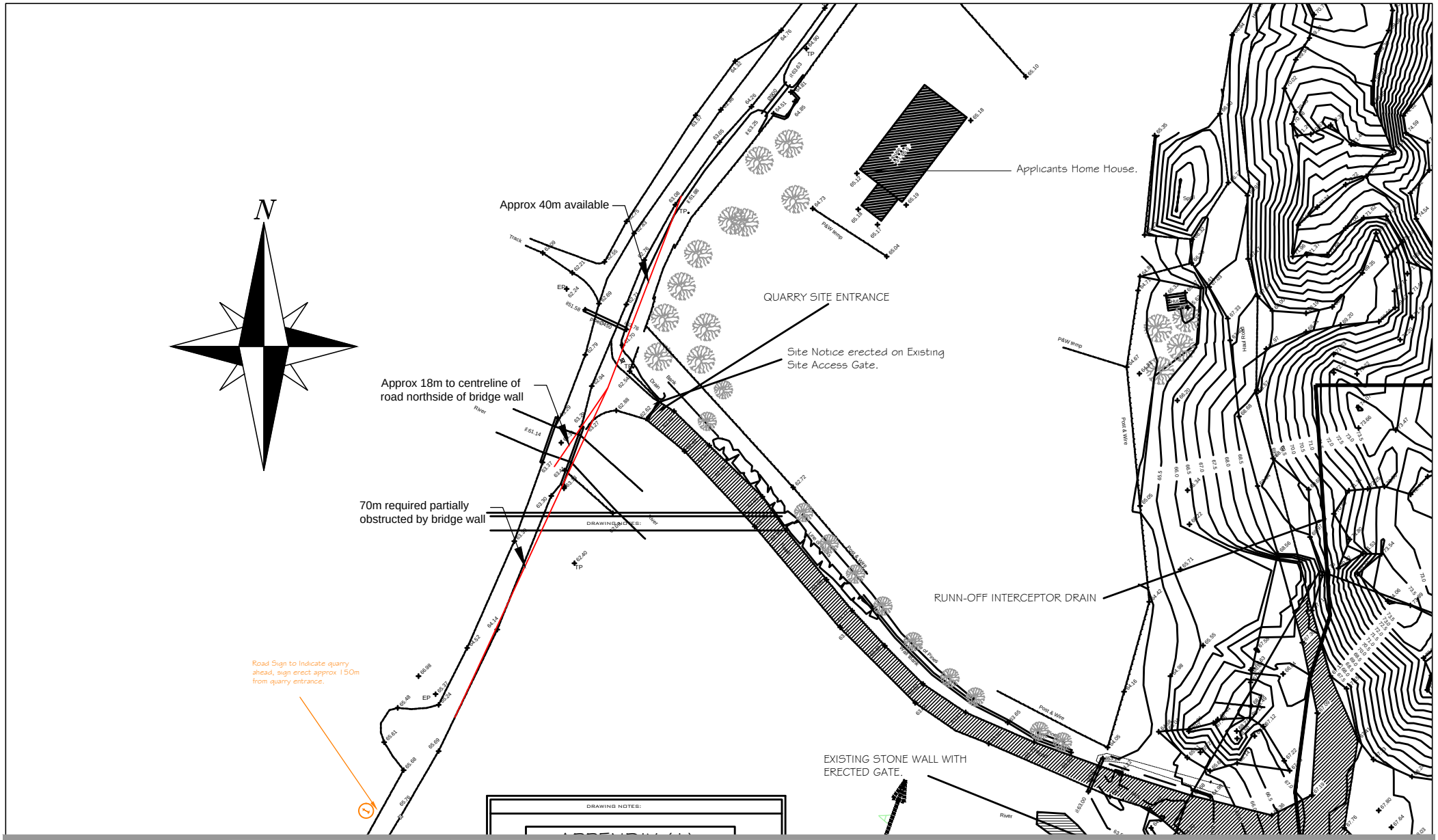
Roads, published by the National Roads Authority. In the context of the access junction to the quarry the following paragraph would apply;

> Section 7.11 *"At junctions onto regional and local urban roads where there is a constraint on overtaking on the approach from the left to the junction, the visibility splay to the left may, as a relaxation, be taken to the nearside edge of the lane for oncoming traffic rather than to the nearside edge of the road."*

With respect to forward visibility and sightlines at the access junction, the following are the main points to note;

- Existing sightlines to the northeast (right) for traffic exiting the site are restricted to approximately 40 metres taken from a point 3 metres back (as recommended in TD 41/42-11) from the carriegway edge to the nearside road edge, as illustrated in Figure 12.1 and shown in Plates 12.7. The obstruction is caused by shrubs and bushes as shown in Plate 12.7.
- To the southwest (left) sightlines are partially obscured by a bridge wall, as shown in Plate 12.8, although an oncoming vehicle can generally be seen up to a distance of approximately 90 metres, beyond which visibility is obscured by both the horizontal and vertical alignment of the road, also shown in Plate 8.
- While the R353 is designated an 80kmph speed limit, the road geometry and alignment results in local speeds being significantly less than the designated limit. If it is assumed that speeds are closer to 50 kmph, the visibility splay required would be 70 metres, as set out in TD 41/42 – 11.
- The 3 x 70 metre visibility splays that should be provided on the site in order to provide safe access for all vehicles are shown in Figure 12.2. Visibility to the northeast (right) will be significantly improved with the clearance of existing shrubs while visibility to the southwest will be improved only by lowering the bridge wall. It is however considered that visibility in this direction is adequate considering vehicle speeds and the fact that oncoming vehicles are partially visible from a distance of 90 metres.

Plate 12.6 The quarry access – looking into the site from the Shannapheasteen Road



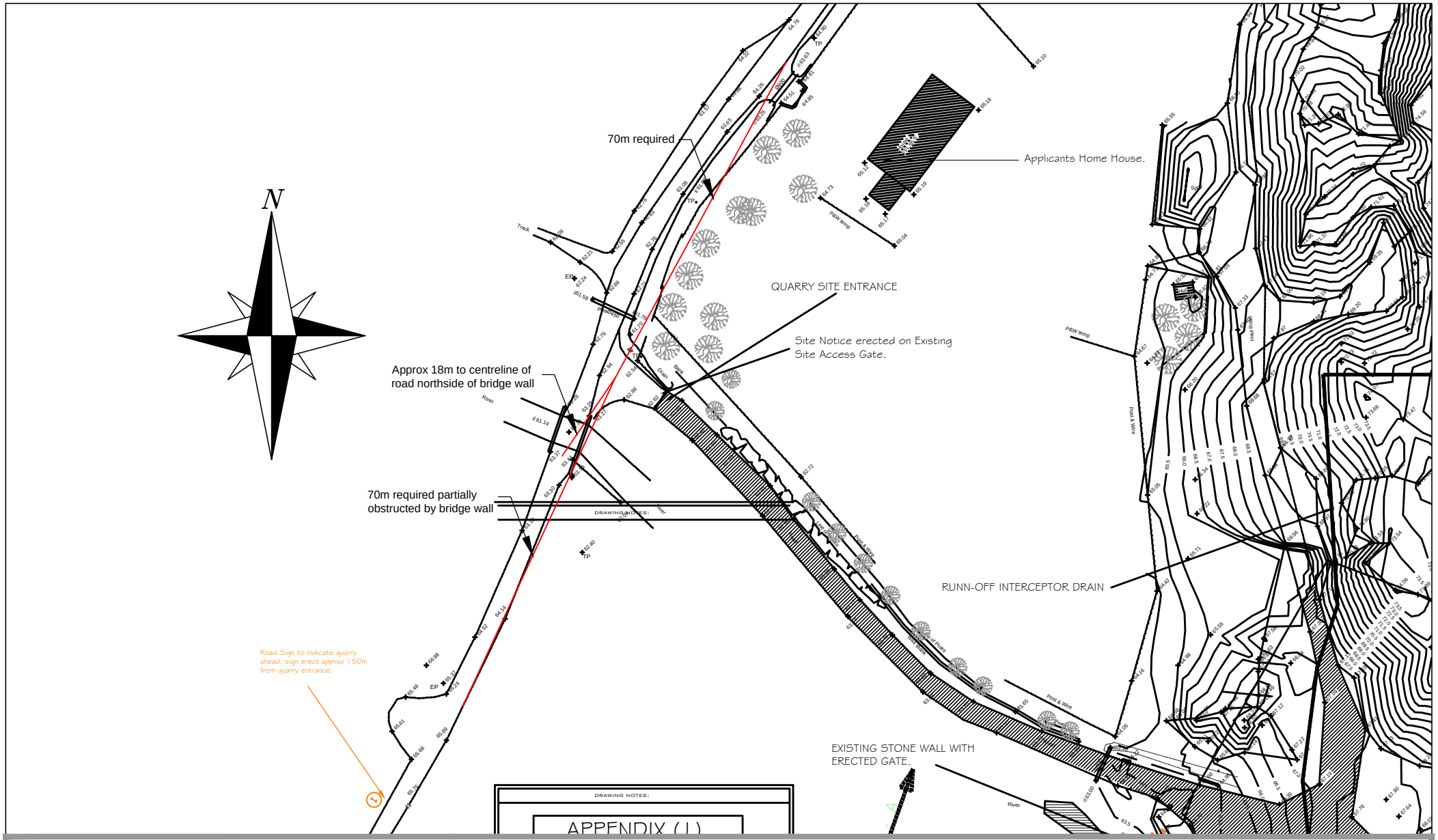
NOTES:

PLANNING DRAWING ONLY - NOT FOR CONSTRUCTION PURPOSES

FIGURE 12.1 AVAILABLE SIGHTLINES AT QUARRY ACCESS ON SHANNAPHEASTEEN ROAD (taken at point 3m from carriageway edge)

PROJECT:	SHANNAPHEASTEEN QUARRY		
CLIENT:	J + S LARKIN	SCALE:	1:1000
PROJECT NO: 3280	DATE: 03.05.13	DRAWN BY:	AL

ALAN LIPSCOMBE
TRAFFIC & TRANSPORT CONSULTANTS



NOTES:

PLANNING DRAWING ONLY - NOT FOR CONSTRUCTION PURPOSES

FIGURE 12.2 REQUIRED SIGHTLINES AT QUARRY ACCESS ON SHANNAPHEASTEEN ROAD (taken at point 3m from carriageway edge)

PROJECT:	SHANNAPHEASTEEN QUARRY		
CLIENT:	J + S LARKIN	SCALE:	1:1000
PROJECT NO: 3280	DATE: 03.05.13	DRAWN BY:	AL

ALAN LIPSCOMBE
TRAFFIC & TRANSPORT CONSULTANTS

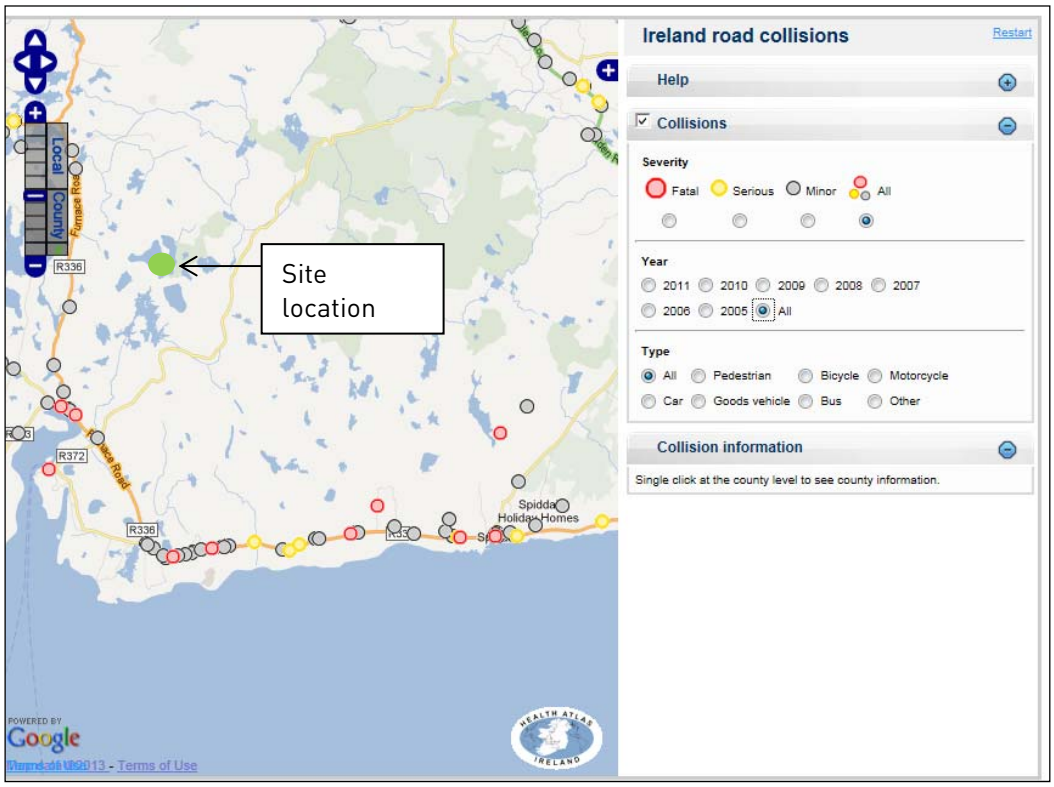
Plate 12.7 The quarry access – visibility to the northeast (right) along the Shannapheasteen Road

Plate 12.8 The quarry access – visibility to the southwest (left) along the Shannapheasteen Road

Plate 12.9 The road alignment to the north east taken from access

12.2.1.1 Recent Accident History on Local Network

In order to assess the relative safety of the existing layout at the quarry site on the Shannapheasteen Road, the most recent 7 years of accident data available for the local area (2005 – 2011 inclusive) was acquired from the Road Safety Authority, and is illustrated in Figure 12.3. The records show that there were no accidents recorded near the quarry or the Shannapheasteen Road and only one minor accident in the 7 year period at the junction with the R336.



Source: Road Safety Authority

Figure 12.3 Accident records maintained by RSA – 2005 – 2011

12.3 Existing Development

12.3.1 Development Content

The quarry produces stone and aggregate for the construction industry.

12.3.2 Trip Generation of Quarry

The quantity of aggregate and number of truck movements generated by the quarry varies according to demand. During the busiest periods a maximum off 1 load each hour leaves the site, resulting in 2 truck movements (1 in and 1 out) per hour or 16 movements per day (8 in and 8 out). On most days activity is less with 2 loads per day or 4 movements.

In addition to the HGV movements generated by the quarry (which are generally made by 8 wheel trucks) the quarry employs 3 people, all of which arrive by car.

12.4 Existing Traffic Flows and Traffic Impact of Quarry

12.4.1 Existing Traffic Flows on the Local Network and the Traffic Impact of the Existing Quarry

The traffic volumes on the local surrounding highway network and the impact of the traffic movements generated by the quarry are shown for the minimum output and maximum output days in Tables 12.1 and 12.2 respectively.

The existing traffic volumes were based on the following;

- Short period traffic counts were observed on the R336 and the Shannapheasteen Road between the hours of 13:00 and 14:00 on Wednesday 10th April, 2013.
- While there is no all-day traffic count information available for either of these roads, 24 hour continuous data recorded by the NRA is available for the N67 near Ennistymon, which shows that the all-day flow on a regional road in the area is approximately 13 times that observed during the hour of 11:00 to 12:00.
- It was assumed that 5% of all movements are HGV's.

For the amount of traffic generated by the quarry, for the quietest days shown in Table 12.1, it is assumed that all movements generated by the quarry travel south towards the R336, with 4 movements (ie 2 in and 2 out) generated by the quarry. Similarly it was assumed that all then travel east towards Galway on the R336. For the busiest days, similar information is shown in Table 12.2 with the additional HGV movements added.

The main points to note from Tables 12.1 and 12.2 are;

- All day traffic volumes on the R336 adjacent to the Shannapheasteen Road was observed to be just over 5,500 vehicles per day, while volumes on the Shannapheasteen Road just north of the junction were observed to be very light at less than 500 per day. It should be noted that volumes on the Shannapheasteen Road adjacent to the quarry access are lighter still, estimated to be less than 200 vehicles per day.

Minimum output days:

- On the Shannapheasteen Road just north of the R336, the quarry generates just 1% of all traffic movements and 17% of all HGV movements
- On the R336 east of the junction the quarry generates less that 1% of all traffic movements and 2% of existing HGV movements.

Maximum output days

- On the Shannapheasteen Road just north of the R336, the quarry generates 3% of all traffic movements and 45% of all HGV movements
- On the R336 east of the junction the quarry generates less that 1% of all traffic movements and 6% of existing HGV movements.

Table 12.1 Traffic flows on surrounding network, Shannapheasteen Quarry, Co Galway, minimum daily quarry output

Link	All traffic 1600-1700	All day flow (AADT)	HGV's (5.6%)	Generated by quarry		
				No of HGV's	% of all traffic	% of all HGV's
Shannapheasteen Road	36	468	23	4	1%	17%
R336	426	5,538	277	4	0%	2%

Table 12.2 Traffic flows on surrounding network, Shannapheasteen Quarry, Co Galway, maximum daily quarry output

Link	All traffic 1600-1700	All day flow (AADT)	HGV's (5.6%)	Generated by quarry		
				No of HGV's	% of all traffic	% of all HGV's
Shannapheasteen Road	37	480	35	16	3%	45%
R336	427	5,550	289	16	0%	6%

The capacity of roads of various types is provided in Table 6/1 of the Road Link Design TD/12 published by the NRA in February 2012. The most compatible standard of road type for the R336 is for a Type 2 single carriageway, with a carriageway of 7.0 meters and 0.5 hard strips. The daily capacity for this type of road is 8,600 vehicles per day.

The R336, with a maximum daily flow of 5,550 vehicles (inclusive of the traffic generated by the quarry) currently operates well within capacity (64% of capacity utilised).

With a varying width generally approximately 4.0 metres the standard of the R353 is less than the Type 3 single carriageway and therefore has a capacity of less than 5,000 vehicles per day. However, even allowing for the reduced lane widths it is clear that a maximum existing flow of 289 vehicles is within the carrying capacity of the road.

The above assessment suggests that the local road network with the Shannapheasteen Quarry in place, operates well with in capacity.

The actual impact of the traffic that is generated by the quarry will vary slightly depending on the output on a given day although it is considered that the impact is slight for all scenarios.

13 INTERACTION OF THE FOREGOING

13.1 Introduction

The preceding Chapters 4 to 12 of this REIS identify the potential environmental impacts that may have occurred as a result of the existing quarry in terms of Human Beings, Flora and Fauna, Soils and Geology, Hydrology and Hydrogeology, Air and Climate, Landscape, Cultural Heritage and Traffic. All of the potential impacts 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 impact there is also the potential for interaction amongst these impacts. The result of interactive impacts may either exacerbate the magnitude of the impact or ameliorate it.

A matrix is presented in Table 13.1 below to identify interactions between the various aspects of the environment already discussed in this REIS. The matrix highlights the occurrence of potential positive or negative impacts of the existing quarry. The matrix is symmetric, with each environmental components addressed in the previous sections of this EIS being placed on both axes of a matrix, and therefore, each potential interaction is identified twice.

Table 13.1 Interaction Matrix

	Human Beings	Flora & Fauna	Soils & Geology	Hydrology & Hydrogeology	Air & Climate	Noise & Vibration	Landscape	Cultural Heritage	Traffic & Transport
Human Beings									
Flora & Fauna									
Soils & Geology									
Hydrology & Hydrogeology									
Air & Climate									
Noise & Vibration									
Landscape									
Cultural Heritage									
Traffic & Transport									

Legend:

Potential Positive Impact:
Potential Neutral Impact:
Potential Negative Impact:
No Interacting Impact:

The potential for interaction of impacts has been assessed as part of the Impact Assessment process. While the work on all parts of the REIS were not carried out by McCarthy Keville O'Sullivan Ltd., the entire project and all the work of all sub-consultants was managed and coordinated by the company. This Remedial Environmental Impact Statement was edited and collated by McCarthy Keville O'Sullivan Ltd. as an integrated report of findings from the impact assessment process, rather than a collection of individual assessments carried out in isolation, and impacts that potentially interact have been discussed in the individual chapters of the REIS above.

13.2 Impact Interactions

13.2.1 Human Beings

Human Beings and Hydrology & Hydrogeology

The operation of the quarry has the potential to give rise to some water pollution as a result of site activities, and any water pollution could impact on other users of that water within the catchment.

Human Beings and Air & Climate

The operation of the quarry has the potential to create dust and other less noticeable air pollutants, which could give rise to nuisance for occupants of nearby dwellings.

Human Beings and Noise & Vibration

The operation of the quarry has the potential to create noise and some vibration, which could give rise to nuisance for occupants of nearby dwellings.

Human Beings and Landscape

The historical quarry operation has had a visible impact on the landscape which alters it from how it otherwise would have appeared in the absence of the quarry. The introduction of the quarry into a natural, but already modified landscape, could be perceived by some to impact on the quality and integrity of the landscape enjoyed by local residents and tourists alike. Whether the long-term change in landscape created by the quarry is deemed to be a significant, or neutral/negative impact is a subjective matter.

Human Beings and Material Assets

The historical operation of the quarry will have given rise to an increase in traffic movements on the local roads surrounding the site, and are likely to have caused some short-term but slight inconvenience for road users.

13.2.2 Flora and Fauna

Flora & Fauna and Soils & Geology

The removal of overburden, soils and bedrock within the development footprint will result in habitat loss and some disturbance of fauna in the areas surrounding the works area.

Flora & Fauna and Hydrology & Hydrogeology

Site activities have the potential to give rise to some water pollution, and consequential impacts on flora and fauna that rely on or use that water within the same catchment.

Flora & Fauna and Noise & Vibration
Site activity during the operation of the quarry has the potential to give rise to noise and some vibration that could disturb fauna.

Flora & Fauna and Landscape
The removal of some vegetation within the development footprint and surrounding areas has resulted in a change to the visual landscape due to the operation of the quarry.

13.2.3 Soils and Geology

Soils & Geology and Human Beings
The extraction of the bedrock resource in the course of the quarrying activity generates employment opportunities and a marketable product of no distinguishable value until it is extracted in the quarry, which in turn generates activity in the local economy from the sale of the local resource.

Soils & Geology and Hydrology & Hydrogeology
The movement and removal of soils, overburden and rock as part of the quarrying activity has the potential to have secondary impacts on water quality in the absence of mitigation.

13.2.4 Air and Climate

Air & Climate and Traffic & Transport
The movement of vehicles both within and to and from the site has the potential to give rise to dust nuisance impacts during the operation of the quarry.

13.3 Mitigation

Where any potential interactive negative impacts have been identified in the above, appropriate mitigation has already been included in the relevant sections (Sections 4-12) of the REIS.

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