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INTRODUCTION

Background

6.1 This Chapter of the Environmental Impact Assessment (EIA) Report addresses the potential impacts on land, soils and geology of the soil and stone waste recovery activities on the western side of Huntstown South Quarry. These activities will facilitate backfilling of the quarry to surrounding ground level and its ultimate long-term restoration to grassland.

6.2 In order to facilitate the transfer and re-location of soil waste recovery activities from the North Quarry (where they are currently ongoing) to the South Quarry, a waste licence review application is to be submitted to the EPA to provide for the following :

- importation of soil and stone waste to the western side of Huntstown South Quarry at a maximum rate of 750,000 tonnes per annum (as permitted by Planning Ref. FW12A/0012);
- extension of the licensed site boundary to incorporate the proposed waste recovery area on the western side of the South Quarry and the haul roads leading to / from it;
- an increase in the total permitted (lifetime) soil and stone waste intake to the (extended) waste facility to 18.76 million tonnes;
- continued use of pre-existing site infrastructure to support recovery activities; and
- re-routing of traffic flows via existing internal haul roads (i.e. within the quarry complex) to access the backfilling / recovery area at the South Quarry.

6.3 No new infrastructure is required to facilitate transfer and re-location of the established soil waste recovery operations at Huntstown North Quarry across to the western side of the South Quarry and the extension of the waste licence boundary to include this area.

6.4 It is currently envisaged that backfilling of the South Quarry will commence in early 2023, at which time it is expected that the ongoing backfilling of the North Quarry to surrounding ground level will be largely complete and the importation, backfilling and recovery of soil and stone waste at that location will cease.

6.5 Prior to commencement of the backfilling and recovery activities at the South Quarry, only a relatively minor amount of construction and/or preparatory site works will be required. These works will principally comprise:

- Upgrading and/or maintenance of existing internal haul roads and hardstanding areas as required to facilitate re-routing of HGV / trucks across the quarry complex;
- Construction of any temporary access ramps which may be required to access initial backfill areas on the western side of the South Quarry; and
- Establishment of any additional environmental control and monitoring infrastructure required in respect of backfilling activities.

6.6 This Chapter provides a description of the existing land, soils and geological setting at the regional and local scale, an assessment of the impact of the backfilling and recovery activities at the South Quarry on surrounding land, soils and geological resources / features. It also addresses other relevant geological aspects of future recovery activities.

6.7 The South Quarry will be backfilled and restored using only inert soil and stone which will have been pre-screened and tested to ensure the materials are inert and/or comply with waste intake acceptance criteria agreed with the EPA in accordance with waste licence conditions. No peat, contaminated soils or non-hazardous waste will be accepted for backfilling or recovery at the quarry. It is envisaged that only the following wastes (EWC codes) will be imported to the recovery facility:

- 17 05 04 Soil and stones other than those mentioned in 17 05 03 and
- 17 05 06 Dredging spoil other than those mentioned in 17 05 05.
- 20 02 02 Soil and stones (from garden and park wastes)

6.8 The proposed development will also provide for temporary / short-term stockpiling of topsoil pending its re-use in the final restoration of the backfilled pit and its return to grassland and long-term agricultural use.

6.9 Further details on the proposed development (site infrastructure, operations, environmental management systems, and controls etc.) are provided in Chapter 2 of this EIAR.

Scope of Work / EIA Scoping

6.10 This EIAR Chapter is based on a geological desk study of the land immediately surrounding Huntstown South Quarry and the internal access roads leading thereto using published geological data, field investigations (including available groundwater well installation records) and a site inspection of the existing quarry and future recovery facility by SLR personnel.

Consultations / Consultees

6.11 In preparing this assessment, the Irish Geological Heritage (IGH) database of the Geological Survey of Ireland (GSI) was consulted in relation to this site.

6.12 Following a review of the proposed activities, existing consents and site mapping / surveys, it was considered that there was no requirement for any other formal external consultations to be carried out in respect of land, soil and geology for the purposes of this assessment. There was however significant consultation with other specialist EIA contributors.

Limitations / Difficulties Encountered

6.13 This EIAR has been prepared based on available desktop information, inspection of the existing quarry faces and application site, groundwater borehole logs, and professional experience.

6.14 No specific difficulties were encountered in the preparation of this Chapter.

Author

6.15 This EIAR Chapter relating to Land, Soils and Geology was prepared by Paul Gordon (EurGeol PGeo) of SLR Consulting. Paul has a BSc in Geology and an MSc in Environmental Management, and has over 20 years' professional experience, primarily in the Irish minerals industry.

REGULATORY BACKGROUND

EU Directives

6.16 The following European Union (EU) Directives relating to Land, Soils and Geology informs the planning / environmental assessment presented in this Chapter of the EIAR:

- Environmental Impact Assessment Directive (2011/92/EU);
- Environmental Impact Assessment Directive (2014/52/EU);
- European Union (Planning and Development) (Environmental Impact Assessment) Regulations 2018 (S.I. 296 of 2018);
- The management of waste from extractive industries (2006/21/EC); and
- Environmental Liability Directive (2004/35/EC).

6.17 The EU EIA Directives regulate the environmental impact assessment process and type of information and assessment to be provided in this EIAR Chapter. The Waste Framework Directive and the Environmental Liability Directive will regulate the future backfilling and soil waste recovery activities at the application site.

Irish Legislation

6.18 The following legislation relating to Land, Soils and Geology informs the planning / environmental assessment presented in this Chapter of the EIAR:

- The Planning and Development Acts, 2000 as amended;
- The Planning and Development Regulations (S.I. 600 of 2001) and subsequent amendments thereto, including, S.I. No. 364 of 2005, S.I. 685 of 2006.
- The European Communities (Environmental Impact Assessment) Regulations, S.I. No. 349 of 1989, and subsequent amendments (including S.I. No. 84 of 1994, S.I. No. 351 of 1998, S.I. No. 93 of 1999, S.I. No. 450 of 2000 and S.I. No. 538 of 2001);
- The European Union (Planning and Development) (Environmental Impact Assessment) Regulations (S.I. No. 543 of 2014), European Union (Planning and Development) (Environmental Impact Assessment) Regulations (S.I. No. 296 of 2018) and European Union (Planning and Development) (Environmental Impact Assessment) (No. 2) Regulations (S.I. No. 404 of 2018);
- European Union (Environmental Impact Assessment and Habitats) Regulations S.I. No. 473 of 2011, and European Union (Environmental Impact Assessment and Habitats) (No.2) Regulations S.I. No. 584 of 2011 and subsequent amendments thereto; and
- European Union (Environmental Impact Assessment) (Minerals Development Act 1940) (Amendment) Regulations, S.I. No. 384 of 2018, and subsequent amendment (including S.I. No. 164 of 2019).

Planning Policy and Development Control

6.19 The Planning Policy and Development Control relating to Land, Soils and Geology at the application site is governed by the Fingal County Development Plan 2017-2023. The development plan sets out conservation objectives in relation to natural heritage and landscape, including geology within the county.

Guidelines

6.20 The Land, Soils and Geology Chapter of this EIAR has been prepared with regard to the following guidelines:

- Environmental Protection Agency (2017) *Guidelines on the Information to be Contained in Environmental Impact Assessment Reports.* Draft dated May 2017. Environmental Protection Agency, Johnstown Castle Estate, Co. Wexford;
- DoEHLG (2010) *Appropriate Assessment of Plans and Projects in Ireland - Guidance for Planning Authorities*;
- Environmental Protection Agency (2002) *Guidelines on the information to be contained in Environmental Impact Statements*;
- Environmental Protection Agency (2003) *Advice Notes on current practice (in the preparation of Environmental Impact Statements)*;
- Geological Survey of Ireland, Irish Concrete Federation (2008) *Geological Heritage Guidelines for the Extractive Industry*;

- Institute of Geologists of Ireland (2013) *Guidelines for the Preparation of Soils, Geology and Hydrogeology Chapters of Environmental Impact Statements*;
- National Roads Authority (2008) *Environmental Impact Assessment of National Road Schemes - A Practical Guide*;
- National Roads Authority (2008) *Guidelines on Procedures for Assessment and Treatment of Geology, Hydrology and Hydrogeology for National Road Schemes*;
- National Roads Authority (2006) *A Guide to Landscape Treatments for National Road Schemes in Ireland*; and
- Transport Infrastructure Ireland (March 2013). *Specification for Road Works Series 600 – Earthworks*.

RECEIVING ENVIRONMENT

Study Area

6.21 The study area for this Land, Soils and Geology Chapter of the EIAR comprises two principal areas:

- the excavated void at Huntstown South Quarry, which is still being actively worked for aggregate extraction and the network of internal access roads which lead to it from the central infrastructure area; and
- the area immediately surrounding the South Quarry within an area extending approximately 1km around the quarry faces.

6.22 Original ground levels around the South Quarry vary between approximately 80mOD and 85mOD (Malin) along the western face and between 75mOD and 80mOD along the eastern face. Existing ground levels immediately behind the quarry faces are locally 5m to 10m higher than surrounding ground due to the presence of perimeter screening mounds.

6.23 At the present time, the existing floor level in the South Quarry varies across a number of benches which are currently being worked, from approximately 5mOD on the western side to -10mOD on the eastern side. The corresponding depth of the quarry from the original (surrounding) ground level varies from 75m to 80m around the western side and from 85m to 90m around the eastern side.

6.24 Rock extraction on the eastern side of the quarry is almost complete and close to the final excavation level which extends locally in a thin strip down to -18mOD, in line with the 2014 grant of planning permission. The bulk of the remaining extractable rock reserves at the quarry are located on the western side of the quarry and in this area too, the final floor level will be -18mOD. It is envisaged that the remaining limestone reserves will be excavated in this area over the next 2 years.

Baseline Study Methodology

6.25 The baseline study undertaken for Land, Soils and Geology, presented herein involves a review of published literature and information, recent well drilling and the findings from a walkover survey / inspection of the application site and the surrounding geological / landscape / environmental context.

6.26 This baseline study describes the receiving environment at, and in the immediate vicinity of, the site using the available baseline information gathered, specifically the:

- **Context** of the receiving environment – location / magnitude / spatial extent and trends of the environmental factors;
- **Character** of the receiving environment - distinguishing aspects of the environment being considered here;

- **Significance** of the receiving environment - the quality, value or designation assigned to the existing environment; and
- **Sensitivity** of the receiving environment - how sensitive is the aspect of the environment to change.

6.27 The baseline study is a qualitative assessment of the available information based on professional experience and interpretation of the available data.

Sources of Information

6.28 The following sources of information were consulted in the preparation of the receiving environment baseline study for Land, Soils and Geology:

- Geological Survey of Ireland (www.gsi.ie);
- Teagasc subsoil mapping for Irish Forestry Soils Project (www.epa.ie);
- Irish Soils Information System (www.teagasc.ie/soils);
- Irish Geological Heritage Programme (www.gsi.ie); and
- Ordnance Survey of Ireland (www.osi.ie).

6.29 SLR Consulting has been advising the Applicant on geological, resource and geotechnical matters at Huntstown for many years. The geological and geotechnical assessment reports generated by that work have been consulted as sources of information in drafting this Chapter of the EIAR.

6.30 Three geological boreholes (designated 15-HTS-04 to 15-HTS-06) were rotary cored at the South Quarry in 2015, to provide further information on the local geology and the quality of the remaining rock resource at the South Quarry. Detailed rotary core logs are reproduced in Appendix 6-A.

6.31 The existing pit / face exposures at the application site were also inspected to validate published information of the local quaternary geology.

Land Baseline

6.32 Within the EIA EU Directive (2014/52/EU) Land is recognised as a 'natural resource' and the Directive also refers to the importance of the sustainable use of soil and the need to address the unsustainable increase in settlement areas over time ('land take'). Therefore, the issues of land as both a natural resource and land take must be considered in an assessment.

6.33 The introduction section to the EU Directive (2014/52/EU) notes that :

'the final document of the United Nations Conference on Sustainable Development held in Rio de Janeiro on 20-22 June 2012, which recognises the economic and social significance of good land management, including soil, and the need for urgent action to reverse land degradation. Public and private projects should therefore consider and limit their impact on land, particularly as regards land take, and on soil, including as regards organic matter, erosion, compaction and sealing; appropriate land use plans and policies at national, regional and local level are also relevant in this regard'.

6.34 Land can be considered to be a resource with a beneficial use to society, for example agricultural land use, extractive industry land use or urban residential land use. Excess or unnecessary land take may therefore result in the loss or sterilisation of key land resources. This in turn has the potential to have adverse social and economic consequences for society.

6.35 Future backfilling and recovery activities will occur within a hard rock, limestone quarry which is expected to be fully worked out within 2 years. Across the quarry footprint, the original soil cover and the underlying subsoil have previously been stripped and removed to facilitate the extraction of underlying natural aggregates for use in the production of construction materials. The stripped

materials have been placed in perimeter screening mounds / bunds and will ultimately be re-used in completing the final restoration works at the quarry.

6.36 The proposed backfilling / soil waste recovery activities will be entirely confined within the existing development footprint, on the western side of the quarry, and will not result in any increased land take or a change in existing land-use for any surrounding land.

6.37 In the long term, once the quarry has been backfilled to its original (pre-extraction) ground level, the land will be restored to grassland or other agricultural use, at least initially, and will thereby provide additional land resource and contribute to potential productive land use within the local area.

6.38 At its southern extremity, Huntstown South Quarry lies c. 350m north and north-west of the M50 motorway. Surrounding land is currently used for a mix of agricultural grassland to the south and east; with commercial/light industrial units to the west. The land to the north of the South Quarry site is part of the Huntstown Quarry complex. A corridor of land running broadly east-west to the south of the application site has been earmarked for future development as part of the Metro West orbital light rail scheme.

Soils Baseline

6.39 Soil is defined as the top layer of the earth's crust and is formed by mineral particles, organic matter, water, air and living organisms. Soil is an extremely complex, variable and living medium and its characteristics are a function of parent subsoil or bedrock materials, climate, relief and the actions of living organisms over time.

6.40 Soil formation is an extremely slow process and can take thousands of years to evolve; soil can be considered essentially as a non-renewable resource.

6.41 As the interface between the earth, the air and the water, soil performs many vital functions; it supports food and other biomass production (forestry, biofuels etc.) by providing anchorage for vegetation and storing water and nutrients long enough for plants to absorb them. Soil also stores, filters and transforms other substances, including carbon and nitrogen, and has a role supporting habitats serving as a platform for human activity.

6.42 Soils have been removed from the area of the existing quarry and almost none remain within the proposed backfill / recovery area at the South Quarry. Any soil stockpiled or mounded around the quarry, will be re-used in the final stage restoration works.

National Soils - Irish Soils Information System

6.43 Almost all soils have been stripped across the South Quarry footprint (including the proposed waste recovery area) to facilitate rock extraction. The Teagasc soil mapping for the Irish Soils Information System (ISIS) mapping project, reproduced in Figure 6-1, indicates that prior to stripping, the soils in the proposed waste licence extension area formed part of the Elton soil association.

6.44 The Elton soil association is described by Creamer & O'Sullivan (2018) as comprising fine, loamy drift with limestones. The soil type is luvisols with surface-water gleys, on glacial drift, containing mixed limestone and siliceous stones. This soil association is moderately draining, and widespread throughout Fingal County and the limestone lowlands of central Ireland. Luvisols in this landscape are considered to be particularly suited to grassland, as they tend to retain nutrients and have a good moisture holding capacity (Creamer & O'Sullivan, 2018).

6.45 The soils to the west and north-west of the Huntstown Quarry Complex form part of the Straffan soil association. The Straffan soil association is also described as fine, loamy drift with limestones (Creamer & O'Sullivan, 2018). The soil type is described as typical surface water gleys. This soil association is poorly draining, with poor structure and is widespread throughout Fingal County and

County Meath. Gley soils are of somewhat limited agricultural value and, where improved, can be used for rough grazing, seasonal grassland and forestry. Poor drainage can make them susceptible to poaching (Creamer & O'Sullivan, 2018).

Subsoils Baseline

Regional Subsoils

6.46 The Quaternary (Subsoil) deposits were deposited during the last 2 million years, and essentially comprise the unconsolidated materials overlying bedrock. The two predominant types of quaternary subsoils in Ireland are glacial till, deposited at the base of ice sheets, and sand and gravel deposits, associated with the melting of the ice sheets and are generally termed 'glaciofluvial outwash sands and gravels'. Other extensive Quaternary subsoils in Ireland include peat, river alluvium and coastal process deposits. Most Quaternary subsoils in Ireland were deposited after the peak of the last glaciation, the Midlandian, which occurred approximately 17,000 years ago.

6.47 The subsoils across Ireland have been mapped on a national basis by Teagasc as part of the EPA Soil and Subsoil Mapping Project for the Irish Forestry Soils (IFS) project. The subsoil mapping was undertaken on a national basis using existing Quaternary Geology maps, publications, remote sensing and field mapping and sampling.

6.48 The published subsoil map for the area around the application site, reproduced in Figure 6-2, indicates that before stripping to facilitate rock extraction, much of the proposed backfill and recovery area was underlain by till derived from carboniferous limestone. The north-central part of the South Quarry footprint and internal access road is underlain by bedrock at or close to the original ground surface. Mapping also indicates that there is a small pocket of gravel derived from limestone on the eastern boundary of the Roadstone landholding, with another a further c.400m to the east.

6.49 Beyond the proposed waste licence extension area, there are areas of Made Ground, associated with housing, commercial and more general urban fringe development, to the south, west, east and south-east.

Bedrock Geology Baseline

Regional Setting

6.50 Bedrock mapping published by the GSI at 1:100,000 scale, reproduced in Figure 6-3, indicates that the South Quarry at Huntstown is underlain by Carboniferous age limestones and calcareous shales.

6.51 The GSI 1:100,000 geology maps (Sheets 13 and 16) show a complex geology around Huntstown. The quarry complex straddles a number of geological formations. The southern part of the complex is underlain by well bedded limestones of the Malahide Formation.

6.52 This is conformably overlain to the north-west by the Waulsortian Limestone of the Feltrim Limestone Formation, described as a clean micritic boundstone with scattered bioclasts. The Waulsortian is massive, with occasional shale partings and is reported to vary in thickness across the lower Carboniferous of central Ireland from < 50m to > 500m.

6.53 The Tober Colleen Formation conformably overlies the Waulsortian to the north-west. Faulting to the south of the Roadstone landholding means that the Tober Colleen is in faulted contact with the Malahide Formation to the south-east, between the quarry and M50 motorway, refer to Figure 6-3.

6.54 It should be noted that GSI mapping refers to the Boston Hill Formation, rather than the Malahide formation, in the immediate vicinity of the quarry. The two formations are stratigraphically equivalent, but SLR considers that the rock at Huntstown is better described as belonging to the Malahide Formation.

Local Detail

6.55 The geological sequence at Huntstown was investigated in detail by *Jones et al*. (1988), although at that time development of the South Quarry had not commenced. The bedrock sequence locally in the Huntstown area, as determined by *Jones et al*. is presented in Table 6-1, below.

Table 6-1
Lithological Sequence Present in Vicinity of Huntstown Quarry Complex

FORMATION	MEMBERS	ESTIMATED THICKNESS	DESCRIPTION
LUCAN FORMATION		250m at Huntstown? 1000m+ Regionally	Dark fine-grained limestone and thin shales
TOBER COLLEEN FORMATION		100m to 200m?	Shales and dark limestones
FELTRIM LIMESTONE FORMATION (WAULSORTIAN)		200m to 250m	Pale-grey micritic sparry limestones
MALAHIDE LIMESTONE FORMATION	Barberstown Nodular Member	84m	Nodular limestones and shales
	Dunsoghley Massive Crinoidal Member	47m	Massive crinoidal limestones
	Huntstown Laminated Member	40m	Laminated coarse limestones
	St Margarets Banded Member	86m	Interbedded shales and limestones
	Swords Argillaceous Bioclastic Member	>860m	Variable. Massive clean limestone units interbedded with banded limestone / shale units and argillaceous bioclastic limestones. Mudstone-dominated units have also been recorded
	Turvey Micrite Member	40m	Micritic limestones and thin shales
	Lower Limestone Shale Unit	>30m	Limestone and shale

6.56 Local geological investigations around the South Quarry at Huntstown indicate that it is developed almost entirely within the limestones of the Malahide Formation (and does not intersect the Waulsortian limestone as suggested by GSI regional geological mapping). The limestone strata dip steeply to the north in the eastern part of the quarry and to the north-west in the western part of the quarry, refer to Figure 6-4. The limestones in quarry exposures are dominated by well-bedded limestones.

6.57 The Tober Colleen Formation, to the northwest of the South Quarry, is in reverse fault contact with the limestones, dolomitised limestones and interbedded argillaceous limestones of the Malahide Formation.

6.58 As previously noted, three rotary cores holes were drilled across South Quarry at Huntstown in 2015. The drillholes, designated 15-HTS-04, 15-HTS-05 and 15-HTS-06, were advanced from the then floor of the quarry, as the locations shown in Figure 6-4. Mapping and borehole logging indicate that the central and southern part of the South Quarry is underlain by the Huntstown Laminated Member of the Malahide Limestone Formation, and that the northern part of the quarry is in the Dunsoghly Massive Crinoidal Member of the Malahide Limestone Formation.

6.59 The presence in the recovered drill core of significant fracturing, veining and dolomitization indicates that the rock mass of the Malahide Formation contains significant internal faulting.

Structure

6.60 The bedrock sequence at Huntstown dips steeply to the north or north-west, with recorded dip values within the formations around the South Quarry varying between 23° to the east of it and 44° in the southern / south-western area.

6.61 The Tober Colleen Formation is interpreted as being approximately 200m thick in the Huntstown area and the steep dip suggests that the sub-crop area of the Tober Colleen Formation would be approximately 100m in width from the known exposure of the basal geological contact of this unit along the Central Quarry access road.

6.62 The rocks of the Tober Colleen Formation are well jointed. The dominant joint-set trends roughly N-S and are sub-vertical, typically dipping between 87° east and 87° west. These joints are frequently associated with calcite or calcite dolomite veins.

Karstification

6.63 A review of the GSI Karst Database indicates that there are no known karst related landforms or features in the immediate vicinity of Huntstown Quarry, although some karst infill clays are identified in bedrock at the extreme north-western corner of the North Quarry.

6.64 The presence, nature and extent of any karstification at Huntstown Quarry has been separately assessed by inspection of existing quarry faces and from the 2015 geological exploration programme. These inspections revealed a number of minor solutionally enlarged and clay-infilled joints, with one particularly wide joint exposed in the eastern part of the South Quarry. This feature appears to pinch (narrow) rapidly to the south and would be expected to pinch with depth. The quarry manager reports that these features do not significantly disrupt or interfere with quarrying operations.

6.65 The ongoing development of the Central Quarry to the north is constrained by a series of major clay-infilled features. Examination of these features indicates that these are largely vertical or sub-vertical features, orientated north-south or north-northwest – south-southeast.

Geological Heritage Baseline

6.66 An audit of County Geological Sites in Fingal County was completed by the GSI Irish Geological Heritage (IGH) Programme in 2013. The GSI Geological Heritage map viewer (at https://www.gsi.ie/en-ie/data-and-maps/Pages/Geoheritage) was reviewed to establish if any geological heritage sites or features were present at the application site or in the immediate vicinity.

6.67 The Huntstown Quarry complex has been designated as a County Geological Site, under IGH Theme No. 8, Lower Carboniferous, refer to Figure 6-5. The principal feature of geological heritage interest is the geological contact between the Tober Colleen formation and the underlying Feltrim (Waulsortian) Limestone formation. This contact is not exposed at the South Quarry, but rather along the existing descent road leading to the Central Quarry.

6.68 Further details in respect of the geological heritage interest of this feature is presented in the GSI Geological Heritage Site Report reproduced in Appendix 6-B of this EIAR.

Sensitive Receptors

6.69 In terms of the land, soils and geology baseline considered here, the principal sensitive receptors are the designated County Geological Site and the bedrock in the quarry.

IMPACT ASSESSMENT

Evaluation Methodology

6.70 This evaluation of impacts of quarry backfilling and recovery activities is based on a methodology similar to that outlined in the '*Guidelines for the Assessment of Geology, Hydrology and Hydrogeology for National Road Schemes*' published by the National Roads Authority (2009) and the '*Guidelines for the Preparation of Soils, Geology and Hydrogeology Chapters of Environmental Impact Statements*' published by the IGI (2013).

Evaluation of Impacts

6.71 This assessment will focus on the potential impact of the proposed backfilling and soil recovery activities on land, soils and geology at the South Quarry and surrounding local area. Full details of the proposed development are provided in Chapter 2 of this EIAR. The proposed development will provide for backfilling of the western side of the existing quarry void to former ground level under licence, using imported soil waste, at the existing approved rate of 750,000 tonnes per annum.

6.72 The status and importance of existing land, soil and geology attributes identified at the application site is assessed in Table 6-2 below.

Table 6-2
Status and Importance Land, Soil and Geology Attributes

Attribute	Status / Occurrence	Importance
Land	The land within the licence extension area currently comprises an almost worked-out limestone quarry and a network of existing internal access roads leading thereto.	As these lands are disturbed by extractive development and do not host any soil resource, they are not currently available / suitable for any other productive use or for a wide range of other prospective land-uses. They are therefore considered to be of low importance.

Attribute	Status / Occurrence	Importance
Soils	Soils across the licence extension area have previously been stripped to facilitate limestone extraction / haul road construction.	There are little or no productive or useable soils remaining across most of the extension area. Any remaining soils, in their current condition are considered to be of low importance.
Subsoils	The subsoils across the licence extension area have previously been stripped to facilitate limestone extraction / haul road construction.	There are little or no useable subsoils remaining across most of the extension area. Remaining subsoils, in their present condition are considered to be of low importance.
Geology	The bedrock across the licence extension area is exposed in the quarry faces.	Given the steeply dipping nature of the bedrock, the existing quarry has largely extracted as much high-quality limestone bedrock resource as occurs at this location. The bedrock geology which will remain in-situ is considered to be of low importance.
Geological Heritage	The existing licenced site and proposed extension area both lie within an IGH Geological Heritage Site. A County Geological Site is located at the Central Quarry (within existing licenced site).	The Tober Colleen Formation / Feltrim Limestone Formation contact is of moderate to high importance at a regional scale as the contact is exposed in a limited number of geological sites.

Operational Stage

6.73 During the operational stage, inert soil and stone / broken rock will be imported to the western side of the South Quarry at Huntstown for backfilling / soil recovery purposes. On completion, the final landform will be topsoiled, seeded and restored to agricultural grassland. The magnitude of the operational stage impacts on the land, soils and geology attributes is assessed in Table 6-3 below.

Table 6-3
Magnitude of Potential Impacts on Land, Soil and Geology (with No Mitigation)

Attribute	Impact of Proposal on Land, Soil and Geology	Magnitude of Potential Impact (with no mitigation)
Land	Restoration of disturbed lands and return to agricultural use.	Moderate positive over medium to long term at a local level as the landform is progressively returned to productive (agricultural grassland) use over time.
Soils	Long-term reinstatement of soil cover across backfill area. Use of existing access / haul routes to import soil and stone materials means there will be no need for any stripping of soil cover.	Moderate positive impact over medium to long term due to the progressive re-establishment of soil as a growth medium and carbon sink and the restoration of its environmental functions on site.

Attribute	Impact of Proposal on Land, Soil and Geology	Magnitude of Potential Impact (with no mitigation)
Subsoils	Long-term reinstatement of subsoils across backfill area. Use of existing access / haul routes to import soil and stone materials means there will be no need for further disturbance of subsoils.	Moderate positive impact over the medium to long term as the subsoils are used to support overlying soils and provide natural drainage.
Bedrock Geology	HGV traffic movements and earthworks plant introduce risk of potential bedrock contamination by way of fuel leaks and/or oil spills. Backfilling / soil recovery inhibits potential future extraction / exploitation of bedrock resource.	Small negative impact given that such a risk already exists at the present time (due to quarrying activities) and, with implementation of appropriate controls, is shown to present low risk to bedrock. No resource related impact given existing impediments to future rock extraction (i.e., quality / suitability of surrounding rock formations for production of construction aggregates).
Geohazards	Elimination of localised erosion at existing slopes and stockpiles.	Small negative short-term / small positive long-term (*Refer to 'Unplanned Events' below*).
Geological Heritage	The backfilling and soi recovery activities will not affect the exposure of the Tober Colleen / Feltrim Limestone contact. The exposure is on either side of the access road to the Central Quarry which will continue in place / in service.	No impact on geological exposure for which the site has been designated of geological heritage value.

6.74 The restoration of the existing extractive void at Huntstown South Quarry (previously approved by Fingal County Council and An Bord Pleanála) by backfilling with imported soils will return the ground surface to its original, pre-extraction level and will 'smooth' the site topography to re-integrate it into the surrounding urban fringe landscape and allow it to be returned (at least initially) to agricultural grassland use.

6.75 The progressive return of the quarry lands to productive land use, the progressive re-establishment of soil as a growth medium and carbon sink and the restoration of its environmental functions on site all constitute moderate-to-long-term improvements on attributes of low importance. The significance of these impacts is therefore assessed as **slight** and **positive**.

6.76 The generation of on-site traffic and handling of imported wastes could increase the risk of a leak or spillage of fuels and/or oils across the proposed licence extension area. There is also a risk that contaminated materials could be imported, thereby introducing potential risk to bedrock across the extended area. The potential impact of imported contaminated soils or hydrocarbon spills, were they to occur, would be localised and long-term.

6.77 Assuming the backfilling / soil waste recovery activities are undertaken in accordance with established waste management practices at the adjoining EPA licensed facility (at the North Quarry), the potential scale of associated risk of introducing ground contamination in imported soils / subsoils is assessed as **moderate** and **negative**.

6.78 Given that the risk of contaminating existing bedrock of low importance is moderate, the significance of this potential impact is assessed as slight and negative. Given the potential for interactions with, and implications for, the underlying groundwater resource however, it is considered that mitigation measures are required to manage / limit potential impacts. These potential interactions are discussed in greater detail in Chapter 7 (Water) of this EIAR.

6.79 There will be no indirect impacts on land, soils, or geology as a result of the backfilling and soil waste recovery activities at the western side of the South Quarry.

Unplanned Events (i.e. Accidents)

6.80 Unplanned events within the application site have the potential to impact on the land, soils and geology adjoining the site. Ground instability, particularly the long-term stability of existing / completed quarry faces, has the potential to impact on adjoining lands. Backfilling of the quarry will safeguard against any future (long-term) instability of existing rock faces.

6.81 Unplanned events in respect of future backfilling and recovery operations could potentially arise from instability caused by over-steep placement of imported soils at the application site. Any short-term instability in the imported soil and stone materials, were it ever to arise, is likely to be localised at small areas within the application site.

6.82 The risk of such instability will be minimised by site management procedures which limit the height and gradient of slopes developed in them, by adhering to the Health and Safety Authority (HSA) Safe Quarry Guidelines[1] and implementing the Safety Health and Welfare at Work (Quarries) Regulations (S.I. No 28 of 2008, as amended). Having regard to the above, it is considered unlikely that face / soil instability will have any adverse impact on land, soils and geology at or immediately beyond the active backfill / soil recovery area.

6.83 From a land, soils and geology perspective, any potential impacts on human health from backfilling and recovery activities at the South Quarry would not be via soil / geology pathways but via other pathways such as air (principally dust) and water (principally groundwater). These are addressed in detail in the relevant Chapters of this EIAR.

Cumulative Impacts

6.84 A search of the Fingal County Council online planning search facilities indicates that the following developments are currently seeking planning permission or have been granted planning permission in the last five years (and not yet built) in the vicinity of the (extended) waste licence area:

- The development of a construction and demolition waste recovery facility on lands within the Huntstown Quarry Complex (Planning Ref. No. FW17A/0012);
- The prospective Irish Water Biosolids Waste Facility to be located in Newtown, on lands to the west of the R135 Regional Road and north-east of the Roadstone landholding (ABP Reference SID/02/18);

[1] *Safe Quarry Guidelines : A Guide for Quarry Workers*, Health and Safety Authority, Dublin , 2019

- The construction of a 5,000m^2 pilot scale circular economy research and development building in the townlands of Huntstown / Coldwinters for Rathdrinagh Land Limited (Planning Ref. No. FW20A/0063); and
- The development of two data centre buildings immediately east of the Huntstown Power Station, between it and the R135 Regional Road (Planning Ref. No FW21A/0151).

6.85 Although the above listed developments (if they proceed) may have some potential adverse impacts on soil resources in particular, in the absence of any substantive impact from the (already approved) backfilling and recovery activities at the South Quarry, no planned or prospective development in the surrounding local area, when considered together with that under assessment in this EIAR, is likely to give rise to any significant cumulative impact on land, soil and geology.

6.86 Backfilling at the Huntstown North Quarry is continuing and nearing completion within a few years. The proposed backfilling and soil recovery activities at the western side of the South Quarry will follow those at the North Quarry. Backfilling of the two quarries will not be progressed simultaneously. Any impacts as regards land, soil and geology arising from activities at the two locations are largely similar in nature and, ultimately, when completed, will be slightly positive.

Interaction with Other Impacts

6.87 The risks associated with the introduction of potentially contaminated soil when backfilling and restoring the western side of the South Quarry with imported soil waste could, with no mitigation measures in place, have implications for groundwater quality, were infiltrating rainfall to percolate down through potentially contaminated backfill materials into the underlying groundwater aquifer. This aspect is discussed in more detail in Chapter 7 of this EIAR (Water).

6.88 When successfully completed however, the restoration / backfilling works will provide an increased thickness of soil and subsoil cover above the existing groundwater table, thereby reducing the potential risk of future groundwater contamination from activities at the surface.

6.89 During the backfilling works, the presence of wider areas of exposed, unvegetated soil surfaces could give rise to dust blows during dry, windy weather. These impacts will however be mitigated by progressive establishment of vegetation / grass cover over the final landform. These issues are discussed in more detail in Chapter 8 of this EIAR (Air Quality).

'Do-Nothing Scenario'

6.90 If the proposed waste licence review application is not approved, alternative strategies would have to be developed to progress the restoration of the South Quarry to agricultural land use in line with the planning conditions attached to the current extractive permission, most likely using materials classified as non-waste by-product.

6.91 Although the end result would be the same as that provided for in the licence review application, it could ultimately take longer to complete given the limited number of decisions made by the Agency confirming by-product status for soil and stone to date.

6.92 Were the quarry backfilling activities not to proceed at all (in contravention of planning permission), the disturbed landform around the South Quarry would remain in place. Assuming quarry dewatering ceased, the worked-out quarry void would be drowned as groundwater levels rebounded to their natural level. This would result in the formation of a sizeable lake which would attract birdlife and ultimately present an increased risk of bird strike to aircraft on the overhead flight path in and out of Dublin Airport.

6.93 Above the water table, there would only be a very slow and gradual recolonization of natural vegetation on excavated faces and surfaces over time given the absence of any soil medium or nutrients to support plant growth. In dry periods, in the absence of any site management practices, dust emissions would be likely to arise on an ongoing basis and surface water bodies / groundwater could be vulnerable to impacts from any future human activities within and/or around the quarry.

MITIGATION MEASURES

6.94 Mitigation measures outlined below will be implemented during the proposed backfilling and recovery activities at the South Quarry (and its ultimate reinstatement to agricultural land use) to mitigate against any potential adverse impacts on the receiving soil / geological environment which could arise during the operational phase.

6.95 The proposed mitigation measures to deal with potential fuel / oil spills include the following :

- Any refuelling of mobile plant undertaken within the quarry void is only to be undertaken using double skinned bowsers with drip trays provided to capture any minor leaks or spills;
- No oils, greases, hydraulic fluids or hazardous substances (or any associated wastes) will be stored across the application site. All such materials will be stored under cover, over fuel spill trays / bunded containers within the existing quarry workshop / garage;
- Good site management practices will be implemented to reduce risks of spills, including regular monitoring and inspection of storage vessels and regular maintenance and servicing of construction plant and equipment;
- Such plant and resources necessary to ensure that the recovery facility will be managed and operated in accordance with best waste management practice will be made available;
- Activities will comply fully with Environmental Management Systems (EMS), planning consents and waste licence conditions; and
- Contingency plans / procedures developed to deal with potential leaks and spills as part of Roadstone's ISO 14001 EMS will be applied to backfill and recovery activities at the South Quarry. An emergency spill response kit will be held on site.

6.96 In order to minimise the risk of importing and introducing contaminated soil / subsoil to the application site, management systems (including characterisation testing) will be introduced to establish the source of imported materials in advance and to confirm that they are inert. Once received at the intake site at Huntstown, a multiple level soil testing regime is envisaged which will test the material for compliance, in line with established EPA methodologies for soil recovery facilities. These include:

- comprehensive on-site verification, comprising visual inspection and record of imported soil end-tipped / unloaded at the site;
- basic characterisation testing covering a range of parameters to determine the leaching behaviour of the inert soils imported to site; and
- frequent, compliance testing covering a limited range of key soil parameters.

6.97 Temporary side slopes in backfilled soils will generally be graded at an angle no steeper than 35° (approximately 1v:1.5h) and often much shallower, sufficient to ensure no large-scale instability arises over the short-term. Ongoing assessment of slope stability will be undertaken at the application site as backfilling progresses and where necessary, slopes will be graded having due regard to safe systems of work.

6.98 During backfilling of the quarry, all temporary surfaces will continue to be graded to facilitate overground run-off to sumps / surface water bodies developed at the low point in the quarry floor and/or against rock faces in backfilled materials. This will encourage percolation through bedrock and minimise the volume percolating through backfilled soils and subsoils.

6.99 In order to confirm that there are no residual risks to in-situ soil and geology, provision is made for regular, continued monitoring of the recently installed groundwater wells around the South Quarry for the duration of the backfilling and soil recovery activities and for a short aftercare period thereafter to ensure there is no adverse impact on groundwater quality.

6.100 In order to reduce the risk of localised erosion (and potential dust emissions) during the backfilling and recovery operations, the area of bare or exposed subsoils will be kept to a minimum, insofar as practicable, by progressive restoration of final, backfilled surfaces and establishment of grass cover at the earliest opportunity. Where required, consideration can also be given to establishing temporary vegetation cover over stockpiled soils (pending re-use) or exposed surfaces (pending further backfilling to final ground level).

6.101 All aspects of the proposed backfilling / operation phase works will be undertaken in accordance with relevant best practice environmental guidance published by the Environmental Protection Agency and other regulatory agencies. All activities will be undertaken in accordance with the provisions in the Waste Management Acts and Regulations.

6.102 In order to maximise the future agricultural potential of the restored land, a minimum 150mm thick layer of topsoil and 150mm of subsoil will be placed over the backfilled materials. The final landform will also be graded so as to facilitate long-term overground run-off (northward) toward pre-existing surface water drainage networks.

RESIDUAL IMPACT ASSESSMENT

6.103 The residual impacts on land, soil and geology are those impacts which remain following the implementation of the mitigation measures outlined above.

Construction Stage

6.104 There are no residual impacts associated with this stage of the proposed development.

Operational Stage

6.105 The potential impacts of the quarry backfilling and recovery activities on land, soil and geology have been identified and assessed. Where appropriate, mitigation measures have been identified which will significantly mitigate any potential environmental impacts arising from the soil importation, backfilling and recovery activities at Huntstown South Quarry.

6.106 With the implementation of the proposed mitigation measures, it is considered that the potential risks of fuel spill and introduction of contaminated soil / subsoils and the associated short-term impact on land, soils and geology, will reduce to **'small'** and **negative**.

6.107 Given that the risk of contamination of the land or soil / subsoil / bedrock of low value and importance is reduced to 'small', the significance of any mitigated, residual impacts on them arising from on-site backfilling and soil recovery activities is assessed as **'imperceptible'**.

Post Operational Phase

6.108 Following completion of the final restoration works and the return of the site to productive agricultural grassland use, the long-term impact of the backfilling and soil recovery activities at the South Quarry will be **slightly positive** at a local scale.

MONITORING

6.109 As was identified in the previous section on mitigation measures, it is envisaged that a multiple level testing regime will be established to test imported soils and ensure compliance with agreed waste intake parameters (as per established EPA methodologies for soil recovery facilities).

6.110 Provision will also be made for continued monitoring of groundwater for the duration of the backfilling and soil recovery activities and for a short aftercare period to confirm that there are no residual risks to in-situ soil and geology arising from future site activities.

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FIGURES

NOTES

1. BASEPLAN IS EXTRACT FROM OSi DISCOVERY SERIES MAP NO. 50

2. **CYAL50167032** (C) ORDNANCE SURVEY IRELAND / GOVERNMENT OF IRELAND

LEGEND

- ROADSTONE LIMITED LAND INTEREST **(C. 171.8 HA)**
- AMENDED WASTE LICENCE AREA (COMPRISING EXISTING LICENCE AREA AND PROPOSED EXTENSION) **(C. 77.5 HA)**
- PROPOSED EXTENSION TO CURRENT WASTE LICENCE AREA
- ELTON
- RIVER / WATERBODY
- STRAFFAN
- URBAN

N

0 800m 2000

Metres 1:25,000

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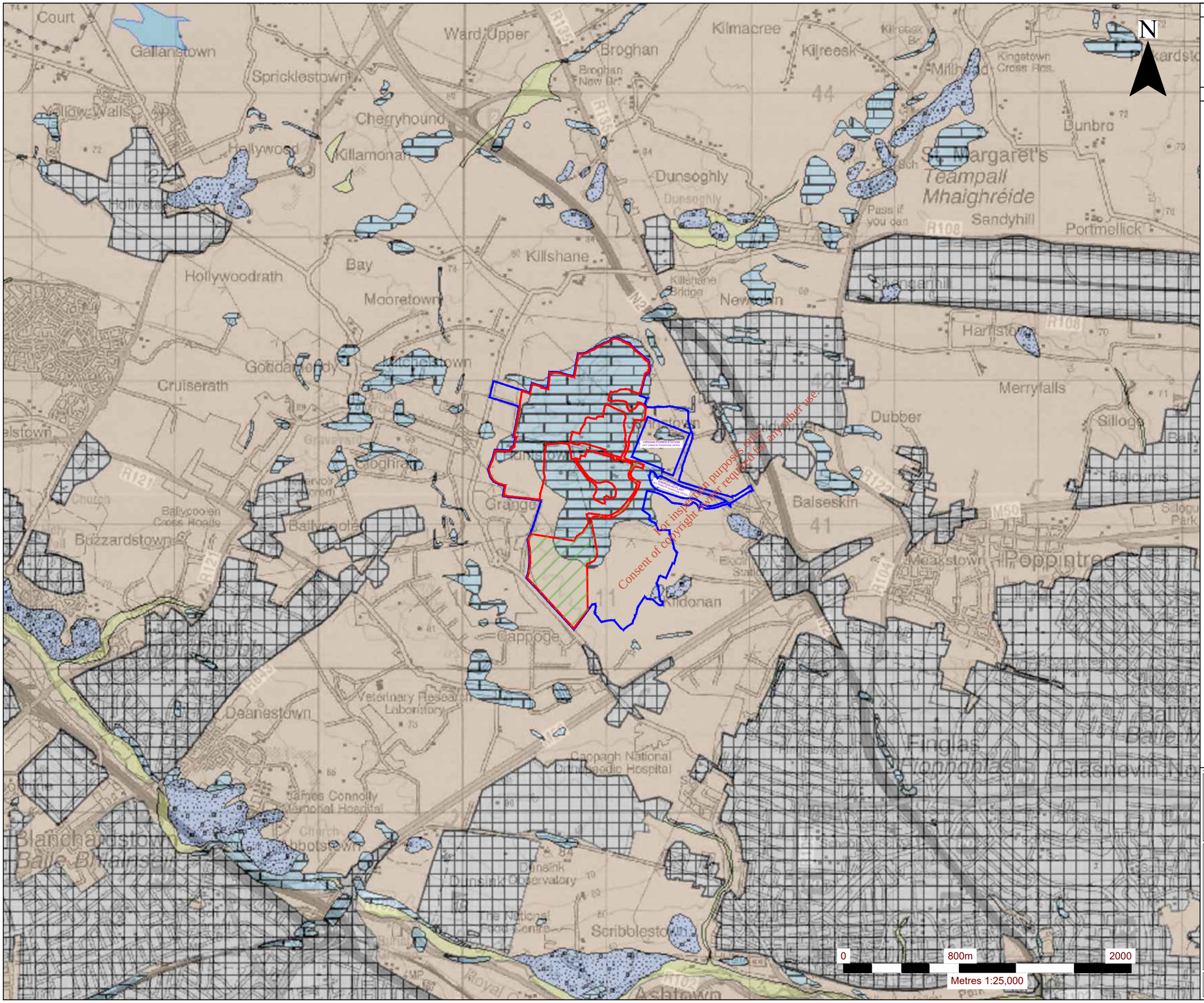
SOILS MAP

FIGURE 6-1

Scale: 1:25,000 @ A3

Date: NOVEMBER 2021

0180.00313.0.Fig 6-1.WLR RevA.Soils Map.dwg



NOTES

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- AMENDED WASTE LICENCE AREA (COMPRISING EXISTING LICENCE AREA AND PROPOSED EXTENSION) **(C. 77.5 HA)**
- PROPOSED EXTENSION TO CURRENT WASTE LICENCE AREA
- GRAVEL DERIVED FROM LIMESTONE
- TILL DERIVED FROM LIMESTONE
- BEDROCK AT SURFACE
- MADE GROUND
- ALLUVIUM
- LAKE SEDIMENTS

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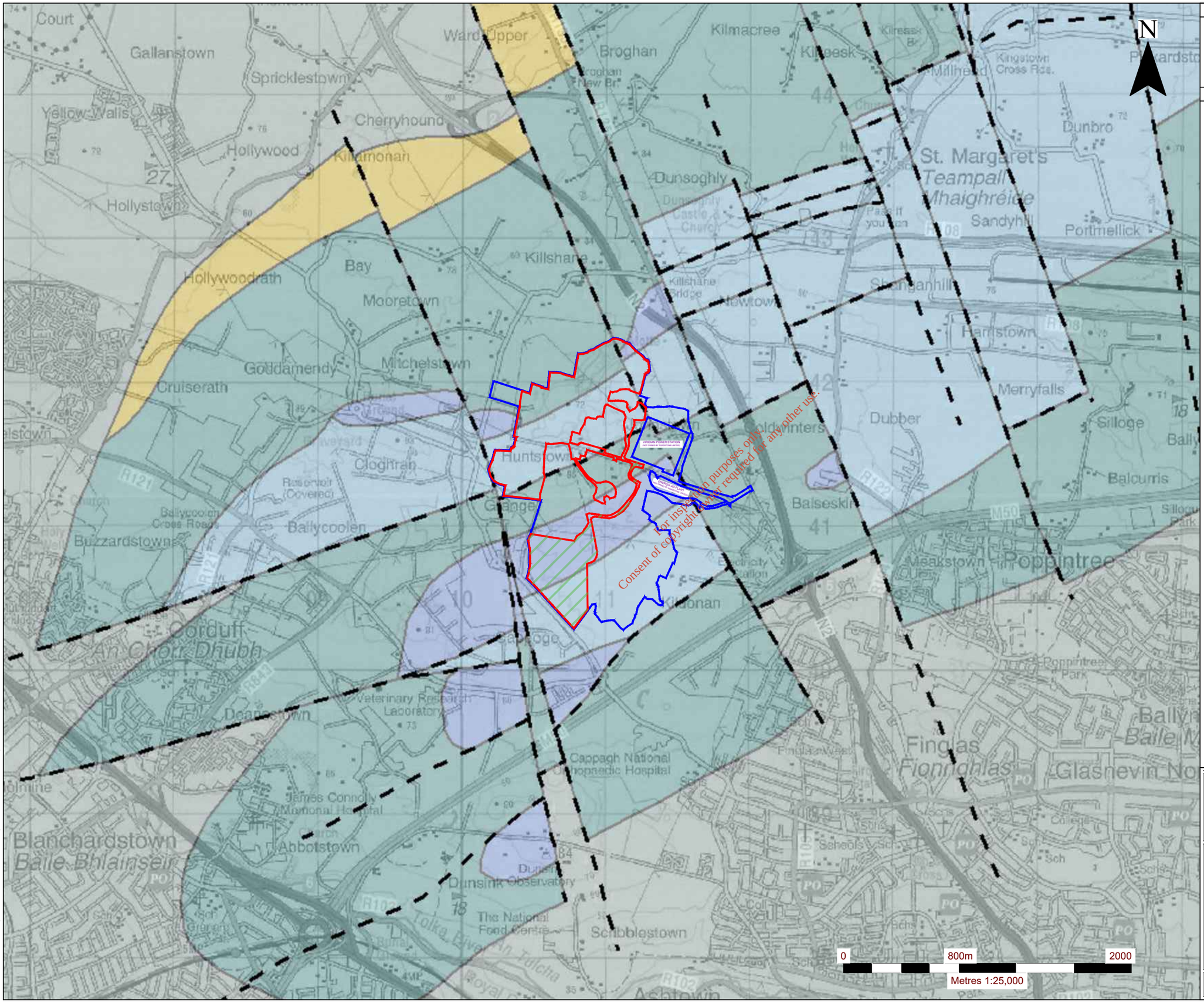
SUBSOILS MAP

FIGURE 6-2

Scale: 1:25,000 @ A3

Date: NOVEMBER 2021

0180.00313.0.Fig 6-2.WLR RevA.Subsoils Map.dwg



NOTES

1. BASEPLAN IS EXTRACT FROM OSi DISCOVERY SERIES MAP **NO. 50**

2. **CYAL50167032** (C) ORDNANCE SURVEY IRELAND / GOVERNMENT OF IRELAND

LEGEND

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- AMENDED WASTE LICENCE AREA (COMPRISING EXISTING LICENCE AREA AND PROPOSED EXTENSION) **(C. 77.5 HA)**
- PROPOSED EXTENSION TO CURRENT WASTE LICENCE AREA
- FAULT
- LUCAN FORMATION
- RUSH CONGLOMERATE FORMATION
- TOBER COLLEEN FORMATION
- WAULSORTIAN LIMESTONES
- MALAHIDE FORMATION

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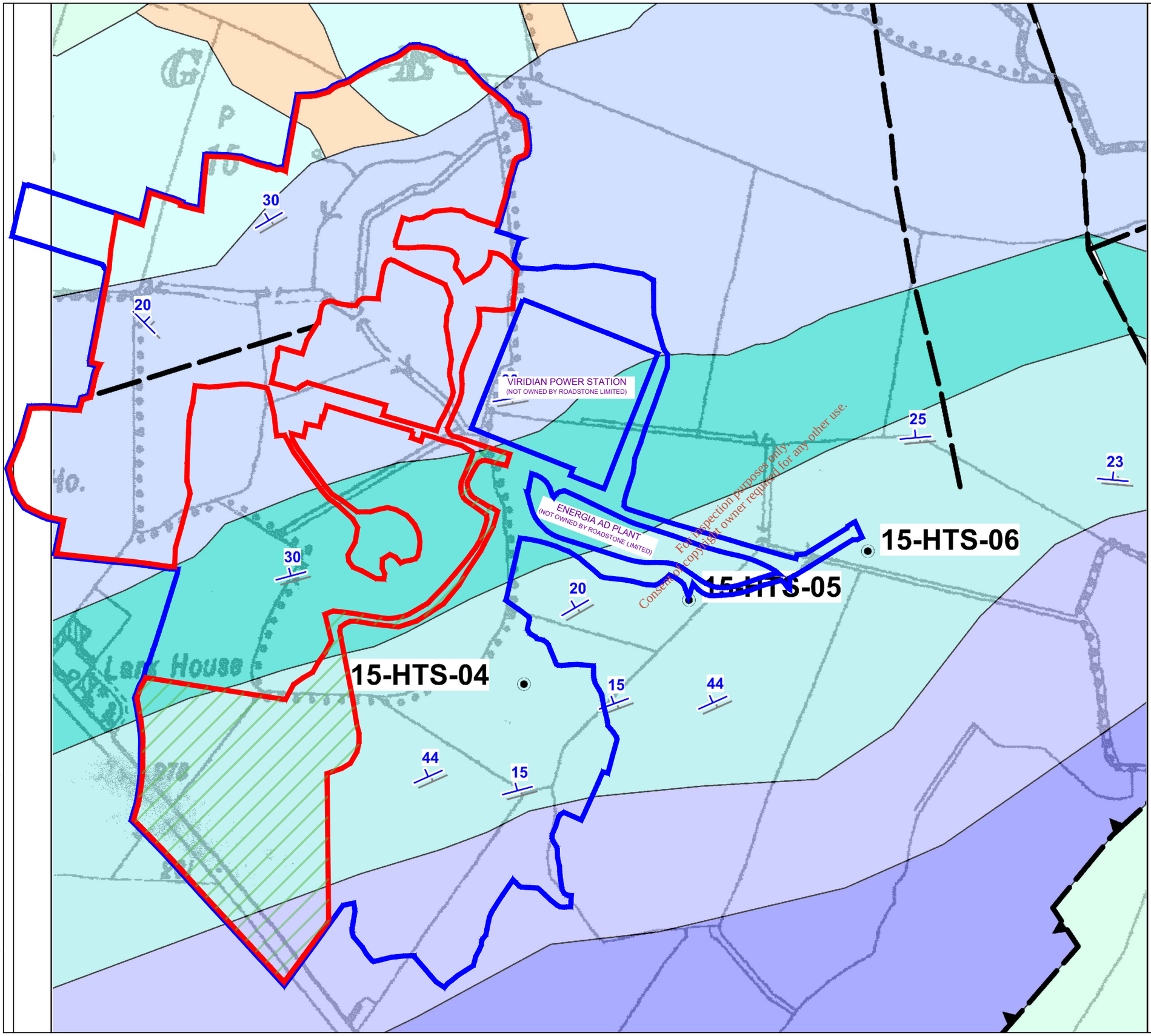
REGIONAL BEDROCK

FIGURE 6-3

Scale: 1:25,000 @ A3

Date: OCTOBER 2021

0180.00313.0.Fig 6-3.WLR RevA.RegionalBedrock.dwg



N

NOTES

1. BASEPLAN IS EXTRACT FROM OSi DISCOVERY SERIES MAP **NO. 50**

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- AMENDED WASTE LICENCE AREA (COMPRISING EXISTING LICENCE AREA AND PROPOSED EXTENSION) **(C. 77.5 HA)**
- PROPOSED EXTENSION TO CURRENT WASTE LICENCE AREA
- FELTRIM LIMESTONE FORMATION (WAULSORTIAN)
- WAULSORTIAN- KARSTIC INFILL CLAYS
- MALAHIDE LST FMN - BARBERSTOWN NOBULAR MEMBER
- MALAHIDE LST FMN - DUNSOGHLY MASSIVE CRINOIDAL MEMBER
- MALAHIDE LST FMN - HUNTSTOWN MEMBER
- MALAHIDE LST FMN - ST MARGARETS BANDED MEMBER
- MALAHIDE LST FMN - SWORDS AB MEMEBER

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DETAILED BEDROCK

FIGURE 6-4

Scale: 1:8,000 @ A3

Date: NOVEMBER 2021

0180.00313.0.Fig 6-4.WLR RevA.Detailed Bedrock.dwg

Mooretown
Newtown
Mitchelstown
Burial Ground
Motte
Huntstown
Coldwinters
Cloghran
Grange
Electricity Station
Kildonan
Cappoge
N2
72
93
90
95
80
78
81
10
11
12
VIRIDIAN POWER STATION
(NOT OWNED BY ROADSTONE LIMITED)
ENERGIA AD PLANT
(NOT OWNED BY ROADSTONE LIMITED)
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N

0 100 200 300 400m 600 800 1000
Metres 1:10,000

NOTES

1. EXTRACT FROM 1:50,000 O.S DISCOVERY MAP **NO. 50**

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LEGEND

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- PROPOSED EXTENSION TO CURRENT WASTE LICENCE AREA
- GEOLOGICAL HERITAGE SITE
- LOCATION OF TOBER COLLEEN / FELTRIM LIMESTONE CONTACT

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GEOHERITAGE

FIGURE 6-5

Scale	Date
1:10,000 @ A3	NOVEMBER 2021

0180.00313.0.Fig 6-5.WLR RevA.Geoheritage.dwg

APPENDIX 6-A
GEOLOGICAL BOREHOLE LOGS

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Borehole No
15-HTS-04

Project Name: Geological Assessment	Project No. 501.00180.00133	Co-ords: 310893E - 240522N	Hole Type Rotary
Location: Huntstown South Quarry		Level: -	Scale 1:50,000
Client: Roadstone Ltd		Dates: 16/12/2015-17/12/2015	Logged By TM

Piezo	Core Geotechnical Data					Depth (m)	Level (m OD)	Litho	Stratum Description
	Drill Tag	TCR	SCR	RQD	FI				
	0.00								Grainstone Strong, banded, pale to mid-grey, fresh, fine to medium grained, GRAINSTONE with occasional mid to dark grey fine grained packstones
		75	73	68	4	1			Bedding @ approximately 10deg
	2.00					2			
		100	95	93	4	3			Bedding @ approximately 10deg
						4			
	5.00					5			
		100	73	73	8	6			
						7			
	8.00					8			Very rare thin (<0.5mm) mudstone horizons
		100	97	97	3	9			

Continued next sheet

Remarks: Drilled by IDL

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Borehole No
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Project Name: Geological Assessment	Project No. 501.00180.00133	Co-ords: 310893E - 240522N	Hole Type Rotary
Location: Huntstown South Quarry		Level: -	Scale 1:50,000
Client: Roadstone Ltd		Dates: 16/12/2015-17/12/2015	Logged By TM

Piezo	Core Geotechnical Data					Depth (m)	Level (m OD)	Litho	Stratum Description
	Drill Tag	TCR	SCR	RQD	FI				
									Grainstone
	11.00					11			
						12			Vuggy calcite veins to 12.25m
		100	98	97	3				13m - Bedding @ approximately 10deg
						13.00			Packstone / Grainstone Strong, pale to mid-grey, fresh, fine to medium grained GRAINSTONE / PACKSTONE with very thin (<0.5mm) mudstone bands
						13.25			Argillaceous Bioclastic Limestone / Mudstone Strong, mid grey, fine grained bioclastic WACKESTONE / PACKSTONE with thin interbedded mudstone bands
	14.00					14			
						14.20			Argillaceous Bioclastic Limestone / Mudstone Interbedded moderately strong to strong, mid grey, fine grained argillaceous bioclastic WACKESTONES and PACKSTONES and weak to moderately strong bioclastic CALCAREOUS MUDSTONE (30%)
		100	98	95	3	15			
						16			
	17.00					17			
						18			
		100	95	87	4	19			Bedding @ approximately 20deg, slightly irregular
									Bedding @ approximately 10deg

Continued next sheet

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Borehole No
15-HTS-04

Project Name: Geological Assessment	Project No. 501.00180.00133	Co-ords: 310893E - 240522N	Hole Type Rotary
Location: Huntstown South Quarry		Level: -	Scale 1:50,000
Client: Roadstone Ltd		Dates: 16/12/2015-17/12/2015	Logged By TM

Piezo	Core Geotechnical Data					Depth (m)	Level (m OD)	Litho	Stratum Description
	Drill Tag	TCR	SCR	RQD	FI				
	20.00					20.00			Mudstone / Argillaceous Bioclastic Limestone Interbedded weak to moderately strong bioclastic CALCAREOUS MUDSTONE (70%) and moderately strong to strong fine grained argillaceous bioclastic WACKESTONES and PACKSTONES
		100	93	87	5	21			
						21.75			Clay Black Clay Infill - possibly fault gouge
						21.95			Mudstone / Argillaceous Bioclastic Limestone Interbedded weak to moderately strong bioclastic CALCAREOUS MUDSTONE (70%) and moderately strong to strong fine grained argillaceous bioclastic WACKESTONES and PACKSTONES
	23.00					23			
						23.20			Argillaceous Bioclastic Limestone / Mudstone Interbedded moderately strong to strong, mid grey, fine grained argillaceous bioclastic WACKESTONES and PACKSTONES and weak to moderately strong bioclastic CALCAREOUS MUDSTONE (30%)
		100	98	94	4	24			
						25			
	26.00					26			
						27			
		100	97	93	7	28			Calcite veining, bedding appears to steepen below
						28.80			Grainstone Strong, banded, pale to mid-grey, fresh, fine to medium grained, GRAINSTONE
	29.00					29			
						29.95			

Continued next sheet

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Borehole No
15-HTS-04

Project Name: Geological Assessment	Project No. 501.00180.00133	Co-ords: 310893E - 240522N	Hole Type Rotary
Location: Huntstown South Quarry		Level: -	Scale 1:50,000
Client: Roadstone Ltd		Dates: 16/12/2015-17/12/2015	Logged By TM

Piezo	Core Geotechnical Data: Drill Tag	TCR	SCR	RQD	FI	Depth (m)	Level (m OD)	Litho	Stratum Description
		100	98	88	9	31			Mudstone Detail 29.95m - 35.00m : Weak to moderately strong, dark grey to black CALCAREOUS MUDSTONES with rare thin argillaceous wackestone bands
	32.00					32			Bedding @ approximately 35 - 40deg
		100	99	98	4	33			2cm band of coarse pyrite
						34			
						35.00			End of Borehole at 35.00 m
						36			
						37			
						38			
						39			

Remarks: Drilled by IDL

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Borehole No
15-HTS-05

Project Name: Geological Assessment	Project No. 501.00180.00133	Co-ords: 311025E - 240590N	Hole Type Rotary
Location: Huntstown South Quarry		Level: -	Scale 1:50,000
Client: Roadstone Ltd		Dates: 17/12/2015-18/12/2015	Logged By TM

Piezo	Core Geotechnical Data					Depth (m)	Level (m OD)	Litho	Stratum Description
	Drill Tag	TCR	SCR	RQD	FI				
	0.00								Grainstone Strong, banded, pale to mid-grey, fresh, fine to medium grained, GRAINSTONE with occasional mid to dark grey fine grained packstones, occasional calcite veining throughout
		70	55	48	7	1			
	2.00					2			Calcite vein to 2.3m
						3			Bedding @ approximately <10deg
		100	90	85	8	4			
	5.00					5			Bedding @ approximately 10 - 15deg
		100	90	90	6	6			
						7			
	8.00					8			Very rare thin (<0.5mm) mudstone horizons
		100	97	87	8	9			

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Location: Huntstown South Quarry		Level: -	Scale 1:50,000
Client: Roadstone Ltd		Dates: 17/12/2015-18/12/2015	Logged By TM

Piezo	Core Geotechnical Data					Depth (m)	Level (m OD)	Litho	Stratum Description
	Drill Tag	TCR	SCR	RQD	FI				
									Grainstone Abundant fossil debris to 10.6m
	11.00					11			
		100	99	95	9	12			
						13			
	14.00					14			
		100	90	90	5	15 15.10			Undulating bedding varying from 15 - 20deg Argillaceous Bioclastic Limestone / Mudstone Interbedded moderately strong to strong, mid grey, fine grained argillaceous bioclastic WACKESTONES and PACKSTONES and weak to moderately strong bioclastic CALCAREOUS MUDSTONE (30%) Bedding @ approximately 10deg
	17.00					16 17			
		100	99	97	4	18 19			
									Continued next sheet

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Borehole No
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Project Name: Geological Assessment	Project No. 501.00180.00133	Co-ords: 311025E - 240590N	Hole Type Rotary
Location: Huntstown South Quarry		Level: -	Scale 1:50,000
Client: Roadstone Ltd		Dates: 17/12/2015-18/12/2015	Logged By TM

Piezo	Core Geotechnical Data					Depth (m)	Level (m OD)	Litho	Stratum Description
	Drill Tag	TCR	SCR	RQD	FI				
	20.00								Argillaceous Bioclastic Limestone / Mudstone
						20.50			Mudstone / Argillaceous Bioclastic Limestone Interbedded weak to moderately strong bioclastic CALCAREOUS MUDSTONE (70%) and moderately strong to strong fine grained argillaceous bioclastic WACKESTONES and PACKSTONES
		100	97	90	7	21			Bedding @ approximately 15 - 20deg
						22			
						22.70			Argillaceous Bioclastic Limestone / Mudstone Interbedded moderately strong to strong, mid grey, fine grained argillaceous bioclastic WACKESTONES and PACKSTONES and weak to moderately strong bioclastic CALCAREOUS MUDSTONE (30%)
	23.00					23			
		100	90	90	5	24			
						25			
	26.00					26			
		100	100	97	5	27			
						28			
	29.00					29			
						29.60			Mudstone / Argillaceous Bioclastic Limestone
									Continued next sheet

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Project Name: Geological Assessment	Project No. 501.00180.00133	Co-ords: 311025E - 240590N	Hole Type Rotary
Location: Huntstown South Quarry		Level: -	Scale 1:50,000
Client: Roadstone Ltd		Dates: 17/12/2015-18/12/2015	Logged By TM

Piezo		Core Geotechnical Data					Depth (m)	Level (m OD)	Litho	Stratum Description
		Drill Tag	TCR	SCR	RQD	FI				
			100	98	98	4	31			Remaining Detail : 29.60m - 35.00m : Interbedded weak to moderately strong bioclastic CALCAREOUS MUDSTONE (80%) and thin moderately strong to strong fine grained argillaceous bioclastic WACKESTONES and PACKSTONES
		32.00					32			
			100	97	97	3	33			
							34			
							35.00			Bedding @ approximately 20deg
										End of Borehole at 35.00 m
							36			
							37			
							38			
							39			

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Borehole No
15-HTS-06

Project Name: Geological Assessment	Project No. 501.00180.00133	Co-ords: 311170E - 240627N	Hole Type Rotary
Location: Huntstown South Quarry		Level: -	Scale 1:50,000
Client: Roadstone Ltd		Dates: 21/12/2015-22/12/2015	Logged By TM

Piezo	Core Geotechnical Data					Depth (m)	Level (m OD)	Litho	Stratum Description
	Drill Tag	TCR	SCR	RQD	FI				
	0.00								Grainstone Strong, banded, pale to mid-grey, fresh, fine to medium grained, GRAINSTONE with occasional mid to dark grey fine grained packstones
		90	70	48	10	1 2			Numerous Calcite veins
	3.00					3			
		100	72	67	11	4 5			
	6.00					6			
		100	93	80	14	7 8			
	9.00					8.90 9			Bedding @ approximately 20- 25deg Argillaceous Bioclastic Limestone / Mudstone Interbedded moderately strong to strong, mid grey, fine grained argillaceous bioclastic WACKESTONES and PACKSTONES and weak to moderately strong bioclastic CALCAREOUS MUDSTONE (30%)

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Borehole No
15-HTS-06

Project Name: Geological Assessment	Project No. 501.00180.00133	Co-ords: 311170E - 240627N	Hole Type Rotary
Location: Huntstown South Quarry		Level: -	Scale 1:50,000
Client: Roadstone Ltd		Dates: 21/12/2015-22/12/2015	Logged By TM

Piezo		Core Geotechnical Data					Depth (m)	Level (m OD)	Litho	Stratum Description
		Drill Tag	TCR	SCR	RQD	FI				
			100	93	70	14	11			Argillaceous Bioclastic Limestone / Mudstone
		12.00					12			Bedding @ approximately 25 - 30deg
			100	97	90	10	13			
							14			
		15.00					15			
			100	97	83	11	16			
							17			
		18.00					18			
			100	95	95	8	19			

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Project Name: Geological Assessment	Project No. 501.00180.00133	Co-ords: 311170E - 240627N	Hole Type Rotary
Location: Huntstown South Quarry		Level: -	Scale 1:50,000
Client: Roadstone Ltd		Dates: 21/12/2015-22/12/2015	Logged By TM

Piezo	Core Geotechnical Data					Depth (m)	Level (m OD)	Litho	Stratum Description
	Drill Tag	TCR	SCR	RQD	FI				
									Argillaceous Bioclastic Limestone / Mudstone
	21.00					21			
						21.50			Mudstone / Argillaceous Bioclastic Limestone Interbedded weak to moderately strong bioclastic CALCAREOUS MUDSTONE (70%) and moderately strong to strong fine grained argillaceous bioclastic WACKESTONES and PACKSTONES
		100	98	97	4	22			Bedding @ approximately 20 - 25deg
						23			
	24.00					24			
		100	95	95	3	25			
						26			
						26.50			Argillaceous Bioclastic Limestone / Mudstone Interbedded moderately strong to strong, mid grey, fine grained argillaceous bioclastic WACKESTONES and PACKSTONES and weak to moderately strong bioclastic CALCAREOUS MUDSTONE (30%)
	27.00					27			Bedding @ approximately 20 - 25deg
		100	100	97	4	28			
						29.00			Mudstone / Argillaceous Bioclastic Limestone Interbedded weak to moderately strong bioclastic CALCAREOUS MUDSTONE (60%) and moderately strong to strong fine grained argillaceous bioclastic WACKESTONES and PACKSTONES

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Project Name: Geological Assessment	Project No. 501.00180.00133	Co-ords: 311170E - 240627N	Hole Type Rotary
Location: Huntstown South Quarry		Level: -	Scale 1:50,000
Client: Roadstone Ltd		Dates: 21/12/2015-22/12/2015	Logged By TM

Piezo	Core Geotechnical Data					Depth (m)	Level (m OD)	Litho	Stratum Description
	Drill Tag	TCR	SCR	RQD	FI				
	30.00								Mudstone / Argillaceous Bioclastic Limestone
		100	100	97	3	31 31.60			Grainstone Strong, banded, pale to mid-grey, fresh, fine to medium grained, GRAINSTONE
	33.00					32 33			Bedding @ approximately 20 - 25deg
		100	90	90	4	33.70 34			Mudstone Weak to moderately strong, dark grey to black CALCAREOUS MUDSTONES with rare thin argillaceous wackestone bands
						34.70 35.00			Argillaceous Bioclastic Limestone / Mudstone Interbedded moderately strong to strong, mid grey, fine grained argillaceous bioclastic WACKESTONES and PACKSTONES and weak to moderately strong bioclastic CALCAREOUS MUDSTONE (30%) End of Borehole at 35.00 m
						36 37 38 39			

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APPENDIX 6-B
GEOLOGICAL HERITAGE SITE REPORT

FINGAL - COUNTY GEOLOGICAL SITE REPORT

NAME OF SITE	**Huntstown Quarry**
Other names used for site	
IGH THEME:	IGH 8 (Lower Carboniferous)
TOWNLAND(S)	Huntstown
NEAREST TOWN	
SIX INCH MAP NUMBER	13 & 14
NATIONAL GRID REFERENCE	310750 241600 = O 107 416
1:50,000 O.S. SHEET NUMBER	50 **1/2 inch Sheet No.**

Outline Site Description
A working quarry (Roadstone Wood Ltd).

Geological System/Age and Primary Rock Type
Lower Carboniferous (Waulsortian) limestone with shale and micrite at the base of the Tober Colleen Formation.

Main Geological or Geomorphological Interest
Quarry exposing the base of the Tober Colleen Formation where it directly overlies Waulsortian. The contact in Huntstown Quarry is conformable although there is considerable discordance of the Tober Colleen shale and micrite beds immediately above the Waulsortian, due to differential competencies at the time of Variscan folding.

Site Importance
This is one of the few sites currently known where the base of the Tober Colleen is seen overlying Waulsortian. It is only otherwise seen in some currently abandoned parts of Feltrim Quarry (NE part where the Tober Colleen lies in hollows in the Waulsortian reef topography). This stratigraphy has also been logged in core from Borehole AD-5.

Management/promotion issues
This is a large working quarry and is therefore a hazardous environment. This site is not suitable for general promotion without appropriate arrangements being made with Roadstone. The relevant sections are exposed along both sides of the access road between the plant offices (North Quarry) and the Central (formerly South) Quarry, which is now used as a re-cycling facility. A barrier or ‘berm’ of waste concrete protects passing quarry vehicles from the eastern scarp of interest, and thereby obscures a complete view of the section. However, it also serves to ‘protect’ the section on this side from inadvertent damage by quarry traffic. The ‘backfilling’ requirement in the restoration plan will not come into effect until the end of quarry life and no disturbance of the sections is envisaged in the mid-term future. The area of geological interest has been noted in re-mapping of the quarry area in an EIS preparation (SLR Consulting Ltd., June 2011).

Waulsortian – Tober Colleen contact east side of central quarry access road, Huntstown Quarry, Dublin. (Photo: J.Kelly)

Waulsortian – Tober Colleen contact west side of central quarry access road, Huntstown Quarry, Dublin. (Photo: J.Kelly)