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INTRODUCTION

Background

- 6.1 This chapter of the EIAR provides a description of the existing land, soils, and geology conditions in the application area of the site within the context of the regional setting. It assesses the potential impacts the proposed development will have on the land, soils, geological features, and other geological aspects of the development. Mitigation measures, if required, are proposed.

Proposed Development

- 6.2 The proposed development is described in detail in Chapter 2: Project Description of this EIAR and only those elements which relate to land, soils, and geology are presented here. The proposed site layout is shown on **Figure 2-2**.
- 6.3 This EIAR provides an assessment of the proposals for a quarry extension which has previously been granted planning permission (P. Ref. 12/101), which is due to expire in early 2023. The proposed extraction area covers c. 4 ha. within an overall planning application area of c. 4.9 ha.
- 6.4 In total 17 years are being sought to allow the finalisation of extractions, including two years for the finalisation of restoration works at the site.
- 6.5 Existing ancillary buildings and facilities including weighbridge, wheelwash, portacabin office / canteen / toilet, waste water treatment system, processing plant, site entrance and all other associated site works, and ancillary activities will be used for the development as the site is an existing and established operation, therefore there is no requirement for any additional site infrastructure or facilities.
- 6.6 The proposed development will include the permanent placement of overburden into dedicated storage bunds along the boundaries of the extraction area, to provide acoustic and visual screening and to provide ecological habitat. This proposed area of landscape screening that will be formed through the management of overburden material equates to the remaining 0.9 ha. of the 4.9 ha. planning application area (additional to the 4.0 ha extraction area).
- 6.7 The method of extraction will be as previously used at the permitted quarry (P. Ref. 07/827), comprising blasting, crushing and screening of the rock. Conventional benching system (steps) will be used for development of quarry, with working faces being progressively advanced in a westerly direction.
- 6.8 It is proposed that the quarry extension extraction area will be worked to the previously permitted depth of c. 110m AOD. When extraction operations commence, it is proposed that water inflows to the extraction area will be diverted to a sump within the quarry floor of the extension area for settlement of any suspended solids and then pumped to the discharge point. This will ensure the quarry area remains dry for the duration of extraction operations.
- 6.9 The permitted quarry within the applicant's landholding has produced a valuable high PSV aggregate product which is important at the local and regional scale. Typically quarry aggregates are only commercially viable for transport within a c. 50-60 km radius of a site due to transport costs. However, high PSV products are a premium aggregate product which are desired in the bitumen making process and are used by local authorities for surface dressing with bitumen emulsions and therefore have a much wider transport range. Planning permission is required to secure this supply of high PSV stone from the site for the next 15-year period, followed by a 2 year restoration period.

Scope of Work

6.10 This EIAR is based on a desk study of the site and surrounding lands using published geological data, previous reports published for the site and an inspection of the lands.

Project Team

6.11 This chapter of the EIAR was prepared by SLR Consulting Ireland. The project team consists of:

- Nikolina Bozinovic BSc, MSc (Engineering Geology and Hydrogeology)
- Peter Glanville BA, MSc, PGeo, EurGeol

REGULATORY BACKGROUND

EU Directives

6.12 The following European Union (EU) Directive relate to Land, Soils and Geology at the site in this EIAR:

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

6.13 The EU EIA Directive regulates the information impact assessment process and information in this EIAR. The management of waste Directive and the Environmental Liability Directive regulate the activities at the site.

Irish Legislation

6.14 The following legislation relating to Land, Soils and Geology at the site is referred to in this EIAR:

- No. 349 of 1989, European Communities (Environmental Impact Assessment) Regulations, and subsequent amendments (S.I. No. 84 of 1994, S.I. No. 352 of 1998, S.I. No.; 93 of 1999, S.I. No. 450 of 2000 and S.I. No. 538 of 2001);
- S.I. No. 473 of 2011, European Union (Environmental Impact Assessment and Habitats) Regulations 2011;
- S.I. No. 584 of 2011, European Union (Environmental Impact Assessment and Habitats) (No.2) Regulations 2011;
- The Planning and Development Act, 2000 (as amended); and
- The Planning and Development (Amendment) Act 2010, S.I. 600 of 2001 Planning and Development Regulations and subsequent amendments including, S.I. No. 364 of 2005 and S.I. 685 of 2006.

6.15 The above legislation regulates the information contained in an EIAR and planning at the site.

Planning Policy and Development Control

- 6.16 The following Planning Policy and Development Control relating to Land, Soils and Geology at the proposed development site is set out in the Cavan County Development Plan (CCDP) 2022-2028.
- 6.17 The 2022-2028 County Development Plan, the current plan, sets out conservation objectives in relation to natural heritage and landscape, including geology, in the county.
- 6.18 Regarding Geological Heritage, Objective **GH6** of the development plan 2022-2028 is to *‘Have regard to the geological and geomorphological heritage values of County Cavan geological heritage sites and to avoid inappropriate development, through consultation with the Geological Survey of Ireland’*.
- 6.19 The current development plan notes that an audit of the Geological Sites of County Cavan was completed in 2013. The audit details sites currently understood by the Irish Geological Heritage Programme (IGH) of the Geological survey of Ireland (GSI) to be the most important sites in Cavan and proposes these sites as County Geological Sites (CGS). Many of the CGS fall within existing pNHAs and SAC’S where the ecological interest is founded upon the underlying geodiversity.
- 6.20 The current development plan also recognises the importance of soil to the environment and to agriculture in the county.
- 6.21 The Cavan County Development Plan 2022-2028 (Section 12.12) recognises the importance of the extractive industry to the economy of the county, and the need to balance the needs of the building industry with environmental protection.
- 6.22 The current development plan contains the following Objective in relation to the Quarrying Development:
- **Q01** Safeguard for future extraction all identified locations of major mineral deposits in the County;
 - **Q02** Promote development involving the extraction of mineral reserves and their associated processes, where Cavan County Council is satisfied that any such development will be carried out in a sustainable manner, that does not adversely impact on the environment or on other land uses. Consideration in this regard shall be given to the impact of the development on the local economy;
 - **Q03** Facilitate adequate supplies of aggregate resources to meet the future growth needs of the County and the wider region while addressing key environmental, traffic and social impacts and details of rehabilitation;
 - **Q04** Ensure that projects associated with the extractive industry carry out screening for Appropriate Assessment in accordance with Article 6(3) of the E.C. Habitats Directive and comply with all relevant Environmental Legislation as required; and
 - **Q05** Facilitate the exploitation of the County’s natural resources and to exercise appropriate control over the types of development, including rural housing, taking place in areas containing proven deposits, whilst also ensuring that such developments are carried out in a manner which would not unduly impinge on the visual amenity or environmental quality of the area.

Guidelines

- 6.23 This Land, Soils and Geology chapter of the EIAR has been prepared with regard to the following guidelines:
- Environmental Protection Agency (2022) *Guidelines on the Information to be Contained in Environmental Impact Assessment Reports..* Environmental Protection Agency

- DoEHLG (2010) Appropriate Assessment of Plans and Projects in Ireland - Guidance for Planning Authorities;
- 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.
- Good Practice Guide for Handling of Soils (UK Ministry of Agriculture, Fisheries and Food, 2000).

RECEIVING ENVIRONMENT

Study Area

- 6.24 For the purposes of this assessment, the study area comprises the application site and the surrounding area up to 2 km from the site to reflect the sensitivity of the Land, Soil and Geology; this is in line with the Institute of Geologists of Ireland's (IGI) guidelines (2013).
- 6.25 The IGI guidelines state that the minimum distance of 2 km should be reviewed in the context of the geological environment as well as the scale of development and increased to reflect the sensitivity of the subsurface. The IGI guidelines also state that maps should be sourced to allow for the review of the geological conditions that exist within a minimum of 2 km of the site boundary (from the outer limit of the planning and/or licence area) and presented at a scale of 1:25,000.
- 6.26 The baseline maps produced in this EIAR are at a scale of 1:25,000 and include an area up to c. 3.5 km from the lands under the control of the applicant.

Baseline Study Methodology

- 6.27 The baseline study undertaken for Land, Soils, and Geology here involves a review of published literature and information, existing site reports, the findings from a walkover survey of the site and the context of the site within the surrounding area.
- 6.28 The baseline study is a qualitative assessment of the available information based on professional experience.

Sources of Information

- 6.29 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 soil and 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).

6.30 The existing exposures at the adjoining quarry on the site also provided information on the local subsoils and bedrock geology at the proposed development site.

Land Baseline

6.31 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.

6.32 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’.

6.33 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; unnecessary land take may result in the loss of this resource which has the potential to have adverse social and economic consequences for society.

6.34 The proposed extension area of the site is characterised by scrub land / trees with some areas of more open land for grazing and an area of stockpiled processed aggregate material.

6.35 The extraction of rock materials at the site is a tied land-use activity as it is dependent on the location and suitability of the rock that is used to produce a range of construction aggregates including high polished stone value (PSV) chippings and may be considered to be a natural resource.

6.36 The land within the immediate vicinity of the proposed extension area has been used in the past for quarrying and aggregate processing activities. In this respect, the proposed quarry extension extraction area may be considered to be compatible with the existing surrounding land use at the site.

Soils Baseline

6.37 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.

6.38 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.

6.39 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.

National Soils

- 6.40 County Cavan did not have a National Soil Survey report or map published for the area. As part of the An Forais Talúntais general soils map of Ireland (1980) a reconnaissance survey of the area was carried out only. Consequently, at the county level the soils were mapped indicating that the county to be primarily composed of acid brown earthy soils with inter-drumlin peat and peaty gleys. These soils were reported as having formed mainly from shale glacial till and from gravels of mixed origin.
- 6.41 These soils are acidic in nature as they occur on lime-deficient parent material. They have a medium texture of sandy loam, loam and sandy clay loam.
- 6.42 The Irish Soil Information System project has developed a national association soil map for Ireland, the project is co-funded by Teagasc and the Environmental Protection Agency (EPA). This soil project has identified a number of Soil Associations across Ireland, which are each comprised of a range of soil types (or 'Series'), each of them different in properties, and in environmental and agronomic responses.
- 6.43 The soil association is classified as the Kilrush (0700h) at the majority of the quarry extension extraction area, characterised as 'Fine loamy drift with siliceous stones' and as the Rock in central area of application, see **Figure 6-1**.
- 6.44 The Kilrush Soil Association is described as comprising 'Typical Surface-water Gleys, on drift with siliceous stones',
- 6.45 Surface Water Gleys/Groundwater Gleys Acidic are deep poorly drained mineral soils also derived from chiefly acidic parent materials.

Site Soils

- 6.46 The soils at the site of the proposed quarry extension extraction area have either been covered by previous stockpiles of aggregates from the existing quarry or support the scrub woodland with small areas of grazing. The soils do not currently support agricultural practises. There are no trial pits in the extension area to indicate the thickness of soils across the area however, the subsoils mapping, see below, indicates that rock is close to the surface across parts of the area and therefore the soils and subsoils are thin or absent here.

Subsoils Baseline

Regional Subsoils

- 6.47 The Quaternary (Subsoil) deposits were deposited during the last 2 million years, and essentially comprise the unconsolidated materials overlying bedrock. The two main types of quaternary subsoils in Ireland are glacial till, deposited at the base of ice sheets, and sand & gravel deposits associated with the melting of the ice sheets which 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 since the maximum of the last glaciation, the Midlandian, which occurred approximately 17,000 years ago.
- 6.48 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 using existing Quaternary Geology maps, publications, remote sensing, field mapping and sampling.

- 6.49 Tills (often referred to as boulder clay or drift) are the most widespread subsoil type found in County Cavan. It is a diverse material which is deposited sub-glacially and it has a wide range of characteristics due to the variety of parent materials and different processes of deposition. Tills are often tightly packed, unsorted, unbedded, and have many different particle and stone sizes and types, which are often angular or subangular.
- 6.50 The tills are categorised according to their dominant lithological component, e.g. Lower Palaeozoic sandstone and shale till (IFS code TLPSSs).
- 6.51 The subsoils at the site have been mapped by Teagasc as bedrock at or close to surface and tills derived from sandstone and shale material, refer to **Figure 6-2**.
- 6.52 In Ireland there are in general two primary types of peat; Raised Bog and Blanket Bog. Raised bog is associated with lowlands and impeded drainage, while Blanket Bog usually occurs at upland areas with excessive rainfall. Cutover Peat refers to Peat Soils that have had the surface peat removed by hand cutting methods, but the peat thickness still meets the criteria for peat soil. Peat subsoils occur throughout Cavan normally forming small deposits in low lying areas between drumlins.

Site Subsoils

- 6.53 According to Teagasc mapping, there are three types of subsoils present at the application site and the immediate surrounding area.
- 6.54 A small central part of it is mapped as bedrock at or close to surface. The remaining majority of application area is underlain by Till derived from Lower Palaeozoic Sandstones and Shales (IFS code TLPSSs).
- 6.55 In the immediate vicinity of the extraction area, to the south east direction, there is a small area mapped as Cutover Raised Peat. Peat soils, when not drained, are normally saturated with extremely high-water content, averaging over 90% by volume.

Bedrock Geology Baseline

- 6.56 The GSI 1:100,000 Geology Map Sheet 8 (2018) indicates that the existing site is underlain by Massive sandstone and microconglomerate from the Lough Avaghon Formation, refer to **Figure 6-3**.
- 6.57 Lough Avaghon Formation (& Cootehill Member) is presented by grey, fine to coarse grained massive muddy sandstones, microconglomerates and amalgamated beds, with interbedded sandstones and mudstones becoming prevalent towards the north-western part of the unit. A volcanic horizon has been described in this bedrock unit; it also contains minor amounts of dark shales. There are two principal lithotypes in the Cootehill Member:
 - (a) Thin-bedded, calcareous shales, mudstones and muddy sandstones; and
 - (b) Very finely-laminated clayey muds with some laminated siltstones.
- 6.58 In addition, horizons of both muddy and clean sandstones are found within this member.
- 6.59 Bedrock is exposed at the existing central quarry area and this proposal will involve the extraction of similar High Polished Stone Value (PSV) bedrock from the proposed extension area. The existing quarry has produced a valuable high PSV aggregate product which is important at the local and regional scale.

- 6.60 Typically quarry aggregates are only commercially viable for transport within a c. 50-60 km radius of a site due to transport costs. However, high PSV products are a premium aggregate product which are desired in the bitumen making process and are used by local authorities for surface dressing with bitumen emulsions and therefore have a much wider transport range.

Geological Heritage Baseline

- 6.61 The Geological Survey of Ireland (GSI) Irish Geological Heritage (IGH) Programme of audited sites was reviewed (www.gsi.ie) to establish if any geological heritage issues were present in relation to the Stradone site.
- 6.62 There are no designated County Geological Sites (CGS) within a 2 km radius of the site. The nearest protected geological heritage site is Cormeen Quarry (Site Code: CN005), located c. 6 km to the north. The Cormeen Quarry site is described as “*the best known representative in Ireland of the ‘Moffat Shale’ graptolitic horizons*”. Its geological significance is attributed to a small quarry cut into ordovician rocks.

Sensitive Receptors

- 6.63 In terms of land, soils and geology baseline considered here, the sensitive receptors identified from this baseline are:
- Land;
 - soils; and
 - the bedrock.

IMPACT ASSESSMENT

Evaluation Methodology

- 6.64 The evaluation of impacts of the proposed development 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

- 6.65 This assessment focuses on the potential impact of the proposed development on the land, soils, and geology at the site. It specifically describes the significance and sensitivity of the receiving environment.
- 6.66 Construction impacts will include soil stripping and vegetation removal across the lands. Operational impacts will include the removal of rock from the proposed quarry extension area.
- 6.67 The importance of existing land, soil, and geology attributes identified at the application site is assessed in **Table 6-1** below.

Table 6-1
Importance of Attributes in Vicinity of Application-site

Attribute	Status / Occurrence	Significance/Sensitivity/Importance
Land	<p>The land at the site comprises previous stockpiling and some limited agricultural lands.</p> <p>The lands have a previous permission for quarrying (P. Ref. 12/101), and it is an established land use in the wider landholding.</p> <p>The extraction land has no particular status in terms of its use or suitability for agriculture.</p>	<p>The quarrying land use at the site is of local and regional importance as a high PSV aggregate. In this respect the quarrying land use is considered to be High importance at the local and regional scale.</p> <p>The agricultural land at the site has a value in terms of its ability to support agriculture and is considered to be of Low importance at the local scale only as it comprises poor grazing only.</p>
Soils	<p>Kilrush Soil Association is comprising 'Typical Surface-water Gleys', associated with perched water tables, therefore, a poor drainage and low permeability soil type.</p> <p>The high silt content of these soils is mainly responsible for the poor drainage.</p> <p>The soils do not have any particular status.</p>	<p>The soils are considered to be of Low importance at the local scale only.</p> <p>These soils are principally used for grassland, and additional usage has a limited potential.</p> <p>As the soils are poorly draining, they can't be used for agriculture without the requirement for drainage improvement works.</p> <p>The soils are not considered to be significant or particularly important.</p>
Subsoils	<p>Any glacial till at the site will be removed and used for screening.</p> <p>The subsoils do not have any designated status.</p>	<p>The subsoils are considered to be of Low importance at the local scale.</p> <p>Glacial tills are the most widespread subsoil type found in County Cavan and therefore are not considered to be significant or particularly important.</p>
Geology	<p>Bedrock is exposed in the current quarry area at the site.</p> <p>The bedrock is a source of high PSV aggregate.</p>	<p>In terms of the proposed development, the Bedrock geology is considered to be of High importance at the local and regional scale.</p>

6.68 The magnitude of these impacts on the land, soils and geology attributes is assessed in **Table 6-2** below.

Table 6-2
Significance of Impacts on Land, Soil and Geology with no Mitigation

Attribute	Impact of Proposal on Land, Soil and Geology	Significance of potential impact
Land	Permanent loss of low quality agricultural lands.	The significance of the impact is considered to be Not Significant only with the permanent loss of a small area of low quality agricultural lands.
	The restored lands at the site will allow the return of the worked-out area to a beneficial ecological after-use area.	Neutral with restoration of the worked-out area to a beneficial ecological after-use area.
Soils	The removed soils will be permanently placed along the boundaries of extraction area, to provide acoustic and visual screening and ecological habitat.	The significance of the impact is considered to be Not Significant with the permanent loss of a small area of low quality agricultural soils.
Subsoils	Permanent loss of till subsoils as part of overburden.	Not Significant. Permanent loss of a small area of glacial till material.
Geology	Permanent loss of high PSV aggregate from proposed extension area.	Significant. Permanent loss of available aggregate resource which is of local and regional importance to the construction industry.

Indirect Impacts

6.69 There will be no indirect impacts on land, soils, or geology as a result of the proposed development at the site.

Unplanned Events

6.70 Unplanned events within the application site, such as accidents, have the potential to impact on the land, soils and geology adjoining the site.

6.71 Ground instability, particularly the long-term stability of quarry faces, has the potential to impact on adjoining lands. Operations at the site will adhere to the Health and Safety Authority Safe Quarry Guidelines in relation to the Safety Health and Welfare at Work (Quarries) Regulations 2008 and this will limit the potential for unplanned events such as instability of quarry faces or instability in adjacent lands. With the implementation of the Quarry Regulations 2008, it is considered unlikely that instability of quarry faces would result in an impact on the land, soils, and geology at the site.

Human Health

6.72 From a land, soils and geology perspective, any potential impacts on human health from the extraction and processing of the extracted rock at the site would not be via the land-use, soils and geology pathways but via other pathways such as air and water, which are addressed in the relevant chapters of this EIAR.

Cumulative Impacts

- 6.73 There is an existing quarry void adjacent to the application site where previously extraction was carried out under the extant planning permission P. Ref. 07/827. It is not anticipated that there will be any cumulative impacts with this existing quarry void.
- 6.74 It is not considered that there are cumulative impacts in terms of the Land, Soil and Geology between this application and existing and/or dormant quarry operations in the surrounding area.

‘Do-nothing Scenario’

- 6.75 If the proposed quarry extension is not permitted, the proposed extension site will remain undeveloped in its current land use.

MITIGATION MEASURES

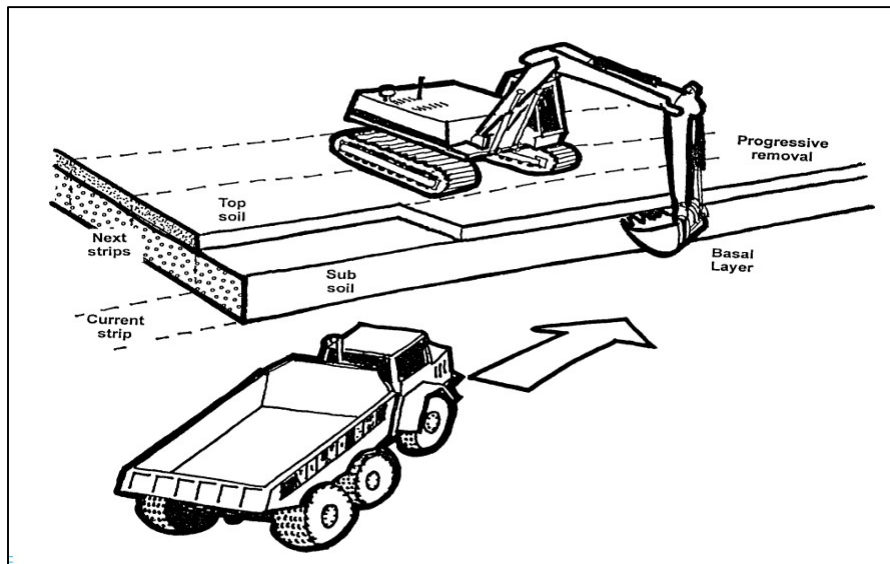
- 6.76 Mitigation measures are outlined here for the construction and operational stages of the proposed development. The construction stage is relatively short lived (< 1 year) and will involve the removal of the soil and top soil from across the site to facilitate extraction.

Construction Stage

- 6.77 Soils will be managed on-site in line with best practice national guidelines (National Roads Authority, 2006) and Specification for Road Works Series 600 – Earthworks (Transport Infrastructure Ireland, March 2013).
- 6.78 A specific Soil Management Plan will be developed for the site.
- 6.79 During the construction stage the topsoil will be stripped off and placed into dedicated landscaping berms/bunds along boundaries where they will provide the most benefit in terms of acoustic and visual screening. The soils will be stripped and stored in accordance with best practice guidance including MAFF (2000) *Good Practice for Handling Soils (Sheet 1 and Sheet 2)*.
- 6.80 The soil handling method can affect the quality of the restoration through severe soil deformation (compression and smearing); this is primarily caused through trafficking, the effects of which increases with increasing soil wetness.
- 6.81 Good practice measures will be implemented at the site to preserve the structure and integrity of the soils and limit the effects of erosion on the stored soil during excavation and storage.
- 6.82 The key operational points to ensure avoidance of severe soil deformation and to minimise compaction using excavators and dump trucks are as follows:
- the dump trucks must only operate on the ‘basal’/non-soil layer, and their wheels must not, on any circumstances, run on to the soil layer(s);
 - the excavator should only operate on the topsoil layer;
 - the adoption of a bed/strip system avoids the need for the trucks to travel on the soil layers; and
 - the machines are to only work when ground conditions enable their maximum operating efficiency.
- 6.83 For soil stripping with excavators and dump trucks:

- the area to be stripped is to be protected from in-flow of water, ponding etc. Wet sites should be drained in advance;
- if significant rainfall occurs during operations, the stripping must be suspended;
- all machines must be always in a safe and efficient working condition. The machines are to only work when ground conditions enable their maximum operating efficiency. The operation is to be suspended before traction becomes a problem and haul routes fail;
- the operation should follow a detailed stripping plan showing soil units to be stripped, haul routes and the phasing of vehicle movements;
- the soil layer should be stripped to its natural thickness without incorporating material from the lower subsoil layers;
- the haul routes and soil storage areas must be defined, and should be stripped first;
- the excavator is only to work on the topsoil layer; the dump trucks are only to travel on the basal/formation layer; and
- stripping is to be undertaken by the excavator standing on the surface of the topsoil and digging the topsoil to its maximum depth and loading into dump trucks. The dump trucks draw alongside the exposed soil profile, standing and travelling only on the basal layer (see **Diagram 6-1** below).

Diagram 6-1
Removal of Topsoil: Stripping Using Excavator and Dump Truck (MAFF 2000)

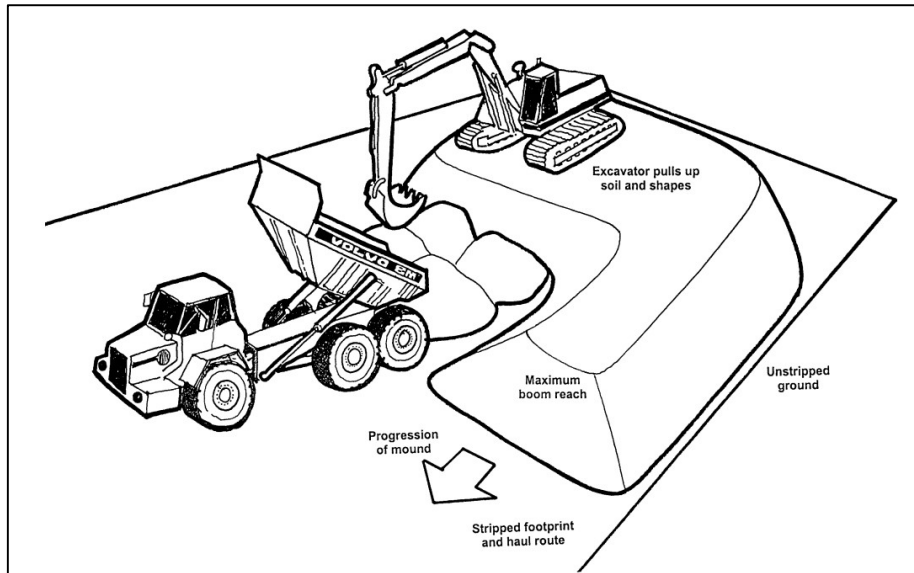


- 6.84 In order to avoid compaction single-tier mounds are preferred to multi-tier mounds for soil storage as it avoids the need for trafficking on the soil being stored.
- 6.85 For the building of soil storage mounds with excavators and dump trucks:
- the mounds should be sited on dry ground, not in hollows and should not disrupt local surface drainage. Where necessary, mounds should be protected from run-off/ponding by a cut-off ditch. Where the storage mound is in a hollow due to the removal of surface soils, measures should be undertaken to ensure that water is not able to pond within the storage area;
 - the dump trucks must only travel within the haul route and operational areas. The trucks should enter the storage area, reverse and back-tip the soil load starting at the furthest point

of the mound from the point of access. The excavator pulls up the soil into a mound of the required dimensions. The excavator operates by standing on the mound (see **Diagram 6-2** below). The excavator bucket can be used to shape and firm the sides as the mound is progressively formed to promote the shedding of rain; particularly at the end of each day, but also on the onset of rain during the day. This should include any exposed incomplete surfaces;

- the process is repeated with the tipping of soil against the forming mound, and without wheels traversing onto previously tipped material;
- work should stop in wet conditions with measures undertaken to prevent ponding at the base of the mound and on the basal layer. At the start of each day ensure there is no ponding on the basal layers and operating areas; and
- topsoil storage mounds will not exceed 2 m in height.

Diagram 6-2
Soil Storage Mound Construction Using Excavator and Dump Truck (MAFF 2000)



- 6.86 Stockpiles of soil will be re-vegetated where they are in place for a sufficient length of time to justify such a measure. The re-handling of soil material will be minimised as much as possible to preserve the integrity of the topsoil material. This is also an economically prudent practice.

Operational Stage

- 6.87 During the operation stage the bedrock materials will be excavated and processed at the site.
- 6.88 Mitigation measures outlined above for the Construction Stage will continue to be implemented throughout the Operation Stage.
- 6.89 Operations at the extraction area will adhere to the Health and Safety Authority Safe Quarry Guidelines in relation to the Safety Health and Welfare at Work (Quarries) Regulations 2008 and this will limit the potential for unplanned events such as instability of quarry faces or instability in adjacent lands.
- 6.90 No other specific mitigation measures are required at the site in terms of land, soil and geology at this stage.

RESIDUAL IMPACT ASSESSMENT

Construction and Operational Stages

- 6.91 The residual impacts on land, soil and geology are those impacts which remain following the implementation of the mitigation measures outlined above.
- 6.92 There will be a residual impact on the land and soil and rock with a permanent loss of the high PSV aggregate as a resource.
- 6.93 It is considered that with mitigation measures the residual impact on the land, soils and subsoils will be **Not Significant**.

MONITORING

- 6.94 Following the restoration of the site initial monitoring will be required over a period of three years to ensure that the restored soil and land-use is successful and that the remaining quarry faces are stable.

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FIGURES

Figure 6-1
National Soils Association Map

Figure 6-2
National Subsoils Map

Figure 6-3
Geology Map

