# 7. LAND SOILS AND GEOLOGY

## 7.1 Introduction

### 7.1.1 Background and Objectives

Hydro-Environmental Services (HES) was engaged by MKO acting on behalf of Newtown Farming Ltd, to prepare an Environmental Impact Assessment Report (EIAR) for the potential likely and significant effects of proposed sand and gravel extraction (Proposed Development) at Lomaunaghbaun, near Tuam Co. Galway on the land, soil and geological environment.

This report provides a baseline assessment of the environmental setting of the Proposed Development site, as described in Chapter 4, in terms of land, soils and geology and discusses the potential likely and significant effects that the construction, operation (extraction) and restoration of the Proposed Development will have. Where required, appropriate mitigation measures to avoid any identified effects to land, soils and geology are recommended and the residual effects of the Proposed Development post-mitigation are assessed. The Proposed Development site is defined by the EIAR Study Area boundary which is the planning application boundary.

The study area for direct, indirect and cumulative effects with regard land, soils and geology is defined by the EIAR Study Area boundary.

### 7.1.2 Statement of Authority

Hydro-Environmental Services (HES) are a specialist geological, hydrological, hydrogeological and environmental practice which delivers a range of water and environmental management consultancy services to the private and public sectors across Ireland and Northern Ireland. HES was established in 2005, and our office is located in Dungarvan, County Waterford.

Our core areas of expertise and experience includes soils, subsoils and geology. We routinely complete impact assessments for land, soils and geology, hydrology and hydrogeology for a large variety of project types including bedrock quarries and sand and gravel extraction.

This chapter of the EIAR was prepared by Michael Gill, David Broderick and Jenny Law.

Michael Gill P. Geo (B.A.I., MSc, Dip. Geol., MIEI) is an Environmental Engineer with over 22 years' environmental consultancy experience in Ireland. Michael has completed numerous geological, hydrological and hydrogeological impact assessments for the extractive industry in Ireland. He has also managed EIAR assessments for infrastructure projects and private residential and commercial developments. In addition, he has substantial experience in wastewater engineering and site suitability assessments, contaminated land investigation and assessment, wetland hydrology/hydrogeology, water resource assessments.

David Broderick P.Geo (BSc, H. Dip Env Eng, MSc) is a Hydrogeologist with over 17 years' experience in both the public and private sectors. Having spent two years working in the Geological Survey of Ireland working mainly on groundwater and source protection studies David moved into the private sector. David has a strong background in groundwater resource assessment and hydrogeological/hydrological investigations in relation to bedrock quarries and sand and gravel extraction developments. David has completed numerous land, soil and geology sections for input into EIARs for a range of commercial developments.

Jenny Law (BSc, MSc) is an Environmental Geoscientist holding a first honours degree in Applied Environmental Geosciences from University College Cork (2022). Jenny has assisted in the preparation

of the land, soils and geology and hydrology chapters for various environmental impact assessment reports, hydrological impact assessments, Water Framework Directive Assessment reports and Flood Risk Assessment reports for a variety of projects including wind farm developments, strategic housing developments and quarries.



## 7.1.3 Relevant Legislation

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

- S.I. No. 349 of 1989: European Communities (Environmental Impact Assessment) Regulations, and subsequent Amendments (S.I. No. 84 of 1995, S.I. No. 352 of 1998, S.I. No. 93 of 1999, S.I. No. 450 of 2000 and S.I. No. 538 of 2001), S.I. No. 30 of 2000, the Planning and Development Act, and S.I. 600 of 2001 Planning and Development Regulations and subsequent Amendments. These instruments implement EU Directive 85/373/EEC and subsequent amendments, on the assessment of the effects of certain public and private projects on the environment;
- Directives 2011/92/EU and 2014/52/EU on the assessment of the effects of certain public and private projects on the environment, including Circular Letter PL 1/2017: Implementation of Directive 2014/52/EU on the effects of certain public and private projects on the environment (EIA Directive);
- Planning and Development Act, 2000, as amended;
- S.I. No 296 of 2018: S.I. No. 296 of 2018: European Union (Planning and Development) (Environmental Impact Assessment) Regulations 2018 which transposes the provisions of Directive 2014/52/EU into Irish law; and,
- S.I. No. 4 of 1995: The Heritage Act 1995, as amended.

## 7.1.4 Relevant Guidance

The Land, Soils and Geology Chapter of this EIAR was prepared having regard, where relevant, to guidance contained in the following documents:

- Environmental Protection Agency (2022): Guidelines on the Information to be contained in Environmental Impact Assessment Reports;
- Institute of Geologists Ireland (2013): Guidelines for the Preparation of Soils, Geology and Hydrogeology Chapters of Environmental Impact Statements;
- National Roads Authority (2008): Guidelines on Procedures for Assessment and Treatment of Geology, Hydrology and Hydrogeology for National Road Schemes;
- Guidelines for Planning Authorities and An Bord Pleanála on carrying out Environmental Impact Assessment (DoHPLG, 2018);
- Department of the Environment, Heritage and Local Government; Quarries and Ancillary Activities – Guidance for Authorities (April, 2014); and,
- Environmental Protection Agency (2006): Environmental Management in the Extractive Industry (Non-Scheduled Minerals).

# 7.2 Assessment Methodology

## 7.2.1 Desk Study

A desk study of the Proposed Development site and receiving environment was completed in advance of undertaking the walkover survey and site investigation. This involved collecting all relevant geological data for the Proposed Development site and surrounding area. This included consultation with the following data sources:

- Environmental Protection Agency database (www.epa.ie);
- Geological Survey of Ireland - Geology Databases (www.gsi.ie);
- Geological Survey of Ireland – Geological Heritage site mapping (www.gsi.ie);
- Bedrock Geology 1:100,000 Scale Map Series, Sheet 14 (Geology of Galway Bay). Geological Survey of Ireland (GSI, 2004);
- Bedrock Geology 1:100,000 Scale Map Series, Sheet 12 (Geology of Longford/Roscommon). Geological Survey of Ireland (GSI, 2003);
- Geological Survey of Ireland – 1:25,000 Field Mapping Sheets;
- General Soil Map of Ireland 2nd edition (www.epa.ie); and,
- OSI aerial photography.

## 7.2.2 Scoping and Consultation

The scope for this EIAR has been informed by consultation with statutory consultees, bodies with environmental responsibility and other interested parties. This consultation process is outlined in Section 2.11 of this EIAR.

Consultations relating to the land, soils and geological environment were only received from the Geological Survey of Ireland (GSI) and the Health Service Executive (HSE).

GSI encourage use and reference of their datasets in the compilation of this EIAR. We use the GSI referenced databases throughout our baseline assessment, and also supplement those online data sources with site specific geological data.

A summary of the scoping responses relevant to Land, Soils and Geology is shown in **Table 7-1** below.

*Table 7-1 Summary of Land, Soils and Geology Related Scoping Responses*

| Consultee | Matters Raised – Description | Addressed in Section |
|---|---|---|
| Geological Survey of Ireland (GSI) | *"Our records show that there are no CGS's (County Geological Heritage Sites in the vicinity of the proposed sand and gravel pit".* | Section 7.3.6 |
| Health Service Executive (HSE) | "*The submission of a Site Restoration Plan, which includes a timeframe for undertaking restoration works, and actual works detail is included as a condition of planning permission, if granted.*<br><br>*To minimise the risk of future water safety issues, consideration be given to an alternative restoration plan for the quarry void involving filling the void and restoring it to agricultural use or as a public amenity".* | Sections 7.4 & 7.4.3 |

### 7.2.3 Baseline Monitoring and Site Investigations

Site walkovers, investigations and baseline monitoring was undertaken by David Broderick of HES (refer to Section 7.1.2 above for qualifications and experience) on 19th and 20th May, 28th June, 24th October 2022 and on 6th June 2023.

In summary, site investigations to address the land, soils and geology chapter of the EIAR included the following:

- Walkover surveys to assess the ground conditions and layout of the Proposed Development site including surveys of the adjacent lands;
- 4 no. investigations boreholes were drilled in May 2022 by Petersen Drilling;
- 5 no. trial pits were excavated in June 2023 under the supervision of HES; and,
- Mineral soils and subsoils were logged according to BS: 5930:2015 Code of Practice for Ground Investigations.

### 7.2.4 Impact Assessment Methodology

Using information from the desk study and data from the site investigations, an assessment of the importance of the soil and geological environment in the area and Proposed Development site is carried out using the criteria set out in **Table 7-2** (NRA, 2008).

*Table 7-2 Estimation of Importance of Soil and Geology Criteria (NRA, 2008).*

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

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

The guideline criteria for the assessment of likely significant effects require that likely effects are described with respect to their extent, magnitude, type (i.e. negative, positive or neutral) probability, duration, frequency, reversibility, and transfrontier nature (if applicable).

The descriptors used in this EIAR are those set out in (the EIA Directive) in the Glossary of effects as shown in Chapter 1 of this EIAR. In addition, the two impact characteristics proximity and probability are described for each impact and these are defined in **Table 7-3**.

In order to provide an understanding of this descriptive system in terms of the geological/hydrological environment, elements of this system of description of effects are related to examples of potential likely significant effects on the geology and morphology of the existing environment, as listed in **Table 7-4**.

*Table 7-3: Additional Impact Characteristics.*

| Impact Characteristic | Degree/ Nature | Description |
|---|---|---|
| Proximity | Direct | An impact which occurs within the area of the proposed project, as a direct result of the proposed project. |
| | Indirect | An impact which is caused by the interaction of effects, or by off-site developments. |
| Probability | Likely | The effects that can reasonably be expected to occur because of the planned project if all mitigation measures are properly implemented. |
| | Unlikely | The effects that can reasonably be expected not to occur because of the planned project if all mitigation measures are properly implemented. |

*Table 7-4: Impact descriptors related to the receiving environment.*

| Impact Characteristics | | Potential Hydrological Impacts |
|---|---|---|
| Quality | Significance | |
| Negative only | Profound | Widespread permanent impact on: |

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

### 7.2.5 Limitations and Difficulties Encountered

No limitations or difficulties were encountered during the preparation of the Land, Soils and Geology Chapter of the EIAR.

# 7.3 Existing Environment

## 7.3.1 Site Description and Topography

The Proposed Development site is located approximately 8.6km to the north-east of Tuam and approximately 7km to the south-east of Dunmore in Co. Galway. The village of Clonberne is located approximately 4.7km to the east. The Proposed Development site, which is a greenfield site comprising several fields separated by hedgerows or stone walls, is 6.2ha in area.

The Proposed Development site has an elevation range of between approximately 96 metres above Ordanance Datum (mOD) and 84mOD. Highest elevations are found near the western boundary with the slope easterly towards the L2232 local road which defines the eastern boundary. The Proposed Development site is bounded by grassland on all other sides. The local surrounding area, including the Proposed Development site itself has an undulating topography.

The Proposed Development site is currently accessed via an existing entrance off the L2232. A disused sand and gravel pit is located on the opposite side of the L2232 road immediately to the east. There is an operational quarry located at Shanvally, 0.8km to the southwest of the Proposed Development site.

## 7.3.2 Land and Land use

Land use in the surrounding area is largely agricultural with scattered rural pattern of residential dwellings and agricultural buildings along local roads.

Based on the Corine (2018) mapping, the Proposed Development site and surrounding area are agricultural lands used for grazing. Agricultural areas dominate the wider surrounding areas with several mapped raised peat bogs within a 1km radius. Pockets of forestry and semi natural areas are mapped in surrounding lands also but to a lesser extent than agriculture.

There are two existing sand and gravel pits located within 1km of the Proposed Development site as described in the above section.

## 7.3.3 Published Mapping

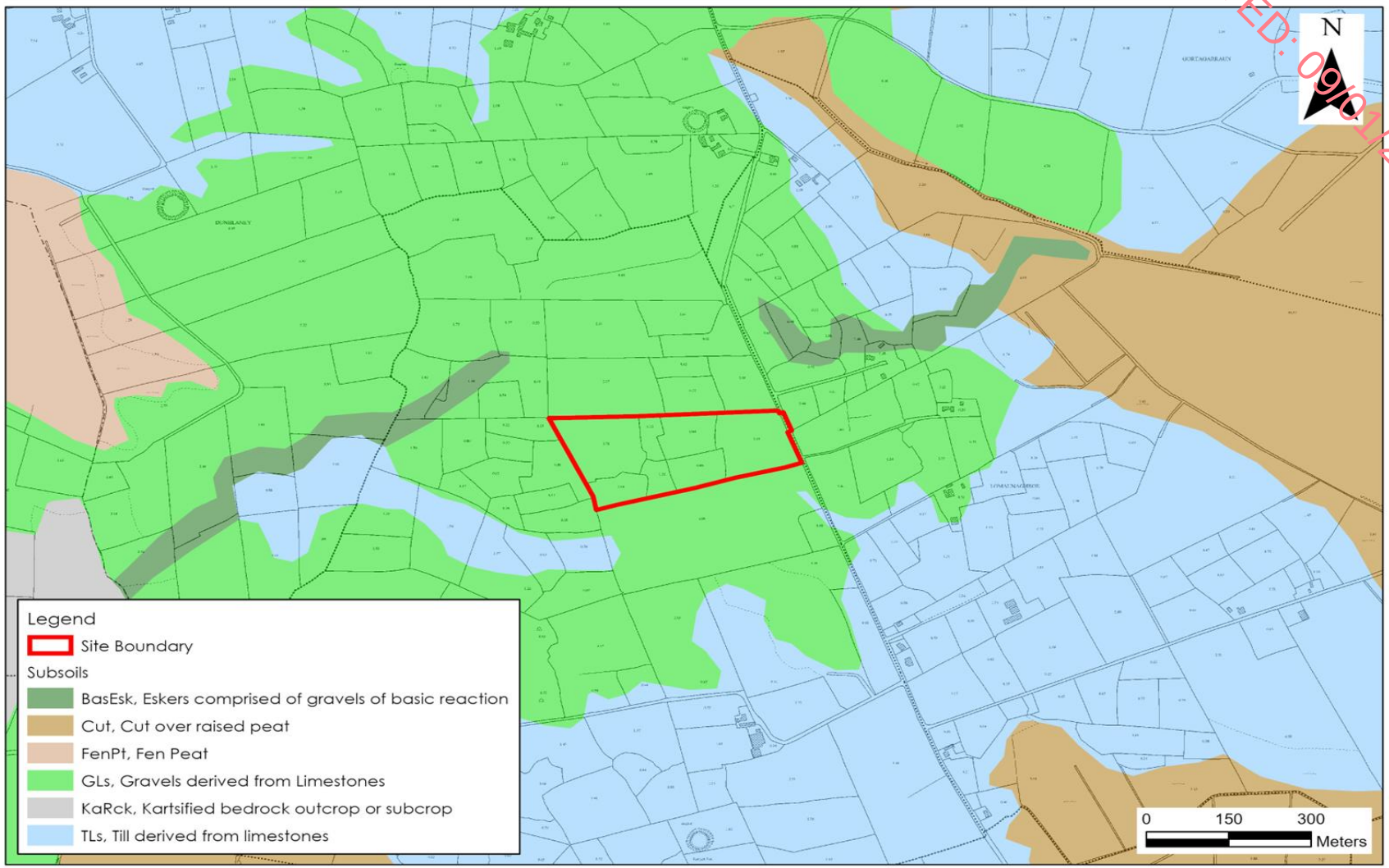
### 7.3.3.1 Soil and Subsoils

The published soils map (www.epa.ie) for the area shows that the Proposed Development site is mapped to be overlain by shallow well drained mineral soils of basic nature (BminSW). BminSW soils also dominate the nearby wider surrounding lands along with areas of Cut Peat Soils and deep well drained mineral soils of basic nature (BminDW) in the wider area.

The GSI subsoils map (www.gsi.ie) show gravels derived from limestone (GLs) are mapped within the Proposed Development site and adjacent lands. Locally there are also gravels in the form of Eskers ridges (BasEsk) but these do not intercept the Proposed Development site.

Other subsoils mapped in the surrounding areas include, cutover raised peat, mainly to the east but there are some smaller areas of cutover raised peat to the north, south and west and there are also areas of till derived limestone (TLs). A map of the local subsoil cover is shown below as **Figure 7-1.**

*Figure 7-1: Local subsoils map*

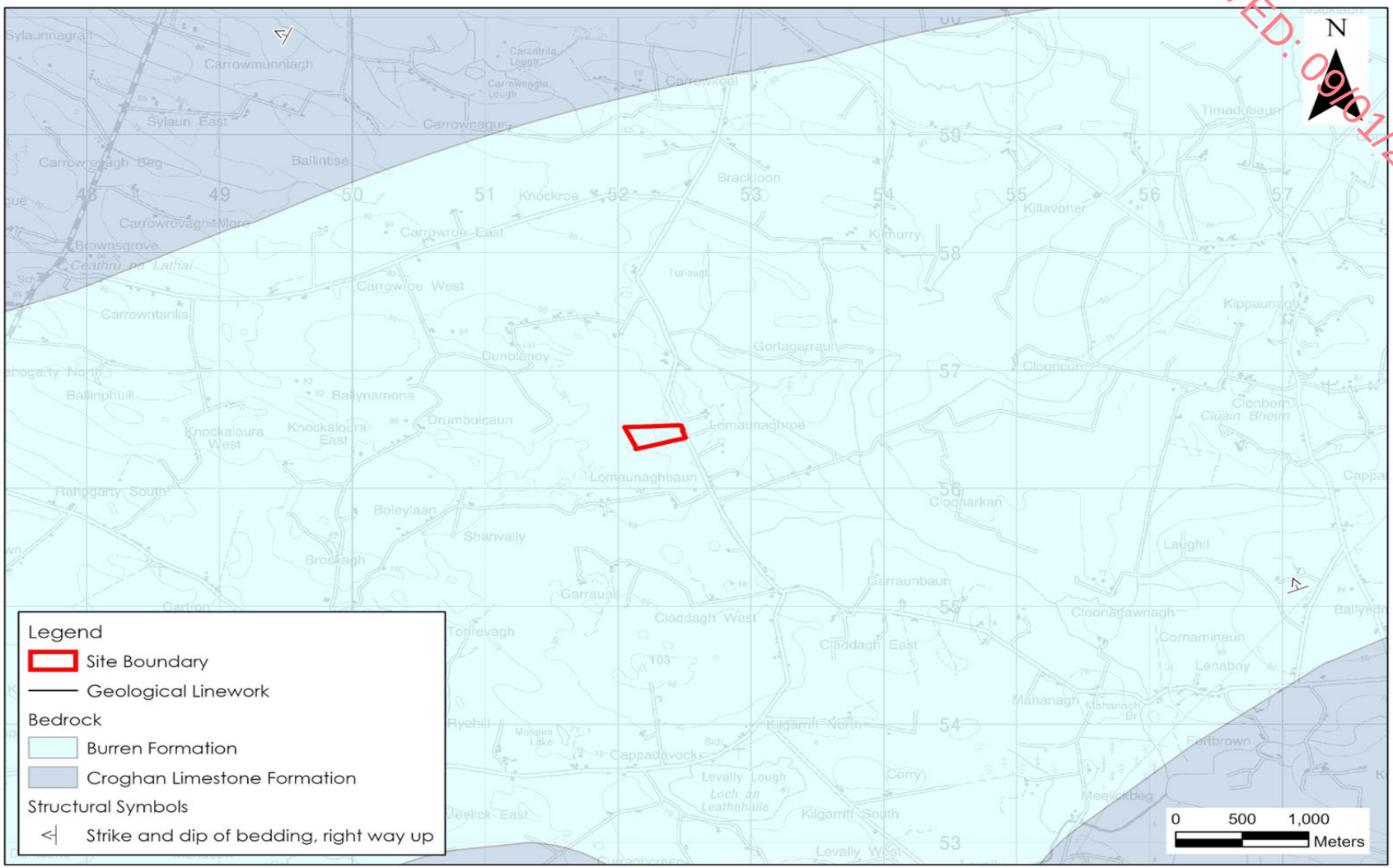


### 7.3.3.2 Bedrock Geology

Based on the GSI bedrock geology map (www.gsi.ie), the Carboniferous (Dinantian) Burren Limestone Formation underlies the Proposed Development site. The Burren Limestone Formation is a pure bedded limestone and is prone to karstification (dissolution of pure limestone by water). A bedrock geology map of the area is attached as Error! Reference source not found.**Figure 7-2.**

The GSI provide the following lithological description of the Burren Limestone Formation: *"The formation is typified by pale-grey packstones and wackestones, but also contains intervals of dark cherty limestones, often associated with oolitic grainstones".*

*Figure 7-2: Bedrock Geology Map.*



## 7.3.4 Site Investigations

Site investigations carried out at the Proposed Development site consisted of trial pitting and borehole drilling.

Trial pits (5 no.) were completed within the area proposed for extraction (refer to **Figure 7-3**). The trial pits extended to depths of between 1.4m and 3m. Bedrock was encountered in 4 no. trial pits at depths of between 1.4 and 2.4m (TP02, TP03, TP04 & TP05). Bedrock was not encountered in TP01 at a depth of 3m below ground level (mbgl) which is located on the lowest lying eastern side of the site. The depth to bedrock on the east of the site was confirmed at 6.1m by drilling (see below).

3 no. of the trial pits encountered silty sandy GRAVEL with cobbles and boulders (TH01, TH02 & TH05) while 2 no. trial pits (TH03 & TH04) encountered a SILT dominated subsoils with appreciable quantities of sand and gravel as a sub-matrix.

Geological logs for the trial pits are attached as **Appendix 7-1.**

Four boreholes were drilled at the Proposed Development site in May 2022 down to a depth of between 33 and 40mbgl. The boreholes were positioned on the boundaries of the site where depths of sand and gravel ranged between 1.1m (BH2) and 6.1m (BH1). Apart from BH1, boreholes encountered unsaturated sand and gravel over bedrock (refer to Chapter 8 - Water for groundwater level data). The borehole locations are also shown on **Figure 7-3** below. Geological logs for the boreholes are attached as **Appendix 7-2.**

The deepest sand and gravel deposits are located on the low-lying east of the Proposed Development site (6.1m @ BH1). BH1 confirmed sand and gravel deposits down to top of bedrock at a depth of 6.1mbgl on the east of the site.

*Investigation drilling at the site encountered limestone bedrock in all boreholes at depths varying from* 1.1 (BH2) to 6.1mbgl (BH1). Bedrock on the east of the site (@BH1) was encountered at 76.84m OD while on the more elevated western site (@BH3) it was met at 90.8m OD and centrally (@BH2 & BH4) at approximately 86.5m OD.

The limestone encountered was strong to very strong with only rare to occasional fractures. Fractures were generally small with the exception of a very weathered section between 30 – 30.5mbgl (57.96 – 57.46m OD) in BH2 where clay filled fractures was noted.

There is no outcropping bedrock in the local area. There are no mapped faults of folds within or adjacent the application site.

*Figure 7-3: Site Investigation Map*

## 7.3.5 Geological Resource Importance

The GSI database[1] shows that the Proposed Development site is located in an area of Very High Potential for granular aggregate. The sands and gravels at the Proposed Development site could be classified as "High" importance. The sand and gravel deposits locally are a proven economically extractable mineral resource for construction purposes, and this is supported by a history of aggregate extraction in the local area.

The Proposed Development site is also mapped in an area of Moderate Potential for crushed rock aggregate (i.e., potential for a bedrock quarry), with the limestone bedrock underlying the site could be classified as "High" importance. The bedrock could be used on a "economic" local scale for construction purposes.

There are a small number of active and historic quarries, pits and mineral occurrences near the Proposed Development site.

An active bedrock quarry is located 0.8km to the west of the Proposed Development site at Shanvally.

There are two more active pits, "Cathill Pit", located approximately 6.5km northwest of the site is listed as having sand and gravel products for general construction and "Dunmore Quarry", located approximately 9.5km northwest of the site is listed as a sand and gravel pit in esker deposits. The disused sand and gravel pit located immediately east of the Proposed Development site is not shown on GSI mapping.

## 7.3.6 Geological Heritage and Designated Sites

The nearest Geological Heritage site is the Levally Lough (Site Code: GY089), which is a turlough located 2.7km to the south of the Proposed Development site. Levally Lough is also a designated pNHA and SAC.

The Proposed Development site is not located within or adjacent to any designated site (i.e. SAC, SPA, NHA, pNHA etc). The closest designated site to the Proposed Development site is Drumbulcaun Bog pNHA which located approximately 0.5km to the west of the Proposed Development.

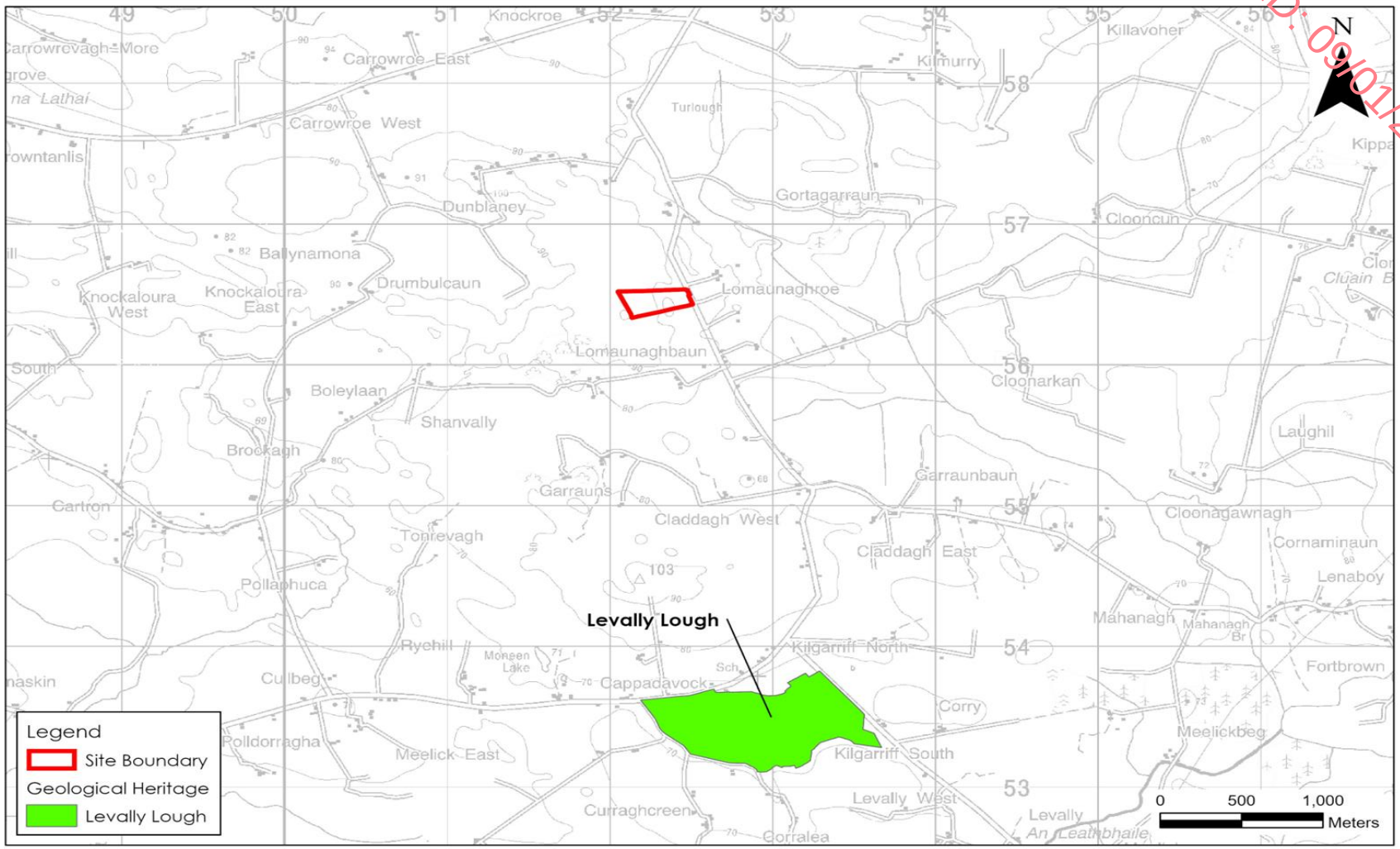
The closest European designated site is Levally Lough SAC (Site Code: 000295) which is located 2.7km to the south of the Proposed Development.

Local designated sites and geological heritage sites are shown in **Figure 7-4**.

Water dependant designated sites that are potentially hydrologically connected to the Proposed Development are dealt with in Chapter 8 (Water).

[1] Source: GSI online Aggregate Potential Mapping Database

*Figure 7-4: Geological Heritage Sites*



### 7.3.7 Geohazards

The GSI Landslide database (www.gsi.ie) does not record any historic landslides in the vicinity of the Proposed Development site or in the surrounding lands.

The GSI Landslide Susceptibility Map (www.gsi.ie) classifies the probability of a landslide occurring at a given location. The probability of a landslide occurring at the Proposed Development Site is mapped as being Low.

### 7.3.8 Soil Contamination

There are no known areas of soil contamination at the Proposed Development site or in the surrounding area. During the site walkover and site investigations, no areas of contamination concern were identified and the results from the groundwater sampling (refer to Chapter 8 – Water) also indicate no soil contamination issues.

As the Proposed Development site is a greenfield site, no historical contamination issues would be expected. There are no known historic mines or waste disposal areas in the immediate vicinity of the Proposed Development, that could potentially have contaminated tailings or infills.

## 7.4 Characteristics of the Proposed Development

### 7.4.1 Construction Phase

Initial preparation/construction work requirements at the site will be minimal and will mainly be site enabling works that will last approximately 1 month.

The construction phase will include:

- Preparation of site for construction.
- Pouring of concrete for refuelling area foundation and foundation for processing plant and associated components;
- Erection off the processing plant and water treatment/recycling tanks;
- Construction of new drainage network and fuel/oil interceptor at refuelling area;
- Road paving/improvements;
- Installation of a weighbridge and wheelwash; and,
- Reprofiling of the public road to allow for sight views for a new site entrance

It is proposed that excavated soil material will be reused onsite for the construction of berms which will be installed along the perimeter of the site for screening purposes.

### 7.4.2 Operational/Extraction Phase

The Proposed Development being applied for under this current planning application includes for the extraction of sand and gravel over almost the full site area (i.e. 6.2ha).

It is proposed to excavate the site down by an average depth of 3 metres from the existing ground levels which range from 84m OD to 96m OD.

It has been calculated that approximately 152,000m$^3$ (291,840 tonnes) of material will be extracted over 10 years. The aggregate will be extracted in three phases and will be washed and processed on-site.

The spoil/fines from the processing will be stored in cells constructed in in-situ sand and gravel deposits.

### 7.4.3 Restoration Phase

Once quarry operations have ceased within the proposed extraction area, all site infrastructure including the processing plant, wheelwash, weighbridge and site office would be disassembled/demolished and removed off-site for disposal/recycling and /or sale unless a new permission is granted which would allow for the retention of these components on-site.

Reinstatement will consist of levelling of extracted topsoil and overburden and replanting of hedgerows, reseeded and returned to agricultural grassland.

## 7.5 Likely Effects and Associated Mitigation Measures

### 7.5.1 Do Nothing Scenario

If the Proposed Development were not to proceed, the site would remain as a greenfield site, continuing to be used for grazing purposes.

### 7.5.2 Construction Phase - Likely Effects and Mitigation Measures

The likely effects of the Proposed Development and mitigation measures that will be put in place during the construction phase to eliminate or reduce them are outlined below.

#### 7.5.2.1 Soil and Subsoils Excavations

Initial preparation/enabling works for the Proposed Development will be minimal and will primarily be site enabling works lasting approximately 1 month.

It is proposed that excavated topsoil material will be reused onsite for the construction of berms which will be installed along the perimeter of the site for screening purposes.

**Pathway:** Excavation of soil and subsoil

**Receptor:** Soils and Subsoils

**Potential Pre-mitigation Impact:** Negative, slight, direct, likely, permanent effect on soils and subsoils.

**Impact Assessment/Mitigation Measures:**

Excavation of soil and subsoil deposits will be required for site levelling and for the installation of infrastructure and foundations for the Proposed Development. All excavated overburden material will be reused on site either for infilling or for landscaping.

**Residual Impact:** The small footprint of the construction works area along with the final reinstatement plan means that the residual effect will be negative, imperceptible, direct, likely, permanent effect on soil and subsoils due to enabling works within the site.

**Significance of Effects:** For the reasons outlined above, no significant effects on soils and subsoils will occur.

#### 7.5.2.2 Contamination of Soil, Subsoils and Bedrock by Oil/Fuel Spillages and Leakages

Enabling works at the Proposed Development site will be completed using machinery. Such machinery are powered by diesel engines and operated using hydraulics. Unless managed carefully such plant and machinery have the potential to leak hydraulic oils or cause fuel leaks during refueling operations.

Only small volumes of fuel/oils will be present on-site and therefore no significant effects are expected as long as standard mitigation is implemented.

**Pathway:** Soil, subsoils and bedrock pore space.

**Receptor:** Soils and Subsoils.

**Pre-Mitigation Potential Impact:** Negative, reversible, slight, direct, unlikely, long-term effect on soil and subsoils.

**Proposed Mitigation Measures:**
The following mitigation measures are proposed:

- All plant and machinery will be serviced before being mobilised to the site;
- Refuelling will be completed in a controlled manner using drip trays (bunded container trays) at all times;
- Drip-trays will be used for fixed or mobile plant in order to retain oil leaks and spills;
- Only designated trained operators will be authorised to refuel plant on site;
- Procedures and contingency plans will be set up to deal with emergency accidents and spills; and,
- An emergency spill kit with oil boom, absorbers etc. will be kept on site for use in the event of an accidental spillage.

**Residual Effect Assessment:** The use and storage of hydrocarbons and small volumes of chemicals is a standard risk associated with all construction sites. Proven and effective measures to mitigate the risk of spills and leaks have been proposed above and will break the pathway between the potential source and the receptor. The residual effect will be negative, reversible, imperceptible, direct, short-term, unlikely effect on soils, subsoils and bedrock.

**Significance of Effects:** No significant effects on soil, subsoils and bedrock are anticipated.

### 7.5.3 Operational/Extraction Phase - Likely Effects and Mitigation Measures

The likely effects of the Proposed Development and mitigation measures that will be put in place during the operational phase to eliminate or reduce them are outlined below.

#### 7.5.3.1 Effects on Land and Landuse

The construction of the Proposed Development will result in the temporary loss of approximately 6.2ha of poor-quality agricultural land. The extraction will result in local topographic changes with the removal of glaciofluvial overburden from the site. There will be no effects on the lands adjoining the Proposed Development site.

**Pathway:** Excavation of topsoil and extraction of aggregate.

**Receptor:** Land and Landuse

**Potential Pre-mitigation Impact:** Negative, moderate, direct, likely, temporary effect on land and landuse.

**Impact Assessment/Mitigation Measures:**

The loss of agricultural land resulting from the Proposed Development on a local or regional scale is minimal and therefore the effects of actual agricultural land loss is negligible.

Mitigation will include a restoration plan which will return the site to grassland by spreading the topsoil/overburden that was previously stripped and stored at the site.

**Residual Impact:** Agricultural land used for grazing is the dominant land use in the area of the Proposed Development. Due to the relatively small footprint of the Proposed Development site on a local scale, along with the proposed restoration plan the residual effect will be negative, direct, slight, likely, temporary effect on land and landuse.

**Significance of Effects:** For the reasons outlined above, no significant effects on land or landuse will occur.

### 7.5.3.2 Excavation of Soil and Subsoils (Aggregates)

As stated in Section 7.4 above, the Proposed Development will then involve the extraction of approximately 152,000m$^3$ (291,840 tonnes) of sand and gravel aggregate down to an average depth of 3m over an area of almost 6.2ha.

In order to extract the aggregate, approximately 6,250m$^3$ of topsoil will also be removed and this will be used to construct a temporary berm along the site boundaries and then ultimately used in the restoration of the site post extraction.

**Pathway:** Aggregate extraction.

**Receptor:** Soil and subsoils.

**Pre-Mitigation Potential Impact:** Negative, irreversible, moderate, direct, likely, permanent effect on soil and subsoils.

**Proposed Mitigation Measures by Design:**

Site earthworks and aggregate extraction will result in a direct impact on the local geological environment, albeit this is an acceptable and unavoidable part of the proposed sand and gravel pit development. These impacts will be localised (i.e., only at the point of extraction) and will be mostly mitigated through the adoption of a suitable landscape and restoration plan which will be undertaken during the extraction phase and on completion of extraction.

The stripped topsoil will be used to form berms along the site boundaries and for the ultimate restoration of the site.

**Residual Effect Assessment:** Negative, irreversible, moderate, direct, likely, permanent effect on soils and subsoils.

**Significance of Effects:** No significant effects on soils and subsoils are anticipated.

### 7.5.3.3 Contamination of Soil, Subsoils and Bedrock by Oil/Fuel Spillages and Leakages

Excavation, processing and transporting of aggregate at the Proposed Development site will be completed using machinery. Such machinery is powered by diesel engines and operated using hydraulics. Unless managed carefully such plant and machinery have the potential to leak hydraulic oils or cause fuel leaks during refueling operations.

Only small volumes of fuel/oils will be present on-site and therefore no significant effects are expected as long as standard mitigation is implemented.

**Pathway:** Soil, subsoil and bedrock pore space.

**Receptor:** Soils and Subsoils.

**Pre-Mitigation Potential Impact:** Negative, reversible, slight, direct, unlikely, long-term effect on soil and subsoils.

**Proposed Mitigation Measures:**
The following mitigation measures are proposed:

- All site refuelling will be carried out in a designated refuelling area in the eastern section of the site. This designated area will be marked by signage;
- The refuelling area will be comprised of concrete hardstanding. A hydrocarbon/oil interceptor will capture and treat runoff from the refuelling area;
- All plant and machinery will be serviced before being mobilised to site, and regular leak inspections will be completed during the site operations;
- No plant maintenance will be completed on site, any broken-down plant will be removed from site to be fixed;
- An emergency spill kit with oil boom, absorbers etc. will be kept on-site for use in the event of an accidental spill;
- Drip-trays will be used for fixed or mobile plant such as pumps and generators in order to retain oil leaks and spills. The drip tray will have a holding capacity of 110% of the volume contained within the machine/ generator; and,
- Only designated trained and competent operatives will be authorised to refuel plant.

**Residual Effect Assessment:** The use and storage of hydrocarbons and small volumes of chemicals is a standard risk associated with all construction sites. Proven and effective measures to mitigate the risk of spills and leaks have been proposed above and will break the pathway between the potential source and the receptor. The residual effect will be negative, reversible, imperceptible, direct, short-term, unlikely effect on soils, subsoils and bedrock.

**Significance of Effects:** No significant effects on soil, subsoils and bedrock are anticipated.

### 7.5.3.4 Erosion of Exposed Soils and Subsoils

There is a high likelihood of erosion of soil and subsoil during its excavation and during extraction works. The main impacts associated with this aspect is to the water environment, and therefore this aspect is further assessed in detail in Chapter 8.

**Pathway:** Vehicle movement, surface water and wind action.

**Receptor:** Soil and subsoil.

**Pre-Mitigation Potential Impact:** Negative, slight, direct, short-term, likely effect on soil and subsoils by erosion and wind action.

**Proposed Mitigation Measures:**

- Soil removed from extraction areas to be used to create a boundary berm around the site;
- Where possible, the upper vegetative layer (where still present) will be stored with the vegetation part of the sod facing the right way up to encourage growth of plants and vegetation at the surface of the stored soil within the soil storage areas;
- The spoil/fines from the processing will be in stored in cells constructed in in-situ sand and gravel deposits; and,
- Re-seeding and spreading/planting will also be carried out in these areas.

**Residual Effect Assessment:** Soils can be eroded by vehicle movements, wind action and by water movement. Following implementation of these measures the residual effect will be negative, imperceptible, direct, long-term, likely effect on soil and subsoils by erosion and wind action.

**Significance of Effects:** No significant effects on soils or subsoils.

## 7.5.4 Restoration Phase - Likely Effects and Mitigation Measures

The restoration plan involves returning the pit to grassland by spreading the topsoil/overburden that was previously stripped and stored at the application site along with some imported material where required. No negative impacts on the land, soil and geological environments are expected during the restoration or post restoration phase. The restoration will have a positive effect in terms of returning the application site back to agriculture.

The mitigation measures relating to oils and fuels during the restoration phase will be the same as those outlined in Section 7.5.2.2 above for the construction phase.

## 7.5.5 Cumulative Effects

The other land use activities in the area are an existing sand and gravel pit, existing farming operations, residential land uses and peat bogs.

Due to the relatively small scale of the Proposed Development and the lack of significant residual impacts from the development that would affect the wider environment, there will be no significant cumulative impacts to land, soils and geology resulting from this project, and other local existing developments, projects and plans. All effects on land, soils and geology relating to the proposed project will be localised and within the development EIAR study area. Also, there is no potential for cumulative effects on local designated sites with regard land, soils and geology.

## 7.5.6 Risk of Major Accidents and Disasters

The risk of a landslide or a mass movement occurring at the Proposed Development site is very low due to the gentle slopes and nature of the soils and subsoils present. The residual risk of a landslide occurring is determined to be imperceptible.

## 7.5.7 Post Construction Monitoring

None required.