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13.0 SOILS AND GEOLOGY

13.1 Introduction

13.1.1 This chapter of the Environmental Impact Assessment Report (EIAR) assesses the likely significant effects of the Proposed Development on geology and soils; 'geology and soils' is a collective term used to describe the geological and soil setting and features, including land contamination.

13.1.2 The Proposed Development will be located within and to the immediate to the north of the existing Tynagh Power Station, located in Derryfrench, Loughrea, Co. Galway, Ireland. A full description of the Site is presented in Chapter 4: Existing Site and Conditions of this EIAR, while details of the Proposed Development are presented in Chapter 5: The Proposed Development of this EIAR.

13.1.3 The nature of the Proposed Development is such that it will disturb the existing ground conditions and, in the absence of mitigating measures, has the potential to result in significant environmental effects.

13.1.4 The Soils and Geology EIAR chapter, reported herein, provides an outline of the legislative and policy framework within which the Site sits (Section 13.2), the assessment methodology (Section 13.3), the baseline ground conditions (Section 13.4), the predicted impacts of the Proposed Development during the construction, operational and decommissioning phases (Section 13.5), any proposed mitigation and enhancement measures (Section 13.6), any residual effects (Section 13.7) and any cumulative effects (Section 13.8).

13.1.5 This chapter is supported by information in the following chapters, figures, and appendices of this EIAR:

- Chapter 4: Existing Site and Conditions;
- Chapter 5: The Proposed Development;
- Chapter 9: Biodiversity;
- Chapter 12: Water Environment;
- Chapter 15: Land Use;
- Figure 13.1: Teagasc Soil Map;
- Figure 13.2: Quaternary Sediments Map;
- Figure 13.3: Bedrock Geology Map;
- Figure 13.4: Locations of Shafts and Tunnels
- Appendix 5A: Outline Construction Environmental Management Plan;
- Appendix 9D: HRA/ AA;
- Appendix 12A: Flood Risk and Drainage Assessment;
- Appendix 13A: Ground Investigation Report, and;
- Appendix 13B: GQRA.

13.2 Assessment Methodology

Assessment guidance

13.2.1 The following guidance has been used to inform the scope and content of this assessment and to assist the identification and mitigation of likely significant effects:

- Environmental Protection Agency (EPA) guidance document 'Guidelines on the Information to be Contained in Environmental Impact Assessment Reports', (EPA, 2022);
- European Commission guidance document 'Environmental Impact Assessment of Projects - Guidance on the preparation of the Environmental Impact Assessment Report' (European Commission, 2017);
- Advice Notes on Current Practice in the Preparation of Environmental Impact Statements, (EPA, 2003); and
- The Institute of Geologists of Ireland (IGI) guidance document 'Guidelines for Preparation of Soils, Geology, Hydrogeology Chapters of Environmental Impact Statements' (IGI, 2013).

Data collection

13.2.2 Establishment of the baseline environment has involved reference to existing data sources, consultation with statutory bodies and other organisations, and fieldwork surveys. The following sources of information have been reviewed:

- Geohive website for historical Ordnance Survey of Ireland (OSI) maps of 1:2,500 scale and 1:10,560 scale (1837 to 1913) and aerial photographs (1995, 2000, 2005, 2013 and 2018);
- Geological Survey Ireland (GSI) website for Public Viewer Geoheritage, Geotechnical, Geochemistry, Geohazards Natural Resources (Minerals/Aggregates) and Groundwater mapping;
- EPA website for groundwater information;
- Environmental Sensitivity Mapping (ESM) website for soil and water data;
- Previous site investigation reports (HGL O'Connor, 2003);
- Local authority web portals;
- Previous environmental impact statements for the site; and
- Previous relevant consultation with key stakeholders (details in Chapter 6: Consultations):
  - Galway County Council (GCC) on environmental impact assessment scoping; and
  - Geological Survey Ireland (GSI) on active and abandoned mines and areas susceptible to subsidence.

13.2.3 Information has also been obtained from a geo-environmental site walkover undertaken by AECOM on 09 February 2022 and from three ground investigation undertaken by Causeway Geotech Limited (on behalf of AECOM) at the site during the periods of 09 to 20 August 2021 (a combined geo-environmental and geotechnical site investigation for the Approved Development Ref:21/2192 Site).

13.2.4 The 'Approved Development Ref: 21/2192' relates to planning application Ref. 21/2192 (submitted as an application to Galway County Council in November 2021, subsequently appealed and approved by ABP under Ref. PL07.313538) – that is a separate 299MW OCGT development and project primarily to the west of the existing Tynagh Power Station to that of the Proposed Development which is for a 350MW facility to the north. Planning approval was obtained for the Approved Development Ref: 21/2192 however the Applicant is unable to implement it (i.e. will not build/operate the Approved Development Ref: 21/2192') for the foreseeable future due to a range of viability constraints. For robust EIA assessment purposes it is nonetheless assumed that the Approved Development may proceed at some point in the future. (Note: some 3rd party reports and technical documents refer to the Approved Development Ref: 21/2192 as Tynagh 1).

13.2.5 A second investigation on the 28 February 2022 (additional geo-environmental site investigations at and immediately to the north of the existing Tynagh Power Station Site) and a third investigation between 23 May and 28 June 2022 for the Proposed Development, Tynagh North.

13.2.6 The August 2021 site investigations for the Approved Development Ref: 21/2192 project were conducted largely on the existing Power Station site to the south and also in the southern portion of the brownfield lands to the north of the existing Tynagh Power Station. Subsequent to this first ground investigation, Causeway Geotech Limited carried out two rounds of ground gas and groundwater monitoring on 23 and 15 September 2021.

13.2.7 The purpose of the 09 February 2022 walkover was to observe local land use, to identify any potential sources of contamination, to identify any receptors with the potential to be affected by development on the Site and to assist with scoping the second ground investigation comprising trial pits dug on 28 February 2022, which were located on both the Approved Development site and Tynagh North sites west of the overhead power lines.

13.2.8 The purpose of the ground investigations was to obtain an overview of the ground and groundwater conditions present at the Site, including the presence or otherwise of soil and groundwater contamination.

13.2.9 The third site investigation on 23 May and 28 June 2022 was targeted on the footprint of the Tynagh North proposed development and consisted of trail pits and boreholes to the east and west of the overhead transmission lines.

Sensitivity of receptors

13.2.10 The sensitivity of a geology or soil receptor has been established through the identification and evaluation of the susceptibility of the receptors' to changes arising from the Proposed Development, and the value attached to these. Susceptibility relates to the ability of a geology or soil receptor to accommodate change without undue consequences.

13.2.11 Examples of sensitive geology or soil receptors include:

- Soil and geological resources (e.g., international, national, or regionally designated sites, soils of high nature conservation or landscape importance, mineral reserves, demand on waste management infrastructure through disposal of soils); and
- Receptors susceptible to land contamination and ground hazard impacts (e.g., human, vegetation, protected habitats and species, surface water and groundwater receptors).

13.2.12 The overall importance/ sensitivity of these receptors is ranked as Very High, High, Medium, or Low based on such variables as the quality of the receptor or its value as a resource and in accordance with Table C2 (Criteria for Rating Site Importance of Geological Features - NRA, 2008) in "*Guidelines for the Preparation of Soils, Geology and Hydrogeology Chapters of Environmental Impact Statements"* by the IGI (2013). The descriptive scale for the importance/ sensitivity of receptors is presented in Table 13.1.

Magnitude of impact criteria

13.2.13 The magnitude of potential impacts or changes to identified receptors, as associated with the Proposed Development, has been determined using Table C4 in the IGI guidance (Large Adverse, Moderate Adverse, Small Adverse, Negligible, Minor Beneficial, Moderate Beneficial, Major Beneficial), taking into account the potential Table 13.2).

Significance of effects

13.2.14 For each of the potential impacts identified, an assessment has been made of the likely level of significance of the resulting effects. The definition of effect significance has been made by considering both the importance/ sensitivity of the receptor and the magnitude of the predicted impact, and is described as Large Adverse, Moderate Adverse, Small Adverse or Negligible from Table C5 of the IGI guidance, using the matrix presented in Table 13.3.

13.2.15 In accordance with the IGI guidance, appropriate mitigation measures are identified to remedy potential impacts and residual impacts are determined.

Table 13.1: **Sensitivity Criteria of Geological Features**

SENSITIVITY	CRITERIA	GEOLOGY	SOIL RESOURCES	CONTAMINATION
Very high	Attribute has a very high quality and rarity on international or national scale or high sensitivity.	Geological feature rare on a regional or national scale (NHA) Large existing quarry or pit Proven economically extractable mineral resource	Volume of peat and/ or soft organic soil underlying route is significant on a national or regional scale	Degree or extent of soil contamination is significant on a national or regional scale
High	Attribute has a high quality, significance or value on a local Scale	Geological feature of high value on a local scale (County Geological Site) Moderately sized existing quarry or pit Marginally economic extractable mineral resource	Volume of peat and/ or soft organic soil underlying route is significant on a local scale Well drained and/ or high fertility soils	Degree or extent of soil contamination is significant on a local scale Contaminated soil on site with previous heavy industrial usage Large recent landfill site for mixed wastes
Medium	Attribute has a medium quality, significance, or value on a local scale	Sub-economic extractable mineral resource	Moderately drained and/ or moderate fertility soils Volume of peat and/ or soft organic soil underlying route is moderate on a local scale	Degree or extent of soil contamination is moderate on a local scale Contaminated soil on site with previous light industrial usage Small recent landfill site for mixed wastes
Low	Attribute has a low quality, significance, or value on a local scale	Volume of peat and/ or soft organic soil underlying route is small on a local scale	Volume of peat and/ or soft organic soil underlying route is small on a local scale	Degree or extent of soil contamination is minor on a local scale Large historical and/ or recent site for construction and demolition wastes Small historical and/ or recent landfill site for construction and demolition wastes

Source: (from IGI, 2013, Table C2)

Table 13.2: Magnitude of Impact on Geology Attribute

SENSITIVITY	CRITERIA	GEOLOGY	SOIL RESOURCES	CONTAMINATION
Large adverse	Results in loss of attribute	Loss of high proportion of future quarry or pit reserves Removal of entirety of geological heritage feature	Irreversible loss of high proportion of local high fertility soils Requirement to excavate and replace high proportion of peat, organic soils and/ or soft mineral soils beneath alignment	Requirement to excavate/ remediate entire waste site
Moderate adverse	Results in effect on integrity of attribute, or loss of part of attribute.	Loss of moderate proportion of future quarry or pit reserves Removal of part of geological heritage feature	Irreversible loss of moderate proportion of local high fertility soils Requirement to excavate and replace moderate proportion of peat, organic soils and/or soft mineral soils beneath alignment.	Requirement to excavate/ remediate significant proportion of waste site
Small adverse	Results in minor impact on integrity of attribute or loss of small part of attribute	Loss of small proportion of future quarry or pit reserves Removal of small part of geological heritage feature	Irreversible loss of small proportion of local high fertility soils and/ or high proportion of local low fertility soils Requirement to excavate and replace small proportion of peat, organic soils and/or soft mineral soils beneath alignment.	Requirement to excavate/ remediate small proportion of waste site
Negligible	Results in effect on attribute, but of insufficient magnitude to affect the use or integrity.	No measurable changes in attributes	No measurable changes in attributes	No measurable changes in attributes
Minor beneficial	Results in minor improvement of attribute quality	Minor enhancement of geological heritage feature		

SENSITIVITY	CRITERIA	GEOLOGY	SOIL RESOURCES	CONTAMINATION
Moderate beneficial	Results in moderate improvement of attribute quality	Moderate enhancement of geological heritage feature		
Major beneficial	Results in major improvement of attribute quality	Major enhancement of geological heritage feature		

Source: (from IGI, 2013, Table C4)

Table 13.3: Rating of Significant Environmental Impacts at EIS Stage

	MAGNITUDE OF IMPACT				
Importance of Attribute		**Negligible**	**Small adverse**	**Moderate adverse**	**Large adverse**
	Extremely high	Imperceptible	Significant	Profound	Profound
	Very High	Imperceptible	Significant/ moderate	Profound/ significant	Profound
	High	Imperceptible	Moderate/ Slight	Significant/ moderate	Profound/ significant
	Medium	Imperceptible	Slight	Moderate	Significant
	Low	Imperceptible	Imperceptible	Slight	Moderate/ Slight

Source: (from IGI, 2013, Table C6)

Assessment Assumptions and Limitations

13.2.16 The assessment has been based on the Proposed Development description detailed within EIAR Volume I, Chapter 5: The Proposed Development.

13.2.17 The assessment undertaken in this chapter has been based on and is limited to the baseline conditions recorded at the time of undertaking field surveys (09 February 2022) and phased ground investigations undertaken between 09 and 20 August 2021, on 28 February 2022 and between 23 May and 28 June 2022.

13.2.18 No agricultural land classification assessment survey or agricultural soil sampling has been undertaken for the Proposed Development as they are not required due to the nature of the Site (i.e. no agricultural land). The assessment relating to agricultural land classification has been based on publicly available GSI data.

Study Area

13.2.19 The study area for the geology and soils assessment is focused on land within the Site boundary and outward to 1km. This area is considered appropriate for the consideration of historic and current potentially contaminative land uses, encompassing the areas of historic mining in the area including underground mineral workings, and aligns with established industry practice and professional judgment for defining land contamination study areas for the assessment.

13.3 Legislative and Policy Framework

13.3.1 The following legislation, planning policy and guidance documents are of direct relevance and have been considered in the preparation of baseline information, the assessment of effects of the Proposed Development on geology and soils, informing the design-development process and when identifying mitigation measures are presented in the sections below, as well as the EIA Regulations relevant to the scheme.

Legislation

13.3.2 This chapter has been prepared with reference to the following:

- European Union Water Framework Directive (WFD) (2000/60/EC).

13.3.3 The following legislation in Ireland governs the shape of the WFD characterisation, monitoring, and status assessment programmes in terms of monitoring different water

categories, determining the quality elements and undertaking characterisation and classification assessments:

- European Communities (Water Policy) Regulations, 2003 (S.I. No. 722 of 2003);
- European Communities Environmental Objectives (Surface Water) Regulations, 2009 ('S.I. No. 272 of 2009 as amended'), as amended in 2012 (by S.I. No. 327/2012), 2015 (by S.I. No. 386/2015) and 2019 (by S.I. No. 77/2019);
- European Communities Environmental Objectives (Groundwater) Regulations, 2010 (S.I. No. 9 of 2010);
- European Communities Environmental Objectives (Groundwater) (Amendment) Regulations, 2016 (S.I. No. 366 of 2016); and
- European Communities, Environmental Impact Assessment of Projects – Guidance on Scoping (Directive 2011/92/EU as amended by 2014/52/EU) (EC, 2017).

13.4 Baseline Environmental Conditions and Constraints

13.4.1 The description of baseline environmental conditions covers the following aspects of the geological and soil setting and features:

- Soil geology;
- Subsoil geology;
- Bedrock geology;
- Ground Investigation Findings;
- Ground stability i.e. potential for subsidence;
- Mining activity and history;
- Agricultural land classification;
- Designated sites;
- Soil chemistry;
- Potential sources of contamination (including historic land use, waste sites, pollution incidents and permitted installations);
- Identified receptors; and
- Conceptual site model.

Soil Geology

13.4.2 According to the Teagasc soils map (available on the GSI map viewer) (see EIAR Volume III Figure 13.1), the Site is underlain by Made Ground, while the Study Area is underlain by Till derived chiefly from limestone, with Alluvium to the north and north-east. Mining spoil/ waste from the former Tynagh mine operations, with elevated heavy metals contents (principally arsenic, cadmium, copper, nickel, and zinc), was observed within the Site and is Made Ground at the Site consists of mainly granular fill material, reinformed concrete foundations, disused concrete structures, metal, and concrete debris. The materials observed in this portion of the Site are thought to be associated with the operation and demolition of the former historic Tynagh Mine site.

13.4.3 Site investigations between August 2021 June 2022 are detailed in Appendix 13A (Ground Investigation Reports) and 13B (Generic Quantitative Risk Assessment Report) and the soil analysis findings are summarised in Section 13.4.39) (refer to EIAR Volume II).

Subsoil Geology

13.4.4 According to the Quaternary Sediments map (available on the GSI map viewer) (see Volume III Figure 13.2, the Site is underlain by Made Ground (Fill) and the broader Study Area is underlain by *Till derived from limestone* with *Alluvium* to the north-eastern edge along Lisduff (Kilcrow) River, small localised occurrences of glacially derived sands and gravels, lacustrine sediments and fen peat can be found to the south and south-west of the site.

13.4.5 Thin deposits of peat were encountered during the August 2021 ground investigation in boreholes BH06, BH07 and BH08. This stratum attained thicknesses of between 0.6m and 0.7m, at depths ranging between 2.7m (BH08) and 4.0m bgl (BH06) and are summarised in Table 13.4 below. Peat was not encountered in the May/June 2022 site investigations.

13.4.6 There are no bedrock outcrop mapped within the Proposed Development Site.

13.4.7 Bedrock outcrops are mapped by GSI within the footprint of the existing Tynagh Power Station to the south of the Site but have been covered by groundworks. Several more bedrock outcrops are located further to the south and southwest of the Site (>600m from the Proposed Development).

13.4.8 Development of the existing Tynagh Power Station to the south of the Site since 2004 has resulted in the construction of a granular platform (of varying height above ground level – see Section 13.4.2 above) on which the existing Tynagh CCGT Power Station and associated infrastructure sits. The approximate level of its platform is 66m above Ordnance Datum (m AOD).

13.4.9 The southern portion of the Proposed Development is relatively flat and slopes eastward from >66.5m AOD in the west to 62.5m AOD in the east close to the former Tailings Pond.

13.4.10 The northern extent of the Proposed Development consists of a mound of mining soil to height of >72m AOD, on top of which are the foundations of a number of previous structures believed to have been temporary construction workers' accommodation blocks during construction of the existing power plant. Site investigations in 2022 have shown the mound to be composed of mixture of mine spoil and demolition wastes related to the former Tynagh mine workings.

13.4.11 The mapped subsoil geology is shown on Figure 13.1 (refer to EIAR Volume III).

13.4.12 There are no verified borehole records available on the GSI map viewer for the Site or Study Area.

13.4.13 A site investigation was completed in 2003 as part of the Environmental Impact Statement for the existing Tynagh Power Station development, consisting of three rotary cored boreholes to depths of 11.80m (BH-1), 7.00m (BH-2) and 10.10m (BH-3) below the then-ground levels (m bgl). All three boreholes were installed as groundwater monitoring wells (MW-1, MW-2 and MW-3). Fifteen trial pits (TP-01 to TP-15) were dug to depths of up to 3.9m below ground level.

13.4.14 Current IED Licence monitoring wells at the existing Tynagh Power Station site are named AGW-1, AGW3 and AGW-4 and their relationship to the 2003 wells is not clear.

No drilling records have been provided for AGW-1, AGW3 and AGW-4. AGW-4 does not appear to coincide with MW-2 from the 2003 study.

13.4.15 Available borehole and trial pit records from the 2003 site investigations were reviewed and indicate Made Ground underlying the Site prior to construction of the Tynagh Power Station, comprising compacted sandy gravels, underlain by soft to firm grey and brown sandy silty clays with frequent gravels. Depth and thicknesses of strata in the trial pits are not reported. BH-3/ MW-3 reported overburden to a depth of 4.6m bgl, consisting of cobbles and boulders of limestone from 1.0 to 2.8m bgl overlying limestone gravel with occasional sandstone clasts to 4.6m bgl.

13.4.16 The August 2021 site investigation locations in the existing Tynagh Power Station encountered angular limestone GRAVEL engineered FILL forming a platform for its construction. Beneath this, and underlying the southern portion of the Proposed Development, Made Ground consisting of medium dense grey to greyish-brown, sandy sub-angular to angular, fine to coarse GRAVEL of limestone with a varying fine-grained component and with cobbles and boulders also present.

13.4.17 Underlying the localised Engineered Fill and extensive Made Ground material, the site investigation encountered sandy gravelly silty CLAY of varying stiffness, with anthropogenic material observed, interpreted as reworked Glacial Till, which in turn overlies limestone bedrock of varying composition.

Bedrock Geology

13.4.18 According to the GSI's online map viewer (see EIAR Volume III Figure 13.3), the entire Site is underlain by Carboniferous limestone and shale of the Lucan Formation (commonly known as Calp). This stratum comprises dark grey to black, fine-grained, occasionally cherty, micritic limestones that weather paler, usually to pale grey. There are rare dark coarser grained calcarenitic limestones, sometimes graded, and interbedded dark-grey calcareous mudstone.

13.4.19 The existing Tynagh Power Station site is underlain by Carboniferous Waulsortian Limestone to the south of the Proposed Development.

13.4.20 It should be noted that due to the presence of the former Tynagh mines and associated zinc-lead orebody, there is potential for base metal sulphide and barite mineralization within both the Lucan Formation and Waulsortian Limestone. This would likely take the form of disseminated to massive pyrite mineralization and, to a lesser extent, occurrences of chalcopyrite, malachite, azurite, sphalerite and galena.

13.4.21 The August 2021 and May/June 2022 site investigations encountered the Lucan Formation bedrock in all bedrock boreholes drilled within the Proposed Development's Site, characterised by weak to medium strong, thinly interbedded dark grey LIMESTONE and light grey PACKSTONE, with some dark grey fossiliferous beds. The limestone is partially weathered in places, with more closely spaced fractures and patchy orangish brown staining and clay infill on some fracture and joint surfaces.

Ground Investigation Findings

13.4.22 The 2003 environmental statement (HGL O'Connor and Company, 2003) noted that concentrations of arsenic, cadmium, nickel, and zinc are generally elevated across the existing Tynagh Power Station Site and are associated with the underlying Tynagh ore body. Elevated concentrations of hydrocarbons (reported as diesel range hydrocarbons and mineral oil) were also detected in some of the 2003 soil samples and the source of these elevated hydrocarbon concentrations was considered to be associated historical

spillages of hydrocarbon fuels at the current power station site during previous operations associated with mining operations.

13.4.23 A summary of findings from the relevant site investigation locations situated within the Proposed Development from the August 2021, February 2022 and May/June 2022 ground investigation completed by Causeway Geotech Limited (on behalf of AECOM) is presented in Table 13.4.

Table 13.5: Generalised Site Geology Based on Results of Site Investigation

HOLE ID	STRATA (M BGL)				
	MADE GROUND (COARSE GRAINED)	**MADE GROUND (FINE GRAINED)**	**GLACIAL TILL (FINE GRAINED)**	**GLACIAL TILL (COARSE GRAINED)**	**LUCAN FORMATION (LIMESTONE BEDROCK)**
TP-22-01	0.0-0.2	0.2-2.8	2.8-3.3+	-	-
TP-22-02	0.0-0.2	0.2-0.6			
TP-22-03	0.0-1.6	1.6-1.7			
TP-22-05	0.0-2.0	2.0-2.9	2.9-3.3+	-	-
BH01	0.0-4.0+	-	-	4.0-4.5	4.5-8.5+
TP101	0.0-0.8+	-	-	-	-
TP101A	0.0-2.1+	-	-	-	-
TP102	0.0-1.7+	-	-	-	-
TP103	0.0-0.7+	-	-	-	-
TP104	0.0-1.8+	-	-	-	-
TP105	0.0-0.5	0.5-4.0	4.0-4.4+	-	-
TP106	0.0-1.6+				
BH101	0.0-9.0+	-	-	-	-
BH102	0.0-3.0	-	3.0-5.0		5.0-11.0+
BH102A	0.0-0.2	0.2-0.6+	-	-	-
BH103_TP	0.0-1.3+				
BH104	0.0-2.7		2.7-4.0	-	4.0-8.6+
BH105	-	0.0-4.0	-	-	4.0-9.6+
BH106	0.0-3.7	-	4.3-8.2	3.7-4.3	8.2-13.5+
BH107	0.0-0.7+	-	-	-	-
BH107A	0.0-0.5+	-	-	-	-
BH107B	0.0-0.8+	-	-	-	-
BH107C	0.0-4.5+	-	-	-	-

Strata Name	**Generalized Strata Description**
Made Ground (coarse grained)	Medium dense grey to greyish-brown sandy sub-angular to angular fine to coarse GRAVEL of limestone with a varying fine-grained component. Cobble, boulders and pieces of reinforced concrete also frequently present along with less frequently reported fragments of steel rope/cable, steel wire, steel bolts, plastic, brick, fabric, rubber, timber and steel pipe. Localised bands of peat (TP105) and some hydrocarbon odours reported (BH104, BH106, TP104, TP105, TP106).
Made Ground (fine grained)	Very soft-soft (BH06 and BH08) to Firm-stiff (TP02, TP04, and BH03) grey to brown (sometimes mottled) sandy gravelly silty CLAY with anthropogenic material observed.
Glacial Till (fine grained)	Stiff to very stiff grey slightly sandy slightly gravelly silty CLAY with a varying cobble and boulder content. This stratum was described as being soft in BH06, which might suggest localised weathering of the till.
Glacial Till (coarse grained)	Medium dense to dense grey to light brown slightly sandy silty fine to coarse GRAVEL with a low cobble and boulder content. A dense grey silty fine to medium SAND was also encountered in BH01.
Lucan Formation (bedrock – north of site)	Weak to medium strong, thinly interbedded, dark grey LIMESTONE and light grey PACKSTONE (BH01,). Partially weathered, with slightly reduced strength and closer fracture spacing (BH01). Mudstone band (5.0-5.9 m bgl) in BH104.

Ground Stability

13.4.24 The granular platform on which the Site and current Tynagh Power Station is located is assumed to have been placed and compacted to appropriate engineering standards of the time (circa 2004). As part of a site visit completed by AECOM on 29 June 2021 this platform was assessed for potential signs of instability. Observations made during this visit indicate the granular platform, which has been constructed with an approximate 1:1

battered face and stands between 1.5m and 5m above original ground level, shows no sign of instability.

13.4.25 There is an approximate 10m high mound, comprising spoil material (angular gravel, cobbles, and boulders of dark grey fossiliferous limestone) and demolition waste material consisting of fragments of reinforced concrete and crushed concrete, with minor other anthropogenic content) which is considered to original from demolition of the previous Tynagh mine working buildings and structures located in the northern part of the Site. BH101 on the top of the mound was drilled to a depth of 9m entirely through this spoil and demolition waste made ground material. The mound appears to be stable within no indication of slope failure. Further assessment of this slope will be considered prior to design and construction of the Proposed Development. If during construction stage excavations are required adjacent to the slope (i.e., construction of the backup fuel tank), then appropriate measures will be considered to maintain stability during reprofiling of the existing slope.

13.4.26 A major bedrock fault (fracture zone) called the North Tynagh Fault, runs east-west for approximately 10km, extending west and east of the former open pit mine site.

13.4.27 The North Tynagh Fault is a deep seated, high angle (60-65°N) normal fault with a maximum displacement of about 600m in the vicinity of the mineralised zone.

13.4.28 Fluid movements along this fault were a critical factor in the deposition of mineral deposits in the Carboniferous period (359.2 to 299 million years ago), and later facilitated movement of acidic water that decalcified and weathered several million tonnes of limestone rock during the Tertiary period (66 to 2.6 million years ago).

13.4.29 This fault is a key element of the local hydrogeology: significantly more groundwater moves through this discrete feature than through the mass of regional rock.

13.4.30 The drilling record for BH-3 in 2003 indicated the section from 2.8 to 4.6m bgl may be an infilled cavity in the bedrock.

13.4.31 There are also known karst features[1] located between 1 and 2km west the Site at Grange Beg and Bracklagh Grange, with a cluster of karst features including seven springs, one enclosed depression and two swallow holes. These features are oriented along the trend of the North Tynagh Fault and are likely to be associated with increased fracturing and fluid movement associated with the fault. The karst features appear to be more associated with the Waulsortian limestones to the south than the Lucan Formation underlying the Site.

13.4.32 No former mine workings are indicated to underly the Site; however, karst features such as open voids and conduits may be present in the limestone bedrock, given the alterations that have occurred to the bedrock at the Site, however no voids were reported in the five boreholes drilled into bedrock on the Site in 2021-2022.

Mining History and Activity

13.4.33 Tynagh mines opened in the 1960's and were an important source of lead and zinc concentrates. From 1965 to 1981 the mines were managed by the Northgate Group subsidiary Irish Base Metals Ltd. According to Meehan *et al.*, 2020: "*The mineralization at Tynagh was mainly hosted by the Waulsortian Limestone in two primary orebodies and one secondary orebody, the latter formed by weathering of the former. Primary ore*

[1] *Karst is a topography formed from the dissolution of soluble rocks such as limestone, dolomite, gypsum and halite deposits. It is characterized by underground drainage systems with sinkholes and caves.*

minerals included silver-bearing galena, sphalerite and barite. The secondary orebody occurred in a karstic sinkhole; secondary minerals included cerussite, smithsonite, azurite, malachite, hemimorphite and dundasite". For almost twenty years, Irish Base Metals Ltd. was a major source of employment for east Galway and the mines were worked on an opencast and underground basis until closure in the early 1980's, after which a period of partial restoration and site rehabilitation was undertaken.

13.4.34 The open pit is located to the south of the Site and the existing Tynagh Power Station, with underground mine workings extending to the east from there. A drawing for the 2003 planning application (refer to Figure 13.4: Locations of Shafts and Tunnels, EIAR Volume III) shows mine shafts and tunnels underly the current Tynagh Power Station's gas turbine hall, steam turbine hall and air condenser at reported depth of -56 to -117m AOD (i.e. > 100m below current ground elevation) (HGL O'Connor drawing 01072 C-P-14 Location Plan showing Locations of Shafts and Tunnels dated 14/03/2003 – see Figure 13.4) but do not indicate mine workings beneath the Proposed Development.

13.4.35 The main horizontal underground historic mine workings are understood to extend several kilometres east of the open pit at three main levels.

13.4.36 The location of mine shafts within the Study Area is presented in Table.

Table 13.6: Historic mine workings within study area

MINE WORKING	DEPTH	EASTING	NORTHING
Production Shaft	-56m AOD	574492*	712931*
Manway Mine Shaft	Not known	574587*	712950*
Mine Tunnel 1	-56m AOD	Straight linear structure 2.4m(H) x 4.6m(W) located beneath the eastern half of the existing power plant.	
Mine Tunnel 2	-117m AOD	Curved linear structure 2.4m(H) x 4.6m(W) located beneath the entire footprint of the existing power plant. Extends to the east away from the site.	

**Approximate coordinates based on available mine plans (HGL O'Connor drawing ref: 01072 C-P-14)*

Agricultural Land

13.4.37 Land within the Site is Made Ground derived from the former and current industrial land use and is not used for agricultural purposes. The Teagasc soil classification and GSI subsoil classification is 'Urban' across the entire former mine site.

13.4.38 Lands within 1km outside the former mining facility footprint are predominately pastureland agricultural lands, with individual or clustered rural residential properties.

Soil Chemistry

13.4.39 During the ground investigation, soil samples were obtained at regular intervals throughout the soil profile. Twenty-five soil samples were obtained within Made Ground deposits and in the underlying superficial deposits (if present), as detailed in Appendix 13A (refer to EIAR Volume II).

13.4.40 Soil samples were analysed for an extensive suite of potential ground contaminants which included:

- Heavy metals suite (antimony (Sb), arsenic (As), boron (B), beryllium (Be), cadmium (Cd), Total Chromium (Cr), trivalent Cr (Cr III), hexavalent Cr (Cr VI), copper (Cu),

lead (Pb), mercury (Hg), molybdenum (Mo), nickel (Ni), selenium (Se), vanadium (V) and zinc (Zn));

- Soil pH;
- BTEX/MTBE suite (benzene, toluene, ethylbenzene, xylenes, methyl tert butyl ether);
- Volatile Organic Compound suite (VOC);
- Semi Volatile Organic Compound suite (SVOC);
- Total Organic Matter and Total Organic Carbon;
- Total Petroleum Hydrocarbons (Criteria Working Group method) (TPH CWG) (aliphatic/ aromatic split and chain length breakdown);
- Speciated Polycyclic Aromatic Hydrocarbons (PAH) suite;
- Total Phenols;
- Poly Chlorinated Biphenyls (PCBs) suite;
- Total cyanide;
- Asbestos screen and identification; and
- Sulphate/ sulphide/ sulphur.

13.4.41 Olfactory evidence of contamination was reported by the drilling contractor during the soil sampling on the Site in the form of hydrocarbon odours in made ground at BH104, BH106, TP104, TP105 and TP106.

13.4.42 Anthropogenic material was encountered during the site investigation at the Proposed Development in the form of fragments of crushed concrete, reinforced concrete, steel rope/cable, steel wire, steel bolts, plastic, brick, fabric, rubber, timber and steel pipe in a number of trial pit sand boreholes.

13.4.43 On-site soil organic vapour screening using a photo-ionisation detector (PID) in 2021 generally reported low or non-detect readings (0.0 to 0.5ppm) at the Proposed Development Site. PID readings were not recorded during the 2022 site investigation.

13.4.44 Soil samples from the site were analysed by Chemtest and were screened by AECOM against Generic Assessment Criteria (GAC) relevant to Human Health (HH) impacts and the continued Commercial/ Industrial Land use of the Site.

13.4.45 A review of the soil data analysed from the Site shows that most soil results were either below laboratory detection limits or below the relevant GAC.

13.4.46 Heavy metals were generally elevated in soils, with arsenic, copper, lead and zinc reported at 100s to 1,000smg/kg in certain site investigation locations and with exceedances of the HH-GAC noted for arsenic (in one sample - BH-01 (1m))), cyanide (in one sample – TP102A (1.0m)), and lead (in ten samples - BH-01 (1m), TP-22-03 (0.5 m), TP-22-03 (1.65 m), TP101A (0.5 m), TP101A (1.0 m), TP101A (2.0 m), TP102 (1.0 m), BH101 (0.5 m), BH101 (2.0 m) and BH102A (1.0 m),)), all from samples of granular made ground material.

13.4.47 These elevated metals detections are likely to be related to reworked local materials (ore-enriched soils and/ or mining spoil) and the metals reported at elevated concentrations are consistent with previous studies of soil composition in the general area of the site by HG O'Connor (2003), EPA (2003) and AECOM (2021).

13.4.48 It is intended to raise ground levels using clean imported fill in the south-eastern part of the Proposed Development Site to elevations similar to the existing Tynagh Power Station (to enable a platform to be created at 67.5m AOD). New, clean imported fill material will break any potential direct human contact pathway with subsoils containing elevated heavy metals. Potential construction phase risks from elevated metals in soils will be managed appropriately during groundworks.

13.4.49 Petroleum hydrocarbons were reported in soil samples from BH03 and TP-22-02 0.50m, but at concentrations below the applicable soil GAC for continued commercial/ industrial land use.

13.4.50 Petroleum hydrocarbons were also detected in groundwater samples from shallow well BH02A which exceeded both the Groundwater Threshold Value (GTV) and Drinking Water Standard (DWS). However, the lack of reported hydrocarbons in soil samples from BH02 or in the deeper groundwater sample in well BH02 suggest the hydrocarbons reported in shallow groundwater at BH02A are very localised.

13.4.51 PCB compounds were reported at low concentrations at BH01 but were below applicable GAC. The PCB detection may be related to historical use of PCBs in electrical switchgear or transformers at the former mine site, as PCB use in new installations was eliminated in Ireland prior to 2000, in line with Council Directives 85/467/EEC and 89/677/EEC.

13.4.52 Other organic compounds reported in soils include two PAH compounds at BH03 1m, but both were below the relevant soil HH-GACs for continued commercial/industrial land use.

13.4.53 Asbestos was not detected in any of the 17 soil samples in which it was analysed.

13.4.54 Further details are provided in Appendix 13B (refer to EIAR Volume II).

Designated Sites

13.4.55 There are no statutory designated sites (Special Protection Areas (SPA), Proposed Natural Heritage Areas (pNHA), Natural Heritage Areas (NHA) or Special Area of Conservation (SAC)), within 5km of the Site.

13.4.56 The nearest Water Framework Directive (WFD) designated feature is the Kilcrow25_070 surface water course (IE_SH_25K010700), with the nearest point at approximately 1.7 km south-east of the Site, and flows in a south easterly direction.

13.4.57 According to the GSI map viewer the Site lies fully within the boundary of the former Tynagh Mine site, which is a County Geological Site (CGS) (Site Code: GY133) described as '*a large abandoned modern mine site partly occupied by a recently constructed power plant'*. The Tynagh mine site is of importance as it was the first of the large Lower Carboniferous-hosted "Irish-type" Zn-Pb base metal mines to be discovered and developed in the 20th century.

Potential sources of contamination

Historic Land Use

13.4.58 The historical land use of the Study Area has been determined by examining the historical mapping for the Tynagh area available on the OSi map viewer (GeoHive) and Google Earth aerial photography. The historic land use is primarily agricultural and scrub land within the Site and wider Study Area. The satellite image from 1985 shows evidence of mining in the area to the north and south of the Site and mining production is known to have begun in the area in 1965. The mine was designed to handle 2000t of raw ore per day in the surface concentrator facility.

13.4.59 The mine initially was open cast and the facilities constructed included a 48.5ha tailings pond. The mine was worked as an open pit from 1965 until 1972 when production then continued from underground sources only.

13.4.60 Mining continued until 1982, and the mining lease expired in November 1983.

13.4.61 The existing Tynagh Power Station and associated power transmission infrastructure, Above Ground Installation (AGI) and natural gas pipeline were constructed on the western part of the former mine in the mid-2000s.

13.4.62 Sperrin Galvanisers Ltd, an Industrial Emissions (IE) licenced metal plating facility was constructed adjacent to the western boundary of the Site in 2004.

13.4.63 The following table summarises the historic land uses recorded on the OSI historic land use mapping available for the Study Area and shown on Figure 13.3 (refer to EIAR Volume III).

Table 13.6: Historical land use within study area

SITE ID	EASTING (ITM)	NORTHING (ITM)	ACTIVITY (DECADE)	DESCRIPTION	CURRENT USE
Agricultural land	574624	712892	Pre-1960	Prior to the start of mining activity, the area of the Proposed Development, and the surrounding area, was used as agricultural land.	Superseded by land uses below.
Former Tynagh mine site	574624	712892	1960s to 1980s	Open pit and underground base metal mine	Activity has ceased, buildings demolished, mining spoil heaps and tailings ponds remain, open pit has been allowed to re-flood
Sperrin Galvanisers	574187	712984	2000s to 2020s	Metal plating facility	Metal plating facility (operational, EPA IE Licence P0658-01)
Tynagh Power Station	574390	712952	2000s to 2020s	CCGT Power Station	CCGT Power Station (operational, EPA IE Licence P0700-02)
Disused gravel pit	574807	712732	Pre-1888	Disused gravel pit indicated on 25inch:1-mile historical mapping series	Within area of current flooded mine pit

Source: GeoHive spatial map viewer

Waste Sites

13.4.64 There are no active or expired waste licences within the Site or the existing Tynagh Power Station or in the 1km Study Area

13.4.65 Part of the Site and significant areas to the south and west of the existing Tynagh Power Station Site and the northern portion to the Proposed Development Site are composed of mine spoil heaps and demolition materials from the Tynagh Mine which predates the construction of the existing Tynagh Power Station in 2004.

Pollution Incidents

13.4.66 The existing Tynagh Power Station is operated by Tynagh Energy Limited and is managed under EPA IE licence P0700-02 which enforces control measures to mitigative against potential risk to receptors.

13.4.67 The existing Tynagh Power Station is subject to the Chemicals Act (Control of Major Accident Hazards (COMAH) involving Dangerous Substances) Regulations 2015 (S.I. No. 209/2015). These regulations establish rules for the prevention of major accidents which might result from certain industrial activities and the limitation of their consequences for human health and the environment.

13.4.68 The existing Tynagh Power Station is classified by the HSA as a Lower Tier establishment under Schedule 1 Regulation 2 of COMAH due to the quantity of dangerous substances it holds[2]. The relevant dangerous substances listed for the site are petroleum products (gas oil) as a backup fuel source.

13.4.69 Site annual environmental reports for the existing Tynagh Power Station to the EPA since 2008 have been reviewed and the only reported loss to ground was a minor loss of diesel in May 2015 at the location of the diesel generator. Impacted soil at the location was reported to be excavated and removed.

13.4.70 There is potential for historical pollution incidents and ground contamination related to the former mining operations.

13.4.71 Site investigation findings in 2021 and 2022 indicate minor localised ground contamination by petroleum hydrocarbons and PCBs at the Proposed Development, likely due to historical fuel use and electrical installations relating to the former site use as a base metals mine and ore processing site.

Permitted Installations

13.4.72 There are two recorded permitted installations licenced by the EPA under the IE Licence within the Study Area. Tynagh Energy Limited (IEL reg P0700-02) is the current Tynagh Power Station. Sperrin Galvanisers (Ireland) Limited (IEL reg P0658-01) is located directly to the west of the Site. There are no other recorded Integrated Pollution Prevention and Control (IPPC) licences, licenced waste facilities or land fill sites recorded within the Study Area.

[2]*Health & Safety Authority, Lower Tier Establishments in Galway/Mayo/Cavan/Roscommon: https://www.hsa.ie/eng/your_industry/chemicals/legislation_enforcement/comah/information_to_the_public/lower_tier_establishments_by_region/lower_tier_establishments_in_galway_mayo_cavan_roscommon/Tynagh_Lower_tier_R25.pdf Accessed: 19/12/2022*

Identified receptors

13.4.73 The principal soil and geological resource receptors which have the potential to be impacted upon by the Proposed Development during construction, operation, and decommissioning include:

- Agriculture land and soil resources: the soil resources within the Site are classified as made ground land use and of negligible sensitivity.
- Designated sites: There are no designated sites (SPA, pNHA, NHA or SAC) within the Site or within 5km of the boundaries of the Site. The remaining area is considered of local importance and of low sensitivity.

13.4.74 The receptors which could be affected by contamination which is created or affected by construction and/ or operation of the Proposed Development are:

- Geology: The Proposed Development does not involve extensive excavations that would impact on the defined County Geological site at the former Tynagh Mine site and, in view of the extensive historical mining operations and deposition of mining spoil, groundworks for the Proposed Development are unlikely to impact high sensitivity geological heritage features.
- Surface water: There are no surface water courses within or bordering the Site. There is an open water body bordering the existing Tynagh Power Station Site to the south (EPA Lake code 25_303, the flooded former open pit mine, 280m to the south-east of the Proposed Development) and in the area to the east (EPA lake code 25_300, former mine site tailings ponds, 40m east of the Proposed Development Site). These surface water bodies are not classified by the EPA under the WFD. Surface streams to the north and south of the former mine site (all termed Lisduff (Kilcrow)_020 (IE_SH_25L060400)) are >500m from the Proposed Development Site and are all classified by EPA as having Poor WFD status and being at risk of not achieving Good status. There are no known surface water abstractions within 1km of the Site. Surface water courses are discussed further in Chapter 12: Water Environment.
- Groundwater: The groundwater receptors identified as being at potential risk from impacts to soil and geological resources are shown on Figure 13.4 (refer to EIAR Volume III) and are as follows:
  - Groundwater in the flooded former open mine pit and tunnels;
  - Groundwater abstracted from the existing Tynagh Power Station well but not used for potable use on its site;
  - There are no public or private water supplies located within the 1km study area recorded in the GSI Groundwater Wells and Springs database however the database is incomplete and private well supplies may exist in the vicinity of the Site;
  - There are no known groundwater dependent terrestrial ecosystems (GWDTEs) within the 1km study area; and
  - The hydrogeology of the Site and wider study area are detailed in Chapter 12: Water Environment of this EIAR.
- Human Health: The land use within the Site is brownfield/industrial with the associated human health considered to be of medium sensitivity. Construction workers also represent additional high sensitivity human receptors during the

construction phase only. Road users by their very nature are transient and are therefore considered to represent a lower risk.

Table 13.7: Sensitive receptors

PRINCIPAL RECEPTOR	RECEPTOR	SENSITIVITY	POTENTIAL TO BE IMPACTED	
			CONSTRUCTION PHASE	OPERATIONAL PHASE
Agricultural soil resources	No agricultural soils within the Proposed Development	Negligible	x	x
Designated geological sites	Former Tynagh Mine site	High	x	x
Surface water	Flooded, former open mine pit	Low – due to naturally elevated heavy metals – non-potable	✓	x
	Tailings Ponds	Low	x	x
	Tributaries of WFD classified watercourse	Low	✓	x
Groundwater	Superficial deposits aquifer (granular Made ground, and Limestone Tills)	Low	✓	✓
	Locally Important Aquifer - Bedrock which is Moderately Productive only in Local Zones (Lucan Formation limestones)	High	✓	✓
Human Health	Industrial land use (Sperrin Galvanisers)	Medium	✓	✓
	Residential (330m+ west and northwest of the site)	High (if potable wells present)	✓	✓
	Construction workers	High	✓	x

Conceptual Site Model

13.4.75 A Conceptual Site Model (CSM) defines the plausible contaminant source, pathway, and receptor linkages, which are integral to identifying potential impacts of the Proposed Development and Site. The CSM presents details of potential sources of contamination, potential receptors and potential contaminant migration pathways that have been identified for these sites. Table 13.9 lists the potential contaminant linkages and associated risks identified for the Proposed Development.

Table 13.8: Potential sources-pathways-receptors of contamination associated with the Proposed Development

POTENTIAL SOURCE	DESCRIPTION	PATHWAY	DESCRIPTION	RECEPTOR
Existing soil contamination	Existing contamination in the made ground and superficial deposits, as a result of deposition of mining spoil and demolition of previous mine buildings and structures and of potential historic pollution incidents could be exposed and disturbed during construction across the Site, depending on the depth of excavations.	Dermal contact	Direct contact with contaminated ground soils, soil derived dust, soil leachate and perched water in the made ground/ subsoil.	- Construction workers
		Inhalation	Inhalation of made ground derived dust, organic vapours or ground generated gas.	- Construction workers - Off-site industrial and residential land users
		Leaching and infiltration into water environment	Rainfall infiltration can generate and mobilise made ground soil/ mining spoil-derived leachate into groundwater within underlying aquifers.	- Surface watercourses - Groundwater - Known/ unknown water supplies
Existing groundwater contamination	Existing contamination in the shallow groundwater (in the superficial deposits) and deep groundwater (in the limestone bedrock aquifers) from presence of the Tynagh ore body and from historical mining activities or pollution incidents.	Dermal contact	Direct contact with contaminated groundwater.	- Construction workers
		Mobilisation and migration along preferential flow paths in superficial or bedrock aquifers	Rainfall infiltration can mobilise contaminated groundwater further into the subsurface from there to other water environment receptors.	- Surface watercourses - Groundwater - Known/ unknown water supplies
Off-site sources	Pollution incidents at off-site sources could result in contamination reaching soil and/ or groundwater in direct	Introduction of new sources of contamination to subsurface	Pollution incidents at off-site sources could result in contamination reaching soil and groundwater in direct	- Construction workers

POTENTIAL SOURCE	DESCRIPTION	PATHWAY	DESCRIPTION	RECEPTOR
	contact with Power Station infrastructure or services.		contact with Power Station infrastructure or services.	- Surface watercourses - Groundwater - Known/ unknown water supplies
On-site sources	Construction activities with the potential to contaminate soils and groundwater on the Site.		Pollution incidents on-site during construction could result in contamination reaching soil and groundwater beneath the Site.	

13.5 Predicted Impacts

Do Nothing Scenario

13.5.1 In the absence of the Proposed Development, no significant changes to soil and geological resource receptors, and indirectly to surface water, groundwater, and human health receptors, are likely to occur under the current regime (operation of the existing Tynagh Power station to the south of the Site) The potential scientific value of the study area (in terms of geological exposures) would continue unchanged.

Construction Phase

13.5.2 The scoping process has identified that the introduction of the Proposed Development would potentially result in different types and durations of impact on soils and geological receptors, during the construction phase. Likely predicted impacts are described below.

13.5.3 As outlined in EIAR Volume I, Chapter 5: The Proposed Development, there are below ground elements to the Proposed Development with the potential to result in impacts on soils and geological receptors. These consist of:

- Development of AGI to deliver the required gas capacity for the Proposed Development and a gas pipeline internal to the site;
- Underground electricity cabling connections and upgrades to the existing electrical sub-station;
- Surface drainage will join into the existing drainage systems on the existing Tynagh Power Station;
- A fire water storage tank and pumphouse south of the proposed distillate storage on the Site; and
- Foundations, including piling for the proposed OCGT.

13.5.4 The new OCGT unit and ancillary infrastructure will be constructed to the immediate north of the existing Tynagh Power Station. The area is existing hardstanding and crushed Construction and Demolition (C&D) debris from the former mine buildings. The southern portion of the Site is at a level varying from east to west from 62m to 66m AOD with the northern part of the Site consisting of a mound of mine-related materials up to 73-74 m AOD high.

13.5.5 This southern portion of the Site will be raised with crushed aggregate (21,000m^3 of imported material) to a enable a proposed level of 67.5m AOD, to match the existing Tynagh Power Station site to the immediate south. This permeable material will allow surface water and rainwater to percolate through it in unsealed areas; no hazardous materials will be stored unbunded within the Site.

13.5.6 The construction for this phase will take place over an 18-24 month period. A final construction programme will be prepared by the Engineering and Construction (E&C) Contractor and presented in a Construction Environmental Management Plan (CEMP). A draft Outline CEMP (oCEMP) is presented in Appendix 5A (refer to EIAR Volume II).

13.5.7 During the construction phase, the following predicted impacts on soils and geological receptors are likely to occur, without the proposed mitigation:

- Temporary impacts on soil structure as a result of soil excavation, smearing and compaction;

- Temporary impacts on soil chemistry as a result of spillages of oils, fuels or other construction chemicals, or through the mobilisation of existing contamination following ground disturbance;
- Impacts on surface and groundwater water quality due to deposition or spillage of soils, sediments, oils, fuels, or other construction chemicals/ wastewater, or through mobilisation of contamination following disturbance of contaminated ground, sediments, or groundwater, or through uncontrolled site run-off;
- Potential increase in volume and rate of surface water runoff from new impervious areas during construction, leading to an impact on flood risk;
- Increased risk of groundwater flooding or recharge as a result of any below ground excavations;
- Alteration in fluvial and overland flow paths as a result of works associated with the Proposed Development; and
- Temporary impacts on off-site receptors, such as urban/ industrial land users, residents and construction workers, through the inhalation of contaminated dust and dermal contact with contaminated soil following ground disturbance.

13.5.8 Construction activities such as earthworks, excavations, site preparation, levelling and grading operations result in the disturbance of soils. Exposed soil is more vulnerable to erosion during rainfall events due to loosening and removal of vegetation to bind it, compaction and increased runoff rates. Surface runoff from such areas can contain excessive quantities of fine sediment, which may eventually be transported to watercourses where it can result in adverse impacts on water quality, flora, and fauna. This sediment could contain contaminants, particularly in the vicinity of the existing power station. The potential impacts of fine sediment on water quality, flora and fauna are addressed in Chapter 12: Water Environment, while the potential impacts of soil contaminants on water quality are addressed herein.

13.5.9 During construction, fuel, hydraulic fluids, solvents, grouts, detergents, and other potentially polluting substances will be stored and/ or used on site. Spillages of these substances could pollute nearby surface watercourses or underlying aquifers if their use or removal is not carefully controlled, and spillages enter existing flow pathways or waterbodies directly. The potential impacts of spillages on water quality, flora and fauna are addressed in Chapter 12: Water Environment, while the potential impacts of the migration of these spillages within the subsurface on water quality are addressed herein.

13.5.10 During construction, groundwater may be encountered in excavations and dewatering may be required. The potential impacts of construction dewatering and subsequent discharging on surface and groundwater receptors are addressed in Chapter 12: Water Environment.

13.5.11 The potential impacts of construction dewatering on ground stability have been scoped out of the impact assessment for the following reasons:

- The proposed construction methodology includes raising the ground level for the OCGT to a platform of 67.5m AOD, where groundwater was recorded in the boreholes at between 2.0 and 2.5m below ground in wells BH102 and BH104 on the lower-lying southern portion of the Proposed Development on 23 August and 15 September 2021 on 12 July and 26 August 2022. Therefore, there is a low likelihood of groundwater being encountered in excavations and for any dewatering to be required during construction. If required, it is anticipated that the volume of

groundwater required will remain less than 25m^3 per day and therefore not require an abstraction licence (refer to EIAR Volume II, Appendix 13B Generic Quantitative Risk Assessment).

- There are no records of historic mine workings or reported karst features within the Site.

13.5.12 The potential impacts of construction on ground stability have been scoped into the impact assessment for the following reasons:

- While there are no recorded collapse features within the 1km Study Area and no historic mine shafts or mines within the Site, there are numerous karst features mapped within 1-2km of the Site, so enlarged conduits in the fractured limestone bedrock cannot be ruled out, however no karst features were identified within the boreholes drilled for this study.
- No karst features were identified in bedrock in the three boreholes drilled on the Site in 2021 (refer to EIAR Volume II Appendix 13A).
- Therefore, it is very unlikely that ground instability as a result of underlying karst will be an issue during construction, operation, or decommissioning of the Proposed Development.

Operational Phase

13.5.13 The introduction of the Proposed Development would potentially result in different types and durations of impact on soils and geological receptors, during the operational phase.

- During the operational phase of the Proposed Development, the following likely predicted impacts on soils and geology receptors are likely to occur, without the proposed mitigation: Impacts on soil chemistry as a result of accidental spillages or leakages from stored backup fuel (distillate fuel or Hydrotreated Vegetable Oil (HVO)) into the subsurface;
- Impacts on surface and groundwater quality through the migration of introduced contamination as a result of accidental spillages or leakages from the underground pipework and/ or locally stored distillate fuel into surface and groundwater receptors; and
- Impacts on groundwater quality as a result of the removal/ treatment/ mitigation of encountered contamination.

Decommissioning Phase

13.5.14 Prior to any decommissioning, a Decommissioning Plan (including a Decommissioning Environmental Management Plan) will be produced and agreed with the EPA as part of the IE Licence and licence surrender process. An environmental Baseline Assessment report at time of commencement of operations will be referred to and updated to determine if any contamination has occurred and what, if any, rehabilitation is required prior to IE Licence surrender.

13.5.15 The predicted impacts on soils and geological receptors likely to occur during the decommissioning phase are anticipated to be similar to those likely to occur during the construction phase with the exception of the impacts relating to unidentified contamination. The likely predicted impacts are as follows without the proposed mitigation:

- Temporary impacts of soil structure due to soil stripping, smearing and compaction;

- Temporary impacts on soil chemistry as a result of spillages of oils, fuels, or other construction chemicals, or through the mobilisation of contamination following ground disturbance; and
- Temporary impacts on surface and groundwater quality through the migration of introduced contaminants as a result of spillages.

13.6 Mitigation and Enhancement Measures

13.6.1 The following mitigation measures have either been incorporated into the design (i.e., embedded mitigation) or are standard construction or operational practices. These measures have, therefore, been taken into account during the impact assessment.

Construction Phase

13.6.2 Prior to construction starting onsite, a Final CEMP will be prepared by the Contractor to be approved by the planning authority. The Final CEMP will detail the measures necessary to avoid, prevent and reduce adverse effects where possible upon soil and geological receptors. An oCEMP is provided in Appendix 5A (refer to EIAR Volume II).

13.6.3 To minimise the potential for adverse impacts to soil structure and quality during construction, the following is an outline of the general mitigation measures that will be in place (see EIAR Appendix 5A for more detail, refer to EIAR Volume II):

- Spoil material will be stored temporarily within the Site in managed stockpiles that will not be allowed to dry out, to avoid generation of wind-blown dust;
- Any stockpiled material will be managed in accordance with best practise guidelines (such as Construction Code of Practice for the Sustainable Use of Soils on Construction Sites (2009)). When required, pre-earthwork drainage will be put in place to avoid sediment being washed off site as outlined in oCEMP; and
- The Contractor will be required to prepare a Construction Traffic Management Plan (CTMP) to minimise site traffic and, if relevant, damage to soil structure from smearing and compaction (see EIAR Chapter 14: Traffic for more detail and Appendix 14E for the CTMP).

13.6.4 To minimise the potential for adverse impacts to soil chemistry and to water quality during construction, the following is an outline of the general mitigation measures that will be in place (see EIAR Appendix 5A and Chapter 12: Water Environment for more detail):

- The construction of the Proposed Development will be in accordance with good practice as detailed in Chapter 5: The Proposed Development.
- The E&C Contractor will be required to include measures in the CEMP for minimising erosion by reducing disturbance and stabilising exposed materials. The plan will also consider control measures to minimise the release of mobilised sediment. The CEMP will also include methods of handling and storing chemicals and fuels, followed by an Emergency Response Plan to be implemented in the event of a spill or leak.
- Water quality monitoring will be undertaken pre and during-construction, details of which will be included in the CEMP. This will be based on a combination of visual observations, in situ testing using handheld water quality probes, and periodic sampling for laboratory analysis.

- The E&C Contractor will be required to ensure the safe storage of any hazardous materials or chemicals required onsite. Storage areas for flammable/ toxic/ corrosive materials will be located in a separate, locked, impermeable bunded and fenced off area. Material data sheets will be available for all these materials and the COSHH (Control of Substances Hazardous to Health) assessments kept within the relevant Risk Assessment for the task, all subject to the Applicant's approval. Storage will not be within 50m of a watercourse and designated storage areas will be bunded to 110% of storage capacity to contain the effects of any spills. These areas will be cleared and re-instated following completion of the Site.
- A Site Waste Management Plan will be prepared, and all relevant contractors will be required to seek to minimise waste arising at source and, where such waste generation is unavoidable, to maximise its recycling and reuse potential. Recycling of materials will primarily take place off-site where noise and dust are more easily managed and less likely to impact on surrounding properties.
- Should significant contamination occur as a result of construction stage activities, Galway County Council and the EPA will be notified and appropriate corrective actions will be agreed and undertaken.
- If water is encountered during below ground construction, suitable best practice de-watering methods will be used. No significant groundwater dewatering is anticipated but, if required, will be undertaken as outlined in Chapter 12: Water Environment.
- Construction works will be carried out in such a way as to prevent, contain, or limit, as far as reasonably practicable, any adverse effects arising from the presence of contaminated land or materials (if encountered) in compliance with the CEMP. Examples of these measures are as follows:
  - The E&C Contractor will ensure that any significant contamination not identified during previous site investigations is recorded and dealt with in line with the EPA's "Guidance on the Management of Contaminated Land and Groundwater at EPA Licensed Sites";
  - Should ground with significant levels of unknown contamination be encountered during construction, working methods and procedures for handling and disposal of material will be employed to minimise risk in line with the EPA's "Guidance on the Management of Contaminated Land and Groundwater at EPA Licensed Sites". If required, the material will be disposed of at a suitably licensed waste facility;
  - 'Clean' and 'dirty' (contaminated) work areas will be divided by internal fencing where contamination is encountered;
  - Personal Protective Equipment (PPE) will be worn by ground workers and other staff (see below for more detail on PPE);
  - Those potentially at risk will be made aware of potential site hazards via site safety induction procedures; and
  - No excavated material will be exported off site.

13.6.5 To minimise the potential for adverse impacts to off-site receptors and construction workers, the following is an outline of the general mitigation measures that will be in place (see Appendix 5A, EIAR Volume II and Chapter 7: Air Quality and Climate, EIAR Volume II for more detail):

- The Contractor has a duty under the Safety, Health and Welfare at Work Act 2005 and the Control of Substances Hazardous to Health (COSHH) Regulations 2002 to protect their employees against hazardous substances encountered at work, particularly in light of the presence of potentially contaminated fill material at surface resulting from deposition of mining spoil with elevated heavy metal concentrations, importation of fill material and demolition of former mine buildings. To that end and in accordance with CIRIA guidance R132 *A guide for safe working on contaminated sites* (1996), the Contractor will be required undertake a COSHH assessment before any work is carried out at the Site which is likely to expose staff to substances hazardous to health. No hazardous substances were identified during the site investigation; however, it would be best practice for the Contractor to ensure that all employees (construction workers) are issued with PPE appropriate to the hazards identified. PPE could consist of hazard-specific gloves, eye protection and respiratory protective equipment (RPE).
- The Contractor will implement measures to minimise the amount of dust produced during the construction phase, including the preparation of a Dust Management Plan (DMP). There will be a Duty of Care on the E&C Contractor to ensure that dust-raising activities are located away, and upwind where possible, from sensitive receptors as much as feasibly possible, the duration be kept to a minimum when in proximity to a receptor, and the spread of dust be controlled by judicious use of water, the most effective and efficient way being in the form of a fine spray.

13.6.6 Comprehensive site investigations have been undertaken as described above and the existing ground conditions are therefore understood and have informed the siting and layout of the Proposed Development.

13.6.7 It should be noted that, unlike the original Tynagh Power Station construction, the Proposed Development involves significantly less excavation as the footprint is smaller and some of the development area is hardstanding. The Proposed Development will be constructed in accordance with current engineering standards, including site investigation and understanding of ground conditions to inform construction works and design. No excavated material will be exported off site.

13.6.8 Mitigation measures for construction works including soil handling are incorporated into the oCEMP (EIAR Volume II Appendix 5A) which will form the basis of the final CEMP to be implemented by the E&C Contractor who will conduct the works. Should GCC consider independent supervision of these works to be required at the expense of the developer, the Applicant would be agreeable to this being implemented through an appropriately-worded planning condition.

Operational Phase

13.6.9 To minimise the potential for adverse impacts to soil chemistry and water quality, the following is an outline of the general mitigation measures that will be in place (see Appendix 5A, and EIAR Chapter 12: Water Environment for more detail):

- The Proposed Development will follow the standards set out in the IE Directive (IED) under its IE Licence. This is set out to limit and minimise the impacts to air, soil, surface and groundwater, and the effects on environment and human health.
- The Proposed Development will be operated in line with appropriate standards and the operator will implement and maintain an Environment Management System (EMS) which will be certified to International Standards Organisation (ISO) 14001.

The EMS will outline requirements and procedures required to ensure that the Proposed Development is operating to the appropriate standard.

- When required sampling and analysis of pollutants will occur. This includes monitoring emissions levels in accordance with the IE Licence.
- To prevent the risk of spillages, flooding, fire, and other potentially major incidents several measures will be in place. These include compliance with all relevant health, safety and environmental legislation; design, build and operation in accordance with industry practice; regular maintenance and inspections to reduce the risk of equipment failures; bunded or double skinned storage areas; good and regular housekeeping; and spill kits stored on Site.

13.6.10 Water quality monitoring will be undertaken post-construction, details of which will be included in the IE Licence. This will be based on a combination of visual observations, in situ testing using handheld water quality probes, and periodic sampling for laboratory analysis.

Decommissioning Phase

13.6.11 As the predicted impacts on soils and geological receptors likely to occur during the decommissioning phase are anticipated to be similar to those likely to occur during the construction phase (with the exception of the soil stripping and excavations and impacts relating to unidentified contamination), the measures to avoid, minimise and reduce these impacts are similar and are outlined in Section 13.5 Predicted Impacts – Construction Phase.

13.6.12 Prior to removing the plant and equipment, all residues and operating chemicals will be cleaned out from the plant in accordance with the IE Licence Decommissioning Plan and disposed of in an appropriate manner.

13.6.13 Prohibited materials such as asbestos, polychlorinated biphenyls (PCBs), ozone depleting substances and carcinogenic materials will not be allowed within the design of the Proposed Development, and other materials recognised to pose a risk to health (but which are not prohibited) will be subject to detailed risk assessment.

13.6.14 The prevention of contamination is a specific requirement of the IE Licence for the Proposed Development. Therefore, it is being designed to not create any new areas of ground contamination or pathways to receptors as a result of construction or operation. Once the plant and equipment has been removed to ground level at decommissioning stage the area it will to be replaced by hardstanding and sealed concrete.

13.6.15 A Decommissioning Plan will be produced and agreed with EPA as part of the IE Licencing and licence surrender process. The plan will include all potential environmental risks on the Site and contain guidance on how risks can be removed or mitigated. In addition, the IE Licence Baseline Assessment Report will be referred to and updated to determine if any contamination has occurred and what, if any, remediation is required prior to IE Licence surrender.

13.6.16 Decommissioning activities will be conducted in accordance with the appropriate guidance and legislation at the time of closure. All decommissioning activities will be carried out in accordance with the waste hierarchy and materials and waste produced during decommissioning and demolition will be stored in segregated areas to maximise reuse and recycling. All materials that cannot be reused or recycled will be removed from the Site and transferred to suitably permitted waste recovery/ disposal facilities. It is intended that a large proportion of the materials resulting from the decommissioning will

be recycled, and a record will be kept demonstrating that the maximum level of recycling and reuse has been achieved.

13.6.17 To ensure work is done in accordance with requirements, when the decommissioning programme is completed, including any remediation works that might be required, EPA will conduct an Exit Audit inspection post-decommissioning. All records from the decommissioning process will be made available for inspection by the EPA and other relevant statutory bodies, in accordance with the IE Licence requirements.

13.7 Residual Effects

13.7.1 The assessment of residual effects takes into account the mitigation and enhancement measures identified within Section 13.6. A summary of likely significant residual effects is outlined in Table 13.11.

Construction Effects

Agricultural land and soil resources

13.7.2 No impact to or removal of agricultural land is proposed or to soil resources is envisaged and all works are on unvegetated Made Ground.

Designated sites – SAC, SPA NHA and pNHA and designations

13.7.3 There are no designated sites on or within 5km of the Site. Further assessment of impacts to designated habitats and species within 15km of the Site is provided in EIAR Chapter 9: Biodiversity.

Surface Water

13.7.4 There is a possibility that soil contamination exposed or disturbed during construction could reach the identified WFD-classified surface water receptors. Potential sources of water potentially containing contaminants include rainfall runoff generated by rainfall falling on land and coming into contact with stockpiles of excavated material, areas of exposed soil for trenching or crossings and powdered grouts and cements, where used.

13.7.5 There is limited potential for contamination from the Site to runoff into the Lisduff (Kilcrow)_020 river (Poor quality under WFD) or its tributaries (Poor quality under WFD). There are no known surface water abstractions from these watercourses within 5km of the site and they are not classified as river drinking water protected areas (DWPA) under WFD. Therefore, **no predicted significant direct or indirect impacts** are anticipated to these potential receptors. This is in line with the assessment of residual impacts on surface water quality in Chapter 12: Water Environment, Table 12.10).

13.7.6 In addition, there is a possibility that contaminants could be introduced to the subsurface as a result of spillages and could potentially migrate towards and into surface water receptors via groundwater pathways. The generally granular made ground at the former mine site is considered likely to be permeable and may act as a groundwater pathway, however the underlying natural clay and peat subsoils are unlikely to be significantly permeable pathways. If unmitigated by implementation of appropriate containment measures and operational controls, chemical spillages could seep into the ground and migrate downwards to the water table (anticipated to be at greater than 5m below the final site level) where the superficial deposits meet the weathered top of bedrock.

13.7.7 Given the implementation of the mitigation measures as described in Section 13.6 (and in EIAR Chapter 12: Water Environment), including implementation of the CEMP, and the fact that there are no direct works to surface watercourses, the impact magnitude of

any existing or introduced contaminants in the subsurface migrating into surface water receptors would be negligible on Lough Derg and/ or the River Shannon and the Lisduff (Kilcrow)_020 river (Poor quality) or its tributaries (Poor quality). Using the assessment criteria in Table 12.3 this would give a negligible effect for all of the waterbodies. As a medium importance receptor, this would give an imperceptible effect (see EIAR Chapter 12: Water Environment).

Groundwater

13.7.8 There is the potential for contamination exposed or disturbed during construction to reach the identified groundwater receptors and for contaminants to be introduced to the subsurface as a result of spillages, and to migrate into groundwater receptors. Rain falling on exposed soil could wash or leach contaminants into the soil and downwards into the superficial deposits, aquifer, and to the water table, which is anticipated to be less than 3m from the pre-construction surface elevation of the site. If unmitigated, chemical spillages could seep into ground and migrate downwards to the water table. From there the contaminants could migrate along the water table in the direction of groundwater flow within the bedrock.

13.7.9 With the implementation of embedded mitigation measures outlined in Section 13.6 (and in Chapter 12: Water Environment), including implementation of the CEMP, in place, the magnitude of potential impact to groundwater quality through the mobilisation of existing contaminants in soil and the migration of introduced contaminants in soil, as a result of spillages, into groundwater receptors is likely to be negligible. This would result in an Imperceptible effect on a high sensitivity receptor (Bedrock Aquifer).

Human Health – Construction Workers and Off-Site Receptors

13.7.10 Should contaminated soil or groundwater be encountered in the course of the excavation and construction work, potential impacts on human receptors may occur via contaminated dust and dermal contact with contaminated soil for the construction workers, and inhalation of contaminated dust for the off-site receptors.

13.7.11 With the embedded mitigation measures outlined in Section 13.6 (and in the oCEMP, Appendix 5A, refer to EIAR Volume II) in place, the impact magnitude on construction workers (high importance), off-site residential receptors (very high importance) and off-site urban/ industrial land users (medium importance) is likely to be negligible, with no further requirements for control measures to reduce risks to human health/ make land suitable for intended use. This would give an **Imperceptible** for off-site residential receptors, off-site urban/ industrial receptors and construction workers.

13.7.12 These effects are considered to be **Not Significant** and therefore no additional mitigation is required, over and above that set out above.

13.7.13 The potential impacts of ground conditions on the design of the Proposed Development have been scoped into the impact assessment, as it is likely that ground contamination relating to mining spoil and the former industrial use of the site will be encountered during construction, as the Application Site is a brownfield site associated with historic and now ceased Tynagh mining and processing operations. Elevated concentrations of contaminants relating to historical mining activities were encountered in the soils during the ground investigation.

Operational Effects

Agricultural land and soil resources

13.7.14 The Proposed Development will not result in a loss of agricultural land or change in land use classification.

13.7.15 However, there is a likelihood that contaminants could be introduced to the subsurface and soil resources as a result of leakages from fuel storage areas. This would result in a small adverse impact, resulting in a **small adverse effect** on Urban grade land. These effects are considered to be **Imperceptible** and therefore no additional mitigation is required, over and above that set out above.

Designated sites

13.7.16 There are **no predicted direct or indirect impacts** to the designated sites during the operational phase of the Proposed Development. Further assessment of impacts to designated habitats and species is provided in Chapter 9: Biodiversity.

Surface water

13.7.17 There is a low likelihood that contaminants in soil, as a result of accidental spillages or leakages, could migrate into surface water receptors. There could also be a potential increase in volume and rate of surface runoff from new impervious areas. The FRA concludes that that the risk of flooding from overland flow at the site can be managed to a level that reduces the risk to low and is considered unlikely to lead to impacts on flood risk upstream or downstream of the Site.

13.7.18 The protection of surface water quality and supplies during the operation phase will be achieved through a surface water management/ drainage system and IE Licence discharge requirements, which are detailed in Chapter 12: Water Environment, and within Appendix 12A Flood Risk and Drainage Assessment (refer to EIAR Volume II).

13.7.19 Given the implementation of the mitigation measures as described in Section 13.6 (and Chapter 12: Water Environment), including implementation of the IE Licence, the impact magnitude of existing or introduced contaminants in the subsurface migrating into surface water receptors would be negligible. Overall, this gives a **slight adverse** effect (see Chapter 12: Water Environment).

13.7.20 These effects are considered to be **Imperceptible** and therefore no additional mitigation is required, over and above that set out above.

Groundwater

13.7.21 There is a likelihood that introduced contaminants in soil, as a result of accidental spillages or leakages and locally stored backup distillate fuel, could migrate into groundwater receptors. The protection of groundwater quality during the operation phase will be achieved through utilisation of a surface water management/ drainage system, IE Licence provisions and Drainage Strategy as outlined in Chapter 12: Water Environment.

13.7.22 With the embedded mitigation measures outlined in Section 13.6 (and in Chapter 12: Water Environment) in place, the impact magnitude of spillages in soil migrating into groundwater receptors is negligible, with a very low risk of pollution leakages. This would give a **small adverse effect** for the superficial deposits and Limestone bedrock aquifers. These effects are considered to be **Imperceptible** and therefore no additional mitigation is required, over and above that set out above.

Human Health

13.7.23 With the facility being operated remotely from a central (existing) Control Module located within the existing Tynagh Power Plant facilities, future staff presence on the Proposed Development will be limited to maintenance and inspection visits and staff are therefore unlikely to interact with the underlying ground conditions or hydrogeology. There are **no direct or indirect impacts** anticipated on off-site human health as a result of the Proposed Development during the operation phase.

Decommissioning Effects

Agricultural land and soil resources

13.7.24 The soil resources within the Site are classified as *Urban* land use and of negligible sensitivity. The predicted impacts on soils and geological receptors likely to occur during the decommissioning phase would be similar to those likely to occur during the construction phase (with the exception of the impacts relating to unidentified contamination). The impact magnitude of temporary damage to soil structure and introduction of new contamination as a result of spillages is anticipated to be small adverse (due to their temporary nature), resulting in a **small adverse effect** on Urban grade land. These effects are considered to be **Imperceptible** and therefore no additional mitigation is required, over and above that set out above.

Surface water

13.7.25 Given the restricted nature of the decommissioning works in comparison to construction, as well as the implementation of best practice, the impact magnitude of introduced contaminants in the subsurface migrating into surface water receptors would be negligible (in line with Chapter 12: Water Environment). These effects are considered to be **Imperceptible** and therefore no additional mitigation is required, over and above that set out above.

Groundwater

13.7.26 The impact magnitude of spillages in soil migrating into groundwater receptors is anticipated to be negligible due to the operational Site comprising hardstanding, resulting in a **small adverse effect** on the superficial deposits and bedrock limestone aquifers. These effects are considered to be **Imperceptible** and therefore no additional mitigation is required, over and above that set out above.

Human Health

13.7.27 Given the restricted nature of the decommissioning works in comparison to construction as well as the implementation of best practice, the impact magnitude of inhalation of contaminated dust and dermal contact within contaminated soil to human health is anticipated to be negligible, resulting in a **negligible impact** on off-site residential receptors, off-site urban/ industrial land users and decommissioning construction workers. These effects are considered to be **Imperceptible** and therefore no additional mitigation is required, over and above that set out in Chapter 16: Population and Human Health.

13.8 Cumulative Effects

13.8.1 This section of the chapter assesses the likelihood of effects of the Proposed Development when considering the potential effects of other development schemes (referred to as 'cumulative developments') within the surrounding area, as listed within Chapter 4: Existing Site and Conditions of this EIAR.

13.8.2 Based on a review of planning applications and permitted developments, as presented in Chapter 4: Existing Site and Conditions, there are no significant projects proposed that are likely to give rise to cumulative effects in conjunction with the Proposed Development.

13.8.3 The Proposed Development, the existing Tynagh Power Station, the Approved Development Ref: 21/2192 and the adjacent Sperrin Galvanisers Limited site further to the west are all sited within the footprint of a historic mine site with proven pre-existing ground quality issues resulting from a combination of the natural soil and bedrock mineralisation in the area and the historic mining operations (1960s to 1980s). The majority of the Proposed Development will be constructed on a made ground platform constructed of clean, imported fill material above the former mining site ground level and there are no extensive excavations proposed, so the underlying soils and geology will not be significantly impacted upon by the Proposed Development. The Proposed Development is therefore not predicted to give rise to any cumulative impacts to soils or geology at the site and surrounding area at either the construction or operational phase.

Table 13.9: Assessment of Significant Residual Effects

RECEPTOR TYPE	RECEPTORS AND SENSITIVITY	DESCRIPTION OF IMPACT	MAGNITUDE OF IMPACT	MITIGATION AND ENHANCEMENT MEASURES	SIGNIFICANCE OF RESIDUAL EFFECT
Construction phase					
Agricultural land and soil resources	Urban/ industrial land/ Low	Mobilisation of existing contaminants in soil as a result of ground disturbance.	Small adverse	No further mitigation to that described in the outline CEMP and outlined in Section 13.6.	**Negligible**
		Introduction of new contamination to the subsurface as a result of spillages.			
Surface water receptors	Poor status surface water bodies: Low No direct works to watercourses, indirect impacts.	Mobilisation of existing contaminants in soil as a result of ground disturbance into surface runoff and surface water receptors.	Negligible	No further mitigation to that described in the outline CEMP and outlined in Section 13.6.	**Negligible** – for all surface water receptors

RECEPTOR TYPE	RECEPTORS AND SENSITIVITY	DESCRIPTION OF IMPACT	MAGNITUDE OF IMPACT	MITIGATION AND ENHANCEMENT MEASURES	SIGNIFICANCE OF RESIDUAL EFFECT
		Migration of introduced contaminants in soil as a result of spillages into surface water receptors.			
Groundwater receptors	Superficial Deposits aquifer: Medium Karstified Limestone Bedrock Aquifer: High	Mobilisation of existing contaminants in soil as a result of ground disturbance into groundwater.	Negligible	No further mitigation to that described in Section 13.6 and the outline CEMP.	Superficial Deposits aquifers: **Imperceptible** Karstified Limestone Bedrock Aquifer: **Imperceptible**
		Migration of introduced contaminants in soil as a result of spillages into groundwater receptors.	Negligible		
Human health receptors	Off-Site receptors – Urban/ industrial use: Medium Off-Site receptors – Residential use: Extremely high Construction workers: High	Inhalation of contaminated dust.	Small adverse – Soils underlying the Proposed Development contain elevated heavy metals and pose a potential risk to human health, particularly in relation to reported arsenic and lead concentrations, if direct contact with soils and dust generation from soil stockpiles, excavated area or haul roads is not appropriately controlled. .	Mitigation measures to control dust generation during the Construction Phase are described in the outline CEMP, (Appendix 5A, EIAR Volume II), and include a Dust Management Plan and measures including dampening haul roads and stockpiles; keeping roads clean; and using covers to minimise dust blow from lorries. No further mitigation to that described in the outline CEMP and outlined in	Off-site receptors - urban/ industrial use: **Imperceptible** Off-site receptors – residential use: **Imperceptible** Construction workers: **Imperceptible**
		Dermal contact with contaminated soil.			

RECEPTOR TYPE	RECEPTORS AND SENSITIVITY	DESCRIPTION OF IMPACT	MAGNITUDE OF IMPACT	MITIGATION AND ENHANCEMENT MEASURES	SIGNIFICANCE OF RESIDUAL EFFECT
				Section 13.6 is required	
Operational phase					
Agricultural land and soil resources	Urban/ industrial land: Negligible	Introduction of new contamination to the subsurface as a result of leakages from fuel storage areas.	Negligible – no restriction on approved future use.	No further mitigation to that described in Section 13.6.	**Imperceptible**
Surface water receptors	Low – Poor status surface water	Migration of introduced contaminants in soil as a result of accidental spillages or leakages from fuel storage areas into surface water receptors.	Negligible – very low risk of pollution leakages.	No further mitigation to that described in Section 13.6.	**Imperceptible**
Decommissioning phase					
Agricultural land and soil resources	ALC Grade urban/ industrial land: Negligible	Temporary damage to soil structure through smearing and compaction. Introduction of new contamination to the subsurface as a result of spillages.	Small adverse impact.	No further mitigation to that described in Section 13.6.	**Imperceptible**
Surface water receptors	Low – Poor status surface water	Migration of introduced contaminants in soil as a result of spillages into surface water receptors.	Negligible – very low risk of pollution leakages.	No further mitigation to that described in the CEMP (which will be similar to the future Demolition Environmental Management Plan (DEMP)) and Section 13.6.	**Imperceptible**

RECEPTOR TYPE	RECEPTORS AND SENSITIVITY	DESCRIPTION OF IMPACT	MAGNITUDE OF IMPACT	MITIGATION AND ENHANCEMENT MEASURES	SIGNIFICANCE OF RESIDUAL EFFECT
Groundwater receptors	Superficial Deposits aquifers: Medium Limestone Bedrock aquifer: High	Migration of introduced contaminants in soil as a result of spillages into groundwater receptors.	Negligible – very low risk of pollution spillages.	No further mitigation to that described in the CEMP (which will be similar to the future Demolition Environmental Management Plan (DEMP)) and Section 13.6.	Superficial Deposits aquifer: **Imperceptible** Mercia Mudstones aquifer: **Imperceptible**
Human health receptors	Off-Site receptors – Urban/ industrial use: Medium Off-Site receptors – Residential use: Very high Decommissioning workers: High	Inhalation of contaminated dust. Dermal contact with contaminated soil.	Negligible – with no further requirements for control measures to reduce risks to human health/ make land suitable for intended use.	No further mitigation to that described in the CEMP (and DEMP) and outlined in Section 13.6.	Off-site receptors - urban/ industrial use: **Imperceptible** Off-site receptors – residential use: **Imperceptible** Construction workers: **Imperceptible**

13.9 References

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