MWP

Chapter 06 Land and Soils

An Rínn Rua Hotel and Leisure Park
County Kerry

Rínn Rua Holiday Park LTD

April 2024

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Project No.	Doc. No.	Rev.	Date	Prepared By	Checked By	Approved By	Status
21513	6006		21/03/2024	MT	AR/Client	AR	DRAFT
21513	6006		23/04/2024	MT	AR/Client	KF	FINAL

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6. Land and Soils

6.1 Introduction

This chapter considers the potential effects on the existing land and soils environment arising from the Proposed Development. A full description of the Proposed Development, development lands and all associated project elements is provided in Chapter 2 Project Description of this EIAR. The nature and probability of effects on the existing land and soils environment arising from the overall project has been assessed. The assessment comprises:

- A review of the existing receiving environment;
- Prediction and characterisation of likely effects;
- Evaluation of effects significance;
- Consideration of mitigation measures, where appropriate.

6.1.1 Competency of Assessor and Reviewer

The assessment was completed by Roman Puotkalis (BSc (Hons), MSc), an Environmental Consultant with MWP. He holds a MSc in Environmental Analytical Chemistry and BSc (Hons) Environmental Science from University College Cork. Roman has been involved in geo-environmental investigation/interpretation and hydrogeological assessment and investigation. Roman has written Land and Soils chapters for various projects such as wind farms, grid routes and power generating stations. This included assessment of environmental impact on Land, Soils, Geology, and Hydrogeology as well as cumulative impacts with various other aspects of the environment. He has also worked on Phase 1 and 2 environmental site assessments for several projects including pharmaceutical facilities, substations, mines, and power stations.

6.1.2 Legislation

This document is written under the following European and Irish legislation and guidelines:

- The Environmental Impact Assessment (EIA) Directive (Council Directive 85/337/EEC of 27th June 1985 as amended by Directive 97/11/EC of 3rd March 1997, Directive 2003/35/EC of 26th May 2003 and Directive 2009/31/EC of 23rd April 2009);
- European Communities (Environmental Impact Assessment) [S.I. 349 of 1989 as amended by S.I. 84 of 1994 as amended by S.I. 93 of 1999];
- Planning and Development Act, 2000. Planning and Development (Amendment) Act 2010;
- Planning and Development Regulations, 2001 – 2022;
- European Union (EU) Directive 2011/92/EU. Assessment of the effects of certain public and private projects on the Environment;
- EU Directive 2014/52/EU. Directive 2014/92/EU of the European Parliament and of the Council.
- Heritage Act 2018.

6.2 Methodology

The assessment methodology included a desk-based study, and a qualitative assessment of the potential effects. The assessment criteria for geology, land and soils are based on the following guidelines:

- *Guidelines on the information to be contained in Environmental Impact Assessment Reports* (EPA, 2022);
- *Guidelines for the Preparation of Soils, Geology and Hydrogeology Chapters of Environmental Impact Statements* (Institute of Geologists of Ireland, 2013);
- *Guidelines on Procedures for Assessment and Treatment of Geology, Hydrology and Hydrogeology for National Road Schemes* (National Roads Authority (NRA), 2009); and
- *Guidelines for Planning Authorities and An Bord Pleanála on carrying out Environmental Impact Assessment* (Department Of Housing, Local Government and Heritage (DHLGH), August 2018).
- National Roads Authority (2009): Guidelines on Procedures for Assessment and Treatment of Geology, Hydrology and Hydrogeology for National Road Schemes.

6.2.1 Desktop Study

The methodology used for this study included desk-based research of published information and site visits to assemble information on the local receiving environment. The desk study included the following activities:

- Review of Ordnance Survey Ireland (OSI) Mapping and aerial photography to establish existing land use and settlement patterns within the study area;
- Examination of the Geological Survey of Ireland (GSI) datasets pertaining to geological (bedrock, heritage, subsoil, ETC.) and extractive industry data;
- Examination of Environmental Protection Agency (EPA) / GeoHive / Teagasc online soil and subsoil maps;
- Review of Kerry County Council's (KCC) local and regional development plans and planning policy in order to identify future development and identify any planning allocations within the study area; and
- Review of KCC's Planning Register to identify relevant development proposals currently under consideration by the Council.

Following the desk top study and field surveys, a set of geological and soils maps were generated in GIS using data acquired by GSI, EPA and GeoHive Online maps, and are included as figures in this chapter.

6.2.2 Scope of Assessment

Land and soils are considered both in geological terms and with reference to current, historical and planned land use. The subject matter of hydrogeology is addressed in **Chapter 7 Water** of this EIAR.

Accordingly, the scope of this assessment is made with respect to these topic areas and considers the effects of the construction and operation of the proposed development in terms of how the proposal could affect the land and soils environment within the site boundary.

6.2.2.1 Assessment Criteria

The method of impact assessment and prediction follows the EPA (2022) *Guidelines on the information to be contained in Environmental Impact Assessment Reports (EIAR).* The methodology and approach outlined in the EPA Guidelines was used to determine whether the proposed development had the potential to cause significant

effects on the land and soils environment. The assessment methodology as per the EPA guidelines is outlined in **Chapter 1 Introduction** of this EIAR.

6.3 Baseline Environment

6.3.1 Site Location and Description

Rínn Rua Holiday Park Limited ('the Applicant') is seeking planning permission for the development of a holiday village with a footprint of 22.6ha. The proposed development will occupy approximately 40% (22.6ha) of the 55.85ha of land owned by the Applicant. The proposed development site is located at the derelict Waterville Beach Hotel at Rínn Rua / Reenroe, Waterville, Co. Kerry on the Iveragh Peninsula between the coastal villages of Waterville and Ballinskelligs as shown in **Figure 6-1**. The proposed development site is located on a small headland on the northern shore of Ballinskelligs Bay, Co. Kerry, just under 1.0km from the R567 Waterville to Ballinskelligs Coast Road. To the west and east of the headland are the sandy/stony beaches of Ballinskelligs Bay and to the south is the Bay. The coordinates for the centre of the proposed development site are: 51°50'38.9"N 10°14'11.1"W.

The proposal will involve restoration of the existing derelict hotel and expansion of the visitor offering to include mobile homes, holiday lodges, touring caravan pitches, and glamping pods along with sensitive landscaping of the entire development area. The development proposal will also include visitor services including a shop, bar, restaurant, reception area, Leisure Centre, and measures to enhance local amenity including improvements to Reenroe beach access road. A habitat enhancement area is also proposed on the lands to the east of the site boundary which are also in the ownership of the applicant.

The proposed development site within the redline boundary (refer to **Figure 6-2**) comprises approximately 22.6 ha and encompasses:

- a large derelict hotel and two storey house;
- the access road to Reenroe beach;
- the Reenroe Cliff Walk; and
- agricultural land.

A detailed description of the proposed site location and description of the proposed development is provided in **Chapter 2 Project Description** of this EIAR.

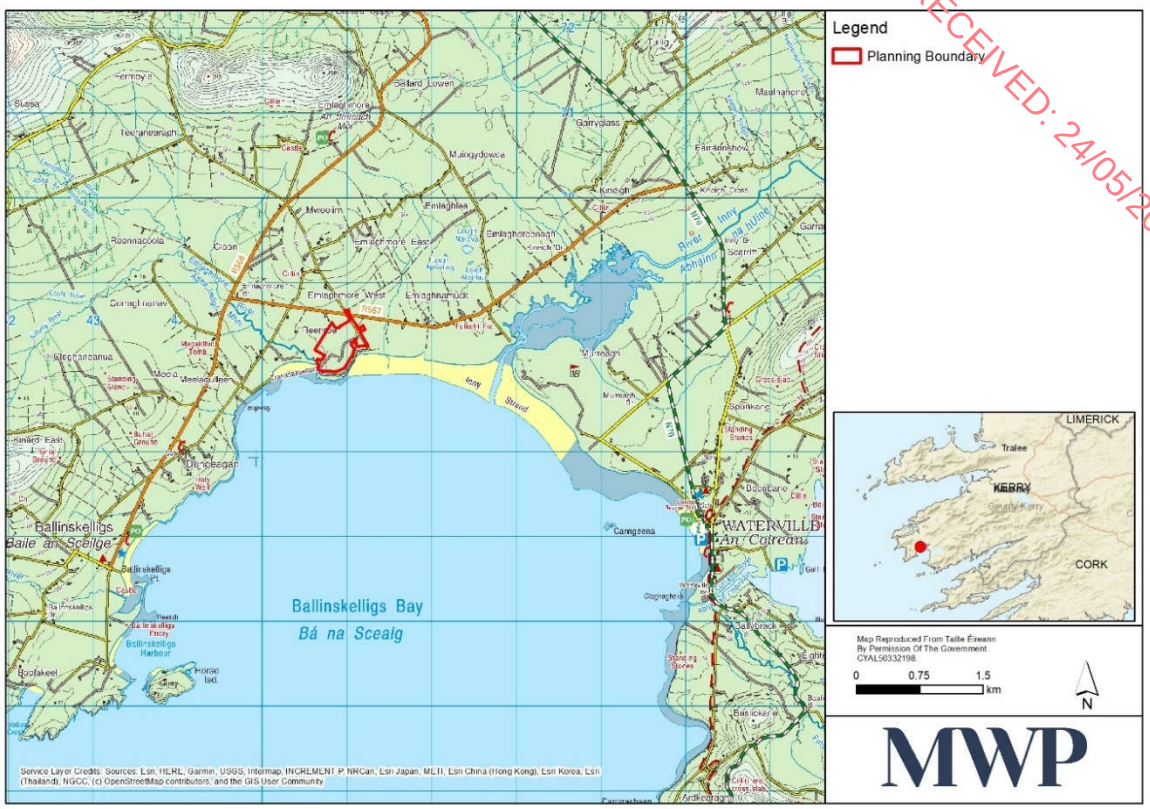

Figure 6-1: Site Location (County Scale)

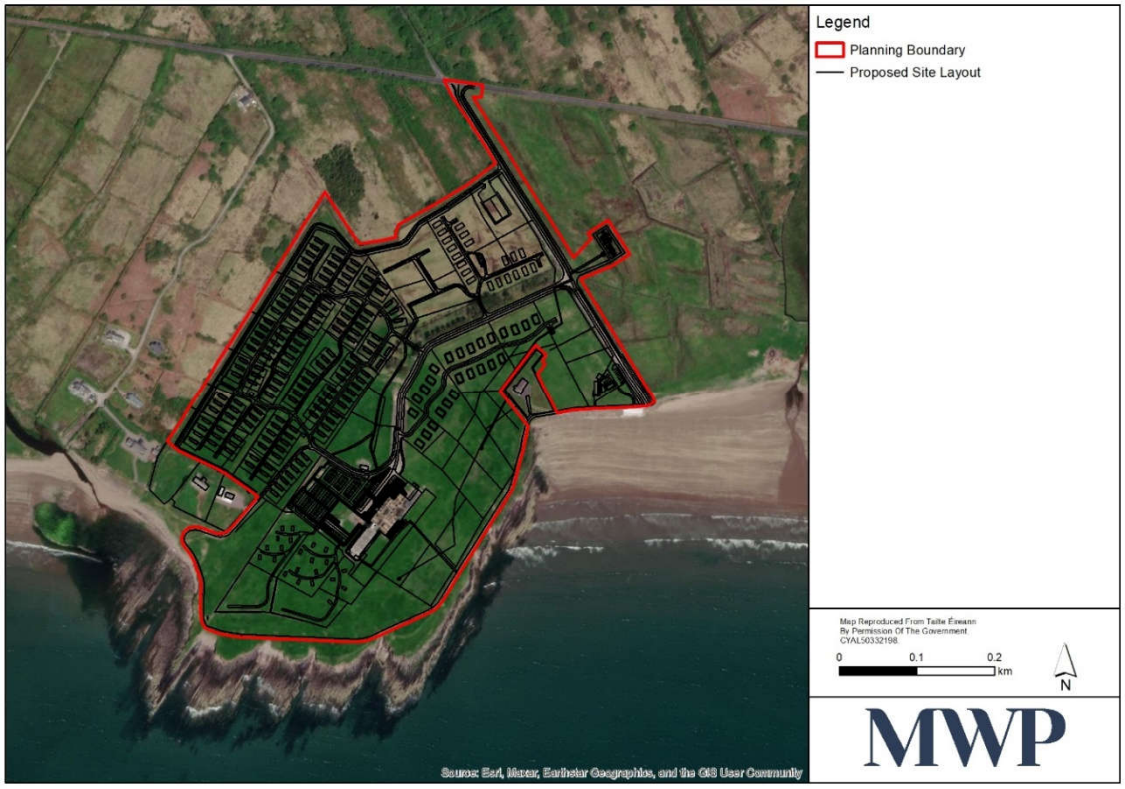

Figure 6-2: Site Layout

6.3.2 Existing Land Use

The proposed development site is presently occupied by two derelict structures, namely a former hotel and a former dwelling house. The derelict hotel is situated in the southeastern part of the proposed development site. This building was constructed over 30 years ago and comprises mainly mass concrete. The structure is aligned in a northwest-southeast direction and commands expansive uninterrupted views of the scenic coastline and the bay to the south. The building comprises a single-story structure on the northern side (largely with roof missing and open to the elements), a tall concrete tower towards the centre and a three-story structure at the south which structurally is in relatively good condition. The various components of the building are largely in various states of disrepair or dereliction.

A small derelict house is located c. 40 m to the north-west of the centre of the hotel building. This two-story house has both a rear and a front entrance and a chimney on both gables. The house has a slate roof, in disrepair, and is of stone construction, although largely plastered over.

Lands within the site are managed for agriculture, comprising grazing for sheep. A minor portion of the northern part of the structure is currently used to house livestock. There are three existing residential properties located outside but immediately adjacent to the proposed development site boundary.

Lands surrounding the site are predominantly in low-intensity agricultural use, with several residential dwellings located further west. Immediately east and west of the small headland respectively are the sandy beaches of Trá Rinn Rua (also known as Inny Strand or Reenroe Beach) and Trá na Sassanach. These beaches are connected by a public right-of-way which travels along the edge of the headland, skirting the southern boundary of the proposed development site. To the south, the site is fronted by rocky shore, sea cliff and the bay.

The land use at the site has been mapped as shown in **Figure 6-3.** The land cover mapping was created using information from CORINE Land Cover 2018 available on the EPA online mapping system.

The following land uses have been identified within and around the site:

- 231 – Pastures;
- 412 – Peat bogs;
- 421 – Salt Marshes;
- 243 - Land principally occupied by agriculture with significant areas of natural vegetation;
- 331 – Beaches, dunes, sand;
- 142 – Sport and leisure facilities;
- 324 – Transitional woodland scrub.

The proposed site location is dominated by land mapped as '*Pastures'*, with some of the section in north and northeast mapped as '*Peatbogs* or *'Beaches, dune, sand'*. Similar habitats occur in the wider area, including also '*Intertidal flats'* and '*Land principally occupied by agriculture with significant area of natural vegetation*' and '*Transitional woodland scrub'* recorded in the wider landscape.

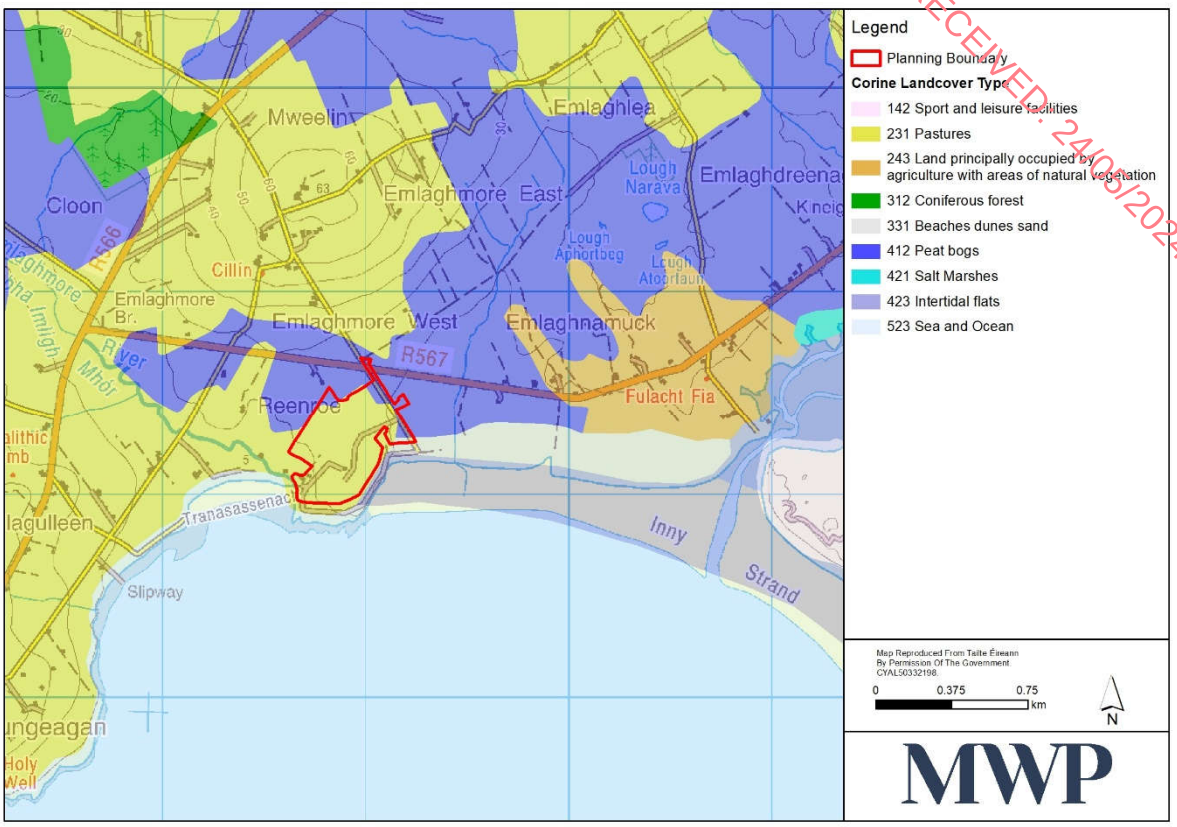

Figure 6-3: CORINE Land Use map (Source: EPA)

6.3.3 Topography

Overall, the site and surrounding area slopes upward from the bay in the south to north to a maximum elevation of 12.0 m above ordnance datum (AOD) found adjacent to the R567 road. The site is bounded by the sea to the south. The elevation of the site approximately is 2.5 m AOD where it borders Reenroe beach. There are steep cliffs on the southwestern part of the site where there are sharp increases in elevation from sea level to 6.0-6.5 m AOD. There are some undulations in the site. In the east-west direction there is a level difference of 7.0 m approximately. In the north-south direction there is a level difference of 7.0-7.5 m approximately across the site excluding the cliffs to the southwest. The elevation changes are more gradual in the eastern part of the site that are adjacent to Reenroe beach where there is level difference of approximately 2.0 m in the east-west direction. A topographical map of the site is presented in **Figure 6-4** where the contour values are between -1.0-12.0 m (AOD).

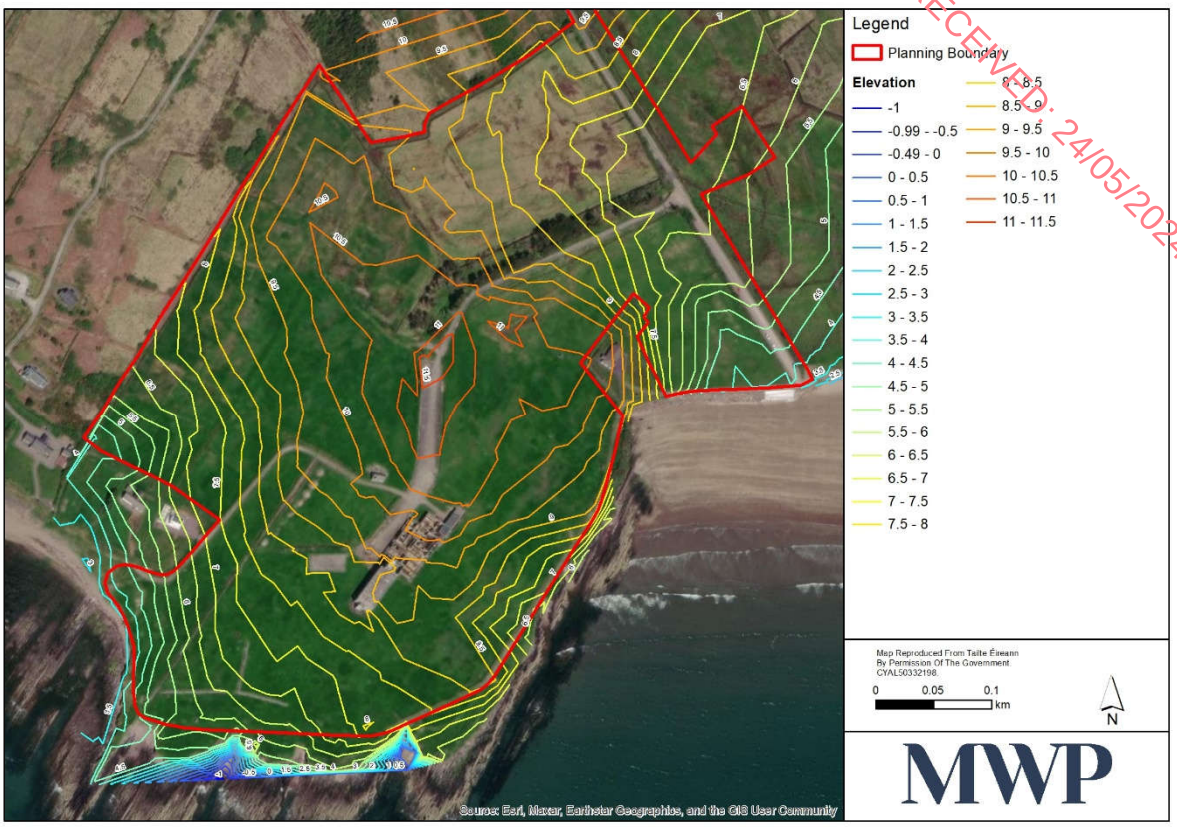

Figure 6-4: Topographical Map of An Rínn Rua Hotel and Leisure Park.

6.3.4 Regional Geology

The regional geology of County Kerry is discussed below to provide a wider context to the geology of the site which is discussed on a localised scale in Section 6.3.5 of this report. The regional geology of the Iveragh Peninsula, Co. Kerry is shown in Figure 6-5.

The geology of County Kerry is described within the Kerry County Development Plan (CDP) as varying in age and rock type across the county. The oldest geological formations date to the Ordovician period (490-450 million years ago (Ma)) and outcrop on the Dingle Peninsula. Much of the county's geology was formed in the Silurian and Devonian period (444-359 Ma). Following the Ordovician, rocks dating from the Silurian period (450 -415 Ma) were formed with evidence on the Dingle Peninsula, in Dunquin, Bull's Head, and Derrymore Glen.

The Old Red Sandstone that makes up much of the Iveragh and Beara Peninsulas, Kerry Head and an area to the east of the Dingle Peninsula was laid down in the Devonian period (415Ma).

The Lower Carboniferous (360-326 Ma) period is represented in the limestones of central and parts of north Kerry with the Upper Carboniferous represented in the shales (326-300 Ma) of east Kerry and the Stacks mountains. Around 300 Ma the Armorican/Hercynian earth movements resulted in the creation of the east-west trending tectonic grain strongly represented in the Iveragh Peninsula where a landscape of mountain ridges and valleys now dominate.

The County's geology has also been shaped by various periods of glaciation over the last 2 million years. The Weichsel or last glaciation is represented in north Kerry by a small area around Tarbert. This glaciation deposited thick drift in the Roughty valley and where it debouched on the Killarney lowlands.

During the Ordovician period (488-444 Ma) Ireland was south of the equator, and the area that now makes up Kerry, was under an ocean that separated two continents. This ocean closed and as it did mud and sand was deposited into it and these eventually became the mudstones. Later during the Silurian period (430 Ma) small volcanic islands that grew above a shallow sea erupted lavas and ash in the Clogher Head area. The muddy sediments were deposited near Dunquin and in Derrymore Glen, and the sandy sediments formed sandstone near Dingle and Slea Head. Eventually by the beginning of the Devonian period (416 Ma) the ocean closed completely and a large continent had formed which was largely desert. Kerry contained large areas of sand dunes which formed much of the sandy Old Red Sandstone (ORS) which makes up much of the Iveragh Peninsula, and in between the dunes occasionally flowed rivers or flash floods. These produced pebbly coarser rocks called conglomerates which may contain white quartz or red jasper. By the end of the Devonian, the land in the county was flooded by warm shallow tropical seas which resulted in the presence of fossils in the Carboniferous limestones (350 Ma). Later the ocean became deeper and muds were carried into it by rivers from the east and north and these became the shales now found in east Kerry and the Stacks Mountains (310 Ma). Much later during the Cretaceous period (146-65 Ma), the whole area was covered by water and chalk, and a pure limestone was deposited.

During parts of the last million years Ireland was covered in ice when glaciers formed on mountainsides and in valleys and spread over the lowlands. Many corries were formed when ice collected on the mountainsides and these now often contain lakes such as Mangerton Lake near Killarney and Pedler's Lake near the Connor Pass. When the ice melted it left behind boulder clay containing many different rock types. The proposed development site is located in the southwest of Co. Kerry in an area mapped of ORS, sandstone, conglomerate & mudstone from the Palaeozoic and Devonian periods (See **Figure 6-5).**

There are three different rock types that make up the County Kerry regional geology: igneous, sedimentary, and metamorphic. The foundation of igneous rocks is marked by the existence of the oldest rocks, which are of Cambrian origin, as well as beds created by the build-up of volcanic ash and tuff. These rocks underwent deformation that led in the production of mudstones, followed by metamorphosis that produced slates, which is the predominant lithology of the present-day land mass of the southern portion of Kilkenny.

The development of Leinster granite and plutons in the southern part of the county, igneous rocks which are Ordovician in age, were caused by volcanic activity that followed the closure of the Iapetus ocean. These events included the addition of heat and pressure, which encouraged the process of metamorphism in the existing rocks of sandstones and mudstones into schists.

Active erosion of the exposed terrestrial lands during the Caledonian orogeny, which followed the Silurian epoch of ocean closure to convergence, resulted in the predominance of sedimentary rocks like sandstones and mudstones. Along with the development of river systems and deltas, the early Silurian was also marked by deposits of mud banks from the sea floor that over time aggregated to form the huge Waulsortian limestones that cover the majority of Ireland.

The late Palaeozoic period prevailed with predominance of limestone deposits, followed by the most recent ice age which led to deposits of glaciofluvial features with a maximum thickness of 10m. Most of these recent deposits are products of ice and melt-water erosional processes.

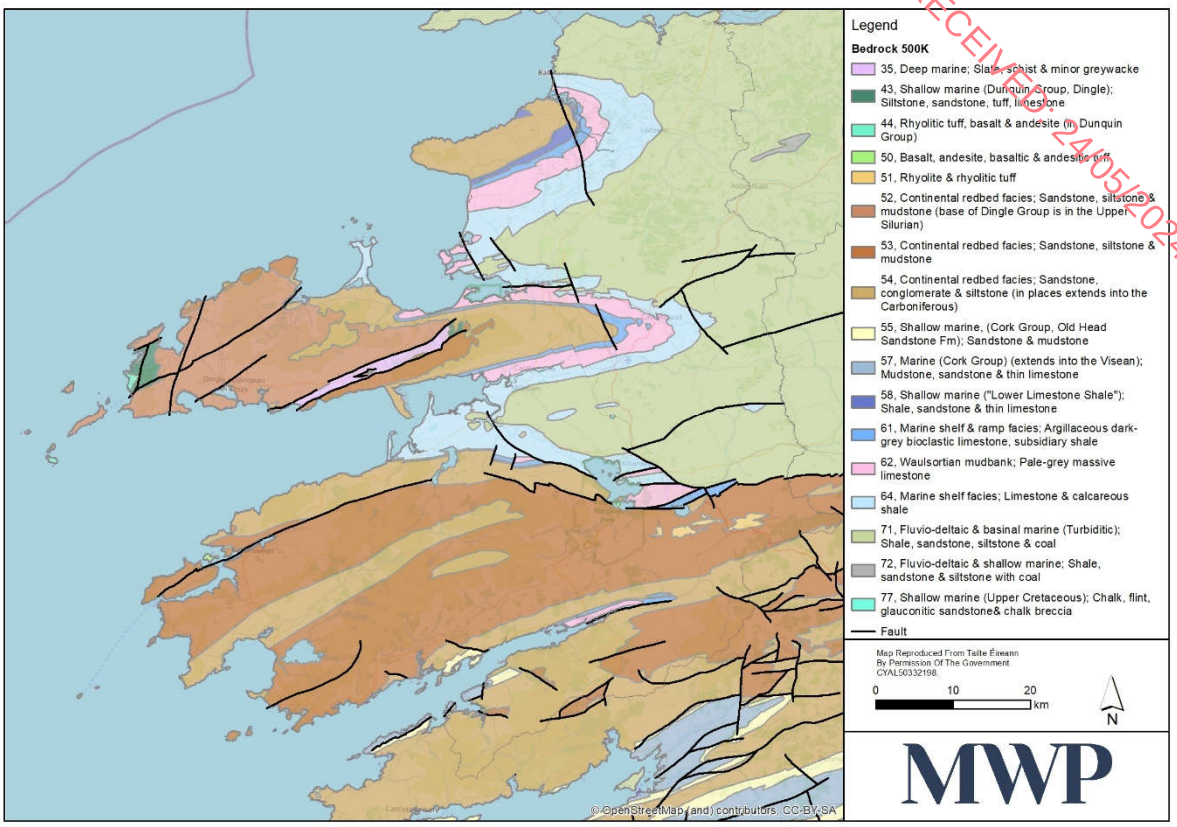

Figure 6-5: Regional geology of Iveragh Peninsula, Co. Kerry (Source: GSI)

6.3.5 Local Geology

The bedrock geology of the site area is predominantly composed of Ballinskelligs Sandstone Formation, purple sandstone & siltstone. The formation comprises a thick sequence of cleaved, bright purple medium-grained sandstones with minor siltstones. The base is defined by Capewell, 1975 where purple sandstones become dominant and in the Sneem area above the highest grey or green sandstone. The local geology of the Ballinskelligs and Waterville area and the site location is shown in Figure 6-6.

Structurally, the geology of the area has been influenced by folding and faulting. According to GSI mapping source, the beds of the site are striking southwest - northeast and dipping at 40° southeast. There is a synclinal axis to the running southwest – northeast parallel to the site location. There are bedrock outcrops present in the vicinity of the site.

The rocks found within and immediately adjacent to the site are described from the literature below with the symbol for each formation given in brackets for cross-reference purposes with the GSI 1:100,000 scale bedrock geology map:

- Ballinskelligs Sandstone Formation (DUBLSK): Described as Upper Devonian purple medium-grained sandstones with siltstones, rare pebbly sandstone and conglomerate beds. Thickness observed is 750-1500m at typical section area;
- St. Finan's Sandstone Formation (DUSTFN): Described as Upper Devonian fine-grained greeny-grey sandstone and siltstone with some purple beds and rare pebbly sandstones. The thickness of the section is generally observed to 1440-2440 m.

- Valentia Slate Formation (DUVLTS): Described as dominantly purple - grey - green siltstones with well-developed axial-plane cleavage with minor fine-grained purple-grey sandstones and medium-grained green quartzitic sandstone. Upper part of the formation contains pebble conglomerate. The thickness of the section is observed to 2560-3200 m.

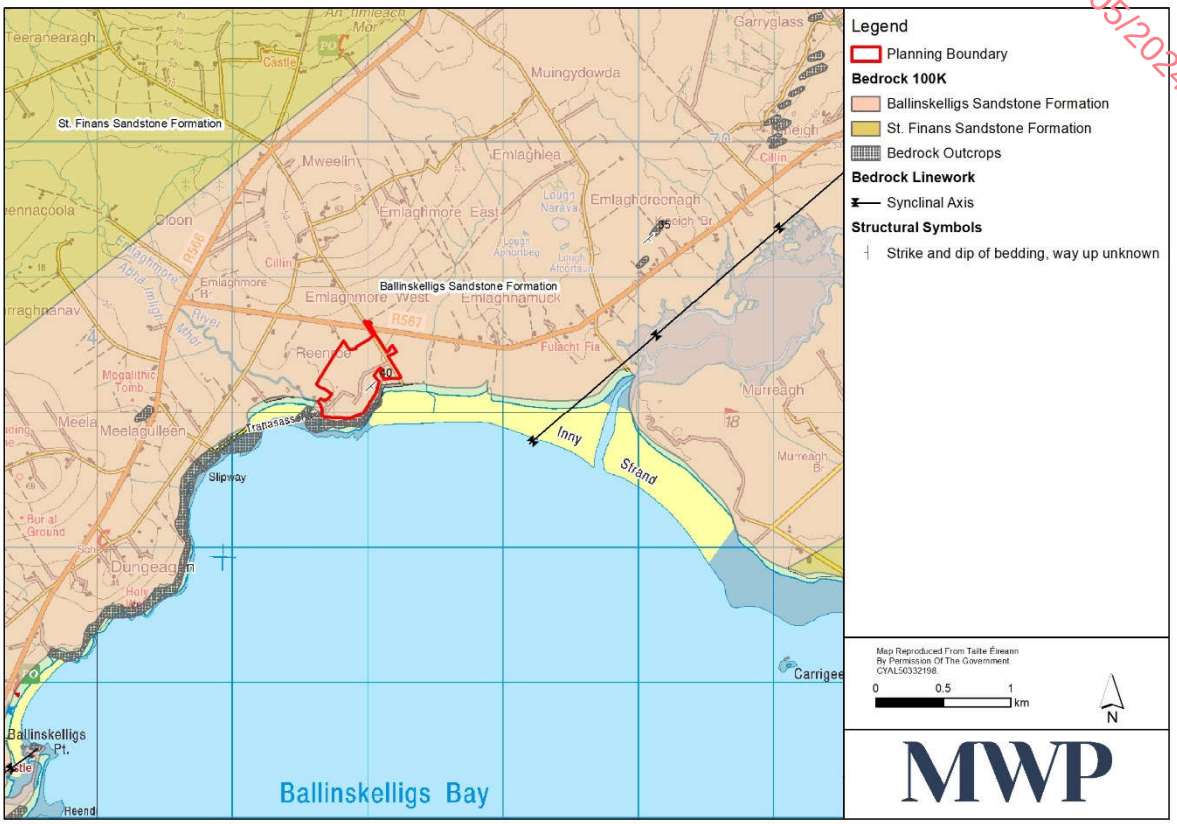

Figure 6-6: Local geology of Waterville and Ballinskelligs area and the site location (Source: GSI)

6.3.6 Soil and Subsoil

Soil includes the topsoil (soil) and subsoil, which together provide for the following important functions;

- Facilitate the hydrological cycle in the filtration/recharge, storage and discharge of rainwater;
- Support all terrestrial ecology, including all flora and fauna (and all food crops);
- Protect and enhance biodiversity;
- Holding or preserving archaeological remains;
- Provision of raw materials and a base on which to build;

Soil (topsoil) and subsoil may derive from parent geological material and organic matter under the influence of processes including weathering and erosion.

The predominant soil types of the site are *"AminPDPT - Peaty poorly drained mineral (Mainly acidic), "AminPD - Mineral poorly drained (Mainly acidic)"* and *"BktPt - Blanket peat"* according to the Teagasc/EPA Soil Maps available on the GSI online mapping viewer **(Figure 6-7)**. *AminPDPT* soils are derived from mainly non-calcareous parent materials and include peaty gleys. *AminPD* soils are derived from mainly calcareous parent materials and include surface water gleys and ground water gleys.

"AeoUND - Aeolian undifferentiated" and *"MarSands - Marine sand and gravel"* soil types are found to the east of the site on Reenroe beach. There are also "AlluvMIN – Alluvial (mineral) soils to the west of the site around the River Emlaghmore.

The Quaternary Sediments at the site shown on the GSI online mapping system include "*TDSs - Till derived from Devonian sandstones"*, "*BktPt,- Blanket Peat*" and "*Mbs - Marine beach sand*". TDSs make up the majority of the site. There are also *"Ws - Windblown Sand"* south and southwest of the site boundary and "*A – Alluvium*" west of the site boundary around the River Emlaghmore. There are also "*Mesc – Esturine silts and clays*" further east of the site around the Inny Estuary **(Figure 6-8).**

There are no geomorphology features located at the proposed development site shown on GSI map viewer.

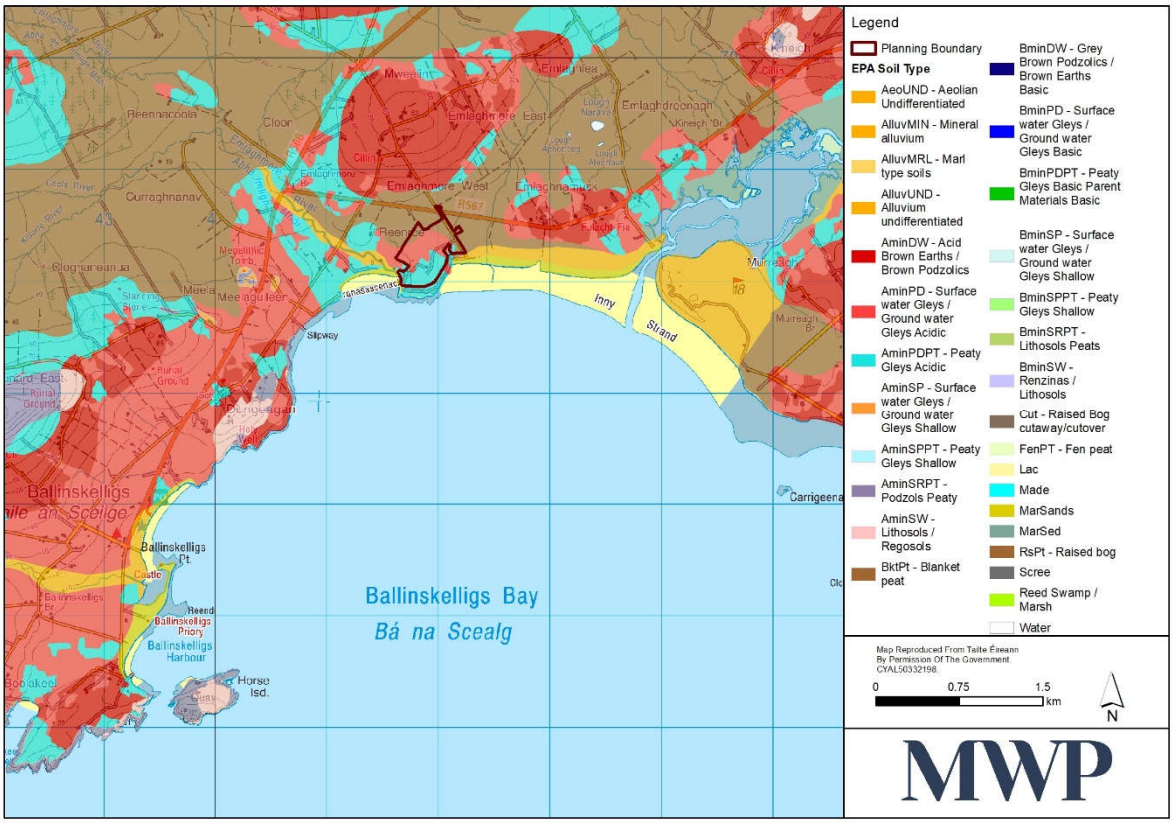

Figure 6-7: Teagasc Soils (Source: GSI)

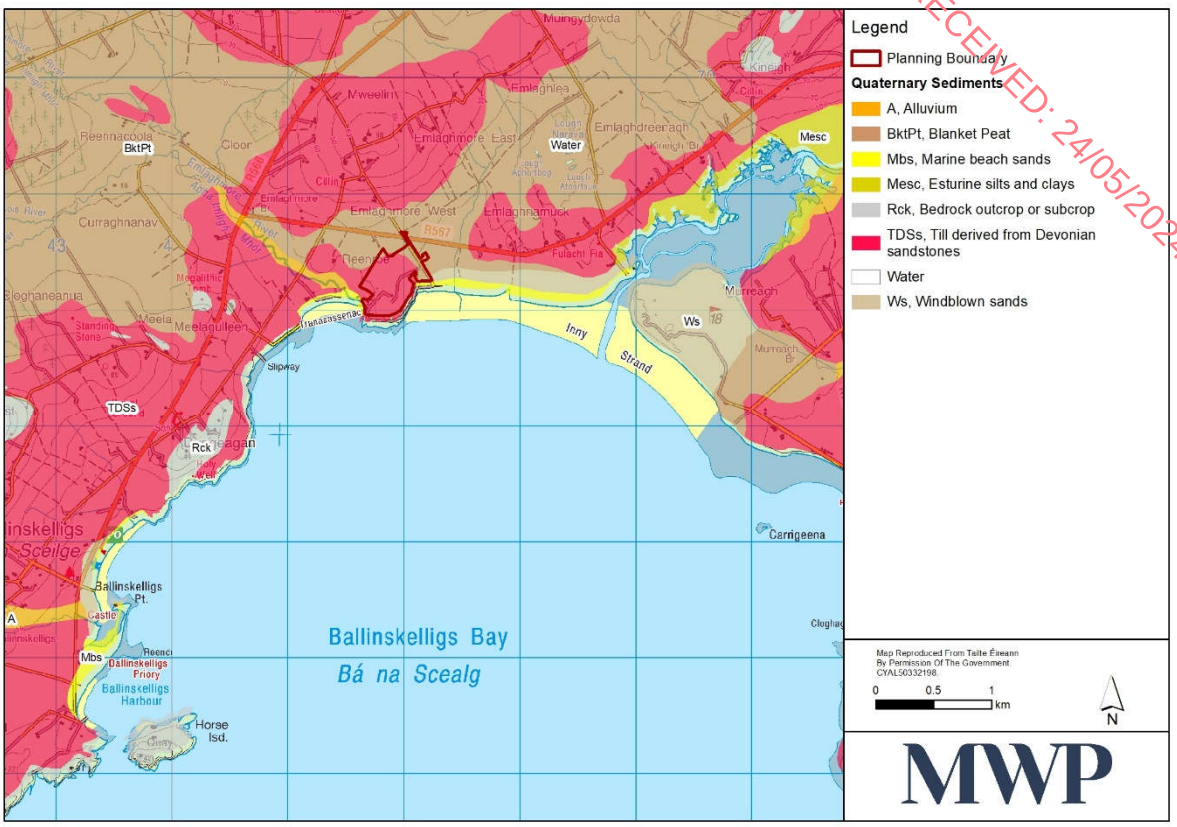

Figure 6-8: Quaternary Sediments and Geomorphology (Source: GSI)

6.3.7 Geological Heritage

The Irish Geological Heritage (IGH) Programme identifies and selects a complete range of sites that represent Ireland's geological heritage under a variety of themes ranging from Karst features to Hydrogeology. The IGH Programme is a partnership between the GSI and the National Parks and Wildlife Service (NPWS) and sites identified as important for conservation are conserved as Natural Heritage Areas (NHA). Review of the GSI Geological Heritage Database available on the GSI online mapping system indicates that there are no Geological Heritage Sites within the site (Figure 6-9). The nearest mapped Unaudited Geological Heritage Sites are listed below in Table 6-1. The Geological Heritage Sites in Co. Kerry were unaudited at the time of this assessment.

Table 6-1: Geological Heritage Sites in Proximity to Site (GSI online database)

Site Name (IGH Theme)	Site Description	Distance from Site Boundary
Ballinskelligs Bay - Lough Currane (IGH 13)	Beach of sand and gravel backed by paired dune-capped sand spits on either side of the outlet from the estuarine lagoon with extensive intertidal mudflats. Pebble and cobble beaches are fronted by a wide gravelly shore exposed at low tide.	2.3 km SE
Puffin Island to Bolus Head (IGH 10)	Include fish beds and includes St. Finan's Bay.	7.0 km W
Valentia (IGH 15)	Extensive slate mine caverns in purple slate. Mined in the 19th century and used widely in Ireland and the UK (e.g. Marylebone station, London).	9.6 km NW

Site Name (IGH Theme)	Site Description	Distance from Site Boundary
Puffin Sound (IGH 2)	Possibly Eifelian fish beds described by Russell, 1978 including Devonian fish fossils.	10.9 km W

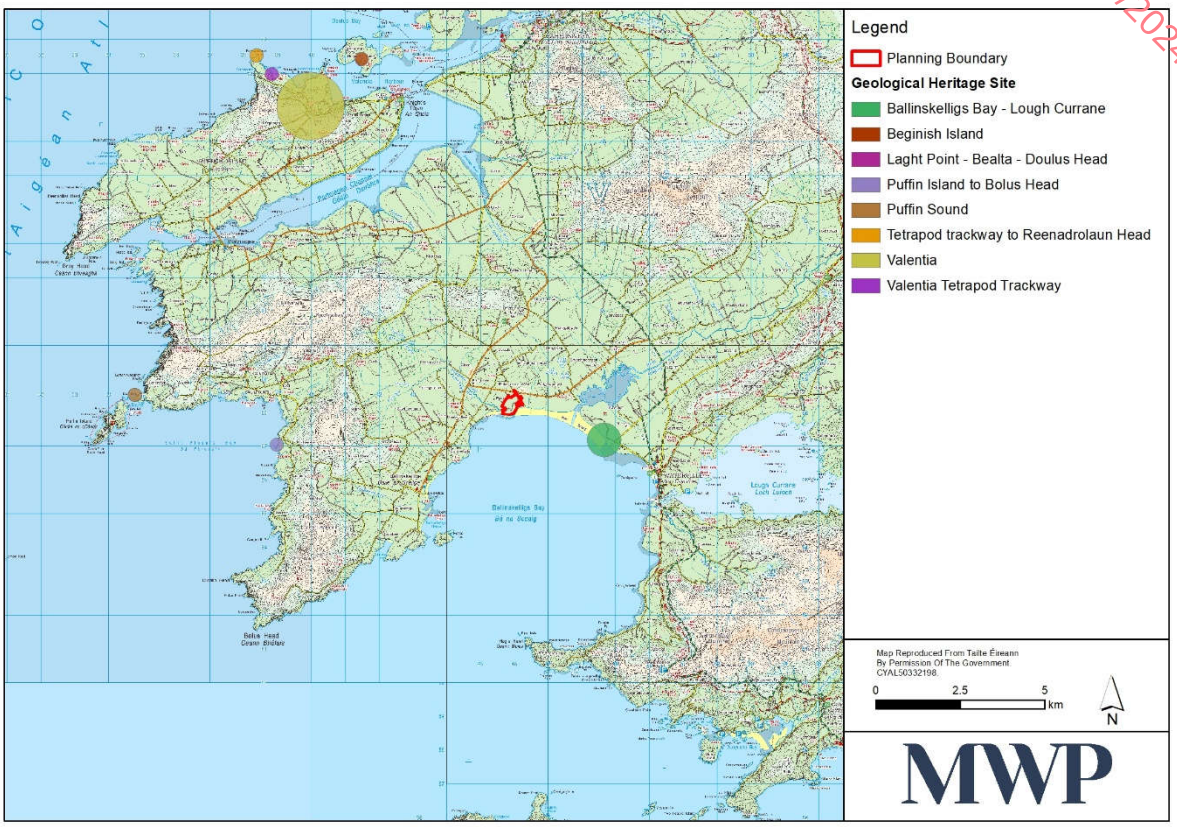

Figure 6-9: Geological Heritage Unaudited Sites (Source: GSI)

6.3.8 Economic Geology

There are no quarries operating in proximity to the proposed development site. The closest quarry operating to the proposed development site is located approximately 10 km northeast of the proposed site boundary:

- Canburn Quarry, Canburn, Caherciveen, Co. Kerry (GSI Quarry Number: KY 002).

The recorded mineral locations have the potential to be used for future mineral extraction. According to the GSI maps there are a number of mineral and non-mineral locations recorded in the area, one of these a known non-metallic quartz mineral locality is within the proposed area of development. The proposed development is unlikely to have any impact on this mineral location is it is a historic record with minor economic potential.

The economic geological sites in the area is shown in **Figure 6-10.**

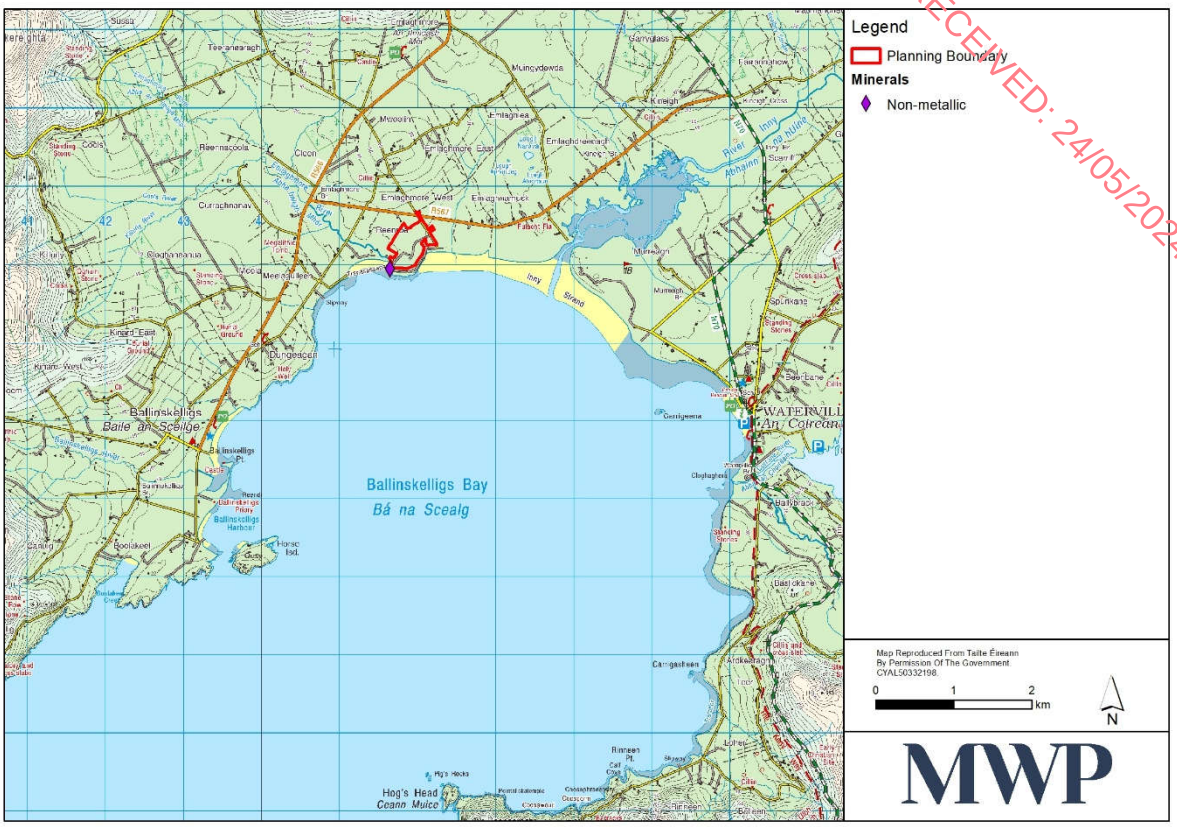

Figure 6-10: Economic geological sites in the Ballinskelligs and Waterville area

6.3.9 Existing Geotechnical Conditions

GSI Online Mapping found no external geotechnical sites within the vicinity of the proposed development site. Geotechnical boreholes and site investigations are submitted by industry to the GSI, stored in the National Geotechnical Borehole Database and displayed online to the public to provide context to the geotechnical conditions in the area.

There is no historical borehole data from GSI online maps in the vicinity of the proposed development.

6.3.10 Landslide Susceptibility

A review of the National Landslide Database and Landslide Susceptibility Map both of which are available for viewing on the GSI Map Viewer indicated that there were no recorded landslide events at the proposed development site. The Landslide Susceptibility Classification for the majority of the proposed development site is 'Low' and 'Low (inferred)' with a section of the eastern portion of the site directly south of the access road to the proposed development site classified as 'Moderately Low' (Figure 6-11).

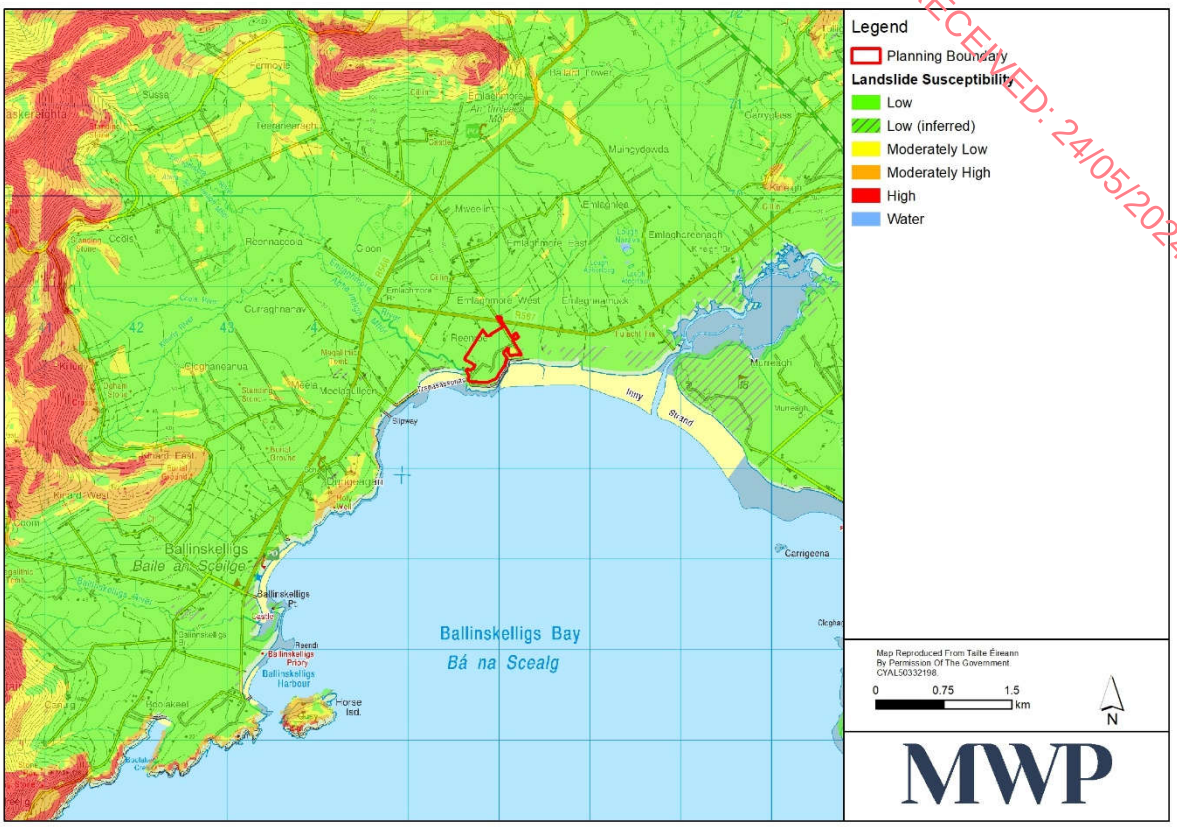

Figure 6-11: Landslide Susceptibility Map (Source: GSI)

6.3.11 Existing Access Roads

Access to the site is via a local road off the R567 Waterville to Ballinskelligs Coast Road, and from there via a private driveway through the site as far as the hotel building. The local road from the R567 also provides access to public car parking facilities for Trá Rinn Rua and the coastal right-of-way/existing access road to Trá na Sassanach and an existing dwelling, which overlooks Trá Rinn Rua. The Dungeagan to Reenroe Walking Loop and the Emlagh Loop, Ballinskelligs pass through the southern section of proposed development site.

6.4 Assessment of Effects

This section details the potential effects on the land and soils environment from the proposed An Rínn Rua Hotel and Leisure Park. The changes proposed on-site comprise several elements including excavation for and construction of the development and construction of a new road system. The relevant works are further discussed in the following sections. This section considers all the phases of construction and operation of the site of the project elements relevant to soil and geology.

6.4.1 Construction Phase

The predicted effects on soils and land for the proposed development are discussed in the following sections.

6.4.1.1 Change of Land Use and Loss of Soil Potential/Soil Sealing

Land use is the term to describe the human activities which take place within a given area of space. The proposed development is located on land which is mapped as pastures. During the construction phase of the works, material

will be excavated, moved, altered, or compacted and will have an impact on the existing land use requirements. In this respect, land use will change over the course of the construction phase from predominantly Pastures to Discontinuous urban fabric.

The land area within and surrounding the footprint of the proposed infrastructure associated with the proposed development will be sterilised (the term used when development or land-use changes take place which permanently prevent current land-use activities from continuing) from its existing land use for the duration of the structures' operational life. Permanent structures will be created during the development as well as new access roads, underground services, and utilities. As part of the design process, the amount of land needed to build, operate, and maintain the proposed development has been kept to a minimal reasonably practicable area.

Soil sealing is described as the destruction or covering of the ground by an impermeable material. It is one of the main causes of soil degradation in the EU, with soil sealing rates increasing annually across Europe. Soil sealing affects fertile agricultural land, puts biodiversity at risk via ecosystem removal, affects water absorption which increases the risk of flooding and water scarcity, affects the filtering and buffering capacity of the soil, and contributes to global warming.

The EU high-resolution Copernicus satellite land imperviousness dataset from 2018 found that the proposed development site pre-construction phase is "non-impervious". During the construction phase, the addition of impervious material to the surface and near surface such as asphalt, cement, soil modification (compaction), and material alteration, will negatively affect land and soil environment's imperviousness.

It is considered that without the implementation of mitigation measures, the alteration of land use from predominantly Pastures to Discontinuous urban fabric and soil sealing, has the potential to alter the character of land and soils (including geological) environmental regime in a manner that is consistent with emerging baseline trends, refer to Table 6-2. Mitigation measures can be found in Section 6.5.1.1.

Table 6-2: Construction Phase Effect: Change of Land Use and Loss of Soil Potential/Soil Sealing

	Receptor	Quality of Effect	Significance	Spatial Extent	Duration	Other Relevant Criteria	Likelihood
Pre – Mitigation	Land, soils, geology	Adverse	Moderate	Localised	Long-term	Direct, Cumulative	Likely

6.4.1.2 Effects on Soil and Geology

6.4.1.2.1 *Soil Erosion*

Soil erosion is the process whereby agents, such as wind and water, gradually detach, remove, and transport soil particles, causing a breakdown in the soil resource. Soil erosion from wind, water and ice can occur when:

- topsoil is removed, exposing the soil and subsoil;
- soil levels from cut and fill practices are altered due to excavation and compaction;
- open excavations are left exposed for a period of time;
- stockpiled and exposed soil is not maintained or stored incorrectly;
- activities from earthworks leave soils exposed;
- mismanagement of material transport, material alterations and waste disposal occurs;

- other construction activities such as vehicular movement and heavy machinery with large tyre threads remove topsoil and soils from excavations; and
- heavy rainfall causes soil to mobilize.

There is a high likelihood of the erosion of soils from excavation and landscaping works during the construction phase of the proposed development. During this phase, soil and subsoil will need to be excavated, moved, altered and/or removed from certain areas of the site.

The management and placement of excavated material on site must be balanced in order to minimise the mobility of the material inside a site. All excavated soils and rock will be reused in landscaping on site.. No excavated material will be removed from the site. The total volume of excavated topsoil and subsoil for the proposed development is approximately 30,065 m^3 (refer to **Chapter 2 Project Description**). Furthermore, excavation and stockpiling activities will be managed during construction as detailed in the CEMP (**Appendix 2-1**).

Table 6-3 details excavation and fill volumes for the various project components.

Table 6-3: Excavation and Fill Volumes for various project components.

Project Components	Excavation	Surfacing repair	Build up Blinding/804	Pipe fill	Fill	Tarmac	Concrete
	typically 0.5m	typically 250mm	250mm	75% excavation	250/500mm	50mm	200mm
Cut or Fill	Cut	Fill					
Main external road		1433.7					
Main Internal Roads		282.1					
Mobile Homes	2939.4				1469.7		1175.8
Mobile Home road	3319.2		1327.7		1659.6	331.9	
Camper Vans	253				253.0		
Camper Van Roads	952.8		476.4		381.1	95.3	
Holiday Cabin Road	668		334.0		267.2	66.8	
Holiday Cabins	1035				621.0		414.0
Hobbit homes roads	859.1				859.1		343.6
WWTP	900				450.0		60.0
Glamping	189		113.4				18.9
Surf Shop/Café	152.6				91.5		61.0
Private Access Road	1520.4		912.2		760.2	152.0	
Leisure Centre + parking Lot	4104.4		2462.6		2462.6	410.4	
Proposed Watermain	6499.8			4874.8			
Proposed Storm Water	1668.1			1251.1			
Proposed WWTP and Pipelines	5004.3			2502.2			
Total (m3)		1715.8	5626.3	8628.1	9275.1	1056.5	2073.3
	30065	28375.1					
Balance	1689.9						

Landscaping activities for the proposed development during and following the construction phase can be designed to reduce weathering and erosion of the land and soils environment. This can be seen in the Landscape Plan (see the **Landscape Design Rationale Report** number **22179 A-2-D01** and the **Landscape Management Plan** number **22179 A2-100 LMP** in the planning pack). The landscape design takes inspiration from the local field

pattern which is distinctive in the Ballinskelligs area. New tree and hedge planting along old field boundaries will establish a green corridor network which will divide the sites into smaller, clearly defined spaces, providing habitat connectivity whilst supporting visual integration in the wider landscape. Vegetated berms (with an average height of 1m) will be developed along the eastern, northern and southern boundaries of the property as well as along the main access road into the development and between the different types of accommodation areas. These will provide visual and sound screening. Existing hedgerows will be maintained and enhanced using native species typical of those already growing in the locality. All planting will be in line with the All-Ireland Pollinator Plan.

The effects on the underlying bedrock geology arising from the construction phase are capable of measurement but without significant consequences and will be imperceptible.

6.4.1.2.2 *Compaction*

Soil compaction describes the reduction of pore space within the soil structure. This also causes the soil to have less total pore volume, an increase in bulk density, reduced rate of water infiltration and drainage, expulsion of air within the soil, and change in soil strength.

Soil compaction may occur due to movement of overland traffic, such as construction and maintenance vehicles. Regular movement of heavy vehicles and plant on off-alignment section, greenfield areas and Temporary Works Areas would result in an increased risk of soil and subsoil integrity during the construction phase of the proposed development. This could in turn lead to other effects such as a temporary increase in surface water runoff, and subsequently to an increase in erosion (see **Section 6.4.1.2.1**).

Soil compaction as part of construction works, including soil improvement works which often require compaction of subsurface material to reach grade, are not included in these effects.

6.4.1.2.3 *Slippage*

A slip is defined as a small movement of soil, debris, earth, or rock down a slope. It can take the form as a minor landslide, a land slip, a soil slip, or soil creep. These can affect the land and soils environment during the construction phase of the proposed development, particularly in excavations, material movement, earthworks, and storage of material on site. This can cause several direct effects including erosion, contamination, sedimentation, instability of the land, and waste generation, as well as indirectly effecting other environments including water, biodiversity, material assets and landscape & visual.

Slippage can occur as a result of an increase in overburden load on slopes, earthworks that affect slope angles and embankments, unstable embankments, unstable excavations, cut-and-fill techniques from excavations, uncovered stockpiled materials, or unforeseen ground conditions not identified during geotechnical investigations. These can be exacerbated by adverse weather conditions from heavy rain, wind, and ice. Slips are more likely to occur on slopes >25° but have been known to occur on much gentler slopes.

Slips on the proposed development are considered low risk due to the relatively flat topography. However, excavation and earthworks will affect this. Stockpiled material is at risk of slipping if no mitigation measures are put in place.

It is considered that without the implementation of mitigation measures, these effects on soil have the potential to alter the character of land and soils environmental regime in a manner that is consistent with emerging baseline trends, refer to **Table 6-3.** This would occur over a short-term period of over 1 – 5 years.

These mitigations are discussed below in **Section 6.5.1.2.3** and within the **CEMP (Appendix 2-1)**.

Table 6-4: Construction Phase: Effect on Soil and Geology

	Receptor	Quality of Effect	Significance	Spatial Extent	Duration	Other Relevant Criteria	Likelihood
Pre – Mitigation	Soils	Negative	Moderate	Localised	Short-term	Direct	Likely
	Geology	Negative	Imperceptible	Localised	Short-term	Indirect	Unlikely

6.4.1.3 Contamination/Pollution

Contamination, or pollution, is the presence of human-made chemicals entering and altering the natural environment. It can occur as a result of waste-related activities, historical activities, leakages and accidental spillages of chemicals. Contamination can lead to the degradation and the physio-chemical alteration of the land and soils environment as well as cause indirect effects to the biodiversity, human health and material asset environments.

Construction materials, including any hazardous substances such as fuel and oil, have the potential to effect on the soil and geological environment should a spill occur. The accumulation of spills of fuels and lubricants during routine plant use can also be a pollution risk. Construction plant and machinery will be run on hydrocarbon fuel and oil and activities relating to hydrocarbons (storage, bunding, refuelling) must be managed during the works. Any effect from a hydrocarbon spill to soil may also indirectly effect the hydrological/hydrogeological environment.

Cement / concrete will be transported to, stored and used across the site. Without proper management, cement spills and other construction materials pose a threat to the land and soils environment (soil matrix) and may indirectly impact on the hydrological environment and groundwater environment as pH would likely be altered. There is the potential for water (rainfall) to become contaminated with pollutants associated with construction activity.

Wastewater from construction processes or leakage from poor welfare facilities can alter the nutrient and microbial balance of the land and soils environment.

Contaminated runoff arising from soil erosion on construction sites can pose a significant risk to the geological and hydrogeological environments, if allowed to percolate into the soil matrix. Sedimentation can also affect safety on the site from build-up, flooding from drain blockage, and maintenance issues from soil erosion. Soil loss due to erosion will be affected if areas are left exposed (see Section 6.4.1.2.1).

It is considered that without the implementation of mitigation measures, contamination/pollution has the potential to alter a sensitive aspect of the land and soils environment by its character, magnitude, duration, or intensity, refer to Table 6-5. This would occur over a short-term period between 1-5 years. Mitigation measures can be found in Section 6.5.1.3.

Table 6-5: Construction Phase: Effect on Contamination/Pollution

	Receptor	Quality of Effect	Significance	Spatial Extent	Duration	Other Relevant Criteria	Likelihood
Pre-Mitigation	Land, Soil	Negative	Significant	Localised	Short term	Indeterminable 'Worst-case'	Likely
	Geology, Groundwater	Negative	Significant	Localised	Short term	Indirect, Cumulative	Likely

6.4.2 Operational Phase

Following the construction stage, the proposed development will enter the operational stage once the facility is in use. The development will not require any further use of the land and soil resources during operation. The land use will change from Pastures to Discontinuous urban fabric and a new baseline environment will pertain.

The potential effects on the land and soils of the site due to excavations will be lower during operation and maintenance, as the majority of excavations will have been reinstated. Some erosion of soil may continue into the operation phase until landscape planting is put in place and starts to mature.

During the operational phase of the proposed development, there is still a risk that contamination from on-site oils, fuels from vehicles, and brown water, can affect the land and soils environment. Responsibility of site management will be handed over to the Applicant at the end of the construction phase. The Applicant will put in place an environmental management plan which will mitigate and manage any spills, leaks, system failures or design error in the plant, machinery, wastewater treatment or storage facilities that have the potential to contaminate or pollute the land and soils environment on site.

The foul (sewage) discharge will be treated at a new on-site tertiary waste-water treatment plant (WWTP) to be built by the developer. The WWTP will be constructed to the east of the beach access road. It will be a sequential batch reactor (SBR) WWTP which treats water in a cycle of four stages namely: Fill, React, Settle and Discharge. Generally, this cycle is repeated 3 times a day, but this can vary 6, 8, 12 or 24 hours to handle varying wastewater and hydraulic conditions.

The treatment tank treats the wastewater prior to discharge to the proposed percolation areas where the waste will be discharged to ground. The percolation areas will be located below the lawns on the seaside of the hotel and lodges within the main development area (see **Drawing 21513 MWP 00 00 DR C 2111** in the planning pack). The size of the percolation area is determined by the maximum volume of wastewater to be discharged.

The expected maximum foul discharge from this facility is: 144,400 litres per day. The expected level of treatment is a minimum of 3:10 BOD:TSS with 99.9% removal of faecal coliforms, with pathogenic bacteria absent.

The design effluent after tertiary treatment are:

Table 6-6: Design Effluent Concentrations from proposed Tertiary Treatment System

Parameter	Concentration	Unit
BOD5 (Biochemical Oxygen Demand)	3	mg/l
TSS (Total Suspended Solids)	10	mg/l
Ammonium-Nitrogen	2	mg/l
Nitrate-Nitrogen	10	mg/l
PO4P (Phosphate)	1	mg/l

This will minimise the potential for any associated contamination being released to the land and soils environment. More details of this system are provided in the **Civils Report** in the planning pack.

Without mitigation measures, the effects of the operation and maintenance of the proposed development represent negative effects on the land and soil environment, refer to **Table 6-7**. Mitigation measures for this can be found in **Section 6.5.2**.

Table 6-7: Operational Phase: Effects

Receptor	Quality of Effect	Significance	Spatial Extent	Duration	Other Relevant Criteria	Likelihood
Land and Soil	Negative	Not Significant	Localised	Permanent	Irreversible	Likely

6.4.3 Do-Nothing

Under the do-nothing scenario, no development would take place on this site, the land and soils environment would remain unchanged, with the exception of future agricultural change.

6.4.4 Cumulative Effects

Cumulative effects relate to the addition of many minor or insignificant effects, including effects of other projects, to create larger, more significant effects. The existing and planned developments around the proposed development are described in Section 1.6.2.5 of Chapter 1 Introduction of the EIAR.

The existing neighbouring land uses are agricultural and holiday homes.

Eleven planning applications were identified. All are related to tourism activities. Six of these were in the pre-covid period and are likely to be completed and will therefore have no cumulative effect with the proposed development. Only one of these (No. 1 - the Hogs Head Hotel complex) included the provision of new tourism accommodation. This facility is a luxury hotel located within a golf estate on the east side of Waterville town on the banks of Lough Currane. Two more recent planning applications include the development of six self-catering accommodation units (7) and five glamping pods (9). One provides a viewing area, path and car park in Ballinskelligs. The two most recent applications involve upgrades and additions to existing tourism businesses that do not include the provision of new tourist accommodation. The decision on two of these applications is still pending and requires further information. All the existing approved planning applications are/will be subject to appropriate planning and regulatory consents, to ensure that there are no significant effects on the land and soils environment.

An Appropriate Assessment Screening Report (see 21513-Appendix 5.1 in Vol. 3 of the EIAR) was completed for the proposed development and concluded following examination of the relevant information, that the proposed development will not adversely affect, either directly or indirectly, the integrity of any European site, either alone or in combination with other plans or project. Additionally, mitigation measures will be implemented as part of this EIAR and the CEMP to ensure that there will be no significant adverse effects on the land and soils regime pertaining to the development site. Having considered the implementation of good construction practice and design for the proposed development and other development in the surrounding area and given that there will be no significant adverse effect on land and soils associated with the proposed development no cumulative effects are anticipated during the construction or operational phases.

6.5 Mitigation and Monitoring Measures

This section outlines the recommended mitigation measures to address potential effects and residual effects to ensure there are no significant negative environmental effects on the soils and geological environment as a result of the construction or operation of the proposed development. A summary table of residual effects pre and post mitigation are presented in Table 6-8 in Section 6.7 Residual Effects.

6.5.1 Construction Phase

6.5.1.1 Change of Land Use and Loss of Soil Potential/Soil Sealing

To mitigate for the potential impact of changing the land use and soil sealing of the proposed development, the following mitigation measures will be implemented:

- Planting of various native tree and other plant species on exposed soils and berms following the construction phase for landscaping;
- Minimising the footprint of the temporary works area: keeping all works within the designated footprint to avoid unnecessary soil sealing; and
- Reusing all excavated material on site in landscaping.

These measures are designed to reduce the effect of land use change by sequestering carbon, reducing waste (soil, subsoil, and rock materials), target limitations and controls on soil sealing.

Within excavations and around excavations, pore water pressure will be kept low by avoiding loading the soil/subsoil and giving careful attention to the existing drainage.

6.5.1.2 Mitigations on Soil and Geology

6.5.1.2.1 *Soil Erosion*

Materials used during the construction phase of the proposed development will be managed in line with the approved CEMP which can be found in **Appendix 2-1** in **Volume 3** of the **EIAR**.

The CEMP includes the following minimum site management controls to mitigate for soil erosion:

- **Soil Stripping** - The timing of the construction phase soil stripping and excavation works will take account of predicted weather, particularly rainfall. The area of exposed ground will be kept to a minimum by maintaining where possible existing vegetation.
- **Excavation Works** - Earth movement activities will be suspended during periods of prolonged rainfall events.
- **Storage and Stockpiles** - Temporary stockpiles of excavated spoil, stored in the footprint of the excavation areas, will be directed for use in backfilling, landscaping and restoration or placed in the deposition areas on site. Reusable excavated sub-soils and aggregate will be stored in temporary stockpiles at suitably sheltered areas to prevent erosion or weathering and shall be shaped to ensure rainfall does not degrade the stored material. Stockpiles will be stored away from any open surface water drains, managing height and slope of all stockpiles and minimising soil movement.

Top-soiling and landscaping works should take place as soon as finished levels are achieved, in order to reduce weathering and erosion and to retain soil properties. A Landscape Plan has been developed which outlines the measures to be taken to prepare soils for planting following construction (see the **Landscape Design Rationale Report** number **22179 A-2-D01** and the **Landscape Management Plan** number **22179 A2-100 LMP** in the planning pack). The planting and re-seeding of open areas will provide resistance against rainfall events, and will minimise sediment and nutrient release until natural re-vegetation reinstates itself.

All temporary cuts/excavations will be carried out such that they are stable or adequately supported. Where appropriate and necessary, cuts and excavations will be protected against ingress of water or erosion by the use of cut off drains around the excavation works. Temporary works will be such that they do not adversely interfere with existing drainage channels/regimes.

Excavated soil will be reused beneficially on site for landscaping and general fill where possible which will reduce waste of the soil resource.

6.5.1.2.2 *Compaction*

The CEMP includes the following minimum site management controls to mitigate for compaction:

- Temporary Construction Works – The compounds, vehicles, stockpiled materials and heavy machinery will be in place for the duration of the construction phase and will be removed once commissioning is complete.
- Excavation Works - The earthworks material will be placed and compacted in layers to prevent water ingress and degradation of the material.

  Within excavations and around excavations, pore water pressure will be kept low by avoiding loading the soil/subsoil and giving careful attention to the existing drainage as compaction would alter the surface drainage regime (see Chapter 07 Water).
- Traffic Management - A traffic management plan (TMP) has been developed as part of the CEMP and measures addressed in Chapter 12 Traffic and Transportation. This is to manage and control vehicular movement onsite. Measures will include the scheduling of HGVs during the construction phase to reduce the number of vehicles moving in, through and off site. This in turn will reduce the impact of soil compaction and erosion. Unscheduled vehicles will not have access to the site. Machinery should not operate directly on excavated/stockpiled soils. Heavy vehicles should only follow designated access tracks and avoid loading areas which are not contained within the footprint of the main works to minimise disturbance of the original soil and subsoil formations and to retain soil structure.

6.5.1.2.3 *Slippage*

All temporary cuts/excavations will be carried out such that they are stable or adequately supported. Temporary works will be such that they do not adversely interfere with existing drainage channels/regimes.

All site excavations and construction should be supervised by a suitably experienced engineer. The Contractor's method statements for each element of work should be reviewed and approved by the engineer prior to site operations. Prior to excavation, drains should be established to effectively intercept overland flow prior to earthworks. The existing network of drainage within the site should be utilised whenever possible. From examination of factual evidence to date, soil erosion and slippage occur after an intense period of rainfall. It is recommended that an emergency response system be developed for the construction phase of the project, particularly during the early excavation phase. This, as a minimum, should involve 24 hour advance meteorological forecasting (Met Eireann download) linked to a trigger-response system. When a pre-determined rainfall trigger level is exceeded (e.g. 1 in 100 year storm event or very heavy rainfall at >25mm/hr), planned responses are undertaken. These responses should include cessation of construction until the storm event including storm runoff has passed over.

Excavated slopes should be no greater than 25°. Identify potential planes of weakness in the overburden such as discrepancies in the material type and foliation direction in the bedrock. Consultation with a geotechnical engineer or engineering geologist during the construction phase of the works will identify high risk areas of potential slip failure and design engineering solutions such as the installation of retaining walls, soil nails, ground anchors and drainage.

6.5.1.3 Contamination/Pollution

The CEMP includes the following minimum site management controls to mitigate for contamination/pollution:

- **Temporary Construction Works** - Drainage within the temporary site compound will be directed to an oil interceptor to prevent pollution if any spillages occur. A bunded containment area will be provided within the compound for the storage of fuels, lubricants, oils etc..
- **Storage and Stockpiles** - Stockpiles of stripped topsoil will be in locations with minimum trafficking to prevent damage and dusting.
- **Refuelling of Construction Plant On-Site** - Refuelling will be carried out using 110% capacity double bunded mobile bowsers. The refuelling bowser will be operated by trained personnel. The bowser will have spill containment equipment which the operators will be fully trained in using. Plant nappies or absorbent mats to be place under refuelling point during all refuelling to absorb drips. Mobile bowsers, tanks and drums should be stored in secure, impermeable storage area, 50m away from drains and open water. To reduce the potential for oil leaks, only vehicles and machinery will be allowed onto the site that are mechanically sound. An up to date service record will be required from the main contractor. Should there be an oil leak or spill, the leak or spill will be contained immediately using oil spill kits, all oil and any contaminated material will be removed and properly disposed of in a licensed facility. Immediate action will be facilitated by easy access to oil spill kits. An oil spill kit that includes absorbing pads and socks will be kept at the site compound and also in site vehicles and machinery. Correct action in the event of a leak or spill will be facilitated by training all vehicle/machinery operators in the use of the spill kits and the correct containment and cleaning up of oil spills or leaks. This training will be provided by the Environmental Manager at site induction. In the event of a major oil spill, a company who provide a rapid response emergency service for major fuel spills will be immediately called for assistance, their contact details will be kept in the site office and in the spill kits kept in site vehicles and machinery.
- **Materials Handling, Fuels and Oil Storage** - Leakages of fuel/ oil from stores will be prevented by storing these materials in bunded tanks which have a capacity of 110% of the total volume of the stored oil. Ancillary equipment such as hoses and pipes will be contained within the bunded storage container. Taps, nozzles or valves will be fitted with a lock system. On-site washing of concrete truck barrels will not be allowed. The washing of the chutes at the rear of the trucks may be permitted. A designated chute wash down area, which will retain the washout water, will be located within the construction compound if required and there will be no other chute wash down activity on any other part of the site.
- **Inspection and maintenance** - The drainage and treatment system will be managed and monitored and particularly after extreme rainfall events during the construction phase. Controls will be regularly inspected and maintained. A programme of inspection and maintenance will be designed and dedicated construction personnel assigned to manage this programme. A checklist of the inspection and maintenance control measures will be developed and records kept of inspections and maintenance works. The purpose of this management control is to ensure that the measures in place are operating effectively, prevent accidental leakages, and identify potential breaches in the protective retention and attenuation network during earthworks operations.
- **Road maintenance** - The road surface can become contaminated with clay or other silty material during construction. Road cleaning will, therefore, need to be undertaken regularly during wet weather to reduce the volume of sediment runoff to the treatment system. This is normally achieved by scraping the road surface with the front bucket of an excavator and disposing of the material at designated locations within the site.

To mitigate against possible contamination of the underlying bedrock/aquifer, refuelling of machinery and plant will only occur at designated refuelling areas.

Excavated materials should be visually assessed for signs of contamination. Should material appear to be contaminated, soil samples should be analysed by an appropriate testing laboratory. Contaminated material should be treated in accordance with the European Union Waste Management (Environmental Impact Assessment) Regulations 2020.

6.5.2 Operational Phase

As vegetation becomes established and equilibrium is achieved, erosion rates will reduce to existing baseline levels.

The Landscape Plan contains detailed plans for the maintenance, care and management of the soils and plants during the lifetime of the development (see the **Landscape Design Rationale Report** number **22179 A-2-D01** and the **Landscape Management Plan** number **22179 A2-100 LMP** in the planning pack). The landscape design takes inspiration from the local field pattern which is distinctive in the Ballinskelligs area. New tree and hedge planting along old field boundaries will establish a green corridor networks which will divide the sites into smaller, clearly defined spaces, providing habitat connectivity whilst supporting visual integration in the wider landscape.

Vegetated berms will be developed along the eastern, northern and southern boundaries of the property to provide visual and sound screening, as well as along the main access road into the development and between the different types of accommodation areas. Existing hedgerows will be maintained and enhanced using native species typical of those already growing in the locality. All planting will be in line with the All Ireland Pollinator Plan.

The Applicant is proposing to set aside part of the land they own, namely the wet lowland area to the east of the proposed development site and west of the SAC that borders the Reenroe stream (see **Figure 2-19**), as a habitat enhancement area to conserve and enhance biodiversity. This area has a mix of peat, poor quality soils, scrub and vegetation which is wet and has potential for ecological restoration. As part of this planning application, a Habitat Enhancement Plan has been developed by qualified ecologists in consultation with the National Parks and Wildlife Service. Refer to **Chapter 05 Biodiversity** and **Appendix 5-5**.

The risks associated with sedimentation and contamination due to erosion and runoff will be mitigated to minimal levels as areas are re-vegetated and construction traffic ceases.

6.5.3 Mitigation Measures for Cumulative Effects

Based on the finding that the potential for significant cumulative effects on land and soils arising from the proposed development is considered to be negligible, no specific measures to mitigate against cumulative effects on land and soils are considered necessary.

6.6 Risk of Major Accidents and Disasters

This section presents an assessment of the vulnerability of the proposed development in relation to major accidents and disasters. It assesses the likelihood of the proposed development to cause an increased risk of major accidents and disasters.

Major accidents can relate to any incident, technological or otherwise, which has the potential to have a significant impact on the facility or on the receiving environment. Examples of major accidents which have such potential are fire, explosion, traffic collisions, contamination and pollution.

A natural disaster is an all-encompassing term which describes any severe natural event which has the potential to cause disturbance to an individual, development or population. The severity depends on the receptor and the type of disaster. Examples of natural disasters are earthquakes, flooding, tsunamis, lightning strikes, hurricanes

or any other extreme natural event. This section has considered the potential increased risk of such events occurring as a result of climate change, such as sea-level rise and increased frequency in the occurrence of extreme weather events.

The Control of Major Accident Hazards Involving Dangerous Substances Regulations 2015 (S.I. No. 209 of 2015) (the "COMAH Regulations") place an obligation on operators of establishments that store, handle or process dangerous substances above certain thresholds to take all necessary measures to prevent major accidents and to limit the consequences for human health and the environment. The proposed development is not subject to the requirements of the COMAH Regulations.

The flood risk assessment has identified that the site is within Flood Zone C as defined in the Flood Risk Management Guidelines and is appropriate for the development of this hotel and leisure park. The topography ensures that the proposed lowest ground elevation is at 5.1 mOD will be positioned well beyond and above any potential flood levels. The recommended finished floor level is 5.4 mOD.

It is considered that there is low risk for the proposed development to cause a major accident or disaster. Furthermore, there is no increased risk to the development from a major accident or disaster.

6.7 Residual Effects

Table 6-8: Residual Effects

EFFECT	RECEPTOR	EFFECT (PRE-MITIGATION)	MITIGATION MEASURES	RESIDUAL EFFECT (POST-MITIGATION)					
				QUALITY OF EFFECT	SIGNIFICANCE	SPATIAL EXTENT	DURATION	OTHER RELEVANT CRITERIA	LIKELIHOOD
CONSTRUCTION									
Change of Land Use and Loss of Soil Potential/Soil Sealing	Land	Likely, negative moderate localised short-term direct cumulative	See **Section 6.5.1**	Negative	Slight	Localised	Short- term	Direct, Cumulative	Likely
Effects on Soil	Soil	Likely, negative moderate localised short-term direct		Negative	Not significant - Slight	Localised	Short- term	Direct	Likely
	Geology	Unlikely, negative imperceptible short-term indirect		Neutral	Imperceptible	Localised	Short- term	Indirect	Unlikely
Contamination/Pollution	Land, soils	Likely, negative significant localised short-term Indeterminable 'Worst-case'		Negative	Not significant	Localised	Short- term	Direct	Unlikely
	Geology, groundwater	Likely, negative significant localised short-term indirect cumulative		Negative	Not significant	Localised	Short- term	Indirect, Cumulative	Unlikely
Waste Generation and Management	Land, Soil, Geology	Likely, negative not significant localised short-term cumulative residual		Negative	Imperceptible	Localised	Short- term	Cumulative, residual	Likely
OPERATIONAL									
Effects	Land and soils	Likely, negative not significant localised permanent irreversible	See **Section 6.5.2**	Negative	Imperceptible	Localised	Permanent	Irreversible	Likely

6.8 References

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