Dunmanway to Clashavoon 110kV Overhead Line Environmental Reports

Constraints Report – Soils and Geology

Submission to: ESB International

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12th August 2010

1.0 SOILS AND GEOLOGY

1.1 Introduction

This section identifies the soils and geological constraints that exist in the study area associated with the proposed 110kV line from Clashavoon to Dunmanway, Co. Cork.

1.2 Methodology and Information Sources

The following list of maps and publications together with databases were reviewed as part of the assessment of constraints in relation to soils and geology:

- Geology of West Cork Sheet 24, Geological Survey of Ireland (GSI),
- Geology of South Cork Sheet 25, GSI
- Geology of Cork-Kerry Sheet 21, GSI
- Karst Database, GSI
- Quaternary (Subsoils) Database, GSI
- Groundwater Well Database, GSI
- Ordnance Survey of Ireland Discovery Series 1:50, 000 Map Series, Nos. 79, 85 & 86
- Soil Map of Ireland, An Foras Taluntaisi, 1980
- Landslides in Ireland, GSI Irish Landslides Working Group, 2006
- GSI Heritage Programme, Sites of Geological Interest
- Cork County Council, Quarry Register
- Cork County Council, Historical Landfill Inventory

1.3 Topography

The study area is approximately 520km^2. The northern section includes the urban area of Macroom and surrounding townlands, the central section is made up of agricultural land uses with undulating topography and the southern section is dominated by the Bandon River and includes the urban area of Dunmanway. The study area varies in topography. The topography of the study area varies approximately from:

- 75m and 380m Above Ordnance Datum (AOD) in the northern section in the Macroom area
- 100m and 260m AOD in the central area near Cappeen village; and
- 40m to 190m AOD in the southern section near Dunmanway.

1.4 Soils

The soils distribution across the study area is provided as part of the Quaternary (Subsoils) Database from the GSI and the General Soil Map of Ireland[1]. There is a distinct east-west divide in the distribution of soils in the study area. To the east of Capeen the soil type is predominantly acid brown earth and brown podzolics. A description of these is as follows:

Acid Brown Earths
These soils are well-drained, mineral soils. Most Brown Earths occur on lime-deficient parent materials. These soils, in general, possess medium textures (sandy loam, loam, sandy clay loam).

Brown Podzolics
These soils are generally poor soils, depleted of nutrients by heavy rainfall leaching through an organic layer (the podzolisation process). The surface layer contains organic matter that is intimately mixed with mineral matter.

To the west of Cappeen the soils are peat derived gleys and podzols. Blanket peat was found to be present in Annahalla townland next to the Geragh nature reserve 4km to the south of Macroom, in the townlands of Commons and Haremount, 2km southwest of Kilmichael and in an elevated area near Capeen.

Gleys
These are soils in which the effects of drainage impedance dominate and which have developed under the influence of permanent or intermittent water logging. The impedance may be due to a high water table, to a 'perched' water table caused by the impervious nature of the soil itself, or to seepage of runoff from slopes.

Podzols
These soils are generally poor soils, depleted of nutrients by heavy rainfall leaching through an organic layer (the podzolisation process). They have high lime and fertiliser requirements and are usually found in hill and mountain areas where mechanical means of reclamation and cultivation are not feasible.

Blanket Peat
These had accumulated under conditions of high rainfall and humidity. Because of poor drainage, adverse physical conditions and their occurrence in areas of poor climate, the range of uses of blanket peat in agriculture is very limited.

Lithosols were found to be present to the north of Ballineen. A description of each soil type is as follows:

Lithosols
These are skeletal stony soils, usually overlying solid or shattered bedrock. They are often associated with podzols at higher elevations. Generally such soil areas have bare rock outcropping at frequent intervals and many also have steep slopes.

1.5 Quaternary Geology

The Quaternary geological period extends from about 1.5 million years ago to the present day and can be sub-divided into the Pleistocene Epoch, which covers the Ice Age period and which extended to 10,000 years ago and the Holocene Epoch, which extends from that time to the present day.

The ice sheet in Ireland was formed by a number of coalescing ice domes, from which the ice flowed outwards in a radial pattern. As the ice travelled over the ground, it eroded the underlying bedrock, which resulted in the formation of sediment beneath and within the ice sheet. The particle size distribution of the sediment varied greatly and ranged from clay particles to large boulders. This material has been labelled glacial till or boulder clay and is the most widespread soil type in Ireland. If conditions were suitable, sediment was also deposited as distinct bands of sand, gravel, silt and clay. Glacial till can range in thickness from less than 1m thick to tens of metres in depth. [2,3,4]

In Southwest Ireland there is evidence for two glaciations. During the earlier of the glacial advances, an ice-sheet centered on the mountainous areas extended radially to cover most of Cork and Kerry. The later glaciation was not as extensive. Ice was centered to the south of the Macgillycuddys reeks, extending radially to form an ice-dome which, at its northeastern margin, abutted the southern margin of an ice-dome that covered the central and southern midlands. The reeks contained small local glaciers. Some of those of the mountains further north formed an independent mountain ice cap.

The ice of the main dome flowed southwestwards into the Atlantic, eastwards into Co. Cork and northward, overtopping mountains up to 700m above sea level[2,3,4].

Local glaciers that formed in the mountains and fed the main ice-sheet formed numerous corries and glaciated valleys. Outside the areas that were glaciated during the last glacial period, older glacial deposits mostly consist of till. [2,3,4]

Post glacial deposits take the form of river alluvium along the valleys of the main rivers. The quaternary deposits of the study area have provided the parent material for almost all the agricultural soils.

With reference to the EPA (http://maps.epa.ie/), the subsoils comprise primarily sandstone till from the Lower Palaeozoic (TDSs). Till derived from various rock formations is the principal material encountered in the study area. Till is an unsorted sediment derived from the transportation and deposition of, by, or from, a glacier. Glacial till is composed of a heterogeneous mixture of clay, sand, gravel and boulders. The following subsoil groups also occur in the study area, but are less dominant:

- TDCSsS - subsoils comprise primarily of Sandstone and Shale Till from the Devonian and Cambrian
- Rck – Bedrock at Surface;
- GDSs – Basic Igneous Till
- BktPt – Blanket Peat
- A – Alluvium undifferentiated

The GSI Well Card Index is a record of wells drilled in Ireland. This Index shows a number of wells in the vicinity of the study area. While much useful information can be obtained from this Index, it is important to note that it is by no means exhaustive, as it requires individual drillers to submit details of wells in each area. Well card data for the study area is shown in Table 1.1. The depth to bedrock and hence the depth of the soil/subsoil varies throughout the study area; this is dependent on the underlying subsoil and the topography for the area.

Table 1.1 GSI Well Data for Study Area showing depth to bedrock (DTB)

GSI Code	Easting	Northing	Townland	DTB (m)
1105NEW022	135960	67320	Dunisky	9.1
1105NEW045	130460	69210	Inchisine	3.0
1105NEW054	136130	65340	Dunmarklun	2.4
1105NEW056	129210	67570	Dromcarra South	4.6
1105NEW058	134730	60580	Moneynacroha	4.6
1105NEW067	133550	69680	Toomsbog	0.9
1105NEW069	136830	61730	Bengour East	7.6
1105NEW070	128930	69330	Milleen	15.8
1105NEW071	127500	61680	Shanacashelkneeves	3.1
1105NEW072	129960	68330	Inchisine	4.3
1105NEW073	130650	66830	Moneycusker	4.6
1105NEW074	130650	66830	Cloonsheer Bog	4.6
1105NEW075	127480	68480	Glasheen	16.8
1105NEW077	134300	66030	Ardnaheen	3.0
1105NEW078	128030	63850	Coolclevane	4.6
1105NEW079	129380	66740	Cooldorragha	10.0
1105NEW081	130550	69110	Inchisine	4.6
1105NEW082	138360	62790	Bengour East	3.1
1105NEW083	138120	67890	Dunisky	4.6
1105NEW085	130150	65520	Cooldorragha	4.6
1105NEW087	129270	67630	Dromcarra South	4.6
1105NEW088	130710	62270	Dane	10.1
1105NEW089	133350	69110	Tooms West	3.1
1105SEW040	134780	54790	Gurteenroe	2.0
1105SEW041	133020	56710	Kinneigh	2.0
1105SEW042	134160	57710	Castletown	6.0
1105SEW043	134250	57820	Castletown	3.0
1105SEW044	134190	57780	Castletown	4.0
1105SEW045	138610	54160	Murragh	36.0
1105SEW046	133480	57710	Castletown	2.0
1105SEW049	139010	52980	Knockmacool	7.0
1105SEW051	136510	53950	Ardkitt West	6.0
1105SEW052	136880	55980	Teadies Upper	1.5
1105SEW053	135740	59320	Rushfield	3.0
1105SEW055	138970	59070	Coolnagh	6.0
1105SEW056	137800	54920	Palaceanne	5.0
1105SEW062	132450	53550	Balineen	7.0
1105SEW066	134380	59290	Moneynacroha	4.6
1105SEW067	138460	55940	Sranaviddoge	4.6
1105SEW068	132420	56640	Cloonareague	3.7
1107SEW078	134710	75060	Kill	9.1
1107SEW081	136800	74800	Shanakill	7.3
1107SEW085	128860	72670	Dromong	2.8
1107SEW096	130690	74370	Glananrig	3.7
1107SEW115	132500	73330	Macroom	7.7
1107SEW116	132580	73340	Macroom	12.0
1107SEW120	132510	73450	Gurteenroe	0.6

Table 1.1 shows that the wells recorded show the depth of overburden to range from 0.9m in Toomsbog to 36.0m BGL in Murragh however the well at this location is influenced by

faulting to the south of the location and is an exception for the depth to bedrock in the study area. The average depth to bedrock that exists in the study area is 6.0m.

1.6 Bedrock Geology

An inspection of the Geological Survey of Ireland (GSI) [2,3,4] records shows the study area to be underlain by mudstones, sandstones and limestones of the Devonian Period. The majority of the study area is underlain by Devonian Old Red Sandstone. This extends from the northern section at Macroom to an area to the north of Dunmanway and Ballineen. Limestones are found in pockets at Annahalla, south of the Geragh Nature Reserve and Poulanargid, south of Kilmurray village. The southern section of the study area is underlain by Dinantian mudstones and sandstones, predominantly the Kinsale Formation. The faults predominantly trend north-south.

The different geological formations that make up the study area are as follows:

OH – Old Head Sandstone Formation
Grey flasser bedded sandstones, fine grained sandstones and minor mudstones and lenticular bedded mudstones.

KN – Kinsale Formation
Overall, mud-dominant succession of grey mudstones and sand lensed mudstones and subsidiary flaser-bedded sandstones.

TH – Toe Head Formation
Large scale cross-bedded sandstones, rippled sandstones, mudstones, interbedded sandstones and mudstones and mudcrack associated facies.

CE – Castleheaven Formation
Purple mudstones and siltstones with sandstone bodies

GP – Gun Point Formation
Green – grey sandstones interbedded with purple siltstones

CH – Caha Mountain Formation
Purple and green siltstones and sandstones

GM – Gortanimill Formation
Medium to fine-grained green sandstone with some red siltstone

WA – Waulsortian Limestone
Massive, unbedded calcilutite “mud bank” facies.

BH – Bird Hill Formation
Purple siltstone and fine-grained sandstone. Fine-grained lithologies dominate the formation.

1.7 Karst Features

The Karst database held by the GSI was consulted. This database holds records of locations and types of reported Karst features. No recorded karst features from the GSI database exist within the study area.

1.8 Slope Stability

The study area consists of gently undulating topography ranging from 40m in the southern section to 380m AOD in the northern section. In areas with sloping ground, the composition and extent of the subsoils is an influencing factor in the stability of slopes.

The actual consolidation of deposits varies considerably based on a wide range of factors at a local level. Detailed information of the geotechnical capability of deposits can only be determined following intrusive site investigation.

The GSI has developed a database of historical landslides in Ireland. This database has been consulted and there have been no recorded events within the study area. There are numerous areas within the study area with significant slopes. In addition many of the upland areas are covered with wet blanket bog. Uncontrolled disturbance of such upland bogs can lead to slope failure and landslides.

There are no historical or active mines in the study area that would contribute to any ground or slope instability.

1.9 Economic Geology

There are several quarries in the study area according to Cork County Council register of quarries obtained from the council website. These are located as follows:

- Ummera, Macroom
- Coolaclevane, Kilmichael
- Shanlaragh, Dunmanway
- Kilnadur, Dunmanway
- Kilcronan East, Dunmanway
- Dromohane, Enniskeane
- Boulteen, Enniskeane
- Dromidiclogh, Ballineen
- Gortauranner, Clondrohid
- Ballingurteen, Enniskeane
- Knockaneady, Enniskeane
- Murragh, Enniskeane
- Cullenagh, Dunmanway
- Dromidiclough, Ballineen
- Shanaway, Ballineen.

1.10 Landfills and Contaminated Sites

The EPA has a database of waste licenced activities in Ireland. The database shows there is no waste licenced activity in the study area.

A number of historical landfill sites are present in the area according to data received from Cork County Council. These are as follows:

- Macroom Landfill
- Dunmanway Landfill located approximately 300m South West of the Dunmanway town centre (E122, 853, N52, 345).

Assessments are currently being prepared by Cork County Council for these sites in order to prioritise further investigation if required.

1.11 Areas of Geological Heritage

The GSI was consulted in relation to any areas of geological heritage or interest located in the study area.

The GSI is in partnership with the National Parks and Wildlife Service (NPWS) to identify and select any important geological and geomorphological sites throughout the country for designation as NHAs (Natural Heritage Areas). This is addressed under 16 different geological themes. A large number of sites are currently being examined in order to identify the most significant scientifically. Sites that do not qualify as a proposed NHA, may qualify under the second tier of County Geological Sites (CGS), which would be included in County Development Plans and receive a measure of protection through inclusion in the planning system.

According to the GSI, there is 1 site of geological interest that lies within the study area. This is "The Gearagh, River Lee"; it is designated for its anastomosing channels. It has been recommended for Natural Heritage Area (NHA) designation under the Irish Geological Heritage (IGH) 14 Fluvial and Lacustrine Geomorphology Theme.

1.12 Constraints

The key constraints in relation to soils and geology are the following:

- **Soft ground including blanket peat –** there are a number of potential impacts associated with construction of structures in soft ground and blanket peat. Slope angle, accumulation of water following a high intensity rainfall event and the presence of drains in the vicinity of the construction area can lead to peat slope failure. On site machinery and dewatering activities are also contributing factors.
- **Areas of made ground** - these areas are located at urban areas (Macroom and Dunmanway) and residential areas (villages such as Cappeen, Kilmurry, Johnstown and Carrigadrohid). Cut material would be generated if construction was located in these areas, however the amount would not be significant.
- **Registered operational quarries –** foundations for the construction of the structures have the potential to be compromised by existing quarries and the extension to these quarries.
- **Landfills and contaminated sites –** sites located at Macroom and Dunmanway. Subsoil and underlying material at these locations would be potentially contaminated.
- **Areas where rock is close to the surface –** Bedrock would be generated as surplus material if construction was located in these areas. Due to the nature of the

construction works the amount would not be significant. The surplus material would need to be managed in accordance with the Waste Management Act 1996 and amendments.

- **Geological heritage areas –** 1 site of geological interest that lies within the study area. This is the Gearagh, River Lee. The GSI have stated that there are no set distance requirements for proposed developments in the vicinity of geological NHAs and County Geological Sites. Distance is decided on a site by site basis. GSI has indicated that at certain geological heritage sites, excavations may contribute to further understanding of the geology. Consultation should take place with the GSI to ensure that structures are located at a suitable distance.

1.13 Conclusions

The constraints in relation to soils and geology are highlighted in the previous section, the potential impact of the proposed development, in relation to soils and geology will be identified in the final environmental assessment. The implementation of appropriate mitigation measures will ensure there will be no significant residual impact on the environment from the proposed development in respect of soils and geology.

REFERENCES

1. An Foras Taluntaisi, (1980), Soil Map of Ireland

2. Sleeman, A.G. & Pracht, M., (1995), Geology of South Cork, Sheet 25. Geological Survey of Ireland.

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4. Pracht, M. and Sleeman, A.G., (2002), Geology of West Cork, Sheet 24. Geological Survey of Ireland.