

Appendix 7-1

Peat Stability Risk Assessment



INTERNATIONAL

Timahoe North Solar Farm

ESB Wind Development Ltd and Bord na Móna
Powergen Ltd

Peat Stability Risk Assessment

Document No.: QS-000218-01-R460-002

Date: August 2018

ESB International, One Dublin Airport Central, Dublin Airport, Cloghran, Co. Dublin, K67 XF72, Ireland.

Phone +353 (0)1 703 8000

www.esbinternational.ie

File Reference:	QS-000218-01	
Client Recipient:	/ ESB Wind Development Ltd and Bord na Móna Powergen Ltd	
Project Title:	Timahoe North Solar Farm	
Report Title:	Peat Stability Risk Assessment	
Report No.:	QS-000218-01-R460-002	
Revision No.:	1	
Prepared by:	Susan Stack	Date: 02/08/2018
Title:	Civil Engineer	
Verified by:	Ronan Canavan	Date: 13/08/2018
Title:	Consultant Geotechnical Engineer	
Approved by:	Annmarie Downey	Date: 13/08/2018
Title:	Project Manager	

Copyright © ESB International Limited

All rights reserved. No part of this work may be modified, reproduced or copied in any form or by any means - graphic, electronic or mechanical, including photocopying, recording, taping or used for any purpose other than its designated purpose, without the written permission of ESBI Engineering & Facility Management Ltd., trading as ESB International.

Template Used: T-020-007-ESBI Report Template

Issue Sheet

Date	New Revision	Author	Summary of Change
February 2018	0	SS	Draft for comment.
August 2018	1	SS	Issued for planning application.

Executive Summary

Timahoe North site is a cut over peat bog which has been out of commercial use for approximately 40 years. The proposed development will consist of a 70 MW solar farm constructed across a site area of approximately 324 hectares (Ha). This will comprise solar panels, inverters, an electrical substation, access track, underground electrical cables linking the inverters with the control buildings, overhead line pole sets and angle masts connecting the new substation to the existing Derryiron to Maynooth 110 kV line, and all related site works and ancillary development including compound areas and peat and mineral soil storage areas. The project is being developed as a joint venture between ESB Generation and Wholesale Markets (ESB G&WM) and Bord na Móna.

The site is mainly overlain with cut over bog. The depth of peat across the site varies from less than 1 m to more than 5 m in certain areas.

The ground conditions across the Timahoe North Solar Farm site generally consists of peat over glacial deposits interbedded with glacio-fluvial deposits over possible bedrock. The peat across the site has been harvested resulting in residual peat depth varying between 0.1 – 4.7 m BGL. The peat on the site is described as soft, dark orange/brown/black and fibrous with many rootlets which extend into the subsoil layer on occasion. The glacial deposits generally consist of soft to very stiff grey gravelly clay/silt. These deposits are interbedded with gravels and sands within the stratum. These are generally over consolidated strata. The consistency of these strata typically tends to improve with depth.

ESB International were engaged to carry out a Peat Stability Risk Assessment (PSRA) for the proposed solar farm development. The PSRA has been carried out in accordance with the best practice guidelines for peat landslide risk assessments published by the Scottish Government Energy Consents Unit in the report "*Peat Landslide Hazard and Risk Assessments: Best Practice Guide for Proposed Electricity Generation Developments (Second Edition, April 2017)*". The first edition of these guidelines have been recommended in the Irish Wind Energy Association (IWEA) "*Best Practice Guidelines for the Irish Wind Energy Industry (2012)*", and is supplemented by the experiences of ESB International on previously developed sites.

Information on the ground conditions, topography, hydrology, ecology, land use and other factors were used to determine the likelihood of peat failure at each location analysed. The impact of a potential peat slide was also considered. The likelihood and impact of a peat failure at different areas of the site were combined to form the risk. The results of the PSRA indicate that the peat stability risk rating across the site is low.

The peat risk has been minimised by optimising the design of the solar farm and will be further mitigated by choosing a safe and controlled construction methodology;

having a rigorous documentation and quality control system during construction and by controlling construction activities carefully.

Contents

Executive Summary	ii
1 Introduction	8
1.1 Timahoe North Solar Farm	8
1.2 Scope of Work	8
2 Desktop Study	9
2.1 Site Location	9
2.2 Topography	9
2.3 Geology	10
2.4 Hydrology	11
2.5 Land Use	15
2.6 Ecology	15
2.7 Bog Workings	15
2.8 Landslide Database	15
2.9 Aerial Photography	16
2.10 Desktop Information Sources	16
3 Site Investigations	18
3.1 Site Works	18
3.2 Summary of Ground Conditions	18
4 Site Observations	19
4.1 Overview	19
4.2 Inverters	19
4.3 Peat Repositories	22
4.4 Overhead Line Structures and Substation	23
4.5 Other Infrastructure	24
5 Evaluation of Stability	26
5.1 General	26
5.2 Methodology for Peat Stability Risk Assessment	26
5.3 Likelihood Factors Affecting Peat Stability	29
5.4 Impact Factors Affecting Peat Stability	32
6 Results	34
6.1 Inverters	34

6.2 Peat Repositories	38
6.3 Overhead Line Structures and Substation	40
6.4 Other Infrastructure	42
7 Mitigation Measures	44
7.1 Mitigation Design and Implementation	44
7.2 Preliminary Design Mitigation Measures	47
7.3 Detailed Design Mitigation Measures	47
7.4 Construction Mitigation Measures	48
8 Conclusions	54
9 Recommendations	55
Appendix A Peat Stability Risk Assessment Sheets	A

Tables

Table 4-1 Critical PSRA Factors at Inverter Locations	19
Table 4-2 Critical PSRA Factors at Peat Repository Locations	22
Table 4-3 Critical PSRA Factors at Overhead Line Structure Locations	23
Table 4-4 Critical PSRA Factors at Other Infrastructure Locations	24
Table 5-1 Likelihood and Impact Scoring System	27
Table 5-2 Risk Ratings and Risk Levels	28
Table 5-3 Likelihood Factors Affecting Peat Stability	29
Table 5-4 Impact Factors Affecting Peat Stability	32
Table 6-1 Inverter Locations Risk Rating	34
Table 6-2 Peat Repository Locations Risk Rating	38
Table 6-3 Overhead Lines Structures and Substation Risk Rating	40
Table 6-4 Other Infrastructure Risk Rating	42
Table 7-1 Peat Repository Net Storage Capacity	50

Figures

Figure 2-1 Timahoe North Solar Farm Site Location (Google Maps)	9
Figure 2-2 Ordnance Survey Map of Timahoe North Solar Farm Site (OSI)	10
Figure 2-3 Bedrock Geology at Timahoe Site (GSI)	11
Figure 2-4 Quaternary Mapping for Timahoe North (GSI)	11
Figure 2-5 Timahoe North Catchments	12
Figure 2-6 Protected Groundwater Source close to Timahoe North Site (shown in green)	13
Figure 2-7 Mean monthly rainfall at Dunsany Observatory 2014 – 2017 (Met Éireann)	14
Figure 2-8 Mean Yearly Rainfall 1981 – 2010 (Met Éireann)	14
Figure 2-9 Landslide Susceptibility Map	16
Figure 5-1 Risk Rating Formula	26
Figure 5-2 Likelihood and Impact Score Formulae	27
Figure 6-1 PSRA Comparative Chart – Inverters Chart 1 of 2	36
Figure 6-2 PSRA Comparative Chart – Inverters Chart 2 of 2	37
Figure 6-3 PSRA Comparative Chart – Peat Repositories	39
Figure 6-4 PSRA Comparative Chart – Overhead Line Structures and Substation	41
Figure 6-5 PSRA Comparative Chart – Other Infrastructure	43
Figure 7-1 Peat Stability Risk Mitigation Process	45
Figure 7-2 Excavation trimmed back to a stable temporary side slope	52
Figure 7-3 Rockfill berm around an area of deep peat on an existing ESB Wind Farm	53

1 Introduction

1.1 Timahoe North Solar Farm

Timahoe North site is a cut over peat bog which has been out of commercial use for approximately 40 years. The site is approximately 8 kilometres east of the village of Carbury in Co. Kildare. The development will consist of a 70 MW solar farm constructed across a site area of approximately 324 hectares (Ha).

The project is being developed as a joint venture between ESB Generation and Wholesale Markets (ESB G&WM) and Bord na Móna. The proposed development is for solar panels, inverters, an electrical substation, access track, underground electrical cables linking the inverters with the control buildings, overhead line pole sets and angle masts connecting the new substation to the existing Derryiron to Maynooth 110 kV line, and all related site works and ancillary development including compound areas and peat and mineral soil storage areas.

The site is mainly overlain with cut over bog. The depth of peat across the site varies from less than 1 m to more than 5 m in certain areas.

1.2 Scope of Work

ESB International were engaged by ESB G&WM and Bord na Móna to undertake a Peat Stability Risk Assessment (PSRA) for Timahoe North Solar Farm. The purpose of this report is to present the results of the PSRA and the mitigation measures adopted to reduce the risk ratings for each element of the solar farm development.

The PSRA is based on a desk top study of the site, a site walkover by ESB International, and the results of a ground investigation comprising peat probes, trial pits and shell and auger boreholes.

2 Desktop Study

2.1 Site Location

The proposed Timahoe North Solar Farm site is located approximately 8.4 km north of Allenwood and 7.1 km east of Carbury in Co. Kildare. The bog within which the site is situated occupies a total area of approximately 807.29 hectares (ha) (1995 acres) and lies within the townlands of Ballynamullagh, Coolree (Carbury By), Drehid, Killyon, Kilmurry (Carbury By), Mucklon and Mulgeeth. The approximate site location is indicated in Figure 2-1.

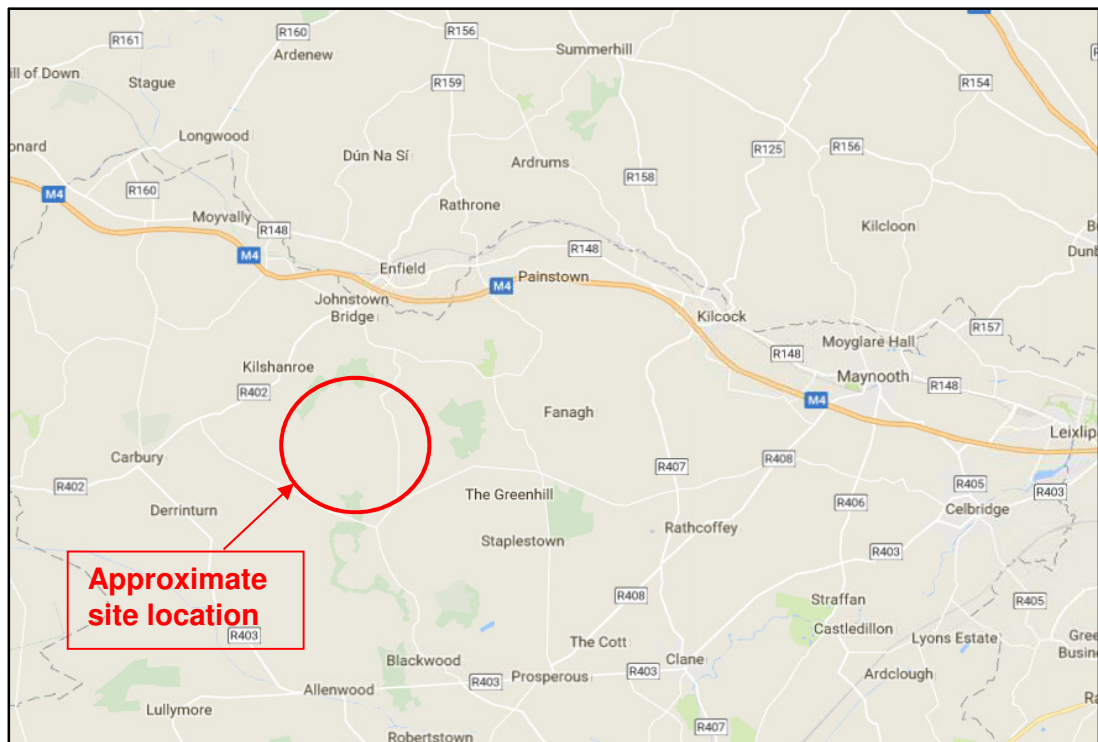


Figure 2-1 Timahoe North Solar Farm Site Location (Google Maps)

The main site entrance is located on the north side of local road L5025 which runs in an approximate east west direction. The L5025 connects to the R402 at its western end and local roads L1017 and L1019 at Timahoe Cross Roads at its eastern end. The site entrance is located approximately 2.3 km west of the cross roads.

2.2 Topography

The site is predominantly flat with elevation levels ranging from approximately 78 to 85 m OD across the majority of the site. Elevation levels for a small area in the southern part of the site reach 89 m OD. An ordnance survey map of the site is shown in Figure 2-2.

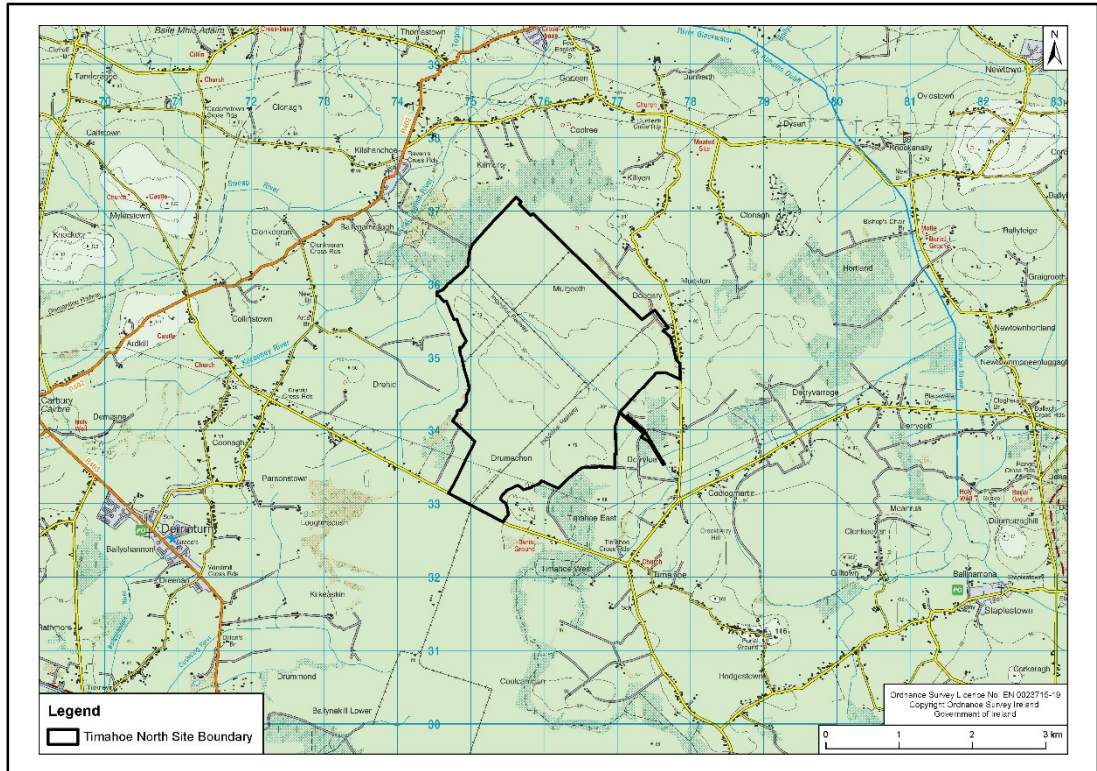


Figure 2-2 Ordnance Survey Map of Timahoe North Solar Farm Site (OSI)

2.3 Geology

2.3.1 Bedrock Geology

Published geological mapping from the Geological Survey of Ireland (GSI) is presented in Figure 2-3. This shows the underlying bedrock at the majority of the solar farm location comprises visean limestone described as dark limestone and shale (calp) of the Lucan formation. A section of the southern end of the site comprises tournaisian waulsortian limestone.

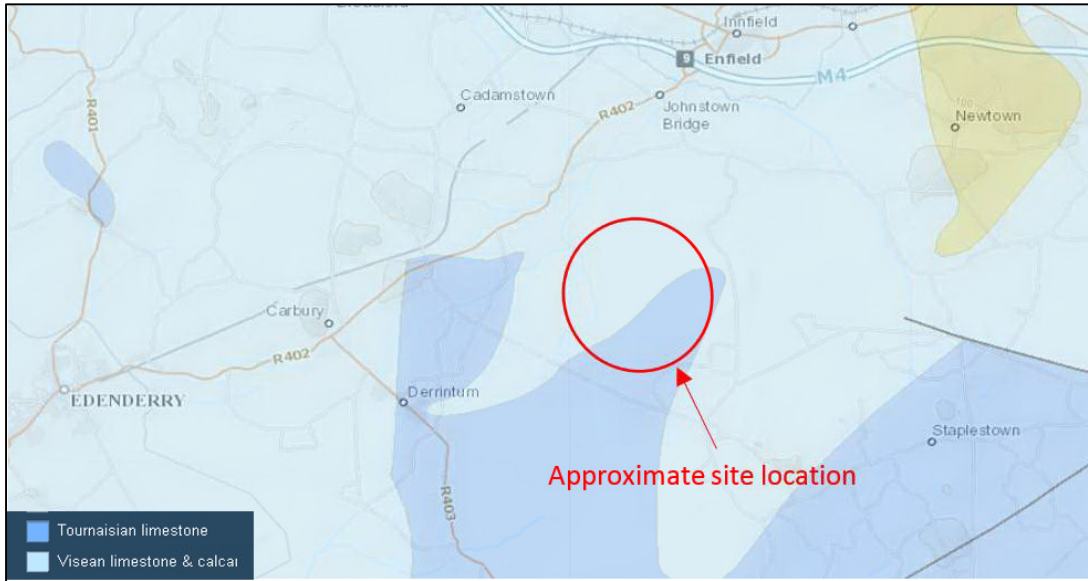


Figure 2-3 Bedrock Geology at Timahoe Site (GSI)

2.3.2 Quaternary Geology

The quaternary geology of the site has been mapped by the Geological Survey of Ireland (GSI). The mapping of the area is shown in Figure 2-4. The GSI mapping describes the lithology of the site as cut over raised peat.

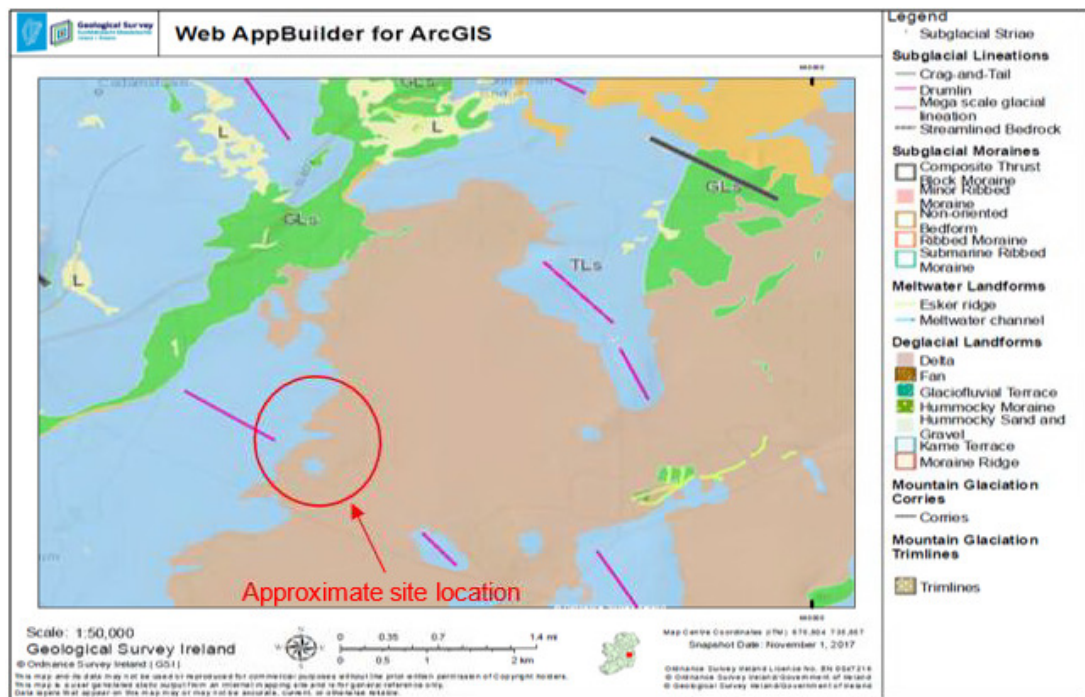


Figure 2-4 Quaternary Mapping for Timahoe North (GSI)

2.4 Hydrology

2.4.1 Watercourses

There is a single watercourse located within the overall Timahoe North site, as shown in Figure 2-5, in addition to a number of nearby watercourses located in close proximity to the site boundary. A drinking water protection area is located close to the site, shown in Figure 2-6.

The entire site is located within the River Boyne catchment. The River Boyne predominantly runs in a south-west to northeast direction. It joins the River Blackwater in Navan, Co. Meath before discharging to the Irish Sea east of Drogheda along the border of Co. Louth and Co. Meath. The discharge location of the River Boyne is within the Boyne Coast and Estuary Special Area of Conservation (SAC) and the Boyne Estuary Special Protected Area (SPA), designated Natura 2000 sites under the EU Habitat's Directive. This SAC and SPA is located more than 56 km from the Timahoe North site.

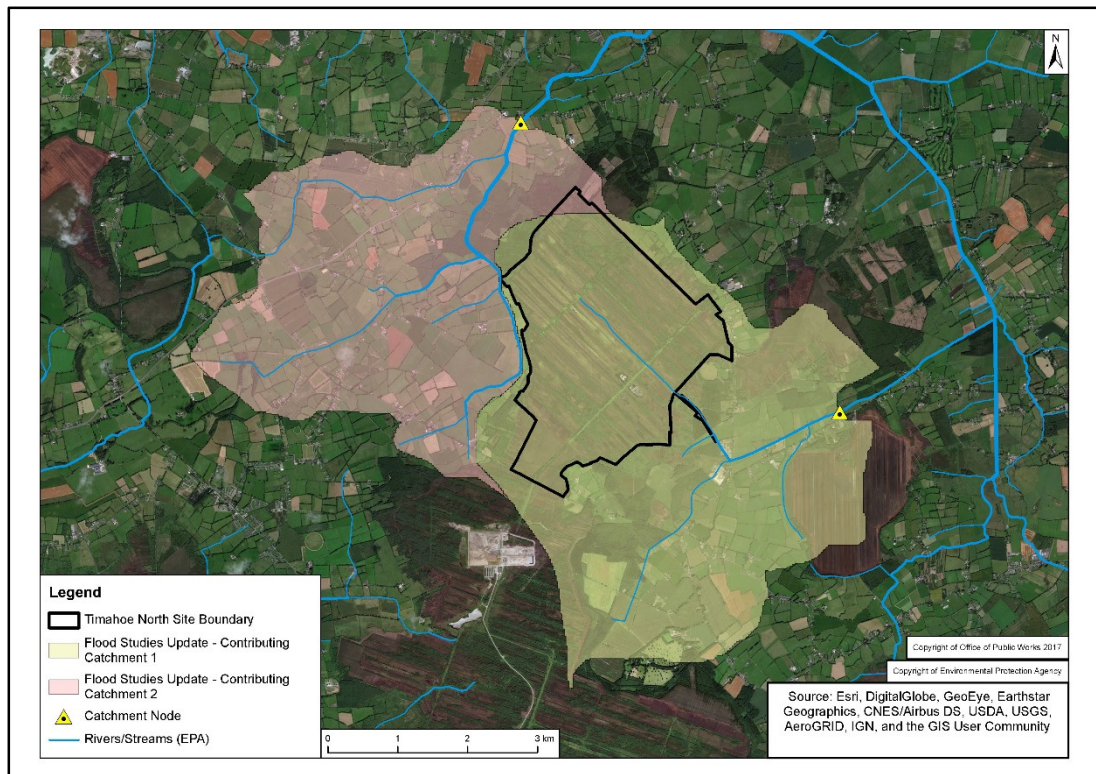


Figure 2-5 Timahoe North Catchments

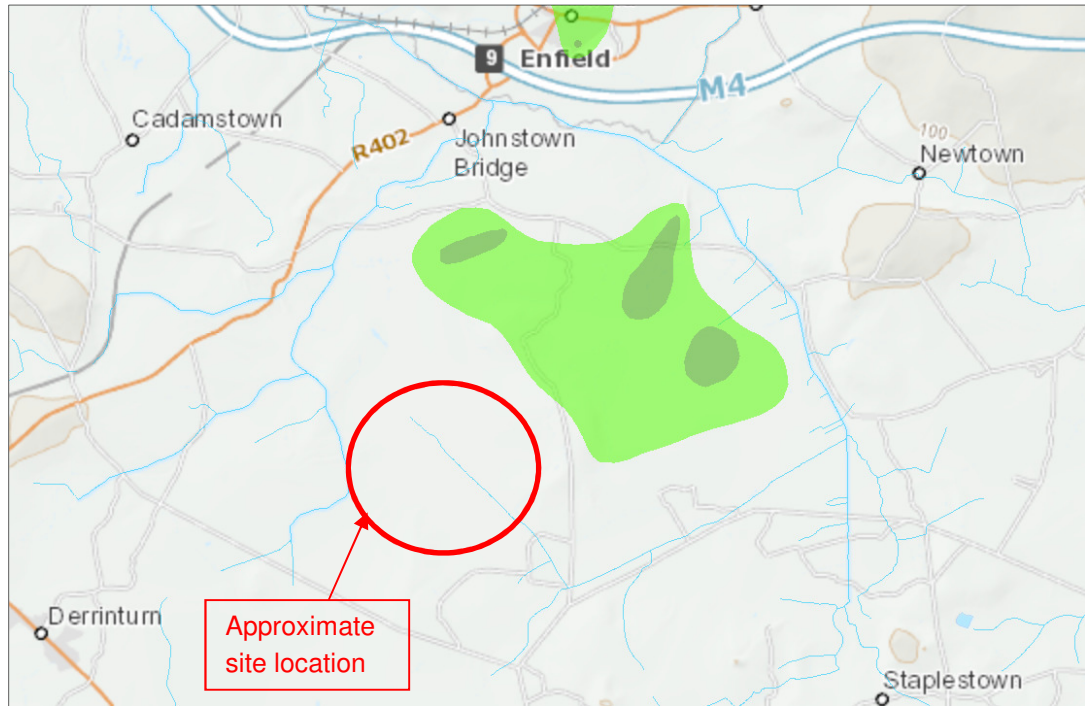


Figure 2-6 Protected Groundwater Source close to Timahoe North Site (shown in green)

2.4.2 Groundwater

The GSI National Draft Bedrock Aquifer map indicates that the bedrock aquifer can be classified as either a locally important aquifer where bedrock is generally moderately productive, or where bedrock is moderately productive only in local zones.

Groundwater was encountered at most trial pit locations during site investigation works. Seepage was largely classed as moderate to very slow with fast to moderate in some locations.

2.4.3 Precipitation

The nearest weather station to Timahoe North Solar Farm is at Dunsany Observatory. This weather station is located approximately 35 km north-east of the proposed solar farm. Given the proximity to the site it is expected that average rainfall would be similar at Timahoe North. The mean monthly rainfall at Dunsany Observatory is presented in Figure 2-7.

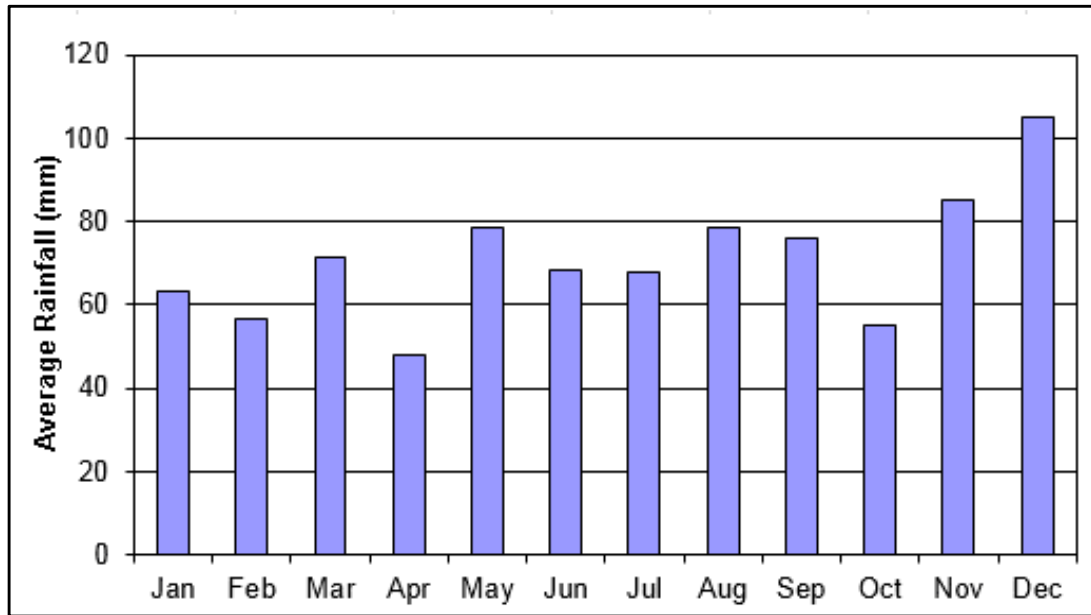


Figure 2-7 Mean monthly rainfall at Dunsany Observatory 2014 – 2017 (Met Éireann)

Met Éireann also publishes rainfall maps based on an observation period of 30 years. Figure 2-8 indicates a mean annual rainfall within the range of 800 – 1,000 mm per year for Timahoe North Solar Farm between 1981 and 2010.

There is no data on snowfall available for the site.

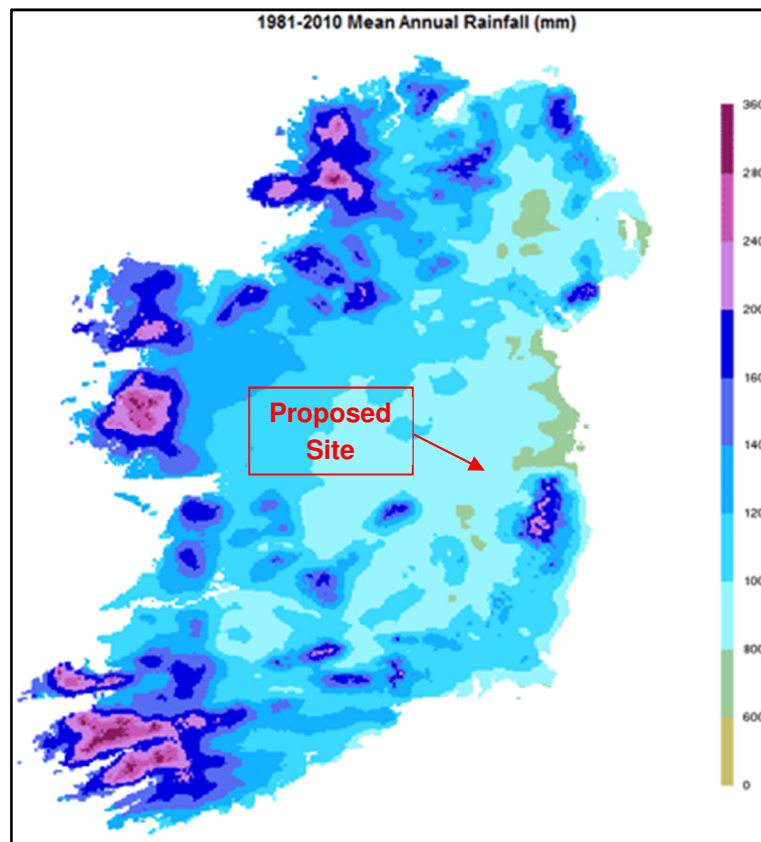


Figure 2-8 Mean Yearly Rainfall 1981 – 2010 (Met Éireann)

2.5 Land Use

The site is on land owned by Bord na Móna however production has been ceased at the site since the 1980s. Some infrastructure still exists on site including decommissioned railway lines and electricity cables.

The high voltage Derryiron to Maynooth 110 kV overhead electricity line crosses the main access route to the site, approximately 500 m from the site entrance.

2.6 Ecology

The site consists largely of cutover bog (PB4) which has been historically milled for peat extraction. Throughout the site there are areas of Wet Heath (HH3), Poor fen and flush (PF2), Raised bog (PB1) and regenerating peatland vegetation with a large network of drainage ditches (FW4), treelines (WL2), areas of scrub (WS1) and bog woodland (WN7) also present. It should be noted that these habitats are secondary habitats which have regenerated following cessation of turf cutting, with the exception of an area of raised bog to the north of the site. Several access tracks are also present crossing the site, which consist of dry meadows and grassy verges (GS2), with areas of buildings and other artificial surfaces (BL3) and recolonising bare ground.

The entire site is within the Mulgeeth River catchment, the river being a tributary of the Blackwater River. A watercourse flowing from the centre of the site drains to the southeast into the Mulgeeth. The Ballynamullagh stream runs along the western boundary of the site and also drains into the Blackwater River. Both streams are within the Boyne River catchment.

The site is not within or immediately adjacent to any designated nature conservation site. There are six Natura 2000 sites and four Natural Heritage Areas within 15 km of the bog. The nearest European site, Ballynafagh Lake SAC, is located 6.8 km (straight line) to the southeast of the works boundary. The nearest site with hydrological connectivity with the works site is River Boyne and River Blackwater SAC and SPA, located 15.3 km (hydrological route) downstream.

2.7 Bog Workings

The peatland at Timahoe North has been a cutaway bog for an extensive period of time. This has enabled the development of large areas of birch and pine scrub/woodland in mosaic with dry heath. The majority of the site has revegetated in some form except for locations where private peat cutting is still carried out.

2.8 Landslide Database

GSI have developed a land slide database that contains locations and details of recorded landslides throughout the Republic of Ireland. Two recorded landslides have occurred within in proximity to the Timahoe North site, both of which were related to canal embankment construction. The slides occurred at Derrymullen and

Edenderry. Both locations are marked on the Landslide Susceptibility Map generated by GSI shown in Figure 2-9. The details provided for these landslides are:

- Derrymullen: The GSI database shows that a landslide occurred at Derrymullen, approximately 7.5 km south of the Drehid cluster boundary. This was a landslide that occurred in peat bog adjacent to the Grand Canal in 1839.
- Edenderry: The GSI database shows that a peat landslide took place approximately 13 km west of the proposed solar farm site in 1916 following a period of heavy rain and flooding. The 270 m long slide occurred on the north bank of the Grand Canal with no apparent impact. A breach occurred again in 1989.



Figure 2-9 Landslide Susceptibility Map

2.9 Aerial Photography

Aerial images of the site are available to view on the Ordnance Survey Ireland website. Aerial photographs of the site from 1995, 2000 and 2005 were examined and features relevant to the geotechnical assessment noted. More recent satellite images from Google Maps, Bing Maps, and images from drone surveys commissioned for the project were also examined.

The aerial photography can be seen on drawing QS-000218-01-D453-028.

2.10 Desktop Information Sources

- Google Maps
- Bing Maps

- Geological Survey of Ireland (GSI)
- Ordnance Survey Ireland (OSI)
- Met Éireann
- LiDar
- Aerial photography
- Drone survey

3 Site Investigations

3.1 Site Works

A preliminary site investigation was carried out on the site by Irish Drilling Ltd in 2017/2018. The preliminary site investigation consisted of 25 no. shell and auger boreholes, 96 no. trial pits and extensive peat probing across the site. The locations of all trial pits and boreholes excavated at Timahoe North Solar Farm are shown on drawing QS-000218-01-D453-030. The results of the site investigation are contained in the ground investigation report.

3.2 Summary of Ground Conditions

Ground conditions at the site generally consists of peat over glacial deposits interbedded with glacio-fluvial deposits over possible bedrock.

The peat across the site has been harvested resulting in residual peat depth varying between 0.1 – 4.7 m BGL. The peat on the site is described as soft, dark orange/brown/black and fibrous with many rootlets which extend into the subsoil layer on occasion.

The glacial deposits generally consist of soft to very stiff grey gravelly clay/silt. These deposits are interbedded with gravels and sands within the stratum. These are generally over consolidated strata. The consistency of these strata typically tends to improve with depth.

Groundwater was observed at almost all of the trial pit locations. Seepage was largely classed as moderate to very slow with fast to moderate in some locations.

4 Site Observations

4.1 Overview

A number of site walkover surveys were carried out by ESB International in 2017. The following drawings summarise information on the site obtained from the desktop and site walkover studies.

- QS-000218-01-D453-028 Site Layout with Satellite Background
- QS-000218-01-D453-029 LIDAR Map
- QS-000218-01-D453-030 Site Investigation Locations
- QS-000218-01-D453-031 Peat Depth Map
- QS-000218-01-D453-032 Ground Slope Map

4.2 Inverters

The critical input values for the inverter locations are presented in Table 4-1.

Table 4-1 Critical PSRA Factors at Inverter Locations

Inverter	Ground Conditions and Topography
Inverter No. 1	<ul style="list-style-type: none"> • Peat depth: 1 – 2 m • Peat condition in trial pits: stands well • Ground slope: < 3° • Distance from nearest watercourse: < 200 m
Inverter No. 2	<ul style="list-style-type: none"> • Peat depth: 1.5 – 2.5 m • Peat condition in trial pits: stands well • Ground slope: < 3° • Distance from nearest watercourse: < 200 m
Inverter No. 3	<ul style="list-style-type: none"> • Peat depth: 1 – 1.5 m • Peat condition in trial pits: stands well • Ground slope: < 3° • Distance from nearest watercourse: < 200 m
Inverter No. 4	<ul style="list-style-type: none"> • Peat depth: 1.5 – 2.0 m • Peat condition in trial pits: stands well • Ground slope: < 3° • Distance from nearest watercourse: < 200 m
Inverter No. 5	<ul style="list-style-type: none"> • Peat depth: 2 – 2.5 m • Peat condition in trial pits: stands well • Ground slope: < 3° • Distance from nearest watercourse: < 200 m
Inverter No. 6	<ul style="list-style-type: none"> • Peat depth: 1.5 – 2 m • Peat condition in trial pits: stands well

Inverter	Ground Conditions and Topography
	<ul style="list-style-type: none"> • Ground slope: < 3° • Distance from nearest watercourse: < 200 m
Inverter No. 7	<ul style="list-style-type: none"> • Peat depth: 2 – 3 m • Peat condition in trial pits: stands well • Ground slope: < 3° • Distance from nearest watercourse: < 200 m
Inverter No. 8	<ul style="list-style-type: none"> • Peat depth: 1.5 – 2 m • Peat condition in trial pits: slowly squeezing • Ground slope: < 3° • Distance from nearest watercourse: < 200 m
Inverter No. 9	<ul style="list-style-type: none"> • Peat depth: 2.5 – 3 m • Peat condition in trial pits: stands well • Ground slope: < 3° • Distance from nearest watercourse: < 200 m
Inverter No. 10	<ul style="list-style-type: none"> • Peat depth: 2 – 2.5 m • Peat condition in trial pits: slowly squeezing • Ground slope: < 3° • Distance from nearest watercourse: < 200 m
Inverter No. 11	<ul style="list-style-type: none"> • Peat depth: 2 – 3 m • Peat condition in trial pits: slowly squeezing • Ground slope: < 3° • Distance from nearest watercourse: < 200 m
Inverter No. 12	<ul style="list-style-type: none"> • Peat depth: 2 – 2.5 m • Peat condition in trial pits: slowly squeezing • Ground slope: < 3° • Distance from nearest watercourse: < 200 m
Inverter No. 13	<ul style="list-style-type: none"> • Peat depth: 1.5 – 2.5 m • Peat condition in trial pits: slowly squeezing • Ground slope: < 3° • Distance from nearest watercourse: < 200 m
Inverter No. 14	<ul style="list-style-type: none"> • Peat depth: 1.5 – 2.5 m • Peat condition in trial pits: slowly squeezing • Ground slope: < 3° • Distance from nearest watercourse: < 200 m
Inverter No. 15	<ul style="list-style-type: none"> • Peat depth: 2 – 2.5 m • Peat condition in trial pits: stands well • Ground slope: < 3° • Distance from nearest watercourse: < 200 m

Inverter	Ground Conditions and Topography
Inverter No. 16	<ul style="list-style-type: none"> • Peat depth: 2.5 – 3 m • Peat condition in trial pits: slowly squeezing • Ground slope: < 3° • Distance from nearest watercourse: < 200 m
Inverter No. 17	<ul style="list-style-type: none"> • Peat depth: 3 – 3.5 m • Peat condition in trial pits: stands well • Ground slope: < 3° • Distance from nearest watercourse: < 200 m
Inverter No. 18	<ul style="list-style-type: none"> • Peat depth: 3 – 4 m • Peat condition in trial pits: stands well • Ground slope: < 3° • Distance from nearest watercourse: < 200 m
Inverter No. 19	<ul style="list-style-type: none"> • Peat depth: 3 – 3.5 m • Peat condition in trial pits: slowly squeezing • Ground slope: < 3° • Distance from nearest watercourse: < 200 m
Inverter No. 20	<ul style="list-style-type: none"> • Peat depth: 2 – 3 m • Peat condition in trial pits: slowly squeezing • Ground slope: < 3° • Distance from nearest watercourse: < 200 m
Inverter No. 21	<ul style="list-style-type: none"> • Peat depth: 2 – 3 m • Peat condition in trial pits: slowly squeezing • Ground slope: < 3° • Distance from nearest watercourse: < 200 m
Inverter No. 22	<ul style="list-style-type: none"> • Peat depth: 1.5 – 2.5 m • Peat condition in trial pits: stands well • Ground slope: < 3° • Distance from nearest watercourse: < 200 m
Inverter No. 23	<ul style="list-style-type: none"> • Peat depth: 1.5 – 2 m • Peat condition in trial pits: slowly squeezing • Ground slope: < 3° • Distance from nearest watercourse: < 200 m
Inverter No. 24	<ul style="list-style-type: none"> • Peat depth: 1.5 – 2.5 m • Peat condition in trial pits: slowly squeezing • Ground slope: < 3° • Distance from nearest watercourse: < 200 m
Inverter No. 25	<ul style="list-style-type: none"> • Peat depth: 2 – 3 m • Peat condition in trial pits: slowly squeezing • Ground slope: < 3°

Inverter	Ground Conditions and Topography
	<ul style="list-style-type: none"> Distance from nearest watercourse: < 200 m
Inverter No. 26	<ul style="list-style-type: none"> Peat depth: 1 – 2 m Peat condition in trial pits: slowly squeezing Ground slope: < 3° Distance from nearest watercourse: < 200 m
Inverter No. 27	<ul style="list-style-type: none"> Peat depth: 2 – 3 m Peat condition in trial pits: slowly squeezing Ground slope: < 3° Distance from nearest watercourse: < 200 m
Inverter No. 28	<ul style="list-style-type: none"> Peat depth: 1.5 – 2 m Peat condition in trial pits: slowly squeezing Ground slope: < 3° Distance from nearest watercourse: < 200 m
Inverter No. 29	<ul style="list-style-type: none"> Peat depth: 1 – 2 m Peat condition in trial pits: slowly squeezing Ground slope: < 3° Distance from nearest watercourse: < 200 m

4.3 Peat Repositories

The critical input values for the peat repository locations are presented in Table 4-2.

Table 4-2 Critical PSRA Factors at Peat Repository Locations

Peat Repository	Ground Conditions and Topography
Peat Repository 1	<ul style="list-style-type: none"> Peat depth: 2 – 3.5 m Peat condition in trial pits: stands well Ground slope: < 3° Distance from nearest watercourse: < 200 m
Peat Repository 2	<ul style="list-style-type: none"> Peat depth: 1 – 3 m Peat condition in trial pits: stands well Ground slope: < 3° Distance from nearest watercourse: < 200 m
Peat Repository 3	<ul style="list-style-type: none"> Peat depth: 1.5 – 3.5 m Peat condition in trial pits: stands well Ground slope: < 3° Distance from nearest watercourse: < 200 m
Peat Repository 4	<ul style="list-style-type: none"> Peat depth: 2.5 – 4 m Peat condition in trial pits: stands well Ground slope: < 3°

Peat Repository	Ground Conditions and Topography
	<ul style="list-style-type: none"> Distance from nearest watercourse: < 200 m
Peat Repository 5	<ul style="list-style-type: none"> Peat depth: 2.5 – 3.5 m Peat condition in trial pits: stands well Ground slope: < 3° Distance from nearest watercourse: < 200 m
Peat Repository 6	<ul style="list-style-type: none"> Peat depth: 2.5 – 4 m Peat condition in trial pits: slowly squeezing Ground slope: < 3° Distance from nearest watercourse: < 200 m
Peat Repository 7	<ul style="list-style-type: none"> Peat depth: 0.5 – 3 m Peat condition in trial pits: slowly squeezing Ground slope: < 3° Distance from nearest watercourse: < 200 m

4.4 Overhead Line Structures and Substation

The critical input values for the Overhead Line Structure locations and substation are presented in Table 4-3.

Table 4-3 Critical PSRA Factors at Overhead Line Structure Locations

Overhead Structure	Line	Ground Conditions and Topography
Poleset 114		<ul style="list-style-type: none"> Peat depth: 1.5 – 3 m Peat condition in trial pits: slowly squeezing Ground slope: < 3° Distance from nearest watercourse: < 200 m
Angle Mast 114A		<ul style="list-style-type: none"> Peat depth: 3 – 4.5 m Peat condition in trial pits: slowly squeezing Ground slope: < 3° Distance from nearest watercourse: < 200 m
Poleset 114B		<ul style="list-style-type: none"> Peat depth: 1 – 1.5 m Peat condition in trial pits: slowly squeezing Ground slope: < 3° Distance from nearest watercourse: < 200 m
Poleset 114C		<ul style="list-style-type: none"> Peat depth: 0.5 – 1.5 m Peat condition in trial pits: slowly squeezing Ground slope: < 3° Distance from nearest watercourse: < 200 m
Angle Mast 114D		<ul style="list-style-type: none"> Peat depth: 0.5 – 2.5 m Peat condition in trial pits: slowly squeezing

Overhead Structure	Line	Ground Conditions and Topography
		<ul style="list-style-type: none"> • Ground slope: < 3° • Distance from nearest watercourse: < 200 m
Angle Mast 115A		<ul style="list-style-type: none"> • Peat depth: 1.5 – 2.5 m • Peat condition in trial pits: slowly squeezing • Ground slope: < 3° • Distance from nearest watercourse: < 200 m
Poleset 115B		<ul style="list-style-type: none"> • Peat depth: 1 – 1.5 m • Peat condition in trial pits: slowly squeezing • Ground slope: < 3° • Distance from nearest watercourse: < 200 m
Poleset 115C		<ul style="list-style-type: none"> • Peat depth: 2 – 3 m • Peat condition in trial pits: slowly squeezing • Ground slope: < 3° • Distance from nearest watercourse: < 200 m
Angle Mast 115D		<ul style="list-style-type: none"> • Peat depth: 1.5 – 3.5 m • Peat condition in trial pits: slowly squeezing • Ground slope: < 3° • Distance from nearest watercourse: < 200 m
Substation		<ul style="list-style-type: none"> • Peat depth: 0.5 – 3 m • Peat condition in trial pits: stands well • Ground slope: < 3° • Distance from nearest watercourse: < 200 m

4.5 Other Infrastructure

The critical input values for other infrastructure locations are presented in Table 4-4.

Table 4-4 Critical PSRA Factors at Other Infrastructure Locations

Location	Ground Conditions and Topography
Site Compound	<ul style="list-style-type: none"> • Peat depth: 1.5 – 3 m • Peat condition in trial pits: stands well • Ground slope: < 3° • Distance from nearest watercourse: < 200 m
Temporary Compound	<ul style="list-style-type: none"> • Peat depth: 1.5 – 3 m • Peat condition in trial pits: stands well • Ground slope: < 3° • Distance from nearest watercourse: < 200 m

Location	Ground Conditions and Topography
Remained of site within probed area (conservative assumptions made)	<ul style="list-style-type: none">• Peat depth: 0 – > 5 m• Peat condition in trial pits: wet• Ground slope: < 3°• Distance from nearest watercourse: < 200 m

5 Evaluation of Stability

5.1 General

The evaluation of the stability of peat at the site is carried out using a Peat Stability Risk Assessment (PSRA). The following section provides the details and results of the first stage PSRA for the site. A peat stability risk assessment has been carried out in accordance with the best practice guidelines for peat landslide risk assessments published by the Scottish Government Energy Consents Unit in the report *"Peat Landslide Hazard and Risk Assessments: Best Practice Guide for Proposed Electricity Generation Developments (Second Edition, April 2017)"*. The first edition of these guidelines have been recommended in the Irish Wind Energy Association (IWEA) *"Best Practice Guidelines for the Irish Wind Energy Industry (2012)"*, and is supplemented by the experiences of ESB International on previously developed sites. This document set out four categories of risk and recommends various avoidance and/or mitigation actions for each category for each.

Peat stability risk is categorised as negligible, low, medium or high. Construction can take place in areas where risk categories range from negligible to medium with varying mitigation requirements. The negligible and low categories represent areas where the risk of peat instabilities are either considered minor in a standard construction environment or considered manageable by the adoption of specific additional mitigation measures respectively.

5.2 Methodology for Peat Stability Risk Assessment

The PSRA quantifies the risk level by assessing the likelihood of a peat instability event and the impact of that event. The risk rating is the product of the likelihood and the impact.

$$\text{Risk Rating} = \text{Likelihood} \times \text{Impact}$$

Figure 5-1 Risk Rating Formula

The likelihood is evaluated by considering all the available geotechnical, topographical, hydrological and hydrogeological characteristics of the site. The amount of information available depends of the level of site investigation that has been carried out.

Factors that are considered to be indicative of slope instability such as peat depth, subsoil conditions and slope angles are measured. Other factors, which have an indirect affect on peat stability, such as drainage, topography, vegetation, land use and previous peat slides in the locality are also assessed.

An impact assessment is carried out based on factors related to the volume of peat in a potential peat slide and the effect of a peat slide down slope. These factors

include peat volume, downslope topography and sensitivity of ecological environment in environment, infrastructure and buildings in potential flow paths.

In the PSRA, 22 likelihood factors and nine impact factors are scored on a scale of 0 to 3. A score of 0 indicates the factor is not relevant and scores of 1 – 3 are assigned depending on the risk associated with the factor from 1 (low) to 3 (high).

Likelihood factors which have the greatest influence on a potential peat failure and impact factors which have the greatest influence on the severity of the consequences are given a weighting to reflect their relative importance.

The score for each factor is multiplied by the weighting and the total of all the factor scores is expressed as a ratio of the maximum possible score.

The maximum possible score only includes the factors that have been used in the assessment i.e. factors with a score of 0 are not relevant and so do not contribute to the maximum possible score.

Likelihood Score = $\frac{\Sigma (\text{Likelihood Factor Score} \times \text{Factor Weighting})}{\Sigma (3 \times \text{Factor Weighting})^*}$

Impact Score = $\frac{\Sigma (\text{Impact Factor Score} \times \text{Factor Weighting})}{\Sigma (3 \times \text{Factor Weighting})^*}$

**only non zero factors counted*

Figure 5-2 Likelihood and Impact Score Formulae

Table 5-1 shows the four categories that the likelihood and impact scores fall into from negligible to high.

Table 5-1 Likelihood and Impact Scoring System

Likelihood Score		Impact Score	
0.0 – 0.3	Negligible	0.0 – 0.3	Negligible
0.3 – 0.5	Low	0.3 – 0.5	Low
0.5 – 0.7	Medium	0.5 – 0.7	Medium
0.7 – 1.0	High	0.7 – 1.0	High

The risk rating is determined by multiplying the likelihood score by the impact score. The risk rating ranges between 0 and 1 and four risk levels are determined based on the risk rating result. The risk levels are given in Table 5-2 and are used to determine the level of site investigation required. A further explanation of the risk ratings is given following the table.

Table 5-2 Risk Ratings and Risk Levels

Risk Rating	Risk Level	Action suggested for each zone
0.0 – 0.185	Negligible	Project should proceed with monitoring and mitigation of peat landslide hazards at these locations as appropriate
0.185 – 0.425	Low	Project may proceed pending further investigation to refine assessment and mitigate hazard through relocation or re-design at these locations
0.425 – 0.665	Medium	Project should not proceed unless risk can be avoided or mitigated at these locations, without significant environmental impact, in order to reduce risk ranking to low or negligible
0.665 – 1.0	High	Avoid project development at these locations

Negligible: Essentially there is no peat depth of consequences on site. There is no likelihood of a peat instability occurring and no significant impact. Good construction practice should be followed but no peat stability risk exists. This amounts to areas where peat depth is less than 0.5 m and this is further supported in the Irish document “*Best Practice Guidelines for the Irish Wind Energy Industry (2012)*” published by IWEA.

Low: Peat exists on site greater than depths of 0.5 m. However, the combination of the risk of an instability event occurring and impact is relatively low. Good construction practice should be followed with elimination of the risk through mitigation by design. Periodic supervision by a geotechnical engineer is required to ensure adequacy of the designed mitigation.

Medium: In this case peat depths are greater than 0.5 m depth. A number of broad scenarios can occur which will place the risk assessment of a site into the medium category and are as follows:

- a) The risk of an instability event is high but the impact of such an event occurring is low (e.g. a depth of peat greater than 1 m on a north facing slope of 3° – 7° close by a sensitive river which would be likely to develop a medium volume of peat flow). In this case only a localised impact may occur and no significant impact will occur overall. Further site investigation serves to refine the risk rating. The detailed design is carried out based on this information with specific mitigation measures. Contractors and site geotechnical staff develop method statements to minimise and mitigate the risk which are signed off. It also requires supervision and monitoring of ground conditions by a geotechnical engineer.
- b) The risk of an instability event is low and the impact of such an occurrence is high (e.g. a depth of peat greater than 1 m on a south facing slope of less than 3° but far removed from a sensitive river which, in the case of an instability event, would be likely to develop a large volume of peat flow). In the unlikely event that such an instability event occurs then the impact will be significant. Mitigation is as above.

- c) The risk of an instability event is high and the impact of such an occurrence is also high (e.g. a depth of peat greater than 1 m on a north facing slope of 3° – 7° but far removed from a sensitive river which would be likely to develop a large volume of peat flow). In this case the impact of the occurrence will be significant.

High: In this case peats depths, slope and potential level of impacts are high with the risk of occurrence very high also. Mitigation is generally not possible and it is not therefore possible to reduce the risk to a manageable or safe level. Construction should not proceed at locations with this risk category

5.3 Likelihood Factors Affecting Peat Stability

Table 5-3 presents a list of likelihood factors that affect the outcome of the peat stability assessment at the site combined with associated comments relevant to this particular site. Where there was limited information available for a factor in a particular area, conservative assumptions were made.

Table 5-3 Likelihood Factors Affecting Peat Stability

Likelihood Factors	Explanation	Comments
Peat Characteristics		
Peat depth	This factor is a critical factor in stability of peat on slopes and is therefore highly weighted	Depth based on peat probes carried out by ESB International and Irish Drilling Ltd, and also trial pits excavated by Irish Drilling Ltd.
Peat stability condition	This factor indicates strength and stability of the peat.	Based on trial pits excavated by Irish Drilling Ltd.
Subsoil Conditions		
Subsoil type	The nature of the subsoil can have an effect on the likelihood of an instability issue, i.e. firm glacial till materials present a lesser risk than soft sensitive soils.	Based on trial pits excavated by Irish Drilling Ltd.
Transition zone and peat subsoil interface	The nature of the interconnection between the peat and the mineral subsoil impacts on the stability.	Based on trial pits excavated by Irish Drilling Ltd.

Likelihood Factors	Explanation	Comments
Topography		
Elevation	Historically sites with elevations > 200 m OD have been more prone to peat slides.	Elevations at Timahoe North Solar Farm vary between approximately 78 and 89 m OD.
Slope aspect	Slopes to the north, north west and northeast present a higher risk of peat instability than to the east, south and west due to increased difficulty in drying.	The proposed areas of construction at Timahoe North Solar Farm are sloping in various directions.
Ground slope	The angle of the ground slope tends to have a significant impact on the stability of peat slopes and this is therefore highly weighted.	The topography across the site is generally quite flat. The slope angles are predominantly < 3° with some steeper slopes at drains, cutaway peat and railway embankments.
Slope characteristics downslope	This includes the nature of the slope, i.e. whether planar or convex and the distance to the break in the slope.	Slope characteristics downslope features are based on LiDar data.
Hydrology		
Distance from defined water course	This factor tends to affect the likelihood of an event with the sites closer to defined water courses presenting more risk.	Measurements to the nearest identified watercourse.
Surface water	This factor indicates a high water table level which can suggest a potential for failure.	Based on aerial photography and site walkover.
Evidence of piping	Peat pipes are natural drains within the peat which can provide pathways for significant amounts of runoff. An accidental blockage of a	There is no evidence of piping in the peat in the proposed construction areas based on the site walkover. The PSRA is to be updated should any evidence of piping be

Likelihood Factors	Explanation	Comments
	peat pipe could result in peat failure.	noted during detailed design and construction stages.
Direction of existing drainage ditches	Drainage ditches that are aligned cross slope can have an effect on the overall stability of a slope face.	Based on aerial photography and site walkover.
Annual rainfall	The annual rainfall level for the site effects how saturated the peat at the site can become and thus effect the strength of the peat, the peat subsoil interface and the load on the peat.	Based on Met Éireann rainfall data. Taken as between 800 and 1000 mm per annum.
Slide History		
Previous slides in the locality	This factor is relatively heavily weighted and suggests that if a peat slide has occurred at the site or within a 10 kilometre radius then there is a graduated risk of an occurrence at the site. However, this does not account for the relative nature of the site topographies or peat depths.	The GSI database shows two recorded landslides have taken place within 7.5 km and 13 km of the Timahoe North site, namely Derrymullen and Edenderry respectively.
Evidence of peat movement	This factor evaluates the effect of any existing on-site peat movement indicators such as tension cracks.	No evidence of peat movement was observed during the site walkovers. The PSRA is to be updated should any evidence of peat movement on the site be noted during detailed design and construction stages.
Other factors		

Likelihood Factors	Explanation	Comments
Vegetation	This is an indicator of the type of peat at the site and the hydrological nature of the site.	The site predominantly comprises of grasses, rushes and heathers. Some sections of the cutaway bog have little or no vegetation.
Peat working	This factor evaluates the effect of various peat workings on the stability of the peat.	The peatland at Timahoe North has been a cutaway bog for an extensive period of time.
Existing road type	This in an indicator of the depth of peat in the area and the likelihood of some stabilising measures.	There are no existing roads across the majority of the site. An assumption was made based on the results of the site investigation.
Time of year of construction	This is linked to the rainfall level at various stages through the year.	A conservative time of year, i.e. late summer/autumn, has been assumed for all locations across the site.

5.4 Impact Factors Affecting Peat Stability

Table 5-4 presents a list of likelihood factors that affect the outcome of the peat stability assessment at the site combined with associated comments relevant to this particular site.

Table 5-4 Impact Factors Affecting Peat Stability

Impact Factors	Explanation	Comments
Volume of peat in potential peat flow	This is the most heavily weighted factor of all factors. It is calculated based on the distance from the nearest defined watercourse and the depth of peat in the area.	A medium (1,000 – 20,000 m ³) peat flow has been calculated for a failure at each of the locations analysed. At some locations a small peat flow volume may be valid however a conservative approach for this factor has been adopted.

Impact Factors	Explanation	Comments
Downslope features	This factor accounts for the type/shape of down slope features.	Downslope features are based on LiDar data.
Proximity to defined valley	This is the distance from the site to the nearest defined river valley.	Distance taken from topographical maps.
Valley profile	This factor accounts for the shape of the valley of the river in question.	Profiles are generally flat across the site.
Downstream aquatic environment	Reflects the severity of the impact a peat slide event would have on the receiving aquatic environment.	Assumed to be sensitive throughout the site due to the proximity to the River Blackwater Special Area of Conservation (SAC).
Public roads in potential peat flow path	Rates the impact of a peat slide striking a public road.	There are no public roads in the potential peat flow paths.
Overhead lines in potential peat flow path	Rates the impact of a peat slide striking a service line.	The high voltage Derryiron to Maynooth 110 kV overhead electricity line crosses the main access route to the site, approximately 500 m from the site entrance. For the majority of the site, it has been deemed that a peat slide would strike watercourses prior to striking existing overhead lines.
Buildings in potential peat flow path	Rates the impact of a peat slide striking a habitable structure.	There are no buildings in the potential peat flow paths.
Capability to respond (access and resources)	Rates the capability of the site staff to respond to a peat instability event.	Assumed to be good based on site facilities during construction.

6 Results

6.1 Inverters

The results of the PSRA indicate that the peat stability risk rating at the inverter locations is low. The detailed risk assessment at each location is presented in Appendix A. An individual rating for each location is presented in Table 6-1.

Table 6-1 Inverter Locations Risk Rating

Inverter	PSRA Risk Rating
Inverter No. 1	Low
Inverter No. 2	Low
Inverter No. 3	Low
Inverter No. 4	Low
Inverter No. 5	Low
Inverter No. 6	Low
Inverter No. 7	Low
Inverter No. 8	Low
Inverter No. 9	Low
Inverter No. 10	Low
Inverter No. 11	Low
Inverter No. 12	Low
Inverter No. 13	Low
Inverter No. 14	Low
Inverter No. 15	Low
Inverter No. 16	Low
Inverter No. 17	Low
Inverter No. 18	Low
Inverter No. 19	Low
Inverter No. 20	Low
Inverter No. 21	Low
Inverter No. 22	Low
Inverter No. 23	Low
Inverter No. 24	Low
Inverter No. 25	Low

Inverter	PSRA Risk Rating
Inverter No. 26	Low
Inverter No. 27	Low
Inverter No. 28	Low
Inverter No. 29	Low

The PSRA results for the inverter locations are also presented graphically on Figure 6-1 and Figure 6-2. These graphs put the risk ratings for Timahoe North Solar Farm into context as the results are presented along with risk ratings for sites of known peat failures. Those sites are Derrybrien, Garvagh Glebe North, Garvagh Glebe South, which are ESB Wind Farms, and a peat slide that occurred in Kerry in 2008.

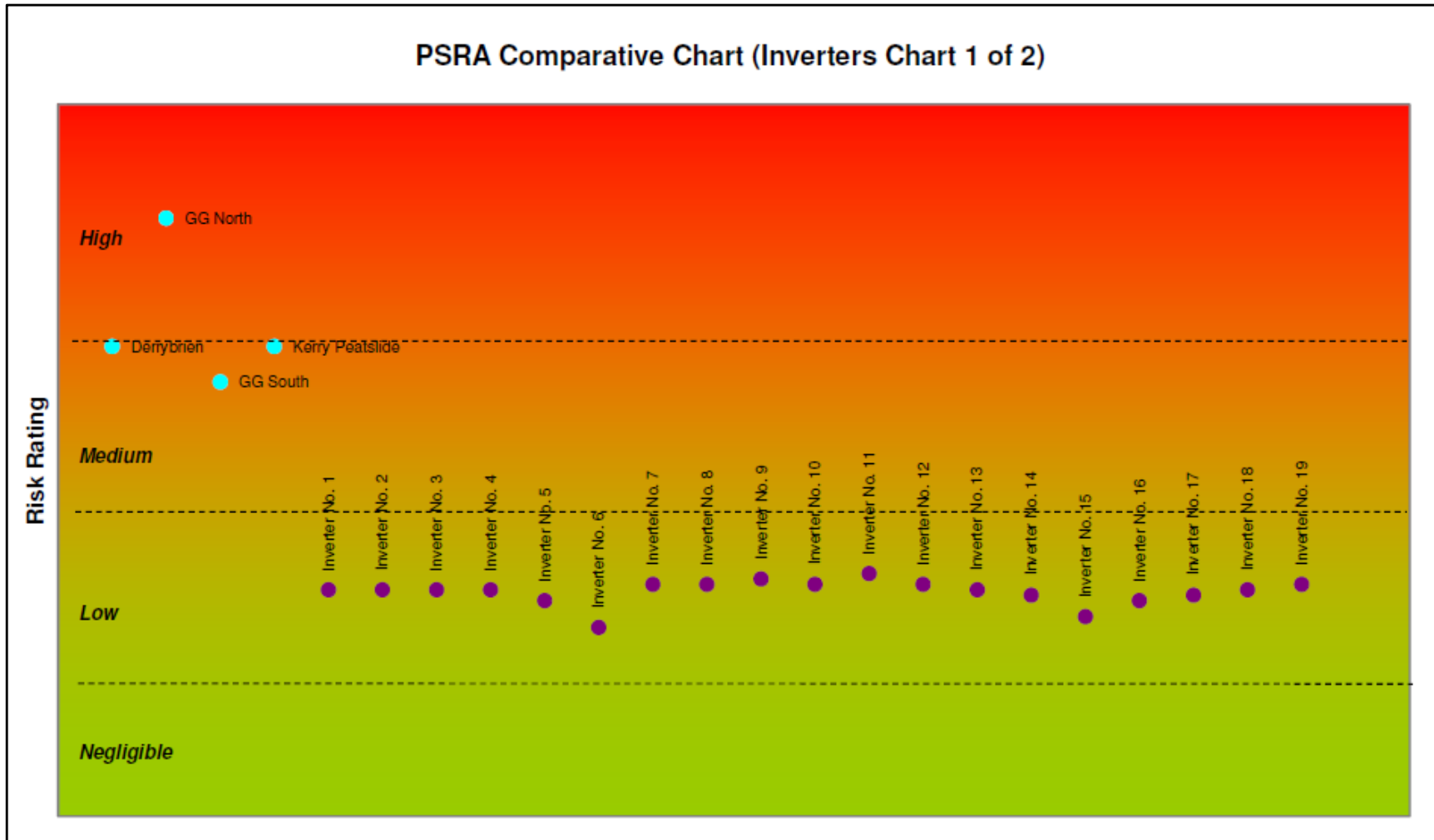


Figure 6-1 PSRA Comparative Chart – Inverters Chart 1 of 2

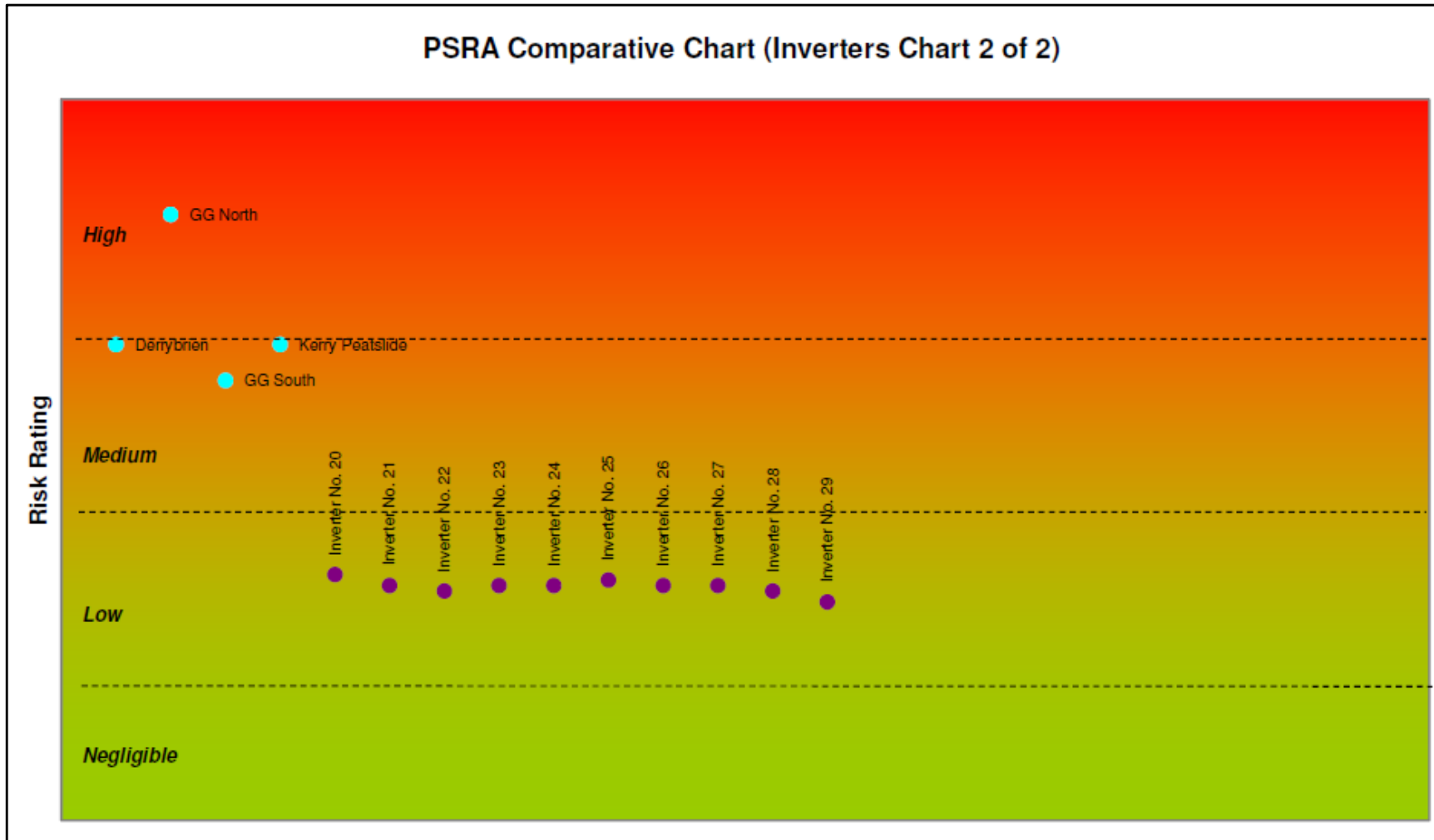


Figure 6-2 PSRA Comparative Chart – Inverters Chart 2 of 2

6.2 Peat Repositories

The results of the PSRA indicate that the peat stability risk rating at the peat repository locations is low. The detailed risk assessment at each location is presented in Appendix A. An individual rating for each location is presented in Table 6-2.

Table 6-2 Peat Repository Locations Risk Rating

Peat Repository	PSRA Risk Rating
Peat Repository 1	Low
Peat Repository 2	Low
Peat Repository 3	Low
Peat Repository 4	Low
Peat Repository 5	Low
Peat Repository 6	Low
Peat Repository 7	Low

The PSRA results for the peat repository locations are also presented graphically on Figure 6-3. This graph put the risk ratings for Timahoe North Solar Farm into context as the results are presented along with risk ratings for sites of known peat failures. Those sites are Derrybrien, Garvagh Glebe North, Garvagh Glebe South, which are ESB Wind Farms, and a peat slide that occurred in Kerry in 2008.

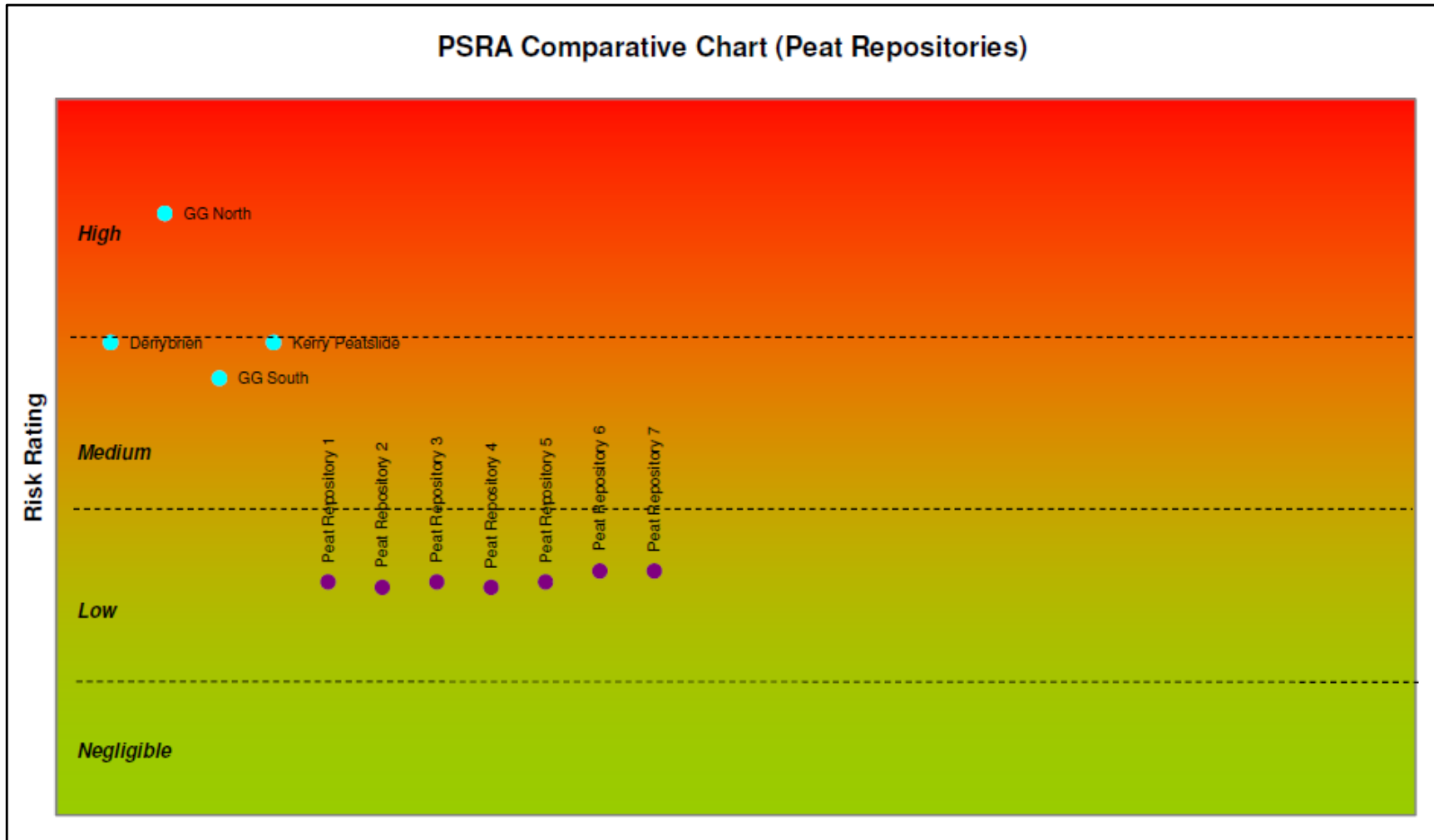


Figure 6-3 PSRA Comparative Chart – Peat Repositories

6.3 Overhead Line Structures and Substation

The results of the PSRA indicate that the peat stability risk rating at the overhead line structure locations is low. The detailed risk assessment at each location is presented in Appendix A. An individual rating for each location is presented in Table 6-3.

Table 6-3 Overhead Lines Structures and Substation Risk Rating

Overhead Line Structure	PSRA Risk Rating
Poleset 114	Low
Angle Mast 114A	Low
Poleset 114B	Low
Poleset 114C	Low
Angle Mast 114D	Low
Angle Mast 115A	Low
Poleset 115B	Low
Poleset 115C	Low
Angle Mast 115D	Low
Substation	Low

The PSRA results for the overhead line structure locations are also presented graphically on Figure 6-4. This graph put the risk ratings for Timahoe North Solar Farm into context as the results are presented along with risk ratings for sites of known peat failures. Those sites are Derrybrien, Garvagh Glebe North, Garvagh Glebe South, which are ESB Wind Farms, and a peat slide that occurred in Kerry in 2008.

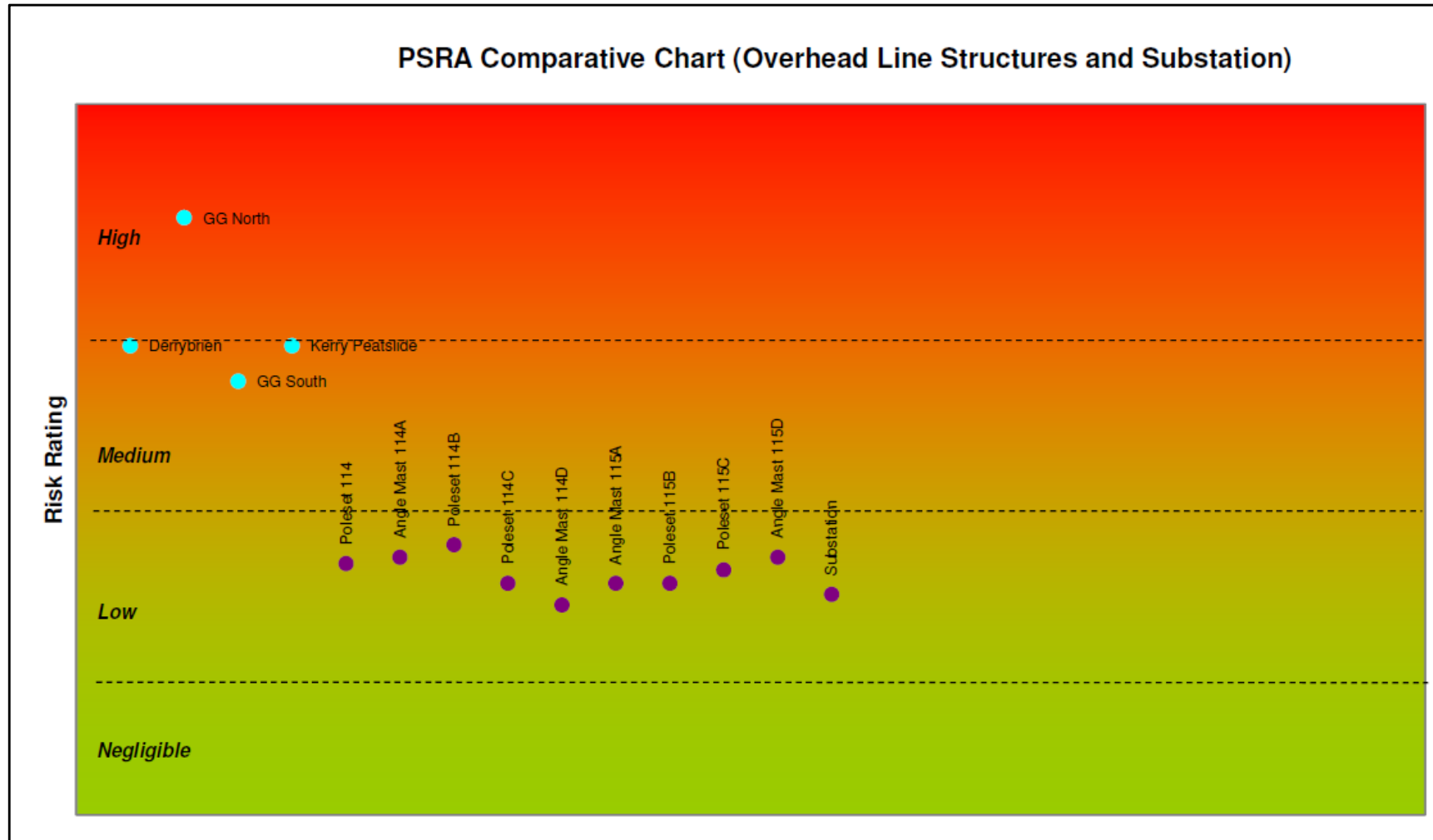


Figure 6-4 PSRA Comparative Chart – Overhead Line Structures and Substation

6.4 Other Infrastructure

The results of the PSRA indicate that the peat stability risk rating at the other infrastructure locations is low. The detailed risk assessment at each location is presented in Appendix A. An individual rating for each location is presented in Table 6-4.

Table 6-4 Other Infrastructure Risk Rating

Site Area	PSRA Risk Rating
Site Compound	Low
Temporary Site Compound	Low
Remained of site within probed area	Low

The PSRA results for the peat repository locations are also presented graphically on Figure 6-5. This graph put the risk ratings for Timahoe North Solar Farm into context as the results are presented along with risk ratings for sites of known peat failures. Those sites are Derrybrien, Garvagh Glebe North, Garvagh Glebe South, which are ESB Wind Farms, and a peat slide that occurred in Kerry in 2008.

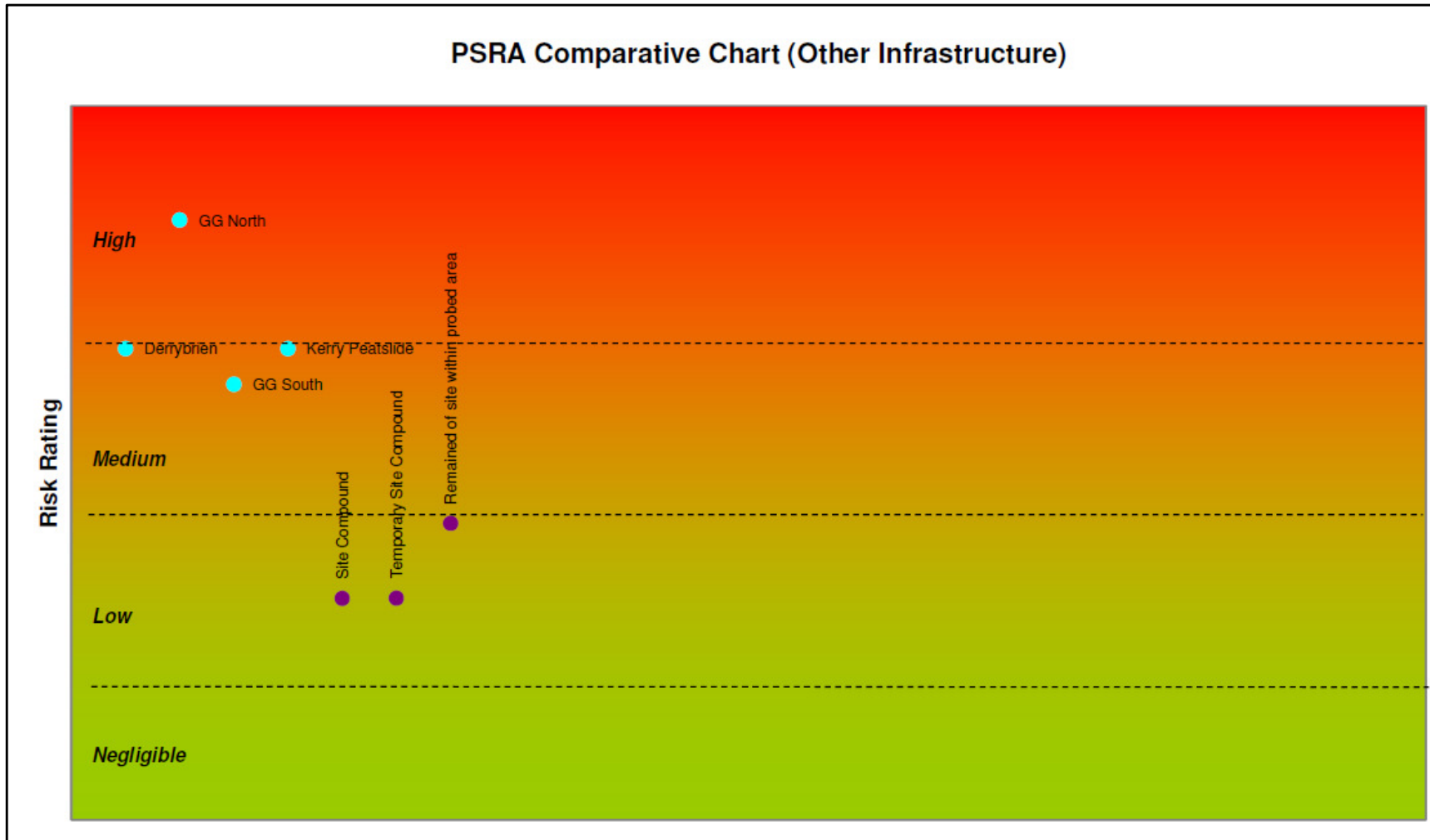


Figure 6-5 PSRA Comparative Chart – Other Infrastructure

7 Mitigation Measures

7.1 Mitigation Design and Implementation

The general process for risk mitigation that is applied in such sites can be demonstrated by the flow chart in Figure 7-1. The level of site investigation, design and control varies in order to minimise the risk as the project progresses through different stages; from pre-planning to detailed design to construction to operation and maintenance.

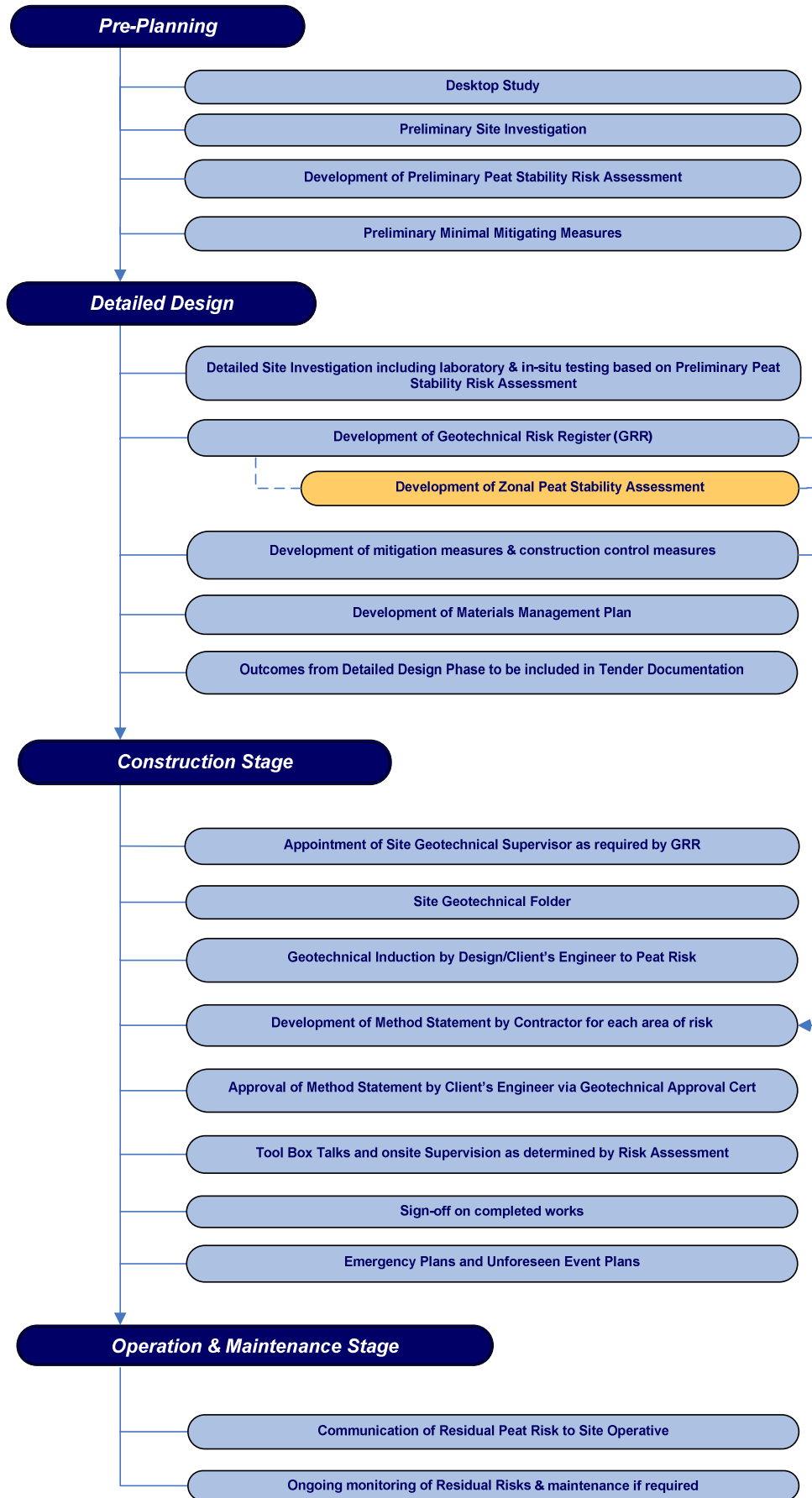


Figure 7-1 Peat Stability Risk Mitigation Process

The process can be summarised as follows:

Pre-Planning Phase:

The following outlines an overview of the tasks for the pre planning phase:

- Carry out a desk top study of the site.
- Carry out a preliminary site investigation.
- Carry out a PSRA for the site based on the site investigation and desk top study.
- Define a risk category for the site based on the PSRA so that the minimum requirements for the detailed design and construction phase are determined or the site is rejected based on severity of peat instability risk.

Detailed Design:

The following outlines an overview of the tasks for the detailed design phase:

- Carry out detailed site investigation if required by the PSRA inclusive of in situ testing and laboratory testing in specific risk areas on the site.
- Develop a Geotechnical Risk Register (GRR).

Construction Phase:

The following outlines an overview of the tasks for the construction phase:

- Client's Geotechnical Engineer to provide a Geotechnical Induction to all contractor supervisory staff.
- Client to appoint a Site Geotechnical Supervisor to carry out supervision of site works as required. The Site Geotechnical Supervisor will be required to inspect that works are carried in accordance with the requirements of the PSRA, identifying new risks and ensuring all method statements for works are in place and certified.
- Retain a Site Geotechnical Folder which contains all the geotechnical aspects of the site including but not limited to GRR, site investigation information, method statements etc.
- Contractor to develop a Method Statement for the works to be carried out in each of the PSRA areas cognisant of the required mitigating measures.
- Client's Geotechnical Engineer/Site Geotechnical Supervisor to approve the method statement via a Geotechnical Approval Cert.
- Contractor to provide tool box talks and on site supervision prior to and during the works.
- Daily sign off by supervising staff on completed works.
- Implementation of emergency plan and unforeseen event plan by the contractor.

Operation and Maintenance Phase:

The following outlines an overview of the tasks for the operation and maintenance phase:

- Communication of residual peat risk to appropriate site operatives.
- Ongoing monitoring of residual risks and maintenance if required. Such items would consist of regular inspection of drains to prevent blockages, inspections of specific areas after a significant rainfall event.

The tasks identified in the pre-planning phase have been carried out for this development. The minimum mitigation requirements for the subsequent phases are presented in the remainder of this section of the report.

7.2 Preliminary Design Mitigation Measures

At preliminary design stage we have carried out a comprehensive PSRA for the development and have advised on the layout of the substation, access roads, and inverter hardstandings taking the results into account in order to reduce peat stability risks.

The following mitigation measures have been implemented during the preliminary design stage:

- A comprehensive desk study and ground investigation was carried out to characterise the peat and subsoil conditions across the site and to identify peat stability risk factors, including topography, hydrology and hydrogeology.
- Earthworks volumes were calculated using the site investigation data, LiDar and AutoCAD Civil 3D software.
- The site layout has been optimised during the detailed site investigations to avoid or minimise risks identified; e.g. moving the substation to a shallower peat area.
- An excavated material management strategy has been developed to store the excavated peat and mineral soil within designated repositories across the site so that the risk of a peat slide from uncontrolled peat storage is negligible. There are seven proposed peat repositories located across the site; PR-1 to PR-7. The quantities of peat and other excavated material to be stored at each location has been estimated.

7.3 Detailed Design Mitigation Measures

The layout of the solar farm has been designed during the pre-planning stage with a view to avoiding and minimising geotechnical risks as far as possible. As the project proceeds into the detailed design stage, ongoing detailed site investigation works will be completed which may identify new risk. Comprehensive site investigation has been carried out to date to enable the completion of peat stability risk assessments, with all trial pitting works completed.

The following mitigation measures are recommended during the detailed design stage:

- A GRR will be developed for the site.
- The formation levels for all structures, hardstandings and access tracks will be finalised following the detailed design site investigations when additional trial pits and boreholes will be excavated at the site. The site investigations carried out to date indicate that piled foundations will be required for the majority of the infrastructure. This will significantly minimise the amount of peat and soil generated during excavation.
- A detailed materials management plan will be written during the detailed design phase of the project. This plan shall specify where material excavated from each excavation or length of access track is to be disposed of.

7.4 Construction Mitigation Measures

7.4.1 Documentation

Construction works in peat areas will be strictly controlled by the Client's site supervisory staff. The following Quality Assurance procedures are proposed:

- Contractor to be supplied with a GRR detailing geotechnical risks.
- Construction methods will be directed by the Client's Geotechnical Engineer/Site Geotechnical Supervisor and strictly adhered to by the Contractor.
- Contractor to produce individual method statements for work in peat taking due account of the peat related risks and other geotechnical risks detailed in the GRR.
- Client's Geotechnical Engineer to approve the Contractor's Method Statement by the issuing of a certificate.
- No work in peat will take place without a Geotechnical Approval Certificate.
- Client's Geotechnical Engineer to provide a Geotechnical Induction to all contractor supervisory staff.
- A toolbox talk is required for the Contractor's operatives prior to commencing work in the peat area.
- Excavation in peat areas is subject to part time supervision by the Site Geotechnical Supervisor at this site depending on the outcome of the GRR.
- A daily record of peat excavations will be completed by the Site Geotechnical Supervisor. Any new risks that come to light will be communicated to the Geotechnical Engineer.

7.4.2 Construction Control Measures

The following control measures will be enforced during construction of the solar farm in areas of deep peat:

- Minimise stockpiling of materials or parking plant on peat.
- Minimise tracking machinery on peat.
- Minimise length of unsupported excavations in peat.
- Side slopes of cuttings in peat will be trimmed back to stable permanent side slopes. In soft potentially unstable peat a berm of mineral soil will be constructed across the top of the cutting slopes to support the peat face.
- No work is to be carried out down slope of a peat excavation at any time.
- Water build up in excavations is to be avoided.
- Peat excavations are not to be left unsupported for extended periods or overnight.
- The use of vibrating rollers not permitted (dead weight permitted).
- Stringlines with posts at 10 m centres downslope of works in deep peat areas. They will be installed prior to commencement of construction and remain in place for the duration of the works to monitor for any potential movements.
- Upslope cut-off drains to be installed in advance of construction.
- The existing drainage patterns in the peat will be maintained as far as is practicable.
- There will be no uncontrolled discharges of water onto peat.
- If there is any deviation from the agreed work methodology, or if work practices are unsafe, the Site Geotechnical Supervisors will give instructions to the Contractor's Supervisor or directly to the Site Operatives.
- The Site Geotechnical Supervisor will suspend work if work practices or weather conditions are unsafe.

7.4.3 General Spoil Management Risk Mitigation Measures

Controlled handling and deposition of excess peat and mineral soil from excavations is an integral component of peat stability risk management for a deep peat site. Uncontrolled deposition of spoil and excessive loading on peat in high-risk areas can lead to a bearing capacity failure or a large scale translational peat slide due to the increased shear stress at the base of the peat under the applied surcharge load.

To reduce the risk of a peat slide due to spoil management the following general risk mitigation measures will be adopted:

- Store peat and mineral soil in designated repository areas.
- No permanent sidecast storage of mineral soil is permitted on the peat.

- Boundary markers will be used within the peat repository areas to control the extent and depth of excavated peat placed during construction. The sidecast peat will be spread out evenly over the repository area to promote runoff and to prevent ponding of rainwater in the remoulded peat. Interceptor drains will be constructed upslope from the peat repositories to prevent the peat from becoming saturated from surface runoff.
- Excavated peat to be inspected by a geotechnical engineer to ensure that it is stable on the slopes at the time of deposition and it will be monitored for signs of creep or movement over the course of construction. The highest risk would be in the short term when the remoulded peat has been freshly placed. Over time the material will dry out and re-vegetate, which will improve the strength and stability of the excavated material, allowing the peat to regenerate.

7.4.4 Specific Spoil Management Risk Mitigation Measures

Spoil will be created from the excavated substation compound, inverter hardstandings, drains, and underground cables. The total volume of materials to be excavated for the various components of the development is estimated to be 63,400 m³.

The peat storage capacity of the repositories and the peat produced from the site infrastructure construction has been calculated using AutoCAD Civil 3D combined with LiDAR, survey, probe data and site investigation results. The net storage capacity of each of the repositories is summarised in Table 7-1.

Table 7-1 Peat Repository Net Storage Capacity

Repository Location	Net Storage Capacity (m ³)
Peat Repository 1	2,500
Peat Repository 2	2,500
Peat Repository 3	9,803
Peat Repository 4	10,056
Peat Repository 5	15,085
Peat Repository 6	12,950
Peat Repository 7	42,232
<i>Total</i>	<i>95,126</i>

The peat repository storage areas are based on peat spread at a height of 1 m. Trenter, N.A. (2001) recommends a bulking factor of 1.25 to 1.45 for peat and 1.20 to 1.40 for cohesive soils. With a repository net storage capacity of 95,126 m³ and a volume of 63,400 m³ of excavated material to be stored in repositories, this results in an allowable bulking factor of 1.5. This indicates that there is more than sufficient capacity in the peat repositories on the site to store the excavated spoil material.

7.4.5 Repositories

The peat and mineral soil will be placed in the repository areas by end-tipping from dump trucks at suitable access points off the site roads. The material will then be spread out across the deposition areas using long reach and/or wide tracked excavators suitable for working on the intact material. The final surface of the placed peat will be $< 2^\circ$.

7.4.6 Cut Slopes in Peat

Where peat is exposed on permanent slopes in cuttings it will be trimmed back to stable slopes of 1V:1H or flatter. For deeper peat or where the peat is too soft to trim it back to permanent slopes of 1V:1H then a berm of rockfill will be constructed along the edge of the slope to support the peat.

Temporary support will be provided to the sides of the excavations during construction unless the sides can be battered back to a stable temporary slope for the duration of the works. This is not only a requirement for peat stability, it is also a health and safety consideration to protect personnel working inside the excavation.

In relatively shallow peat, typically less than about 2.0 – 2.5 m deep, where the peat strength and groundwater conditions are favourable it is often possible to trim the sides of the excavation in peat back to stable slopes of about 1V:1H to 1V:3H. The slope angle should be determined by a geotechnical engineer following the observational approach.

Figure 7-2 shows an excavation in peat up to about 2.5 – 3.0 m deep on a previous ESB Wind Farm site in Co. Tyrone where the peat conditions were very favourable and the sides were trimmed back to temporary slopes of about 1V:1H during construction.



Figure 7-2 Excavation trimmed back to a stable temporary side slope

Areas where it may be possible to trim back the side slopes of excavations are often indicated by stable trial pits in peat with little or no ingress of groundwater during excavation. Relatively high undrained shear strengths from a hand vane (> 10 kPa) would also indicate where the side slopes could be stable. It should be confirmed by inspection by a geotechnical engineer on site during excavation.

Where there are deep deposits of weak amorphous peat with a high groundwater table and significant groundwater ingress in the excavation it will generally be necessary to provide some temporary support to the peat slopes during or in advance of excavation to prevent any shear failure in the peat and to stabilise the excavation. This can normally be achieved with sheet piles or by constructing a rockfill berm around the perimeter of the excavation over the full depth of peat in advance of excavation. Rockfill berms are normally constructed in a trench using the controlled displacement of peat. This involves initially excavating to a stable depth in the peat and then pushing coarse rockfill into the weak peat below this level to refusal on the underlying mineral soil. The weak peat is displaced largely upward and removed in the process to form a berm with a matrix of rockfill supported on the mineral soil. The rockfill berm is then constructed up to original ground level to support the peat over the full height.

The berm is constructed in a continuous operation around the perimeter of the excavation, starting on the upslope side. The peat inside the berm is subsequently excavated out to complete the excavation to formation. The berm has to be set out in advance to allow sufficient clearance to provide stable temporary side slopes in the mineral soil above formation. The berms are usually up to 4 m wide to support a

mechanical excavator used to construct the berm. The inside face is subsequently trimmed back to a stable angle of repose at about 1V:1H.

Figure 7-3 shows an excavation in 4.5 m of very soft and weak peat where a rockfill berm was constructed around the perimeter of the excavation to support the peat.



Figure 7-3 Rockfill berm around an area of deep peat on an existing ESB Wind Farm

8 Conclusions

The peat stability risk assessments have shown that there is a low risk of peat instability at the Timahoe North Solar Farm site in the absence of mitigation measures. This risk has been minimised by optimising the design of the solar farm. The implementation of mitigation measures during the detailed design and construction stages of the project will further reduce the risk rating of peat instability across the site.

9 Recommendations

The following recommendations are made for the detailed design and construction stages of the development:

- A GRR will be developed for the site.
- The formation levels for foundations and hardstandings are to be finalised following the detailed design site investigations.
- A materials management plan will be written for the site, estimating the volumes of excavated material and specifying how and where material is to be disposed.
- All peat and mineral soil excavated during construction will be separated and stored in designed repository areas.
- A documentation and quality assurance system for construction in peat will be put in place.
- The construction methodology chosen will minimise the risk of peat instability. Construction control measures will be strictly enforced on site.

Appendix A Peat Stability Risk Assessment Sheets



**Peat Stability Risk Assessment
Timahoe North Solar Farm**

Location:	Inverter No. 7
Inspected on:	2017
Inspected by:	ESB International
Completed by:	SS
Date:	February 2018

Inverter No. 7										
No.	Likelihood/ Impact Factors	Value	Rating				Rating Value	Weighting	Score	Comment
			1	2	3					
LIKELIHOOD										
1.0	Ground Conditions									
	Peat									
1.1	Peat Depth	2 - 3 m	< 1 m	> 3 m	1 - 3 m	3	2	6	Based on peat probes carried out by ESB International and Irish Drilling, and also trial pits excavated by Irish Drilling Ltd in 2017.	
1.2	Peat Condition in Trial Pits	Stands Well	Dry/ Stands well	Slowly squeezing	Extremely Wet/ Undiggable	1	1	1	Trial pits excavated by Irish Drilling Ltd in 2017.	
	Subsoil Characteristics									
1.3	Subsoil Type	Soft silt	Gravel/ Firm Glacial Till	Smooth Rock	Soft Sensitive Clay	3	1	3	Trial pits excavated by Irish Drilling Ltd in 2017.	
1.4	Peat fibres continuous across transition to subsoil	Partially	Yes	Partially	No	2	1	2	Trial pits excavated by Irish Drilling Ltd in 2017.	
2.0	Topography									
	Situation									
2.1	Elevation OD [m]	~ 78 - 89 mOD	< 200 m		> 200 m	1	1	1	From LiDar.	
2.2	Slope Aspect	S	SW, S, SE	W, E	NW, N, NE	1	1	1	From LiDar.	
	Slope Angle									
2.3	Slope Angle - Ground Surface	< 3°	< 3°	> 7°	3° - 7°	1	2	2	From LiDar.	
	Geomorphology									
2.4	General slope characteristics downslope	Planar	Concave	Planar	Convex	2	1	2	From LiDar.	
2.5	Distance from break in slope	>100m	> 100 m	50 - 100 m	< 50 m	1	1	1	From LiDar.	
3.0	Hydrology									
	Hydrology									
3.1	In broad valley upslope from defined watercourse	Yes, slopes < 3°	No	Yes, slopes < 3°	Yes, slopes ≥ 3°	2	1	2	From LiDar.	
3.2	Distance from head of defined watercourse	< 200m	> 300 m	200 - 300 m	< 200 m	3	1	3	From LiDar.	
3.3	Surface water	Localised	Localised	Ponded in drains	Springs/ Surface Water	1	1	1		
3.4	Evidence of piping	No	No	-	Yes	1	1	1	From site walk and site investigation.	
3.5	Existing drainage ditches	Varied	Down slope	Varied / Oblique	Across slope	2	1	2		
3.6	Annual Rainfall	800 - 1000 mm/yr	< 1000 mm/yr	1000 - 1400 mm/yr	>1400 mm/yr	1	1	1	From Met Éireann.	
4.0	Other Factors									
	Vegetation									
4.1	Vegetation	Wetlands	Dry Heather	Grasslands	Wetlands	3	1	3	From aerial photography, drone survey and site walk.	
4.2	Forestry (if applicable)	N/A	Good Growth	Fair	Stunted Growth	0	1.5	0	From aerial photography, drone survey and site walk.	
	Slide History									
4.3	Previous slides in locality	> 5 km	> 5 km	< 5 km	On site	1	2	2	From Geological Survey of Ireland.	
4.4	Evidence of movement in peat (e.g. tension cracks, step features, compression features)	No	No	-	Yes	1	1	1	From site walk and site investigation.	
	Land Use									
4.5	Peat Workings	Cutaway/Turbary	None	Cutaway/Turbary	Machine Cut	2	1	2	From aerial photography, drone survey and site walk.	
	Other Factors									
4.6	Existing roads in place	Floating Road	Solid Road		Floating Road	3	1	3	No existing road. Value assumed.	
4.7	Time of year for construction	Late Summer/ Autumn	Spring	Winter / Early Summer	Late Summer/ Autumn	3	1	3	Worst case scenario assumed.	
	Likelihood Rating									
						Total		43		
						Max Possible		72		
									Likelihood Score	
									0.0-0.3	
									Negligible	
									1	
									0.3-0.5	
									Low	
									2	
									0.5-0.7	
									Medium	
									3	
									0.7-1.0	
									High	
									4	

IMPACT									
5.0	Impact Factors								
5.1	Volume of peat in potential peat flow	Medium (1,000 - 20,000 m³)	Small volume (<1,000 m³)	Medium (1,000 - 20,000 m³)	Potential for Bog burst	2	3	6	Based on distance to downslope watercourse.
5.2	Downslope features	Watercourse	Bowl/ contained	Minor undefined watercourse	Valley	2	1	2	From LiDar
5.3	Proximity to defined valley	< 200 m	> 500 m	200 - 500 m	< 200 m	3	1	3	From LiDar
5.4	Valley profile	Flat	Flat	Intermediate	Steep	1	1	1	From LiDar
5.5	Downstream aquatic environment	Sensitive	Non-sensitive	Sensitive	Drinking water supply	2	1	2	River Blackwater Special Area of Conservation (SAC).
5.6	Public roads in potential peat flow path	No	No	Local Road	Regional Road	1	1	1	From aerial photography, drone survey and site walk
5.7	Overhead lines in potential peat flow path	No	Phone Lines	Electricity, LV	Electricity MV, HV	1	1	1	From service drawings and site walk
5.8	Buildings in potential peat flow path	No	No	Farm out-houses	Dwelling	1	1	1	From aerial photography, drone survey and site walk
5.9	Capability to respond (access and resources)	Good	Good	Fair	Poor	1	1	1	Based on contractor facilities on site during construction.
	Impact Rating								
						Total		18	
						Max Possible		33	
									Impact Score
									0.0-0.3
									Negligible
									1
									0.3-0.5
									Low
									2
									0.5-0.7
									Medium
									3
									0.7-1.0
									High
									4

RISK RATING

Risk Rating = Likelihood * Impact

Risk Rating = 0.60 * 0.55 = 0.33 Low

Risk Rating	Risk Level	Action Required
0.0 - 0.18	Negligible	Normal SI
0.19 - 0.42	Low	Targeted SI, design of specific mitigation measures. Part time supervision during construction.
0.43 - 0.66	Medium	Avoid construction in the area if possible. If unavoidable, detailed SI and design of specific mitigation measures. Full time supervision during construction.
0.67 - 1.0	High	Avoid construction in this area.



**Peat Stability Risk Assessment
Timahoe North Solar Farm**

Location:	Inverter No. 9
Inspected on:	2017
Inspected by:	ESB International
Completed by:	SS
Date:	February 2018

Inverter No. 9												
No.	Likelihood/ Impact Factors	Value	Rating				Rating Value	Weighting	Score	Comment		
			1	2	3	4						
LIKELIHOOD												
1.0	Ground Conditions											
	Peat											
1.1	Peat Depth	2.5 - 3.0 m	< 1 m	> 3 m	1 - 3 m	3	2	6		Based on peat probes carried out by ESB International and Irish Drilling, and also trial pits excavated by Irish Drilling Ltd in 2017.		
1.2	Peat Condition in Trial Pits	Stands Well	Dry/ Stands well	Slowly squeezing	Extremely Wet/ Undiggable	1	1	1		Trial pits excavated by Irish Drilling Ltd in 2017.		
	Subsoil Characteristics											
1.3	Subsoil Type	Very soft silt	Gravel/ Firm Glacial Till	Smooth Rock	Soft Sensitive Clay	3	1	3		Trial pits excavated by Irish Drilling Ltd in 2017.		
1.4	Peat fibres continuous across transition to subsoil	No	Yes	Partially	No	3	1	3		Trial pits excavated by Irish Drilling Ltd in 2017.		
2.0	Topography											
	Situation											
2.1	Elevation OD [m]	~ 78 - 89 mOD	< 200 m	> 200 m	> 200 m	1	1	1		From LiDar.		
2.2	Slope Aspect	S	SW, S, SE	W, E	NW, N, NE	1	1	1		From LiDar.		
	Slope Angle											
2.3	Slope Angle - Ground Surface	< 3°	< 3°	> 7°	3° - 7°	1	2	2		From LiDar.		
	Geomorphology											
2.4	General slope characteristics downslope	Planar	Concave	Planar	Convex	2	1	2		From LiDar.		
2.5	Distance from break in slope	>100m	> 100 m	50 - 100 m	< 50 m	1	1	1		From LiDar.		
3.0	Hydrology											
	Hydrology											
3.1	In broad valley upslope from defined watercourse	Yes, slopes < 3°	No	Yes, slopes < 3°	Yes, slopes ≥ 3°	2	1	2		From LiDar.		
3.2	Distance from head of defined watercourse	< 200m	> 300 m	200 - 300 m	< 200 m	3	1	3		From LiDar.		
3.3	Surface water	Localised	Localised	Ponded in drains	Springs/ Surface Water	1	1	1				
3.4	Evidence of piping	No	No	-	Yes	1	1	1		From site walk and site investigation.		
3.5	Existing drainage ditches	Varied	Down slope	Varied / Oblique	Across slope	2	1	2				
3.6	Annual Rainfall	800 - 1000 mm/yr	< 1000 mm/yr	1000 - 1400 mm/yr	>1400 mm/yr	1	1	1		From Met Éireann.		
4.0	Other Factors											
	Vegetation											
4.1	Vegetation	Wetlands	Dry Heather	Grasslands	Wetlands	3	1	3		From aerial photography, drone survey and site walk.		
4.2	Forestry (if applicable)	N/A	Good Growth	Fair	Stunted Growth	0	1.5	0		From aerial photography, drone survey and site walk.		
	Slide History											
4.3	Previous slides in locality	> 5 km	> 5 km	< 5 km	On site	1	2	2		From Geological Survey of Ireland.		
4.4	Evidence of movement in peat (e.g. tension cracks, step features, compression features)	No	No	-	Yes	1	1	1		From site walk and site investigation.		
	Land Use											
4.5	Peat Workings	Cutaway/Turbary	None	Cutaway/Turbary	Machine Cut	2	1	2		From aerial photography, drone survey and site walk.		
	Other Factors											
4.6	Existing roads in place	Floating Road	Solid Road		Floating Road	3	1	3		No existing road. Value assumed.		
4.7	Time of year for construction	Late Summer/ Autumn	Spring	Winter / Early Summer	Late Summer/ Autumn	3	1	3		Worst case scenario assumed.		
	Likelihood Rating											
								Total	44			
								Max Possible	72			
								Likelihood	0.61			
										Likelihood Score		
										Scale		
										0.0-0.3	Negligible	1
										0.3-0.5	Low	2
										0.5-0.7	Medium	3
										0.7-1.0	High	4

IMPACT												
5.0	Impact Factors											
5.1	Volume of peat in potential peat flow	Medium (1,000 - 20,000 m³)	Small volume (<1,000 m³)	Medium (1,000 - 20,000 m³)	Potential for Bog burst	2	3	6		Based on distance to downslope watercourse.		
5.2	Downslope features	Watercourse	Bowl/ contained	Minor undefined watercourse	Valley	2	1	2		From LiDar		
5.3	Proximity to defined valley	< 200 m	> 500 m	200 - 500 m	< 200 m	3	1	3		From LiDar		
5.4	Valley profile	Flat	Flat	Intermediate	Steep	1	1	1		From LiDar		
5.5	Downstream aquatic environment	Sensitive	Non-sensitive	Sensitive	Drinking water supply	2	1	2		River Blackwater Special Area of Conservation (SAC).		
5.6	Public roads in potential peat flow path	No	No	Local Road	Regional Road	1	1	1		From aerial photography, drone survey and site walk		
5.7	Overhead lines in potential peat flow path	No	Phone Lines	Electricity, LV	Electricity MV, HV	1	1	1		From service drawings and site walk		
5.8	Buildings in potential peat flow path	No	No	Farm out-houses	Dwelling	1	1	1		From aerial photography, drone survey and site walk		
5.9	Capability to respond (access and resources)	Good	Good	Fair	Poor	1	1	1		Based on contractor facilities on site during construction.		
	Impact Rating											
								Total	18			
								Max Possible	33			
								Impact	0.55			
										Impact Score		
										Scale		
										0.0-0.3	Negligible	1
										0.3-0.5	Low	2
										0.5-0.7	Medium	3
										0.7-1.0	High	4

RISK RATING

Risk Rating = Likelihood * Impact

Risk Rating = 0.61 * 0.55 = 0.33 Low

Risk Rating	Risk Level	Action Required
0.0 - 0.18	Negligible	Normal SI
0.19 - 0.42	Low	Targeted SI, design of specific mitigation measures. Part time supervision during construction.
0.43 - 0.66	Medium	Avoid construction in the area if possible. If unavoidable, detailed SI and design of specific mitigation measures. Full time supervision during construction.
0.67 - 1.0	High	Avoid construction in this area.



Peat Stability Risk Assessment
Timahoe North Solar Farm

Location:	Inverter No. 10
Inspected on:	2017
Inspected by:	ESB International
Completed by:	SS
Date:	February 2018

Inverter No. 10													
No.	Likelihood/ Impact Factors	Value	Rating				Rating Value	Weighting	Score	Comment			
			1	2	3	4							
LIKELIHOOD													
1.0 Ground Conditions													
Peat													
1.1	Peat Depth	2 - 2.5 m	< 1 m	> 3 m	1 - 3 m	3	2	6	Based on peat probes carried out by ESB International and Irish Drilling, and also trial pits excavated by Irish Drilling Ltd in 2017.				
1.2	Peat Condition in Trial Pits	Slowly squeezing	Dry/ Stands well	Slowly squeezing	Extremely Wet/ Undiggable	2	1	2	Trial pits excavated by Irish Drilling Ltd in 2017.				
Subsoil Characteristics													
1.3	Subsoil Type	Soft silt	Gravel/ Firm Glacial Till	Smooth Rock	Soft Sensitive Clay	3	1	3	Trial pits excavated by Irish Drilling Ltd in 2017.				
1.4	Peat fibres continuous across transition to subsoil	No	Yes	Partially	No	3	1	3	Trial pits excavated by Irish Drilling Ltd in 2017.				
2.0 Topography													
Situation													
2.1	Elevation OD [m]	~ 78 - 89 mOD	< 200 m		> 200 m	1	1	1	From LiDar.				
2.2	Slope Aspect	S	SW, S, SE	W, E	NW, N, NE	1	1	1	From LiDar.				
Slope Angle													
2.3	Slope Angle - Ground Surface	< 3°	< 3°	> 7°	3° - 7°	1	2	2	From LiDar.				
Geomorphology													
2.4	General slope characteristics downslope	Planar	Concave	Planar	Convex	2	1	2	From LiDar.				
2.5	Distance from break in slope	>100m	> 100 m	50 - 100 m	< 50 m	1	1	1	From LiDar.				
3.0 Hydrology													
Hydrology													
3.1	In broad valley upslope from defined watercourse	Yes, slopes < 3°	No	Yes, slopes < 3°	Yes, slopes ≥ 3°	2	1	2	From LiDar.				
3.2	Distance from head of defined watercourse	< 200m	> 300 m	200 - 300 m	< 200 m	3	1	3	From LiDar.				
3.3	Surface water	Localised	Localised	Ponded in drains	Springs/ Surface Water	1	1	1					
3.4	Evidence of piping	No	No	-	Yes	1	1	1	From site walk and site investigation.				
3.5	Existing drainage ditches	Varied	Down slope	Varied / Oblique	Across slope	2	1	2					
3.6	Annual Rainfall	800 - 1000 mm/yr	< 1000 mm/yr	1000 - 1400 mm/yr	>1400 mm/yr	1	1	1	From Met Éireann.				
4.0 Other Factors													
Vegetation													
4.1	Vegetation	Wetlands	Dry Heather	Grasslands	Wetlands	3	1	3	From aerial photography, drone survey and site walk.				
4.2	Forestry (if applicable)	N/A	Good Growth	Fair	Stunted Growth	0	1.5	0	From aerial photography, drone survey and site walk.				
Slide History													
4.3	Previous slides in locality	> 5 km	> 5 km	< 5 km	On site	1	2	2	From Geological Survey of Ireland.				
4.4	Evidence of movement in peat (e.g. tension cracks, step features, compression features)	No	No	-	Yes	1	1	1	From site walk and site investigation.				
Land Use													
4.5	Peat Workings	Cutaway/Turbary	None	Cutaway/Turbary	Machine Cut	2	1	2	From aerial photography, drone survey and site walk.				
Other Factors													
4.6	Existing roads in place	Solid Road	Solid Road		Floating Road	1	1	1	No existing road. Value assumed.				
4.7	Time of year for construction	Late Summer/ Autumn	Spring	Winter / Early Summer	Late Summer/ Autumn	3	1	3	Worst case scenario assumed.				
Likelihood Rating													
								Total	43		Likelihood Score	Scale	
								Max Possible	72		0.0-0.3	Negligible	1
											0.3-0.5	Low	2
								Likelihood	0.60		0.5-0.7	Medium	3
											0.7-1.0	High	4

IMPACT													
5.0 Impact Factors													
5.1	Volume of peat in potential peat flow	Medium (1,000 - 20,000 m³)	Small volume (<1,000 m³)	Medium (1,000 - 20,000 m³)	Potential for Bog burst	2	3	6	Based on distance to downslope watercourse.				
5.2	Downslope features	Watercourse	Bowl/ contained	Minor undefined watercourse	Valley	2	1	2	From LiDar				
5.3	Proximity to defined valley	< 200 m	> 500 m	200 - 500 m	< 200 m	3	1	3	From LiDar				
5.4	Valley profile	Flat	Flat	Intermediate	Steep	1	1	1	From LiDar				
5.5	Downstream aquatic environment	Sensitive	Non-sensitive	Sensitive	Drinking water supply	2	1	2	River Blackwater Special Area of Conservation (SAC).				
5.6	Public roads in potential peat flow path	No	No	Local Road	Regional Road	1	1	1	From aerial photography, drone survey and site walk				
5.7	Overhead lines in potential peat flow path	No	Phone Lines	Electricity, LV	Electricity MV, HV	1	1	1	From service drawings and site walk				
5.8	Buildings in potential peat flow path	No	No	Farm out-houses	Dwelling	1	1	1	From aerial photography, drone survey and site walk				
5.9	Capability to respond (access and resources)	Good	Good	Fair	Poor	1	1	1	Based on contractor facilities on site during construction.				
Impact Rating													
								Total	18		Impact Score	Scale	
								Max Possible	33		0.0-0.3	Negligible	1
											0.3-0.5	Low	2
								Impact	0.55		0.5-0.7	Medium	3
											0.7-1.0	High	4

RISK RATING																								
Risk Rating = Likelihood * Impact																								
Risk Rating = 0.60 * 0.55 = 0.33 Low																								
<table border="1"> <thead> <tr><th>Risk Rating</th><th>Risk Level</th><th>Action Required</th></tr> </thead> <tbody> <tr><td>0.0 - 0.18</td><td>Negligible</td><td>Normal SI</td></tr> <tr><td>0.19 - 0.42</td><td>Low</td><td>Targeted SI, design of specific mitigation measures. Part time supervision during construction.</td></tr> <tr><td>0.43 - 0.66</td><td>Medium</td><td>Avoid construction in the area if possible. If unavoidable, detailed SI and design of specific mitigation measures. Full time supervision during construction.</td></tr> <tr><td>0.67 - 1.0</td><td>High</td><td>Avoid construction in this area.</td></tr> </tbody> </table>										Risk Rating	Risk Level	Action Required	0.0 - 0.18	Negligible	Normal SI	0.19 - 0.42	Low	Targeted SI, design of specific mitigation measures. Part time supervision during construction.	0.43 - 0.66	Medium	Avoid construction in the area if possible. If unavoidable, detailed SI and design of specific mitigation measures. Full time supervision during construction.	0.67 - 1.0	High	Avoid construction in this area.
Risk Rating	Risk Level	Action Required																						
0.0 - 0.18	Negligible	Normal SI																						
0.19 - 0.42	Low	Targeted SI, design of specific mitigation measures. Part time supervision during construction.																						
0.43 - 0.66	Medium	Avoid construction in the area if possible. If unavoidable, detailed SI and design of specific mitigation measures. Full time supervision during construction.																						
0.67 - 1.0	High	Avoid construction in this area.																						



Peat Stability Risk Assessment
Timahoe North Solar Farm

Location:	Inverter No. 11
Inspected on:	2017
Inspected by:	ESB International
Completed by:	SS
Date:	February 2018

Inverter No. 11												
No.	Likelihood/ Impact Factors	Value	Rating				Rating Value	Weighting	Score	Comment		
			1	2	3	4						
LIKELIHOOD												
1.0 Ground Conditions												
Peat												
1.1	Peat Depth	2 - 3 m	< 1 m	> 3 m	1 - 3 m	3	2	6	Based on peat probes carried out by ESB International and Irish Drilling, and also trial pits excavated by Irish Drilling Ltd in 2017.			
1.2	Peat Condition in Trial Pits	Slowly squeezing	Dry/ Stands well	Slowly squeezing	Extremely Wet/ Undiggable	2	1	2	Trial pits excavated by Irish Drilling Ltd in 2017.			
Subsoil Characteristics												
1.3	Subsoil Type	Soft silt	Gravel/ Firm Glacial Till	Smooth Rock	Soft Sensitive Clay	3	1	3	Trial pits excavated by Irish Drilling Ltd in 2017.			
1.4	Peat fibres continuous across transition to subsoil	No	Yes	Partially	No	3	1	3	Trial pits excavated by Irish Drilling Ltd in 2017.			
2.0 Topography												
Situation												
2.1	Elevation OD [m]	~ 78 - 89 mOD	< 200 m	> 200 m		1	1	1	From LiDar.			
2.2	Slope Aspect	S	SW, S, SE	W, E	NW, N, NE	1	1	1	From LiDar.			
Slope Angle												
2.3	Slope Angle - Ground Surface	< 3°	< 3°	> 7°	3° - 7°	1	2	2	From LiDar.			
Geomorphology												
2.4	General slope characteristics downslope	Planar	Concave	Planar	Convex	2	1	2	From LiDar.			
2.5	Distance from break in slope	>100m	> 100 m	50 - 100 m	< 50 m	1	1	1	From LiDar.			
3.0 Hydrology												
Hydrology												
3.1	In broad valley upslope from defined watercourse	Yes, slopes < 3°	No	Yes, slopes < 3°	Yes, slopes ≥ 3°	2	1	2	From LiDar.			
3.2	Distance from head of defined watercourse	< 200m	> 300 m	200 - 300 m	< 200 m	3	1	3	From LiDar.			
3.3	Surface water	Localised	Localised	Ponded in drains	Springs/ Surface Water	1	1	1				
3.4	Evidence of piping	No	No	-	Yes	1	1	1	From site walk and site investigation.			
3.5	Existing drainage ditches	Varied	Down slope	Varied / Oblique	Across slope	2	1	2				
3.6	Annual Rainfall	800 - 1000 mm/yr	< 1000 mm/yr	1000 - 1400 mm/yr	>1400 mm/yr	1	1	1	From Met Éireann.			
4.0 Other Factors												
Vegetation												
4.1	Vegetation	Wetlands	Dry Heather	Grasslands	Wetlands	3	1	3	From aerial photography, drone survey and site walk.			
4.2	Forestry (if applicable)	N/A	Good Growth	Fair	Stunted Growth	0	1.5	0	From aerial photography, drone survey and site walk.			
Slide History												
4.3	Previous slides in locality	> 5 km	> 5 km	< 5 km	On site	1	2	2	From Geological Survey of Ireland.			
4.4	Evidence of movement in peat (e.g. tension cracks, step features, compression features)	No	No	-	Yes	1	1	1	From site walk and site investigation.			
Land Use												
4.5	Peat Workings	Cutaway/Turbary	None	Cutaway/Turbary	Machine Cut	2	1	2	From aerial photography, drone survey and site walk.			
Other Factors												
4.6	Existing roads in place	Floating Road	Solid Road		Floating Road	3	1	3	No existing road. Value assumed.			
4.7	Time of year for construction	Late Summer/ Autumn	Spring	Winter / Early Summer	Late Summer/ Autumn	3	1	3	Worst case scenario assumed.			
Likelihood Rating												
								Total	45			
								Max Possible	72	0.0-0.3	Negligible	1
								Likelihood	0.63	0.3-0.5	Low	2
										0.5-0.7	Medium	3
										0.7-1.0	High	4

IMPACT												
5.0 Impact Factors												
5.1	Volume of peat in potential peat flow	Medium (1,000 - 20,000 m³)	Small volume (<1,000 m³)	Medium (1,000 - 20,000 m³)	Potential for Bog burst	2	3	6	Based on distance to downslope watercourse.			
5.2	Downslope features	Watercourse	Bowl/ contained	Minor undefined watercourse	Valley	2	1	2	From LiDar			
5.3	Proximity to defined valley	< 200 m	> 500 m	200 - 500 m	< 200 m	3	1	3	From LiDar			
5.4	Valley profile	Flat	Flat	Intermediate	Steep	1	1	1	From LiDar			
5.5	Downstream aquatic environment	Sensitive	Non-sensitive	Sensitive	Drinking water supply	2	1	2	River Blackwater Special Area of Conservation (SAC).			
5.6	Public roads in potential peat flow path	No	No	Local Road	Regional Road	1	1	1	From aerial photography, drone survey and site walk			
5.7	Overhead lines in potential peat flow path	No	Phone Lines	Electricity, LV	Electricity MV, HV	1	1	1	From service drawings and site walk			
5.8	Buildings in potential peat flow path	No	No	Farm out-houses	Dwelling	1	1	1	From aerial photography, drone survey and site walk			
5.9	Capability to respond (access and resources)	Good	Good	Fair	Poor	1	1	1	Based on contractor facilities on site during construction.			
Impact Rating												
								Total	18			
								Max Possible	33	0.0-0.3	Negligible	1
								Impact	0.55	0.3-0.5	Low	2
										0.5-0.7	Medium	3
										0.7-1.0	High	4

RISK RATING			
Risk Rating = Likelihood * Impact			
Risk Rating =	0.63	0.55	= 0.34 Low
Risk Rating	Risk Level	Action Required	
0.0 - 0.18	Negligible	Normal SI	
0.19 - 0.42	Low	Targeted SI, design of specific mitigation measures. Part time supervision during construction.	
0.43 - 0.66	Medium	Avoid construction in the area if possible. If unavoidable, detailed SI and design of specific mitigation measures. Full time supervision during construction.	
0.67 - 1.0	High	Avoid construction in this area.	



INTERNATIONAL

Peat Stability Risk Assessment
Timahoe North Solar Farm

Location:	Inverter No. 12
Inspected on:	2017
Inspected by:	ESB International
Completed by:	SS
Date:	February 2018

Inverter No. 12													
No.	Likelihood/ Impact Factors	Value	Rating				Rating Value	Weighting	Score	Comment			
			1	2	3	4							
LIKELIHOOD													
1.0	Ground Conditions												
	Peat												
1.1	Peat Depth	2 - 2.5 m	< 1 m	> 3 m	1 - 3 m	3	2	6	Based on peat probes carried out by ESB International and Irish Drilling, and also trial pits excavated by Irish Drilling Ltd in 2017.				
1.2	Peat Condition in Trial Pits	Slowly squeezing	Dry/ Stands well	Slowly squeezing	Extremely Wet/ Undiggable	2	1	2	Trial pits excavated by Irish Drilling Ltd in 2017.				
	Subsoil Characteristics												
1.3	Subsoil Type	Soft silt	Gravel/ Firm Glacial Till	Smooth Rock	Soft Sensitive Clay	3	1	3	Trial pits excavated by Irish Drilling Ltd in 2017.				
1.4	Peat fibres continuous across transition to subsoil	No	Yes	Partially	No	3	1	3	Trial pits excavated by Irish Drilling Ltd in 2017.				
2.0	Topography												
	Situation												
2.1	Elevation OD [m]	~ 78 - 89 mOD	< 200 m		> 200 m	1	1	1	From LiDar.				
2.2	Slope Aspect	S	SW, S, SE	W, E	NW, N, NE	1	1	1	From LiDar.				
	Slope Angle												
2.3	Slope Angle - Ground Surface	< 3°	< 3°	> 7°	3° - 7°	1	2	2	From LiDar.				
	Geomorphology												
2.4	General slope characteristics downslope	Planar	Concave	Planar	Convex	2	1	2	From LiDar.				
2.5	Distance from break in slope	>100m	> 100 m	50 - 100 m	< 50 m	1	1	1	From LiDar.				
3.0	Hydrology												
	Hydrology												
3.1	In broad valley upslope from defined watercourse	Yes, slopes < 3°	No	Yes, slopes < 3°	Yes, slopes ≥ 3°	2	1	2	From LiDar.				
3.2	Distance from head of defined watercourse	< 200m	> 300 m	200 - 300 m	< 200 m	3	1	3	From LiDar.				
3.3	Surface water	Localised	Localised	Ponded in drains	Springs/ Surface Water	1	1	1					
3.4	Evidence of piping	No	No	-	Yes	1	1	1	From site walk and site investigation.				
3.5	Existing drainage ditches	Varied	Down slope	Varied / Oblique	Across slope	2	1	2					
3.6	Annual Rainfall	800 - 1000 mm/yr	< 1000 mm/yr	1000 - 1400 mm/yr	>1400 mm/yr	1	1	1	From Met Éireann.				
4.0	Other Factors												
	Vegetation												
4.1	Vegetation	Wetlands	Dry Heather	Grasslands	Wetlands	3	1	3	From aerial photography, drone survey and site walk.				
4.2	Forestry (if applicable)	N/A	Good Growth	Fair	Stunted Growth	0	1.5	0	From aerial photography, drone survey and site walk.				
	Slide History												
4.3	Previous slides in locality	> 5 km	> 5 km	< 5 km	On site	1	2	2	From Geological Survey of Ireland.				
4.4	Evidence of movement in peat (e.g. tension cracks, step features, compression features)	No	No	-	Yes	1	1	1	From site walk and site investigation.				
	Land Use												
4.5	Peat Workings	Cutaway/Turbary	None	Cutaway/Turbary	Machine Cut	2	1	2	From aerial photography, drone survey and site walk.				
	Other Factors												
4.6	Existing roads in place	Solid Road	Solid Road		Floating Road	1	1	1	No existing road. Value assumed.				
4.7	Time of year for construction	Late Summer/ Autumn	Spring	Winter / Early Summer	Late Summer/ Autumn	3	1	3	Worst case scenario assumed.				
								Total	43		Likelihood Score	Scale	
								Max Possible	72		0.0-0.3	Negligible	1
								Likelihood	0.60		0.3-0.5	Low	2
											0.5-0.7	Medium	3
											0.7-1.0	High	4

IMPACT													
5.0	Impact Factors												
5.1	Volume of peat in potential peat flow	Medium (1,000 - 20,000 m³)	Small volume (<1,000 m³)	Medium (1,000 - 20,000 m³)	Potential for Bog burst	2	3	6	Based on distance to downslope watercourse.				
5.2	Downslope features	Watercourse	Bowl/ contained	Minor undefined watercourse	Valley	2	1	2	From LiDar				
5.3	Proximity to defined valley	< 200 m	> 500 m	200 - 500 m	< 200 m	3	1	3	From LiDar				
5.4	Valley profile	Flat	Flat	Intermediate	Steep	1	1	1	From LiDar				
5.5	Downstream aquatic environment	Sensitive	Non-sensitive	Sensitive	Drinking water supply	2	1	2	River Blackwater Special Area of Conservation (SAC).				
5.6	Public roads in potential peat flow path	No	No	Local Road	Regional Road	1	1	1	From aerial photography, drone survey and site walk				
5.7	Overhead lines in potential peat flow path	No	Phone Lines	Electricity, LV	Electricity MV, HV	1	1	1	From service drawings and site walk				
5.8	Buildings in potential peat flow path	No	No	Farm out-houses	Dwelling	1	1	1	From aerial photography, drone survey and site walk				
5.9	Capability to respond (access and resources)	Good	Good	Fair	Poor	1	1	1	Based on contractor facilities on site during construction.				
								Total	18		Impact Score	Scale	
								Max Possible	33		0.0-0.3	Negligible	1
								Impact	0.55		0.3-0.5	Low	2
											0.5-0.7	Medium	3
											0.7-1.0	High	4

RISK RATING									
Risk Rating = Likelihood * Impact									
Risk Rating = 0.60 0.55 = 0.33 Low									
Risk Rating	Risk Level	Action Required							
0.0 - 0.18	Negligible	Normal SI							
0.19 - 0.42	Low	Targeted SI, design of specific mitigation measures. Part time supervision during construction.							
0.43 - 0.66	Medium	Avoid construction in the area if possible. If unavoidable, detailed SI and design of specific mitigation measures. Full time supervision during construction.							
0.67 - 1.0	High	Avoid construction in this area.							



INTERNATIONAL

Peat Stability Risk Assessment
Timahoe North Solar Farm

Location:	Inverter No. 13
Inspected on:	2017
Inspected by:	ESB International
Completed by:	SS
Date:	February 2018

Inverter No. 13											
No.	Likelihood/ Impact Factors	Value	Rating			Rating Value	Weighting	Score	Comment		
			1	2	3						
LIKELIHOOD											
1.0	Ground Conditions										
	Peat										
1.1	Peat Depth	1.5 - 2.5 m	< 1 m	> 3 m	1 - 3 m	3	2	6	Based on peat probes carried out by ESB International and Irish Drilling, and also trial pits excavated by Irish Drilling Ltd in 2017.		
1.2	Peat Condition in Trial Pits	Slowly squeezing	Dry/ Stands well	Slowly squeezing	Extremely Wet/ Undiggable	2	1	2	Trial pits excavated by Irish Drilling Ltd in 2017.		
	Subsoil Characteristics										
1.3	Subsoil Type	Soft silt	Gravel/ Firm Glacial Till	Smooth Rock	Soft Sensitive Clay	3	1	3	Trial pits excavated by Irish Drilling Ltd in 2017.		
1.4	Peat fibres continuous across transition to subsoil	Partially	Yes	Partially	No	2	1	2	Trial pits excavated by Irish Drilling Ltd in 2017.		
2.0	Topography										
	Situation										
2.1	Elevation OD [m]	~ 78 - 89 mOD	< 200 m		> 200 m	1	1	1	From LiDar.		
2.2	Slope Aspect	S	SW, S, SE	W, E	NW, N, NE	1	1	1	From LiDar.		
	Slope Angle										
2.3	Slope Angle - Ground Surface	< 3°	< 3°	> 7°	3° - 7°	1	2	2	From LiDar.		
	Geomorphology										
2.4	General slope characteristics downslope	Planar	Concave	Planar	Convex	2	1	2	From LiDar.		
2.5	Distance from break in slope	>100m	> 100 m	50 - 100 m	< 50 m	1	1	1	From LiDar.		
3.0	Hydrology										
	Hydrology										
3.1	In broad valley upslope from defined watercourse	Yes, slopes < 3°	No	Yes, slopes < 3°	Yes, slopes ≥ 3°	2	1	2	From LiDar.		
3.2	Distance from head of defined watercourse	< 200m	> 300 m	200 - 300 m	< 200 m	3	1	3	From LiDar.		
3.3	Surface water	Localised	Localised	Ponded in drains	Springs/ Surface Water	1	1	1			
3.4	Evidence of piping	No	No	-	Yes	1	1	1	From site walk and site investigation.		
3.5	Existing drainage ditches	Varied	Down slope	Varied / Oblique	Across slope	2	1	2			
3.6	Annual Rainfall	800 - 1000 mm/yr	< 1000 mm/yr	1000 - 1400 mm/yr	>1400 mm/yr	1	1	1	From Met Éireann.		
4.0	Other Factors										
	Vegetation										
4.1	Vegetation	Wetlands	Dry Heather	Grasslands	Wetlands	3	1	3	From aerial photography, drone survey and site walk.		
4.2	Forestry (if applicable)	N/A	Good Growth	Fair	Stunted Growth	0	1.5	0	From aerial photography, drone survey and site walk.		
	Slide History										
4.3	Previous slides in locality	> 5 km	> 5 km	< 5 km	On site	1	2	2	From Geological Survey of Ireland.		
4.4	Evidence of movement in peat (e.g. tension cracks, step features, compression features)	No	No	-	Yes	1	1	1	From site walk and site investigation.		
	Land Use										
4.5	Peat Workings	Cutaway/Turbary	None	Cutaway/Turbary	Machine Cut	2	1	2	From aerial photography, drone survey and site walk.		
	Other Factors										
4.6	Existing roads in place	Solid Road	Solid Road		Floating Road	1	1	1	No existing road. Value assumed.		
4.7	Time of year for construction	Late Summer/ Autumn	Spring	Winter / Early Summer	Late Summer/ Autumn	3	1	3	Worst case scenario assumed.		
Likelihood Rating											
							Total	42			
							Max Possible	72			
							Likelihood	0.58			
									Likelihood Score		
									0.0-0.3	Negligible	1
									0.3-0.5	Low	2
									0.5-0.7	Medium	3
									0.7-1.0	High	4

IMPACT											
5.0	Impact Factors										
5.1	Volume of peat in potential peat flow	Medium (1,000 - 20,000 m ³)	Small volume (<1,000 m ³)	Medium (1,000 - 20,000 m ³)	Potential for Bog burst	2	3	6	Based on distance to downslope watercourse.		
5.2	Downslope features	Watercourse	Bowl/ contained	Minor undefined watercourse	Valley	2	1	2	From LiDar		
5.3	Proximity to defined valley	< 200 m	> 500 m	200 - 500 m	< 200 m	3	1	3	From LiDar		
5.4	Valley profile	Flat	Flat	Intermediate	Steep	1	1	1	From LiDar		
5.5	Downstream aquatic environment	Sensitive	Non-sensitive	Sensitive	Drinking water supply	2	1	2	River Blackwater Special Area of Conservation (SAC).		
5.6	Public roads in potential peat flow path	No	No	Local Road	Regional Road	1	1	1	From aerial photography, drone survey and site walk		
5.7	Overhead lines in potential peat flow path	No	Phone Lines	Electricity, LV	Electricity MV, HV	1	1	1	From service drawings and site walk		
5.8	Buildings in potential peat flow path	No	No	Farm out-houses	Dwelling	1	1	1	From aerial photography, drone survey and site walk		
5.9	Capability to respond (access and resources)	Good	Good	Fair	Poor	1	1	1	Based on contractor facilities on site during construction.		
Impact Rating											
							Total	18			
							Max Possible	33			
							Impact	0.55			
									Impact Score		
									0.0-0.3	Negligible	1
									0.3-0.5	Low	2
									0.5-0.7	Medium	3
									0.7-1.0	High	4

RISK RATING

Risk Rating = Likelihood * Impact

Risk Rating = 0.58 * 0.55 = 0.32 Low

Risk Rating	Risk Level	Action Required
0.0 - 0.18	Negligible	Normal SI
0.19 - 0.42	Low	Targeted SI, design of specific mitigation measures. Part time supervision during construction.
0.43 - 0.66	Medium	Avoid construction in the area if possible. If unavoidable, detailed SI and design of specific mitigation measures. Full time supervision during construction.
0.67 - 1.0	High	Avoid construction in this area.



INTERNATIONAL

Peat Stability Risk Assessment
Timahoe North Solar Farm

Location:	Inverter No. 14
Inspected on:	2017
Inspected by:	ESB International
Completed by:	SS
Date:	February 2018

Inverter No. 14										
No.	Likelihood/ Impact Factors	Value	Rating				Rating Value	Weighting	Score	Comment
			1	2	3					
LIKELIHOOD										
1.0	Ground Conditions									
	Peat									
1.1	Peat Depth	1.5 - 2.5 m	< 1 m	> 3 m	1 - 3 m	3	2	6	Based on peat probes carried out by ESB International and Irish Drilling, and also trial pits excavated by Irish Drilling Ltd in 2017.	
1.2	Peat Condition in Trial Pits	Slowly squeezing	Dry/ Stands well	Slowly squeezing	Extremely Wet/ Undiggable	2	1	2	Trial pits excavated by Irish Drilling Ltd in 2017.	
	Subsoil Characteristics									
1.3	Subsoil Type	Firm gravelly sandy silt	Gravel/ Firm Glacial Till	Smooth Rock	Soft Sensitive Clay	1	1	1	Trial pits excavated by Irish Drilling Ltd in 2017.	
1.4	Peat fibres continuous across transition to subsoil	No	Yes	Partially	No	3	1	3	Trial pits excavated by Irish Drilling Ltd in 2017.	
2.0	Topography									
	Situation									
2.1	Elevation OD [m]	~ 78 - 89 mOD	< 200 m		> 200 m	1	1	1	From LiDar.	
2.2	Slope Aspect	S	SW, S, SE	W, E	NW, N, NE	1	1	1	From LiDar.	
	Slope Angle									
2.3	Slope Angle - Ground Surface	< 3°	< 3°	> 7°	3° - 7°	1	2	2	From LiDar.	
	Geomorphology									
2.4	General slope characteristics downslope	Planar	Concave	Planar	Convex	2	1	2	From LiDar.	
2.5	Distance from break in slope	>100m	> 100 m	50 - 100 m	< 50 m	1	1	1	From LiDar.	
3.0	Hydrology									
	Hydrology									
3.1	In broad valley upslope from defined watercourse	Yes, slopes < 3°	No	Yes, slopes < 3°	Yes, slopes ≥ 3°	2	1	2	From LiDar.	
3.2	Distance from head of defined watercourse	< 200m	> 300 m	200 - 300 m	< 200 m	3	1	3	From LiDar.	
3.3	Surface water	Localised	Localised	Ponded in drains	Springs/ Surface Water	1	1	1		
3.4	Evidence of piping	No	No	-	Yes	1	1	1	From site walk and site investigation.	
3.5	Existing drainage ditches	Varied	Down slope	Varied / Oblique	Across slope	2	1	2		
3.6	Annual Rainfall	800 - 1000 mm/yr	< 1000 mm/yr	1000 - 1400 mm/yr	>1400 mm/yr	1	1	1	From Met Éireann.	
4.0	Other Factors									
	Vegetation									
4.1	Vegetation	Wetlands	Dry Heather	Grasslands	Wetlands	3	1	3	From aerial photography, drone survey and site walk.	
4.2	Forestry (if applicable)	N/A	Good Growth	Fair	Stunted Growth	0	1.5	0	From aerial photography, drone survey and site walk.	
	Slide History									
4.3	Previous slides in locality	> 5 km	> 5 km	< 5 km	On site	1	2	2	From Geological Survey of Ireland.	
4.4	Evidence of movement in peat (e.g. tension cracks, step features, compression features)	No	No	-	Yes	1	1	1	From site walk and site investigation.	
	Land Use									
4.5	Peat Workings	Cutaway/Turbary	None	Cutaway/Turbary	Machine Cut	2	1	2	From aerial photography, drone survey and site walk.	
	Other Factors									
4.6	Existing roads in place	Solid Road	Solid Road		Floating Road	1	1	1	No existing road. Value assumed.	
4.7	Time of year for construction	Late Summer/ Autumn	Spring	Winter / Early Summer	Late Summer/ Autumn	3	1	3	Worst case scenario assumed.	
	Likelihood Rating									
								Total	41	
								Max Possible	72	
									Likelihood Score	
									0.0-0.3	
									Negligible	
									1	
									Scale	
									0.3-0.5	
									Low	
									2	
									Likelihood	
									0.57	
									0.5-0.7	
									Medium	
									3	
									0.7-1.0	
									High	
									4	

IMPACT									
5.0	Impact Factors								
5.1	Volume of peat in potential peat flow	Medium (1,000 - 20,000 m³)	Small volume (<1,000 m³)	Medium (1,000 - 20,000 m³)	Potential for Bog burst	2	3	6	Based on distance to downslope watercourse.
5.2	Downslope features	Watercourse	Bowl/ contained	Minor undefined watercourse	Valley	2	1	2	From LiDar
5.3	Proximity to defined valley	< 200 m	> 500 m	200 - 500 m	< 200 m	3	1	3	From LiDar
5.4	Valley profile	Flat	Flat	Intermediate	Steep	1	1	1	From LiDar
5.5	Downstream aquatic environment	Sensitive	Non-sensitive	Sensitive	Drinking water supply	2	1	2	River Blackwater Special Area of Conservation (SAC).
5.6	Public roads in potential peat flow path	No	No	Local Road	Regional Road	1	1	1	From aerial photography, drone survey and site walk
5.7	Overhead lines in potential peat flow path	No	Phone Lines	Electricity, LV	Electricity MV, HV	1	1	1	From service drawings and site walk
5.8	Buildings in potential peat flow path	No	No	Farm out-houses	Dwelling	1	1	1	From aerial photography, drone survey and site walk
5.9	Capability to respond (access and resources)	Good	Good	Fair	Poor	1	1	1	Based on contractor facilities on site during construction.
	Impact Rating								
								Total	18
								Max Possible	33
									Impact Score
									0.0-0.3
									Negligible
									1
									Scale
									0.3-0.5
									Low
									2
									Impact
									0.55
									0.5-0.7
									Medium
									3
									0.7-1.0
									High
									4

RISK RATING

Risk Rating = Likelihood * Impact

Risk Rating = 0.57 * 0.55 = 0.31 Low

Risk Rating	Risk Level	Action Required
0.0 - 0.18	Negligible	Normal SI
0.19 - 0.42	Low	Targeted SI, design of specific mitigation measures. Part time supervision during construction.
0.43 - 0.66	Medium	Avoid construction in the area if possible. If unavoidable, detailed SI and design of specific mitigation measures. Full time supervision during construction.
0.67 - 1.0	High	Avoid construction in this area.



Peat Stability Risk Assessment
Timahoe North Solar Farm

Location:	Inverter No. 15
Inspected on:	2017
Inspected by:	ESB International
Completed by:	SS
Date:	February 2018

Inverter No. 15													
No.	Likelihood/ Impact Factors	Value	Rating				Rating Value	Weighting	Score	Comment			
			1	2	3								
LIKELIHOOD													
1.0 Ground Conditions													
Peat													
1.1	Peat Depth	2 - 2.5 m	< 1 m	> 3 m	1 - 3 m	1	2	2	Based on peat probes carried out by ESB International and Irish Drilling, and also trial pits excavated by Irish Drilling Ltd in 2017.				
1.2	Peat Condition in Trial Pits	Stands Well	Dry/ Stands well	Slowly squeezing	Extremely Wet/ Undiggable	1	1	1	Trial pits excavated by Irish Drilling Ltd in 2017.				
Subsoil Characteristics													
1.3	Subsoil Type	Soft silt	Gravel/ Firm Glacial Till	Smooth Rock	Soft Sensitive Clay	3	1	3	Trial pits excavated by Irish Drilling Ltd in 2017.				
1.4	Peat fibres continuous across transition to subsoil	Partially	Yes	Partially	No	2	1	2	Trial pits excavated by Irish Drilling Ltd in 2017.				
2.0 Topography													
Situation													
2.1	Elevation OD [m]	~ 78 - 89 mOD	< 200 m	> 200 m		1	1	1	From LiDar.				
2.2	Slope Aspect	S	SW, S, SE	W, E	NW, N, NE	1	1	1	From LiDar.				
Slope Angle													
2.3	Slope Angle - Ground Surface	< 3°	< 3°	> 7°	3° - 7°	1	2	2	From LiDar.				
Geomorphology													
2.4	General slope characteristics downslope	Planar	Concave	Planar	Convex	2	1	2	From LiDar.				
2.5	Distance from break in slope	>100m	> 100 m	50 - 100 m	< 50 m	1	1	1	From LiDar.				
3.0 Hydrology													
Hydrology													
3.1	In broad valley upslope from defined watercourse	Yes, slopes < 3°	No	Yes, slopes < 3°	Yes, slopes ≥ 3°	2	1	2	From LiDar.				
3.2	Distance from head of defined watercourse	< 200m	> 300 m	200 - 300 m	< 200 m	3	1	3	From LiDar.				
3.3	Surface water	Localised	Localised	Ponded in drains	Springs/ Surface Water	1	1	1					
3.4	Evidence of piping	No	No	-	Yes	1	1	1	From site walk and site investigation.				
3.5	Existing drainage ditches	Varied	Down slope	Varied / Oblique	Across slope	2	1	2					
3.6	Annual Rainfall	800 - 1000 mm/yr	< 1000 mm/yr	1000 - 1400 mm/yr	>1400 mm/yr	1	1	1	From Met Éireann.				
4.0 Other Factors													
Vegetation													
4.1	Vegetation	Wetlands	Dry Heather	Grasslands	Wetlands	3	1	3	From aerial photography, drone survey and site walk.				
4.2	Forestry (if applicable)	N/A	Good Growth	Fair	Stunted Growth	0	1.5	0	From aerial photography, drone survey and site walk.				
Slide History													
4.3	Previous slides in locality	> 5 km	> 5 km	< 5 km	On site	1	2	2	From Geological Survey of Ireland.				
4.4	Evidence of movement in peat (e.g. tension cracks, step features, compression features)	No	No	-	Yes	1	1	1	From site walk and site investigation.				
Land Use													
4.5	Peat Workings	Cutaway/Turbary	None	Cutaway/Turbary	Machine Cut	2	1	2	From aerial photography, drone survey and site walk.				
Other Factors													
4.6	Existing roads in place	Solid Road	Solid Road		Floating Road	1	1	1	No existing road. Value assumed.				
4.7	Time of year for construction	Late Summer/ Autumn	Spring	Winter / Early Summer	Late Summer/ Autumn	3	1	3	Worst case scenario assumed.				
Likelihood Rating													
									Total	37			
									Max Possible	72			
									Likelihood	0.51			
											Likelihood Score	Scale	
											0.0-0.3	Negligible	1
											0.3-0.5	Low	2
											0.5-0.7	Medium	3
											0.7-1.0	High	4

IMPACT													
5.0 Impact Factors													
5.1	Volume of peat in potential peat flow	Medium (1,000 - 20,000 m³)	Small volume (<1,000 m³)	Medium (1,000 - 20,000 m³)	Potential for Bog burst	2	3	6	Based on distance to downslope watercourse.				
5.2	Downslope features	Watercourse	Bowl/ contained	Minor undefined watercourse	Valley	2	1	2	From LiDar				
5.3	Proximity to defined valley	< 200 m	> 500 m	200 - 500 m	< 200 m	3	1	3	From LiDar				
5.4	Valley profile	Flat	Flat	Intermediate	Steep	1	1	1	From LiDar				
5.5	Downstream aquatic environment	Sensitive	Non-sensitive	Sensitive	Drinking water supply	2	1	2	River Blackwater Special Area of Conservation (SAC).				
5.6	Public roads in potential peat flow path	No	No	Local Road	Regional Road	1	1	1	From aerial photography, drone survey and site walk				
5.7	Overhead lines in potential peat flow path	No	Phone Lines	Electricity, LV	Electricity MV, HV	1	1	1	From service drawings and site walk				
5.8	Buildings in potential peat flow path	No	No	Farm out-houses	Dwelling	1	1	1	From aerial photography, drone survey and site walk				
5.9	Capability to respond (access and resources)	Good	Good	Fair	Poor	1	1	1	Based on contractor facilities on site during construction.				
Impact Rating													
									Total	18			
									Max Possible	33			
									Impact	0.55			
											Impact Score	Scale	
											0.0-0.3	Negligible	1
											0.3-0.5	Low	2
											0.5-0.7	Medium	3
											0.7-1.0	High	4

RISK RATING					
Risk Rating = Likelihood * Impact					
Risk Rating = 0.51 * 0.55 = 0.28 Low					
Risk Rating	Risk Level	Action Required			
0.0 - 0.18	Negligible	Normal SI			
0.19 - 0.42	Low	Targeted SI, design of specific mitigation measures. Part time supervision during construction.			
0.43 - 0.66	Medium	Avoid construction in the area if possible. If unavoidable, detailed SI and design of specific mitigation measures. Full time supervision during construction.			
0.67 - 1.0	High	Avoid construction in this area.			

Inverter No. 16																							
No.	Likelihood/ Impact Factors	Value	Rating			Rating Value	Weighting	Score	Comment														
			1	2	3																		
LIKELIHOOD																							
1.0 Ground Conditions																							
Peat																							
1.1	Peat Depth	2.5 - 3.m	< 1 m	> 3 m	1 - 3 m	1	2	2	Based on peat probes carried out by ESB International and Irish Drilling, and also trial pits excavated by Irish Drilling Ltd in 2017.														
1.2	Peat Condition in Trial Pits	Slowly squeezing	Dry/ Stands well	Slowly squeezing	Extremely Wet/ Undiggable	2	1	2	Trial pits excavated by Irish Drilling Ltd in 2017.														
Subsoil Characteristics																							
1.3	Subsoil Type	Soft silt	Gravel/ Firm Glacial Till	Smooth Rock	Soft Sensitive Clay	3	1	3	Trial pits excavated by Irish Drilling Ltd in 2017.														
1.4	Peat fibres continuous across transition to subsoil	Partially	Yes	Partially	No	2	1	2	Trial pits excavated by Irish Drilling Ltd in 2017.														
2.0 Topography																							
Situation																							
2.1	Elevation OD [m]	~ 78 - 89 mOD	< 200 m	> 200 m		1	1	1	From LiDar.														
2.2	Slope Aspect	S	SW, S, SE	W, E	NW, N, NE	1	1	1	From LiDar.														
Slope Angle																							
2.3	Slope Angle - Ground Surface	< 3°	< 3°	> 7°	3° - 7°	1	2	2	From LiDar.														
Geomorphology																							
2.4	General slope characteristics downslope	Planar	Concave	Planar	Convex	2	1	2	From LiDar.														
2.5	Distance from break in slope	>100m	> 100 m	50 - 100 m	< 50 m	1	1	1	From LiDar.														
3.0 Hydrology																							
Hydrology																							
3.1	In broad valley upslope from defined watercourse	Yes, slopes < 3°	No	Yes, slopes < 3°	Yes, slopes ≥ 3°	2	1	2	From LiDar.														
3.2	Distance from head of defined watercourse	< 200m	> 300 m	200 - 300 m	< 200 m	3	1	3	From LiDar.														
3.3	Surface water	Localised	Localised	Ponded in drains	Springs/ Surface Water	1	1	1															
3.4	Evidence of piping	No	No	-	Yes	1	1	1	From site walk and site investigation.														
3.5	Existing drainage ditches	Varied	Down slope	Varied / Oblique	Across slope	2	1	2															
3.6	Annual Rainfall	800 - 1000 mm/yr	< 1000 mm/yr	1000 - 1400 mm/yr	>1400 mm/yr	1	1	1	From Met Éireann.														
4.0 Other Factors																							
Vegetation																							
4.1	Vegetation	Wetlands	Dry Heather	Grasslands	Wetlands	3	1	3	From aerial photography, drone survey and site walk.														
4.2	Forestry (if applicable)	N/A	Good Growth	Fair	Stunted Growth	0	1.5	0	From aerial photography, drone survey and site walk.														
Slide History																							
4.3	Previous slides in locality	> 5 km	> 5 km	< 5 km	On site	1	2	2	From Geological Survey of Ireland.														
4.4	Evidence of movement in peat (e.g. tension cracks, step features, compression features)	No	No	-	Yes	1	1	1	From site walk and site investigation.														
Land Use																							
4.5	Peat Workings	Cutaway/Turbary	None	Cutaway/Turbary	Machine Cut	2	1	2	From aerial photography, drone survey and site walk.														
Other Factors																							
4.6	Existing roads in place	Floating Road	Solid Road		Floating Road	3	1	3	No existing road. Value assumed.														
4.7	Time of year for construction	Late Summer/ Autumn	Spring	Winter / Early Summer	Late Summer/ Autumn	3	1	3	Worst case scenario assumed.														
Likelihood Rating																							
								Total	40														
								Max Possible	72														
								Likelihood	0.56														
								Likelihood Score	0.0-0.3	Negligible	1												
									0.3-0.5	Low	2												
									0.5-0.7	Medium	3												
									0.7-1.0	High	4												
IMPACT																							
5.0 Impact Factors																							
5.1	Volume of peat in potential peat flow	Medium (1,000 - 20,000 m³)	Small volume (<1,000 m³)	Medium (1,000 - 20,000 m³)	Potential for Bog burst	2	3	6	Based on distance to downslope watercourse.														
5.2	Downslope features	Watercourse	Bowl/ contained	Minor undefined watercourse	Valley	2	1	2	From LiDar														
5.3	Proximity to defined valley	< 200 m	> 500 m	200 - 500 m	< 200 m	3	1	3	From LiDar														
5.4	Valley profile	Flat	Flat	Intermediate	Steep	1	1	1	From LiDar														
5.5	Downstream aquatic environment	Sensitive	Non-sensitive	Sensitive	Drinking water supply	2	1	2	River Blackwater Special Area of Conservation (SAC).														
5.6	Public roads in potential peat flow path	No	No	Local Road	Regional Road	1	1	1	From aerial photography, drone survey and site walk														
5.7	Overhead lines in potential peat flow path	No	Phone Lines	Electricity, LV	Electricity MV, HV	1	1	1	From service drawings and site walk														
5.8	Buildings in potential peat flow path	No	No	Farm out-houses	Dwelling	1	1	1	From aerial photography, drone survey and site walk														
5.9	Capability to respond (access and resources)	Good	Good	Fair	Poor	1	1	1	Based on contractor facilities on site during construction.														
Impact Rating																							
								Total	18														
								Max Possible	33														
								Impact	0.55														
								Impact Score	0.0-0.3	Negligible	1												
									0.3-0.5	Low	2												
									0.5-0.7	Medium	3												
									0.7-1.0	High	4												
RISK RATING																							
Risk Rating = Likelihood * Impact																							
Risk Rating = 0.56 * 0.55 = 0.30 Low																							
<table border="1"> <thead> <tr> <th>Risk Rating</th> <th>Risk Level</th> <th>Action Required</th> </tr> </thead> <tbody> <tr> <td>0.0 - 0.18</td> <td>Negligible</td> <td>Normal SI</td> </tr> <tr> <td>0.19 - 0.42</td> <td>Low</td> <td>Targeted SI, design of specific mitigation measures. Part time supervision during construction.</td> </tr> <tr> <td>0.43 - 0.66</td> <td>Medium</td> <td>Avoid construction in the area if possible. If unavoidable, detailed SI and design of specific mitigation measures. Full time supervision during construction.</td> </tr> <tr> <td>0.67 - 1.0</td> <td>High</td> <td>Avoid construction in this area.</td> </tr> </tbody> </table>									Risk Rating	Risk Level	Action Required	0.0 - 0.18	Negligible	Normal SI	0.19 - 0.42	Low	Targeted SI, design of specific mitigation measures. Part time supervision during construction.	0.43 - 0.66	Medium	Avoid construction in the area if possible. If unavoidable, detailed SI and design of specific mitigation measures. Full time supervision during construction.	0.67 - 1.0	High	Avoid construction in this area.
Risk Rating	Risk Level	Action Required																					
0.0 - 0.18	Negligible	Normal SI																					
0.19 - 0.42	Low	Targeted SI, design of specific mitigation measures. Part time supervision during construction.																					
0.43 - 0.66	Medium	Avoid construction in the area if possible. If unavoidable, detailed SI and design of specific mitigation measures. Full time supervision during construction.																					
0.67 - 1.0	High	Avoid construction in this area.																					

Inverter No. 17												
No.	Likelihood/ Impact Factors	Value	Rating			Rating Value	Weighting	Score	Comment			
			1	2	3							
LIKELIHOOD												
1.0 Ground Conditions												
Peat												
1.1	Peat Depth	3 - 3.5 m	< 1 m	> 3 m	1 - 3 m	2	2	4	Based on peat probes carried out by ESB International and Irish Drilling, and also trial pits excavated by Irish Drilling Ltd in 2017.			
1.2	Peat Condition in Trial Pits	Stands Well	Dry/ Stands well	Slowly squeezing	Extremely Wet/ Undiggable	1	1	1	Trial pits excavated by Irish Drilling Ltd in 2017.			
Subsoil Characteristics												
1.3	Subsoil Type	Very soft silt	Gravel/ Firm Glacial Till	Smooth Rock	Soft Sensitive Clay	3	1	3	Trial pits excavated by Irish Drilling Ltd in 2017.			
1.4	Peat fibres continuous across transition to subsoil	Partially	Yes	Partially	No	2	1	2	Trial pits excavated by Irish Drilling Ltd in 2017.			
2.0 Topography												
Situation												
2.1	Elevation OD [m]	~ 78 - 89 mOD	< 200 m		> 200 m	1	1	1	From LiDar.			
2.2	Slope Aspect	S	SW, S, SE	W, E	NW, N, NE	1	1	1	From LiDar.			
Slope Angle												
2.3	Slope Angle - Ground Surface	< 3°	< 3°	> 7°	3° - 7°	1	2	2	From LiDar.			
Geomorphology												
2.4	General slope characteristics downslope	Planar	Concave	Planar	Convex	2	1	2	From LiDar.			
2.5	Distance from break in slope	>100m	> 100 m	50 - 100 m	< 50 m	1	1	1	From LiDar.			
3.0 Hydrology												
Hydrology												
3.1	In broad valley upslope from defined watercourse	Yes, slopes < 3°	No	Yes, slopes < 3°	Yes, slopes ≥ 3°	2	1	2	From LiDar.			
3.2	Distance from head of defined watercourse	< 200m	> 300 m	200 - 300 m	< 200 m	3	1	3	From LiDar.			
3.3	Surface water	Localised	Localised	Ponded in drains	Springs/ Surface Water	1	1	1				
3.4	Evidence of piping	No	No	-	Yes	1	1	1	From site walk and site investigation.			
3.5	Existing drainage ditches	Varied	Down slope	Varied / Oblique	Across slope	2	1	2				
3.6	Annual Rainfall	800 - 1000 mm/yr	< 1000 mm/yr	1000 - 1400 mm/yr	>1400 mm/yr	1	1	1	From Met Éireann.			
4.0 Other Factors												
Vegetation												
4.1	Vegetation	Wetlands	Dry Heather	Grasslands	Wetlands	3	1	3	From aerial photography, drone survey and site walk.			
4.2	Forestry (if applicable)	N/A	Good Growth	Fair	Stunted Growth	0	1.5	0	From aerial photography, drone survey and site walk.			
Slide History												
4.3	Previous slides in locality	> 5 km	> 5 km	< 5 km	On site	1	2	2	From Geological Survey of Ireland.			
4.4	Evidence of movement in peat (e.g. tension cracks, step features, compression features)	No	No	-	Yes	1	1	1	From site walk and site investigation.			
Land Use												
4.5	Peat Workings	Cutaway/Turbary	None	Cutaway/Turbary	Machine Cut	2	1	2	From aerial photography, drone survey and site walk.			
Other Factors												
4.6	Existing roads in place	Floating Road	Solid Road		Floating Road	3	1	3	No existing road. Value assumed.			
4.7	Time of year for construction	Late Summer/ Autumn	Spring	Winter / Early Summer	Late Summer/ Autumn	3	1	3	Worst case scenario assumed.			
Likelihood Rating												
								Total	41			
								Max Possible	72			
										Likelihood Score	Scale	
										0.0-0.3	Negligible	1
										0.3-0.5	Low	2
										0.5-0.7	Medium	3
										0.7-1.0	High	4
								Likelihood	0.57			

IMPACT												
5.0 Impact Factors												
5.1	Volume of peat in potential peat flow	Medium (1,000 - 20,000 m³)	Small volume (<1,000 m³)	Medium (1,000 - 20,000 m³)	Potential for Bog burst	2	3	6	Based on distance to downslope watercourse.			
5.2	Downslope features	Watercourse	Bowl/ contained	Minor undefined watercourse	Valley	2	1	2	From LiDar			
5.3	Proximity to defined valley	< 200 m	> 500 m	200 - 500 m	< 200 m	3	1	3	From LiDar			
5.4	Valley profile	Flat	Flat	Intermediate	Steep	1	1	1	From LiDar			
5.5	Downstream aquatic environment	Sensitive	Non-sensitive	Sensitive	Drinking water supply	2	1	2	River Blackwater Special Area of Conservation (SAC).			
5.6	Public roads in potential peat flow path	No	No	Local Road	Regional Road	1	1	1	From aerial photography, drone survey and site walk			
5.7	Overhead lines in potential peat flow path	No	Phone Lines	Electricity, LV	Electricity MV, HV	1	1	1	From service drawings and site walk			
5.8	Buildings in potential peat flow path	No	No	Farm out-houses	Dwelling	1	1	1	From aerial photography, drone survey and site walk			
5.9	Capability to respond (access and resources)	Good	Good	Fair	Poor	1	1	1	Based on contractor facilities on site during construction.			
Impact Rating												
								Total	18			
								Max Possible	33			
										Impact Score	Scale	
										0.0-0.3	Negligible	1
										0.3-0.5	Low	2
										0.5-0.7	Medium	3
										0.7-1.0	High	4
								Impact	0.55			

RISK RATING

Risk Rating = Likelihood * Impact

Risk Rating = 0.57 * 0.55 = 0.31 Low

Risk Rating	Risk Level	Action Required
0.0 - 0.18	Negligible	Normal SI
0.19 - 0.42	Low	Targeted SI, design of specific mitigation measures. Part time supervision during construction.
0.43 - 0.66	Medium	Avoid construction in the area if possible. If unavoidable, detailed SI and design of specific mitigation measures. Full time supervision during construction.
0.67 - 1.0	High	Avoid construction in this area.

Location:	Inverter No. 19
Inspected on:	2017
Inspected by:	ESB International
Completed by:	SS
Date:	February 2018

Inverter No. 19												
No.	Likelihood/ Impact Factors	Value	Rating				Rating Value	Weighting	Score	Comment		
			1	2	3	4						
LIKELIHOOD												
1.0 Ground Conditions												
Peat												
1.1	Peat Depth	3 - 3.5 m	< 1 m	> 3 m	1 - 3 m	2	2	4	Based on peat probes carried out by ESB International and Irish Drilling, and also trial pits excavated by Irish Drilling Ltd in 2017.			
1.2	Peat Condition in Trial Pits	Slowly squeezing	Dry/ Stands well	Slowly squeezing	Extremely Wet/ Undiggable	2	1	2	Trial pits excavated by Irish Drilling Ltd in 2017.			
Subsoil Characteristics												
1.3	Subsoil Type	Organic silt	Gravel/ Firm Glacial Till	Smooth Rock	Soft Sensitive Clay	3	1	3	Trial pits excavated by Irish Drilling Ltd in 2017.			
1.4	Peat fibres continuous across transition to subsoil	No	Yes	Partially	No	3	1	3	Trial pits excavated by Irish Drilling Ltd in 2017.			
2.0 Topography												
Situation												
2.1	Elevation OD [m]	~ 78 - 89 mOD	< 200 m	> 200 m		1	1	1	From LiDar.			
2.2	Slope Aspect	S	SW, S, SE	W, E	NW, N, NE	1	1	1	From LiDar.			
Slope Angle												
2.3	Slope Angle - Ground Surface	< 3°	< 3°	> 7°	3° - 7°	1	2	2	From LiDar.			
Geomorphology												
2.4	General slope characteristics downslope	Planar	Concave	Planar	Convex	2	1	2	From LiDar.			
2.5	Distance from break in slope	>100m	> 100 m	50 - 100 m	< 50 m	1	1	1	From LiDar.			
3.0 Hydrology												
Hydrology												
3.1	In broad valley upslope from defined watercourse	Yes, slopes < 3°	No	Yes, slopes < 3°	Yes, slopes ≥ 3°	2	1	2	From LiDar.			
3.2	Distance from head of defined watercourse	< 200m	> 300 m	200 - 300 m	< 200 m	3	1	3	From LiDar.			
3.3	Surface water	Localised	Localised	Ponded in drains	Springs/ Surface Water	1	1	1				
3.4	Evidence of piping	No	No	-	Yes	1	1	1	From site walk and site investigation.			
3.5	Existing drainage ditches	Varied	Down slope	Varied / Oblique	Across slope	2	1	2				
3.6	Annual Rainfall	800 - 1000 mm/yr	< 1000 mm/yr	1000 - 1400 mm/yr	>1400 mm/yr	1	1	1	From Met Éireann.			
4.0 Other Factors												
Vegetation												
4.1	Vegetation	Wetlands	Dry Heather	Grasslands	Wetlands	3	1	3	From aerial photography, drone survey and site walk.			
4.2	Forestry (if applicable)	N/A	Good Growth	Fair	Stunted Growth	0	1.5	0	From aerial photography, drone survey and site walk.			
Slide History												
4.3	Previous slides in locality	> 5 km	> 5 km	< 5 km	On site	1	2	2	From Geological Survey of Ireland.			
4.4	Evidence of movement in peat (e.g. tension cracks, step features, compression features)	No	No	-	Yes	1	1	1	From site walk and site investigation.			
Land Use												
4.5	Peat Workings	Cutaway/Turbary	None	Cutaway/Turbary	Machine Cut	2	1	2	From aerial photography, drone survey and site walk.			
Other Factors												
4.6	Existing roads in place	Floating Road	Solid Road		Floating Road	3	1	3	No existing road. Value assumed.			
4.7	Time of year for construction	Late Summer/ Autumn	Spring	Winter / Early Summer	Late Summer/ Autumn	3	1	3	Worst case scenario assumed.			
Likelihood Rating												
								Total	43			
								Max Possible	72			
								Likelihood	0.60			
										0.3-0.5	Low	2
										0.5-0.7	Medium	3
										0.7-1.0	High	4

IMPACT												
5.0 Impact Factors												
5.1	Volume of peat in potential peat flow	Medium (1,000 - 20,000 m ³)	Small volume (<1,000 m ³)	Medium (1,000 - 20,000 m ³)	Potential for Bog burst	2	3	6	Based on distance to downslope watercourse.			
5.2	Downslope features	Watercourse	Bowl/ contained	Minor undefined watercourse	Valley	2	1	2	From LiDar			
5.3	Proximity to defined valley	< 200 m	> 500 m	200 - 500 m	< 200 m	3	1	3	From LiDar			
5.4	Valley profile	Flat	Flat	Intermediate	Steep	1	1	1	From LiDar			
5.5	Downstream aquatic environment	Sensitive	Non-sensitive	Sensitive	Drinking water supply	2	1	2	River Blackwater Special Area of Conservation (SAC).			
5.6	Public roads in potential peat flow path	No	No	Local Road	Regional Road	1	1	1	From aerial photography, drone survey and site walk			
5.7	Overhead lines in potential peat flow path	No	Phone Lines	Electricity, LV	Electricity MV, HV	1	1	1	From service drawings and site walk			
5.8	Buildings in potential peat flow path	No	No	Farm out-houses	Dwelling	1	1	1	From aerial photography, drone survey and site walk			
5.9	Capability to respond (access and resources)	Good	Good	Fair	Poor	1	1	1	Based on contractor facilities on site during construction.			
Impact Rating												
								Total	18			
								Max Possible	33			
								Impact	0.55			
										0.3-0.5	Low	2
										0.5-0.7	Medium	3
										0.7-1.0	High	4

RISK RATING

Risk Rating = Likelihood * Impact

Risk Rating = 0.60 0.55 = 0.33 **Low**

Risk Rating	Risk Level	Action Required
0.0 - 0.18	Negligible	Normal SI
0.19 - 0.42	Low	Targeted SI, design of specific mitigation measures. Part time supervision during construction.
0.43 - 0.66	Medium	Avoid construction in the area if possible. If unavoidable, detailed SI and design of specific mitigation measures. Full time supervision during construction.
0.67 - 1.0	High	Avoid construction in this area.

Inverter No. 20													
No.	Likelihood/ Impact Factors	Value	Rating				Rating Value	Weighting	Score	Comment			
			1	2	3								
LIKELIHOOD													
1.0 Ground Conditions													
Peat													
1.1	Peat Depth	2 - 3 m	< 1 m	> 3 m	1 - 3 m	3	2	6	Based on peat probes carried out by ESB International and Irish Drilling, and also trial pits excavated by Irish Drilling Ltd in 2017.				
1.2	Peat Condition in Trial Pits	Slowly squeezing	Dry/ Stands well	Slowly squeezing	Extremely Wet/ Undiggable	2	1	2	Trial pits excavated by Irish Drilling Ltd in 2017.				
Subsoil Characteristics													
1.3	Subsoil Type	Soft silt	Gravel/ Firm Glacial Till	Smooth Rock	Soft Sensitive Clay	3	1	3	Trial pits excavated by Irish Drilling Ltd in 2017.				
1.4	Peat fibres continuous across transition to subsoil	No	Yes	Partially	No	3	1	3	Trial pits excavated by Irish Drilling Ltd in 2017.				
2.0 Topography													
Situation													
2.1	Elevation OD [m]	~ 78 - 89 mOD	< 200 m		> 200 m	1	1	1	From LiDar.				
2.2	Slope Aspect	S	SW, S, SE	W, E	NW, N, NE	1	1	1	From LiDar.				
Slope Angle													
2.3	Slope Angle - Ground Surface	< 3°	< 3°	> 7°	3° - 7°	1	2	2	From LiDar.				
Geomorphology													
2.4	General slope characteristics downslope	Planar	Concave	Planar	Convex	2	1	2	From LiDar.				
2.5	Distance from break in slope	>100m	> 100 m	50 - 100 m	< 50 m	1	1	1	From LiDar.				
3.0 Hydrology													
Hydrology													
3.1	In broad valley upslope from defined watercourse	Yes, slopes < 3°	No	Yes, slopes < 3°	Yes, slopes ≥ 3°	2	1	2	From LiDar.				
3.2	Distance from head of defined watercourse	< 200m	> 300 m	200 - 300 m	< 200 m	3	1	3	From LiDar.				
3.3	Surface water	Localised	Localised	Ponded in drains	Springs/ Surface Water	1	1	1					
3.4	Evidence of piping	No	No	-	Yes	1	1	1	From site walk and site investigation.				
3.5	Existing drainage ditches	Varied	Down slope	Varied / Oblique	Across slope	2	1	2					
3.6	Annual Rainfall	800 - 1000 mm/yr	< 1000 mm/yr	1000 - 1400 mm/yr	>1400 mm/yr	1	1	1	From Met Éireann.				
4.0 Other Factors													
Vegetation													
4.1	Vegetation	Wetlands	Dry Heather	Grasslands	Wetlands	3	1	3	From aerial photography, drone survey and site walk.				
4.2	Forestry (if applicable)	N/A	Good Growth	Fair	Stunted Growth	0	1.5	0	From aerial photography, drone survey and site walk.				
Slide History													
4.3	Previous slides in locality	> 5 km	> 5 km	< 5 km	On site	1	2	2	From Geological Survey of Ireland.				
4.4	Evidence of movement in peat (e.g. tension cracks, step features, compression features)	No	No	-	Yes	1	1	1	From site walk and site investigation.				
Land Use													
4.5	Peat Workings	Cutaway/Turbary	None	Cutaway/Turbary	Machine Cut	2	1	2	From aerial photography, drone survey and site walk.				
Other Factors													
4.6	Existing roads in place	Floating Road	Solid Road		Floating Road	3	1	3	No existing road. Value assumed.				
4.7	Time of year for construction	Late Summer/ Autumn	Spring	Winter / Early Summer	Late Summer/ Autumn	3	1	3	Worst case scenario assumed.				
Likelihood Rating													
								Total	45		Likelihood Score	Scale	
								Max Possible	72		0.0-0.3	Negligible	1
								Likelihood	0.63		0.3-0.5	Low	2
											0.5-0.7	Medium	3
											0.7-1.0	High	4

IMPACT													
5.0 Impact Factors													
5.1	Volume of peat in potential peat flow	Medium (1,000 - 20,000 m³)	Small volume (<1,000 m³)	Medium (1,000 - 20,000 m³)	Potential for Bog burst	2	3	6	Based on distance to downslope watercourse.				
5.2	Downslope features	Watercourse	Bowl/ contained	Minor undefined watercourse	Valley	2	1	2	From LiDar				
5.3	Proximity to defined valley	< 200 m	> 500 m	200 - 500 m	< 200 m	3	1	3	From LiDar				
5.4	Valley profile	Flat	Flat	Intermediate	Steep	1	1	1	From LiDar				
5.5	Downstream aquatic environment	Sensitive	Non-sensitive	Sensitive	Drinking water supply	2	1	2	River Blackwater Special Area of Conservation (SAC).				
5.6	Public roads in potential peat flow path	No	No	Local Road	Regional Road	1	1	1	From aerial photography, drone survey and site walk				
5.7	Overhead lines in potential peat flow path	No	Phone Lines	Electricity, LV	Electricity MV, HV	1	1	1	From service drawings and site walk				
5.8	Buildings in potential peat flow path	No	No	Farm out-houses	Dwelling	1	1	1	From aerial photography, drone survey and site walk				
5.9	Capability to respond (access and resources)	Good	Good	Fair	Poor	1	1	1	Based on contractor facilities on site during construction.				
Impact Rating													
								Total	18		Impact Score	Scale	
								Max Possible	33		0.0-0.3	Negligible	1
								Impact	0.55		0.3-0.5	Low	2
											0.5-0.7	Medium	3
											0.7-1.0	High	4

RISK RATING			
Risk Rating = Likelihood * Impact			
Risk Rating =	0.63	0.55	= 0.34 Low
Risk Rating	Risk Level	Action Required	
0.0 - 0.18	Negligible	Normal SI	
0.19 - 0.42	Low	Targeted SI, design of specific mitigation measures. Part time supervision during construction.	
0.43 - 0.66	Medium	Avoid construction in the area if possible. If unavoidable, detailed SI and design of specific mitigation measures. Full time supervision during construction.	
0.67 - 1.0	High	Avoid construction in this area.	



INTERNATIONAL

Peat Stability Risk Assessment
Timahoe North Solar Farm

Location:	Inverter No. 21
Inspected on:	2017
Inspected by:	ESB International
Completed by:	SS
Date:	February 2018

Inverter No. 21													
No.	Likelihood/ Impact Factors	Value	Rating				Rating Value	Weighting	Score	Comment			
			1	2	3	4							
LIKELIHOOD													
1.0	Ground Conditions												
Peat													
1.1	Peat Depth	2 - 3 m	< 1 m	> 3 m	1 - 3 m	3	2	6		Based on peat probes carried out by ESB International and Irish Drilling, and also trial pits excavated by Irish Drilling Ltd in 2017.			
1.2	Peat Condition in Trial Pits	Slowly squeezing	Dry/ Stands well	Slowly squeezing	Extremely Wet/ Undiggable	2	1	2		Trial pits excavated by Irish Drilling Ltd in 2017.			
Subsoil Characteristics													
1.3	Subsoil Type	Firm gravelly silt	Gravel/ Firm Glacial Till	Smooth Rock	Soft Sensitive Clay	1	1	1		Trial pits excavated by Irish Drilling Ltd in 2017.			
1.4	Peat fibres continuous across transition to subsoil	No	Yes	Partially	No	3	1	3		Trial pits excavated by Irish Drilling Ltd in 2017.			
2.0	Topography												
Situation													
2.1	Elevation OD [m]	~ 78 - 89 mOD	< 200 m		> 200 m	1	1	1		From LiDar.			
2.2	Slope Aspect	S	SW, S, SE	W, E	NW, N, NE	1	1	1		From LiDar.			
Slope Angle													
2.3	Slope Angle - Ground Surface	< 3°	< 3°	> 7°	3° - 7°	1	2	2		From LiDar.			
Geomorphology													
2.4	General slope characteristics downslope	Planar	Concave	Planar	Convex	2	1	2		From LiDar.			
2.5	Distance from break in slope	>100m	> 100 m	50 - 100 m	< 50 m	1	1	1		From LiDar.			
3.0	Hydrology												
Hydrology													
3.1	In broad valley upslope from defined watercourse	Yes, slopes < 3°	No	Yes, slopes < 3°	Yes, slopes ≥ 3°	2	1	2		From LiDar.			
3.2	Distance from head of defined watercourse	< 200m	> 300 m	200 - 300 m	< 200 m	3	1	3		From LiDar.			
3.3	Surface water	Localised	Localised	Ponded in drains	Springs/ Surface Water	1	1	1					
3.4	Evidence of piping	No	No	-	Yes	1	1	1		From site walk and site investigation.			
3.5	Existing drainage ditches	Varied	Down slope	Varied / Oblique	Across slope	2	1	2					
3.6	Annual Rainfall	800 - 1000 mm/yr	< 1000 mm/yr	1000 - 1400 mm/yr	>1400 mm/yr	1	1	1		From Met Éireann.			
4.0	Other Factors												
Vegetation													
4.1	Vegetation	Wetlands	Dry Heather	Grasslands	Wetlands	3	1	3		From aerial photography, drone survey and site walk.			
4.2	Forestry (if applicable)	N/A	Good Growth	Fair	Stunted Growth	0	1.5	0		From aerial photography, drone survey and site walk.			
Slide History													
4.3	Previous slides in locality	> 5 km	> 5 km	< 5 km	On site	1	2	2		From Geological Survey of Ireland.			
4.4	Evidence of movement in peat (e.g. tension cracks, step features, compression features)	No	No	-	Yes	1	1	1		From site walk and site investigation.			
Land Use													
4.5	Peat Workings	Cutaway/Turbary	None	Cutaway/Turbary	Machine Cut	2	1	2		From aerial photography, drone survey and site walk.			
Other Factors													
4.6	Existing roads in place	Floating Road	Solid Road		Floating Road	3	1	3		No existing road. Value assumed.			
4.7	Time of year for construction	Late Summer/ Autumn	Spring	Winter / Early Summer	Late Summer/ Autumn	3	1	3		Worst case scenario assumed.			
Likelihood Rating													
							Total	43			Likelihood Score	Scale	
							Max Possible	72			0.0-0.3	Negligible	1
							Likelihood	0.60			0.3-0.5	Low	2
											0.5-0.7	Medium	3
											0.7-1.0	High	4

IMPACT													
5.0	Impact Factors												
5.1	Volume of peat in potential peat flow	Medium (1,000 - 20,000 m³)	Small volume (<1,000 m³)	Medium (1,000 - 20,000 m³)	Potential for Bog burst	2	3	6		Based on distance to downslope watercourse.			
5.2	Downslope features	Watercourse	Bowl/ contained	Minor undefined watercourse	Valley	2	1	2		From LiDar			
5.3	Proximity to defined valley	< 200 m	> 500 m	200 - 500 m	< 200 m	3	1	3		From LiDar			
5.4	Valley profile	Flat	Flat	Intermediate	Steep	1	1	1		From LiDar			
5.5	Downstream aquatic environment	Sensitive	Non-sensitive	Sensitive	Drinking water supply	2	1	2		River Blackwater Special Area of Conservation (SAC).			
5.6	Public roads in potential peat flow path	No	No	Local Road	Regional Road	1	1	1		From aerial photography, drone survey and site walk			
5.7	Overhead lines in potential peat flow path	No	Phone Lines	Electricity, LV	Electricity MV, HV	1	1	1		From service drawings and site walk			
5.8	Buildings in potential peat flow path	No	No	Farm out-houses	Dwelling	1	1	1		From aerial photography, drone survey and site walk			
5.9	Capability to respond (access and resources)	Good	Good	Fair	Poor	1	1	1		Based on contractor facilities on site during construction.			
Impact Rating													
							Total	18			Impact Score	Scale	
							Max Possible	33			0.0-0.3	Negligible	1
							Impact	0.55			0.3-0.5	Low	2
											0.5-0.7	Medium	3
											0.7-1.0	High	4

RISK RATING

Risk Rating = Likelihood * Impact

Risk Rating = 0.60 * 0.55 = 0.33 Low

Risk Rating	Risk Level	Action Required
0.0 - 0.18	Negligible	Normal SI
0.19 - 0.42	Low	Targeted SI, design of specific mitigation measures. Part time supervision during construction.
0.43 - 0.66	Medium	Avoid construction in the area if possible. If unavoidable, detailed SI and design of specific mitigation measures. Full time supervision during construction.
0.67 - 1.0	High	Avoid construction in this area.



**Peat Stability Risk Assessment
Timahoe North Solar Farm**

Location:	Inverter No. 22
Inspected on:	2017
Inspected by:	ESB International
Completed by:	SS
Date:	February 2018

Inverter No. 22															
No.	Likelihood/ Impact Factors	Value	Rating				Rating Value	Weighting	Score	Comment					
			1	2	3	4									
LIKELIHOOD															
1.0	Ground Conditions														
	Peat														
1.1	Peat Depth	1.5 - 2.5 m	< 1 m	> 3 m	1 - 3 m	3	2	6	Based on peat probes carried out by ESB International and Irish Drilling, and also trial pits excavated by Irish Drilling Ltd in 2017.						
1.2	Peat Condition in Trial Pits	Stands Well	Dry/ Stands well	Slowly squeezing	Extremely Wet/ Undiggable	1	1	1	Trial pits excavated by Irish Drilling Ltd in 2017.						
	Subsoil Characteristics														
1.3	Subsoil Type	Sandy gravel	Gravel/ Firm Glacial Till	Smooth Rock	Soft Sensitive Clay	3	1	3	Trial pits excavated by Irish Drilling Ltd in 2017.						
1.4	Peat fibres continuous across transition to subsoil	No	Yes	Partially	No	3	1	3	Trial pits excavated by Irish Drilling Ltd in 2017.						
2.0	Topography														
	Situation														
2.1	Elevation OD [m]	~ 78 - 89 mOD	< 200 m	> 200 m		1	1	1	From LiDar.						
2.2	Slope Aspect	S	SW, S, SE	W, E	NW, N, NE	1	1	1	From LiDar.						
	Slope Angle														
2.3	Slope Angle - Ground Surface	< 3°	< 3°	> 7°	3° - 7°	1	2	2	From LiDar.						
	Geomorphology														
2.4	General slope characteristics downslope	Planar	Concave	Planar	Convex	2	1	2	From LiDar.						
2.5	Distance from break in slope	>100m	> 100 m	50 - 100 m	< 50 m	1	1	1	From LiDar.						
3.0	Hydrology														
	Hydrology														
3.1	In broad valley upslope from defined watercourse	Yes, slopes < 3°	No	Yes, slopes < 3°	Yes, slopes ≥ 3°	2	1	2	From LiDar.						
3.2	Distance from head of defined watercourse	< 200m	> 300 m	200 - 300 m	< 200 m	3	1	3	From LiDar.						
3.3	Surface water	Localised	Localised	Ponded in drains	Springs/ Surface Water	1	1	1							
3.4	Evidence of piping	No	No	-	Yes	1	1	1	From site walk and site investigation.						
3.5	Existing drainage ditches	Varied	Down slope	Varied / Oblique	Across slope	2	1	2							
3.6	Annual Rainfall	800 - 1000 mm/yr	< 1000 mm/yr	1000 - 1400 mm/yr	>1400 mm/yr	1	1	1	From Met Éireann.						
4.0	Other Factors														
	Vegetation														
4.1	Vegetation	Wetlands	Dry Heather	Grasslands	Wetlands	3	1	3	From aerial photography, drone survey and site walk.						
4.2	Forestry (if applicable)	N/A	Good Growth	Fair	Stunted Growth	0	1.5	0	From aerial photography, drone survey and site walk.						
	Slide History														
4.3	Previous slides in locality	> 5 km	> 5 km	< 5 km	On site	1	2	2	From Geological Survey of Ireland.						
4.4	Evidence of movement in peat (e.g. tension cracks, step features, compression features)	No	No	-	Yes	1	1	1	From site walk and site investigation.						
	Land Use														
4.5	Peat Workings	Cutaway/Turbary	None	Cutaway/Turbary	Machine Cut	2	1	2	From aerial photography, drone survey and site walk.						
	Other Factors														
4.6	Existing roads in place	Solid Road	Solid Road		Floating Road	1	1	1	No existing road. Value assumed.						
4.7	Time of year for construction	Late Summer/ Autumn	Spring	Winter / Early Summer	Late Summer/ Autumn	3	1	3	Worst case scenario assumed.						
	Likelihood Rating														
								Total	42			Likelihood Score		Scale	
								Max Possible	72			0.0-0.3	Negligible	1	
												0.3-0.5	Low	2	
								Likelihood	0.58			0.5-0.7	Medium	3	
												0.7-1.0	High	4	
IMPACT															
5.0	Impact Factors														
5.1	Volume of peat in potential peat flow	Medium (1,000 - 20,000 m³)	Small volume (<1,000 m³)	Medium (1,000 - 20,000 m³)	Potential for Bog burst	2	3	6	Based on distance to downslope watercourse.						
5.2	Downslope features	Watercourse	Bowl/ contained	Minor undefined watercourse	Valley	2	1	2	From LiDar						
5.3	Proximity to defined valley	< 200 m	> 500 m	200 - 500 m	< 200 m	3	1	3	From LiDar						
5.4	Valley profile	Flat	Flat	Intermediate	Steep	1	1	1	From LiDar						
5.5	Downstream aquatic environment	Sensitive	Non-sensitive	Sensitive	Drinking water supply	2	1	2	River Blackwater Special Area of Conservation (SAC).						
5.6	Public roads in potential peat flow path	No	No	Local Road	Regional Road	1	1	1	From aerial photography, drone survey and site walk						
5.7	Overhead lines in potential peat flow path	No	Phone Lines	Electricity, LV	Electricity MV, HV	1	1	1	From service drawings and site walk						
5.8	Buildings in potential peat flow path	No	No	Farm out-houses	Dwelling	1	1	1	From aerial photography, drone survey and site walk						
5.9	Capability to respond (access and resources)	Good	Good	Fair	Poor	1	1	1	Based on contractor facilities on site during construction.						
	Impact Rating														
								Total	18			Impact Score		Scale	
								Max Possible	33			0.0-0.3	Negligible	1	
												0.3-0.5	Low	2	
								Impact	0.55			0.5-0.7	Medium	3	
												0.7-1.0	High	4	
RISK RATING															
<p>Risk Rating = Likelihood * Impact</p> <p>Risk Rating = 0.58 * 0.55 = 0.32 Low</p>															
Risk Rating	Risk Level	Action Required													
0.0 - 0.18	Negligible	Normal SI													
0.19 - 0.42	Low	Targeted SI, design of specific mitigation measures. Part time supervision during construction.													
0.43 - 0.66	Medium	Avoid construction in the area if possible. If unavoidable, detailed SI and design of specific mitigation measures. Full time supervision during construction.													
0.67 - 1.0	High	Avoid construction in this area.													



INTERNATIONAL

Peat Stability Risk Assessment
Timahoe North Solar Farm

Location:	Inverter No. 23
Inspected on:	2017
Inspected by:	ESB International
Completed by:	SS
Date:	February 2018

Inverter No. 23													
No.	Likelihood/ Impact Factors	Value	Rating				Rating Value	Weighting	Score	Comment			
			1	2	3								
LIKELIHOOD													
1.0	Ground Conditions												
Peat													
1.1	Peat Depth	1.5 - 2 m	< 1 m	> 3 m	1 - 3 m	3	2	6	Based on peat probes carried out by ESB International and Irish Drilling, and also trial pits excavated by Irish Drilling Ltd in 2017.				
1.2	Peat Condition in Trial Pits	Slowly squeezing	Dry/ Stands well	Slowly squeezing	Extremely Wet/ Undiggable	2	1	2	Trial pits excavated by Irish Drilling Ltd in 2017.				
Subsoil Characteristics													
1.3	Subsoil Type	Soft silt	Gravel/ Firm Glacial Till	Smooth Rock	Soft Sensitive Clay	3	1	3	Trial pits excavated by Irish Drilling Ltd in 2017.				
1.4	Peat fibres continuous across transition to subsoil	No	Yes	Partially	No	3	1	3	Trial pits excavated by Irish Drilling Ltd in 2017.				
2.0	Topography												
Situation													
2.1	Elevation OD [m]	~ 78 - 89 mOD	< 200 m	> 200 m		1	1	1	From LiDar.				
2.2	Slope Aspect	S	SW, S, SE	W, E	NW, N, NE	1	1	1	From LiDar.				
Slope Angle													
2.3	Slope Angle - Ground Surface	< 3°	< 3°	> 7°	3° - 7°	1	2	2	From LiDar.				
Geomorphology													
2.4	General slope characteristics downslope	Planar	Concave	Planar	Convex	2	1	2	From LiDar.				
2.5	Distance from break in slope	>100m	> 100 m	50 - 100 m	< 50 m	1	1	1	From LiDar.				
3.0	Hydrology												
Hydrology													
3.1	In broad valley upslope from defined watercourse	Yes, slopes < 3°	No	Yes, slopes < 3°	Yes, slopes ≥ 3°	2	1	2	From LiDar.				
3.2	Distance from head of defined watercourse	< 200m	> 300 m	200 - 300 m	< 200 m	3	1	3	From LiDar.				
3.3	Surface water	Localised	Localised	Ponded in drains	Springs/ Surface Water	1	1	1					
3.4	Evidence of piping	No	No	-	Yes	1	1	1	From site walk and site investigation.				
3.5	Existing drainage ditches	Varied	Down slope	Varied / Oblique	Across slope	2	1	2					
3.6	Annual Rainfall	800 - 1000 mm/yr	< 1000 mm/yr	1000 - 1400 mm/yr	>1400 mm/yr	1	1	1	From Met Éireann.				
4.0	Other Factors												
Vegetation													
4.1	Vegetation	Wetlands	Dry Heather	Grasslands	Wetlands	3	1	3	From aerial photography, drone survey and site walk.				
4.2	Forestry (if applicable)	N/A	Good Growth	Fair	Stunted Growth	0	1.5	0	From aerial photography, drone survey and site walk.				
Slide History													
4.3	Previous slides in locality	> 5 km	> 5 km	< 5 km	On site	1	2	2	From Geological Survey of Ireland.				
4.4	Evidence of movement in peat (e.g. tension cracks, step features, compression features)	No	No	-	Yes	1	1	1	From site walk and site investigation.				
Land Use													
4.5	Peat Workings	Cutaway/Turbary	None	Cutaway/Turbary	Machine Cut	2	1	2	From aerial photography, drone survey and site walk.				
Other Factors													
4.6	Existing roads in place	Solid Road	Solid Road		Floating Road	1	1	1	No existing road. Value assumed.				
4.7	Time of year for construction	Late Summer/ Autumn	Spring	Winter / Early Summer	Late Summer/ Autumn	3	1	3	Worst case scenario assumed.				
Likelihood Rating													
								Total	43		Likelihood Score	Scale	
								Max Possible	72		0.0-0.3	Negligible	1
											0.3-0.5	Low	2
								Likelihood	0.60		0.5-0.7	Medium	3
											0.7-1.0	High	4

IMPACT													
5.0	Impact Factors												
5.1	Volume of peat in potential peat flow	Medium (1,000 - 20,000 m³)	Small volume (<1,000 m³)	Medium (1,000 - 20,000 m³)	Potential for Bog burst	2	3	6	Based on distance to downslope watercourse.				
5.2	Downslope features	Watercourse	Bowl/ contained	Minor undefined watercourse	Valley	2	1	2	From LiDar				
5.3	Proximity to defined valley	< 200 m	> 500 m	200 - 500 m	< 200 m	3	1	3	From LiDar				
5.4	Valley profile	Flat	Flat	Intermediate	Steep	1	1	1	From LiDar				
5.5	Downstream aquatic environment	Sensitive	Non-sensitive	Sensitive	Drinking water supply	2	1	2	River Blackwater Special Area of Conservation (SAC).				
5.6	Public roads in potential peat flow path	No	No	Local Road	Regional Road	1	1	1	From aerial photography, drone survey and site walk				
5.7	Overhead lines in potential peat flow path	No	Phone Lines	Electricity, LV	Electricity MV, HV	1	1	1	From service drawings and site walk				
5.8	Buildings in potential peat flow path	No	No	Farm out-houses	Dwelling	1	1	1	From aerial photography, drone survey and site walk				
5.9	Capability to respond (access and resources)	Good	Good	Fair	Poor	1	1	1	Based on contractor facilities on site during construction.				
Impact Rating													
								Total	18		Impact Score	Scale	
								Max Possible	33		0.0-0.3	Negligible	1
											0.3-0.5	Low	2
								Impact	0.55		0.5-0.7	Medium	3
											0.7-1.0	High	4

RISK RATING

Risk Rating = Likelihood * Impact

Risk Rating = 0.60 * 0.55 = 0.33 Low

Risk Rating	Risk Level	Action Required
0.0 - 0.18	Negligible	Normal SI
0.19 - 0.42	Low	Targeted SI, design of specific mitigation measures. Part time supervision during construction.
0.43 - 0.66	Medium	Avoid construction in the area if possible. If unavoidable, detailed SI and design of specific mitigation measures. Full time supervision during construction.
0.67 - 1.0	High	Avoid construction in this area.

Inverter No. 24												
No.	Likelihood/ Impact Factors	Value	Rating				Rating Value	Weighting	Score	Comment		
			1	2	3							
LIKELIHOOD												
1.0 Ground Conditions												
Peat												
1.1	Peat Depth	1.5 - 2.5 m	< 1 m	> 3 m	1 - 3 m	3	2	6	Based on peat probes carried out by ESB International and Irish Drilling, and also trial pits excavated by Irish Drilling Ltd in 2017.			
1.2	Peat Condition in Trial Pits	Slowly squeezing	Dry/ Stands well	Slowly squeezing	Extremely Wet/ Undiggable	2	1	2	Trial pits excavated by Irish Drilling Ltd in 2017.			
Subsoil Characteristics												
1.3	Subsoil Type	Very soft silt	Gravel/ Firm Glacial Till	Smooth Rock	Soft Sensitive Clay	3	1	3	Trial pits excavated by Irish Drilling Ltd in 2017.			
1.4	Peat fibres continuous across transition to subsoil	No	Yes	Partially	No	3	1	3	Trial pits excavated by Irish Drilling Ltd in 2017.			
2.0 Topography												
Situation												
2.1	Elevation OD [m]	~ 78 - 89 mOD	< 200 m	> 200 m		1	1	1	From LiDar.			
2.2	Slope Aspect	S	SW, S, SE	W, E	NW, N, NE	1	1	1	From LiDar.			
Slope Angle												
2.3	Slope Angle - Ground Surface	< 3°	< 3°	> 7°	3° - 7°	1	2	2	From LiDar.			
Geomorphology												
2.4	General slope characteristics downslope	Planar	Concave	Planar	Convex	2	1	2	From LiDar.			
2.5	Distance from break in slope	>100m	> 100 m	50 - 100 m	< 50 m	1	1	1	From LiDar.			
3.0 Hydrology												
Hydrology												
3.1	In broad valley upslope from defined watercourse	Yes, slopes < 3°	No	Yes, slopes < 3°	Yes, slopes ≥ 3°	2	1	2	From LiDar.			
3.2	Distance from head of defined watercourse	< 200m	> 300 m	200 - 300 m	< 200 m	3	1	3	From LiDar.			
3.3	Surface water	Localised	Localised	Ponded in drains	Springs/ Surface Water	1	1	1				
3.4	Evidence of piping	No	No	-	Yes	1	1	1	From site walk and site investigation.			
3.5	Existing drainage ditches	Varied	Down slope	Varied / Oblique	Across slope	2	1	2				
3.6	Annual Rainfall	800 - 1000 mm/yr	< 1000 mm/yr	1000 - 1400 mm/yr	>1400 mm/yr	1	1	1	From Met Éireann.			
4.0 Other Factors												
Vegetation												
4.1	Vegetation	Wetlands	Dry Heather	Grasslands	Wetlands	3	1	3	From aerial photography, drone survey and site walk.			
4.2	Forestry (if applicable)	N/A	Good Growth	Fair	Stunted Growth	0	1.5	0	From aerial photography, drone survey and site walk.			
Slide History												
4.3	Previous slides in locality	> 5 km	> 5 km	< 5 km	On site	1	2	2	From Geological Survey of Ireland.			
4.4	Evidence of movement in peat (e.g. tension cracks, step features, compression features)	No	No	-	Yes	1	1	1	From site walk and site investigation.			
Land Use												
4.5	Peat Workings	Cutaway/Turbary	None	Cutaway/Turbary	Machine Cut	2	1	2	From aerial photography, drone survey and site walk.			
Other Factors												
4.6	Existing roads in place	Solid Road	Solid Road		Floating Road	1	1	1	No existing road. Value assumed.			
4.7	Time of year for construction	Late Summer/ Autumn	Spring	Winter / Early Summer	Late Summer/ Autumn	3	1	3	Worst case scenario assumed.			
Likelihood Rating												
							Total	43		Likelihood Score	Scale	
							Max Possible	72		0.0-0.3	Negligible	1
										0.3-0.5	Low	2
							Likelihood	0.60		0.5-0.7	Medium	3
										0.7-1.0	High	4

IMPACT												
5.0 Impact Factors												
5.1	Volume of peat in potential peat flow	Medium (1,000 - 20,000 m ³)	Small volume (<1,000 m ³)	Medium (1,000 - 20,000 m ³)	Potential for Bog burst	2	3	6	Based on distance to downslope watercourse.			
5.2	Downslope features	Watercourse	Bowl/ contained	Minor undefined watercourse	Valley	2	1	2	From LiDar			
5.3	Proximity to defined valley	< 200 m	> 500 m	200 - 500 m	< 200 m	3	1	3	From LiDar			
5.4	Valley profile	Flat	Flat	Intermediate	Steep	1	1	1	From LiDar			
5.5	Downstream aquatic environment	Sensitive	Non-sensitive	Sensitive	Drinking water supply	2	1	2	River Blackwater Special Area of Conservation (SAC).			
5.6	Public roads in potential peat flow path	No	No	Local Road	Regional Road	1	1	1	From aerial photography, drone survey and site walk			
5.7	Overhead lines in potential peat flow path	No	Phone Lines	Electricity, LV	Electricity MV, HV	1	1	1	From service drawings and site walk			
5.8	Buildings in potential peat flow path	No	No	Farm out-houses	Dwelling	1	1	1	From aerial photography, drone survey and site walk			
5.9	Capability to respond (access and resources)	Good	Good	Fair	Poor	1	1	1	Based on contractor facilities on site during construction.			
Impact Rating												
							Total	18		Impact Score	Scale	
							Max Possible	33		0.0-0.3	Negligible	1
										0.3-0.5	Low	2
							Impact	0.55		0.5-0.7	Medium	3
										0.7-1.0	High	4

RISK RATING			
Risk Rating = Likelihood * Impact			
Risk Rating = 0.60 * 0.55 = 0.33 Low			
Risk Rating	Risk Level	Action Required	
0.0 - 0.18	Negligible	Normal SI	
0.19 - 0.42	Low	Targeted SI, design of specific mitigation measures. Part time supervision during construction.	
0.43 - 0.66	Medium	Avoid construction in the area if possible. If unavoidable, detailed SI and design of specific mitigation measures. Full time supervision during construction.	
0.67 - 1.0	High	Avoid construction in this area.	

Inverter No. 25													
No.	Likelihood/ Impact Factors	Value	Rating				Rating Value	Weighting	Score	Comment			
			1	2	3								
LIKELIHOOD													
1.0 Ground Conditions													
Peat													
1.1	Peat Depth	2 - 3 m	< 1 m	> 3 m	1 - 3 m	3	2	6	Based on peat probes carried out by ESB International and Irish Drilling, and also trial pits excavated by Irish Drilling Ltd in 2017.				
1.2	Peat Condition in Trial Pits	Slowly squeezing	Dry/ Stands well	Slowly squeezing	Extremely Wet/ Undiggable	2	1	2	Trial pits excavated by Irish Drilling Ltd in 2017.				
Subsoil Characteristics													
1.3	Subsoil Type	Soft silt	Gravel/ Firm Glacial Till	Smooth Rock	Soft Sensitive Clay	3	1	3	Trial pits excavated by Irish Drilling Ltd in 2017.				
1.4	Peat fibres continuous across transition to subsoil	Partially	Yes	Partially	No	2	1	2	Trial pits excavated by Irish Drilling Ltd in 2017.				
2.0 Topography													
Situation													
2.1	Elevation OD [m]	~ 78 - 89 mOD	< 200 m		> 200 m	1	1	1	From LiDar.				
2.2	Slope Aspect	S	SW, S, SE	W, E	NW, N, NE	1	1	1	From LiDar.				
Slope Angle													
2.3	Slope Angle - Ground Surface	< 3°	< 3°	> 7°	3° - 7°	1	2	2	From LiDar.				
Geomorphology													
2.4	General slope characteristics downslope	Planar	Concave	Planar	Convex	2	1	2	From LiDar.				
2.5	Distance from break in slope	>100m	> 100 m	50 - 100 m	< 50 m	1	1	1	From LiDar.				
3.0 Hydrology													
Hydrology													
3.1	In broad valley upslope from defined watercourse	Yes, slopes < 3°	No	Yes, slopes < 3°	Yes, slopes ≥ 3°	2	1	2	From LiDar.				
3.2	Distance from head of defined watercourse	< 200m	> 300 m	200 - 300 m	< 200 m	3	1	3	From LiDar.				
3.3	Surface water	Localised	Localised	Ponded in drains	Springs/ Surface Water	1	1	1					
3.4	Evidence of piping	No	No	-	Yes	1	1	1	From site walk and site investigation.				
3.5	Existing drainage ditches	Varied	Down slope	Varied / Oblique	Across slope	2	1	2					
3.6	Annual Rainfall	800 - 1000 mm/yr	< 1000 mm/yr	1000 - 1400 mm/yr	>1400 mm/yr	1	1	1	From Met Éireann.				
4.0 Other Factors													
Vegetation													
4.1	Vegetation	Wetlands	Dry Heather	Grasslands	Wetlands	3	1	3	From aerial photography, drone survey and site walk.				
4.2	Forestry (if applicable)	N/A	Good Growth	Fair	Stunted Growth	0	1.5	0	From aerial photography, drone survey and site walk.				
Slide History													
4.3	Previous slides in locality	> 5 km	> 5 km	< 5 km	On site	1	2	2	From Geological Survey of Ireland.				
4.4	Evidence of movement in peat (e.g. tension cracks, step features, compression features)	No	No	-	Yes	1	1	1	From site walk and site investigation.				
Land Use													
4.5	Peat Workings	Cutaway/Turbary	None	Cutaway/Turbary	Machine Cut	2	1	2	From aerial photography, drone survey and site walk.				
Other Factors													
4.6	Existing roads in place	Floating Road	Solid Road		Floating Road	3	1	3	No existing road. Value assumed.				
4.7	Time of year for construction	Late Summer/ Autumn	Spring	Winter / Early Summer	Late Summer/ Autumn	3	1	3	Worst case scenario assumed.				
Likelihood Rating													
								Total	44		Likelihood Score	Scale	
								Max Possible	72		0.0-0.3	Negligible	1
											0.3-0.5	Low	2
								Likelihood	0.61		0.5-0.7	Medium	3
											0.7-1.0	High	4

IMPACT													
5.0 Impact Factors													
5.1	Volume of peat in potential peat flow	Medium (1,000 - 20,000 m³)	Small volume (<1,000 m³)	Medium (1,000 - 20,000 m³)	Potential for Bog burst	2	3	6	Based on distance to downslope watercourse.				
5.2	Downslope features	Watercourse	Bowl/ contained	Minor undefined watercourse	Valley	2	1	2	From LiDar				
5.3	Proximity to defined valley	< 200 m	> 500 m	200 - 500 m	< 200 m	3	1	3	From LiDar				
5.4	Valley profile	Flat	Flat	Intermediate	Steep	1	1	1	From LiDar				
5.5	Downstream aquatic environment	Sensitive	Non-sensitive	Sensitive	Drinking water supply	2	1	2	River Blackwater Special Area of Conservation (SAC).				
5.6	Public roads in potential peat flow path	No	No	Local Road	Regional Road	1	1	1	From aerial photography, drone survey and site walk				
5.7	Overhead lines in potential peat flow path	No	Phone Lines	Electricity, LV	Electricity MV, HV	1	1	1	From service drawings and site walk				
5.8	Buildings in potential peat flow path	No	No	Farm out-houses	Dwelling	1	1	1	From aerial photography, drone survey and site walk				
5.9	Capability to respond (access and resources)	Good	Good	Fair	Poor	1	1	1	Based on contractor facilities on site during construction.				
Impact Rating													
								Total	18		Impact Score	Scale	
								Max Possible	33		0.0-0.3	Negligible	1
											0.3-0.5	Low	2
								Impact	0.55		0.5-0.7	Medium	3
											0.7-1.0	High	4

RISK RATING									
Risk Rating = Likelihood * Impact									
Risk Rating = 0.61 * 0.55 = 0.33 Low									
Risk Rating	Risk Level	Action Required							
0.0 - 0.18	Negligible	Normal SI							
0.19 - 0.42	Low	Targeted SI, design of specific mitigation measures. Part time supervision during construction.							
0.43 - 0.66	Medium	Avoid construction in the area if possible. If unavoidable, detailed SI and design of specific mitigation measures. Full time supervision during construction.							
0.67 - 1.0	High	Avoid construction in this area.							



INTERNATIONAL

Peat Stability Risk Assessment
Timahoe North Solar Farm

Location: Inverter No. 26
Inspected on: 2017
Inspected by: ESB International
Completed by: SS
Date: February 2018

Table with columns: No., Likelihood/ Impact Factors, Value, Rating (1-3), Rating Value, Weighting, Score, Comment. Section: LIKELIHOOD. Includes rows for Ground Conditions, Topography, Hydrology, and Other Factors.

Table with columns: No., Impact Factors, Value, Rating (1-3), Rating Value, Weighting, Score, Comment. Section: IMPACT. Includes rows for Volume of peat, Downslope features, Proximity to defined valley, etc.

RISK RATING

Risk Rating = Likelihood * Impact

Risk Rating = 0.60 * 0.55 = 0.33 Low

Table with columns: Risk Rating, Risk Level, Action Required. Rows: 0.0 - 0.18 (Negligible), 0.19 - 0.42 (Low), 0.43 - 0.66 (Medium), 0.67 - 1.0 (High).



INTERNATIONAL

Peat Stability Risk Assessment Timahoe North Solar Farm

Location:	Inverter No. 27
Inspected on:	2017
Inspected by:	ESB International
Completed by:	SS
Date:	February 2018

Inverter No. 27										
No.	Likelihood/ Impact Factors	Value	Rating				Rating Value	Weighting	Score	Comment
			1	2	3					
LIKELIHOOD										
1.0 Ground Conditions										
Peat										
1.1	Peat Depth	2 - 3 m	< 1 m	> 3 m	1 - 3 m	3	2	6	Based on peat probes carried out by ESB International and Irish Drilling, and also trial pits excavated by Irish Drilling Ltd in 2017.	
1.2	Peat Condition in Trial Pits	Slowly squeezing	Dry/ Stands well	Slowly squeezing	Extremely Wet/ Undruggable	2	1	2	Trial pits excavated by Irish Drilling Ltd in 2017.	
Subsoil Characteristics										
1.3	Subsoil Type	Gravelly sandy silt	Gravel/ Firm Glacial Till	Smooth Rock	Soft Sensitive Clay	1	1	1	Trial pits excavated by Irish Drilling Ltd in 2017.	
1.4	Peat fibres continuous across transition to subsoil	No	Yes	Partially	No	3	1	3	Trial pits excavated by Irish Drilling Ltd in 2017.	
2.0 Topography										
Situation										
2.1	Elevation OD [m]	~ 78 - 89 mOD	< 200 m		> 200 m	1	1	1	From LiDar.	
2.2	Slope Aspect	S	SW, S, SE	W, E	NW, N, NE	1	1	1	From LiDar.	
Slope Angle										
2.3	Slope Angle - Ground Surface	< 3°	< 3°	> 7°	3° - 7°	1	2	2	From LiDar.	
Geomorphology										
2.4	General slope characteristics downslope	Planar	Concave	Planar	Convex	2	1	2	From LiDar.	
2.5	Distance from break in slope	>100m	> 100 m	50 - 100 m	< 50 m	1	1	1	From LiDar.	
3.0 Hydrology										
Hydrology										
3.1	In broad valley upslope from defined watercourse	Yes, slopes < 3°	No	Yes, slopes < 3°	Yes, slopes ≥ 3°	2	1	2	From LiDar.	
3.2	Distance from head of defined watercourse	< 200m	> 300 m	200 - 300 m	< 200 m	3	1	3	From LiDar.	
3.3	Surface water	Localised	Localised	Ponded in drains	Springs/ Surface Water	1	1	1		
3.4	Evidence of piping	No	No	-	Yes	1	1	1	From site walk and site investigation.	
3.5	Existing drainage ditches	Varied	Down slope	Varied / Oblique	Across slope	2	1	2		
3.6	Annual Rainfall	800 - 1000 mm/yr	< 1000 mm/yr	1000 - 1400 mm/yr	>1400 mm/yr	1	1	1	From Met Éireann.	
4.0 Other Factors										
Vegetation										
4.1	Vegetation	Wetlands	Dry Heather	Grasslands	Wetlands	3	1	3	From aerial photography, drone survey and site walk.	
4.2	Forestry (if applicable)	N/A	Good Growth	Fair	Stunted Growth	0	1.5	0	From aerial photography, drone survey and site walk.	
Slide History										
4.3	Previous slides in locality	> 5 km	> 5 km	< 5 km	On site	1	2	2	From Geological Survey of Ireland.	
4.4	Evidence of movement in peat (e.g. tension cracks, step features, compression features)	No	No	-	Yes	1	1	1	From site walk and site investigation.	
Land Use										
4.5	Peat Workings	Cutaway/Turbary	None	Cutaway/Turbary	Machine Cut	2	1	2	From aerial photography, drone survey and site walk.	
Other Factors										
4.6	Existing roads in place	Floating Road	Solid Road		Floating Road	3	1	3	No existing road. Value assumed.	
4.7	Time of year for construction	Late Summer/ Autumn	Spring	Winter / Early Summer	Late Summer/ Autumn	3	1	3	Worst case scenario assumed.	
Likelihood Rating										
							Total	43		
							Max Possible	72		
							Likelihood	0.60		

IMPACT										
5.0 Impact Factors										
5.1	Volume of peat in potential peat flow	Medium (1,000 - 20,000 m³)	Small volume (<1,000 m³)	Medium (1,000 - 20,000 m³)	Potential for Bog burst	2	3	6	Based on distance to downslope watercourse.	
5.2	Downslope features	Watercourse	Bowl/ contained	Minor undefined watercourse	Valley	2	1	2	From LiDar	
5.3	Proximity to defined valley	< 200 m	> 500 m	200 - 500 m	< 200 m	3	1	3	From LiDar	
5.4	Valley profile	Flat	Flat	Intermediate	Steep	1	1	1	From LiDar	
5.5	Downstream aquatic environment	Sensitive	Non-sensitive	Sensitive	Drinking water supply	2	1	2	River Blackwater Special Area of Conservation (SAC).	
5.6	Public roads in potential peat flow path	No	No	Local Road	Regional Road	1	1	1	From aerial photography, drone survey and site walk	
5.7	Overhead lines in potential peat flow path	No	Phone Lines	Electricity, LV	Electricity MV, HV	1	1	1	From service drawings and site walk	
5.8	Buildings in potential peat flow path	No	No	Farm out-houses	Dwelling	1	1	1	From aerial photography, drone survey and site walk	
5.9	Capability to respond (access and resources)	Good	Good	Fair	Poor	1	1	1	Based on contractor facilities on site during construction.	
Impact Rating										
							Total	18		
							Max Possible	33		
							Impact	0.55		

RISK RATING				
Risk Rating = Likelihood * Impact				
Risk Rating = 0.60 * 0.55 = 0.33 Low				
Risk Rating	Risk Level	Action Required		
0.0 - 0.18	Negligible	Normal SI		
0.19 - 0.42	Low	Targeted SI, design of specific mitigation measures. Part time supervision during construction.		
0.43 - 0.66	Medium	Avoid construction in the area if possible. If unavoidable, detailed SI and design of specific mitigation measures. Full time supervision during construction.		
0.67 - 1.0	High	Avoid construction in this area.		

		Inverter No. 28																						
No.	Likelihood/ Impact Factors	Value	Rating			Rating Value	Weighting	Score	Comment															
			1	2	3																			
LIKELIHOOD																								
1.0	Ground Conditions																							
	Peat																							
1.1	Peat Depth	1.5 - 2 m	< 1 m	> 3 m	1 - 3 m	3	2	6	Based on peat probes carried out by ESB International and Irish Drilling, and also trial pits excavated by Irish Drilling Ltd in 2017.															
1.2	Peat Condition in Trial Pits	Slowly squeezing	Dry/ Stands well	Slowly squeezing	Extremely Wet/ Undiggable	2	1	2	Trial pits excavated by Irish Drilling Ltd in 2017.															
	Subsoil Characteristics																							
1.3	Subsoil Type	Organic silt	Gravel/ Firm Glacial Till	Smooth Rock	Soft Sensitive Clay	3	1	3	Trial pits excavated by Irish Drilling Ltd in 2017.															
1.4	Peat fibres continuous across transition to subsoil	Partially	Yes	Partially	No	2	1	2	Trial pits excavated by Irish Drilling Ltd in 2017.															
2.0	Topography																							
	Situation																							
2.1	Elevation OD [m]	~ 78 - 89 mOD	< 200 m		> 200 m	1	1	1	From LiDar.															
2.2	Slope Aspect	S	SW, S, SE	W, E	NW, N, NE	1	1	1	From LiDar.															
	Slope Angle																							
2.3	Slope Angle - Ground Surface	< 3°	< 3°	> 7°	3° - 7°	1	2	2	From LiDar.															
	Geomorphology																							
2.4	General slope characteristics downslope	Planar	Concave	Planar	Convex	2	1	2	From LiDar.															
2.5	Distance from break in slope	>100m	> 100 m	50 - 100 m	< 50 m	1	1	1	From LiDar.															
3.0	Hydrology																							
	Hydrology																							
3.1	In broad valley upslope from defined watercourse	Yes, slopes < 3°	No	Yes, slopes < 3°	Yes, slopes ≥ 3°	2	1	2	From LiDar.															
3.2	Distance from head of defined watercourse	< 200m	> 300 m	200 - 300 m	< 200 m	3	1	3	From LiDar.															
3.3	Surface water	Localised	Localised	Ponded in drains	Springs/ Surface Water	1	1	1																
3.4	Evidence of piping	No	No	-	Yes	1	1	1	From site walk and site investigation.															
3.5	Existing drainage ditches	Varied	Down slope	Varied / Oblique	Across slope	2	1	2																
3.6	Annual Rainfall	800 - 1000 mm/yr	< 1000 mm/yr	1000 - 1400 mm/yr	>1400 mm/yr	1	1	1	From Met Éireann.															
4.0	Other Factors																							
	Vegetation																							
4.1	Vegetation	Wetlands	Dry Heather	Grasslands	Wetlands	3	1	3	From aerial photography, drone survey and site walk.															
4.2	Forestry (if applicable)	N/A	Good Growth	Fair	Stunted Growth	0	1.5	0	From aerial photography, drone survey and site walk.															
	Slide History																							
4.3	Previous slides in locality	> 5 km	> 5 km	< 5 km	On site	1	2	2	From Geological Survey of Ireland.															
4.4	Evidence of movement in peat (e.g. tension cracks, step features, compression features)	No	No	-	Yes	1	1	1	From site walk and site investigation.															
	Land Use																							
4.5	Peat Workings	Cutaway/Turbary	None	Cutaway/Turbary	Machine Cut	2	1	2	From aerial photography, drone survey and site walk.															
	Other Factors																							
4.6	Existing roads in place	Solid Road	Solid Road		Floating Road	1	1	1	No existing road. Value assumed.															
4.7	Time of year for construction	Late Summer/ Autumn	Spring	Winter / Early Summer	Late Summer/ Autumn	3	1	3	Worst case scenario assumed.															
	Likelihood Rating																							
							Total	42																
							Max Possible	72																
								0.0-0.3	Negligible	1														
								0.3-0.5	Low	2														
							Likelihood	0.58	0.5-0.7	Medium	3													
								0.7-1.0	High	4														
IMPACT																								
5.0	Impact Factors																							
5.1	Volume of peat in potential peat flow	Medium (1,000 - 20,000 m ³)	Small volume (<1,000 m ³)	Medium (1,000 - 20,000 m ³)	Potential for Bog burst	2	3	6	Based on distance to downslope watercourse.															
5.2	Downslope features	Watercourse	Bowl/ contained	Minor undefined watercourse	Valley	2	1	2	From LiDar															
5.3	Proximity to defined valley	< 200 m	> 500 m	200 - 500 m	< 200 m	3	1	3	From LiDar															
5.4	Valley profile	Flat	Flat	Intermediate	Steep	1	1	1	From LiDar															
5.5	Downstream aquatic environment	Sensitive	Non-sensitive	Sensitive	Drinking water supply	2	1	2	River Blackwater Special Area of Conservation (SAC).															
5.6	Public roads in potential peat flow path	No	No	Local Road	Regional Road	1	1	1	From aerial photography, drone survey and site walk															
5.7	Overhead lines in potential peat flow path	No	Phone Lines	Electricity, LV	Electricity MV, HV	1	1	1	From service drawings and site walk															
5.8	Buildings in potential peat flow path	No	No	Farm out-houses	Dwelling	1	1	1	From aerial photography, drone survey and site walk															
5.9	Capability to respond (access and resources)	Good	Good	Fair	Poor	1	1	1	Based on contractor facilities on site during construction.															
	Impact Rating																							
							Total	18																
							Max Possible	33																
								0.0-0.3	Negligible	1														
								0.3-0.5	Low	2														
							Impact	0.55	0.5-0.7	Medium	3													
								0.7-1.0	High	4														
RISK RATING																								
<p>Risk Rating = Likelihood * Impact</p> <p>Risk Rating = 0.58 * 0.55 = 0.32 Low</p>																								
<table border="1" style="width:100%; border-collapse: collapse;"> <thead> <tr> <th>Risk Rating</th> <th>Risk Level</th> <th>Action Required</th> </tr> </thead> <tbody> <tr> <td>0.0 - 0.18</td> <td>Negligible</td> <td>Normal SI</td> </tr> <tr> <td>0.19 - 0.42</td> <td>Low</td> <td>Targeted SI, design of specific mitigation measures. Part time supervision during construction.</td> </tr> <tr> <td>0.43 - 0.66</td> <td>Medium</td> <td>Avoid construction in the area if possible. If unavoidable, detailed SI and design of specific mitigation measures. Full time supervision during construction.</td> </tr> <tr> <td>0.67 - 1.0</td> <td>High</td> <td>Avoid construction in this area.</td> </tr> </tbody> </table>										Risk Rating	Risk Level	Action Required	0.0 - 0.18	Negligible	Normal SI	0.19 - 0.42	Low	Targeted SI, design of specific mitigation measures. Part time supervision during construction.	0.43 - 0.66	Medium	Avoid construction in the area if possible. If unavoidable, detailed SI and design of specific mitigation measures. Full time supervision during construction.	0.67 - 1.0	High	Avoid construction in this area.
Risk Rating	Risk Level	Action Required																						
0.0 - 0.18	Negligible	Normal SI																						
0.19 - 0.42	Low	Targeted SI, design of specific mitigation measures. Part time supervision during construction.																						
0.43 - 0.66	Medium	Avoid construction in the area if possible. If unavoidable, detailed SI and design of specific mitigation measures. Full time supervision during construction.																						
0.67 - 1.0	High	Avoid construction in this area.																						



INTERNATIONAL

Peat Stability Risk Assessment Timahoe North Solar Farm

Location:	Inverter No. 29
Inspected on:	2017
Inspected by:	ESB International
Completed by:	SS
Date:	February 2018

		Inverter No. 29											
No.	Likelihood/ Impact Factors	Value	Rating				Rating Value	Weighting	Score	Comment			
			1	2	3						Likelihood Score	Scale	
LIKELIHOOD													
1.0	Ground Conditions												
Peat													
1.1	Peat Depth	1 - 2 m	< 1 m	> 3 m	1 - 3 m	3	2	6	Based on peat probes carried out by ESB International and Irish Drilling, and also trial pits excavated by Irish Drilling Ltd in 2017.				
1.2	Peat Condition in Trial Pits	Slowly squeezing	Dry/ Stands well	Slowly squeezing	Extremely Wet/ Undiggable	2	1	2	Trial pits excavated by Irish Drilling Ltd in 2017.				
Subsoil Characteristics													
1.3	Subsoil Type	Firm gravelly silt	Gravel/ Firm Glacial Till	Smooth Rock	Soft Sensitive Clay	1	1	1	Trial pits excavated by Irish Drilling Ltd in 2017.				
1.4	Peat fibres continuous across transition to subsoil	Partially	Yes	Partially	No	2	1	2	Trial pits excavated by Irish Drilling Ltd in 2017.				
2.0	Topography												
Situation													
2.1	Elevation OD [m]	~ 78 - 89 mOD	< 200 m		> 200 m	1	1	1	From LiDar.				
2.2	Slope Aspect	S	SW, S, SE	W, E	NW, N, NE	1	1	1	From LiDar.				
Slope Angle													
2.3	Slope Angle - Ground Surface	< 3°	< 3°	> 7°	3° - 7°	1	2	2	From LiDar.				
Geomorphology													
2.4	General slope characteristics downslope	Planar	Concave	Planar	Convex	2	1	2	From LiDar.				
2.5	Distance from break in slope	>100m	> 100 m	50 - 100 m	< 50 m	1	1	1	From LiDar.				
3.0	Hydrology												
Hydrology													
3.1	In broad valley upslope from defined watercourse	Yes, slopes < 3°	No	Yes, slopes < 3°	Yes, slopes ≥ 3°	2	1	2	From LiDar.				
3.2	Distance from head of defined watercourse	< 200m	> 300 m	200 - 300 m	< 200 m	3	1	3	From LiDar.				
3.3	Surface water	Localised	Localised	Ponded in drains	Springs/ Surface Water	1	1	1					
3.4	Evidence of piping	No	No	-	Yes	1	1	1	From site walk and site investigation.				
3.5	Existing drainage ditches	Varied	Down slope	Varied / Oblique	Across slope	2	1	2					
3.6	Annual Rainfall	800 - 1000 mm/yr	< 1000 mm/yr	1000 - 1400 mm/yr	>1400 mm/yr	1	1	1	From Met Éireann.				
4.0	Other Factors												
Vegetation													
4.1	Vegetation	Wetlands	Dry Heather	Grasslands	Wetlands	3	1	3	From aerial photography, drone survey and site walk.				
4.2	Forestry (if applicable)	N/A	Good Growth	Fair	Stunted Growth	0	1.5	0	From aerial photography, drone survey and site walk.				
Slide History													
4.3	Previous slides in locality	> 5 km	> 5 km	< 5 km	On site	1	2	2	From Geological Survey of Ireland.				
4.4	Evidence of movement in peat (e.g. tension cracks, step features, compression features)	No	No	-	Yes	1	1	1	From site walk and site investigation.				
Land Use													
4.5	Peat Workings	Cutaway/Turbary	None	Cutaway/Turbary	Machine Cut	2	1	2	From aerial photography, drone survey and site walk.				
Other Factors													
4.6	Existing roads in place	Solid Road	Solid Road		Floating Road	1	1	1	No existing road. Value assumed.				
4.7	Time of year for construction	Late Summer/ Autumn	Spring	Winter / Early Summer	Late Summer/ Autumn	3	1	3	Worst case scenario assumed.				
Likelihood Rating													
									Total	40			
									Max Possible	72	0.0-0.3	Negligible	1
									Likelihood	0.56	0.3-0.5	Low	2
											0.5-0.7	Medium	3
											0.7-1.0	High	4

IMPACT													
5.0	Impact Factors												
5.1	Volume of peat in potential peat flow	Medium (1,000 - 20,000 m³)	Small volume (<1,000 m³)	Medium (1,000 - 20,000 m³)	Potential for Bog burst	2	3	6	Based on distance to downslope watercourse.				
5.2	Downslope features	Watercourse	Bowl/ contained	Minor undefined watercourse	Valley	2	1	2	From LiDar				
5.3	Proximity to defined valley	< 200 m	> 500 m	200 - 500 m	< 200 m	3	1	3	From LiDar				
5.4	Valley profile	Flat	Flat	Intermediate	Steep	1	1	1	From LiDar				
5.5	Downstream aquatic environment	Sensitive	Non-sensitive	Sensitive	Drinking water supply	2	1	2	River Blackwater Special Area of Conservation (SAC).				
5.6	Public roads in potential peat flow path	No	No	Local Road	Regional Road	1	1	1	From aerial photography, drone survey and site walk				
5.7	Overhead lines in potential peat flow path	No	Phone Lines	Electricity, LV	Electricity MV, HV	1	1	1	From service drawings and site walk				
5.8	Buildings in potential peat flow path	No	No	Farm out-houses	Dwelling	1	1	1	From aerial photography, drone survey and site walk				
5.9	Capability to respond (access and resources)	Good	Good	Fair	Poor	1	1	1	Based on contractor facilities on site during construction.				
Impact Rating													
									Total	18			
									Max Possible	33	0.0-0.3	Negligible	1
									Impact	0.55	0.3-0.5	Low	2
											0.5-0.7	Medium	3
											0.7-1.0	High	4

RISK RATING

Risk Rating = Likelihood * Impact

Risk Rating = 0.56 * 0.55 = 0.30 Low

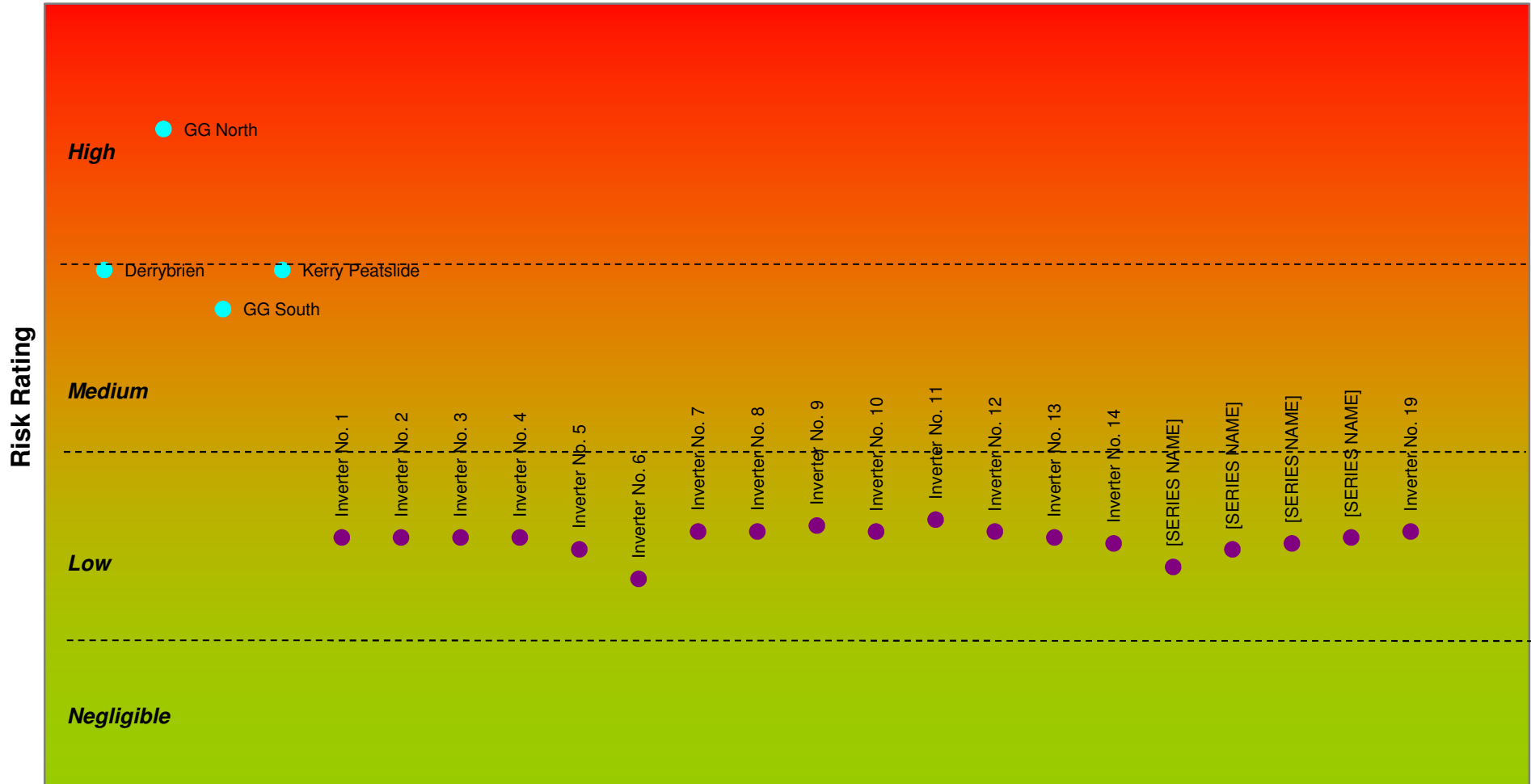
Risk Rating	Risk Level	Action Required
0.0 - 0.18	Negligible	Normal SI
0.19 - 0.42	Low	Targeted SI, design of specific mitigation measures. Part time supervision during construction.
0.43 - 0.66	Medium	Avoid construction in the area if possible. If unavoidable, detailed SI and design of specific mitigation measures. Full time supervision during construction.
0.67 - 1.0	High	Avoid construction in this area.



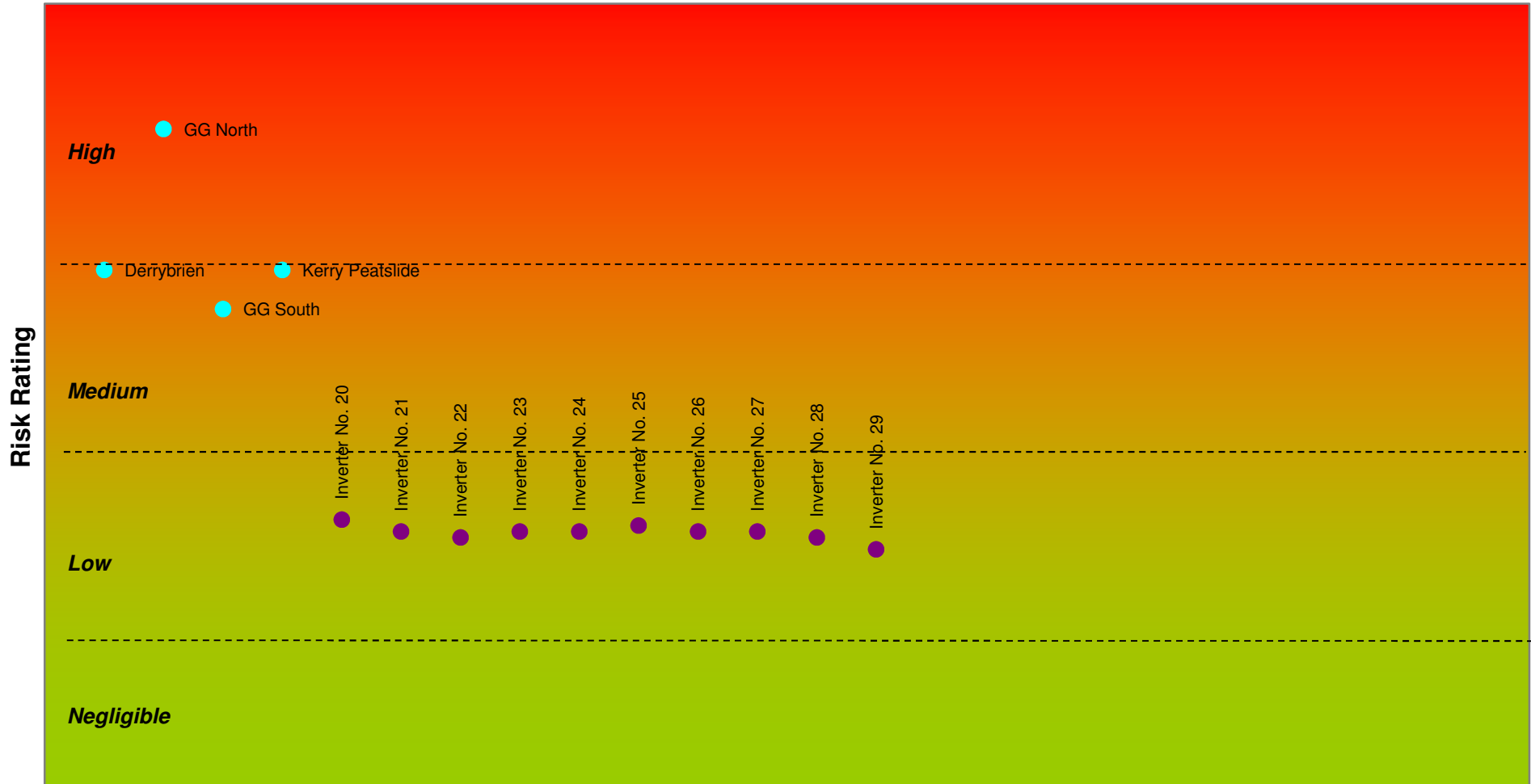
RESULTS OF PEAT STABILITY RISK ASSESSMENT

Area	Risk Level
Inverters	
Inverter No. 1	Low
Inverter No. 2	Low
Inverter No. 3	Low
Inverter No. 4	Low
Inverter No. 5	Low
Inverter No. 6	Low
Inverter No. 7	Low
Inverter No. 8	Low
Inverter No. 9	Low
Inverter No. 10	Low
Inverter No. 11	Low
Inverter No. 12	Low
Inverter No. 13	Low
Inverter No. 14	Low
Inverter No. 15	Low
Inverter No. 16	Low
Inverter No. 17	Low
Inverter No. 18	Low
Inverter No. 19	Low
Inverter No. 20	Low
Inverter No. 21	Low
Inverter No. 22	Low
Inverter No. 23	Low
Inverter No. 24	Low
Inverter No. 25	Low
Inverter No. 26	Low
Inverter No. 27	Low
Inverter No. 28	Low
Inverter No. 29	Low

PSRA Comparative Chart (Inverters Chart 1 of 2)



PSRA Comparative Chart (Inverters Chart 2 of 2)





Peat Stability Risk Assessment
Timahoe North Solar Farm

Location:	Peat Repository 1
Inspected on:	2017
Inspected by:	ESB International
Completed by:	SS
Date:	February 2018

Peat Repository 1													
No.	Likelihood/ Impact Factors	Value	Rating				Rating Value	Weighting	Score	Comment			
			1	2	3	4							
LIKELIHOOD													
1.0	Ground Conditions												
Peat													
1.1	Peat Depth	2 - 3.5 m	< 1 m	> 3 m	1 - 3 m	3	2	6	Based on peat probes carried out by ESB International and Irish Drilling, and also trial pits excavated by Irish Drilling Ltd in 2017.				
1.2	Peat Condition in Trial Pits	Stands Well	Dry/ Stands well	Slowly squeezing	Extremely Wet/ Undiggable	1	1	1	Trial pits excavated by Irish Drilling Ltd in 2017.				
Subsoil Characteristics													
1.3	Subsoil Type	Soft silt	Gravel/ Firm Glacial Till	Smooth Rock	Soft Sensitive Clay	3	1	3	Trial pits excavated by Irish Drilling Ltd in 2017.				
1.4	Peat fibres continuous across transition to subsoil	Partially	Yes	Partially	No	2	1	2	Trial pits excavated by Irish Drilling Ltd in 2017.				
2.0	Topography												
Situation													
2.1	Elevation OD [m]	~ 78 - 89 mOD	< 200 m		> 200 m	1	1	1	From LiDar.				
2.2	Slope Aspect	S	SW, S, SE	W, E	NW, N, NE	1	1	1	From LiDar.				
Slope Angle													
2.3	Slope Angle - Ground Surface	< 3°	< 3°	> 7°	3° - 7°	1	2	2	From LiDar.				
Geomorphology													
2.4	General slope characteristics downslope	Planar	Concave	Planar	Convex	2	1	2	From LiDar.				
2.5	Distance from break in slope	>100m	> 100 m	50 - 100 m	< 50 m	1	1	1	From LiDar.				
3.0	Hydrology												
Hydrology													
3.1	In broad valley upslope from defined watercourse	Yes, slopes < 3°	No	Yes, slopes < 3°	Yes, slopes ≥ 3°	2	1	2	From LiDar.				
3.2	Distance from head of defined watercourse	< 200m	> 300 m	200 - 300 m	< 200 m	3	1	3	From LiDar.				
3.3	Surface water	Localised	Localised	Ponded in drains	Springs/ Surface Water	1	1	1					
3.4	Evidence of piping	No	No	-	Yes	1	1	1	From site walk and site investigation.				
3.5	Existing drainage ditches	Varied	Down slope	Varied / Oblique	Across slope	2	1	2					
3.6	Annual Rainfall	800 - 1000 mm/yr	< 1000 mm/yr	1000 - 1400 mm/yr	>1400 mm/yr	1	1	1	From Met Éireann.				
4.0	Other Factors												
Vegetation													
4.1	Vegetation	Wetlands	Dry Heather	Grasslands	Wetlands	3	1	3	From aerial photography, drone survey and site walk.				
4.2	Forestry (if applicable)	N/A	Good Growth	Fair	Stunted Growth	0	1.5	0	From aerial photography, drone survey and site walk.				
Slide History													
4.3	Previous slides in locality	> 5 km	> 5 km	< 5 km	On site	1	2	2	From Geological Survey of Ireland.				
4.4	Evidence of movement in peat (e.g. tension cracks, step features, compression features)	No	No	-	Yes	1	1	1	From site walk and site investigation.				
Land Use													
4.5	Peat Workings	Cutaway/Turbary	None	Cutaway/Turbary	Machine Cut	2	1	2	From aerial photography, drone survey and site walk.				
Other Factors													
4.6	Existing roads in place	Floating Road	Solid Road		Floating Road	3	1	3	No existing road. Value assumed.				
4.7	Time of year for construction	Late Summer/ Autumn	Spring	Winter / Early Summer	Late Summer/ Autumn	3	1	3	Worst case scenario assumed.				
Likelihood Rating													
								Total	43		Likelihood Score	Scale	
								Max Possible	72		0.0-0.3	Negligible	1
											0.3-0.5	Low	2
								Likelihood	0.60		0.5-0.7	Medium	3
											0.7-1.0	High	4

IMPACT													
5.0	Impact Factors												
5.1	Volume of peat in potential peat flow	Medium (1,000 - 20,000 m³)	Small volume (<1,000 m³)	Medium (1,000 - 20,000 m³)	Potential for Bog burst	2	3	6	Based on distance to downslope watercourse.				
5.2	Downslope features	Watercourse	Bowl/ contained	Minor undefined watercourse	Valley	2	1	2	From LiDar				
5.3	Proximity to defined valley	< 200 m	> 500 m	200 - 500 m	< 200 m	3	1	3	From LiDar				
5.4	Valley profile	Flat	Flat	Intermediate	Steep	1	1	1	From LiDar				
5.5	Downstream aquatic environment	Sensitive	Non-sensitive	Sensitive	Drinking water supply	2	1	2	River Blackwater Special Area of Conservation (SAC).				
5.6	Public roads in potential peat flow path	No	No	Local Road	Regional Road	1	1	1	From aerial photography, drone survey and site walk				
5.7	Overhead lines in potential peat flow path	No	Phone Lines	Electricity, LV	Electricity MV, HV	1	1	1	From service drawings and site walk				
5.8	Buildings in potential peat flow path	No	No	Farm out-houses	Dwelling	1	1	1	From aerial photography, drone survey and site walk				
5.9	Capability to respond (access and resources)	Good	Good	Fair	Poor	1	1	1	Based on contractor facilities on site during construction.				
Impact Rating													
								Total	18		Impact Score	Scale	
								Max Possible	33		0.0-0.3	Negligible	1
											0.3-0.5	Low	2
								Impact	0.55		0.5-0.7	Medium	3
											0.7-1.0	High	4

RISK RATING									
Risk Rating = Likelihood * Impact									
Risk Rating = 0.60 0.55 = 0.33 Low									
Risk Rating	Risk Level	Action Required							
0.0 - 0.18	Negligible	Normal SI							
0.19 - 0.42	Low	Targeted SI, design of specific mitigation measures. Part time supervision during construction.							
0.43 - 0.66	Medium	Avoid construction in the area if possible. If unavoidable, detailed SI and design of specific mitigation measures. Full time supervision during construction.							
0.67 - 1.0	High	Avoid construction in this area.							



Peat Stability Risk Assessment
Timahoe North Solar Farm

Location:	Peat Repository 2
Inspected on:	2017
Inspected by:	ESB International
Completed by:	SS
Date:	February 2018

Peat Repository 2												
No.	Likelihood/ Impact Factors	Value	Rating				Rating Value	Weighting	Score	Comment		
			1	2	3							
LIKELIHOOD												
1.0 Ground Conditions												
Peat												
1.1	Peat Depth	1 - 3 m	< 1 m	> 3 m	1 - 3 m	3	2	6	Based on peat probes carried out by ESB International and Irish Drilling, and also trial pits excavated by Irish Drilling Ltd in 2017.			
1.2	Peat Condition in Trial Pits	Stands Well	Dry/ Stands well	Slowly squeezing	Extremely Wet/ Undiggable	1	1	1	Trial pits excavated by Irish Drilling Ltd in 2017.			
Subsoil Characteristics												
1.3	Subsoil Type	Firm to stiff silt	Gravel/ Firm Glacial Till	Smooth Rock	Soft Sensitive Clay	1	1	1	Trial pits excavated by Irish Drilling Ltd in 2017.			
1.4	Peat fibres continuous across transition to subsoil	No	Yes	Partially	No	3	1	3	Trial pits excavated by Irish Drilling Ltd in 2017.			
2.0 Topography												
Situation												
2.1	Elevation OD [m]	~ 78 - 89 mOD	< 200 m		> 200 m	1	1	1	From LiDar.			
2.2	Slope Aspect	S	SW, S, SE	W, E	NW, N, NE	1	1	1	From LiDar.			
Slope Angle												
2.3	Slope Angle - Ground Surface	< 3°	< 3°	> 7°	3° - 7°	1	2	2	From LiDar.			
Geomorphology												
2.4	General slope characteristics downslope	Planar	Concave	Planar	Convex	2	1	2	From LiDar.			
2.5	Distance from break in slope	>100m	> 100 m	50 - 100 m	< 50 m	1	1	1	From LiDar.			
3.0 Hydrology												
Hydrology												
3.1	In broad valley upslope from defined watercourse	Yes, slopes < 3°	No	Yes, slopes < 3°	Yes, slopes ≥ 3°	2	1	2	From LiDar.			
3.2	Distance from head of defined watercourse	< 200m	> 300 m	200 - 300 m	< 200 m	3	1	3	From LiDar.			
3.3	Surface water	Localised	Localised	Ponded in drains	Springs/ Surface Water	1	1	1				
3.4	Evidence of piping	No	No	-	Yes	1	1	1	From site walk and site investigation.			
3.5	Existing drainage ditches	Varied	Down slope	Varied / Oblique	Across slope	2	1	2				
3.6	Annual Rainfall	800 - 1000 mm/yr	< 1000 mm/yr	1000 - 1400 mm/yr	>1400 mm/yr	1	1	1	From Met Éireann.			
4.0 Other Factors												
Vegetation												
4.1	Vegetation	Wetlands	Dry Heather	Grasslands	Wetlands	3	1	3	From aerial photography, drone survey and site walk.			
4.2	Forestry (if applicable)	N/A	Good Growth	Fair	Stunted Growth	0	1.5	0	From aerial photography, drone survey and site walk.			
Slide History												
4.3	Previous slides in locality	> 5 km	> 5 km	< 5 km	On site	1	2	2	From Geological Survey of Ireland.			
4.4	Evidence of movement in peat (e.g. tension cracks, step features, compression features)	No	No	-	Yes	1	1	1	From site walk and site investigation.			
Land Use												
4.5	Peat Workings	Cutaway/Turbary	None	Cutaway/Turbary	Machine Cut	2	1	2	From aerial photography, drone survey and site walk.			
Other Factors												
4.6	Existing roads in place	Floating Road	Solid Road		Floating Road	3	1	3	No existing road. Value assumed.			
4.7	Time of year for construction	Late Summer/ Autumn	Spring	Winter / Early Summer	Late Summer/ Autumn	3	1	3	Worst case scenario assumed.			
Likelihood Rating												
								Total	42			
								Max Possible	72			
										Likelihood Score		
										0.0-0.3	Negligible	1
										0.3-0.5	Low	2
										0.5-0.7	Medium	3
										0.7-1.0	High	4
								Likelihood	0.58			

IMPACT												
5.0 Impact Factors												
5.1	Volume of peat in potential peat flow	Medium (1,000 - 20,000 m³)	Small volume (<1,000 m³)	Medium (1,000 - 20,000 m³)	Potential for Bog burst	2	3	6	Based on distance to downslope watercourse.			
5.2	Downslope features	Watercourse	Bowl/ contained	Minor undefined watercourse	Valley	2	1	2	From LiDar			
5.3	Proximity to defined valley	< 200 m	> 500 m	200 - 500 m	< 200 m	3	1	3	From LiDar			
5.4	Valley profile	Flat	Flat	Intermediate	Steep	1	1	1	From LiDar			
5.5	Downstream aquatic environment	Sensitive	Non-sensitive	Sensitive	Drinking water supply	2	1	2	River Blackwater Special Area of Conservation (SAC).			
5.6	Public roads in potential peat flow path	No	No	Local Road	Regional Road	1	1	1	From aerial photography, drone survey and site walk			
5.7	Overhead lines in potential peat flow path	No	Phone Lines	Electricity, LV	Electricity MV, HV	1	1	1	From service drawings and site walk			
5.8	Buildings in potential peat flow path	No	No	Farm out-houses	Dwelling	1	1	1	From aerial photography, drone survey and site walk			
5.9	Capability to respond (access and resources)	Good	Good	Fair	Poor	1	1	1	Based on contractor facilities on site during construction.			
Impact Rating												
								Total	18			
								Max Possible	33			
										Impact Score		
										0.0-0.3	Negligible	1
										0.3-0.5	Low	2
										0.5-0.7	Medium	3
										0.7-1.0	High	4
								Impact	0.55			

RISK RATING			
Risk Rating = Likelihood * Impact			
Risk Rating = 0.58 * 0.55 = 0.32 Low			
Risk Rating	Risk Level	Action Required	
0.0 - 0.18	Negligible	Normal SI	
0.19 - 0.42	Low	Targeted SI, design of specific mitigation measures. Part time supervision during construction.	
0.43 - 0.66	Medium	Avoid construction in the area if possible. If unavoidable, detailed SI and design of specific mitigation measures. Full time supervision during construction.	
0.67 - 1.0	High	Avoid construction in this area.	



Peat Stability Risk Assessment
Timahoe North Solar Farm

Location:	Peat Repository 3
Inspected on:	2017
Inspected by:	ESB International
Completed by:	SS
Date:	February 2018

Peat Repository 3													
No.	Likelihood/ Impact Factors	Value	Rating				Rating Value	Weighting	Score	Comment			
			1	2	3								
LIKELIHOOD													
1.0 Ground Conditions													
Peat													
1.1	Peat Depth	1.5 - 3.5 m	< 1 m	> 3 m	1 - 3 m	3	2	6	Based on peat probes carried out by ESB International and Irish Drilling, and also trial pits excavated by Irish Drilling Ltd in 2017.				
1.2	Peat Condition in Trial Pits	Stands Well	Dry/ Stands well	Slowly squeezing	Extremely Wet/ Undiggable	1	1	1	Trial pits excavated by Irish Drilling Ltd in 2017.				
Subsoil Characteristics													
1.3	Subsoil Type	Soft silt	Gravel/ Firm Glacial Till	Smooth Rock	Soft Sensitive Clay	3	1	3	Trial pits excavated by Irish Drilling Ltd in 2017.				
1.4	Peat fibres continuous across transition to subsoil	Partially	Yes	Partially	No	2	1	2	Trial pits excavated by Irish Drilling Ltd in 2017.				
2.0 Topography													
Situation													
2.1	Elevation OD [m]	~ 78 - 89 mOD	< 200 m		> 200 m	1	1	1	From LiDar.				
2.2	Slope Aspect	S	SW, S, SE	W, E	NW, N, NE	1	1	1	From LiDar.				
Slope Angle													
2.3	Slope Angle - Ground Surface	< 3°	< 3°	> 7°	3° - 7°	1	2	2	From LiDar.				
Geomorphology													
2.4	General slope characteristics downslope	Planar	Concave	Planar	Convex	2	1	2	From LiDar.				
2.5	Distance from break in slope	>100m	> 100 m	50 - 100 m	< 50 m	1	1	1	From LiDar.				
3.0 Hydrology													
Hydrology													
3.1	In broad valley upslope from defined watercourse	Yes, slopes < 3°	No	Yes, slopes < 3°	Yes, slopes ≥ 3°	2	1	2	From LiDar.				
3.2	Distance from head of defined watercourse	< 200m	> 300 m	200 - 300 m	< 200 m	3	1	3	From LiDar.				
3.3	Surface water	Localised	Localised	Ponded in drains	Springs/ Surface Water	1	1	1					
3.4	Evidence of piping	No	No	-	Yes	1	1	1	From site walk and site investigation.				
3.5	Existing drainage ditches	Varied	Down slope	Varied / Oblique	Across slope	2	1	2					
3.6	Annual Rainfall	800 - 1000 mm/yr	< 1000 mm/yr	1000 - 1400 mm/yr	>1400 mm/yr	1	1	1	From Met Éireann.				
4.0 Other Factors													
Vegetation													
4.1	Vegetation	Wetlands	Dry Heather	Grasslands	Wetlands	3	1	3	From aerial photography, drone survey and site walk.				
4.2	Forestry (if applicable)	N/A	Good Growth	Fair	Stunted Growth	0	1.5	0	From aerial photography, drone survey and site walk.				
Slide History													
4.3	Previous slides in locality	> 5 km	> 5 km	< 5 km	On site	1	2	2	From Geological Survey of Ireland.				
4.4	Evidence of movement in peat (e.g. tension cracks, step features, compression features)	No	No	-	Yes	1	1	1	From site walk and site investigation.				
Land Use													
4.5	Peat Workings	Cutaway/Turbary	None	Cutaway/Turbary	Machine Cut	2	1	2	From aerial photography, drone survey and site walk.				
Other Factors													
4.6	Existing roads in place	Floating Road	Solid Road		Floating Road	3	1	3	No existing road. Value assumed.				
4.7	Time of year for construction	Late Summer/ Autumn	Spring	Winter / Early Summer	Late Summer/ Autumn	3	1	3	Worst case scenario assumed.				
Likelihood Rating													
								Total	43		Likelihood Score	Scale	
								Max Possible	72		0.0-0.3	Negligible	1
											0.3-0.5	Low	2
								Likelihood	0.60		0.5-0.7	Medium	3
											0.7-1.0	High	4

IMPACT													
5.0 Impact Factors													
5.1	Volume of peat in potential peat flow	Medium (1,000 - 20,000 m³)	Small volume (<1,000 m³)	Medium (1,000 - 20,000 m³)	Potential for Bog burst	2	3	6	Based on distance to downslope watercourse.				
5.2	Downslope features	Watercourse	Bowl/ contained	Minor undefined watercourse	Valley	2	1	2	From LiDar				
5.3	Proximity to defined valley	< 200 m	> 500 m	200 - 500 m	< 200 m	3	1	3	From LiDar				
5.4	Valley profile	Flat	Flat	Intermediate	Steep	1	1	1	From LiDar				
5.5	Downstream aquatic environment	Sensitive	Non-sensitive	Sensitive	Drinking water supply	2	1	2	River Blackwater Special Area of Conservation (SAC).				
5.6	Public roads in potential peat flow path	No	No	Local Road	Regional Road	1	1	1	From aerial photography, drone survey and site walk				
5.7	Overhead lines in potential peat flow path	No	Phone Lines	Electricity, LV	Electricity MV, HV	1	1	1	From service drawings and site walk				
5.8	Buildings in potential peat flow path	No	No	Farm out-houses	Dwelling	1	1	1	From aerial photography, drone survey and site walk				
5.9	Capability to respond (access and resources)	Good	Good	Fair	Poor	1	1	1	Based on contractor facilities on site during construction.				
Impact Rating													
								Total	18		Impact Score	Scale	
								Max Possible	33		0.0-0.3	Negligible	1
											0.3-0.5	Low	2
								Impact	0.55		0.5-0.7	Medium	3
											0.7-1.0	High	4

RISK RATING									
Risk Rating = Likelihood * Impact									
Risk Rating = 0.60 0.55 = 0.33 Low									
Risk Rating	Risk Level	Action Required							
0.0 - 0.18	Negligible	Normal SI							
0.19 - 0.42	Low	Targeted SI, design of specific mitigation measures. Part time supervision during construction.							
0.43 - 0.66	Medium	Avoid construction in the area if possible. If unavoidable, detailed SI and design of specific mitigation measures. Full time supervision during construction.							
0.67 - 1.0	High	Avoid construction in this area.							

Peat Repository 4													
No.	Likelihood/ Impact Factors	Value	Rating				Rating Value	Weighting	Score	Comment			
			1	2	3	4							
LIKELIHOOD													
1.0	Ground Conditions												
Peat													
1.1	Peat Depth	2.5 - 4 m	< 1 m	> 3 m	1 - 3 m	3	2	6	Based on peat probes carried out by ESB International and Irish Drilling, and also trial pits excavated by Irish Drilling Ltd in 2017.				
1.2	Peat Condition in Trial Pits	Stands Well	Dry/ Stands well	Slowly squeezing	Extremely Wet/ Undiggable	1	1	1	Trial pits excavated by Irish Drilling Ltd in 2017.				
Subsoil Characteristics													
1.3	Subsoil Type	Gravelly sandy silt	Gravel/ Firm Glacial Till	Smooth Rock	Soft Sensitive Clay	1	1	1	Trial pits excavated by Irish Drilling Ltd in 2017.				
1.4	Peat fibres continuous across transition to subsoil	No	Yes	Partially	No	3	1	3	Trial pits excavated by Irish Drilling Ltd in 2017.				
2.0	Topography												
Situation													
2.1	Elevation OD [m]	~ 78 - 89 mOD	< 200 m		> 200 m	1	1	1	From LiDar.				
2.2	Slope Aspect	S	SW, S, SE	W, E	NW, N, NE	1	1	1	From LiDar.				
Slope Angle													
2.3	Slope Angle - Ground Surface	< 3°	< 3°	> 7°	3° - 7°	1	2	2	From LiDar.				
Geomorphology													
2.4	General slope characteristics downslope	Planar	Concave	Planar	Convex	2	1	2	From LiDar.				
2.5	Distance from break in slope	>100m	> 100 m	50 - 100 m	< 50 m	1	1	1	From LiDar.				
3.0	Hydrology												
Hydrology													
3.1	In broad valley upslope from defined watercourse	Yes, slopes < 3°	No	Yes, slopes < 3°	Yes, slopes ≥ 3°	2	1	2	From LiDar.				
3.2	Distance from head of defined watercourse	< 200m	> 300 m	200 - 300 m	< 200 m	3	1	3	From LiDar.				
3.3	Surface water	Localised	Localised	Ponded in drains	Springs/ Surface Water	1	1	1					
3.4	Evidence of piping	No	No	-	Yes	1	1	1	From site walk and site investigation.				
3.5	Existing drainage ditches	Varied	Down slope	Varied / Oblique	Across slope	2	1	2					
3.6	Annual Rainfall	800 - 1000 mm/yr	< 1000 mm/yr	1000 - 1400 mm/yr	>1400 mm/yr	1	1	1	From Met Éireann.				
4.0	Other Factors												
Vegetation													
4.1	Vegetation	Wetlands	Dry Heather	Grasslands	Wetlands	3	1	3	From aerial photography, drone survey and site walk.				
4.2	Forestry (if applicable)	N/A	Good Growth	Fair	Stunted Growth	0	1.5	0	From aerial photography, drone survey and site walk.				
Slide History													
4.3	Previous slides in locality	> 5 km	> 5 km	< 5 km	On site	1	2	2	From Geological Survey of Ireland.				
4.4	Evidence of movement in peat (e.g. tension cracks, step features, compression features)	No	No	-	Yes	1	1	1	From site walk and site investigation.				
Land Use													
4.5	Peat Workings	Cutaway/Turbary	None	Cutaway/Turbary	Machine Cut	2	1	2	From aerial photography, drone survey and site walk.				
Other Factors													
4.6	Existing roads in place	Floating Road	Solid Road		Floating Road	3	1	3	No existing road. Value assumed.				
4.7	Time of year for construction	Late Summer/ Autumn	Spring	Winter / Early Summer	Late Summer/ Autumn	3	1	3	Worst case scenario assumed.				
Likelihood Rating													
								Total	42		Likelihood Score	Scale	
								Max Possible	72		0.0-0.3	Negligible	1
											0.3-0.5	Low	2
								Likelihood	0.58		0.5-0.7	Medium	3
											0.7-1.0	High	4

IMPACT													
5.0	Impact Factors												
5.1	Volume of peat in potential peat flow	Medium (1,000 - 20,000 m³)	Small volume (<1,000 m³)	Medium (1,000 - 20,000 m³)	Potential for Bog burst	2	3	6	Based on distance to downslope watercourse.				
5.2	Downslope features	Watercourse	Bowl/ contained	Minor undefined watercourse	Valley	2	1	2	From LiDar				
5.3	Proximity to defined valley	< 200 m	> 500 m	200 - 500 m	< 200 m	3	1	3	From LiDar				
5.4	Valley profile	Flat	Flat	Intermediate	Steep	1	1	1	From LiDar				
5.5	Downstream aquatic environment	Sensitive	Non-sensitive	Sensitive	Drinking water supply	2	1	2	River Blackwater Special Area of Conservation (SAC).				
5.6	Public roads in potential peat flow path	No	No	Local Road	Regional Road	1	1	1	From aerial photography, drone survey and site walk				
5.7	Overhead lines in potential peat flow path	No	Phone Lines	Electricity, LV	Electricity MV, HV	1	1	1	From service drawings and site walk				
5.8	Buildings in potential peat flow path	No	No	Farm out-houses	Dwelling	1	1	1	From aerial photography, drone survey and site walk				
5.9	Capability to respond (access and resources)	Good	Good	Fair	Poor	1	1	1	Based on contractor facilities on site during construction.				
Impact Rating													
								Total	18		Impact Score	Scale	
								Max Possible	33		0.0-0.3	Negligible	1
											0.3-0.5	Low	2
								Impact	0.55		0.5-0.7	Medium	3
											0.7-1.0	High	4

RISK RATING									
<p align="center">Risk Rating = Likelihood * Impact</p> <p align="center">Risk Rating = 0.58 0.55 = 0.32 Low</p>									
Risk Rating	Risk Level	Action Required							
0.0 - 0.18	Negligible	Normal SI							
0.19 - 0.42	Low	Targeted SI, design of specific mitigation measures. Part time supervision during construction.							
0.43 - 0.66	Medium	Avoid construction in the area if possible. If unavoidable, detailed SI and design of specific mitigation measures. Full time supervision during construction.							
0.67 - 1.0	High	Avoid construction in this area.							



Peat Stability Risk Assessment
Timahoe North Solar Farm

Location:	Peat Repository 5
Inspected on:	2017
Inspected by:	ESB International
Completed by:	SS
Date:	February 2018

Peat Repository 5														
No.	Likelihood/ Impact Factors	Value	Rating				Rating Value	Weighting	Score	Comment				
			1	2	3									
LIKELIHOOD														
1.0	Ground Conditions													
	Peat													
1.1	Peat Depth	2.5 - 3.5 m	< 1 m	> 3 m	1 - 3 m	3	2	6	Based on peat probes carried out by ESB International and Irish Drilling, and also trial pits excavated by Irish Drilling Ltd in 2017.					
1.2	Peat Condition in Trial Pits	Stands Well	Dry/ Stands well	Slowly squeezing	Extremely Wet/ Undiggable	1	1	1	Trial pits excavated by Irish Drilling Ltd in 2017.					
	Subsoil Characteristics													
1.3	Subsoil Type	Very soft organic silt	Gravel/ Firm Glacial Till	Smooth Rock	Soft Sensitive Clay	3	1	3	Trial pits excavated by Irish Drilling Ltd in 2017.					
1.4	Peat fibres continuous across transition to subsoil	Partially	Yes	Partially	No	2	1	2	Trial pits excavated by Irish Drilling Ltd in 2017.					
2.0	Topography													
	Situation													
2.1	Elevation OD [m]	~ 78 - 89 mOD	< 200 m		> 200 m	1	1	1	From LiDar.					
2.2	Slope Aspect	S	SW, S, SE	W, E	NW, N, NE	1	1	1	From LiDar.					
	Slope Angle													
2.3	Slope Angle - Ground Surface	< 3°	< 3°	> 7°	3° - 7°	1	2	2	From LiDar.					
	Geomorphology													
2.4	General slope characteristics downslope	Planar	Concave	Planar	Convex	2	1	2	From LiDar.					
2.5	Distance from break in slope	>100m	> 100 m	50 - 100 m	< 50 m	1	1	1	From LiDar.					
3.0	Hydrology													
	Hydrology													
3.1	In broad valley upslope from defined watercourse	Yes, slopes < 3°	No	Yes, slopes < 3°	Yes, slopes ≥ 3°	2	1	2	From LiDar.					
3.2	Distance from head of defined watercourse	< 200m	> 300 m	200 - 300 m	< 200 m	3	1	3	From LiDar.					
3.3	Surface water	Localised	Localised	Ponded in drains	Springs/ Surface Water	1	1	1						
3.4	Evidence of piping	No	No	-	Yes	1	1	1	From site walk and site investigation.					
3.5	Existing drainage ditches	Varied	Down slope	Varied / Oblique	Across slope	2	1	2						
3.6	Annual Rainfall	800 - 1000 mm/yr	< 1000 mm/yr	1000 - 1400 mm/yr	>1400 mm/yr	1	1	1	From Met Éireann.					
4.0	Other Factors													
	Vegetation													
4.1	Vegetation	Wetlands	Dry Heather	Grasslands	Wetlands	3	1	3	From aerial photography, drone survey and site walk.					
4.2	Forestry (if applicable)	N/A	Good Growth	Fair	Stunted Growth	0	1.5	0	From aerial photography, drone survey and site walk.					
	Slide History													
4.3	Previous slides in locality	> 5 km	> 5 km	< 5 km	On site	1	2	2	From Geological Survey of Ireland.					
4.4	Evidence of movement in peat (e.g. tension cracks, step features, compression features)	No	No	-	Yes	1	1	1	From site walk and site investigation.					
	Land Use													
4.5	Peat Workings	Cutaway/Turbary	None	Cutaway/Turbary	Machine Cut	2	1	2	From aerial photography, drone survey and site walk.					
	Other Factors													
4.6	Existing roads in place	Floating Road	Solid Road		Floating Road	3	1	3	No existing road. Value assumed.					
4.7	Time of year for construction	Late Summer/ Autumn	Spring	Winter / Early Summer	Late Summer/ Autumn	3	1	3	Worst case scenario assumed.					
Likelihood Rating														
								Total	43			Likelihood Score	Scale	
								Max Possible	72			0.0-0.3	Negligible	1
												0.3-0.5	Low	2
								Likelihood	0.60			0.5-0.7	Medium	3
												0.7-1.0	High	4

IMPACT														
5.0	Impact Factors													
5.1	Volume of peat in potential peat flow	Medium (1,000 - 20,000 m ³)	Small volume (<1,000 m ³)	Medium (1,000 - 20,000 m ³)	Potential for Bog burst	2	3	6	Based on distance to downslope watercourse.					
5.2	Downslope features	Watercourse	Bowl/ contained	Minor undefined watercourse	Valley	2	1	2	From LiDar					
5.3	Proximity to defined valley	< 200 m	> 500 m	200 - 500 m	< 200 m	3	1	3	From LiDar					
5.4	Valley profile	Flat	Flat	Intermediate	Steep	1	1	1	From LiDar					
5.5	Downstream aquatic environment	Sensitive	Non-sensitive	Sensitive	Drinking water supply	2	1	2	River Blackwater Special Area of Conservation (SAC).					
5.6	Public roads in potential peat flow path	No	No	Local Road	Regional Road	1	1	1	From aerial photography, drone survey and site walk					
5.7	Overhead lines in potential peat flow path	No	Phone Lines	Electricity, LV	Electricity MV, HV	1	1	1	From service drawings and site walk					
5.8	Buildings in potential peat flow path	No	No	Farm out-houses	Dwelling	1	1	1	From aerial photography, drone survey and site walk					
5.9	Capability to respond (access and resources)	Good	Good	Fair	Poor	1	1	1	Based on contractor facilities on site during construction.					
Impact Rating														
								Total	18			Impact Score	Scale	
								Max Possible	33			0.0-0.3	Negligible	1
												0.3-0.5	Low	2
								Impact	0.55			0.5-0.7	Medium	3
												0.7-1.0	High	4

RISK RATING			
Risk Rating = Likelihood * Impact			
Risk Rating = 0.60 * 0.55 = 0.33 Low			
Risk Rating	Risk Level	Action Required	
0.0 - 0.18	Negligible	Normal SI	
0.19 - 0.42	Low	Targeted SI, design of specific mitigation measures. Part time supervision during construction.	
0.43 - 0.66	Medium	Avoid construction in the area if possible. If unavoidable, detailed SI and design of specific mitigation measures. Full time supervision during construction.	
0.67 - 1.0	High	Avoid construction in this area.	



Peat Stability Risk Assessment
Timahoe North Solar Farm

Location:	Peat Repository 6
Inspected on:	2017
Inspected by:	ESB International
Completed by:	SS
Date:	February 2018

Peat Repository 6											
No.	Likelihood/ Impact Factors	Value	Rating				Rating Value	Weighting	Score	Comment	
			1	2	3						
LIKELIHOOD											
1.0	Ground Conditions										
	Peat										
1.1	Peat Depth	2.5 - 4 m	< 1 m	> 3 m	1 - 3 m	3	2	6	Based on peat probes carried out by ESB International and Irish Drilling, and also trial pits excavated by Irish Drilling Ltd in 2017.		
1.2	Peat Condition in Trial Pits	Slowly squeezing	Dry/ Stands well	Slowly squeezing	Extremely Wet/ Undruggable	2	1	2	Trial pits excavated by Irish Drilling Ltd in 2017.		
	Subsoil Characteristics										
1.3	Subsoil Type	Soft silt	Gravel/ Firm Glacial Till	Smooth Rock	Soft Sensitive Clay	3	1	3	Trial pits excavated by Irish Drilling Ltd in 2017.		
1.4	Peat fibres continuous across transition to subsoil	No	Yes	Partially	No	3	1	3	Trial pits excavated by Irish Drilling Ltd in 2017.		
2.0	Topography										
	Situation										
2.1	Elevation OD [m]	~ 78 - 89 mOD	< 200 m		> 200 m	1	1	1	From LiDar.		
2.2	Slope Aspect	S	SW, S, SE	W, E	NW, N, NE	1	1	1	From LiDar.		
	Slope Angle										
2.3	Slope Angle - Ground Surface	< 3°	< 3°	> 7°	3° - 7°	1	2	2	From LiDar.		
	Geomorphology										
2.4	General slope characteristics downslope	Planar	Concave	Planar	Convex	2	1	2	From LiDar.		
2.5	Distance from break in slope	>100m	> 100 m	50 - 100 m	< 50 m	1	1	1	From LiDar.		
3.0	Hydrology										
	Hydrology										
3.1	In broad valley upslope from defined watercourse	Yes, slopes < 3°	No	Yes, slopes < 3°	Yes, slopes ≥ 3°	2	1	2	From LiDar.		
3.2	Distance from head of defined watercourse	< 200m	> 300 m	200 - 300 m	< 200 m	3	1	3	From LiDar.		
3.3	Surface water	Localised	Localised	Ponded in drains	Springs/ Surface Water	1	1	1			
3.4	Evidence of piping	No	No	-	Yes	1	1	1	From site walk and site investigation.		
3.5	Existing drainage ditches	Varied	Down slope	Varied / Oblique	Across slope	2	1	2			
3.6	Annual Rainfall	800 - 1000 mm/yr	< 1000 mm/yr	1000 - 1400 mm/yr	>1400 mm/yr	1	1	1	From Met Éireann.		
4.0	Other Factors										
	Vegetation										
4.1	Vegetation	Wetlands	Dry Heather	Grasslands	Wetlands	3	1	3	From aerial photography, drone survey and site walk.		
4.2	Forestry (if applicable)	N/A	Good Growth	Fair	Stunted Growth	0	1.5	0	From aerial photography, drone survey and site walk.		
	Slide History										
4.3	Previous slides in locality	> 5 km	> 5 km	< 5 km	On site	1	2	2	From Geological Survey of Ireland.		
4.4	Evidence of movement in peat (e.g. tension cracks, step features, compression features)	No	No	-	Yes	1	1	1	From site walk and site investigation.		
	Land Use										
4.5	Peat Workings	Cutaway/Turbary	None	Cutaway/Turbary	Machine Cut	2	1	2	From aerial photography, drone survey and site walk.		
	Other Factors										
4.6	Existing roads in place	Floating Road	Solid Road		Floating Road	3	1	3	No existing road. Value assumed.		
4.7	Time of year for construction	Late Summer/ Autumn	Spring	Winter / Early Summer	Late Summer/ Autumn	3	1	3	Worst case scenario assumed.		
	Likelihood Rating										
							Total	45			
							Max Possible	72			
									Likelihood Score	Scale	
									0.0-0.3	Negligible	1
									0.3-0.5	Low	2
							Likelihood	0.63	0.5-0.7	Medium	3
									0.7-1.0	High	4

IMPACT											
5.0	Impact Factors										
5.1	Volume of peat in potential peat flow	Medium (1,000 - 20,000 m³)	Small volume (<1,000 m³)	Medium (1,000 - 20,000 m³)	Potential for Bog burst	2	3	6	Based on distance to downslope watercourse.		
5.2	Downslope features	Watercourse	Bowl/ contained	Minor undefined watercourse	Valley	2	1	2	From LiDar		
5.3	Proximity to defined valley	< 200 m	> 500 m	200 - 500 m	< 200 m	3	1	3	From LiDar		
5.4	Valley profile	Flat	Flat	Intermediate	Steep	1	1	1	From LiDar		
5.5	Downstream aquatic environment	Sensitive	Non-sensitive	Sensitive	Drinking water supply	2	1	2	River Blackwater Special Area of Conservation (SAC).		
5.6	Public roads in potential peat flow path	No	No	Local Road	Regional Road	1	1	1	From aerial photography, drone survey and site walk		
5.7	Overhead lines in potential peat flow path	No	Phone Lines	Electricity, LV	Electricity MV, HV	1	1	1	From service drawings and site walk		
5.8	Buildings in potential peat flow path	No	No	Farm out-houses	Dwelling	1	1	1	From aerial photography, drone survey and site walk		
5.9	Capability to respond (access and resources)	Good	Good	Fair	Poor	1	1	1	Based on contractor facilities on site during construction.		
	Impact Rating										
							Total	18			
							Max Possible	33			
									Impact Score	Scale	
									0.0-0.3	Negligible	1
									0.3-0.5	Low	2
							Impact	0.55	0.5-0.7	Medium	3
									0.7-1.0	High	4

RISK RATING

Risk Rating = Likelihood * Impact

Risk Rating = 0.63 * 0.55 = 0.34 Low

Risk Rating	Risk Level	Action Required
0.0 - 0.18	Negligible	Normal SI
0.19 - 0.42	Low	Targeted SI, design of specific mitigation measures. Part time supervision during construction.
0.43 - 0.66	Medium	Avoid construction in the area if possible. If unavoidable, detailed SI and design of specific mitigation measures. Full time supervision during construction.
0.67 - 1.0	High	Avoid construction in this area.



Peat Stability Risk Assessment
Timahoe North Solar Farm

Location:	Peat Repository 7
Inspected on:	2017
Inspected by:	ESB International
Completed by:	SS
Date:	February 2018

Peat Repository 7												
No.	Likelihood/ Impact Factors	Value	Rating				Rating Value	Weighting	Score	Comment		
			1	2	3	4						
LIKELIHOOD												
1.0 Ground Conditions												
Peat												
1.1	Peat Depth	0.5 - 3 m	< 1 m	> 3 m	1 - 3 m	3	2	6	Based on peat probes carried out by ESB International and Irish Drilling, and also trial pits excavated by Irish Drilling Ltd in 2017.			
1.2	Peat Condition in Trial Pits	Slowly squeezing	Dry/ Stands well	Slowly squeezing	Extremely Wet/ Undiggable	2	1	2	Trial pits excavated by Irish Drilling Ltd in 2017.			
Subsoil Characteristics												
1.3	Subsoil Type	Soft organic silt	Gravel/ Firm Glacial Till	Smooth Rock	Soft Sensitive Clay	3	1	3	Trial pits excavated by Irish Drilling Ltd in 2017.			
1.4	Peat fibres continuous across transition to subsoil	No	Yes	Partially	No	3	1	3	Trial pits excavated by Irish Drilling Ltd in 2017.			
2.0 Topography												
Situation												
2.1	Elevation OD [m]	~ 78 - 89 mOD	< 200 m	> 200 m		1	1	1	From LiDar.			
2.2	Slope Aspect	S	SW, S, SE	W, E	NW, N, NE	1	1	1	From LiDar.			
Slope Angle												
2.3	Slope Angle - Ground Surface	< 3°	< 3°	> 7°	3° - 7°	1	2	2	From LiDar.			
Geomorphology												
2.4	General slope characteristics downslope	Planar	Concave	Planar	Convex	2	1	2	From LiDar.			
2.5	Distance from break in slope	>100m	> 100 m	50 - 100 m	< 50 m	1	1	1	From LiDar.			
3.0 Hydrology												
Hydrology												
3.1	In broad valley upslope from defined watercourse	Yes, slopes < 3°	No	Yes, slopes < 3°	Yes, slopes ≥ 3°	2	1	2	From LiDar.			
3.2	Distance from head of defined watercourse	< 200m	> 300 m	200 - 300 m	< 200 m	3	1	3	From LiDar.			
3.3	Surface water	Localised	Localised	Ponded in drains	Springs/ Surface Water	1	1	1				
3.4	Evidence of piping	No	No	-	Yes	1	1	1	From site walk and site investigation.			
3.5	Existing drainage ditches	Varied	Down slope	Varied / Oblique	Across slope	2	1	2				
3.6	Annual Rainfall	800 - 1000 mm/yr	< 1000 mm/yr	1000 - 1400 mm/yr	>1400 mm/yr	1	1	1	From Met Éireann.			
4.0 Other Factors												
Vegetation												
4.1	Vegetation	Wetlands	Dry Heather	Grasslands	Wetlands	3	1	3	From aerial photography, drone survey and site walk.			
4.2	Forestry (if applicable)	N/A	Good Growth	Fair	Stunted Growth	0	1.5	0	From aerial photography, drone survey and site walk.			
Slide History												
4.3	Previous slides in locality	> 5 km	> 5 km	< 5 km	On site	1	2	2	From Geological Survey of Ireland.			
4.4	Evidence of movement in peat (e.g. tension cracks, step features, compression features)	No	No	-	Yes	1	1	1	From site walk and site investigation.			
Land Use												
4.5	Peat Workings	Cutaway/Turbary	None	Cutaway/Turbary	Machine Cut	2	1	2	From aerial photography, drone survey and site walk.			
Other Factors												
4.6	Existing roads in place	Floating Road	Solid Road		Floating Road	3	1	3	No existing road. Value assumed.			
4.7	Time of year for construction	Late Summer/ Autumn	Spring	Winter / Early Summer	Late Summer/ Autumn	3	1	3	Worst case scenario assumed.			
Likelihood Rating												
								Total	45			
								Max Possible	72			
								Likelihood	0.63			
										Likelihood Score		
										0.0-0.3	Negligible	1
										0.3-0.5	Low	2
										0.5-0.7	Medium	3
										0.7-1.0	High	4

IMPACT												
5.0 Impact Factors												
5.1	Volume of peat in potential peat flow	Medium (1,000 - 20,000 m³)	Small volume (<1,000 m³)	Medium (1,000 - 20,000 m³)	Potential for Bog burst	2	3	6	Based on distance to downslope watercourse.			
5.2	Downslope features	Watercourse	Bowl/ contained	Minor undefined watercourse	Valley	2	1	2	From LiDar			
5.3	Proximity to defined valley	< 200 m	> 500 m	200 - 500 m	< 200 m	3	1	3	From LiDar			
5.4	Valley profile	Flat	Flat	Intermediate	Steep	1	1	1	From LiDar			
5.5	Downstream aquatic environment	Sensitive	Non-sensitive	Sensitive	Drinking water supply	2	1	2	River Blackwater Special Area of Conservation (SAC).			
5.6	Public roads in potential peat flow path	No	No	Local Road	Regional Road	1	1	1	From aerial photography, drone survey and site walk			
5.7	Overhead lines in potential peat flow path	No	Phone Lines	Electricity, LV	Electricity MV, HV	1	1	1	From service drawings and site walk			
5.8	Buildings in potential peat flow path	No	No	Farm out-houses	Dwelling	1	1	1	From aerial photography, drone survey and site walk			
5.9	Capability to respond (access and resources)	Good	Good	Fair	Poor	1	1	1	Based on contractor facilities on site during construction.			
Impact Rating												
								Total	18			
								Max Possible	33			
								Impact	0.55			
										Impact Score		
										0.0-0.3	Negligible	1
										0.3-0.5	Low	2
										0.5-0.7	Medium	3
										0.7-1.0	High	4

RISK RATING

Risk Rating = Likelihood * Impact

Risk Rating = 0.63 * 0.55 = 0.34 Low

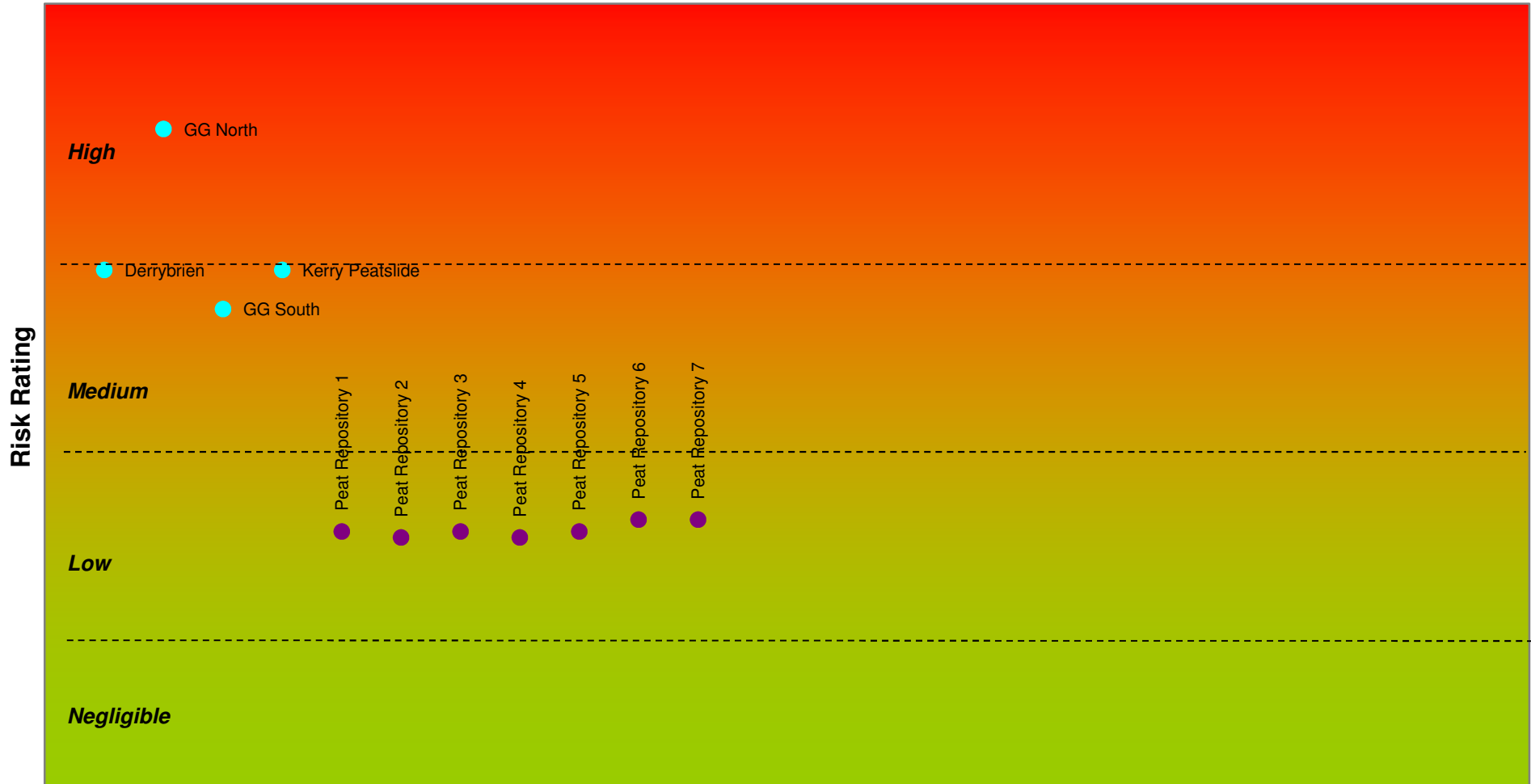
Risk Rating	Risk Level	Action Required
0.0 - 0.18	Negligible	Normal SI
0.19 - 0.42	Low	Targeted SI, design of specific mitigation measures. Part time supervision during construction.
0.43 - 0.66	Medium	Avoid construction in the area if possible. If unavoidable, detailed SI and design of specific mitigation measures. Full time supervision during construction.
0.67 - 1.0	High	Avoid construction in this area.



RESULTS OF PEAT STABILITY RISK ASSESSMENT

Area	Risk Level
Peat Repositories	
Peat Repository 1	Low
Peat Repository 2	Low
Peat Repository 3	Low
Peat Repository 4	Low
Peat Repository 5	Low
Peat Repository 6	Low
Peat Repository 7	Low

PSRA Comparative Chart (Peat Repositories)





Peat Stability Risk Assessment
Timahoe North Solar Farm

Location:	Poleset 114
Inspected on:	2017
Inspected by:	ESB International
Completed by:	SS
Date:	February 2018

Poleset 114										
No.	Likelihood/ Impact Factors	Value	Rating				Rating Value	Weighting	Score	Comment
			1	2	3	4				
LIKELIHOOD										
1.0 Ground Conditions										
Peat										
1.1	Peat Depth	1.5 - 3 m	< 1 m	> 3 m	1 - 3 m	1	2	3	Based on peat probes carried out by ESB International and Irish Drilling, and also trial pits excavated by Irish Drilling Ltd in 2017.	
1.2	Peat Condition in Trial Pits	Slowly squeezing	Dry/ Stands well	Slowly squeezing	Extremely Wet/ Undiggable	2	1	2	Trial pits excavated by Irish Drilling Ltd in 2017.	
Subsoil Characteristics										
1.3	Subsoil Type	Firm silt	Gravel/ Firm Glacial Till	Smooth Rock	Soft Sensitive Clay	1	1	1	Trial pits excavated by Irish Drilling Ltd in 2017.	
1.4	Peat fibres continuous across transition to subsoil	No	Yes	Partially	No	3	1	3	Trial pits excavated by Irish Drilling Ltd in 2017.	
2.0 Topography										
Situation										
2.1	Elevation OD [m]	~ 78 - 89 mOD	< 200 m	> 200 m	> 200 m	1	1	1	From LiDar.	
2.2	Slope Aspect	S	SW, S, SE	W, E	NW, N, NE	1	1	1	From LiDar.	
Slope Angle										
2.3	Slope Angle - Ground Surface	< 3°	< 3°	> 7°	3° - 7°	1	2	2	From LiDar.	
Geomorphology										
2.4	General slope characteristics downslope	Planar	Concave	Planar	Convex	2	1	2	From LiDar.	
2.5	Distance from break in slope	>100m	> 100 m	50 - 100 m	< 50 m	1	1	1	From LiDar.	
3.0 Hydrology										
Hydrology										
3.1	In broad valley upslope from defined watercourse	Yes, slopes < 3°	No	Yes, slopes < 3°	Yes, slopes ≥ 3°	2	1	2	From LiDar.	
3.2	Distance from head of defined watercourse	< 200m	> 300 m	200 - 300 m	< 200 m	3	1	3	From LiDar.	
3.3	Surface water	Localised	Localised	Ponded in drains	Springs/ Surface Water	1	1	1		
3.4	Evidence of piping	No	No	-	Yes	1	1	1	From site walk and site investigation.	
3.5	Existing drainage ditches	Varied	Down slope	Varied / Oblique	Across slope	2	1	2		
3.6	Annual Rainfall	800 - 1000 mm/yr	< 1000 mm/yr	1000 - 1400 mm/yr	>1400 mm/yr	1	1	1	From Met Éireann.	
4.0 Other Factors										
Vegetation										
4.1	Vegetation	Wetlands	Dry Heather	Grasslands	Wetlands	3	1	3	From aerial photography, drone survey and site walk.	
4.2	Forestry (if applicable)	N/A	Good Growth	Fair	Stunted Growth	0	1.5	0	From aerial photography, drone survey and site walk.	
Slide History										
4.3	Previous slides in locality	> 5 km	> 5 km	< 5 km	On site	1	2	2	From Geological Survey of Ireland.	
4.4	Evidence of movement in peat (e.g. tension cracks, step features, compression features)	No	No	-	Yes	1	1	1	From site walk and site investigation.	
Land Use										
4.5	Peat Workings	Cutaway/Turbary	None	Cutaway/Turbary	Machine Cut	2	1	2	From aerial photography, drone survey and site walk.	
Other Factors										
4.6	Existing roads in place	Floating Road	Solid Road	-	Floating Road	3	1	3	No existing road. Value assumed.	
4.7	Time of year for construction	Late Summer/ Autumn	Spring	Winter / Early Summer	Late Summer/ Autumn	3	1	3	Worst case scenario assumed.	
Likelihood Rating										
								Total	40	
								Max Possible	72	
										Likelihood Score
									0.0-0.3	Negligible
									0.3-0.5	Low
									0.5-0.7	Medium
									0.7-1.0	High
								Likelihood	0.56	

IMPACT										
5.0 Impact Factors										
5.1	Volume of peat in potential peat flow	Medium (1,000 - 20,000 m³)	Small volume (<1,000 m³)	Medium (1,000 - 20,000 m³)	Potential for Bog burst	2	3	6	Based on distance to downslope watercourse.	
5.2	Downslope features	Watercourse	Bowl/ contained	Minor undefined watercourse	Valley	2	1	2	From LiDar	
5.3	Proximity to defined valley	< 200 m	> 500 m	200 - 500 m	< 200 m	3	1	3	From LiDar	
5.4	Valley profile	Flat	Flat	Intermediate	Steep	1	1	1	From LiDar	
5.5	Downstream aquatic environment	Sensitive	Non-sensitive	Sensitive	Drinking water supply	2	1	2	River Blackwater Special Area of Conservation (SAC).	
5.6	Public roads in potential peat flow path	Local Road	No	Local Road	Regional Road	2	1	2	From aerial photography, drone survey and site walk	
5.7	Overhead lines in potential peat flow path	Electricity MV, HV	Phone Lines	Electricity, LV	Electricity MV, HV	3	1	3	From service drawings and site walk	
5.8	Buildings in potential peat flow path	No	No	Farm out-houses	Dwelling	1	1	1	From aerial photography, drone survey and site walk	
5.9	Capability to respond (access and resources)	Good	Good	Fair	Poor	1	1	1	Based on contractor facilities on site during construction.	
Impact Rating										
								Total	21	
								Max Possible	33	
										Impact Score
									0.0-0.3	Negligible
									0.3-0.5	Low
									0.5-0.7	Medium
									0.7-1.0	High
								Impact	0.64	

RISK RATING

Risk Rating = Likelihood * Impact

Risk Rating = 0.56 0.64 = 0.35 Low

Risk Rating	Risk Level	Action Required
0.0 - 0.18	Negligible	Normal SI
0.19 - 0.42	Low	Targeted SI, design of specific mitigation measures. Part time supervision during construction.
0.43 - 0.66	Medium	Avoid construction in the area if possible. If unavoidable, detailed SI and design of specific mitigation measures. Full time supervision during construction.
0.67 - 1.0	High	Avoid construction in this area.



INTERNATIONAL

**Peat Stability Risk Assessment
Timahoe North Solar Farm**

Location:	Angle Mast 114A
Inspected on:	2017
Inspected by:	ESB International
Completed by:	SS
Date:	February 2018

		Angle Mast 114A																							
No.	Likelihood/ Impact Factors	Value	Rating				Rating Value	Weighting	Score	Comment															
			1	2	3																				
LIKELIHOOD																									
1.0	Ground Conditions																								
Peat																									
1.1	Peat Depth	3 - 4.5 m	< 1 m	> 3 m	1 - 3 m	2	2	4	Based on peat probes carried out by ESB International and Irish Drilling, and also trial pits excavated by Irish Drilling Ltd in 2017.																
1.2	Peat Condition in Trial Pits	Slowly squeezing	Dry/ Stands well	Slowly squeezing	Extremely Wet/ Undiggable	2	1	2	Trial pits excavated by Irish Drilling Ltd in 2017.																
Subsoil Characteristics																									
1.3	Subsoil Type	Firm silt	Gravel/ Firm Glacial Till	Smooth Rock	Soft Sensitive Clay	1	1	1	Trial pits excavated by Irish Drilling Ltd in 2017.																
1.4	Peat fibres continuous across transition to subsoil	No	Yes	Partially	No	3	1	3	Trial pits excavated by Irish Drilling Ltd in 2017.																
2.0	Topography																								
Situation																									
2.1	Elevation OD [m]	~ 78 - 89 mOD	< 200 m	> 200 m		1	1	1	From LiDar.																
2.2	Slope Aspect	S	SW, S, SE	W, E	NW, N, NE	1	1	1	From LiDar.																
Slope Angle																									
2.3	Slope Angle - Ground Surface	< 3°	< 3°	> 7°	3° - 7°	1	2	2	From LiDar.																
Geomorphology																									
2.4	General slope characteristics downslope	Planar	Concave	Planar	Convex	2	1	2	From LiDar.																
2.5	Distance from break in slope	>100m	> 100 m	50 - 100 m	< 50 m	1	1	1	From LiDar.																
3.0	Hydrology																								
Hydrology																									
3.1	In broad valley upslope from defined watercourse	Yes, slopes < 3°	No	Yes, slopes < 3°	Yes, slopes ≥ 3°	2	1	2	From LiDar.																
3.2	Distance from head of defined watercourse	< 200m	> 300 m	200 - 300 m	< 200 m	3	1	3	From LiDar.																
3.3	Surface water	Localised	Localised	Ponded in drains	Springs/ Surface Water	1	1	1																	
3.4	Evidence of piping	No	No	-	Yes	1	1	1	From site walk and site investigation.																
3.5	Existing drainage ditches	Varied	Down slope	Varied / Oblique	Across slope	2	1	2																	
3.6	Annual Rainfall	800 - 1000 mm/yr	< 1000 mm/yr	1000 - 1400 mm/yr	>1400 mm/yr	1	1	1	From Met Éireann.																
4.0	Other Factors																								
Vegetation																									
4.1	Vegetation	Wetlands	Dry Heather	Grasslands	Wetlands	3	1	3	From aerial photography, drone survey and site walk.																
4.2	Forestry (if applicable)	N/A	Good Growth	Fair	Stunted Growth	0	1.5	0	From aerial photography, drone survey and site walk.																
Slide History																									
4.3	Previous slides in locality	> 5 km	> 5 km	< 5 km	On site	1	2	2	From Geological Survey of Ireland.																
4.4	Evidence of movement in peat (e.g. tension cracks, step features, compression features)	No	No	-	Yes	1	1	1	From site walk and site investigation.																
Land Use																									
4.5	Peat Workings	Cutaway/Turbary	None	Cutaway/Turbary	Machine Cut	2	1	2	From aerial photography, drone survey and site walk.																
Other Factors																									
4.6	Existing roads in place	Floating Road	Solid Road		Floating Road	3	1	3	No existing road. Value assumed.																
4.7	Time of year for construction	Late Summer/ Autumn	Spring	Winter / Early Summer	Late Summer/ Autumn	3	1	3	Worst case scenario assumed.																
Likelihood Rating																									
								Total	41																
								Max Possible	72	0.0-0.3	Negligible	1													
										0.3-0.5	Low	2													
								Likelihood	0.57	0.5-0.7	Medium	3													
										0.7-1.0	High	4													
IMPACT																									
5.0	Impact Factors																								
5.1	Volume of peat in potential peat flow	Medium (1,000 - 20,000 m³)	Small volume (<1,000 m³)	Medium (1,000 - 20,000 m³)	Potential for Bog burst	2	3	6	Based on distance to downslope watercourse.																
5.2	Downslope features	Watercourse	Bowl/ contained	Minor undefined watercourse	Valley	2	1	2	From LiDar																
5.3	Proximity to defined valley	< 200 m	> 500 m	200 - 500 m	< 200 m	3	1	3	From LiDar																
5.4	Valley profile	Flat	Flat	Intermediate	Steep	1	1	1	From LiDar																
5.5	Downstream aquatic environment	Sensitive	Non-sensitive	Sensitive	Drinking water supply	2	1	2	River Blackwater Special Area of Conservation (SAC).																
5.6	Public roads in potential peat flow path	Local Road	No	Local Road	Regional Road	2	1	2	From aerial photography, drone survey and site walk																
5.7	Overhead lines in potential peat flow path	Electricity MV, HV	Phone Lines	Electricity, LV	Electricity MV, HV	3	1	3	From service drawings and site walk																
5.8	Buildings in potential peat flow path	No	No	Farm out-houses	Dwelling	1	1	1	From aerial photography, drone survey and site walk																
5.9	Capability to respond (access and resources)	Good	Good	Fair	Poor	1	1	1	Based on contractor facilities on site during construction.																
Impact Rating																									
								Total	21																
								Max Possible	33	0.0-0.3	Negligible	1													
										0.3-0.5	Low	2													
								Impact	0.64	0.5-0.7	Medium	3													
										0.7-1.0	High	4													
RISK RATING																									
<p>Risk Rating = Likelihood * Impact</p> <p>Risk Rating = 0.57 0.64 = 0.36 Low</p>																									
<table border="1"> <thead> <tr> <th>Risk Rating</th> <th>Risk Level</th> <th>Action Required</th> </tr> </thead> <tbody> <tr> <td>0.0 - 0.18</td> <td>Negligible</td> <td>Normal SI</td> </tr> <tr> <td>0.19 - 0.42</td> <td>Low</td> <td>Targeted SI, design of specific mitigation measures. Part time supervision during construction.</td> </tr> <tr> <td>0.43 - 0.66</td> <td>Medium</td> <td>Avoid construction in the area if possible. If unavoidable, detailed SI and design of specific mitigation measures. Full time supervision during construction.</td> </tr> <tr> <td>0.67 - 1.0</td> <td>High</td> <td>Avoid construction in this area.</td> </tr> </tbody> </table>											Risk Rating	Risk Level	Action Required	0.0 - 0.18	Negligible	Normal SI	0.19 - 0.42	Low	Targeted SI, design of specific mitigation measures. Part time supervision during construction.	0.43 - 0.66	Medium	Avoid construction in the area if possible. If unavoidable, detailed SI and design of specific mitigation measures. Full time supervision during construction.	0.67 - 1.0	High	Avoid construction in this area.
Risk Rating	Risk Level	Action Required																							
0.0 - 0.18	Negligible	Normal SI																							
0.19 - 0.42	Low	Targeted SI, design of specific mitigation measures. Part time supervision during construction.																							
0.43 - 0.66	Medium	Avoid construction in the area if possible. If unavoidable, detailed SI and design of specific mitigation measures. Full time supervision during construction.																							
0.67 - 1.0	High	Avoid construction in this area.																							

Poleset 114B																							
No.	Likelihood/ Impact Factors	Value	Rating				Rating Value	Weighting	Score	Comment													
			1	2	3																		
LIKELIHOOD																							
1.0	Ground Conditions																						
Peat																							
1.1	Peat Depth	1 - 1.5 m	< 1 m	> 3 m	1 - 3 m	3	2	6	Based on peat probes carried out by ESB International and Irish Drilling, and also trial pits excavated by Irish Drilling Ltd in 2017.														
1.2	Peat Condition in Trial Pits	Slowly squeezing	Dry/ Stands well	Slowly squeezing	Extremely Wet/ Undruggable	2	1	2	Trial pits excavated by Irish Drilling Ltd in 2017.														
Subsoil Characteristics																							
1.3	Subsoil Type	Soft clay	Gravel/ Firm Glacial Till	Smooth Rock	Soft Sensitive Clay	3	1	3	Trial pits excavated by Irish Drilling Ltd in 2017.														
1.4	Peat fibres continuous across transition to subsoil	No	Yes	Partially	No	3	1	3	Trial pits excavated by Irish Drilling Ltd in 2017.														
2.0	Topography																						
Situation																							
2.1	Elevation OD [m]	~ 78 - 89 mOD	< 200 m		> 200 m	1	1	1	From LiDar.														
2.2	Slope Aspect	S	SW, S, SE	W, E	NW, N, NE	1	1	1	From LiDar.														
Slope Angle																							
2.3	Slope Angle - Ground Surface	< 3°	< 3°	> 7°	3° - 7°	1	2	2	From LiDar.														
Geomorphology																							
2.4	General slope characteristics downslope	Planar	Concave	Planar	Convex	2	1	2	From LiDar.														
2.5	Distance from break in slope	>100m	> 100 m	50 - 100 m	< 50 m	1	1	1	From LiDar.														
3.0	Hydrology																						
Hydrology																							
3.1	In broad valley upslope from defined watercourse	Yes, slopes < 3°	No	Yes, slopes < 3°	Yes, slopes ≥ 3°	2	1	2	From LiDar.														
3.2	Distance from head of defined watercourse	< 200m	> 300 m	200 - 300 m	< 200 m	3	1	3	From LiDar.														
3.3	Surface water	Localised	Localised	Ponded in drains	Springs/ Surface Water	1	1	1															
3.4	Evidence of piping	No	No	-	Yes	1	1	1	From site walk and site investigation.														
3.5	Existing drainage ditches	Varied	Down slope	Varied / Oblique	Across slope	2	1	2															
3.6	Annual Rainfall	800 - 1000 mm/yr	< 1000 mm/yr	1000 - 1400 mm/yr	>1400 mm/yr	1	1	1	From Met Éireann.														
4.0	Other Factors																						
Vegetation																							
4.1	Vegetation	Wetlands	Dry Heather	Grasslands	Wetlands	3	1	3	From aerial photography, drone survey and site walk.														
4.2	Forestry (if applicable)	N/A	Good Growth	Fair	Stunted Growth	0	1.5	0	From aerial photography, drone survey and site walk.														
Slide History																							
4.3	Previous slides in locality	> 5 km	> 5 km	< 5 km	On site	1	2	2	From Geological Survey of Ireland.														
4.4	Evidence of movement in peat (e.g. tension cracks, step features, compression features)	No	No	-	Yes	1	1	1	From site walk and site investigation.														
Land Use																							
4.5	Peat Workings	Cutaway/Turbary	None	Cutaway/Turbary	Machine Cut	2	1	2	From aerial photography, drone survey and site walk.														
Other Factors																							
4.6	Existing roads in place	Solid Road	Solid Road		Floating Road	1	1	1	No existing road. Value assumed.														
4.7	Time of year for construction	Late Summer/ Autumn	Spring	Winter / Early Summer	Late Summer/ Autumn	3	1	3	Worst case scenario assumed.														
Likelihood Rating																							
								Total	43		Likelihood Score	Scale											
								Max Possible	72		0.0-0.3	Negligible	1										
											0.3-0.5	Low	2										
								Likelihood	0.60		0.5-0.7	Medium	3										
											0.7-1.0	High	4										
IMPACT																							
5.0	Impact Factors																						
5.1	Volume of peat in potential peat flow	Medium (1,000 - 20,000 m³)	Small volume (<1,000 m³)	Medium (1,000 - 20,000 m³)	Potential for Bog burst	2	3	6	Based on distance to downslope watercourse.														
5.2	Downslope features	Watercourse	Bowl/ contained	Minor undefined watercourse	Valley	2	1	2	From LiDar														
5.3	Proximity to defined valley	< 200 m	> 500 m	200 - 500 m	< 200 m	3	1	3	From LiDar														
5.4	Valley profile	Flat	Flat	Intermediate	Steep	1	1	1	From LiDar														
5.5	Downstream aquatic environment	Sensitive	Non-sensitive	Sensitive	Drinking water supply	2	1	2	River Blackwater Special Area of Conservation (SAC).														
5.6	Public roads in potential peat flow path	No	No	Local Road	Regional Road	1	1	1	From aerial photography, drone survey and site walk														
5.7	Overhead lines in potential peat flow path	Electricity MV, HV	Phone Lines	Electricity, LV	Electricity MV, HV	3	1	3	From service drawings and site walk														
5.8	Buildings in potential peat flow path	No	No	Farm out-houses	Dwelling	1	1	1	From aerial photography, drone survey and site walk														
5.9	Capability to respond (access and resources)	Good	Good	Fair	Poor	1	1	1	Based on contractor facilities on site during construction.														
Impact Rating																							
								Total	20		Impact Score	Scale											
								Max Possible	33		0.0-0.3	Negligible	1										
											0.3-0.5	Low	2										
								Impact	0.61		0.5-0.7	Medium	3										
											0.7-1.0	High	4										
RISK RATING																							
<p>Risk Rating = Likelihood * Impact</p> <p>Risk Rating = 0.60 0.61 = 0.36 Low</p>																							
<table border="1"> <thead> <tr> <th>Risk Rating</th> <th>Risk Level</th> <th>Action Required</th> </tr> </thead> <tbody> <tr> <td>0.0 - 0.18</td> <td>Negligible</td> <td>Normal SI</td> </tr> <tr> <td>0.19 - 0.42</td> <td style="background-color: green;">Low</td> <td>Targeted SI, design of specific mitigation measures. Part time supervision during construction.</td> </tr> <tr> <td>0.43 - 0.66</td> <td style="background-color: yellow;">Medium</td> <td>Avoid construction in the area if possible. If unavoidable, detailed SI and design of specific mitigation measures. Full time supervision during construction.</td> </tr> <tr> <td>0.67 - 1.0</td> <td style="background-color: red;">High</td> <td>Avoid construction in this area.</td> </tr> </tbody> </table>									Risk Rating	Risk Level	Action Required	0.0 - 0.18	Negligible	Normal SI	0.19 - 0.42	Low	Targeted SI, design of specific mitigation measures. Part time supervision during construction.	0.43 - 0.66	Medium	Avoid construction in the area if possible. If unavoidable, detailed SI and design of specific mitigation measures. Full time supervision during construction.	0.67 - 1.0	High	Avoid construction in this area.
Risk Rating	Risk Level	Action Required																					
0.0 - 0.18	Negligible	Normal SI																					
0.19 - 0.42	Low	Targeted SI, design of specific mitigation measures. Part time supervision during construction.																					
0.43 - 0.66	Medium	Avoid construction in the area if possible. If unavoidable, detailed SI and design of specific mitigation measures. Full time supervision during construction.																					
0.67 - 1.0	High	Avoid construction in this area.																					



Peat Stability Risk Assessment
Timahoe North Solar Farm

Location:	Poleset 114C
Inspected on:	2017
Inspected by:	ESB International
Completed by:	SS
Date:	February 2018

Poleset 114C																								
No.	Likelihood/ Impact Factors	Value	Rating				Rating Value	Weighting	Score	Comment														
			1	2	3	4																		
LIKELIHOOD																								
1.0	Ground Conditions																							
Peat																								
1.1	Peat Depth	0.5 - 1.5 m	< 1 m	> 3 m	1 - 3 m	3	2	6	Based on peat probes carried out by ESB International and Irish Drilling, and also trial pits excavated by Irish Drilling Ltd in 2017.															
1.2	Peat Condition in Trial Pits	Slowly squeezing	Dry/ Stands well	Slowly squeezing	Extremely Wet/ Undiggable	2	1	2	Trial pits excavated by Irish Drilling Ltd in 2017.															
Subsoil Characteristics																								
1.3	Subsoil Type	Soft clay	Gravel/ Firm Glacial Till	Smooth Rock	Soft Sensitive Clay	3	1	3	Trial pits excavated by Irish Drilling Ltd in 2017.															
1.4	Peat fibres continuous across transition to subsoil	No	Yes	Partially	No	3	1	3	Trial pits excavated by Irish Drilling Ltd in 2017.															
2.0	Topography																							
Situation																								
2.1	Elevation OD [m]	~ 78 - 89 mOD	< 200 m		> 200 m	1	1	1	From LiDar.															
2.2	Slope Aspect	S	SW, S, SE	W, E	NW, N, NE	1	1	1	From LiDar.															
Slope Angle																								
2.3	Slope Angle - Ground Surface	< 3°	< 3°	> 7°	3° - 7°	1	2	2	From LiDar.															
Geomorphology																								
2.4	General slope characteristics downslope	Planar	Concave	Planar	Convex	2	1	2	From LiDar.															
2.5	Distance from break in slope	>100m	> 100 m	50 - 100 m	< 50 m	1	1	1	From LiDar.															
3.0	Hydrology																							
Hydrology																								
3.1	In broad valley upslope from defined watercourse	Yes, slopes < 3°	No	Yes, slopes < 3°	Yes, slopes ≥ 3°	2	1	2	From LiDar.															
3.2	Distance from head of defined watercourse	< 200m	> 300 m	200 - 300 m	< 200 m	3	1	3	From LiDar.															
3.3	Surface water	Localised	Localised	Ponded in drains	Springs/ Surface Water	1	1	1																
3.4	Evidence of piping	No	No	-	Yes	1	1	1	From site walk and site investigation.															
3.5	Existing drainage ditches	Varied	Down slope	Varied / Oblique	Across slope	2	1	2																
3.6	Annual Rainfall	800 - 1000 mm/yr	< 1000 mm/yr	1000 - 1400 mm/yr	>1400 mm/yr	1	1	1	From Met Éireann.															
4.0	Other Factors																							
Vegetation																								
4.1	Vegetation	Wetlands	Dry Heather	Grasslands	Wetlands	3	1	3	From aerial photography, drone survey and site walk.															
4.2	Forestry (if applicable)	N/A	Good Growth	Fair	Stunted Growth	0	1.5	0	From aerial photography, drone survey and site walk.															
Slide History																								
4.3	Previous slides in locality	> 5 km	> 5 km	< 5 km	On site	1	2	2	From Geological Survey of Ireland.															
4.4	Evidence of movement in peat (e.g. tension cracks, step features, compression features)	No	No	-	Yes	1	1	1	From site walk and site investigation.															
Land Use																								
4.5	Peat Workings	Cutaway/Turbary	None	Cutaway/Turbary	Machine Cut	2	1	2	From aerial photography, drone survey and site walk.															
Other Factors																								
4.6	Existing roads in place	Solid Road	Solid Road		Floating Road	1	1	1	No existing road. Value assumed.															
4.7	Time of year for construction	Late Summer/ Autumn	Spring	Winter / Early Summer	Late Summer/ Autumn	3	1	3	Worst case scenario assumed.															
Likelihood Rating																								
								Total	43															
								Max Possible	72	0.0-0.3	Negligible	1												
										0.3-0.5	Low	2												
								Likelihood	0.60	0.5-0.7	Medium	3												
										0.7-1.0	High	4												
IMPACT																								
5.0	Impact Factors																							
5.1	Volume of peat in potential peat flow	Medium (1,000 - 20,000 m³)	Small volume (<1,000 m³)	Medium (1,000 - 20,000 m³)	Potential for Bog burst	2	3	6	Based on distance to downslope watercourse.															
5.2	Downslope features	Watercourse	Bowl/ contained	Minor undefined watercourse	Valley	2	1	2	From LiDar															
5.3	Proximity to defined valley	< 200 m	> 500 m	200 - 500 m	< 200 m	3	1	3	From LiDar															
5.4	Valley profile	Flat	Flat	Intermediate	Steep	1	1	1	From LiDar															
5.5	Downstream aquatic environment	Sensitive	Non-sensitive	Sensitive	Drinking water supply	2	1	2	River Blackwater Special Area of Conservation (SAC).															
5.6	Public roads in potential peat flow path	No	No	Local Road	Regional Road	1	1	1	From aerial photography, drone survey and site walk															
5.7	Overhead lines in potential peat flow path	No	Phone Lines	Electricity, LV	Electricity MV, HV	1	1	1	From service drawings and site walk															
5.8	Buildings in potential peat flow path	No	No	Farm out-houses	Dwelling	1	1	1	From aerial photography, drone survey and site walk															
5.9	Capability to respond (access and resources)	Good	Good	Fair	Poor	1	1	1	Based on contractor facilities on site during construction.															
Impact Rating																								
								Total	18															
								Max Possible	33	0.0-0.3	Negligible	1												
										0.3-0.5	Low	2												
								Impact	0.55	0.5-0.7	Medium	3												
										0.7-1.0	High	4												
RISK RATING																								
<p>Risk Rating = Likelihood * Impact</p> <p>Risk Rating = 0.60 * 0.55 = 0.33 Low</p>																								
<table border="1"> <thead> <tr> <th>Risk Rating</th> <th>Risk Level</th> <th>Action Required</th> </tr> </thead> <tbody> <tr> <td>0.0 - 0.18</td> <td>Negligible</td> <td>Normal SI</td> </tr> <tr> <td>0.19 - 0.42</td> <td>Low</td> <td>Targeted SI, design of specific mitigation measures. Part time supervision during construction.</td> </tr> <tr> <td>0.43 - 0.66</td> <td>Medium</td> <td>Avoid construction in the area if possible. If unavoidable, detailed SI and design of specific mitigation measures. Full time supervision during construction.</td> </tr> <tr> <td>0.67 - 1.0</td> <td>High</td> <td>Avoid construction in this area.</td> </tr> </tbody> </table>										Risk Rating	Risk Level	Action Required	0.0 - 0.18	Negligible	Normal SI	0.19 - 0.42	Low	Targeted SI, design of specific mitigation measures. Part time supervision during construction.	0.43 - 0.66	Medium	Avoid construction in the area if possible. If unavoidable, detailed SI and design of specific mitigation measures. Full time supervision during construction.	0.67 - 1.0	High	Avoid construction in this area.
Risk Rating	Risk Level	Action Required																						
0.0 - 0.18	Negligible	Normal SI																						
0.19 - 0.42	Low	Targeted SI, design of specific mitigation measures. Part time supervision during construction.																						
0.43 - 0.66	Medium	Avoid construction in the area if possible. If unavoidable, detailed SI and design of specific mitigation measures. Full time supervision during construction.																						
0.67 - 1.0	High	Avoid construction in this area.																						

Angle Mast 114D													
No.	Likelihood/ Impact Factors	Value	Rating				Rating Value	Weighting	Score	Comment			
			1	2	3								
LIKELIHOOD													
1.0 Ground Conditions													
Peat													
1.1	Peat Depth	0.5 - 2.5 m	< 1 m	> 3 m	1 - 3 m	1	2	2	Based on peat probes carried out by ESB International and Irish Drilling, and also trial pits excavated by Irish Drilling Ltd in 2017.				
1.2	Peat Condition in Trial Pits	Slowly squeezing	Dry/ Stands well	Slowly squeezing	Extremely Wet/ Undiggable	2	1	2	Trial pits excavated by Irish Drilling Ltd in 2017.				
Subsoil Characteristics													
1.3	Subsoil Type	Soft clay	Gravel/ Firm Glacial Till	Smooth Rock	Soft Sensitive Clay	3	1	3	Trial pits excavated by Irish Drilling Ltd in 2017.				
1.4	Peat fibres continuous across transition to subsoil	No	Yes	Partially	No	3	1	3	Trial pits excavated by Irish Drilling Ltd in 2017.				
2.0 Topography													
Situation													
2.1	Elevation OD [m]	~ 78 - 89 mOD	< 200 m		> 200 m	1	1	1	From LiDar.				
2.2	Slope Aspect	S	SW, S, SE	W, E	NW, N, NE	1	1	1	From LiDar.				
Slope Angle													
2.3	Slope Angle - Ground Surface	< 3°	< 3°	> 7°	3° - 7°	1	2	2	From LiDar.				
Geomorphology													
2.4	General slope characteristics downslope	Planar	Concave	Planar	Convex	2	1	2	From LiDar.				
2.5	Distance from break in slope	>100m	> 100 m	50 - 100 m	< 50 m	1	1	1	From LiDar.				
3.0 Hydrology													
Hydrology													
3.1	In broad valley upslope from defined watercourse	Yes, slopes < 3°	No	Yes, slopes < 3°	Yes, slopes ≥ 3°	2	1	2	From LiDar.				
3.2	Distance from head of defined watercourse	< 200m	> 300 m	200 - 300 m	< 200 m	3	1	3	From LiDar.				
3.3	Surface water	Localised	Localised	Ponded in drains	Springs/ Surface Water	1	1	1					
3.4	Evidence of piping	No	No	-	Yes	1	1	1	From site walk and site investigation.				
3.5	Existing drainage ditches	Varied	Down slope	Varied / Oblique	Across slope	2	1	2					
3.6	Annual Rainfall	800 - 1000 mm/yr	< 1000 mm/yr	1000 - 1400 mm/yr	>1400 mm/yr	1	1	1	From Met Éireann.				
4.0 Other Factors													
Vegetation													
4.1	Vegetation	Wetlands	Dry Heather	Grasslands	Wetlands	3	1	3	From aerial photography, drone survey and site walk.				
4.2	Forestry (if applicable)	N/A	Good Growth	Fair	Stunted Growth	0	1.5	0	From aerial photography, drone survey and site walk.				
Slide History													
4.3	Previous slides in locality	> 5 km	> 5 km	< 5 km	On site	1	2	2	From Geological Survey of Ireland.				
4.4	Evidence of movement in peat (e.g. tension cracks, step features, compression features)	No	No	-	Yes	1	1	1	From site walk and site investigation.				
Land Use													
4.5	Peat Workings	Cutaway/Turbary	None	Cutaway/Turbary	Machine Cut	2	1	2	From aerial photography, drone survey and site walk.				
Other Factors													
4.6	Existing roads in place	Solid Road	Solid Road		Floating Road	1	1	1	No existing road. Value assumed.				
4.7	Time of year for construction	Late Summer/ Autumn	Spring	Winter / Early Summer	Late Summer/ Autumn	3	1	3	Worst case scenario assumed.				
Likelihood Rating													
								Total	39				
								Max Possible	72				
											Likelihood Score	Scale	
											0.0-0.3	Negligible	1
											0.3-0.5	Low	2
								Likelihood	0.54		0.5-0.7	Medium	3
											0.7-1.0	High	4

IMPACT													
5.0 Impact Factors													
5.1	Volume of peat in potential peat flow	Medium (1,000 - 20,000 m³)	Small volume (<1,000 m³)	Medium (1,000 - 20,000 m³)	Potential for Bog burst	2	3	6	Based on distance to downslope watercourse.				
5.2	Downslope features	Watercourse	Bowl/ contained	Minor undefined watercourse	Valley	2	1	2	From LiDar				
5.3	Proximity to defined valley	< 200 m	> 500 m	200 - 500 m	< 200 m	3	1	3	From LiDar				
5.4	Valley profile	Flat	Flat	Intermediate	Steep	1	1	1	From LiDar				
5.5	Downstream aquatic environment	Sensitive	Non-sensitive	Sensitive	Drinking water supply	2	1	2	River Blackwater Special Area of Conservation (SAC).				
5.6	Public roads in potential peat flow path	No	No	Local Road	Regional Road	1	1	1	From aerial photography, drone survey and site walk				
5.7	Overhead lines in potential peat flow path	No	Phone Lines	Electricity, LV	Electricity MV, HV	1	1	1	From service drawings and site walk				
5.8	Buildings in potential peat flow path	No	No	Farm out-houses	Dwelling	1	1	1	From aerial photography, drone survey and site walk				
5.9	Capability to respond (access and resources)	Good	Good	Fair	Poor	1	1	1	Based on contractor facilities on site during construction.				
Impact Rating													
								Total	18				
								Max Possible	33				
											Impact Score	Scale	
											0.0-0.3	Negligible	1
											0.3-0.5	Low	2
								Impact	0.55		0.5-0.7	Medium	3
											0.7-1.0	High	4

RISK RATING									
Risk Rating = Likelihood * Impact									
Risk Rating = 0.54 * 0.55 = 0.30 Low									
Risk Rating	Risk Level	Action Required							
0.0 - 0.18	Negligible	Normal SI							
0.19 - 0.42	Low	Targeted SI, design of specific mitigation measures. Part time supervision during construction.							
0.43 - 0.66	Medium	Avoid construction in the area if possible. If unavoidable, detailed SI and design of specific mitigation measures. Full time supervision during construction.							
0.67 - 1.0	High	Avoid construction in this area.							



Peat Stability Risk Assessment
Timahoe North Solar Farm

Location:	Angle Mast 115A
Inspected on:	2017
Inspected by:	ESB International
Completed by:	SS
Date:	February 2018

Angle Mast 115A																							
No.	Likelihood/ Impact Factors	Value	Rating			Rating Value	Weighting	Score	Comment														
			1	2	3																		
LIKELIHOOD																							
1.0	Ground Conditions																						
	Peat																						
1.1	Peat Depth	1.5 - 2.5 m	< 1 m	> 3 m	1 - 3 m	3	2	6	Based on peat probes carried out by ESB International and Irish Drilling, and also trial pits excavated by Irish Drilling Ltd in 2017.														
1.2	Peat Condition in Trial Pits	Slowly squeezing	Dry/ Stands well	Slowly squeezing	Extremely Wet/ Undiggable	2	1	2	Trial pits excavated by Irish Drilling Ltd in 2017.														
	Subsoil Characteristics																						
1.3	Subsoil Type	Soft clay	Gravel/ Firm Glacial Till	Smooth Rock	Soft Sensitive Clay	3	1	3	Trial pits excavated by Irish Drilling Ltd in 2017.														
1.4	Peat fibres continuous across transition to subsoil	No	Yes	Partially	No	3	1	3	Trial pits excavated by Irish Drilling Ltd in 2017.														
2.0	Topography																						
	Situation																						
2.1	Elevation OD [m]	~ 78 - 89 mOD	< 200 m		> 200 m	1	1	1	From LiDar.														
2.2	Slope Aspect	S	SW, S, SE	W, E	NW, N, NE	1	1	1	From LiDar.														
	Slope Angle																						
2.3	Slope Angle - Ground Surface	< 3°	< 3°	> 7°	3° - 7°	1	2	2	From LiDar.														
	Geomorphology																						
2.4	General slope characteristics downslope	Planar	Concave	Planar	Convex	2	1	2	From LiDar.														
2.5	Distance from break in slope	>100m	> 100 m	50 - 100 m	< 50 m	1	1	1	From LiDar.														
3.0	Hydrology																						
	Hydrology																						
3.1	In broad valley upslope from defined watercourse	Yes, slopes < 3°	No	Yes, slopes < 3°	Yes, slopes ≥ 3°	2	1	2	From LiDar.														
3.2	Distance from head of defined watercourse	< 200m	> 300 m	200 - 300 m	< 200 m	3	1	3	From LiDar.														
3.3	Surface water	Localised	Localised	Ponded in drains	Springs/ Surface Water	1	1	1															
3.4	Evidence of piping	No	No	-	Yes	1	1	1	From site walk and site investigation.														
3.5	Existing drainage ditches	Varied	Down slope	Varied / Oblique	Across slope	2	1	2															
3.6	Annual Rainfall	800 - 1000 mm/yr	< 1000 mm/yr	1000 - 1400 mm/yr	>1400 mm/yr	1	1	1	From Met Éireann.														
4.0	Other Factors																						
	Vegetation																						
4.1	Vegetation	Wetlands	Dry Heather	Grasslands	Wetlands	3	1	3	From aerial photography, drone survey and site walk.														
4.2	Forestry (if applicable)	N/A	Good Growth	Fair	Stunted Growth	0	1.5	0	From aerial photography, drone survey and site walk.														
	Slide History																						
4.3	Previous slides in locality	> 5 km	> 5 km	< 5 km	On site	1	2	2	From Geological Survey of Ireland.														
4.4	Evidence of movement in peat (e.g. tension cracks, step features, compression features)	No	No	-	Yes	1	1	1	From site walk and site investigation.														
	Land Use																						
4.5	Peat Workings	Cutaway/Turbary	None	Cutaway/Turbary	Machine Cut	2	1	2	From aerial photography, drone survey and site walk.														
	Other Factors																						
4.6	Existing roads in place	Solid Road	Solid Road		Floating Road	1	1	1	No existing road. Value assumed.														
4.7	Time of year for construction	Late Summer/ Autumn	Spring	Winter / Early Summer	Late Summer/ Autumn	3	1	3	Worst case scenario assumed.														
Likelihood Rating																							
								Total	43														
								Max Possible	72	0.0-0.3	Negligible	1											
								Likelihood	0.60	0.3-0.5	Low	2											
										0.5-0.7	Medium	3											
										0.7-1.0	High	4											
IMPACT																							
5.0	Impact Factors																						
5.1	Volume of peat in potential peat flow	Medium (1,000 - 20,000 m³)	Small volume (<1,000 m³)	Medium (1,000 - 20,000 m³)	Potential for Bog burst	2	3	6	Based on distance to downslope watercourse.														
5.2	Downslope features	Watercourse	Bowl/ contained	Minor undefined watercourse	Valley	2	1	2	From LiDar														
5.3	Proximity to defined valley	< 200 m	> 500 m	200 - 500 m	< 200 m	3	1	3	From LiDar														
5.4	Valley profile	Flat	Flat	Intermediate	Steep	1	1	1	From LiDar														
5.5	Downstream aquatic environment	Sensitive	Non-sensitive	Sensitive	Drinking water supply	2	1	2	River Blackwater Special Area of Conservation (SAC).														
5.6	Public roads in potential peat flow path	No	No	Local Road	Regional Road	1	1	1	From aerial photography, drone survey and site walk														
5.7	Overhead lines in potential peat flow path	No	Phone Lines	Electricity, LV	Electricity MV, HV	1	1	1	From service drawings and site walk														
5.8	Buildings in potential peat flow path	No	No	Farm out-houses	Dwelling	1	1	1	From aerial photography, drone survey and site walk														
5.9	Capability to respond (access and resources)	Good	Good	Fair	Poor	1	1	1	Based on contractor facilities on site during construction.														
Impact Rating																							
								Total	18														
								Max Possible	33	0.0-0.3	Negligible	1											
								Impact	0.55	0.3-0.5	Low	2											
										0.5-0.7	Medium	3											
										0.7-1.0	High	4											
RISK RATING																							
<p>Risk Rating = Likelihood * Impact</p> <p>Risk Rating = 0.60 * 0.55 = 0.33 Low</p>																							
<table border="1"> <thead> <tr> <th>Risk Rating</th> <th>Risk Level</th> <th>Action Required</th> </tr> </thead> <tbody> <tr> <td>0.0 - 0.18</td> <td>Negligible</td> <td>Normal SI</td> </tr> <tr> <td>0.19 - 0.42</td> <td style="background-color: green;">Low</td> <td>Targeted SI, design of specific mitigation measures. Part time supervision during construction.</td> </tr> <tr> <td>0.43 - 0.66</td> <td style="background-color: yellow;">Medium</td> <td>Avoid construction in the area if possible. If unavoidable, detailed SI and design of specific mitigation measures. Full time supervision during construction.</td> </tr> <tr> <td>0.67 - 1.0</td> <td style="background-color: red;">High</td> <td>Avoid construction in this area.</td> </tr> </tbody> </table>									Risk Rating	Risk Level	Action Required	0.0 - 0.18	Negligible	Normal SI	0.19 - 0.42	Low	Targeted SI, design of specific mitigation measures. Part time supervision during construction.	0.43 - 0.66	Medium	Avoid construction in the area if possible. If unavoidable, detailed SI and design of specific mitigation measures. Full time supervision during construction.	0.67 - 1.0	High	Avoid construction in this area.
Risk Rating	Risk Level	Action Required																					
0.0 - 0.18	Negligible	Normal SI																					
0.19 - 0.42	Low	Targeted SI, design of specific mitigation measures. Part time supervision during construction.																					
0.43 - 0.66	Medium	Avoid construction in the area if possible. If unavoidable, detailed SI and design of specific mitigation measures. Full time supervision during construction.																					
0.67 - 1.0	High	Avoid construction in this area.																					



**Peat Stability Risk Assessment
Timahoe North Solar Farm**

Location:	Poleset 115B
Inspected on:	2017
Inspected by:	ESB International
Completed by:	SS
Date:	February 2018

Poleset 115B												
No.	Likelihood/ Impact Factors	Value	Rating				Rating Value	Weighting	Score	Comment		
			1	2	3	4						
LIKELIHOOD												
1.0	Ground Conditions											
	Peat											
1.1	Peat Depth	1 - 1.5 m	< 1 m	> 3 m	1 - 3 m	3	2	6		Based on peat probes carried out by ESB International and Irish Drilling, and also trial pits excavated by Irish Drilling Ltd in 2017.		
1.2	Peat Condition in Trial Pits	Slowly squeezing	Dry/ Stands well	Slowly squeezing	Extremely Wet/ Undruggable	2	1	2		Trial pits excavated by Irish Drilling Ltd in 2017.		
	Subsoil Characteristics											
1.3	Subsoil Type	Soft clay	Gravel/ Firm Glacial Till	Smooth Rock	Soft Sensitive Clay	3	1	3		Trial pits excavated by Irish Drilling Ltd in 2017.		
1.4	Peat fibres continuous across transition to subsoil	No	Yes	Partially	No	3	1	3		Trial pits excavated by Irish Drilling Ltd in 2017.		
2.0	Topography											
	Situation											
2.1	Elevation OD [m]	~ 78 - 89 mOD	< 200 m		> 200 m	1	1	1		From LiDar.		
2.2	Slope Aspect	S	SW, S, SE	W, E	NW, N, NE	1	1	1		From LiDar.		
	Slope Angle											
2.3	Slope Angle - Ground Surface	< 3°	< 3°	> 7°	3° - 7°	1	2	2		From LiDar.		
	Geomorphology											
2.4	General slope characteristics downslope	Planar	Concave	Planar	Convex	2	1	2		From LiDar.		
2.5	Distance from break in slope	>100m	> 100 m	50 - 100 m	< 50 m	1	1	1		From LiDar.		
3.0	Hydrology											
	Hydrology											
3.1	In broad valley upslope from defined watercourse	Yes, slopes < 3°	No	Yes, slopes < 3°	Yes, slopes ≥ 3°	2	1	2		From LiDar.		
3.2	Distance from head of defined watercourse	< 200m	> 300 m	200 - 300 m	< 200 m	3	1	3		From LiDar.		
3.3	Surface water	Localised	Localised	Ponded in drains	Springs/ Surface Water	1	1	1				
3.4	Evidence of piping	No	No	-	Yes	1	1	1		From site walk and site investigation.		
3.5	Existing drainage ditches	Varied	Down slope	Varied / Oblique	Across slope	2	1	2				
3.6	Annual Rainfall	800 - 1000 mm/yr	< 1000 mm/yr	1000 - 1400 mm/yr	>1400 mm/yr	1	1	1		From Met Éireann.		
4.0	Other Factors											
	Vegetation											
4.1	Vegetation	Wetlands	Dry Heather	Grasslands	Wetlands	3	1	3		From aerial photography, drone survey and site walk.		
4.2	Forestry (if applicable)	N/A	Good Growth	Fair	Stunted Growth	0	1.5	0		From aerial photography, drone survey and site walk.		
	Slide History											
4.3	Previous slides in locality	> 5 km	> 5 km	< 5 km	On site	1	2	2		From Geological Survey of Ireland.		
4.4	Evidence of movement in peat (e.g. tension cracks, step features, compression features)	No	No	-	Yes	1	1	1		From site walk and site investigation.		
	Land Use											
4.5	Peat Workings	Cutaway/Turbary	None	Cutaway/Turbary	Machine Cut	2	1	2		From aerial photography, drone survey and site walk.		
	Other Factors											
4.6	Existing roads in place	Solid Road	Solid Road		Floating Road	1	1	1		No existing road. Value assumed.		
4.7	Time of year for construction	Late Summer/ Autumn	Spring	Winter / Early Summer	Late Summer/ Autumn	3	1	3		Worst case scenario assumed.		
	Likelihood Rating											
								Total	43			
								Max Possible	72			
										Likelihood Score		
										Scale		
										0.0-0.3	Negligible	1
										0.3-0.5	Low	2
								Likelihood	0.60	0.5-0.7	Medium	3
										0.7-1.0	High	4

IMPACT												
5.0	Impact Factors											
5.1	Volume of peat in potential peat flow	Medium (1,000 - 20,000 m³)	Small volume (<1,000 m³)	Medium (1,000 - 20,000 m³)	Potential for Bog burst	2	3	6		Based on distance to downslope watercourse.		
5.2	Downslope features	Watercourse	Bowl/ contained	Minor undefined watercourse	Valley	2	1	2		From LiDar		
5.3	Proximity to defined valley	< 200 m	> 500 m	200 - 500 m	< 200 m	3	1	3		From LiDar		
5.4	Valley profile	Flat	Flat	Intermediate	Steep	1	1	1		From LiDar		
5.5	Downstream aquatic environment	Sensitive	Non-sensitive	Sensitive	Drinking water supply	2	1	2		River Blackwater Special Area of Conservation (SAC).		
5.6	Public roads in potential peat flow path	No	No	Local Road	Regional Road	1	1	1		From aerial photography, drone survey and site walk		
5.7	Overhead lines in potential peat flow path	No	Phone Lines	Electricity, LV	Electricity MV, HV	1	1	1		From service drawings and site walk		
5.8	Buildings in potential peat flow path	No	No	Farm out-houses	Dwelling	1	1	1		From aerial photography, drone survey and site walk		
5.9	Capability to respond (access and resources)	Good	Good	Fair	Poor	1	1	1		Based on contractor facilities on site during construction.		
	Impact Rating											
								Total	18			
								Max Possible	33			
										Impact Score		
										Scale		
										0.0-0.3	Negligible	1
										0.3-0.5	Low	2
								Impact	0.55	0.5-0.7	Medium	3
										0.7-1.0	High	4

RISK RATING

Risk Rating = Likelihood * Impact

Risk Rating = 0.60 * 0.55 = 0.33 Low

Risk Rating	Risk Level	Action Required
0.0 - 0.18	Negligible	Normal SI
0.19 - 0.42	Low	Targeted SI, design of specific mitigation measures. Part time supervision during construction.
0.43 - 0.66	Medium	Avoid construction in the area if possible. If unavoidable, detailed SI and design of specific mitigation measures. Full time supervision during construction.
0.67 - 1.0	High	Avoid construction in this area.

		Poleset 115C											
No.	Likelihood/ Impact Factors	Value	Rating				Rating Value	Weighting	Score	Comment			
			1	2	3								
LIKELIHOOD													
1.0	Ground Conditions												
	Peat												
1.1	Peat Depth	2 - 3 m	< 1 m	> 3 m	1 - 3 m	1	2	2	Based on peat probes carried out by ESB International and Irish Drilling, and also trial pits excavated by Irish Drilling Ltd in 2017.				
1.2	Peat Condition in Trial Pits	Slowly squeezing	Dry/ Stands well	Slowly squeezing	Extremely Wet/ Undiggable	2	1	2	Trial pits excavated by Irish Drilling Ltd in 2017.				
	Subsoil Characteristics												
1.3	Subsoil Type	Soft clay	Gravel/ Firm Glacial Till	Smooth Rock	Soft Sensitive Clay	3	1	3	Trial pits excavated by Irish Drilling Ltd in 2017.				
1.4	Peat fibres continuous across transition to subsoil	No	Yes	Partially	No	3	1	3	Trial pits excavated by Irish Drilling Ltd in 2017.				
2.0	Topography												
	Situation												
2.1	Elevation OD [m]	~ 78 - 89 mOD	< 200 m	> 200 m	> 200 m	1	1	1	From LiDar.				
2.2	Slope Aspect	S	SW, S, SE	W, E	NW, N, NE	1	1	1	From LiDar.				
	Slope Angle												
2.3	Slope Angle - Ground Surface	< 3°	< 3°	> 7°	3° - 7°	1	2	2	From LiDar.				
	Geomorphology												
2.4	General slope characteristics downslope	Planar	Concave	Planar	Convex	2	1	2	From LiDar.				
2.5	Distance from break in slope	>100m	> 100 m	50 - 100 m	< 50 m	1	1	1	From LiDar.				
3.0	Hydrology												
	Hydrology												
3.1	In broad valley upslope from defined watercourse	Yes, slopes < 3°	No	Yes, slopes < 3°	Yes, slopes ≥ 3°	2	1	2	From LiDar.				
3.2	Distance from head of defined watercourse	< 200m	> 300 m	200 - 300 m	< 200 m	3	1	3	From LiDar.				
3.3	Surface water	Localised	Localised	Ponded in drains	Springs/ Surface Water	1	1	1					
3.4	Evidence of piping	No	No	-	Yes	1	1	1	From site walk and site investigation.				
3.5	Existing drainage ditches	Varied	Down slope	Varied / Oblique	Across slope	2	1	2					
3.6	Annual Rainfall	800 - 1000 mm/yr	< 1000 mm/yr	1000 - 1400 mm/yr	>1400 mm/yr	1	1	1	From Met Éireann.				
4.0	Other Factors												
	Vegetation												
4.1	Vegetation	Wetlands	Dry Heather	Grasslands	Wetlands	3	1	3	From aerial photography, drone survey and site walk.				
4.2	Forestry (if applicable)	N/A	Good Growth	Fair	Stunted Growth	0	1.5	0	From aerial photography, drone survey and site walk.				
	Slide History												
4.3	Previous slides in locality	> 5 km	> 5 km	< 5 km	On site	1	2	2	From Geological Survey of Ireland.				
4.4	Evidence of movement in peat (e.g. tension cracks, step features, compression features)	No	No	-	Yes	1	1	1	From site walk and site investigation.				
	Land Use												
4.5	Peat Workings	Cutaway/Turbary	None	Cutaway/Turbary	Machine Cut	2	1	2	From aerial photography, drone survey and site walk.				
	Other Factors												
4.6	Existing roads in place	Solid Road	Solid Road		Floating Road	1	1	1	No existing road. Value assumed.				
4.7	Time of year for construction	Late Summer/ Autumn	Spring	Winter / Early Summer	Late Summer/ Autumn	3	1	3	Worst case scenario assumed.				
	Likelihood Rating												
									Total	39			
									Max Possible	72			
											Likelihood Score		Scale
											0.0-0.3	Negligible	1
											0.3-0.5	Low	2
									Likelihood	0.54	0.5-0.7	Medium	3
											0.7-1.0	High	4

IMPACT															
5.0	Impact Factors														
5.1	Volume of peat in potential peat flow	Medium (1,000 - 20,000 m ³)	Small volume (<1,000 m ³)	Medium (1,000 - 20,000 m ³)	Potential for Bog burst	2	3	6	Based on distance to downslope watercourse.						
5.2	Downslope features	Watercourse	Bowl/ contained	Minor undefined watercourse	Valley	2	1	2	From LiDar						
5.3	Proximity to defined valley	< 200 m	> 500 m	200 - 500 m	< 200 m	3	1	3	From LiDar						
5.4	Valley profile	Flat	Flat	Intermediate	Steep	1	1	1	From LiDar						
5.5	Downstream aquatic environment	Sensitive	Non-sensitive	Sensitive	Drinking water supply	2	1	2	River Blackwater Special Area of Conservation (SAC).						
5.6	Public roads in potential peat flow path	Local Road	No	Local Road	Regional Road	2	1	2	From aerial photography, drone survey and site walk						
5.7	Overhead lines in potential peat flow path	Electricity MV, HV	Phone Lines	Electricity, LV	Electricity MV, HV	3	1	3	From service drawings and site walk						
5.8	Buildings in potential peat flow path	No	No	Farm out-houses	Dwelling	1	1	1	From aerial photography, drone survey and site walk						
5.9	Capability to respond (access and resources)	Good	Good	Fair	Poor	1	1	1	Based on contractor facilities on site during construction.						
	Impact Rating														
									Total	21	Impact Score			Scale	
									Max Possible	33	0.0-0.3			Negligible	1
											0.3-0.5		Low	2	
									Impact	0.64	0.5-0.7	Medium	3		
											0.7-1.0	High	4		

RISK RATING

Risk Rating = Likelihood * Impact

Risk Rating = 0.54 0.64 = 0.34 **Low**

Risk Rating	Risk Level	Action Required
0.0 - 0.18	Negligible	Normal SI
0.19 - 0.42	Low	Targeted SI, design of specific mitigation measures. Part time supervision during construction.
0.43 - 0.66	Medium	Avoid construction in the area if possible. If unavoidable, detailed SI and design of specific mitigation measures. Full time supervision during construction.
0.67 - 1.0	High	Avoid construction in this area.

Angle Mast 115D									
No.	Likelihood/ Impact Factors	Value	Rating			Rating Value	Weighting	Score	Comment
			1	2	3				
LIKELIHOOD									
1.0 Ground Conditions									
Peat									
1.1	Peat Depth	1.5 - 3.5 m	< 1 m	> 3 m	1 - 3 m	1	2	2	Based on peat probes carried out by ESB International and Irish Drilling, and also trial pits excavated by Irish Drilling Ltd in 2017.
1.2	Peat Condition in Trial Pits	Slowly squeezing	Dry/ Stands well	Slowly squeezing	Extremely Wet/ Undiggable	2	1	2	Trial pits excavated by Irish Drilling Ltd in 2017.
Subsoil Characteristics									
1.3	Subsoil Type	Soft clay	Gravel/ Firm Glacial Till	Smooth Rock	Soft Sensitive Clay	3	1	3	Trial pits excavated by Irish Drilling Ltd in 2017.
1.4	Peat fibres continuous across transition to subsoil	No	Yes	Partially	No	3	1	3	Trial pits excavated by Irish Drilling Ltd in 2017.
2.0 Topography									
Situation									
2.1	Elevation OD [m]	~ 78 - 89 mOD	< 200 m		> 200 m	1	1	1	From LiDar.
2.2	Slope Aspect	S	SW, S, SE	W, E	NW, N, NE	1	1	1	From LiDar.
Slope Angle									
2.3	Slope Angle - Ground Surface	< 3°	< 3°	> 7°	3° - 7°	1	2	2	From LiDar.
Geomorphology									
2.4	General slope characteristics downslope	Planar	Concave	Planar	Convex	2	1	2	From LiDar.
2.5	Distance from break in slope	>100m	> 100 m	50 - 100 m	< 50 m	1	1	1	From LiDar.
3.0 Hydrology									
Hydrology									
3.1	In broad valley upslope from defined watercourse	Yes, slopes < 3°	No	Yes, slopes < 3°	Yes, slopes ≥ 3°	2	1	2	From LiDar.
3.2	Distance from head of defined watercourse	< 200m	> 300 m	200 - 300 m	< 200 m	3	1	3	From LiDar.
3.3	Surface water	Localised	Localised	Ponded in drains	Springs/ Surface Water	1	1	1	
3.4	Evidence of piping	No	No	-	Yes	1	1	1	From site walk and site investigation.
3.5	Existing drainage ditches	Varied	Down slope	Varied / Oblique	Across slope	2	1	2	
3.6	Annual Rainfall	800 - 1000 mm/yr	< 1000 mm/yr	1000 - 1400 mm/yr	>1400 mm/yr	1	1	1	From Met Éireann.
4.0 Other Factors									
Vegetation									
4.1	Vegetation	Wetlands	Dry Heather	Grasslands	Wetlands	3	1	3	From aerial photography, drone survey and site walk.
4.2	Forestry (if applicable)	N/A	Good Growth	Fair	Stunted Growth	0	1.5	0	From aerial photography, drone survey and site walk.
Slide History									
4.3	Previous slides in locality	> 5 km	> 5 km	< 5 km	On site	1	2	2	From Geological Survey of Ireland.
4.4	Evidence of movement in peat (e.g. tension cracks, step features, compression features)	No	No	-	Yes	1	1	1	From site walk and site investigation.
Land Use									
4.5	Peat Workings	Cutaway/Turbary	None	Cutaway/Turbary	Machine Cut	2	1	2	From aerial photography, drone survey and site walk.
Other Factors									
4.6	Existing roads in place	Floating Road	Solid Road		Floating Road	3	1	3	No existing road. Value assumed.
4.7	Time of year for construction	Late Summer/ Autumn	Spring	Winter / Early Summer	Late Summer/ Autumn	3	1	3	Worst case scenario assumed.
Likelihood Rating									
						Total		41	
						Max Possible		72	
									Likelihood Score
									0.0-0.3 Negligible 1
									0.3-0.5 Low 2
						Likelihood		0.57	0.5-0.7 Medium 3
									0.7-1.0 High 4

IMPACT									
5.0 Impact Factors									
5.1	Volume of peat in potential peat flow	Medium (1,000 - 20,000 m³)	Small volume (<1,000 m³)	Medium (1,000 - 20,000 m³)	Potential for Bog burst	2	3	6	Based on distance to downslope watercourse.
5.2	Downslope features	Watercourse	Bowl/ contained	Minor undefined watercourse	Valley	2	1	2	From LiDar
5.3	Proximity to defined valley	< 200 m	> 500 m	200 - 500 m	< 200 m	3	1	3	From LiDar
5.4	Valley profile	Flat	Flat	Intermediate	Steep	1	1	1	From LiDar
5.5	Downstream aquatic environment	Sensitive	Non-sensitive	Sensitive	Drinking water supply	2	1	2	River Blackwater Special Area of Conservation (SAC).
5.6	Public roads in potential peat flow path	Local Road	No	Local Road	Regional Road	2	1	2	From aerial photography, drone survey and site walk
5.7	Overhead lines in potential peat flow path	Electricity MV, HV	Phone Lines	Electricity, LV	Electricity MV, HV	3	1	3	From service drawings and site walk
5.8	Buildings in potential peat flow path	No	No	Farm out-houses	Dwelling	1	1	1	From aerial photography, drone survey and site walk
5.9	Capability to respond (access and resources)	Good	Good	Fair	Poor	1	1	1	Based on contractor facilities on site during construction.
Impact Rating									
						Total		21	
						Max Possible		33	
									Impact Score
									0.0-0.3 Negligible 1
									0.3-0.5 Low 2
						Impact		0.64	0.5-0.7 Medium 3
									0.7-1.0 High 4

RISK RATING

Risk Rating = Likelihood * Impact

Risk Rating = 0.57 0.64 = 0.36 Low

Risk Rating	Risk Level	Action Required
0.0 - 0.18	Negligible	Normal SI
0.19 - 0.42	Low	Targeted SI, design of specific mitigation measures. Part time supervision during construction.
0.43 - 0.66	Medium	Avoid construction in the area if possible. If unavoidable, detailed SI and design of specific mitigation measures. Full time supervision during construction.
0.67 - 1.0	High	Avoid construction in this area.



INTERNATIONAL

Peat Stability Risk Assessment Timahoe North Solar Farm

Location:	Substation
Inspected on:	2017
Inspected by:	ESB International
Completed by:	SS
Date:	February 2018

No.	Likelihood/ Impact Factors	Value	Rating				Rating Value	Weighting	Score	Comment		
			1	2	3							
LIKELIHOOD												
1.0 Ground Conditions												
Peat												
1.1	Peat Depth	0.5 - 3 m	< 1 m	> 3 m	1 - 3 m		3	2	6	Based on peat probes carried out by ESB International and Irish Drilling, and also trial pits excavated by Irish Drilling Ltd in 2017.		
1.2	Peat Condition in Trial Pits	Stands Well	Dry/ Stands well	Slowly squeezing	Extremely Wet/ Undiggable		1	1	1	Trial pits excavated by Irish Drilling Ltd in 2017.		
Subsoil Characteristics												
1.3	Subsoil Type	Soft silt	Gravel/ Firm Glacial Till	Smooth Rock	Soft Sensitive Clay		3	1	3	Trial pits excavated by Irish Drilling Ltd in 2017.		
1.4	Peat fibres continuous across transition to subsoil	No	Yes	Partially	No		3	1	3	Trial pits excavated by Irish Drilling Ltd in 2017.		
2.0 Topography												
Situation												
2.1	Elevation OD [m]	~ 78 - 89 mOD	< 200 m		> 200 m		1	1	1	From LiDar.		
2.2	Slope Aspect	S	SW, S, SE	W, E	NW, N, NE		1	1	1	From LiDar.		
Slope Angle												
2.3	Slope Angle - Ground Surface	< 3°	< 3°	> 7°	3° - 7°		1	2	2	From LiDar.		
Geomorphology												
2.4	General slope characteristics downslope	Planar	Concave	Planar	Convex		2	1	2	From LiDar.		
2.5	Distance from break in slope	>100m	> 100 m	50 - 100 m	< 50 m		1	1	1	From LiDar.		
3.0 Hydrology												
Hydrology												
3.1	In broad valley upslope from defined watercourse	Yes, slopes < 3°	No	Yes, slopes < 3°	Yes, slopes ≥ 3°		2	1	2	From LiDar.		
3.2	Distance from head of defined watercourse	< 200m	> 300 m	200 - 300 m	< 200 m		3	1	3	From LiDar.		
3.3	Surface water	Localised	Localised	Ponded in drains	Springs/ Surface Water		1	1	1			
3.4	Evidence of piping	No	No	-	Yes		1	1	1	From site walk and site investigation.		
3.5	Existing drainage ditches	Varied	Down slope	Varied / Oblique	Across slope		2	1	2			
3.6	Annual Rainfall	800 - 1000 mm/yr	< 1000 mm/yr	1000 - 1400 mm/yr	>1400 mm/yr		1	1	1	From Met Éireann.		
4.0 Other Factors												
Vegetation												
4.1	Vegetation	Wetlands	Dry Heather	Grasslands	Wetlands		3	1	3	From aerial photography, drone survey and site walk.		
4.2	Forestry (if applicable)	Good Growth	Good Growth	Fair	Stunted Growth		1	1.5	1.5	From aerial photography, drone survey and site walk.		
Slide History												
4.3	Previous slides in locality	> 5 km	> 5 km	< 5 km	On site		1	2	2	From Geological Survey of Ireland.		
4.4	Evidence of movement in peat (e.g. tension cracks, step features, compression features)	No	No	-	Yes		1	1	1	From site walk and site investigation.		
Land Use												
4.5	Peat Workings	Cutaway/Turbary	None	Cutaway/Turbary	Machine Cut		2	1	2	From aerial photography, drone survey and site walk.		
Other Factors												
4.6	Existing roads in place	Solid Road	Solid Road		Floating Road		1	1	1	No existing road. Value assumed.		
4.7	Time of year for construction	Late Summer/ Autumn	Spring	Winter / Early Summer	Late Summer/ Autumn		3	1	3	Worst case scenario assumed.		
Likelihood Rating												
								Total	43.5			
								Max Possible	76.5			
								Likelihood	0.57			
										Likelihood Score		
										0.0-0.3	Negligible	1
										0.3-0.5	Low	2
										0.5-0.7	Medium	3
										0.7-1.0	High	4

IMPACT												
5.0 Impact Factors												
5.1	Volume of peat in potential peat flow	Medium (1,000 - 20,000 m³)	Small volume (<1,000 m³)	Medium (1,000 - 20,000 m³)	Potential for Bog burst		2	3	6	Based on distance to downslope watercourse.		
5.2	Downslope features	Watercourse	Bowl/ contained	Minor undefined watercourse	Valley		2	1	2	From LiDar		
5.3	Proximity to defined valley	< 200 m	> 500 m	200 - 500 m	< 200 m		3	1	3	From LiDar		
5.4	Valley profile	Flat	Flat	Intermediate	Steep		1	1	1	From LiDar		
5.5	Downstream aquatic environment	Sensitive	Non-sensitive	Sensitive	Drinking water supply		2	1	2	River Blackwater Special Area of Conservation (SAC).		
5.6	Public roads in potential peat flow path	No	No	Local Road	Regional Road		1	1	1	From aerial photography, drone survey and site walk		
5.7	Overhead lines in potential peat flow path	No	Phone Lines	Electricity, LV	Electricity MV, HV		1	1	1	From service drawings and site walk		
5.8	Buildings in potential peat flow path	No	No	Farm out-houses	Dwelling		1	1	1	From aerial photography, drone survey and site walk		
5.9	Capability to respond (access and resources)	Good	Good	Fair	Poor		1	1	1	Based on contractor facilities on site during construction.		
Impact Rating												
								Total	18			
								Max Possible	33			
								Impact	0.55			
										Impact Score		
										0.0-0.3	Negligible	1
										0.3-0.5	Low	2
										0.5-0.7	Medium	3
										0.7-1.0	High	4

RISK RATING

Risk Rating = Likelihood * Impact

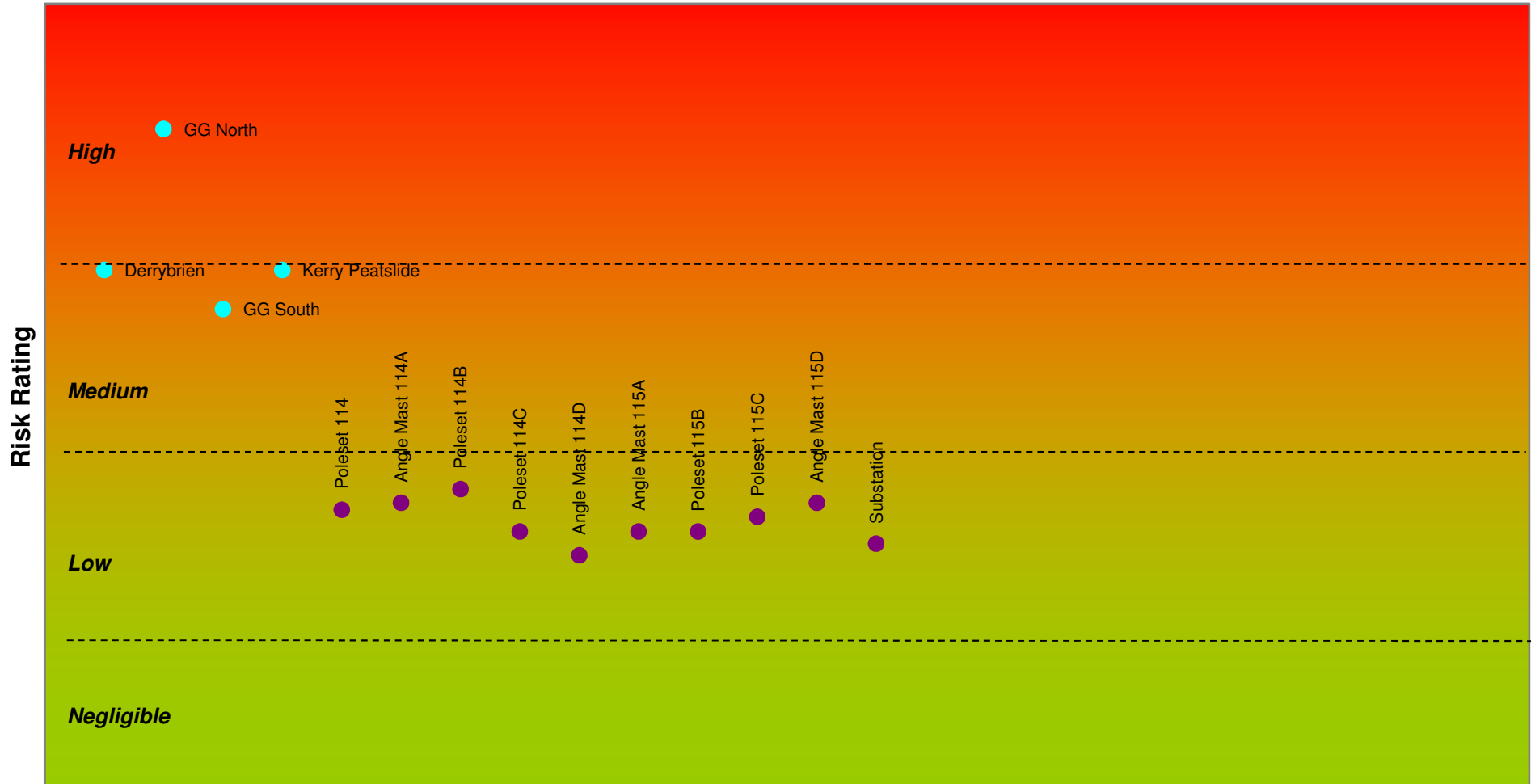
Risk Rating = 0.57 * 0.55 = 0.31 Low

Risk Rating	Risk Level	Action Required
0.0 - 0.18	Negligible	Normal SI
0.19 - 0.42	Low	Targeted SI, design of specific mitigation measures. Part time supervision during construction.
0.43 - 0.66	Medium	Avoid construction in the area if possible. If unavoidable, detailed SI and design of specific mitigation measures. Full time supervision during construction.
0.67 - 1.0	High	Avoid construction in this area.

RESULTS OF PEAT STABILITY RISK ASSESSMENT

Area	Risk Level
Overhead Line Structures	
Poleset 114	Low
Angle Mast 114A	Low
Poleset 114B	Low
Poleset 114C	Low
Angle Mast 114D	Low
Angle Mast 115A	Low
Poleset 115B	Low
Poleset 115C	Low
Angle Mast 115D	Low
Substation	Low

PSRA Comparative Chart (Overhead Line Structures and Substation)



No.	Likelihood/ Impact Factors	Value	Rating			Rating Value	Weighting	Score	Comment	
			1	2	3					
LIKELIHOOD										
1.0	Ground Conditions									
	Peat									
1.1	Peat Depth	1.5 - 3 m	< 1 m	> 3 m	1 - 3 m	3	2	6	Based on peat probes carried out by ESB International and Irish Drilling, and also trial pits excavated by Irish Drilling Ltd in 2017.	
1.2	Peat Condition in Trial Pits	Stands Well	Dry/ Stands well	Slowly squeezing	Extremely Wet/ Undiggable	1	1	1	Trial pits excavated by Irish Drilling Ltd in 2017.	
	Subsoil Characteristics									
1.3	Subsoil Type	Soft silt	Gravel/ Firm Glacial Till	Smooth Rock	Soft Sensitive Clay	3	1	3	Trial pits excavated by Irish Drilling Ltd in 2017.	
1.4	Peat fibres continuous across transition to subsoil	No	Yes	Partially	No	3	1	3	Trial pits excavated by Irish Drilling Ltd in 2017.	
2.0	Topography									
	Situation									
2.1	Elevation OD [m]	~ 78 - 89 mOD	< 200 m	> 200 m		1	1	1	From LiDar.	
2.2	Slope Aspect	S	SW, S, SE	W, E	NW, N, NE	1	1	1	From LiDar.	
	Slope Angle									
2.3	Slope Angle - Ground Surface	< 3°	< 3°	> 7°	3° - 7°	1	2	2	From LiDar.	
	Geomorphology									
2.4	General slope characteristics downslope	Planar	Concave	Planar	Convex	2	1	2	From LiDar.	
2.5	Distance from break in slope	>100m	> 100 m	50 - 100 m	< 50 m	1	1	1	From LiDar.	
3.0	Hydrology									
	Hydrology									
3.1	In broad valley upslope from defined watercourse	Yes, slopes < 3°	No	Yes, slopes < 3°	Yes, slopes ≥ 3°	2	1	2	From LiDar.	
3.2	Distance from head of defined watercourse	< 200m	> 300 m	200 - 300 m	< 200 m	3	1	3	From LiDar.	
3.3	Surface water	Localised	Localised	Ponded in drains	Springs/ Surface Water	1	1	1		
3.4	Evidence of piping	No	No	-	Yes	1	1	1	From site walk and site investigation.	
3.5	Existing drainage ditches	Varied	Down slope	Varied / Oblique	Across slope	2	1	2		
3.6	Annual Rainfall	800 - 1000 mm/yr	< 1000 mm/yr	1000 - 1400 mm/yr	>1400 mm/yr	1	1	1	From Met Éireann.	
4.0	Other Factors									
	Vegetation									
4.1	Vegetation	Wetlands	Dry Heather	Grasslands	Wetlands	3	1	3	From aerial photography, drone survey and site walk.	
4.2	Forestry (if applicable)	Good Growth	Good Growth	Fair	Stunted Growth	1	1.5	1.5	From aerial photography, drone survey and site walk.	
	Slide History									
4.3	Previous slides in locality	> 5 km	> 5 km	< 5 km	On site	1	2	2	From Geological Survey of Ireland.	
4.4	Evidence of movement in peat (e.g. tension cracks, step features, compression features)	No	No	-	Yes	1	1	1	From site walk and site investigation.	
	Land Use									
4.5	Peat Workings	Cutaway/Turbary	None	Cutaway/Turbary	Machine Cut	2	1	2	From aerial photography, drone survey and site walk.	
	Other Factors									
4.6	Existing roads in place	Solid Road	Solid Road		Floating Road	1	1	1	No existing road. Value assumed.	
4.7	Time of year for construction	Late Summer/ Autumn	Spring	Winter / Early Summer	Late Summer/ Autumn	3	1	3	Worst case scenario assumed.	
	Likelihood Rating									
					Total		43.5			
					Max Possible		76.5			
								Likelihood Score	Scale	
								0.0-0.3	Negligible	1
								0.3-0.5	Low	2
					Likelihood		0.57	0.5-0.7	Medium	3
								0.7-1.0	High	4

IMPACT										
5.0	Impact Factors									
5.1	Volume of peat in potential peat flow	Medium (1,000 - 20,000 m ³)	Small volume (<1,000 m ³)	Medium (1,000 - 20,000 m ³)	Potential for Bog burst	2	3	6	Based on distance to downslope watercourse.	
5.2	Downslope features	Watercourse	Bowl/ contained	Minor undefined watercourse	Valley	2	1	2	From LiDar	
5.3	Proximity to defined valley	< 200 m	> 500 m	200 - 500 m	< 200 m	3	1	3	From LiDar	
5.4	Valley profile	Flat	Flat	Intermediate	Steep	1	1	1	From LiDar	
5.5	Downstream aquatic environment	Sensitive	Non-sensitive	Sensitive	Drinking water supply	2	1	2	River Blackwater Special Area of Conservation (SAC).	
5.6	Public roads in potential peat flow path	No	No	Local Road	Regional Road	1	1	1	From aerial photography, drone survey and site walk	
5.7	Overhead lines in potential peat flow path	No	Phone Lines	Electricity, LV	Electricity MV, HV	1	1	1	From service drawings and site walk	
5.8	Buildings in potential peat flow path	No	No	Farm out-houses	Dwelling	1	1	1	From aerial photography, drone survey and site walk	
5.9	Capability to respond (access and resources)	Good	Good	Fair	Poor	1	1	1	Based on contractor facilities on site during construction.	
	Impact Rating									
					Total		18			
					Max Possible		33			
								Impact Score	Scale	
								0.0-0.3	Negligible	1
								0.3-0.5	Low	2
					Impact		0.55	0.5-0.7	Medium	3
								0.7-1.0	High	4

RISK RATING

Risk Rating = Likelihood * Impact

Risk Rating = 0.57 * 0.55 = 0.31 Low

Risk Rating	Risk Level	Action Required
0.0 - 0.18	Negligible	Normal SI
0.19 - 0.42	Low	Targeted SI, design of specific mitigation measures. Part time supervision during construction.
0.43 - 0.66	Medium	Avoid construction in the area if possible. If unavoidable, detailed SI and design of specific mitigation measures. Full time supervision during construction.
0.67 - 1.0	High	Avoid construction in this area.

Temporary Site Compound													
No.	Likelihood/ Impact Factors	Value	Rating				Rating Value	Weighting	Score	Comment			
			1	2	3	4							
LIKELIHOOD													
1.0 Ground Conditions													
Peat													
1.1	Peat Depth	1.5 - 3 m	< 1 m	> 3 m	1 - 3 m	3	2	6	Based on peat probes carried out by ESB International and Irish Drilling, and also trial pits excavated by Irish Drilling Ltd in 2017.				
1.2	Peat Condition in Trial Pits	Stands Well	Dry/ Stands well	Slowly squeezing	Extremely Wet/ Undiggable	1	1	1	Trial pits excavated by Irish Drilling Ltd in 2017.				
Subsoil Characteristics													
1.3	Subsoil Type	Soft silt	Gravel/ Firm Glacial Till	Smooth Rock	Soft Sensitive Clay	3	1	3	Trial pits excavated by Irish Drilling Ltd in 2017.				
1.4	Peat fibres continuous across transition to subsoil	Partially	Yes	Partially	No	2	1	2	Trial pits excavated by Irish Drilling Ltd in 2017.				
2.0 Topography													
Situation													
2.1	Elevation OD [m]	~ 78 - 89 mOD	< 200 m	> 200 m	> 200 m	1	1	1	From LiDar.				
2.2	Slope Aspect	S	SW, S, SE	W, E	NW, N, NE	1	1	1	From LiDar.				
Slope Angle													
2.3	Slope Angle - Ground Surface	< 3°	< 3°	> 7°	3° - 7°	1	2	2	From LiDar.				
Geomorphology													
2.4	General slope characteristics downslope	Planar	Concave	Planar	Convex	2	1	2	From LiDar.				
2.5	Distance from break in slope	>100m	> 100 m	50 - 100 m	< 50 m	1	1	1	From LiDar.				
3.0 Hydrology													
Hydrology													
3.1	In broad valley upslope from defined watercourse	Yes, slopes < 3°	No	Yes, slopes < 3°	Yes, slopes ≥ 3°	2	1	2	From LiDar.				
3.2	Distance from head of defined watercourse	< 200m	> 300 m	200 - 300 m	< 200 m	3	1	3	From LiDar.				
3.3	Surface water	Localised	Localised	Ponded in drains	Springs/ Surface Water	1	1	1					
3.4	Evidence of piping	No	No	-	Yes	1	1	1	From site walk and site investigation.				
3.5	Existing drainage ditches	Varied	Down slope	Varied / Oblique	Across slope	2	1	2					
3.6	Annual Rainfall	800 - 1000 mm/yr	< 1000 mm/yr	1000 - 1400 mm/yr	>1400 mm/yr	1	1	1	From Met Éireann.				
4.0 Other Factors													
Vegetation													
4.1	Vegetation	Wetlands	Dry Heather	Grasslands	Wetlands	3	1	3	From aerial photography, drone survey and site walk.				
4.2	Forestry (if applicable)	N/A	Good Growth	Fair	Stunted Growth	0	1.5	0	From aerial photography, drone survey and site walk.				
Slide History													
4.3	Previous slides in locality	> 5 km	> 5 km	< 5 km	On site	1	2	2	From Geological Survey of Ireland.				
4.4	Evidence of movement in peat (e.g. tension cracks, step features, compression features)	No	No	-	Yes	1	1	1	From site walk and site investigation.				
Land Use													
4.5	Peat Workings	Cutaway/Turbary	None	Cutaway/Turbary	Machine Cut	2	1	2	From aerial photography, drone survey and site walk.				
Other Factors													
4.6	Existing roads in place	Solid Road	Solid Road	Winter / Early Summer	Floating Road	1	1	1	No existing road. Value assumed.				
4.7	Time of year for construction	Late Summer/ Autumn	Spring	Winter / Early Summer	Late Summer/ Autumn	3	1	3	Worst case scenario assumed.				
Likelihood Rating													
								Total	41		Likelihood Score	Scale	
								Max Possible	72		0.0-0.3	Negligible	1
											0.3-0.5	Low	2
								Likelihood	0.57		0.5-0.7	Medium	3
											0.7-1.0	High	4

IMPACT													
5.0 Impact Factors													
5.1	Volume of peat in potential peat flow	Medium (1,000 - 20,000 m³)	Small volume (<1,000 m³)	Medium (1,000 - 20,000 m³)	Potential for Bog burst	2	3	6	Based on distance to downslope watercourse.				
5.2	Downslope features	Watercourse	Bowl/ contained	Minor undefined watercourse	Valley	2	1	2	From LiDar				
5.3	Proximity to defined valley	< 200 m	> 500 m	200 - 500 m	< 200 m	3	1	3	From LiDar				
5.4	Valley profile	Flat	Flat	Intermediate	Steep	1	1	1	From LiDar				
5.5	Downstream aquatic environment	Sensitive	Non-sensitive	Sensitive	Drinking water supply	2	1	2	River Blackwater Special Area of Conservation (SAC).				
5.6	Public roads in potential peat flow path	No	No	Local Road	Regional Road	1	1	1	From aerial photography, drone survey and site walk				
5.7	Overhead lines in potential peat flow path	No	Phone Lines	Electricity, LV	Electricity MV, HV	1	1	1	From service drawings and site walk				
5.8	Buildings in potential peat flow path	No	No	Farm out-houses	Dwelling	1	1	1	From aerial photography, drone survey and site walk				
5.9	Capability to respond (access and resources)	Good	Good	Fair	Poor	1	1	1	Based on contractor facilities on site during construction.				
Impact Rating													
								Total	18		Impact Score	Scale	
								Max Possible	33		0.0-0.3	Negligible	1
											0.3-0.5	Low	2
								Impact	0.55		0.5-0.7	Medium	3
											0.7-1.0	High	4

RISK RATING

Risk Rating = Likelihood * Impact

Risk Rating = 0.57 * 0.55 = 0.31 Low

Risk Rating	Risk Level	Action Required
0.0 - 0.18	Negligible	Normal SI
0.19 - 0.42	Low	Targeted SI, design of specific mitigation measures. Part time supervision during construction.
0.43 - 0.66	Medium	Avoid construction in the area if possible. If unavoidable, detailed SI and design of specific mitigation measures. Full time supervision during construction.
0.67 - 1.0	High	Avoid construction in this area.



Peat Stability Risk Assessment
Timahoe North Solar Farm

Location: Remained of site within probed area
Inspected on: 2017
Inspected by: ESB International
Completed by: SS
Date: February 2018

Table with columns: No., Likelihood/ Impact Factors, Value, Rating (1-3), Rating Value, Weighting, Score, Comment. Section: LIKELIHOOD. Rows include Ground Conditions, Topography, Hydrology, and Other Factors.

Table with columns: No., Impact Factors, Value, Rating (1-3), Rating Value, Weighting, Score, Comment. Section: IMPACT. Rows include Volume of peat in potential peat flow, Downslope features, Proximity to defined valley, etc.

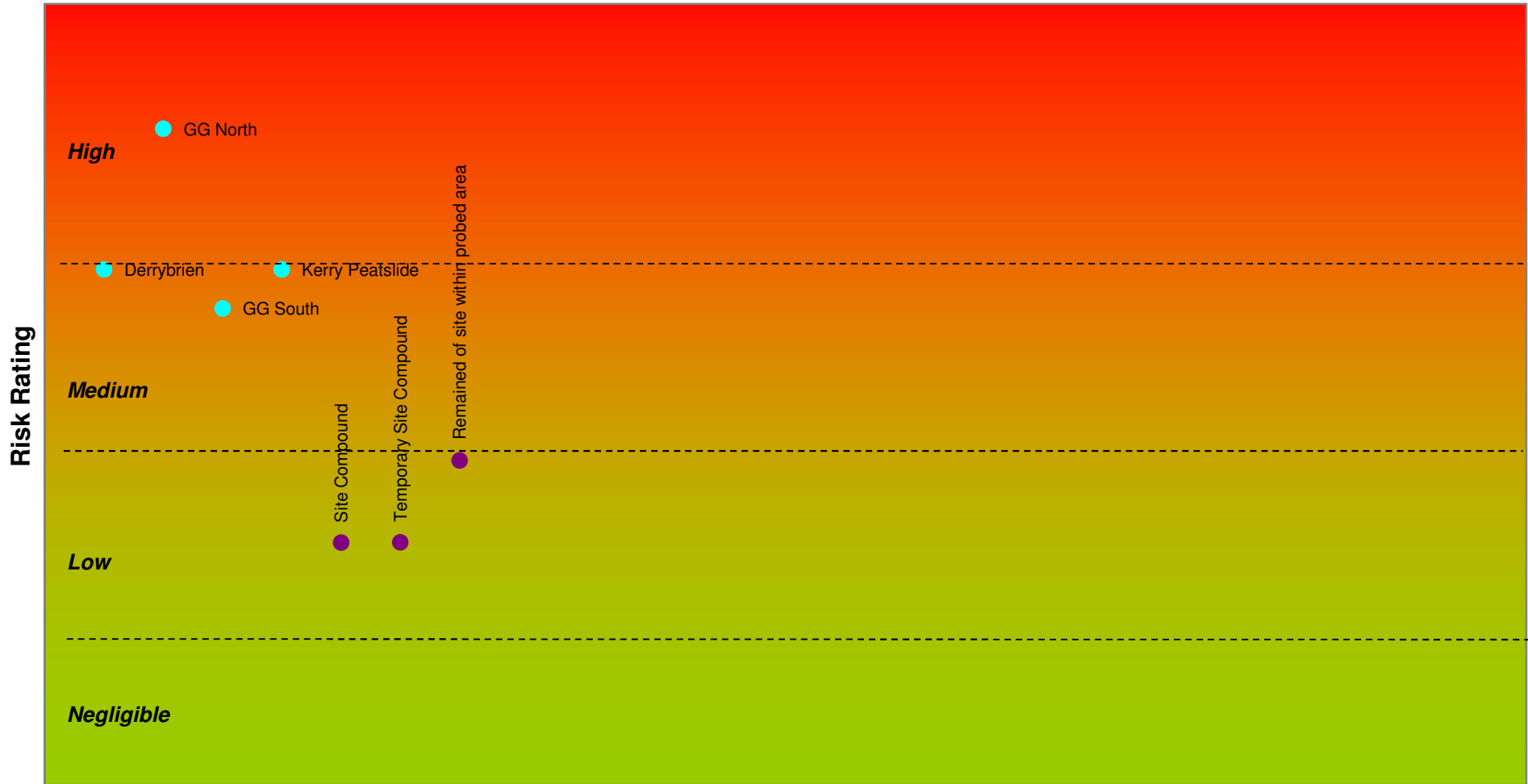
RISK RATING

Risk Rating = Likelihood * Impact

Risk Rating = 0.65 * 0.64 = 0.42 Low

Table with columns: Risk Rating, Risk Level, Action Required. Rows show ranges from 0.0-0.18 (Negligible) to 0.67-1.0 (High).

PSRA Comparative Chart (Other Infrastructure)

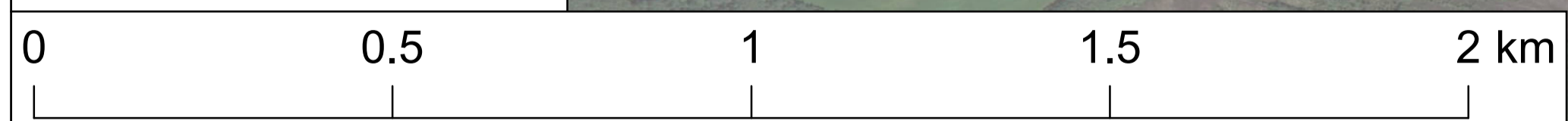




Legend

- Timahoe North Site Boundary
- Existing Structure
- New Intermediate Poleset
- New Angle Mast
- 110 kV Line
- EXISTING DRAINS
- PV TABLE
- EXISTING ACCESS ROAD TO BE UPGRADED
- NEW ACCESS ROADS
- BRIDGE OVER DRAIN WITH ACCESS ROAD
- INVERTER STATION WITH PAD AND LABELING (PAD SIZE: 25m x 25m)
- DEER FENCE (PROJECT BOUNDARIES)
- BRIDGING STRUCTURE OVER DRAIN FOR THE DEER FENCE CROSSING
- ACCESS GATES
- SHEEP FENCE (AROUND DRAINS)
- SUBSTATION FENCE
- TEMPORARY COMPOUND FENCE
- PEAT STORAGE AREA
- SUBSTATION AREA
- HYDROLOGICAL FEATURE AND BUFFER ZONE
- TEMPORARY COMPOUND AREA
- MAIN COMPOUND AREA
- CCTV CAMERA
- SWITCHBOARD (NORTH SIDE)

Imagery Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community



Rev	Revision Description	Date
0	Issued For Report	15/08/2018

COPYRIGHT © ESBI ENGINEERING & FACILITY MANAGEMENT LTD.
 All rights reserved. No part of this work may be modified or reproduced or copied in any form or by any means - graphics, electronic or mechanical, including photocopying, recording, taping or information-and-retrieval system, or used for any purpose than its designated purpose, without the written permission of ESBI Engineering & Facility Management Ltd.

ESB INTERNATIONAL
 One Dublin Airport Central,
 Dublin Airport, Cloghran, Co. Dublin
 Tel: 353 1 703 8000 Email: marketing@esbi.ie
 Web: www.esbinternational.ie
 ESBI International is a trading name of
 ESBI Engineering & Facility Management Ltd.
 Registered Office: as above
 Registered in Ireland No. 155249

Client
 ESB Wind Development Ltd
 and Bord Na Móna Powergen Ltd

Project
 Timahoe North Solar Project

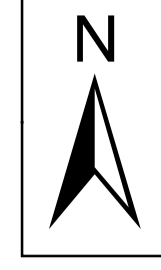
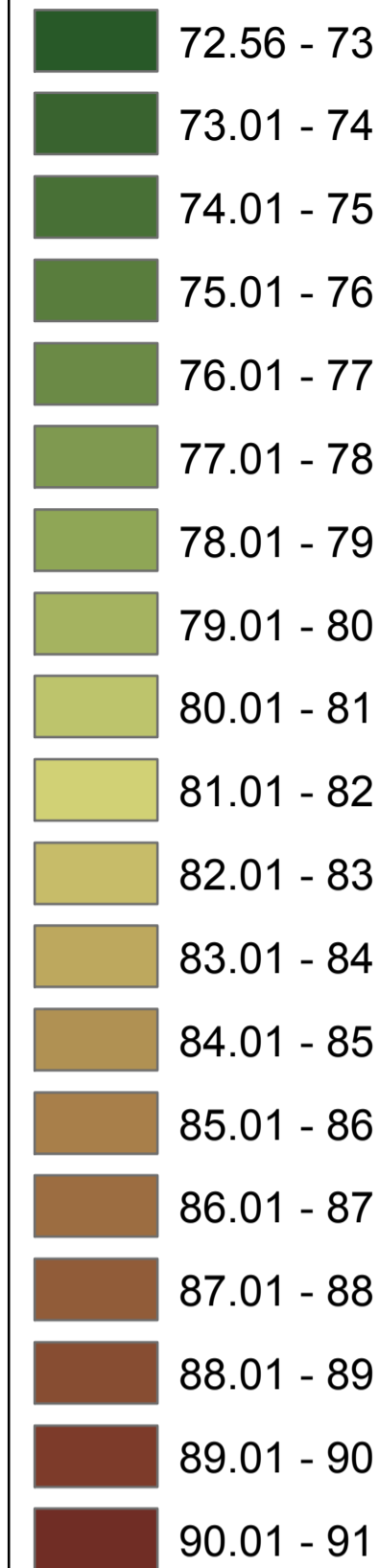
Title
 Timahoe North
 Peat Stability Risk Assessment:
 Site Layout with Satellite Imagery

Production Unit
 Civil & Environmental Engineering

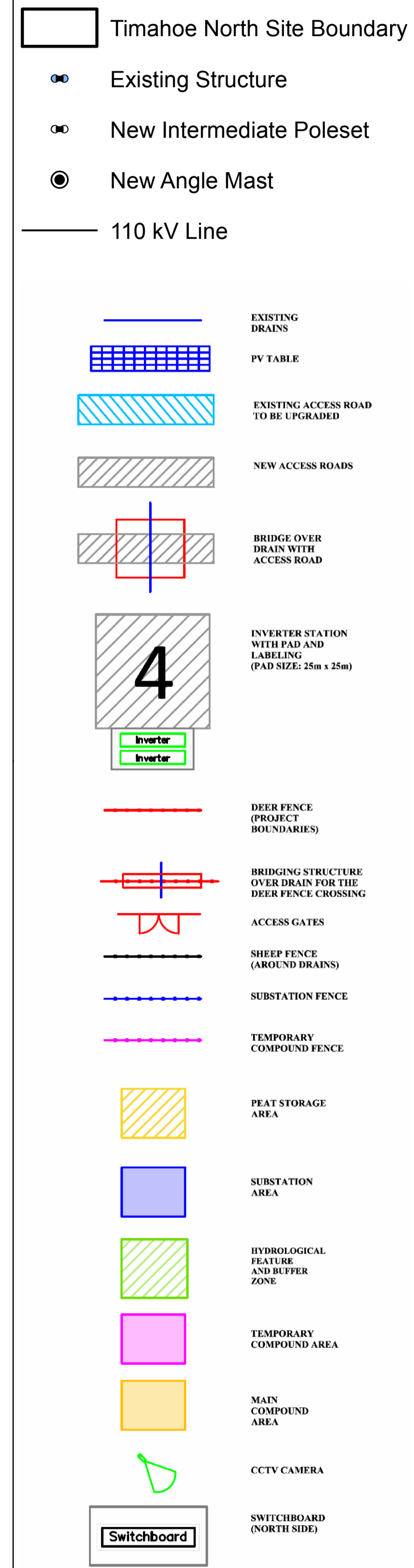
DRAWN BY	PRODUCED BY	VERIFIED BY	APPROVED BY	REVISION	APPROVED DATE
T. O'Rourke	T. O'Rourke	S. Stack	R. Canavan	00	15/08/2018
CLIENT REF. 00-00		NO. OF SHEETS 1/1		SHEET SIZE A1	
MAP REFERENCE		SCALE 1:8,000			
QS-000218-01-D453-028					

BnM LIDAR 2008

(in metres)

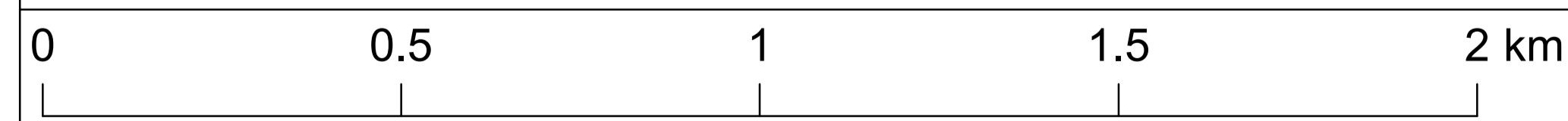


Legend



Peat Repository 1
Peat Repository 2
Peat Repository 3
Peat Repository 4
Peat Repository 5
Peat Repository 6
Peat Repository 7

Substation Area
114D 115A
114C 115B
114B 115C
114 114A 115D



0	Issued For Report	15/08/2018
Rev	Revision Description	Date

ESB INTERNATIONAL
 One Dublin Airport Central,
 Dublin Airport, Cloghran, Co. Dublin
 Tel: 353 1 703 8000 Email: marketing@esbi.ie
 Web: www.esbinternational.ie
 ESBI International is a trading name of
 ESBI Engineering & Facility Management Ltd.
 Registered Office: as above
 Registered in Ireland No. 155249

Client
 ESB Wind Development Ltd
 and Bord Na Móna Powergen Ltd

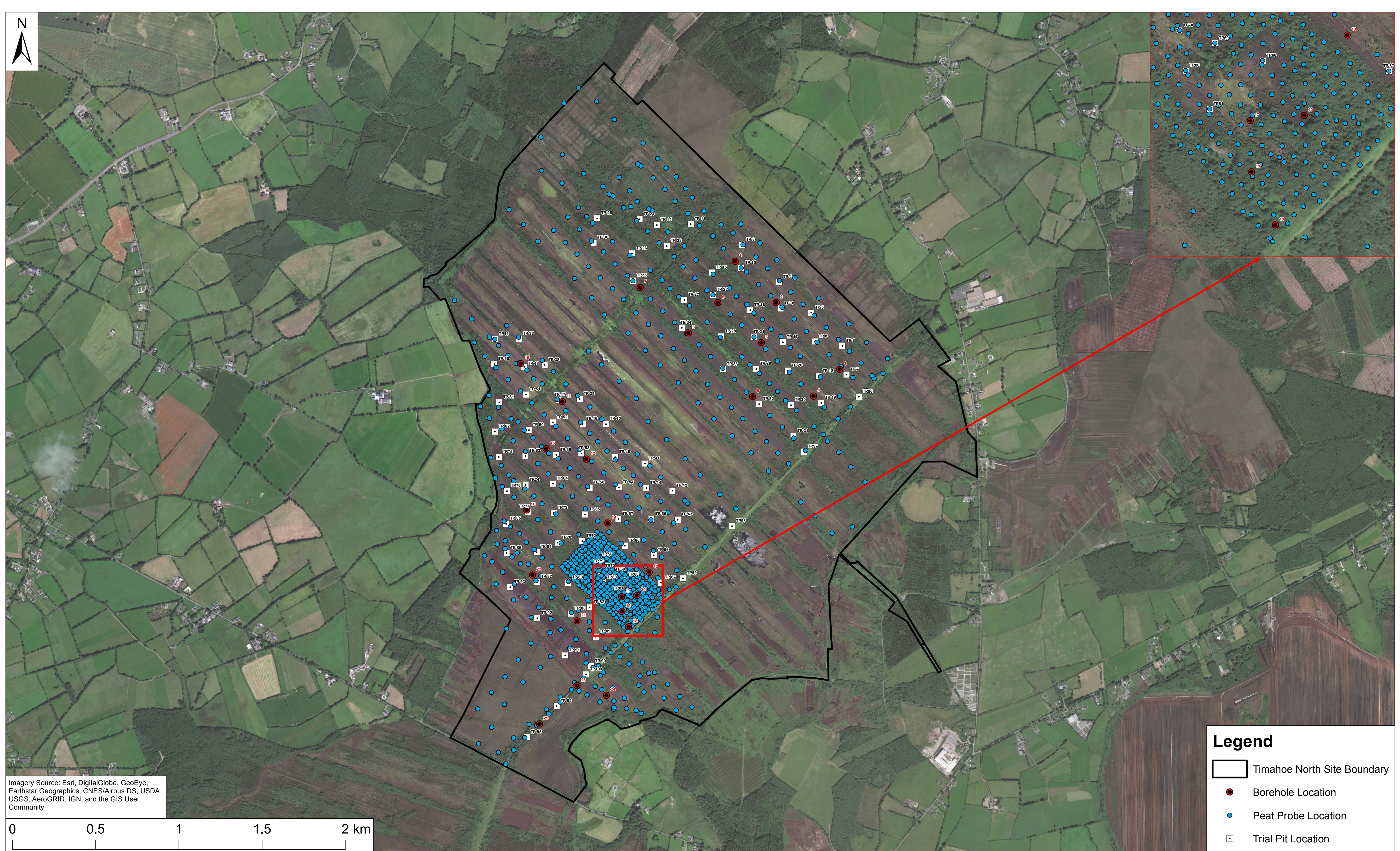
Project
 Timahoe North Solar Project

Title
 Timahoe North
 Peat Stability Risk Assessment:
 Site Layout with LIDAR Elevation Surface

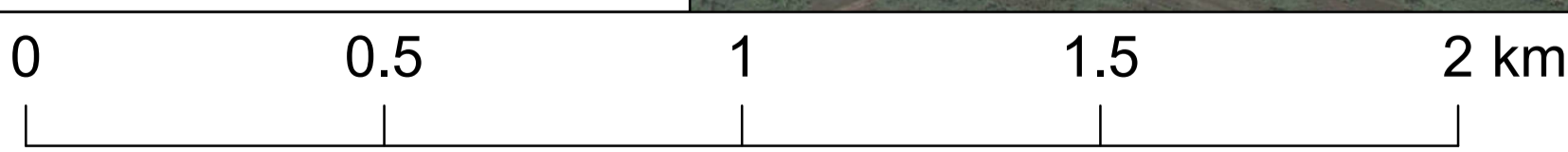
Production Unit
 Civil & Environmental Engineering

DRAWN BY T. O'Rourke	PRODUCED BY T. O'Rourke	VERIFIED BY S. Stack	APPROVED BY R. Canavan	REVISION 00	APPROVED DATE 15/08/2018
CLIENT REF. 00-00		NO. OF SHEETS 1/1	SHEET SIZE A1	SCALE 1:8,000	
MAP REFERENCE QS-000218-01-D453-029					

COPYRIGHT © ESBI ENGINEERING & FACILITY MANAGEMENT Ltd.
 All rights reserved. No part of this work may be modified or reproduced or copied in any form or by any means - graphics, electronic or mechanical, including photocopying, recording, taping or information-and-retrieval system, or used for any purpose than its designated purpose, without the written permission of ESBI Engineering & Facility Management Ltd.



Imagery Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community



Legend					
	Timahoe North Site Boundary		Borehole Location		Peat Probe Location
	Trial Pit Location				

Rev	Issued For Report	15/08/2018
	Revision Description	Date

ESB INTERNATIONAL
 One Dublin Airport Central,
 Dublin Airport, Cloughran, Co. Dublin
 Tel: 353 1 703 8000 Email: marketing@esbi.ie
 Web: www.esbinternational.ie
 ESB International is a trading name of
 ESB Engineering & Facility Management Ltd.
 Registered Office: as above
 Registered in Ireland No. 155249

Client
 ESB Wind Development Ltd
 and Bord Na Móna Powergen Ltd

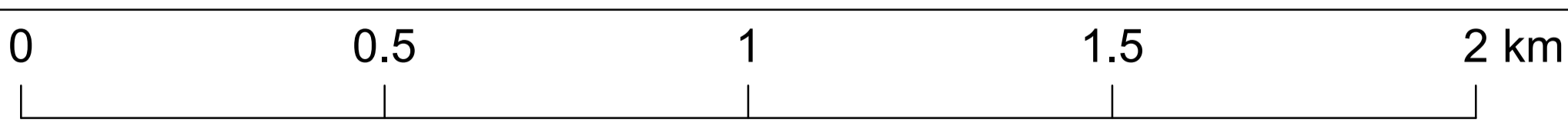
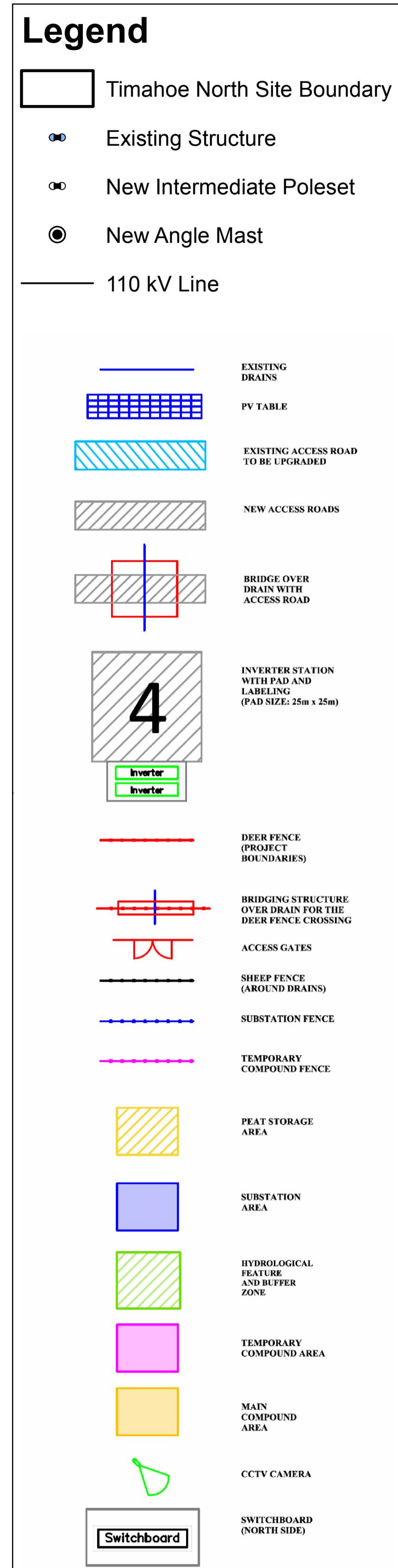
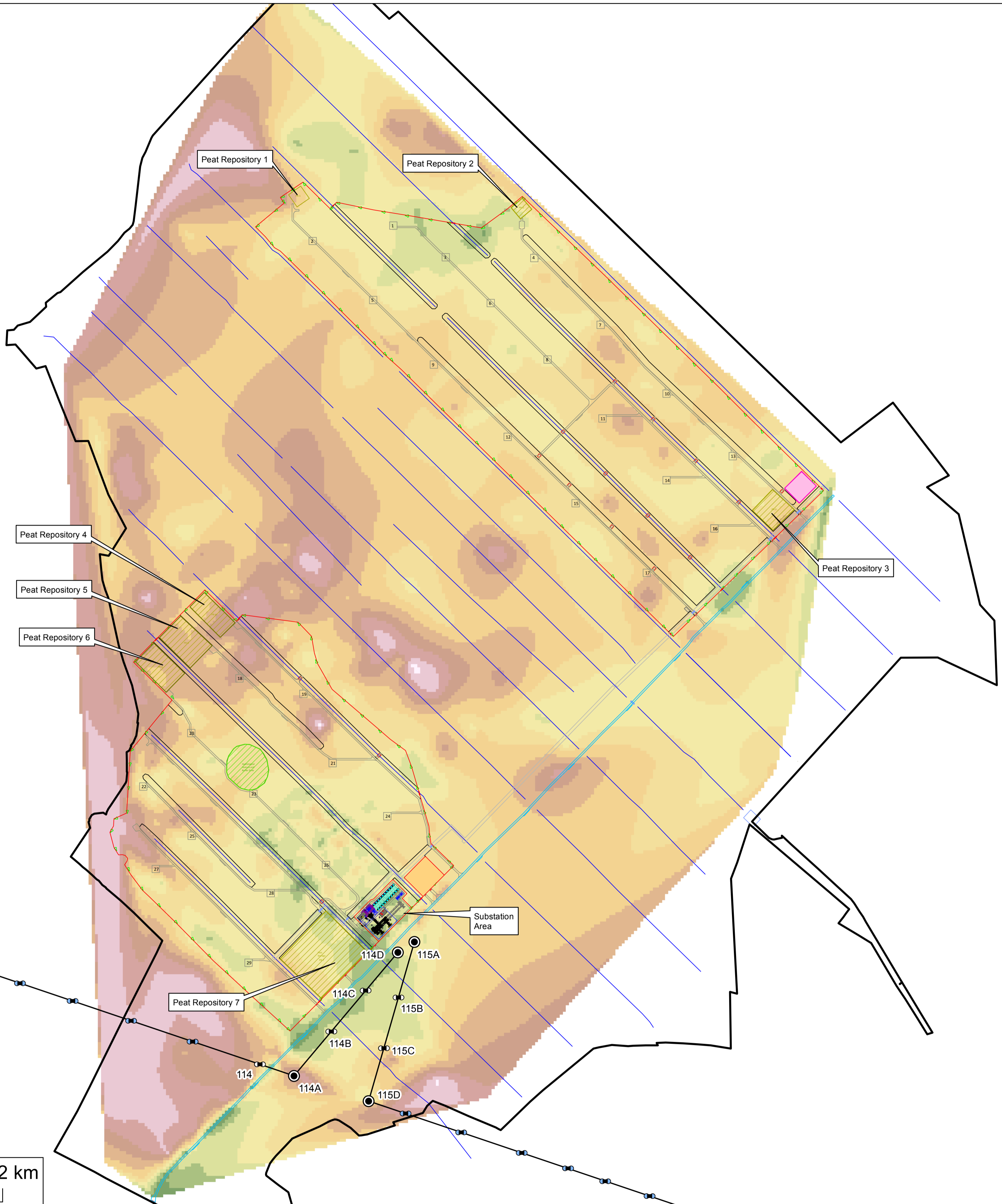
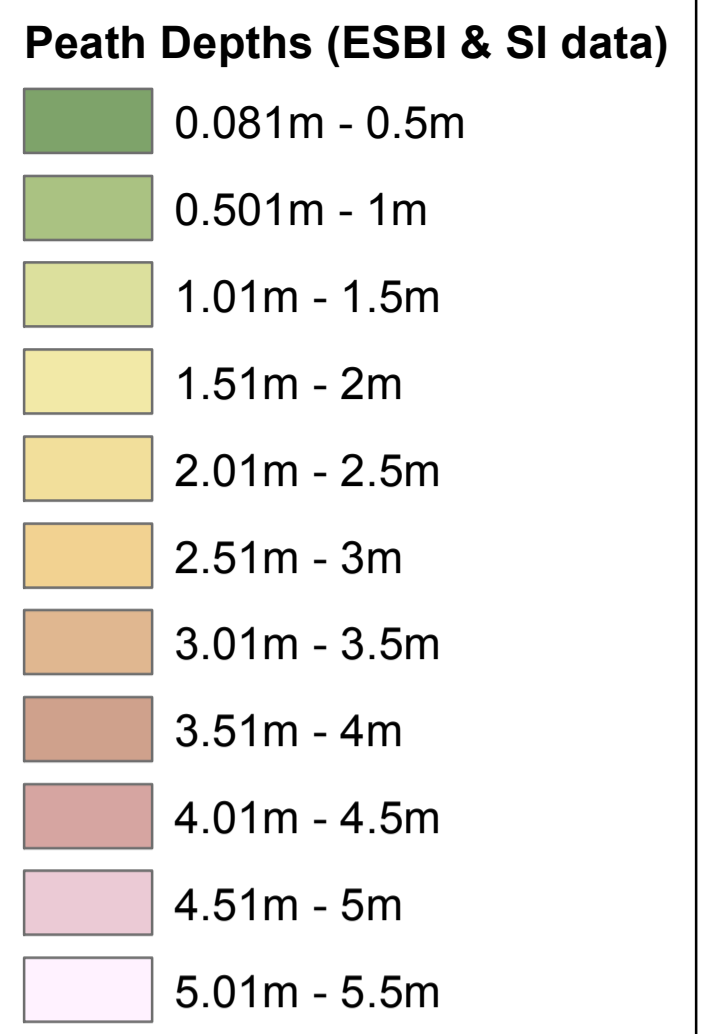
Project
 Timahoe North Solar Project

Title
 Timahoe North
 Peat Stability Risk Assessment:
 Site Layout and Site Investigation Locations

Production Unit
 Civil & Environmental Engineering

DRAWN BY	PRODUCED BY	VERIFIED BY	APPROVED BY	REVISION	APPROVED DATE
T. O'Rourke	T. O'Rourke	S. Stack	R. Canavan	00	15/08/2018
CLIENT REF.	NO. OF SHEETS	SHEET SIZE	SCALE		
00-00	1/1	A1	1:10,000		
MAP REFERENCE					
QS-000218-01-D453-030					

COPYRIGHT © ESB ENGINEERING & FACILITY MANAGEMENT Ltd.
 All rights reserved. No part of this work may be modified or reproduced or copied in any form or by any means - graphics, electronic or mechanical, including photocopying, recording, taping or information-and-retrieval system, or used for any purpose than its designated purpose, without the written permission of ESB Engineering & Facility Management Ltd.



0	Issued For Report	15/08/2018
Rev	Revision Description	Date

COPYRIGHT © ESBI ENGINEERING & FACILITY MANAGEMENT Ltd.
 All rights reserved. No part of this work may be modified or reproduced or copied in any form or by any means - graphics, electronic or mechanical, including photocopying, recording, taping or information-and-retrieval system, or used for any purpose than its designated purpose, without the written permission of ESBI Engineering & Facility Management Ltd.

ESB INTERNATIONAL
 One Dublin Airport Central,
 Dublin Airport, Cloghran, Co. Dublin
 Tel: 353 1 703 8000 Email: marketing@esbi.ie
 Web: www.esbinternational.ie
 ESBI International is a trading name of
 ESBI Engineering & Facility Management Ltd.
 Registered Office: as above
 Registered in Ireland No. 155249

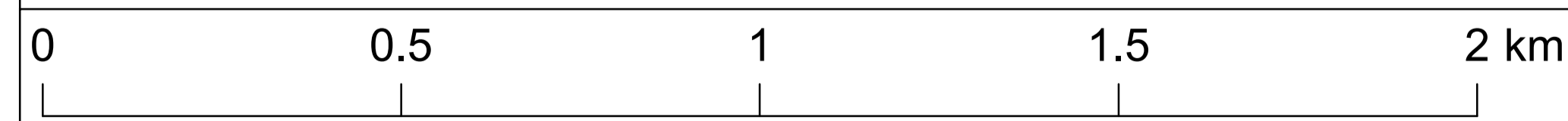
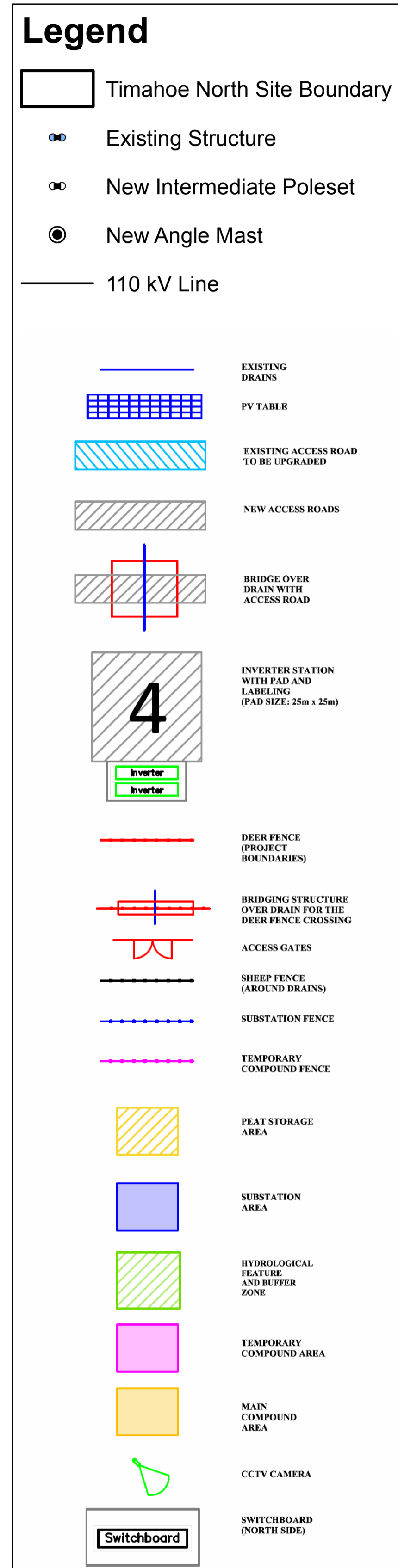
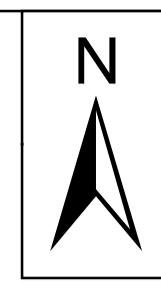
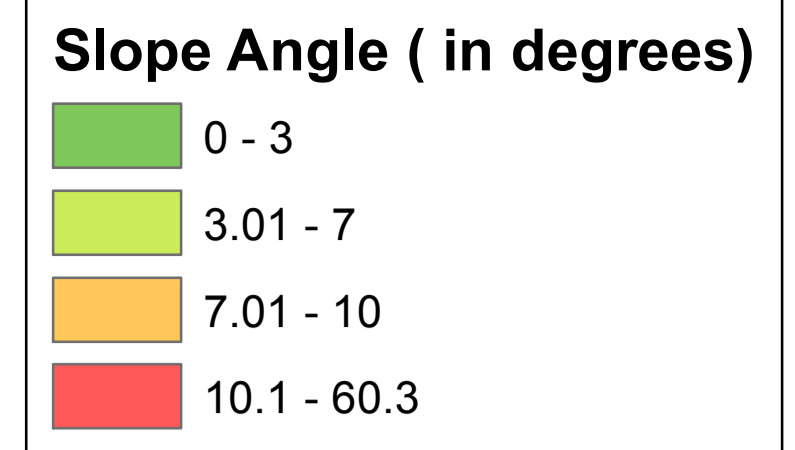
Client
 ESB Wind Development Ltd
 and Bord Na Móna Powergen Ltd

Project
 Timahoe North Solar Project

Title
 Timahoe North
 Peat Stability Risk Assessment:
 Site Layout with Peat Depth Interpolation

Production Unit
 Civil & Environmental Engineering

DRAWN BY T. O'Rourke	PRODUCED BY T. O'Rourke	VERIFIED BY S. Stack	APPROVED BY R. Canavan	REVISION 00	APPROVED DATE 15/08/2018
CLIENT REF. 00-00	NO. OF SHEETS 1/1	SHEET SIZE A1	SCALE 1:8,000	MAP REFERENCE QS-000218-01-D453-031	



Rev	Revision Description	Date
0	Issued For Report	15/08/2018

ESB INTERNATIONAL

One Dublin Airport Central,
Dublin Airport, Cloghran, Co. Dublin

Tel: 353 1 703 8000 Email: marketing@esbi.ie
Web: www.esbinternational.ie

ESB International is a trading name of
ESBI Engineering & Facility Management Ltd.

Registered Office: as above
Registered in Ireland No. 155249

Client
ESB Wind Development Ltd
and Bord Na Móna Powergen Ltd

Project
Timahoe North Solar Project

Title
Timahoe North
Peat Stability Risk Assessment:
Site Layout and Slope Map

Production Unit
Civil & Environmental Engineering

DRAWN BY	PRODUCED BY	VERIFIED BY	APPROVED BY	REVISION	APPROVED DATE
T. O'Rourke	T. O'Rourke	S. Stack	R. Canavan	00	15/08/2018
CLIENT REF. 00-00		NO. OF SHEETS 1/1	SHEET SIZE A1	SCALE 1:8,000	
MAP REFERENCE QS-000218-01-D453-032					

COPYRIGHT © ESBI ENGINEERING & FACILITY MANAGEMENT Ltd.
All rights reserved. No part of this work may be modified or reproduced or copied in any form or by any means - graphics, electronic or mechanical, including photocopying, recording, taping or information-and-retrieval system, or used for any purpose than its designated purpose, without the written permission of ESBI Engineering & Facility Management Ltd.