

**TECHNICAL NOTE**

**L05858-CLK-XX-XX-RP-GT-0003TN**

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Subject: Ground Gas Risk Assessment Date: 04/04/2022

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Issue Date	Issue	Status	Description of Amendments
04/04/2022	P01	S2	For information

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## 1 Introduction

In March 2022 Clarkebond (UK) Limited was commissioned by K2 Consultancy on behalf of SeAH Wind Ltd, to undertake a Grounds Gas Risk Assessment for land within the Teesport regeneration area. The land proposed for development comprises a circa 36ha plot of land formerly referred to as the GE plot.

The site is intended for development as an integrated wind turbine monopile manufacturing facility with associated ancillary buildings. Due to the manufacturing purpose of the building it comprises a predominately large open facility housing manufacturing plant.

The site has been subject to a number of ground investigations to inform the planning of the regeneration area and to inform enabling works. Outline planning permission has been gained for the masterplan vision for the site and adjacent land. Reports that have been prepared to support the planning application have been prepared for the South Tees Development Corporation (now known as Teesworks). The pertinent reports relevant to the current land holding and the required ground gas assessment are as follows:

- Arcadis, South Bank, Teesworks, Redcar, Detailed Quantitative Risk Assessment, South Tees Development Corporation, ref 10035117-AUK-XX-XX-RP-ZZ-0331-02-SB\_DQRA, rev 02, September 2021
- Arcadis, Geo-environmental Assessment of the GE Plot, South Bank, Teesworks, 10035117-AUK-XX-XX-RP-ZZ-0395-01-GE Plot, rev 02, March 2022

Of the available documentation, the most relevant is the Geoenvironmental Assessment of the GE plot prepared by Arcadis, which was revised with finalised data and conclusions in March 2022.

Clarkebond are currently undertaking a further assessment of the plot, to both confirm the existing understanding of the ground and to provide additional data for geotechnical design. At the time of writing the physical site works are complete, with laboratory testing and reporting in progress. The findings of the site works confirmed the geological sequences presented within the previous works, along with the geoenvironmental conditions.

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This assessment draws on the previous works and supplied data, supplemented with additional Clarkebond data as required.

## 2 Site Details

The site is located within the Teesport regeneration area, as illustrated in Figure 2.1 below. The development area lies within the South Bank area, highlighted in yellow below:



Figure 2.1 Site Location

### 2.1 Site Description

The development area has undergone remediation as part of the enabling works in advance of construction. The remedial works have required the excavation of the near surface materials to approximately two metres below proposed final level. The resultant void has been backfilled using crushed slag materials derived from processing on site materials, interlayered with mudstone. The backfilling has been undertaken in a controlled engineering manner to produce a development platform.

During the course of the remediation a watching brief was maintained. In the event grossly contaminated materials were identified, these will be removed. At the time of writing the remedial works are ongoing, although it is understood no significant contamination has been identified to date.

Upon the completion of the remedial works the development platform will comprise a nominally level area lying at approximately 9.25m AOD.

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Adjacent to the plot is the High Tip landfill, a licenced landfill to accept a variety of commercial and residential wastes. It is understood from previous investigations, and by direct observation, that the landfill is in reality a land raise with the significant portion of landfill rising above the prevailing ground level.

### 3 Ground Conditions

#### 3.1 General

The site has been subject to ground investigation by the South Teesport Development Corporation and their appointed consultants during 2021 and 2022. The resultant ground investigation reports are summarised in Section 1.4 above. Further ground investigation has been undertaken by Clarkebond in 2022, the reporting of which is in progress at the time of writing. However, the initial findings of the current works confirm the previously identified ground conditions.

#### 3.2 Geological Sequence

The ground investigation has identified relatively consistent ground conditions both beneath the proposed development area and the surrounding land. These works may be broadly summarised as follows.

Strata	Thickness (m) (range)	Description
Made Ground	6-10	Slag brick and concrete, occasional clinker and ash; dominated by slag. Typically granular in nature, comprising cobbles and boulders.
Tidal Flat Deposits	0-1	Grey brown silty sand.
Alluvium	2-6	Laminated clays with silt and sand noted on some laminations forming discrete partings. Typically firm, locally soft.
Glacial Till	3-8	Red brown slightly sandy silty gravelly clay, with cobbles. Typically firm to stiff, becoming stiff and very stiff with depth.
Mercia Mudstone	To depth (20m+)	Typically a weak mottled red/green mudstone, distinctly to partially weathered predominately in upper 8-10m across much of the site. Grading from Grade iva/iii weathering to i/ii with depth.

#### 3.3 Ground Contamination with respect to Ground Gas

A Geo-environmental assessment of the former GE plot has been undertaken by Arcadis for the South Tees Development Corporation (reference 10035117-AUK-XX-XX-RP-ZZ-0395-01-GE Plot, rev 02, March 2022). Review of the document indicated the following key factors pertaining to this ground gas risk assessment:

- A series of gas monitoring wells installed around the High Tip landfill have, particularly in the last 5 years, recorded very low concentrations of permeant ground gases.

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- The South Bank Coke Ovens, presumed to a probable source of NAPL contamination, are considered too remote to the GE pot to pose a credible ground gas source.
- Occasional NAPL has been identified typically towards the lower portion the made ground/slag deposits and at the interface between the made ground and the underlying tidal flat deposits
- NAPL has not been identified within monitoring wells within the site.
- Betterment by means of shallow hotspot removal would be undertaken during enabling earthworks.
- Additional ground gas monitoring undertaken by Ambisense using continuous gas monitoring methods installed with boreholes within the GE plot and between the GE Plot and the High Tip landfill. No hazardous ground gas conditions were identified.

These findings have been considered as part of the evidence base upon which the following assessment has been based.

## 4 Risk Assessment

### 4.1 Existing Assessments

The Geoenvironmental risk assessment undertaken by Arcadis for the South Tees Development Corporation reviews the prevailing ground conditions and presents a detailed ground gas risk assessment. That risk assessment has been reviewed as part of this risk assessment. The assessment follows what is considered to be best practice, as detailed within BS8485:2015+A1 2019, supplemented with Claire technical bulletin TB17 and BS8576:2013.

In addition to assessing ground gas conditions and data the assessment also gives due consideration to the ground model and the viability of potential migration pathways. As such the assessment is considered robust and following review, the conclusions drawn are considered valid.

For brevity and to avoid repetition, the full detail has therefore not been replicated.

### 4.2 Assessment

Following review Clarkebond are of the option that the site presents a very low ground gas risk to the proposed development. The following key observations are drawn:

- The host geology is not conducive to gas generation nor to gas migration. The high groundwater level within the natural soils is noted and will further inhibit ground gas movement.
- The adjacent landfill is in reality a land raise. Gas monitoring around the landfill has not indicated it to be a source of significant ground gas
- Monitoring using best practice, including continuous ground gas monitoring by a monitoring specialist has been undertaken, with again no significant ground gas being identified.
- The proposed development comprises a large manufacturing facility with large open internal spaces. Processes within the facility such as spraying and application of protective coatings will require active air extraction and the building will be subject to managed ventilation.

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- The proposed development floor construction will comprise a cast in-situ concrete floor with a minimum thickness of 0.5m. Penetrations through the slab will be minimal, with services typically entering via plant rooms. The slab will be reinforced to minimise cracking.

Given the above factors Clarkebond concur with previous assessments and consider that the site should be classified as presenting CS1 ground gas conditions and that therefore no remedial actions are required with respect to ground gases.

----- End of Technical Note -----