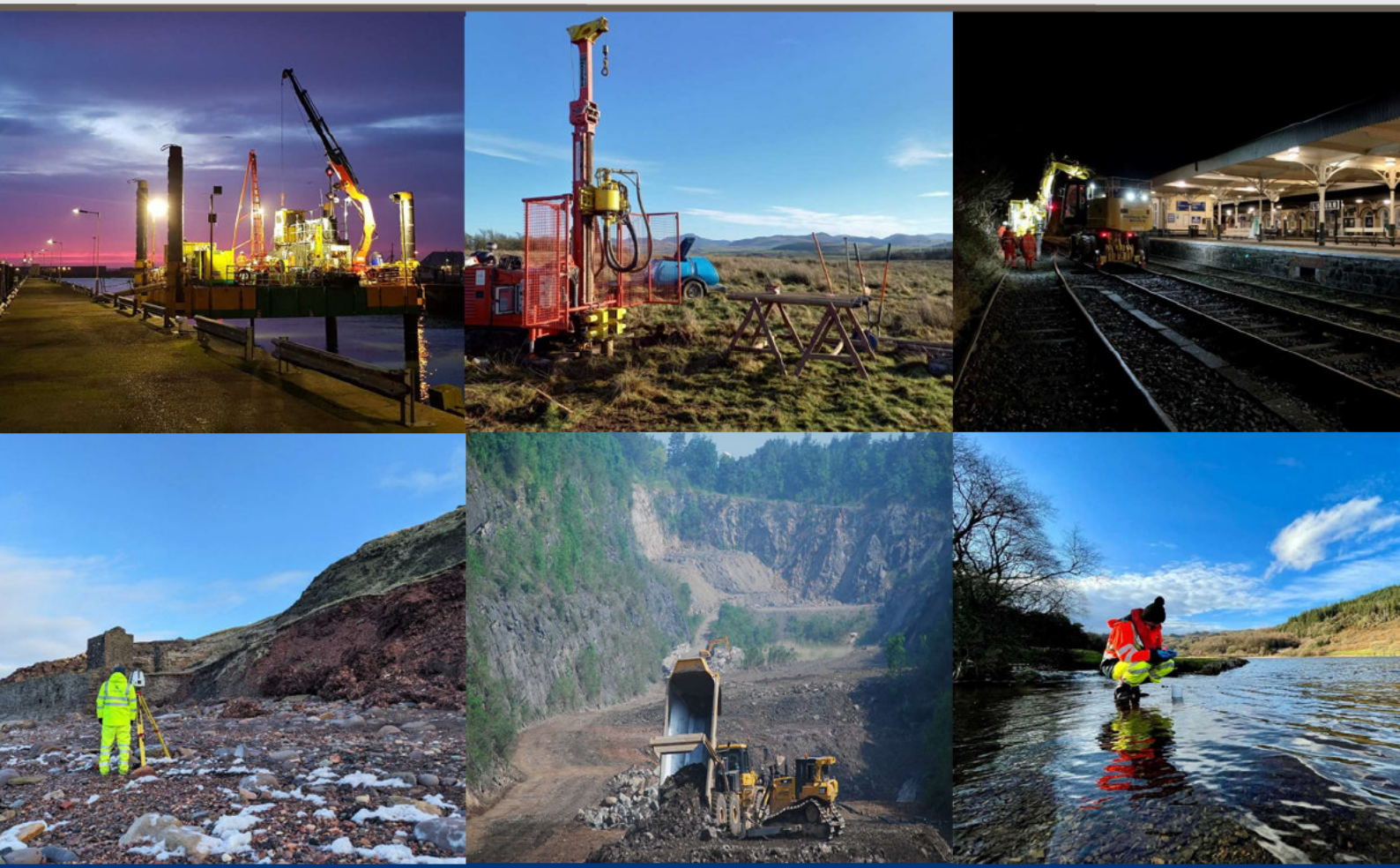
Parc Emlyn, Pen-y-Groes

Desk Top Study Review and Coal Mining Risk Assessment



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TETRA TECH

Desk Top Study Review and Coal Mining Risk Assessment

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EXECUTIVE SUMMARY

Report Context	The report provides a summary review of previous works undertaken on the site within the context of potential ground contamination and risks associated with the mining legacy. The key conclusions of the previous works have been presented and used to facilitate an updated risk assessment within the context of a proposed residential development on the site. Potential constraints have been highlighted including areas of uncertainty which require further investigation and remedial works.
The Site	The site covers the majority of the Parc Emlyn Development site to the west of Pen-y-Groes, Carmarthenshire. It is largely undeveloped, however at the time of writing a spur road, the Cross Hands Economic Link Road, was being constructed across the northern part of the site. Ground cover varies, with informal scrubby vegetation and open areas across the majority of the site.
Historical Development	Historical developments on the site are recorded associated with the former Emlyn Colliery and subsequent Brick Works, including the placement of colliery spoil across the majority of the site. Small quarries have also been recorded in the eastern and western areas of the site, the latter of which is subsequently recorded as a landfill.
Previous Investigations	Several previous investigations have been undertaken on the site to support previous proposals for redevelopment. These assessments were designed to identify and manage risks associated with mine entries present within the site boundary and also localised sources of potentially contaminated material. These investigations considered potential sources of contamination which may pose a risk to both human health and the wider environment (groundwater and surface water). Consideration has also been given to potential contamination associated with materials which had been stored on the site for use within the brick making process. These materials have subsequently been removed from the site and disposed of at an off-site waste disposal facility. The general conclusion from the previous assessments indicated that the site did not pose a significant risk to future site users or the wider environment, however a 1m cap was recommended in areas of soft landscaping due to elevated heavy metals in the near surface soils (colliery spoil). It should be noted that the assessments were undertaken using screening values applicable at the time which have subsequently been revised. Additional investigation will be required in due course to confirm current ground conditions and to provide an updated risk assessment. Within the planning content a statutory response from NRW notes the sensitivity of the surface water bodies within close proximity to the site, highlighting the need for potential further assessment of the risks posed by contamination on site to controlled waters. Detailed assessment may therefore be required to support any future planning application.
Geology	The solid geology according to the British Geological Survey of Great Britain (Sheet 230 – 1:50,000 Series) indicates the site to be underlain by Middle Coal Measures of the Carboniferous Period. A synclinal structure is shown on the map trending north-east to south-west. The site is shown on the map to be covered by Made Ground. Peat deposits are also shown within and adjacent to the site. Glacial Till is present to the south-west of the site.

	Previous ground investigations have confirmed the following units to be underlying the site: • Made Ground – Colliery Spoil and mine waste tailings • Peat Deposits • Glacial Sands and Gravels • Middle Coal Measures Mudstones
Environmental Setting	With the exception of the mining legacy of the site and the wider area, the site is located within a predominantly residential / rural setting with limited development in the surrounding area which is considered to pose a risk to the site in terms of ground contamination. An historical landfill is recorded at the site of a former quarry in the western extent of the site, however recent investigations associated with the link road indicate the material is largely soil based with minor anthropogenic inclusions (largely bricks and brick waste). The sensitivity of surface water bodies receiving water which drains from the site either through overland flow or through groundwater seepages has been highlighted by NRW and will need to be considered in more detail as part of any future assessment on the site.
Coal Mining Risk Assessment	For much of the site (central, eastern and northern areas), there is a low risk of ground instability as a result of recorded/unrecorded shallow (<30m) mining and mining geology. The mine entries located in this area (Shaft 258-213-033 and Adit 258-213-123) were treated as part of the previous remedial works. No buildings should be constructed over these treated entries, but roadways or parking areas are normally permitted with use of geogrids. No further remedial works for mine workings are deemed necessary in this area. In the southern area of the site, there is a high risk of ground instability. This is a consequence of recorded/unrecorded shallow (<30m) mining and mining geology being present in addition to the five former mine entries (four shafts and one adit) being present. Further investigation and remedial works are required to support a future development on the site Although there is limited borehole data for the western part of the site, it is likely that any workings will be at sufficient depth so as not to be deemed high risk. However, this will need to be confirmed by further investigation (rotary probe drilling).
Preliminary geotechnical assessment conclusions	Earthworks were undertaken on the site in 2006 to reprofile the site and treat a number of coal mining features on the site. Measured properties of samples taken during the course of the work met or exceeded the requirements of the specification, and subsequent ground investigations undertaken at various parts of the site have also confirmed this, such that the compacted fill has sufficiently high strength and low compressibility to support low rise structures and pavements. Given the anticipated ground conditions it is considered likely that traditional shallow foundations (likely to be rafts and/or strip and pads) formed within the re-compacted Made Ground deposits will be suitable within the context of the proposed development. Soft strata such as peat and mine waste tailings are present below the fill and the presence of these materials below the development should be considered in the

	foundation design for each structure proposed. The lateral extent and elevation of these strata have been determined by probe hole drilling on a grid pattern in September 2006. Near surface soft areas have been excavated and removed from site and unsuitable materials identified in areas cut during the earthworks were excluded from being re-used as fill.
Preliminary ground contamination assessment conclusions	Due to the historical developments and mining legacy there is the potential for contamination to be present on the site associated with: • general made ground and colliery spoil which is present across the majority of the site in significant thicknesses • localised contamination associated with spills and specific on-site activities. • historical storage of materials on the site for brick making. Previous ground investigations have been undertaken on this site to consider the risks to both human health and the wider environment. This included the excavation of more than 150 trial pits across the site. The results of the assessment presented by SES did does not identify areas of gross contamination, however a recommendation for the placement of a clean cap across the site in areas of soft landscaping is presented. Risks associated with the storage of historic brickmaking materials have been largely mitigated due to the removal of such material and confirmatory testing of the colliery spoil deposits in these areas. It should however be noted that localised contamination may still remain on the site which has not been identified within the previous ground investigations. Due to the time elapsed since the completion of the previous investigations, further assessment will be required to support any future development to confirm ground conditions and to facilitate an updated ground contamination risk assessment in line with current guidelines and best practice. This should include an assessment of the potential for asbestos containing materials and fibres to be entrained within the made ground, which was not considered in detail as part of the previous assessments. The ground investigation should be designed to provide a comprehensive assessment for potential contamination to impact human heath as well as groundwater and surface water bodies including the presence of perched groundwater bodies within the colliery spoil and their interaction with surface water bodies both on site and those receiving waters draining from the site.
Recommendations	Where there is a low risk of ground instability as a result of recorded/unrecorded shallow (<30m) mining and mining geology, supplementary ground investigation and assessment should be undertaken to support the detailed design of the development. It is envisaged that the scope of such work should include the following: • Confirm ground conditions, material geotechnical parameters and soil contaminants to inform an updated ground contamination GQRA for human health and the wider environment and geotechnical assessment to confirm foundation and pavement design. • Ground gas risk assessment in line with the requirements of CIRIA 665, including the consideration of gas generation on site as well as mine gases derived from shallow workings and mine entries. • Soil infiltration testing to inform drainage design and support an application to the SAB with regards to the use of sustainable drainage on the site.

Based on the previous investigations and assessment reviewed as part of this report but critically subject to the findings of the supplementary ground investigation and proposed design for the site, the following activities may also be required.

- Development of a remedial strategy and verification plan to manage any risks associated with:
    - previously un-discovered ground contamination on the site which may be encountered during construction
    - the installation of clean capping in areas of soft landscaping.
    - localised removal of previously undiscovered contaminated soils may also be required.
- Implementation of a Materials Management Plan to document the re-use of soils on the site and the importation and disposal of soils to facilitate the development. This document should be completed in line with the requirement of the CL:AIRE document 'Definition of Waste: Code of Practice.
- Asbestos management plan to manage materials which are impacted by asbestos containing materials and asbestos fibres. This should include requirements to control the exposure to asbestos during the development phase.

Where there remains a high risk of ground instability as a consequence of recorded/unrecorded shallow (<30m) mining, mining geology and former mine entries being present further investigation and remedial measures should be carried out in the first instance. Additional investigation works should include geophysical surveys and trenching to locate mine entries and rotary probing to confirm presence of shallow workings and the backfill condition of mine entries. Upon completion, remedial works comprising excavation, re-compaction, grouting (shallow and deep) and backfilling and capping mine entries are likely to be required. The southern area of the site has previously been zoned based on likely additional investigation and remedial works required. Any development in this area will also be subject to the required detailed above for the low risk areas.

Advice should be sought from an invasive weed specialist with regards to development over the Japanese Knotweed Deposition Area. Given the treatment process adopted, depth of burial and time that has lapsed since completion, should any re-growth have occurred it would be visible/present at surface. If no re-growth is present and the deposition area remains undisturbed, construction above the area is likely to be permitted.

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ACRONYMS/ABBREVIATIONS

Acronyms/Abbreviations	Definition
AOD	above Ordnance Datum
bgl	below ground level
BGS	British Geological Survey
BTEX	Benzene, Toluene, Ethylbenzene and Xylenes
C4SL	Category 4 Screening Levels
CIEH	Chartered Institute of Environmental Health
CLEA	Contaminated Land Exposure Assessment
CoC	Constituent of Concern
CSM	Conceptual Site Model
DEFRA	Department of Environment, food and Rural Affairs
DQRA	Detailed Quantitative Risk Assessment
DTS	Desktop Study
DRO	Diesel Range Organics
DWS	Drinking Water Standard
EA	Environment Agency (England)
EPH	Extractable Petroleum Hydrocarbons
EQS	Environmental Quality Standards
FOC	Fraction Organic Carbon
GPR	Ground Penetrating Radar
LOD	Limit of detection
LQM	Land Quality Management
NRW	Natural Resources Wales
OS	Ordnance Survey
PAH	Polycyclic aromatic hydrocarbon
PCB	Polychlorinated biphenyl
PPE	Personal Protection Equipment
ppm	parts per million
PRO	Petroleum Range Organics
SGV	Soil Guideline Values
SOM	Soil Organic Matter
SVOC	Semi-volatile organic compounds
TPH	Total Petroleum Hydrocarbon
TSV	Tier 1 Screening Values
VOC	Volatile Organic Carbon
VPH	Volatile Petroleum Hydrocarbons
AOD	above Ordnance Datum

1.0 INTRODUCTION

1.1 INSTRUCTION

Tetra Tech Ltd (Tetra Tech) was commissioned by Parc Emlyn Development Limited (the client) to undertake a data review and updated risk assessment of ground conditions for a site known as Parc Emlyn, Pen-y-Groes (known hereafter as "the site").

The location of the site is shown on Figure 1.

1.2 BRIEF

The brief was to review the available data relating to the site and to provide a contemporary assessment of Geotechnical and Geo-environmental risks associated with the site.

1.3 PROPOSED DEVELOPMENT

No development plans are currently available for the site and Tetra Tech understand that the development is currently in the early stages. However, it is understood that the site is being considered for a residential development.

1.4 REPORT SCOPE

This report includes the following key elements:

- Review of all available historical site data, reports and plans:
- Obtain updated Coal Authority Consultants Mining Report.
- Preliminary UXO check.
- Use all available ground data to prepare a Conceptual Site Model (CSM) of the ground conditions and potential contamination including consideration of potential sources, pathways (on and off-site migration) and receptors both on and off-site.
- Undertake a qualitative ground and groundwater contamination risk assessment (compliant with CIRIA 552 methodology).
- Undertake a geotechnical risk assessment and present a risk register.
- Undertake a Coal Mining Risk Assessment
- Present risk mitigation/management options, where required.
- An executive summary of the report to allow a rapid, layman's overview.

1.5 LIMITATIONS

The recommendations and opinions expressed in this report are based on information obtained as part of the desk study or provided by others. Information provided from other sources is taken in good faith and Tetra Tech cannot guarantee its accuracy.

This report is subject to the report conditions presented in Appendix A.

The information contained in this report is intended for the use of the Parc Emlyn Development Limited and Tetra Tech can take no responsibility for the use of this information by any third party or for uses other than that described in this report or detailed within the terms of our engagement.

2.0 SITE INFORMATION

2.1 LOCATION

The site is located on the western boundary of Pen-y-Groes, Carmarthenshire, approximately 2km east of Cross Hands. The site is approximately 20ha in area and is centered on National Grid Reference (NGR) 258169, 213447.

A site location plan is presented in Figure 1.

2.2 GENERAL AREA CONTEXT

Table 2-1 - Surrounding land uses

	Description
North	B4556, Norton Road with associated residential and industrial development and agricultural beyond.
East	B4297 Bridge Street with residential properties and agricultural beyond.
South	Gors Ddu Road with residential properties and agricultural beyond.
West	Construction of new link road with agricultural land beyond.

2.3 SITE DESCRIPTION

The site is situated approximately 1km to the east of the A48 trunk road where it passes through the town of Cross Hands in Carmarthenshire, at National Grid Reference SN 580 135 – see Figure 1. The site, a former colliery and brickworks, covers a large area and is bounded to the north, south and east by residential development and roads. To the west the site is bounded by fields.

The site is currently largely undeveloped. Most of the site is covered by colliery spoil with a maximum elevation of approximately 196m AOD and a minimum elevation of approximately 180m AOD. Ground levels on the north and southern boundaries range from 180m to 186m AOD and 182m to 190m AOD respectively.

Part of the original brickworks in the eastern area is still present and used by a small business. Temporary offices and a wheel wash facility are sited on the north-eastern boundary at a locked gate entrance alongside the local rugby club building.

At the time of writing the Cross Hands Economic Link Road was being constructed along the western boundary of the site, linking Black Lion Road to Norton Road with a spur road (Parc Emlyn link) crossing the north-western area of the site including a roundabout in approximately the centre of the site with a further link onto Norton Road on the northern boundary of the site.

3.0 SUMMARY OF SITE SETTING

3.1 GEOLOGY, HYDROGEOLOGY, HYDROLOGY AND RADON

3.1.1 Geology

The geology of the site is covered in British Geological Survey (BGS) Sheet No. 230 (Ammanford) Solid and Drift Edition 1:50 000 scale. The mapping indicates the site to be underlain by Middle Coal Measures of the Carboniferous Period. A synclinal structure is shown on the map trending north-east to south-west.

The mapping indicates the presence of Peat deposits across northern and western areas of the site, along with the potential presence of Made Ground strata. Superficial strata of Glacial Sands and Gravels are also anticipated.

The underlying bedrock geology consists of strata associated with the South Wales Middle Coal Measures Formation consisting of sandstone, mudstone and siltstone strata. The BGS define this formation as

"Grey, (productive) coal-bearing mudstones/siltstones, with seatearths and minor sandstones."

3.1.2 Hydrogeology

The Bedrock strata are designated as a Secondary A Aquifer. These are permeable layers capable of supporting water supplies at a local rather than strategic scale, and in some cases forming an important source of base flow to rivers.

The superficial peat deposits are designated as Unproductive Strata. These are predominantly rock layers or drift deposits with low permeability that have negligible significance for water supply or river base flow.

There are no groundwater source protection zones within 1km of the site.

There are no recorded groundwater abstractions recorded on site or within 2km of the site.

3.1.3 Hydrology

Numerous field drains, ponds and streams are present in the immediate area of the site. An 'issue' is recorded along the north-eastern boundary.

The site is located on the watershed of the Gwendraeth Fawr located 750m north-east which discharges into Carmarthen Bay at Kidwelly and the River Loughor/Afon Llwchwr located 5km southwest and discharges into Burry Inlet.

There are no recorded groundwater abstractions recorded on site or within 2km of the site.

There is one recorded consent for discharge to controlled waters within the site boundary. This record is dated 1978 and was revoked in 1992 and relates to an unspecified discharge to land near the Afon Lash.

3.1.4 Radon

The BRE document 211 (Scivyer, 2015) mapping coverage for the site area was consulted and indicates that the site is located within an area where no radon protection measures are required for new developments.

3.2 SUMMARY OF SITE HISTORY

The earliest available mapping dates to 1876 and shows the site as largely undeveloped agricultural land with the exception of a rail line (Mountain Branch Line) which is recorded along the north-eastern boundary of the site, a quarry is present in the north-western area and an air shaft in the southern extent of the site.