



Mynydd Llanhilleth Wind Farm

Phase 1 Geoenvironmental Desk Study



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Document revisions

No.	Details	Date
1	Draft Report	November 2022

Executive summary

Purpose of this report

This report has been produced to support the Draft Environmental Statement prepared for the development of a wind farm on land at Mynydd Llanhilleth. The Proposed Development comprises up to eight turbines, with associated infrastructure and a link to the transmission grid. The report has been prepared using publicly available information provided by third parties.

For the purposes of this report, the term “the Site” has been used to refer to the total land area encompassed by the Proposed Development application boundary. Within the site, there are three distinct elements, comprising the:

- Wind Farm development;
- Access Road; and
- Grid connection corridor.

Where appropriate, the Site areas are referred to or considered, separately in this report as the ‘Wind Farm Site’ ‘Access Road’ and the ‘grid connection corridor’.

Background

The Proposed Development site is on an undulating plateau with steep valley sides between Pontypool and Abertillery, South Wales. Bedrock has been identified to be at shallow depth across the Site, comprising Coal Measures strata, with thin intermittent cover of peaty soil. Historical development on the Site has been limited, with the predominant agricultural land use. Forestry is present on the valley slopes.

Extensive historical mining activity has been identified beneath the Site and the wider area, including recorded and unrecorded underground mining beneath and open cast mining within the Site. The Site is also undermined from historical activities in the surrounding valleys, and areas of mining risk have been identified.

Conclusions

Contamination

The Site is used for agriculture, and locally for forestry. No significant contamination sources have been identified and those which have been considered are likely to be limited in extent or where larger potential sources are present (e.g., restored mine workings) they are considered to present low risk due to nature of materials and/or lack of disturbance/exposure during routine site activities. Current and former agricultural activities also represent potential sources, although these are likely to be sporadic and localised in nature. However, some potential contaminant linkages have been identified that require further consideration for the Proposed Development, as summarised below.

Moderate/low risks to current and future site users (site workers, public open space users) are associated with possible asbestos in proximity to demolished or dilapidated farm buildings where asbestos fibres could feasibly have been released to ground. Although in general site users in the current site configuration or following the proposed wind farm development are unlikely to encounter or disturb material that may contain asbestos/asbestos fibres and sources are likely to be limited in extent, the severity of the consequence of a contaminant linkage raises the risk level, and the Proposed Development could potentially expose soils currently covered by vegetation, increasing the risk of exposure. There is a moderate risk to future site users associated with mine gas, the risk to current site users is assessed to be moderate/low. The Proposed Development would have limited enclosed spaces where gas could accumulate, however, mine gas issues have been identified within the vicinity of the Site. In addition, the opencast backfill represents a more permeable material than intact rock and residual workings and associated voids are present beneath areas of the Site. The risk level reflects the severity of consequence of a contaminant linkage being realised.

In relation to potential metal contamination in mine waste, there is no evidence of vegetation dieback at surface that could indicate large areas of near surface contamination by metals and given the limited current and proposed future use of the Site by workers and members of the public, the risk to current and future site users is assessed to be low.

The other risks to future site users have been assessed as low or very low, on the basis that future site users, including workers and open space users, are unlikely to disturb contaminated soil during normal site usage.

The risks to controlled waters are assessed to be low or very low due to the limited identified potential sources and on the basis that the groundwater (bedrock secondary A aquifer) underlying the Site is likely to be impacted by historical mining activities. There is anecdotal evidence that flow is mainly through fissures, site groundwater is therefore not considered to be a sensitive groundwater resource. Surface water receptors are either not located near potential sources, or the source, if present, is likely to be of limited extent and unlikely to result in significant degradation of water quality.

Geotechnical

A review of geohazards has identified a number of potential constraints. These principally relate to former underground coal mining activities and ground disturbance arising from opencast activities in the southern and central Wind Farm Site areas. Shallow mining related risk has been identified in the southern section of the Wind Farm Site, whilst risks associated with opencast backfill and highwall locations have been identified in the southern and central areas. Other constraints include valley side instability, possible weathering of shallow bedrock and the presence of acidic soils either due to the presence of peat (thin surface layer has been confirmed on parts of the site) or sulphate minerals associated with the Coal Measures strata/colliery wastes.

These constraints will require further assessment as part of the detailed design process prior to construction of the Proposed Development, and it is recommended that intrusive ground investigation is undertaken to inform this assessment.

Recommendations

The desk-based assessment has identified some potential contamination constraints associated with the proposed future wind farm use of the site. No ground investigation data is currently available.

The potential land contamination constraints can be mitigated through targeted ground investigation to confirm the presence/absence of contamination (e.g., by metals, hydrocarbons or asbestos), in areas where development is proposed, method statements including procedures for encountering unexpected contamination, Environmental Management Plans, health and safety plans for the works and compliance with the Control of Asbestos Regulations 2012 (in relation to preventing the spread of asbestos). The findings of these investigations and soil testing should inform the detailed design of the Proposed Development and the design of any required remedial measures. It is therefore recommended that this report and all previous reports be thoroughly consulted and incorporated where required into the package of information for the Site for any ground works.

Regarding the identified potential geohazards, it is recommended that a programme of intrusive investigation works with associated testing and monitoring for gas and groundwater are undertaken at the proposed turbine locations and mine related features beneath the Access Road, grid connection corridor and upgraded internal roads.

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1. Introduction

Background

This report presents a Phase 1 Geo-environmental desk study at Mynydd Llanhilleth in Blaenau Gwent, Wales, where Pennant Walters is seeking planning permission for the construction and operation of a wind farm and associated infrastructure.

For the purposes of this report, the term “the Site” has been used to refer to the total land area encompassed by the Proposed Development application boundary. Within the Site, there are three distinct elements, comprising the:

- Wind Farm development;
- Access Road; and
- grid connection corridor.

Where appropriate, the three site areas are referred to or considered, separately in this report as the ‘Wind Farm site’, the ‘Access Road and the ‘grid connection corridor’.

The main constituents of the Proposed Development are summarised below:

Wind Farm development:

- Up to eight wind turbines;
- A substation and transformer house with associated cabling;
- Temporary construction compound and site office;
- Crane pads; and
- Site access road and internal access tracks.

Grid connection:

- Grid connection corridor to link the substation to the existing distribution network.

The Proposed Development requires environmental impact assessment (EIA) because it falls under paragraph 3(i) (“Installations for the harnessing of wind power for energy production (wind farms)” of Schedule 2 of the EIA Regulations and exceeds its thresholds for both site area and hub height.

As the installed generating capacity of the Proposed Development would exceed 10 megawatts (MW), it qualifies as a Development of National Significance (DNS) according to the criteria set out in Regulation 4A of The Developments of National Significance (Specified Criteria and Prescribed Secondary Consents) (Wales) (Amendment) Regulations 2016.

Purpose of the Report

The purpose of this report is to inform the Ground Conditions chapter (**Chapter 11**) of the Draft Environmental Statement. With reference to Planning Policy Wales¹, the report will assist in determining whether the Site is suitable for its proposed use.

¹ Welsh Government (2021) Planning Policy Wales, Edition 11, February 2021. [online]. Available at: https://gov.wales/sites/default/files/publications/2021-02/planning-policy-wales-edition-11_0.pdf. [Accessed January 2022].

Scope of work

The scope of work comprises a Phase 1 Geo-environmental Desk Study and includes the following:

- Identification and review of selected contemporary information including geological, mining, environmental, hydrological, and hydrogeological data, where available, for the site and its surroundings;
- Review of historical mapping for the Site and its surroundings to determine the historical land uses and to identify potential contaminative activities;
- A walkover of the key elements of the Site (conducted in 2022) to identify potential evidence of contamination and verify selected desk study information;
- Development of a Conceptual Model (CM) and a Tier 1: Preliminary Risk Assessment, to assess the status of any potential contamination and identify any potentially significant contaminant linkages that require further consideration in line with current guidance including Land Contamination Risk Management (LCRM) guidance published by the Environment Agency; and
- Identification of information gaps, geo-environmental development constraints and any requirements for further assessment.

Sources of information

The following sources of information were reviewed during the preparation of this desk study:

- Landmark Envirocheck Report, Slices A to D, Reference 26008261, 07 September 2021 (Annex A);
- Landmark Envirocheck Report, Reference 302929263, 21 October 2022, grid connection corridor;
- Landmark Envirocheck Report, Reference 302923074, 21 October 2022, Access Road;
- British Geological Survey (BGS) 1:50 000 Geological Sheet 232, Abergavenny, Solid and Drift, 1990;
- British Geological Survey (BGS) 1:50 000 Geological Sheet 249, Newport, Solid and Drift, 1997;
- BGS WMS layers (superficial, bedrock, mass movement, detailed geology);
- British Geological Survey, Geology of the South Wales Coalfield, Part II, the country around Abergavenny, Memoir for 1:50 000 geological sheet 232, Third Edition, 1989;
- British Geological Survey, Geology of the South Wales Coalfield, Part I, The country around Newport (Mon.), Explanation of One inch Geological Sheet 249, New Series, 1969;
- Coal Authority Interactive Map viewer, <http://mapapps2.bgs.ac.uk/coalauthority/home.html>, accessed September 2022;
- Coal Authority WMS layers;
- Consultants Coal Mining Report (CCMR), Mynydd Llanhilleth, Blaenau Gwent, The Coal Authority, Reference 51002673082001, 08 September 2021 (Annex B);
- Consultants Coal Mining Report (CCMR), Mynydd Llanhilleth North Site, Torfaen, The Coal Authority, Reference 51003317560001, 11 October 2022 – Access Road (Annex B);

- Consultants Coal Mining Report (CCMR), Mynydd Llanhilleth South Site, Torfaen, The Coal Authority, Reference 51003317521001, 11 October 2022 – grid connection corridor (Annex B);
- Mine Abandonment Plans, The Coal Authority – various references in text;
- Site walkover on 11th May 2022;
- Mynydd Llanhilleth Wind Farm, Peat Depth Survey Depth Report, Technical Note, Wood, October 2021;
- Multi Agency Geographic Information for the Countryside (MAGIC) interactive map, www.magic.gov.uk, accessed April 2022;
- NRW interactive map viewer, <https://naturalresources.wales/evidence-and-data/maps/browse-map-of-data-about-the-natural-environment/?lang=en>, accessed April 2022;
- Flood Risk Assessment Wales Map, <https://naturalresourceswales.gov.uk/flooding/check-your-flood-risk-on-a-map-flood-risk-assessment-wales-map/?lang=en>, accessed April 2022;
- BGS, GeoIndex, <http://mapapps2.bgs.ac.uk/geoindex/home.html>, accessed September 2022;
- BGS, Geology of Britain Viewer, <http://mapapps.bgs.ac.uk/geologyofbritain/home.html>, accessed September 2022;
- Savills Scoping Report (2021), Mynydd Llanhilleth Wind Farm Environmental Impact Assessment Scoping Report (Ref. 70060590 ML-PW, May 2021);
- Royal Commission on the Ancient and Historical Monuments of Wales, historical aerial photographs – various dates in text; and
- Natural Resources Wales, Flood Map for Planning, <https://flood-map-for-planning.naturalresources.wales/>.

Geotechnical Classification of Structures

In line with BS EN 1997:1 (Eurocode 7 Geotechnical Design) it is anticipated that the proposed structures will be classified as follows:

- Wind turbine generator and foundation – Category 3;
- Substation – Category 2; and
- Access tracks, hardstanding, compounds – Category 2.

The turbines and associated foundations are anticipated to be Category 3 structures due to their large size and loading conditions, which incorporate dynamic loading and lateral loads with high overturning forces.

Limitations

The conclusions reached and advice given in this report are based in part upon information and/or documents that have been prepared by third parties. In view of this, we accept no responsibility or liability of any kind in relation to such third party information and no representation, warranty or undertaking of any kind, express or implied, is made with respect to the completeness, accuracy, or adequacy of such third party information. In preparing this report we have assumed that all information provided by the Client is complete, accurate and not misleading.

2. Site details and environmental context

2.1 Site details

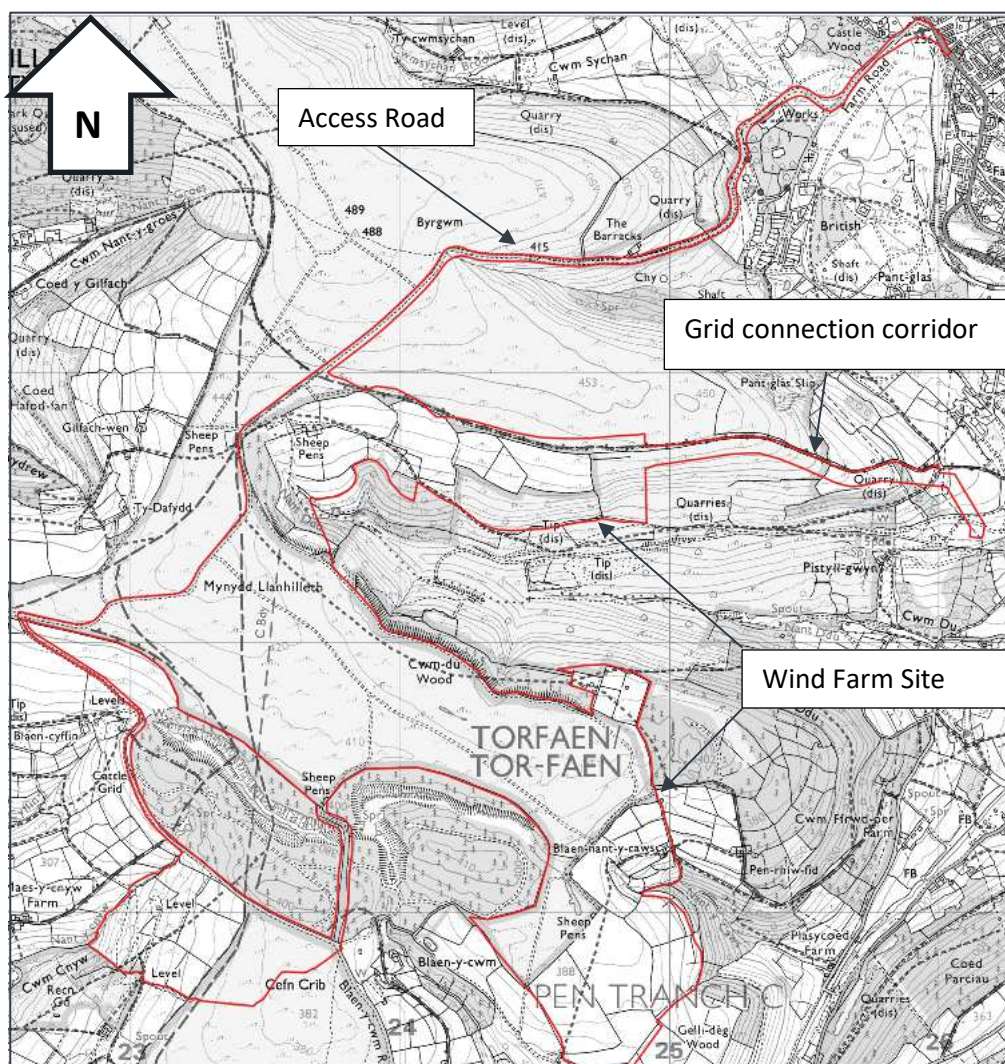
Site Location

The Wind Farm development site is located on an upland ridge between the Ebbw Fach valley to the west and the Cwm Afon valley to the east. It is split between two Local Planning Authorities: the majority of the Site lies to the east within Torfaen County Borough Council (TCBC); part of the Site to the west lies within Blaenau Gwent County Borough Council (BGCBC), South Wales.

The Site boundary is approximately 300 m from the eastern edge of Llanhilleth and the village of Brynithel is located approximately 500 m to the south west of the Site at its closest point.

The Site location is shown on Figure 1, which shows the layout of the sub-divided areas.

Figure 1 Site Location



Grid Reference	The grid reference for the approximate centre of the site is 323846 201616 (SO 23846 01616).
Site Address	The Site is accessed from the north east via an existing tarmac road called British Road (Farm Road), which is accessed via the B4246 in the settlement of Talywain at grid reference 325994 204249. Access is also currently possible via Blaen-y-cwm Road and Cefn-crib Road from the settlement of Hafodyrnys.
Site Description	<p>The Site comprises three principal areas: the proposed Wind Farm development site that will accommodate the wind farm turbines and associated infrastructure; the grid connection corridor to the east, which will tie into an existing distribution network; and the Access Road which will be an upgrade to an existing metalled road.</p> <p>The Wind Farm site is an area of undulating high moorland plateau on two north west to south east trending ridges and occupies part of Mynydd Llanhilleth Common between Abersychan/Pontypool and Abertillery. The ridges are divided by a west to east trending valley, Cwm Du, and the southern ridge wraps around an east to west trending valley feature known locally as The Canyons. A steep sided valley, Cwm y Glyn is located to the east of the Site. The elevation of the Site ranges between 350 m to 450 m OD, reducing to 250 m OD where the Access Road joins the B4246.</p> <p>The Wind Farm Site comprises a combination of reinstated former opencast with associated coniferous woodland over the southern area and intensively managed semi-improved and unimproved grassland over the high ground. The northern slopes of the Wind Farm site are covered by coniferous and non-coniferous woodland. The Site is crossed by a number of public rights of way and also by an adopted road, Blaen y cwm Road. It covers an area of 259 ha. The main land use on site is agricultural and the Wind Farm site is used for sheep grazing. Fields are divided by a mix of stonewall and post and wire fencing.</p> <p>The grid connection corridor runs along an east-west trending ridge to the north of the Nant Du watercourse, from an elevation of 410 m to 270 m OD and comprises agricultural fields.</p> <p>The current site layout is shown on Figure 11A.1.</p>
Boundaries (Land uses and relevant features)	The Wind Farm site is bounded by a mix of British Road, Blaen-y cwm Road and stone walls and post/wire fencing in varying condition. Details of adjacent land use are provided below.
North	Adjacent land use is predominantly open moorland.
East	Predominantly grazing, with some areas of forestry.
South	Predominantly grazing.
West	Predominantly grazing, with some areas of forestry.
Grid Connection site	Underground cables linking the Site to the existing distribution network will run through the grid connection corridor. This extends eastwards from the northern area of the Wind Farm site to a point of connection to the existing distribution network close to Tal-ochor Farm, west of Pontnewynydd. It extends along the northern flank of Cwm Ddu, down the valley slope of Cwm-y-Glyn via predominantly rough grassland with occasional mature trees.
Site Walkover	A site visit was carried out on 11 th May 2022, by a Wood Geoenvironmental Engineer. Key features identified during this walkover are noted below:

- Forestry operations were ongoing in the area around The Canyons, which bounds the Wind Farm site on its southern edge;
- Several areas of suspected restored opencast were identified based on the topography observed, predominantly in the areas to the north and south of The Canyons;
- Evidence of former mining activity was noted in the valley to the north of the Wind Farm site, along which the proposed Access Road runs;
- Some limited areas of forestry were observed at the western end of Cwm Du valley; and
- Limited evidence of former development in the form of demolished structures and associated small piles of rubble.

Current Site Activities

Current site activities within the boundary of the Proposed Development area are limited to agricultural land use. The area is used for sheep grazing, predominantly in unimproved moorland, occasionally within improved enclosed fields.

There is some evidence of historical activity in the form of demolished structures and associated small piles of rubble.

Services

A medium pressure gas main crosses the Wind Farm site in a dog-leg orientation from north to south. The alignment is defined by above ground marker posts on site.

Proposed Development

The aspects of the Proposed Development are summarised in Section 1 above. More detail on each aspect is presented below:

- Wind turbines: up to eight turbines with a hub height of 122m and a maximum tip height of 180m. Proposed locations have been selected, which may require some minor amendments based on any identified constraints. Foundations will depend on the findings of intrusive investigation, but may comprise gravity foundations bearing directly onto bedrock, where it is encountered intact; alternative foundation solutions may be required e.g., piled foundations depending upon the ground conditions at the proposed turbine locations;
- Crane pads: an area of hardstanding adjacent to each turbine as a lay down area for construction and future maintenance activities. Crane pads will comprise an area of hardstanding located adjacent to each wind turbine. The area is subject to Contractor design but is anticipated to be approximately 2 500 m²;
- Temporary contractors' compound;
- Electrical substation and transformer housing with associated cabling: Anticipated to comprise a single storey structure with shallow foundations underground cables will link the turbines to each other and to the on-site substation. Cables will be laid in trenches typically 750 mm deep and 450 mm wide;
- Site access road and internal tracks. Main access will comprise an upgrade to the existing British Road/Farm Road from Talywain. Internal access tracks will be required between the proposed infrastructure; and
- Grid Connection: underground cables which will link the Site to the existing distribution network. Proposed route comprises a 1.5 to 2 km long underground cable to the east where it ties into the existing network north west of Pontnewynydd. Cables will be laid into a trench using open cut methods with a depth of up to 1.5 m; a trench width of 0.6 m to 1.5 m is anticipated, in a corridor with an overall width of approximately 11.5 m.

The proposed Wind Farm development layout is shown below and in Figure 11A.2.

2.2 Environmental context

Topography

The topography of the Wind Farm site is variable and comprises the open ridge of Mynydd Llanhilleth. The northern boundary of the Site defines its most elevated point, where it achieves a height of approximately 460m above Ordnance Datum (AOD). The central area slopes gently to the south, reducing in elevation to approximately 350 m AOD.

Several valleys define specific areas of the Site. Cwm Du divides the northern and central/southern sections with the north eastern section of the Site sloping steeply to the south at Cwm Du valley. The north western area of the Site slopes steeply down to the south at Cwm Cyffin valley and the south western area slopes steeply down to the west at Cwm Cnyw.

Within the Site, the former Llanhilleth Opencast (Tir Pentwys, also known as 'The Canyons') is located in the southern area of the Site. It comprises a series of linear rock faces of approximately 20 m to 30 m in height, and also slopes of backfilled material.

The grid connection corridor and Access Road extend off the plateau down the valley slopes to the adjacent valley floor, reducing in elevation to approximately 250 m to 270 m OD.

Hydrology and drainage

The Site sits on the watershed between the Afon Ebwy Fach/Afon Ebwy catchment to the west and Afon Lwyd catchment to the east, both of which are classified as Main Rivers by NRW. The NRW data set indicates that there are no Main Rivers within the Site boundary.

The Site is intersected by the headwaters of several tributaries of the Afon Ebwy Fach, Afon Ebwy and Afon Lwyd; the tributaries are classified as ordinary watercourses. The headwaters of Nant Cwmmllwydrew, Nant Cyffin and Nant-y-Cnyw cross the west and southwestern boundaries of the Wind Farm site and drain southwards into the Afon Ebwy. The headwaters of the Nant Ffwydd-oer, Nant-y Caws and Nant Ddu cross the southeastern boundary of the Site and drain into the Afon Lwyd catchment. Nant Ddu has a GQA Grade of River Quality B.

No watercourses have been identified crossing the grid connection corridor. Several minor watercourses cross the alignment of the Access Road including the Cwm Sychan Brook, which has a GQA Grade of River Quality A

There are no licensed surface water abstractions on the Site.

Two licensed discharge consents are recorded on the Envirocheck report within the Wind Farm Site; one is located at the top of Nant Ddu, which is noted to be revoked for a soakaway. The second is located on the grid connection corridor and is noted to be for sewage effluent. A further four revoked discharge consents are recorded in within 250 m which are associated with historic mining activity. There are no licensed discharge consents within 250 m of either the grid connection corridor or Access Road.

Flood risk

Limited potential for flooding has been identified on the Wind Farm site. The Envirocheck Report indicates the majority of the Wind Farm site and grid connection corridor is defined as having limited potential for groundwater flooding. The proposed Access Road is largely within an area defined as having potential for groundwater flooding to occur at surface.

The Flood Map for Planning (FMfP) (Rivers) shows that the Wind Farm development area lies primarily within an area of very low risk of fluvial flooding (corresponding to Flood Zone A on the Development Advice Map (DAM) (TAN15) and Flood Zone 1 (low probability of flooding) in the FMfP. However, the proposed access route to the operational Wind Farm development intersects Flood Zone C2 (without significant flood defence infrastructure) in the DAM and Flood Zone 3 (high probability of flooding) in the FMfP, associated with the Cwmsychan Brook and Nant Ffrwd.

Owing to the higher resolution of the modelling outputs, the FMfP (surface water and small watercourses) has been used to provide an improved indication of the flood risk to the area. The mapping indicates a narrow band of Flood Zone 3 through the road, coincident with the watercourse centreline, though it is acknowledged that the road crossing appears to have been represented using a 2D 'cut' approach without explicit representation of a culvert present (estimated to be a 2m diameter circular culvert,). Therefore, the flood risk mapping across the road at this crossing point is erroneous.

The grid connection corridor runs across the northern valley face of the Nant Ddu across a ridge at elevations of approximately 270m AOD to 400m AOD. This is entirely within a region of very low risk of fluvial flooding (corresponding to Flood Zone A in the DAM (Figure 10A.5, Appendix A) and Flood Zone 1 in the FMfP (Figure 10A.4, Appendix A), and hence the risk of fluvial flooding is considered to be negligible.

Environmental designations

Areas of local ancient and semi-natural woodland are located around the site on the valley slopes and locally encroach into the Site at the top of Nant Ddu, Nant-y Caws and Cwm Cnyw. None of the proposed turbine locations intersect the areas of ancient woodland.

The Magic and NRW websites were examined to identify whether any environmental designations applied to the site. None of the following designations have been identified on site: Ramsar, Site of Special Scientific Interest (SSSI), Special Area of Conservation (SAC), Special Protection Area (SPA), Area of Outstanding Natural Beauty (AONB), National Nature Reserve, Local Nature Reserve, National Park.

There are 15 Sites of Interest for Nature Conservation (SINCs) onsite, these are areas of land recognised for their importance for wildlife at a local level, and which fall outside the legal protection of the Sites of Special Scientific Interest (SSSI) system.

The closest Local Nature Reserve is at Tir-Pentwys on the southern boundary of the Wind Farm Site.

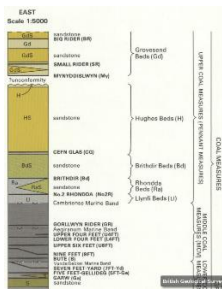
Environmental sensitivity

The Site has no significant (nationally or internationally important) environmentally sensitive areas within it.

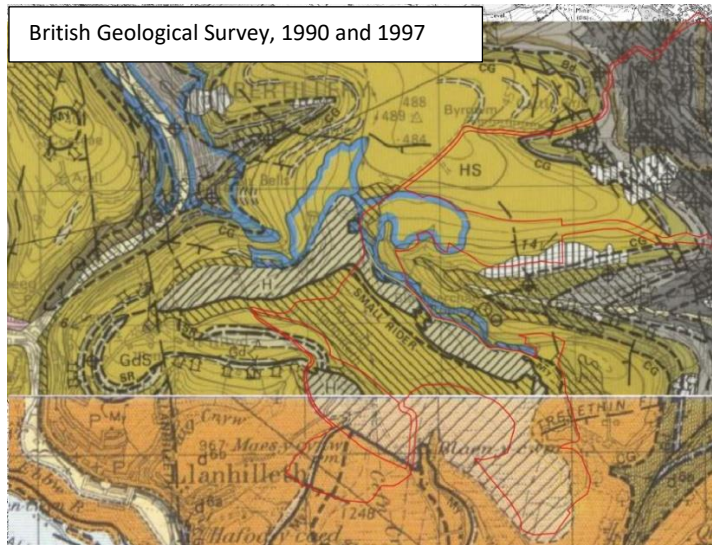
2.3 Ground conditions

Geology (BGS map and WMS layers, memoir and GeoIndex)

The ground conditions have been derived from a combination of published information and the Envirocheck report together with information from the Site walkover. An extract from BGS sheet 1:50 000 Abergavenny Sheet 232 and Newport Sheet 249 is included below and summarised in text in the following table. It is noted that the quality of information and nomenclature of the geological units varies between the two sheets, as a consequence of their different publication dates.



British Geological Survey, 1990 and 1997



Strata

Comments

Made ground

Wind Farm Site: The central and southern areas are underlain by a combination of made ground and worked out opencast/worked out coal workings. There is some inconsistency between the definition of the material type between the two geological sheets, but overall, it indicates the presence of disturbed strata over the majority of the site area.

Grid connection corridor: southern end of the corridor encroaches onto a linear area of made ground which runs along Cwm Ddu.

Access Road: Area of made ground shown to be present at eastern end of route.

No indication of depth or thickness in any of the areas – assumed to be present at ground level or beneath thin topsoil.

Wind Farm Site: No data on composition, likely to be associated with opencast workings and/or colliery spoil.

Grid connection corridor: No data on composition or derivation; anticipated to be colliery spoil.

Access Road: No data on composition or derivation; anticipated to be colliery spoil.

Superficial Deposits

Wind Farm Site Area: Absent beneath the majority of the Site. Glacial Till (diamicton), present in a small area in the north at the head of Cwm Ddu.

Grid connection corridor: absent.

Access Road: A large area of Head Deposits is noted to underlie the northern end of the Access Road

Glacial Till typically comprises a gravelly sandy clay.

Head Deposits typically comprise mixed clay, silt, sand and gravel and are associated with downslope movement of material under periglacial conditions.

See also results of peat probing survey in Section 2.6.

Bedrock:

Wind Farm Site Area: Upper Coal Measures (Carboniferous Age) Hughes Member of the Pennant Sandstone Formation, with an area of Grovesend Member in the centre of the Site oriented approximately east-west.

Depth uncertain over most of the Site. Lack of drift cover infers shallow depth, however, opencast workings over central and southern areas of Wind Farm Site are likely to have resulted in disturbance and reinstatement with opencast backfill. Made ground associated with historic spoil heaps at eastern end of Access Road is of uncertain thickness.

Grid connection corridor: Extends from Hughes Member of Upper Coal Measures to upper strata of Middle Coal Measures.

Access Road: Extends from Hughes Member of the Upper Coal Measures beneath the western third to the faulted Middle and Lower Coal Measures strata, beneath the central and eastern section.

Strata shown to dip at 14° towards the south west in the north eastern area. Additional information on strata dip and orientation discussed in mining section. The Hughes Member is indicated to comprise a series of greenish grey lithic arenites (Pennant Sandstones) with thin mudstone/siltstone and seatearth interbeds and mainly thin coals; the BGS memoir indicates that the Hughes Member is approximately 130 m thick in this area. The Grovesend Member is of similar composition. The Middle and Lower Coal Measures strata have a higher proportion of mudstone and siltstone units.

A landslip is shown to be present along the northern valley side of Cwm Du, which encroaches into the northern section of the Wind Farm site and lies immediately to the south of the grid connection corridor.

Mining – published mapping

Wind Farm Site: Coal seam outcrops are shown around the margin of the topographic high which forms the plateau. The Cefn Glas seam is the shallowest named seam, which is shown to underlie the Site area, with the Brithdir seam below. The Small Rider and Mynyddislwyn seams are shown to subcrop within the boundary of the Site although the form of the outcrop appears to have been amended by the opencast workings. There is some variation in the naming of coal seams both within the BGS mapping in different areas of the Site and between the BGS and the Coal Authority; this is discussed in more detail in the CMRA.

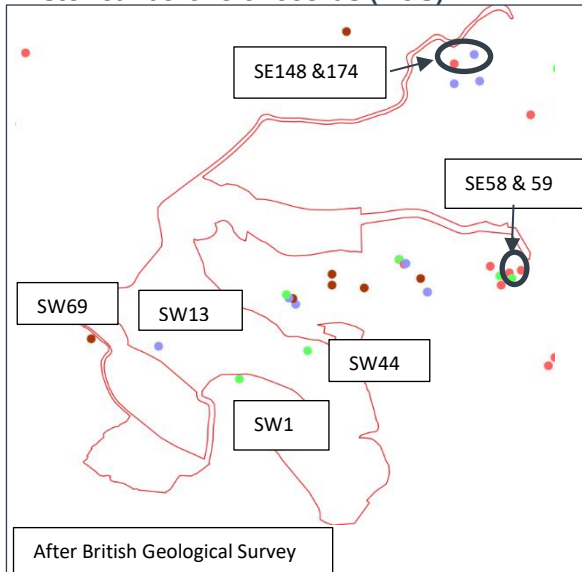
A number of mine entries are shown on the flanks of the plateau, comprising both shafts and adits, where they are associated with the Mynyddislwyn seam in the west and the Cefn Glas and Brithdir seams in the east.

Several faults are shown crossing the Site – there appear to be two fault sets, one running broadly north to south and the other running west to east, which is consistent with the regional pattern. The most significant is the Trevithin Fault which runs across the south eastern site area and is shown to terminate at the area of worked out coal seam.

Grid connection corridor: Crosses several seam outcrops at the eastern end extending from the Cefn Glas seam to the Upper Four Feet seam. Several shafts are shown adjacent to the eastern end of the corridor. Faults cross the eastern end of the Grid Connection Corridor; the alignment is predominantly north west to south east.

Access Road: Crosses numerous coal seam outcrops/subcrops extending from the Cefn Glas seam to the Five Foot Gellideg seam. The sequence below the Tillery Brithdir seam is shown to have a drift cover of Head Deposits as noted above. A number of shafts are shown in the vicinity of the Access Road. The strata are noted to be faulted, most notably in the eastern half of the Site; the predominant alignment of the faults is noted to be north west to south east.

Historical borehole records (BGS)



No previous ground investigation data has been identified for any of the existing developments or structures on site.

Limited existing borehole data has been identified on the BGS website for the Site and immediate surrounding area to inform a preliminary ground model. The following existing records been identified and viewed:

WIND FARM SITE AREA

- SO20SW44: Blaenserchan G4 Trial Gate (L.H.R) – underground borehole to prove Five Feet/Gellideg coal seam. Borehole commenced at 45m BOD (below Ordnance Datum).
- SO20NW1: O/C Site, Tirpentwys Group, 37, 37A, 68, 74, 73, 89, 39 – borehole record not available on BGS website, noted to have been moved to Opencast Collection.
- SO20SW13: NCB U.G.B.H. No 2 Blaenserchan – underground borehole to prove measures below the Seven Feet seam.
- SO20SW69: Blaen Cyffin Colliery – no record available on BGS website

GRID CONNECTION CORRIDOR

- SO20SE58 and 59 (Greenland 4 and 5 respectively): these were drilled on the Greenland Tip site (not all pages are available on GeoIndex). Boreholes record spoil to 4.8 m to 5.25m bgl overlying 0.70 m to 0.75 m of '*probably head and/or landslip*' which is logged as a clay. This is underlain by bedrock comprising predominantly mudstone. A number of seatearth layers are noted, and a thin coal seam (c. 0.4 m to 0.5 m thick) is noted at depths of 12.25 m bgl (Greenland 4) and 17.2mbgl (Greenland 5). A cavity/soft ground is recorded in Greenland 4 between 25.4 m and 27 m bgl. correspondence included within the log record notes faulting of the strata and surface landslipping. This includes a fault identified as the Greenland Fault which is inferred to underlie the grid connection corridor. It notes numerous seams have been washed out in this area.

ACCESS ROAD

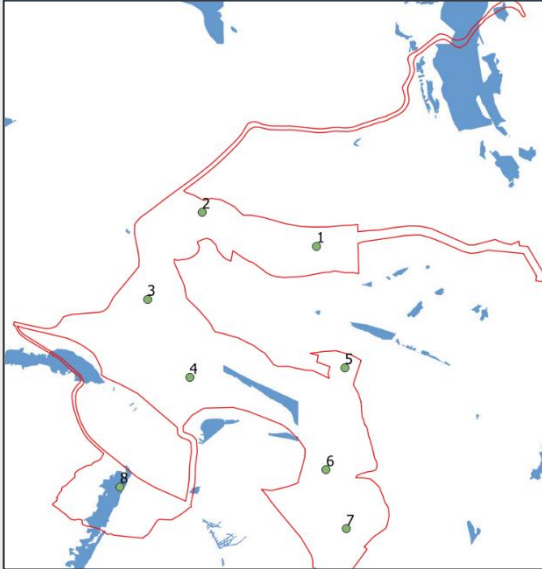
- SO20SE148: image would not display in GeoIndex – noted to be associated with Navigation Pit.
- SO20SE174: Log missing.

The majority of the boreholes available were drilled in former tip locations in the valleys between the plateau areas and are of limited relevance with respect to ground conditions as the borehole ground elevations are much lower than those at the proposed turbine locations.

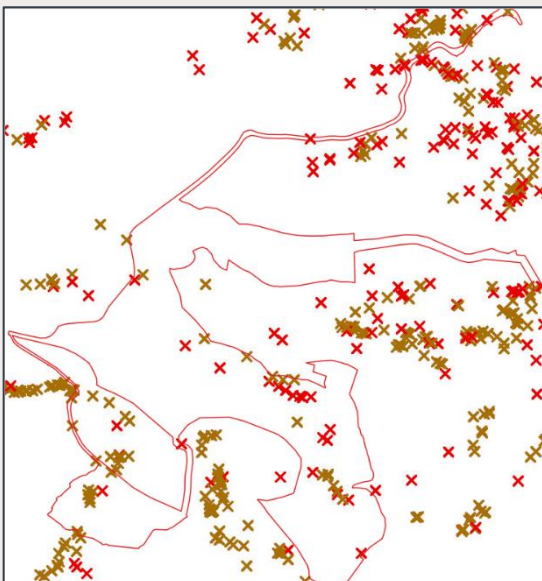
It is understood that ground investigation was undertaken for a gas main which crosses the Site, however these

records are not in the public domain and have therefore not been available for review.

Mining – coal Coal Authority Interactive Viewer, WMS layers and Envirocheck Report



Recorded Shallow Mining (Source: Coal Authority WMS layer)



Mine Entries (Source: Coal Authority WMS layer)

The Coal Authority Interactive Mapping tool shows the Site to be within a Coal Mining Reporting Area within an area which may be affected by coal mining. Layers within the viewer were examined to identify mining related aspects, which are summarised below. Historical mining features are also shown on the historical maps included with the Envirocheck in Annex A and on the extracts from the geological sheets as described above.

Coal outcrops shown on the Interactive Viewer are broadly consistent with those on the geological map, with the Brithdir and Cefn Glas seams inferred to underlie the Wind Farm site; the Mynyddislwyn and Mynyddislwyn Small Rider seams underlie the southern and central area of the main turbine site but have been variously removed by historical opencast activities. The seam names are not identified on the Interactive Viewer and thus consistency of seam naming cannot be confirmed.

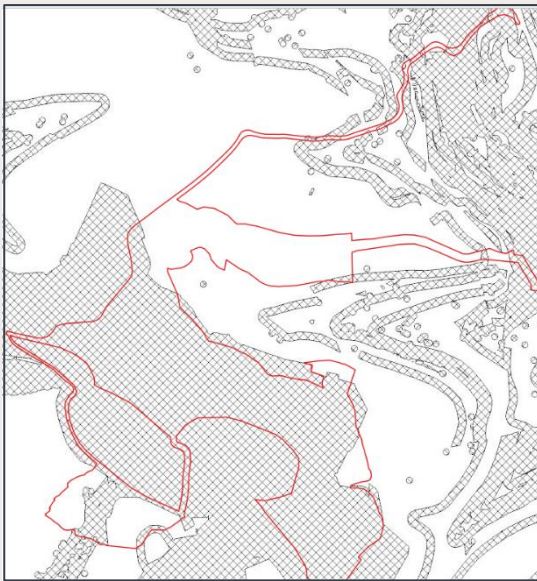
Areas of past shallow working underlie Turbine 8, the central site area of the Wind Farm site and Blaen y Cwm Road associated with the Mynyddislwyn seam. Areas of past shallow working are also shown beneath the northern eastern section of the Access Road, which are likely to be associated with the Five Foot Gellideg, Bute and Lower Seven Foot Bottom Leaf (Yard) seams.

The eastern end of the grid connection corridor is shown to be underlain by a probable shallow mineworkings; these are likely to be associated with the Upper Six Foot, Upper and Lower Four Foot and Gorllwyn Rider seams, based on the outcrop pattern.

A large number of mine entries are shown on the Interactive Viewer within the Site boundary, particularly in the southern half of the Wind Farm site, with a large number also shown on the valley slopes outside the Site boundaries. Within the Site the mine entries are generally consistent with the mapped outcrop of the Mynyddislwyn and Small Rider seams. Those on the valley slopes are consistent with the mapped outcrops of the Cefn Glas and Brithdir coal seams. Mine entries are also shown at the eastern end of the grid connection corridor and the eastern section of the Access Road.

The number and locations of the mine entries identified above is different to that shown on the BGS geological map, with significantly more entries shown on the Interactive viewer. Considering the large number of mine entries identified, not all have been listed in this document in terms of their location, type, orientation and treatment; they are considered in more detail in the Coal Mining Risk Assessment (Annex B).

The majority of the Wind Farm site is classified as a Development High Risk Area on the Coal Authority Interactive Viewer; this is consistent with the mapped area of surface working (historic/current) and an area of



Development High Risk Areas (Source: Coal Authority WMS layer)

Mining - Consultants Coal Mining Report and Coal Mining Risk Assessment (Appendix B)

recorded shallow mining beneath Turbine 8. The eastern end of the grid connection corridor and the northern half of the Access Road are underlain by Development High Risk Areas that are consistent with mapped coal seam outcrops and areas of probable and past shallow mining respectively.

No fissures and breaklines are identified within the Site boundary.

The Envirocheck reports record a large number of BGS Recorded Mineral Sites on and in the vicinity of the Site. These are noted as underground and opencast workings for coal and to a lesser extent sandstone.

Consultants Coal Mining Reports have been obtained from the Coal Authority for the three Site areas, which are included in Annex B.

A number of seams are noted to outcrop beneath the Site, with the seam arrangement varying between the Wind Farm site and the Access Road/grid connection corridor as a result of topographical variations. This has resulted in the upland areas of the Wind Farm site being associated with outcrops of seams within the Upper Coal Measures, whilst the Access Road and grid connection corridor being associated with outcrops in the Middle and Lower Coal Measures as they cross lower elevations on the plateau flanks. Details of the coal seams outcropping in specific areas is given in the CMRA.

The Consultants Coal Mining Report indicates past underground mining has been recorded in a large number of seams beneath all areas of the Site. The shallowest worked seam beneath the Wind Farm Site is identified as the Mynyddislwyn Top Leaf, which has a recorded depth of 0 m bgl at its shallowest. The extraction thickness of this seam is noted to be 100 cm to 273 cm, with the last year of working in 1999 from Pantygasseg Colliery. The seam is noted to dip towards the south west at between 1.4° and 5.4°. The Mynyddislwyn Lower Leaf is also recorded to have been worked at shallow depth beneath the Site, with the shallowest recorded depth noted to be 9 m bgl. This seam is noted to have an extraction thickness between 69 cm and 274 cm and has a recorded dip of 1.2° and 3.6° towards the south west. The last year of recorded extraction was 2001 from Blaencuffin (Blaen Cyffin) colliery.

Additional recorded worked seams are identified beneath the Site at depths of between 130m and 546m bgl. The shallowest of these is the Tillery/Brithdir Seam, which is recorded to have been worked beneath the Wind Farm site with the most recent date of working 1909. The seam

dips at a shallow angle of between 2.7° and 11.3° towards the south/southwest/west and has an extraction thickness between 25 cm and 150 cm. The depth of the seam beneath the Site is recorded to range between 104 m and 208 m bgl, which is a function of the variation in topography and the seam dip.

The CCMR indicates recorded workings beneath the Access Road in 11 seams of coal / fireclay / ironstone. Shallow workings (<30 m) were recorded in the Bute, Five Foot Gellideg and Lower 7 Foot Bottom Leaf at depths between 15 m and 29 m bgl and extraction thicknesses between 160 cm and 320 cm. The most recent date of recorded working is 1983 at a depth of 121m bgl in the Lower 7 Foot Bottom Leaf.

The CCMR indicates recorded workings beneath the grid connection corridor in 10 seams of coal/ironstone/fireclay. The shallowest recorded workings are in the Tillery Brithdir seam at a depth 86 m bgl and an extraction thickness of 0.75 m. The most recent date of recorded working is 1962 in the Five Foot Gellideg seam at a depth of 381 m bgl.

Additional recorded worked seams are recorded at greater depth beneath all areas of the Site and are detailed in the relevant CCMR. The plans which accompany the CCMRs indicate that a large proportion of the Wind Farm site is within an area of unlicensed opencast. Additional unlicensed opencast workings are also shown to the east of the grid connection corridor. No other information is provided in this regard.

Spine roadways are also recorded to be present beneath the Site at shallow depth. Information with regard to these roadways has been obtained for the Wind Farm Site through the inspection of Abandonment Plans. Such plans have not been obtained to date for the other site areas.

There are twelve remediated sites within the Wind Farm Site boundary, although no detail is provided; it is likely they relate to former mine entries.

The CCMR notes that there are no probable unrecorded shallow workings within the Wind Farm Site or Access Road. Probable unrecorded workings are identified in the CCMR for the grid connection corridor, which is consistent with the Interactive Viewer, which shows an area at the eastern end of the Site.

A large number of former mine entries are identified, which is consistent with the Interactive Viewer. Of these a significant proportion within the Wind Farm Site are noted which '*may have been partially or wholly excavated during past opencast mining*'. Several mineshafts are also recorded as having been subject to specific treatment, which is detailed in the report: these relate to mine entries in the Canyons, when this was formerly included within the Site boundary.

There are no recorded subsidence related claims within the Site. An area of subsidence claim which was rejected

is shown adjacent to the northern boundary of the grid connection corridor.

There is no recorded mine gas within the Site, however the Coal Authority has investigated and subsequently remediated the effects of mine or ground gas emissions following specific reported hazards within the Wind Farm Site.

A mine water treatment scheme is located 325 m northeast of the Wind Farm site.

Aerial imagery from 2000 shows no visible mining related features within the Site boundary. Additional historical imagery was obtained from the Royal Commission in Wales, some of which shows evidence of open cast working – this is discussed in more detail in Section 2.5 and in the CMRA.

Other extractive industries

No other extractive industries identified on the Site in the Envirocheck report. There are BGS recorded mineral sites on the hill slopes below the Site for both coal and sandstone; all are noted to be ceased.

Natural ground hazards

The Envirocheck Report notes the following ground related hazards:

- ▶ Collapsible ground – No to very low hazard;
- ▶ Compressible ground – no to very low hazard;
- ▶ Ground dissolution – no hazard;
- ▶ Landslide – very low to moderate generally, very low to moderate on grid connection corridor and high associated with area of identified instability;
- ▶ Running sand – no to very low hazard; and
- ▶ Shrinking/swelling clay – no to very low hazard.

Radon is of low to intermediate probability, which requires no or basic radon protection measures respectively.

Hydrogeology

The localised Glacial Till and Head Deposits are classified as Secondary Undifferentiated aquifers.

Bedrock is classified as a Secondary A Aquifer and is a designated Water Framework Directive (WFD) groundwater body. It achieved Good quantitative status and Poor chemical status in the 2016 WFD classification.

There are no licensed groundwater abstractions on the Wind Farm Site identified in the Envirocheck report; the closest is within the Canyons area which is from a spring for general farming and domestic use at a farm.

The Envirocheck report indicates three revoked discharge consents related to former mining; they were revoked in 1995 and have a status of 'expired'.

Hydrogeological sensitivity

The bedrock aquifer is classified as being of Low to High Vulnerability, which is considered to be due to the variable nature of drift cover and possibly reworking associated with historic opencast activity.

The Site is not within any currently defined Groundwater Source Protection Zones (SPZ).

Groundwater sensitivity

Groundwater beneath the Site is considered to be of low sensitivity. It is likely to have been impacted by former coal mining activities. In addition, there are no abstractions or SPZs defined in the vicinity of the site.

2.4 Other regulatory database information

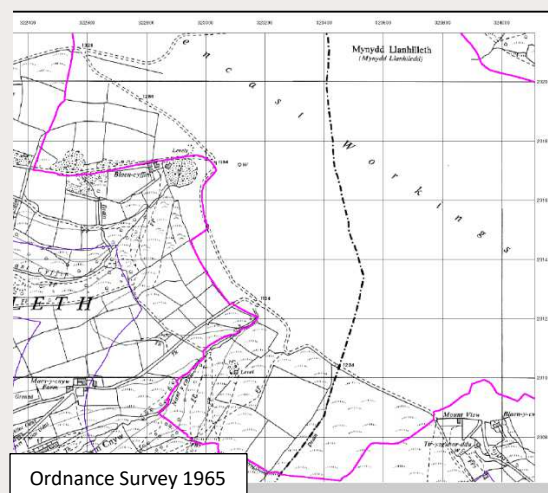
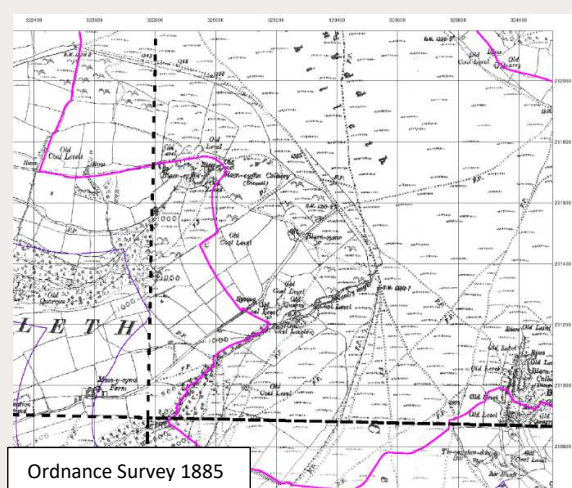
Activity	On Site	0 to 250 m	Details
Waste management / transfer / treatment facilities / disposal	N	N	
Landfill	N	N	The closest landfill is located approximately 320 m from the Wind Farm site, which is indicated to be a historic landfill. Historic quarries are also identified as potentially infilled land in the vicinity of the Wind Farm Site and grid connection corridor.
Site handling hazardous or explosive substances	N	N	None identified on site.
Pollution incidents / other	N	N	None identified on site
Unexploded Ordnance and Bomb Strike	NA	NA	Not assessed.
Current land use	Y	Y	<p>The Envirocheck reports do not identify any contemporary industrial land uses on Site or in the immediate vicinity. Limited historical features are identified on Site or in the vicinity as follows:</p> <ul style="list-style-type: none"> - Spoil heaps associated with former extractive activities.

2.5 Site history

A summary of the historical development of the Site is presented below. This is based on historical Ordnance Survey (OS) mapping, supplemented by publicly available aerial imagery on Google Earth. Where relevant, interpretation of the maps is supported by information obtained from discussions with the client and other stakeholders, together with any previous reports available for the Site. For ease of reference and considering the available information, the Site areas to the north and south of Nant Ddu have been considered separately. In some instances, the pink

boundary shown on the Envirocheck excerpts below varies slightly from the Proposed Development application boundary, this is due to design evolution of the Proposed Development after the data was obtained. The 'red line' boundary of the Site is shown in Figures 11A.1 to 11A.3.

Wind Farm site South of Nant Ddu



Site Area and Immediate Vicinity:

1885/1886: Site shown to be open space comprising predominantly rough grassland crossed by several tracks. Several small settlements/farmsteads shown to be present adjacent to the southern and eastern Site boundaries. There is evidence of mining activity around the Site, with a number of shafts, levels and collieries present; these are generally outside the site boundary, although a shaft is noted in the eastern area of the Site, close to where Nant-y Caws rises, and two air shafts and two coal levels are noted in the northern Site area at the crest of the valley slope on the southern side of Nant Ddu. Pen-rhiw-fid Quarry is the largest quarry in the vicinity of the Site, on the eastern valley flank

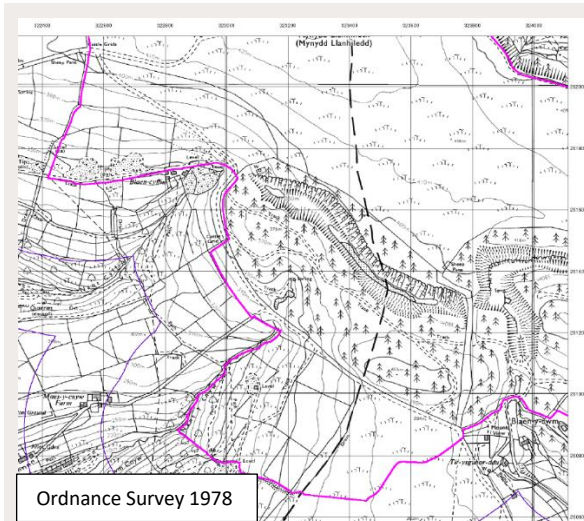
1901: No significant changes on Site. An old quarry is shown on the northern boundary, on the southern flank of Cwm Ddu. Pen-rhiw-fid Quarry had increased in size.

1922/38: A significant increase in the number of mining/mineral working related features in the form of old coal levels, collieries and occasionally quarries, is noted, which are generally indicated to be disused. These tend to be associated with the topographical valleys associated with the watercourses which drain the plateau, presumably where the coal was exposed in the valley sides. Several of the old coal levels are present within the eastern area of the Site, close to the air shaft which was noted at the head of Nant-y Caws from the previous edition. Pen-rhiw-fid Quarry shown to be disused.

1953: an aerial ropeway is shown extending into the north eastern Site area from Colliery in Nant Ddu, with a narrow linear area of spoil shown on site along the alignment of the ropeway.

1965: Significant changes noted on site. The road associated with Blaen-y-cwm Road is shown predominantly on its current alignment. All of the field boundaries and vegetation ornament is not shown with the exception of a small area in the east of the Site around Blean-nant-y-caws, at the head of Nant-y Caws where field boundaries and a small area of woodland remain, together with another area in the south west at Nany-y cnyw where field boundaries and mining related features remain. The rest of the Site is noted to be Opencast Workings, which extended to the valley of Nant Ddu. Features identified as tips are noted to be present on the valley sides outside of the Site boundary, most notably at Cwm Cyffin and Ty-gwyn, and within Cwm Ddu.

1978: The areas of the Site previously shown to have been opencast are shown to have been reinstated, with ground contours which are similar to the current



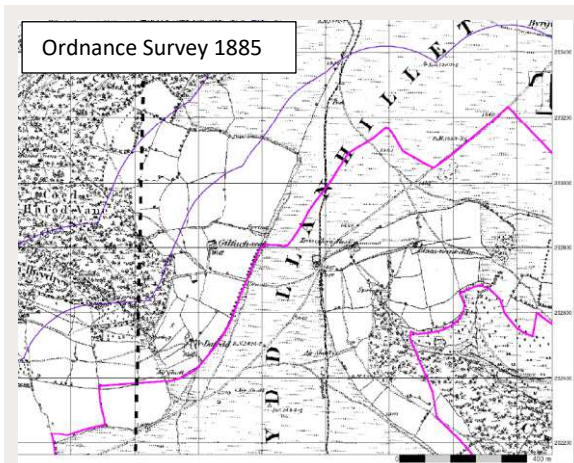
OS mapping. Slope ornament shown along the southern crest of Cwm Ddu, associated with reinstatement of the opencast workings. There is slope ornament to the north west of Blaen-nant-y-caws which was not on previous editions, which is likely associated with the reinstatement of ground levels. The aerial ropeway is no longer shown. Rock slopes are now shown in the area of the Canyons.

1990, 1999, 2006: no significant changes on site.

2021: The slope ornament to the north west of Blaen-nant-y-caws is no longer shown.

Google Earth imagery between 2001 and 2021 was examined. Residual tracks from the opencast operations are apparent crossing the Site areas. No significant changes are noted during this period.

Wind Farm Site North of Nant Ddu and grid connection corridor



Site Area and Immediate Vicinity

1885: shown to be open space, comprising predominantly fields, assumed to be pasture land, with rough ground shown along the grid connection corridor. Several farmsteads are noted within the Site close to the head of Cwm Ddu, where a spring is also noted, presumably the headwater of Nant Ddu. The Travellers Rest, presumably a public house, was located close to the top of Cwm Ddu. It is noted that the northern boundary of the grid connection corridor follows the alignment of a former Roman Road. A large area, noted as Pant-Glas Slip is located on the north east facing valley side approximately 130 m north of the northern boundary of the grid connection corridor. Collieries noted in Cwm Ddu to the south and Cwm Byrgum to the north.

1901: no significant changes on site. The Site of the Roman Road is shown to run along the northern boundary of the Site, now shown as Rhiw Frank.

1922: No significant changes on Site. Three 'Rises' shown within the Site all which drain into Cwm Ddu. Old coal levels and old quarries shown around the site boundaries, most notably in Cwm Ddu and Cwm Byrgum. An old rifle range is shown on the plateau to the north of the Site.

1938, 1953: no significant change.

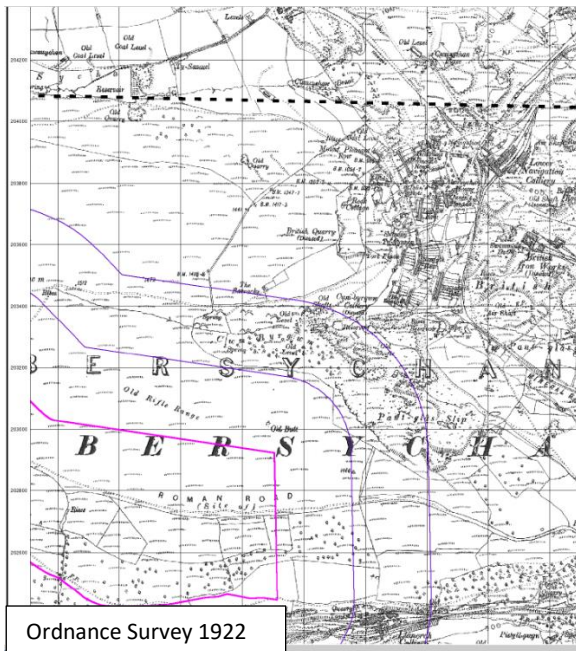
1965 – No significant changes on site. Travellers Rest is no longer shown. Spoil heaps shown in Cwm Ddu.

1978: no significant changes on site. Additional forestry is shown at the head of Cwm Ddu. The tips in Cwm Ddu had increased significantly in size.

1989/90, 1999, 2006, 2021: no significant change on site.

Google Earth imagery from 2001 to 2021 was examined. No significant changes were noted during this period.

Access Road



1886: The western section of the alignment is shown to be a track, which runs through rough grazing on the northern edge of Cwm Byrgwm. Several collieries and shafts are shown towards the base of the valley slope within Cwm Byrgwm. The eastern half of the route passes through an industrialised area, with a track/roadway shown to have been present intermittently. British Quarry and British Iron Works are shown in close proximity to the route, which crosses and runs adjacent to several areas of spoil heaps to the north of the area identified as British. Two reservoirs associated with British Iron Works were located immediately to the south of the alignment.

1902: No changes noted over western end of route. In the eastern half of the route, British Quarry is now shown to be disused, and the two reservoirs associated with British Iron Works are no longer shown, presumed to have been infilled. A mineral railway runs adjacent to and crosses the route at its eastern end.

1922: No significant changes noted in western area. Lower Navigation Colliery is shown adjacent to the route in the northern section of the area identified as British. The section of the track extending from Lower Navigation Colliery to Abersychan is called Farm Road. British Iron Works shown to be disused.

1938, 1953: No significant changes identified along the route. Lower Navigation Colliery shown to have been disused on the 1953 edition.

1965: The track on the alignment of British road appears to have been formalised into a road, which extends along the entire length of the route, including through the area to the north of British. Slope markers are shown along the western section, indicating the road has been formed as cut and fill into the valley slope.

1978/79: No significant changes along the route. Works are shown to be present adjacent to the road in British.

1989, 1990, 1999, 2006, 2021: No significant changes along the route. Much of the former development is removed during this period, assumed to have been demolished. A number of disused workings and quarries are noted particularly where the route passes through British.

2.6 Previous work at the site

Report Reference	Comments
Mynydd Llanhilleth Wind Farm – Peat Depth Survey Report, Technical Note, Wood, 2021	A Phase 1 peat depth survey undertaken on a 100 m by 100 m grid of points, with peat depth measurement taken at each point was completed in 2021. Soils were indicated to comprise a combination of restored soils associated with quarry/opencast working and very acid loamy upland soil with a wet peaty surface and locally free draining acid loamy soil, predominantly on

Report Reference	Comments
	<p>sloping ground. (Cranfield Soil and Agrifood Institute Soilscales Map).</p> <p>A total of 201 peat probes were taken across the Wind Farm site as defined at the time. The recorded thickness of potential peat material ranged from 0 m to 0.4 m, with a calculated mean depth of <0.1 m. Only two locations recorded a potential peat depth of 0.4 m which is the depth defined by the Welsh Government as that which defines true peat and is therefore considered to be very localised in occurrence. All of the turbine locations are within areas where the depth of peat was ≤ 0.2 m.</p> <p>It was recommended that the peat depths were confirmed by intrusive ground investigation. A Phase 2 peat survey was not considered necessary.</p> <p>The peat probing report is included as Annex C.</p>

3. Preliminary environmental risk assessment

3.1 Conceptual Model

The Site has a relatively simple ground model comprising shallow soil/peat and local superficial deposits comprising Glacial Till or Head overlying bedrock at shallow depth, which is classed as a Secondary A aquifer. The peat is not considered to be sufficiently thick or of sufficient extent where identified, to be a significant constraint to development of the windfarm. Extensive mining has taken place beneath the Site and in the wider area. The mining situation is complicated with several phases of underground and opencast activity identified in the southern and central area associated with the Mynyddislwyn seam. The Cefn Glas seam is inferred to underlie the northern section of the Wind Farm site and also the Grid Connection corridor. Multiple seams are inferred to underlie the eastern section of the Access Road. There is no documented and visual evidence of subsidence associated with mining across the Wind Farm site in the form of resolved mining subsidence claims. Groundwater quality on the Site and in the surrounding area is likely to be impacted by the historical mining and landfilling activities.

The Wind Farm site has been subject to opencast mining around the margins of the southern plateau area during the 1950s and 1960s. The opencast voids were reinstated presumably with the overburden material removed to access the coal seam.

A number of small watercourses flow from the plateau either to Afon Ebwy or Afon Lwyd.

Limited potential sources of contamination have been identified on the Site. Potential sources include areas of disturbed ground, former and current farm areas and mining. Except for the areas of former opencast workings and colliery spoil, potential sources are likely to be sporadic in occurrence and generally localised.

3.2 Potential contamination sources

A review of the Site's history and environmental setting has identified potential contaminant sources on the Site and in the surrounding area, as summarised below in **Table 3.2**. The list of contaminants has been established through a review of Annex 3 in the Guidance for the Safe Development of Housing on Land Affected by Contamination R&D66: 2008 Volume 2.

As noted previously, limited sources of potential contamination have been identified based on current and historical usage of the Site.

The main potential source is associated with areas of former opencast workings and local spoil heaps on Site from the underground workings. The opencast backfill is anticipated to have comprised the overburden materials, which from the available records is likely to comprise predominantly sandstone. It is possible that other materials became entrained within the backfill material, however, it was an engineered material, and it is likely to have been a controlled operation.

Farm operations are a potential source of ground and groundwater contamination arising from the use of pesticides, sheep dip, agricultural chemicals, and fuels. In addition, historical agricultural buildings may include asbestos containing materials or instance included within roofing and/or cladding materials. When in a dilapidated state there is the potential for these to release asbestos fibres to ground. Occasional relic structures/demolition materials are noted around the Site, likely to be associated with former mining operations, however these are localised in nature.

Former mine workings are a potential source of toxic and explosive gas. The Coal Authority Report notes remedial works for mine gas from the vicinity of the Site and open voids associated with workings are inferred to underlie the southern site area. The opencast backfill is likely to be more permeable than the intact rock due to its disturbed nature and migration of mine gas is possible. Whilst the turbines are not associated with significant enclosed spaces, it has been considered for the proposed built environment, particularly the substation building and for construction working in excavations. Proximity to mine entries would increase this potential risk.

Potential source areas are shown on **Figure 11A.3**.

Table 3.1 Current and historical contamination sources

No	Source	Likely Contaminants	Location	Source to be considered further
1	Residual mine waste - localised	Metals	Localised across Site	Yes
2	Opencast operations	Fuels, oils, waste materials	Localised in operational areas in Wind Farm site	Yes
3	Opencast backfill	Metals	Southern area of Wind Farm site	Yes
4	Historical farm operations, predominantly around buildings	Hydrocarbons (fuels and oils), pesticides, agricultural chemicals, sheep dip	Current and former farm buildings	Yes
5	Asbestos containing materials associated with demolished or dilapidated buildings (fibres released to ground)	Asbestos	Current and former buildings	Yes
6	Mine Gas	Carbon dioxide, methane	Coal seams and mine entries across Site	Yes

3.3 Potential receptors and exposure pathways

The potential receptors and associated pathways that have been identified are shown in Table 3.2.

Table 3.2 Pathways and receptors

Receptors	Potential Pathways
Current site users – site workers (agricultural workers, operatives/maintenance workers), public open space users	Dermal contact, ingestion (including of contaminated potable water), inhalation of dusts, vapours, fibres and accumulates gases

Receptors	Potential Pathways
Future site users – site workers (agricultural workers, operatives/maintenance workers), public open space users	Dermal contact, ingestion (including of contaminated potable water), inhalation of dusts, vapours, fibres and accumulates gases
Current buildings and services	Direct contact, ingress, and accumulation of gases
Future buildings and services*	Direct contact, ingress and accumulation of gases
Controlled water; Surface water – Nant Ddu, Nant-y-cnyw, Nant-y-Caws, Nant Cyffin**	Surface water runoff, baseflow migration
Controlled water: Groundwater – Secondary A aquifer (Coal Measures), Secondary (undifferentiated) aquifer (Glacial Till and Head)**	Leaching, groundwater migration

*The risk assessment assumes that there will be no mains water supply to the Proposed Development and that if temporary water supply is provided to cabins during construction that this will not be via underground pipes.

**The risks to current and future controlled waters are not likely to change due to the Proposed Development and the risk assessment for these receptors therefore reflects the current and future scenario post development.

3.4 Exclusion from risk assessment

Residential site users

Residential site users of the Site in its current configuration are not considered as part of this assessment as no changes to residential properties are proposed.

Redevelopment/construction workers

The conceptual model does not consider risks to construction/ site maintenance workers on the basis that risks to workers will be dealt with under the Health and Safety at Work Act (1974) and regulations made under the Act. Site-specific contamination data obtained from all site investigations should be included in the pre-construction information (requirement of Construction Design and management Regulations 2015) for the proposed works, to enable any contractors to address potential risk from contamination as necessary in their risk assessments and method statements. Moreover, as the exact details of the method adopted are not currently known, it is not considered appropriate to provide a wide ranging and speculative risk assessment for redevelopment workers.

Invasive species

Invasive species (such as Japanese knot weed and giant hogweed) are not considered within the risk assessment for contamination.

Unexploded ordnance (UXO)

A UXO assessment has not been carried out as part of this study.

Aggressive ground conditions

Constraints including sulphate and ammonia attack of concrete are considered in the geohazards section.

3.5 Preliminary environmental risk assessment

For land contamination risk to be realised, a 'contaminant linkage' must exist. A contaminant linkage requires the presence of a:

- Source of contamination;
- Receptor capable of being harmed; and
- Pathway capable of exposing a receptor to the contaminant.

A preliminary risk assessment has been undertaken for these potential contaminant linkages to identify potentially unacceptable risks on a qualitative basis. Risk is therefore based on a consideration of both:

- The likelihood of an event (probability – takes into account both the presence of the hazard and receptor and the integrity of the pathway); and
- The severity of the potential consequence (takes into account both the potential severity of the hazard and the sensitivity of the receptor).

Further information on the risk assessment methodology used is given in Annex D. The method of dealing with identified risks and the level of significance of those risks will be a function of site use. The risk assessment is based on the future proposed land use and assumes no control measures to manage the risk (e.g., source removal or capping) have been incorporated in the development.

Table 3.3 Preliminary Risk Assessment

Potential Source	Potential Pollutant	Potential Receptors	Potential Pathways to Receptors	Associated Hazard (severity)	Likelihood of Occurrence	Risk/Significance
1 Residual Mine Waste	Metals, sulfates, cyanide	Current site users – site workers, public open space users	Direct contact, inhalation, ingestion	Health Hazard [Mild]	Unlikely Material is likely to have been used locally and to be highly degraded after approximately 60 years. Likely to have been buried/removed during restoration	Very Low
		Future site users – site workers, public open space users	Direct contact, inhalation, ingestion	Health Hazard [Medium]	Unlikely Material is unlikely to be disturbed during routine site activities and to be highly degraded.	Low
		Buildings and services	Direct contact	Degradation of concrete, impact on in ground services [Mild]	Low Any such impact likely to be localised and at depth.	Low
		Controlled water – surface water	Run off, base flow	Water quality impact [Mild]	Unlikely Significant run off not anticipated from this area, any impact likely to be localised and highly degraded. Main watercourses located remotely from site.	Very Low

Potential Source	Potential Pollutant	Potential Receptors	Potential Pathways to Receptors	Associated Hazard (severity)	Likelihood of Occurrence	Risk/Significance
2 Former open cast operations		Controlled water – groundwater	Leaching, migration	Water quality impact [Mild]	Unlikely Groundwater likely to be deep beneath the Site and water quality impacted by historical mining activities.	Very Low
	Fuels	Current site users – site workers, public open space users	Direct contact, inhalation, ingestion	Health Hazard [Mild]	Unlikely Material is likely to have been used locally and to be highly degraded after approximately 60 years. Likely to have been buried/removed during restoration	Very Low
	Fuels	Future site users – site workers, public open space users	Direct contact, inhalation, ingestion	Health Hazard [Medium]	Unlikely Material is unlikely to be disturbed during routine site activities and to be highly degraded.	Low
	Fuels	Controlled water – surface water	Run off, base flow	Water quality impact [Mild]	Unlikely Significant run off not anticipated from this area, any impact likely to be localised and highly degraded. Main watercourses located remotely from site.	Very Low

Potential Source	Potential Pollutant	Potential Receptors	Potential Pathways to Receptors	Associated Hazard (severity)	Likelihood of Occurrence	Risk/Significance
	Fuels	Controlled water – groundwater	Leaching, migration	Water quality impact [Mild]	Unlikely Groundwater likely to be deep beneath the Site and water quality impacted by historical mining activities.	Very Low
3 Opencast backfill – entrainment of non-specification materials	Heavy metals, hydrocarbons	Current site users – site workers, public open space users	Direct contact, inhalation, ingestion, vapour inhalation	Health Hazard [Medium]	Unlikely Material is unlikely to be disturbed during routine site activities. No evidence of vegetation dieback observed. Any such impact likely to be at depth.	Low
	Heavy metals, hydrocarbons	Future site users – site workers, public open space users	Direct contact, inhalation, ingestion, vapour inhalation	Health Hazard [Medium]	Unlikely Material is unlikely to be disturbed during routine site activities.	Low
	Asbestos	Current site users – site workers, public open space users	Inhalation, ingestion	Health Hazard [Severe]	Unlikely Source is limited in extent. Material is unlikely to be disturbed during routine site activities.	Moderate/Low
	Asbestos	Future site users – site workers, public open space users	Inhalation, ingestion.	Health Hazard [Severe]	Unlikely Source is limited in extent. Material is unlikely to be disturbed during routine site activities.	Moderate/Low

Potential Source	Potential Pollutant	Potential Receptors	Potential Pathways to Receptors	Associated Hazard (severity)	Likelihood of Occurrence	Risk/Significance
	Heavy metals, hydrocarbons	Buildings and services	Direct contact	Degradation of concrete, impact on in ground services [Mild]	Low Any such impact likely to be localised and at depth.	Low
	Heavy metals, hydrocarbons	Controlled water – surface water	Runoff, base flow	Water quality impact [Medium]	Unlikely Main watercourses located remotely from site	Low
	Heavy metals, hydrocarbons	Controlled water – groundwater	Leaching, migration	Water quality impact [Medium]	Unlikely Groundwater likely to be deep beneath the Site and water quality impacted by mining activities.	Low
4 Agricultural operations	Hydrocarbons, pesticide, sheep dip, agricultural chemicals	Current site users – site workers, public open space users	Direct contact, inhalation, ingestion, vapour inhalation	Health Hazard [Medium]	Unlikely Any impact is likely to be highly localised and is unlikely to be disturbed during routine site activities. No sheep dipping areas identified.	Low
	Hydrocarbons, pesticide, sheep dip, agricultural chemicals	Future site users – site workers, public open space users	Direct contact, inhalation, ingestion, vapour inhalation	Health Hazard [Medium]	Unlikely Any impact is likely to be highly localised and is unlikely to be disturbed during routine site activities. No sheep dipping areas identified	Low

Potential Source	Potential Pollutant	Potential Receptors	Potential Pathways to Receptors	Associated Hazard (severity)	Likelihood of Occurrence	Risk/Significance
	Hydrocarbons, pesticide, sheep dip, agricultural chemicals	Buildings and services	Direct contact	Degradation of concrete, impact on in ground services [Medium]	Unlikely Potential source areas are likely to be of limited in size and highly localised. No sheep dipping areas identified.	Low
	Hydrocarbons, pesticide, sheep dip, agricultural chemicals	Controlled water – surface water	Run off, base flow	Water quality impact [Mild]	Unlikely Main watercourses located remotely from site. No sheep dipping areas identified.	Very low
	Hydrocarbons, pesticide, sheep dip, agricultural chemicals	Controlled water – groundwater	Leaching, migration	Water quality impact [Mild]	Unlikely Groundwater likely to be deep beneath the site. May be impacted by mining activities. Non sensitive location. No sheep dipping areas identified.	Very low
5 Asbestos containing materials associated with demolished former buildings (fibres released to ground)	Asbestos	Current site users – site workers, public open space users	Inhalation	Health Hazard [Severe]	Unlikely Material is unlikely to be disturbed during routine site activities. Only small volumes in restricted areas identified.	Moderate/low
	Asbestos	Future site users – site workers, public open space users	Inhalation	Health Hazard [Severe]	Unlikely Material is unlikely to be disturbed during routine site activities. Only small	Moderate/low

Potential Source	Potential Pollutant	Potential Receptors	Potential Pathways to Receptors	Associated Hazard (severity)	Likelihood of Occurrence	Risk/Significance
					volumes in restricted areas identified.	
6 Mine gas	Carbon dioxide, methane	Current site users – site workers, public open space users	Inhalation	Health Hazard – toxic/asphyxiation. Explosion/fire risk [Severe]	Unlikely Limited enclosed spaces present. Shallow seam locally removed; opencast backfill more permeable than intact rock cover.	Moderate/low
	Carbon dioxide, methane	Future site users – site workers, public open space users	Inhalation	Health Hazard – toxic/asphyxiation. Explosion/fire risk [Severe]	Low Substation and other enclosed spaces will be present, though not accessed frequently in Proposed Development. Not located close to identified mine entries. Gas remedial works recorded by Coal Authority.	Moderate
	Methane	Current buildings and services	Migration, accumulation	Explosion, fire [Severe]	Low Limited enclosed space. Mine gas remedial works identified from the wider area	Moderate
	Methane	Future buildings and services	Migration, accumulation	Explosion, fire [Severe]	Low Limited enclosed space, not located close to mine entries and occupancy infrequent. Opencast backfill more permeable than intact rock cover. Gas remedial work recorded by Coal Authority.	Moderate

4. Geohazards

A review of potential geohazards has been completed, using the information listed in Section 1. The following potential geotechnical constraints have been identified and are summarised on **Figure 11A.3**.

- **Reworked ground:** reworked ground associated with opencast backfill and related opencast operations is anticipated over the majority of the southern Wind Farm Site area. This is unlikely to have been reinstated in an engineered manner, and to comprise overburden materials, predominantly comprising sandstone with variable clast sizes. Opencast backfill can be susceptible to collapse settlement, particularly where groundwater conditions change. Turbines 3 and 7 are located within the area of recorded opencast, whilst Turbine 6 is located very close to the limit of the recorded opencast area. Remedial works, such as dynamic compaction or alternative foundation solutions such as piled foundations extending to the intact rock are likely to be required at these locations. In addition, the BGS record made ground at Turbine 4 location, although this is anticipated to be thinner as it is outwith the main recorded opencast excavation;
- **Mine spoil:** localised areas of suspected reworking of the ground surface, possibly arising from storage/processing and/or shallow disposal of mined materials have been identified, mainly around the margins of the Wind Farm Site associated with the recorded mine entries and along the grid connection corridor and Access Road. None of these are located in the vicinity of the proposed turbines;
- **Mine entries:** the CCMRs indicate a number of mine entries to be present in all areas of the Site. The majority are within the Wind Farm Site, some of which are anticipated to have been wholly or partially removed by opencast operations, however a number remain which have not been subject to recorded treatment. These represent areas of potential instability and would require treatment for structures located within the zone of influence; Turbine 6 is located in close proximity to recorded mine entries. Two shafts are shown to be present at the extreme eastern end of the grid connection corridor. Nine shafts are shown to underlie or potentially interact with the Access Road, two of which are adjacent to/within areas of proposed amendment to the alignment to facilitate construction traffic. Investigation and treatment (infilling) of the shafts is anticipated in these areas;
- **Historical shallow mining Wind Farm Site:** The Mynyddislwyn seam has been widely worked beneath the southern area, both as recorded and unrecorded workings. Areas of historical unrecorded workings in the Mynyddislwyn seam are considered to have been largely removed by subsequent opencast operations which also locally removed the overlying Mynyddislwyn Rider seam; there are no recorded underground workings in this higher seam, however, it is anticipated to underlie the southern area at shallow depth. The next seam which underlies these areas is the Cefn Glas seam which is not recorded as having been worked and is anticipated to be present at sufficient depth to be considered to present negligible risk of instability. Outside of the areas of recorded opencast in the south west and centre of the Wind Farm site, areas at risk of instability have been identified associated with recorded shallow historical mining activities, where the Mynyddislwyn seam has not been removed by subsequent opencast operations. Based on elevations on the Abandonment Plans, the majority of the recorded workings are at depths in excess of 10 times seam thickness, using a seam thickness of 2.5 m, including at Turbine 4 which is within the area of recorded underground workings. In addition, the overlying material is recorded as being

sandstone on the opencast records, which is likely to provide a competent roof rock. The Mynyddislwyn Small Rider seam is anticipated to be present within this zone and no evidence of workings is recorded nor was it noted to have been worked where it was removed by opencast operations. However, given the sensitivity of the proposed turbine structures, further assessment of the risk associated with these mining activities by intrusive investigation is recommended. Turbine 8 is located within an area of recorded workings within the Mynyddislwyn seam where the thickness of rock cover is less than 10 times the seam thickness. The method of working in the vicinity of the turbine is not clear from the plan – total extraction appears to have been used more widely in this area. In addition, workings in the seam beneath Blean-y-cwm Road associated with roadways from mine entries to the south of the road have less than 10 times seam thickness of rock cover;

- Historical mining, Wind Farm Site opencast highwall: the opencast operations will be associated with highwalls, which are buried steep sided faces of intact rock at the margins of the opencast activities. In these locations, the intact rock is adjacent to reinstated opencast backfill, and as a result there is the potential for significant differential settlement of structures or infrastructure where it spans a highwall. As a result, location of structures on or in the immediate vicinity of highwalls should be avoided. Turbine 3 is located adjacent to an inferred highwall, and a highwall also runs beneath the internal access track between the two areas of the Canyons. The situation at Turbine 6 is unclear as it is located close to the outcrop of the Mynyddislwyn seam, but is just outwith the recorded opencast area, so there is the potential for a limited highwall in this area if the seam has not been fully worked out;
- Historical deep mining Wind Farm Site: the Cefn Glas seam is inferred to be the shallowest seam to underlie the northern area of the proposed wind farm (Turbines 1 and 2), as the ground elevations at the turbine locations are below the extrapolated elevation of the Mynyddislwyn seam based on recorded levels in the area to the south. The Cefn Glas seam is a thin coal and is not recorded to have been worked and is anticipated to be at depths greater than 10 times seam cover, and so risks associated with possible unrecorded workings in this seam area considered to be low. The Wind Farm site is underlain by recorded workings in Brithdir seam at 104 m to 248 m bgl, with additional workings in multiple seams at greater depth. There is considered to be sufficient cover to these seams based on a 'rule of thumb' of 10 times seam cover, to mitigate risk of crown hole migration;
- Historical underground mining grid connection corridor: an area of probable shallow mineworkings is mapped at the eastern end of the grid connection corridor. These are likely to be associated with the Gorllwyn Rider, Upper Six Foot and Upper and Lower Four Foot seams. The Cefn Glas and Brithdir seams are also anticipated to underlie the corridor and may have been subject to historical workings;
- Historical underground mining Access Road: The Access Road route crosses a number of seam subcrops. The depth of these subcrops are unknown as superficial Head Deposits are mapped, however, shallow recorded mining <30 m bgl is identified beneath the eastern end of the route, which is recorded in the CCMR as being associated with the Lower 7 Foot Bottom Leaf, Bute and Five Foot Gellideg coal seams. It is not anticipated that stabilisation of these workings will be required beneath the access road, although strengthening the road foundation should be considered as part of the upgrade works, possibly by incorporation of geotextile, together with implementation of a road maintenance programme to mitigate any mining related subsidence; investigation of these seams should still be undertaken to clarify risk;
- Mining – Fault reactivation: Reactivation of faults by deep mining is a known feature of the South Wales coalfield. In addition, lateral spreading/valley cambering of the

valley sides has taken place, which has been exacerbated by displacement arising from deep mining. No features associated with fault reactivation have been identified from the Coal Authority report (subsidence/fissures), however an area of mass movement has been identified on the northern valley slope of Cwm Ddu, which encroaches into the Wind Farm site and lies to the south of the grid connection corridor, as discussed below. In addition, a subsidence claim from 2010 was lodged in a location to the north of the grid connection corridor although the claim was not accepted. Further information is included in the Coal Mining Risk Assessment in Annex B;

- Faults – faults have been recorded on site. As noted above these may be reactivated by movement associated with mining subsidence and should be avoided when determining locations for wind farm infrastructure. The Coal Authority do not identify any High Risk Development Areas associated with faulting or fissuring on site; however several faults are identified on published mapping and in Abandonment Plans. Fault locations from Coal Authority mapping are shown on Figure 11A.3;
- Bedrock: bedrock is anticipated to be present at shallow depth across the Site. Beneath the Wind Farm site, it may be overlain by a thin veneer of peat and locally superficial deposits overlying, or made ground/opencast backfill where present. Bedrock is also anticipated to be deeper where made ground and head deposits are present in the eastern section of the Access Road. Where the bedrock is intact, it should provide a suitable founding stratum for the identified infrastructure, notwithstanding observations above about mining related displacement and the presence of opencast backfill. It is not known whether bedrock has a weathered upper layer, which may require deepening of foundations. The presence of drift materials, including Glacial Till in the central area of the Site; these may be associated with a requirement for deeper/amended foundation solutions;
- Soil chemistry: any peat is likely to be acidic and sulphate minerals may be present within the Coal Measures strata. This should be assessed to determine the requirements for in ground concrete structures;
- Slope stability: The BGS mapping records evidence of slope instability on the northern valley slope of Cwm Ddu, which is identified as an area of mass movement. The BGS memoir notes landslides on the steep valley sides are common in the South Wales coalfield, where Pennant Sandstone overlies weaker mudstone strata. It notes that most of the movement took place on periglacial conditions during deglaciation, when the support of valley glaciers was removed. It is noted that mass movement does continue, and instability of valley slopes can still present engineering problems. In addition, such movement can result in fissuring of the scarp faces, which can be affected by mining related movement as noted above. Considering the locations of the majority of the proposed turbine structures on the upper valley slopes and plateau, the risk from mass movement of the valley slopes is considered to be negligible, however this should be confirmed at detailed design stage, particularly for Turbine 1, which is located approximately 140 m from the mapped area in Cwm Ddu. Most of the proposed wind farm infrastructure is located on the undulating plateau, and slope stability is therefore not considered to be a significant constraint for most structures. This should be assessed where steeper gradients are present related to former mining activity or on the flank of the plateau along the Grid Connection site;
- Historical in-ground structures: Historical development on Site has been limited, with agricultural buildings predominating. Evidence of relic materials likely associated with demolished structures was locally noted during the Site visit. Relic foundations or inground structures may locally be present arising from former activities, however this is not considered to be a significant constraint for the Proposed Development;

- Peat: potential for landslide/instability. The average peat depth was <0.1 m and only extended to 0.4 m in two locations; all of the turbine locations were in areas where the peat thickness did not exceed 0.2 m. Slope gradients are generally greater than 2°, however, considering the thin nature or absence of peat it is not considered to be a significant constraint. It is recommended that the peat thickness at the proposed turbine locations is proven by intrusive investigation; and
- Existing utilities: a gas main is identified crossing the Wind Farm site; this will be associated with an easement. Utilities information has not been obtained as part of this study.

5. Conclusions and recommendations

5.1 Conclusions

Contamination

The Site is used for agriculture, and locally for forestry. No significant contamination sources have been identified and those which have been considered are likely to be limited in extent or where larger potential sources are present (e.g., restored mine workings) they are considered to present low risk due to nature of materials and/or lack of disturbance/exposure during routine site activities. Current and former agricultural activities also represent potential sources, although these are likely to be sporadic and localised in nature. However, some potential contaminant linkages have been identified that require further consideration for the Proposed Development, as summarised below.

Moderate/low risks to current and future site users (site workers, public open space users) are associated with possible asbestos in proximity to demolished or dilapidated farm buildings where asbestos fibres could feasibly have been released to ground. Although in general site users in the current site configuration or following the proposed wind farm development are unlikely to encounter or disturb material that may contain asbestos/asbestos fibres and sources are likely to be limited in extent, the severity of the consequence of a contaminant linkage raises the risk level, and the Proposed Development could potentially expose soils currently covered by vegetation, increasing the risk of exposure. There is a moderate risk to future site users associated with mine gas, the risk to current site users is assessed to be moderate/low. The Proposed Development would have limited enclosed spaces where gas could accumulate, however, mine gas issues have been identified from the vicinity of the Site. In addition, the opencast backfill represents a more permeable material than intact rock and residual workings and associated voids are present beneath areas of the Site. The risk level reflects the severity of consequence of a contaminant linkage being realised.

In relation to potential metal contamination in mine waste, there is no evidence of vegetation dieback at surface that could indicate large areas of near surface contamination by metals and given the limited current and proposed future use of the Site by workers and members of the public, the risk to current and future site users is assessed to be low.

The other risks to future site users have been assessed as low or very low, on the basis that future site users, including workers and open space users, are unlikely to disturb contaminated soil during normal site usage.

The risks to controlled waters are assessed to be low or very low due to the limited identified potential sources and on the basis that the groundwater (bedrock secondary A aquifer) underlying the Site is likely to be impacted by historical mining activities. There is anecdotal evidence that flow is mainly through fissures, site groundwater is therefore not considered to be a sensitive groundwater resource. Surface water receptors are either not located near potential sources, or the source, if present, is likely to be of limited extent and unlikely to result in significant degradation of water quality.

As previously discussed, the conceptual model does not consider risks to construction /site maintenance workers on the basis that risks to workers will be dealt with under the Health and Safety at Work Act (1974) and regulations made under the act. Site-specific contamination data obtained through subsequent assessments of the site should be included in the health and safety file for the proposed works, to enable any contractors to address as necessary in their risk assessments and method statements.

Geotechnical

A review of geohazards has identified a number of potential constraints. These principally relate to former underground coal mining activities and ground disturbance arising from opencast activities in the southern and central areas of the Wind Farm site. Shallow mining related risk has been identified in the south of the Wind Farm site area whilst risks associated with opencast backfill and highwall locations have been identified in the southern and central areas of the Wind Farm site. Shallow mining risk have also been identified at the eastern end of both the Access Track and the grid connection corridor. Other constraints include valley side instability, possible weathering of shallow bedrock and the presence of acidic soils either due to the presence of peat (thin surface layer has been confirmed on parts of the site) or sulphate minerals associated with the Coal Measures strata/colliery wastes.

These constraints will require further assessment as part of the detailed design process prior to construction of the Proposed Development, and it is recommended that intrusive ground investigation is undertaken to inform this assessment.

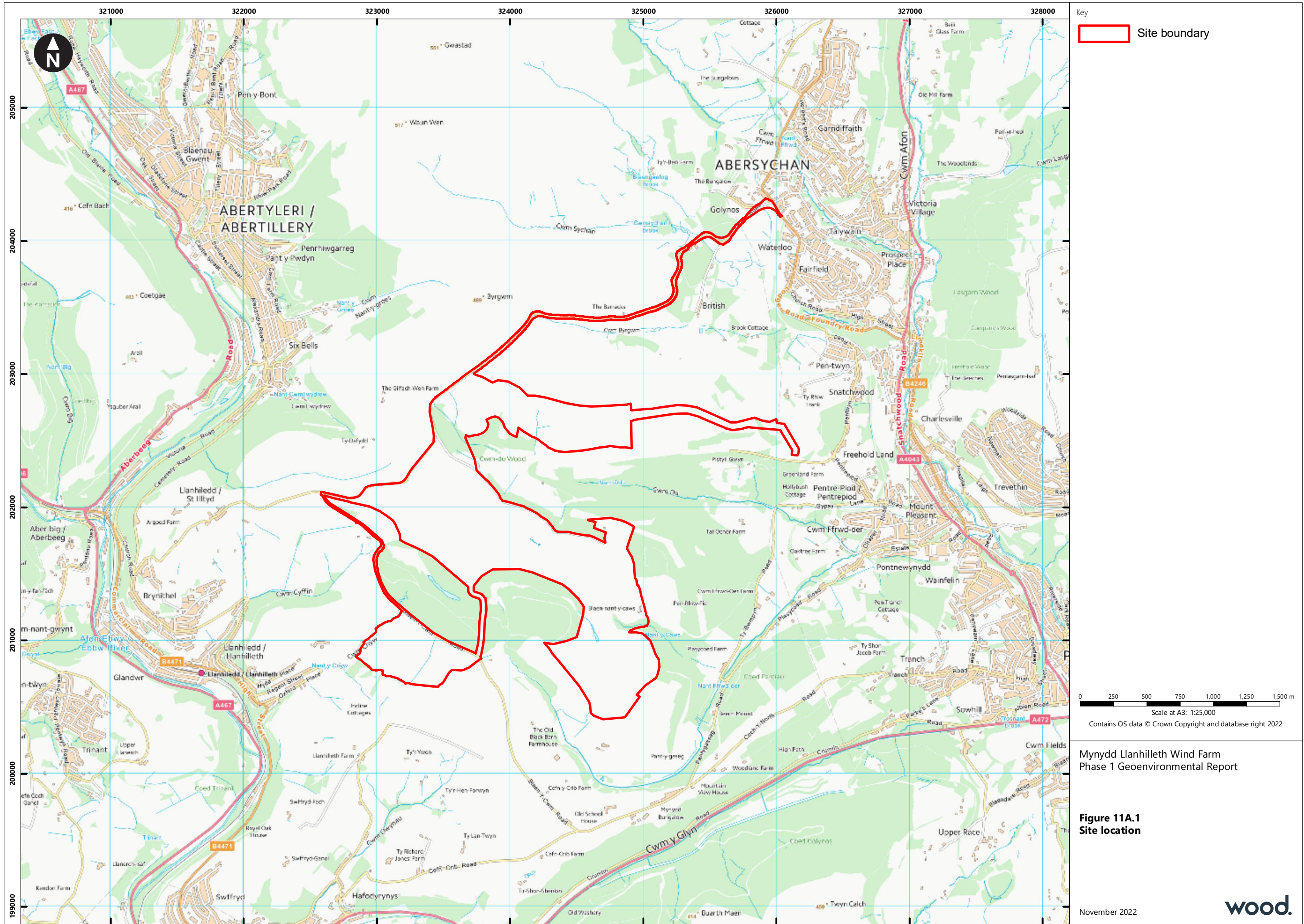
5.2 Recommendations

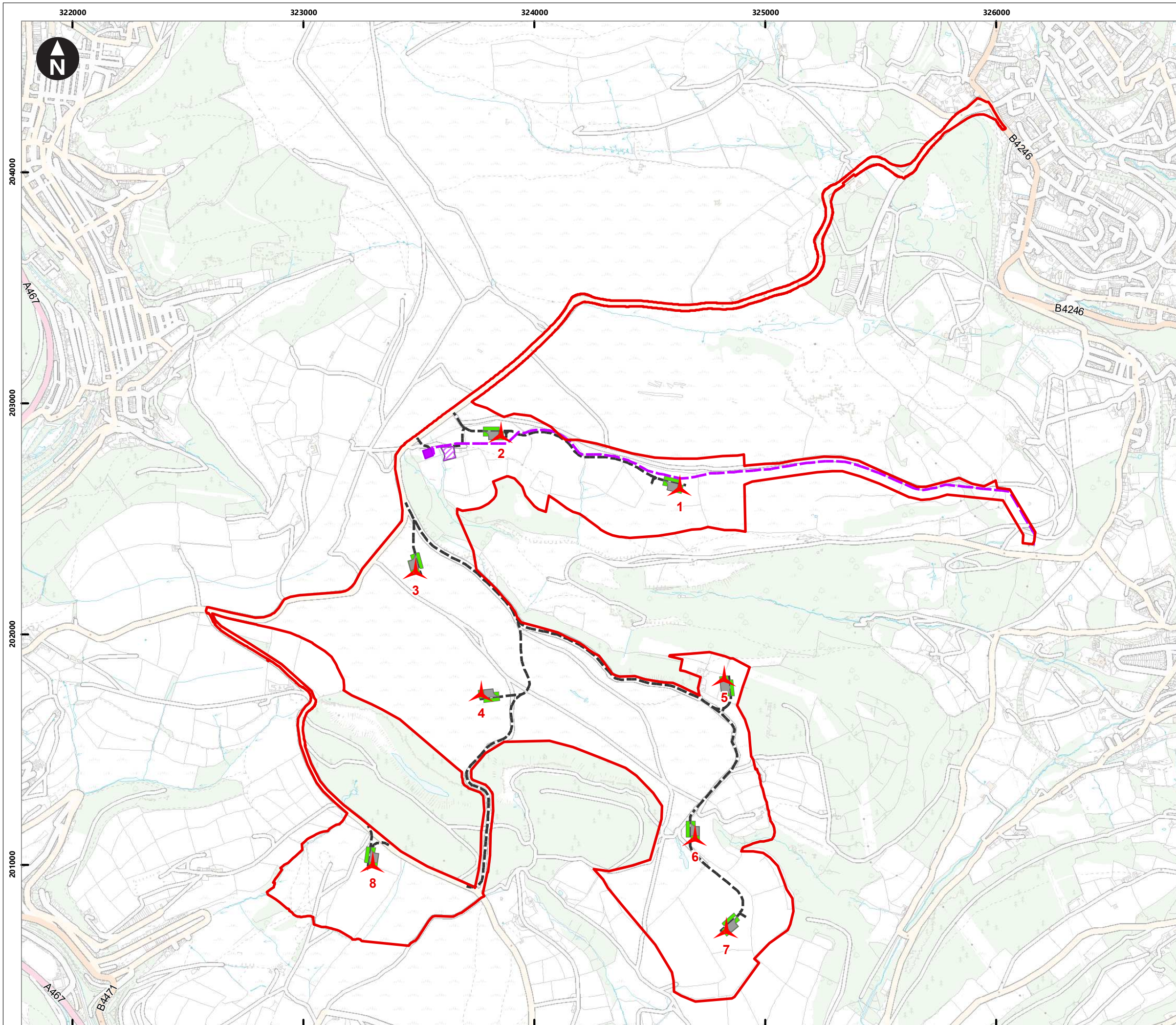
The desk-based assessment has identified some potential contamination constraints associated with the proposed future wind farm use of the site. No ground investigation data is currently available.

The potential land contamination constraints can be mitigated through targeted ground investigation to confirm the presence/absence of contamination (e.g., by metals, hydrocarbons or asbestos), in areas where development is proposed, method statements including procedures for encountering unexpected contamination, Environmental Management Plans, health and safety plans for the works and compliance with the Control of Asbestos Regulations 2012 (in relation to preventing the spread of asbestos). The findings of these investigations and soil testing should inform the detailed design of the Proposed Development and the design of any required remedial measures. It is therefore recommended that this report and all previous reports be thoroughly consulted and incorporated where required into the package of information for the site for any ground works.

Regarding the identified potential geohazards, it is recommended that additional information is obtained from the Coal Authority. This would include a Surface Hazards Incident Report and a Mine Gas Emission Report, together with Abandonment Plans for the shallow recorded workings at the eastern end of the Access Road. A programme of intrusive investigation works is recommended, with associated testing and monitoring for gas and groundwater, to be undertaken at the proposed turbine locations and mine related features beneath access/internal roads to confirm seam depths and conditions, and the thickness of condition of opencast backfill and/or made ground. Confirmation of shaft locations should be undertaken, most likely using geophysical techniques, with possible physical location by excavation or drilling. The location of the opencast highwalls(s) should also be confirmed, possibly through the use of geophysical survey. The area of landslip should be physically mapped and inspected for evidence of recent displacement. More detailed recommendations for further work are included in the CMRA.

Figures





- Key
- Site boundary
 - Turbine location
 - Grid connection
 - Crane pad
 - Crane pad storage
 - Substation
 - Construction compound
 - Access track

0 250 500 750 m

Scale at A3: 1:16,000
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Mynydd Llanhilleth Wind Farm
Phase 1 Geoenvironmental Report

Figure 11A.2
Site layout

November 2022



R:\Projects\807095 Mynydd Llanhilleth Wind Farm\Deliver Stage\ID Design_Technical\Drawings\GIS\MXD\807095-WOOD-FG-OC-00006_P01.2.mxd Originator: jacqui.parkin

