



Phase I Desk Study & Coal Mining Risk Assessment Report

Project Name: Penygarnddu Industrial Estate

Location: Merthyr Tydfil, Wales CF48 2TA

Client: Glanville Consultants Ltd.

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For and on behalf of Southern Testing Laboratories Limited

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A INTRODUCTION

1 Authority

Our authority for carrying out this work is contained in an email from Mr J Cross of Glanville Consulting Engineers, dated 29th August 2024, together with a Glanville Purchase Order (PO No. PO GCH1136).

2 Location

The site is located in the Penygarnddu Industrial Estate to the north east of Merthyr Tydfil in Wales, as indicated on Figure 1 within Appendix A. The approximate National Grid Reference of the site is SO 07802 08695.

3 Proposed Construction

It is proposed to construct a new McDonald's building on the site with associated car parking and drive-thru as per the proposed site layout plan (Figure 2 in Appendix A).

For the purposes of the contamination risk assessment, the proposed development land use is classified as Commercial/Industrial CLEA Model Ref [1].

The gas sensitivity of the proposed development is therefore rated as Low CIRIA C665 Ref [1].

4 Object

This is a Phase 1 Desk Study, including walkover survey, the object of which was to assess the likely nature and extent of soil, groundwater and soil gas contamination on the site. Desk based geotechnical appraisal is extended to include a coal mining risk assessment and associated searches.

5 Scope

This report presents our desk study findings and our interpretation of these data. No intrusive investigation has been carried out to date.

A Preliminary UXO risk assessment was included within our brief for the investigation and was undertaken by specialist contractors in advance of any intrusive investigation works being undertaken. The assessment was made with specific regard to the proposed investigation works/site works and its conclusion may not be appropriate to other activities. This is appended for reference, as is a report by the Coal Authority.

The findings and opinions conveyed via this desks study are based on information obtained from a variety of sources as detailed within this report, and which Southern Testing Laboratories Ltd. believes are reliable. Nevertheless, Southern Testing Laboratories Ltd. cannot and does not guarantee the authenticity or reliability of the information it has obtained from others.

This desk study was conducted and this report has been prepared for the sole internal use and reliance of McDonalds and their appointed Engineers. This report shall not be relied upon or transferred to any other parties without the express written authorisation of Southern Testing Laboratories Ltd. If an unauthorised third party comes into possession of this report they rely on it at their peril and the authors owe them no duty of care and skill.

The recommendations contained in this report are made in respect of the particular context of the investigation as described in the report and may not be appropriate to alternative development schemes. This report should be considered in its entirety and Southern Testing Laboratories Ltd accepts no responsibility for and excludes liability in respect of any omission or alteration made by others, and any use of the report for any purpose other than that for which it was produced.

B DESK STUDY AND WALKOVER SURVEY

6 Desk Study

A desk study has been carried out. Reference has been made to the following information sources.

- Online Geological Maps Ref [4] & Ref [5]
- Online Hydrogeological Maps Ref [6]
- Aerial Photographs
- Historical Ordnance Survey Maps
- Environmental Databases
- BGS Online Historical Borehole Records Ref [7]
- Search on Local Authority Planning Portal for planning history
- MAGIC website mapping Ref [8]
- Gov.UK Website Flood Risk Ref [9]
- Natural Resources Wales
- UXO Risk Assessment
- UK Radon Ref [10] and BRE Radon Ref [11]
- Google Earth (for old aerial photographs)
- Coal Authority Search

The environmental databases search report compiled for this desk study contains site-specific environmental data drawn from data sets that comprise publicly available information together with data from third parties, some of which is under review. Accordingly, Southern Testing Laboratories Limited does not warrant its accuracy, reliability or completeness.

The full report is included in Appendix C and D, a summary of the salient features is included in the following sections of this report.

6.1 Geology

The British Geological Survey Map of the area (Sheet No. 231 – Merthyr Tydfil) together with the BGS online maps, indicates that the site geology consists of Made Ground over Till over South Wales Lower Coal Measures Formation (SWLCM). Detailed review in sections to follow will infer the Till and underlying ironstone and coal beds have been worked opencast for the majority of the north of the site mid 19th Century, leaving deeper fills. The Southern boundary may be a more nearly complete sequence, but with a 1.35m thick coal seam at 11m showing likely evidence of mine works. This seam is believed to be the lowest in the SWLCM, albeit underlain by productive ironstone bands.

6.1.1 Fill and Made Ground

"Fill" and "made ground" are terms which are used interchangeably to describe material that has been placed by man. It may have been placed in a controlled or uncontrolled manner and, if the latter term applies, then very great variations in material type, depth and density are likely to occur. Old refuse filling often contains sulphate rich materials, heavy metals and other dangerous chemicals, and may produce methane gas. Many fills are subject to high and variable amounts of settlement when loaded.

6.1.2 Till

Till deposits are glacial in origin and were formed underneath the former ice sheets. They consist of interbedded clays and silty clays composed of ground-up debris, or rock flour, in which boulders and rocky fragments of all sizes are embedded. Deposits of sand and gravel may be found within the Boulder Clay. The colour of the clay depends on the colour of the rock over which the ice has passed.

6.1.3 South Wales Lower Coal Measures Formation

The South Wales Lower Coal Measures Formation generally consists of grey, coal-bearing mudstones/siltstones and minor sandstones formed in swamps during the Carboniferous period. It should be noted that the strata have been subjected to varying amounts of folding and disturbance. The coals present in the strata vary greatly in both thickness and depth and are thought to extend laterally from southern Wales through to the Bristol Coalfield.

Near Merthyr it is predominantly argillaceous, comprising a sequence of mudstone- siltstone- seatearth cycles and including several widely worked coals. Precise correlation of these seams remains uncertain.

Tabular and nodular ironstones distributed through the measures were formerly worked from patchworks and shallow mines, particularly in the area north of Merthyr Tydfil.

This formation is known to contain pyrite.

6.2 Historical Borehole Records

A search of historic exploratory hole records, both from the online British Geological Survey database [7] and Southern Testing in-house records, revealed three records within 100m of the site, all of which were from the BGS database. Two of the boreholes were relative shallow (1.52m & 1.83m deep), with the third borehole being 15.5m deep and located around 15m away.

A summary of the exploratory holes within 100m of the site is included in the table below.

BGS BH Reference	Final Depth (m bgl)	Distance from site (m) & Direction	Remarks
SO00NE66 accessed 20/09/2024	15.5m	13m East	GL – 0.9m – Made Ground 0.9 – 4.0m – Sand & Gravel 4.0 – 7.5m – Clayey Silt & Sand 7.5 – 9.0m – Gravel & Sand 9.0 – 10.5m – Coal 10.5 – 12.2m – Mudstone & Siltstone 12.2 – 12.92m – Shale 12.92 – 14.15m – Sandstone & Siltstone 14.15 – 15.5m - Shale
			Standing Water Level at 8.5m (bgl).
SO00NE40 accessed 20/09/2024	1.52m	59m South East	GL – 0.9m – Fill 0.9m – 1.52m – Limestone & black Clay Made Ground
			Dry
SO00NE39 accessed 20/09/2024	1.83m	94m South	GL – 0.15m – Topsoil 0.15 – 0.9m – Shale 0.9 – 1.68m – Clay & Gravel 1.68 – 1.83m – Shaley Clay
			Dry

By way of comment, a series of three borehole records approximately 140m to the south of the site recorded the presence of coal seams and potentially collapsed mine workings at depths. These are summarised in the table below.

BGS BH Reference	Distance from site (m) & Direction	Depth (m bgl)	Remarks
SO00NE442 accessed 20/09/2024	137m South	13.43 – 15.51m	Coal
		15.84 – 16.65m	Coal
SO00NE443 accessed 20/09/2024	139m South	8.30 – 11.45m	Coal
		14.05 – 14.35m	Void
		14.35 – 17.65m	Made Ground: Probable collapsed mine workings.
		17.65 – 17.85m	Coal
		17.85 – 19.65m	Probable collapsed mine workings.
SO00NE446 accessed 20/09/2024	142m South	8.80 – 13.35m	Possible collapsed mine workings.
		10.60 – 11.10m	Coal

6.3 Geological Hazards and Mining Activities

Data from various sources relating to potential geological hazards at the site are summarized below. The Hazard Potentials listed for the BGS data are as presented in the Envirocheck report, derived from various generic BGS sources, **which are not considered as site-specific**. It is important that this information is considered in context of the actual site topography, ground conditions encountered during future investigation, and development proposals.

Data Source	Hazard	Hazard Potential to Site	Remarks
BGS	Potential for Collapsible Ground Stability Hazard	Very Low	
	Potential for Compressible Ground Stability Hazard	Very Low	
	Potential for Ground Dissolution Stability Hazard	No Hazard	
	Potential for Landslide Ground Stability Hazard	Very Low	Low risk recorded 30m to the north-east
	Potential for Running Sand Ground Stability Hazard	Very Low	Although expressed as “Very Low” the presence of potentially granular strata within the Till and/or South Wales Coal Measures, may give rise to running sand, especially if groundwater is encountered.
	Potential for Swelling or Shrinkage Clay Ground Stability Hazard	Very Low	Although expressed as “Very Low” the presence of potentially cohesive soils within the Till and/or South Wales Coal Measures, may lead to more significant swelling and shrinkage, especially if high water demand trees are present on site.
	Shallow Mining Hazard	The Envirocheck datasheet lists the site within an area that may be affected by coal mining activity (see below).	
	BGS recorded mineral site	The Envirocheck datasheet lists 2 No. <i>BGS Recorded Mineral Sites</i> within 250m of the site, the nearest entry is listed as an Iron Ore mine 234m to the south of the site.	

Data Source	Hazard	Hazard Potential to Site	Remarks
PBA	Natural & Mining Cavities	The Envirocheck datasheet lists no <i>Natural or Man-Made Mining Cavities</i> within 2km of the site.	

6.4 Radon Risk

With reference to the Envirocheck report, UK Radon Ref [10] and BRE Radon Ref [11] guidance: The site is listed within a lower probability radon area (less than 1% of homes are estimated to be at or above the action level) and therefore, no radon protection is required on this site.

The UK Health Security Agency and HSE policy and guidance recommends and, in some cases, requires, that the owner and/or occupier of buildings undertake radon monitoring in all occupied and used basement areas.

It is therefore the owner and/or occupier's responsibility to ensure that the above policy and statutory requirements regarding radon monitoring are followed.

If future monitoring identifies radon levels above 100Bq/m³ within a dwelling or above the relevant action level for occupational exposure, the Local Authority should be notified.

6.5 Hydrology and Hydrogeology

Data from Natural Resources Wales and other information relating to controlled waters is summarised below.

Data		Remarks	Possible Hazard to/from Site (Y/ N)
Aquifer Designation	Superficial Deposits	The Superficial Deposits (Till) mapped beneath the site are classified as a Secondary Undifferentiated Aquifer - Material previous designated minor or non-aquifers, but information is insufficient to classify them as either a Secondary A or B Aquifer.	N
	Bedrock	The Bedrock (Lower South Wales Coal Measures) mapped beneath the superficial deposits is classified as a Secondary A Aquifer - Permeable layers capable of supporting water supplied at a local rather than strategic scale, and in some cases forming an important source of base flow.	Y
Groundwater Vulnerability	Superficial Deposits	The Superficial Deposits are classified as a Low vulnerability, Undifferentiated Secondary Aquifer.	N
	Bedrock	The Bedrock is classified as a Low vulnerability, Secondary A Aquifer	N
Abstractions	Surface Water	The Envirocheck datasheet lists 14 No. Surface Water Abstractions within 2km of the site. The nearest entry is listed as a roadside pond 281m to the east of the site.	N
	Groundwater	The Envirocheck datasheet lists 5 No. Groundwater Abstractions within 2km of the site. The nearest entry is listed as a borehole 194m to the north-east of the site (slaughtering process water).	N
Source Protection Zones		On the basis of the Envirocheck datasheet the site is not mapped within a Source Protection Zone (SPZ).	N
Surface Watercourses		The Envirocheck datasheet lists the <i>Nearest Surface Water Feature</i> as 58m to the north of the site. It is believed this refers to a drainage ditch.	Y

Data	Remarks	Possible Hazard to/from Site (Y/ N)
Groundwater Flood Risk*	The Envirocheck datasheet lists the site as within an area where there is potential for groundwater flooding to occur within property situated below ground level.	N
Surface Water Flood Risk*	The Natural Resources Wales "Check your flood risk" website (September 2024) lists the site to be within an area of Very Low Risk in terms of flooding from surface water and small watercourses. Very Low Risk means that each year this area has a chance of flooding of less than 0.1%.	N
Marine / Fluvial Flood Risk*	The Natural Resources Wales "Check your flood risk" website (September 2024) lists the site to be within an area of Very Low Risk in terms of flooding from river or the sea.	N
Discharge Consents	The Envirocheck datasheet lists 3 No. Discharge Consents within 250m of the site. The nearest entry is listed as the discharge of trade effluent from the adjacent Ready Mixed Concrete site to the immediate south-west.	N

* Based on data from Natural Resources Wales. These sections are provided for information only, this report does not constitute a formal flood risk assessment and specialist advice should be sought in relation to potential flooding issues.

The site is mapped to be underlain by Till, which is classified as a Secondary Undifferentiated Aquifer (material previous designated minor or non-aquifers), suggesting these materials have fairly low permeability. Therefore, the risk to groundwater, from potentially mobile contaminants at the site surface, will be fairly low.

6.6 Historical Ordnance Survey Maps

Copy extracts of historical Ordnance Survey plans dating from 1876 to 2024 were obtained and are presented in Appendix H. In summary, the earliest maps show the site to have been already worked out and remaindered rough and undulating as heathland for grazing. Undulation reconfiguration infers additional fill movements in the 1960's and 1980's - the latter potentially associated with site use change to batching / aggregate works operations.

From the earliest map (1876) until the 1920s mapping, the site is shown to comprise an area of open land. A railway line, running approximately north-east to south-west, together with its associated station and siding, are shown adjacent to the south/south-east boundary of the site. The station is labelled "Dowlais Top Station".



Beyond the railway line/station is a road and another railway line also running north-east to south-west. A series of structures labelled "Old Shaft (Ironstone)" are present approximately 250m to the south/south-west of the site. A

large area of pits/earthworks, labelled as an “Old Quarry” is present approximately 100m to the north/north-west of the site. A structure labelled “Limekiln” is shown approximately 50m to the north-east of the site, adjacent to a railway line, shown to be running from the main railway line to the area of the old quarry.

On the 1960s mapping the site and surrounding area are shown in a similar configuration to the earlier mapping, with the railway lines and road still present, although the pits/earthworks features of the “Old Quarry” previously shown to the north/north-west of the site have extended onto the site and the surrounding area, north of the railway line. The limekiln and its associated railway line are no longer present, with the railway line annotated as dismantled. The road to the south/south-east of the site is labelled as “Heads of the Valleys Road (A465)”. The larger railway line adjacent to the road is labelled as “Dismantled”.

By the 1975 map the pits/earthworks features on site and to the north of the railway are no longer mapped; these areas are labelled as “Tip (disused)”. The railway line adjacent to the south/south-east of the site is labelled as “Dismantled”. Dowlais Top Station is also no longer present. The area to the south of the road/dismantled railway line is labelled as “Opencast Workings”.

From the 1980s mapping onwards the site and surrounding area appear in a similar configuration to the modern day mapping. The site is labelled as a “Works” with a hopper and conveyor belt present on site. An earthworks slope/bund is present adjacent to the hopper/conveyor belt. The railway lines to the south/south-east of the site are no longer present, although the road (Heads of the Valleys Road) is still present. The area to the north/north-west of the road/site comprises a series of warehouse structures and a superstore.

6.7 Environmental Databases

Data Source	Distance (m)	Direction	Details	Possible Hazard to Site (Y/N)
Historical Industrial Land Use	The Envirocheck datasheet lists 9 No. <i>Potentially Contaminative Past Land Uses</i> within 250m of the site, these are listed below.			
	0	E	General quarrying: 1891-1905	Y
	0	SE	Railways: 1891-1951	Y
	8	SE	Railways: 1891-1965	Y
	59	N	Mineral railway: 1905	N
	61	E	Railways: 1891-1951	N
	80	S	Sawmilling: 1891	N
	88	SE	Railways: 1891-1951	N
	109	SE	General quarrying: 1891	N
	123	SW	General quarrying: 1891	N
Current Industrial Land Use	The Envirocheck datasheet lists 11 No. <i>Contemporary Trade Directory Entries</i> within 250m of the site, these are listed below. Any duplicates have been omitted.			
	0	E	Food Product Manufacturers – Inactive	N
	0	E	Ready mixed Concrete & Mortar – Inactive	Y
	23	N	Sand, Gravel & Other Aggregates (concrete plant) – Active	N
	41	NE	MOT testing – Active	N
	41	NE	Ready mixed Concrete & Mortar – Inactive	N
	41	NE	Garage Services – Inactive	N
	97	S	Petrol Filling Station – Inactive	N

Data Source	Distance (m)	Direction	Details	Possible Hazard to Site (Y/N)
	109	S	Petrol Filling Station – Active	N
Current and Historical Landfills	The Envirocheck datasheet lists 2 No. <i>Historical Landfill Site</i> , 2 No. <i>Licensed Waste Management Facility</i> entry and 1 No. <i>Registered Landfill Site</i> entry within 250m of the site. These are listed below. Any duplicates have been omitted.			
	1	SW	Deposited Waste included Inert Waste: 1991-1992	Y
	30	W	No known restriction on source of waste	Y
	155	SE	Deposited Waste included Industrial, Commercial and Household Waste: 1970-1989	Y
	200	NE	Metals Recycling Site	N
Fuel Sites	The Envirocheck datasheet lists 2 No. <i>Fuel Station Entries</i> within 250m of the site. These are listed below.			
	109	S	Texaco Petrol Station - Open	N
	153	W	Asda Hypermarket - Open	N
Pollution Incidents	The Envirocheck datasheet lists no <i>Pollution Incidents to Controlled Waters</i> with 300m of the site.			N
IPPC/LAPPC Authorisations	The Envirocheck lists 5 No. <i>Local Authority Pollution Prevention and Controls</i> within 250m of the site. These are listed below.			
	0	E	Blending, packing, loading and use of bulk cement.	Y
	34	N	Animal carcase incineration processes under 1 tonne an hour.	Y
	37	NE	Waste oil burners, less than 0.4MW net rated thermal input.	Y
	109	S	Petrol filling station.	N
	175	W	Petrol filling station	N
Hazardous Substances Consents	The Envirocheck datasheet lists no Hazardous Substances Consents within 250m of the site.			N

Generally only potential sources within 250m of the site have been considered above. While additional potential sources may exist, due to their distance from the site, the mapped underlying low-permeability superficial deposits and topography of the local area, they are not considered to pose a significant risk.

Potential contaminants associated with the petrol filling station, waste oil burners, Texaco, Asda Hypermarket are not considered to pose a risk to the site, given the anticipated depth of the groundwater (8.5m in a BGS borehole around 13m away) therefore contaminants mobilised within the groundwater from off-site sources are unlikely to impact the site via lateral groundwater flow. The clay content within the superficial till will also limit vertical migration of potential contaminants within the groundwater to the site. Additionally, there is only potential for groundwater flooding at buildings below ground level and, as there are no basements proposed, groundwater flooding is unlikely to be shallow enough to affect the soils at surface level. The only potential identified pathway would be via surface run-off as the local topography slopes from the north to the south, although the site is not a localised low point. Pathways associated with run-off are also unlikely for certain sources due to local topography sloping from the north to the south.

6.8 Planning Application History

Planning application records were accessed via the Merthyr Tydfil County Borough Council website (September 2024). The applications relating to the site are summarised in the table below.

Application Number	Application Date	Proposal Details / Comments	Decision
P/96/0443	November 1996	Construction of enclosure to loading dock on existing food store. Lidl (UK) Ltd. Penygarnddu Dowlais Top.	Approved
P/12/0273	May 2013	Erection of ready mix concrete plant. Land Adjacent To Station House Pengarnddu Industrial Estate Dowlais Top Merthyr Tydfil.	Approved

One entry refers to the Lidl store, adjacent to the western site boundary. The other entry refers to the site use as a concrete mixing facility.

Whilst additional historical planning applications for the site may exist, these have not been obtained via the Merthyr Tydfil County Borough Council website.

6.9 Ground Gas Risk

There is the potential for ground gas (including methane, carbon dioxide and depleted oxygen) to be derived from the four landfills located within 200m of the site, the closest located 1m to the south-west of the site which relates to an inert landfill active from 1991 until 1992. Additionally, a landfill with no known restriction in terms of accepted waste was present 30m to the west of the site which was closed in 1993, therefore the nature of the infill material is unknown and could contain a high proportion of degradable materials and organic content.

The site is also mapped as being underlain by Made Ground, which is also acknowledged as a potential source of land gas although, in our experience, this material is thought likely to be reworked natural material and, therefore, unlikely to be a viable source of land gas.

6.9.1 Ground Gas Risk - Coal Mining

The site is situated within a Coal Mining 'Development High Risk Area' (CMRA), where shallow coal mining activities are considered high-risk for proposed developments. Ground gases, including methane, coal mine methane, carbon monoxide, hydrogen sulphide, and carbon dioxide, can originate from both natural processes related to coal and anthropogenic activities linked to coal mining. Given the proposal for a permanent building on the site, there is a risk of ground gas ingress and accumulation into proposed structures. Additionally, the presence of mine gas flows may contribute to a high-risk scenario. While unworked coal measures in the ground are not a credible source of ground gas that could affect a building, there may be shallow, unrecorded workings that pose a significant risk [12]. Mine entries and historical shallow workings are documented in close proximity to the south-east of the site, where the underlying geology may contain preferential pathways in the productive superficial and bedrock aquifers. The migration potential of the low permeability superficial deposits will act as a barrier to ground gas migration to the upper surface.

There are no recorded instances of mine gas reported; however, this does not mean that mine gas is not present within the vicinity. The Coal Authority Report indicates that the site falls within a High Risk Zone concerning development, and potential ground gas generation from coal seams should be further considered during intrusive fieldworks.

Although the gas sensitivity of the proposed development is rated as Low CIRIA C665, given the distance of the identified potential sources of ground gas from the site (and receptors), the age of the materials (could be actively gassing), and the high ground gas potential of this source, the characteristic gas situation for the site should be assessed. Response zones of the ground gas monitoring wells should be installed to target potential onsite and offsite source or migration pathway and to establish the potential source of ground gas onsite. For example, the response zone should be situated within Made Ground, any superficial deposits, in a worked coal seam or in the surrounding Coal Measures strata [13].

6.10 UXO Risk Management

The possibility of unexploded ordnance (UXO) being encountered on a site falls within the category of a potentially significant risk and should be addressed as a legal duty under the Construction (Design and Management) Regulations by the Client as early as possible in a project.

The CIRIA publication C681 Ref [14] has been developed to provide a consistent framework for the management of potential risks posed by UXO during site investigation and groundwork phases of construction. The process adopts a tiered approach, divided into four distinct stages; Preliminary risk assessment, Detailed risk assessment, Risk mitigation and Implementation.

A preliminary UXO risk assessment has been prepared by 1st Line Defence and concluded that the risk from UXO on site is not anticipated to be above the “background risk” for the Merthyr Tdyfil area, which sustained an overall low density of bombing, during the Second World War. The assessment was made with specific regard to the proposed investigation works/site works and its conclusions may not be appropriate to other activities.

7 Site Walkover Survey

7.1 General Site Description and Boundaries

The site, which is located within the Penygarnddu Industrial Estate, is roughly rectangular and extends to a maximum of approximately 70m x 40m. At the time of the walkover, site comprised a disused area of land, covered in hardstanding. An earth bund approximately 3-4m in height is present within the south-west/north-western section of the site.

The site is bounded to the north-east by an unnamed road, which runs approximately east to west. The south-eastern site boundary is marked by a derelict fence beyond which is an aggregate/highways yard which includes piles of aggregate; to the south of the aggregate yard, is the Heads of the Valleys Road (A465). The south-western/north western site boundary is marked by an earth bund beyond which is a retaining wall which marks the edge of a car parking area.

7.2 Topography and Drainage

On a regional scale, the topography of the local area generally slopes down from the north and the south-east, with the Heads of the Valleys Road (A465) marking a relatively low point within the local area.

The site itself slopes down gently from the gate/site entrance in the northern corner towards the south-eastern site boundary. An earth bund, approximately 3-4m in height, is present within the south-western/north-western section of the site. An approximately 2m high retaining wall and gabion wall were present along the southern edge of the earth bund.

At the time of the walkover, an area of standing water was noted within the south-western section of the site.

7.3 Vegetation

The main body of the site is generally absent of any significant vegetation. The earth bund on site was noted to be covered in grass, shrubs and some semi-mature saplings/trees. A number of semi-mature to mature trees were noted within the north-eastern corner of the site.

7.4 Buildings and Land Use on Site and Nearby

At the time of the walkover survey, the majority of the site was vacant. A disused welfare cabin was present within the north-eastern corner of the site. The main body of the site was covered in a mixture of concrete and gravel hardstanding. An approximately 2m high retaining wall and gabion wall were present adjacent to the earth bund on site.

During the course of the walkover survey, an area of fly-tipped material was noted between the back of the earth bund and the retaining wall for the adjacent car park area.

The area surrounding the site comprised predominately commercial/industrial properties, with their associated car parking areas. An aggregate/highway yard was noted to the south-east of the site. A derelict residential property is present to the north-east of the site. A supermarket with its associated car parking area is present to the north-west/south-west of the site.

7.5 Site Photographs

A series of photographs showing the site and surrounding area at the time of the walkover survey is included in Appendix G.

C PRELIMINARY SITE MODELS

8 Conceptual Engineering Geological Ground Model

From the desk study information and walkover undertaken at this site the following conceptual ground model has been formulated.

Data Source	Comments
Geology	The BGS mapped geology comprises of Made Ground over Till over South Wales Lower Coal Measures Formation. The nearest publically available BGS borehole log recorded Made Ground up to 0.9-1.52m bgl, underlain by Till deposits comprising sand/gravel and clayey silt/sand up to 9.0m bgl, underlain by bedrock geology of interbedded layers of coal, mudstone/siltstone, shale, sandstone/siltstone and shale proven up to 15.5m bgl.
Former Site Use	There is worked ground/potentially infilled quarry/spoil heaps located on site; the nature of any infill material although unknown at this stage, on the basis of our previous experience, is thought likely to comprise reworked natural soil. Made Ground is generally highly variable and typically unsuitable for shallow foundations, which should be considered if the proposed development includes structures constructed in this area. Old refuse filling, if present, often contains sulphate rich materials, which are aggressive to concrete.
Groundwater	Shallow groundwater is considered unlikely to be encountered within the South Wales Lower Coal Measures Formation bedrock geology underlying the site; a nearby borehole log records a standing water level of 8.5m bgl, although perched water seepages may be present in the Made Ground and in the Till (depending on the clay content). Therefore, some minor de-watering may be required, particularly in the northern portion of the site.
Surface Water	The site is generally located in an area of very low risk from surface water flooding and from flooding from rivers without defences, so flood defences are unlikely to be required in the future design.
Potential Geo-hazards	Till is defined as a heterogeneous deposit which may have the potential for shrinking and swelling in clay deposits, especially if high water demand trees are present on site. There is also the potential for Running Sand Ground Stability Hazard depending on the sand content, especially if groundwater is encountered. Perched water may also be present depending on the clay content. South Wales Lower Coal Measures Formation - Historical and current coal mining activities have the potential to cause ground instability, where unrecorded workings pose an additional risk. There is the potential for shrinking and swelling in clay deposits, especially if high water demand trees are present on site. There is also the potential for a Running Sand Ground Stability Hazard depending on the sand content, especially if groundwater is encountered.

There is a probability of deep un-engineered made ground and shallow coal workings affecting the site. An abnormal foundation solution is highly likely, potentially requiring both ground improvement and mineworks treatment exercises. This is dependent on the position of the build-print on the site and whether it falls inside or outside the opencast worked area (and or the remaining coal seam).

On the basis of the available information the geotechnical categorization for the proposed structure(s) is considered to fall within Geotechnical Category 2 – Conventional structure with no exceptional risk or difficult ground or loading conditions; Eurocode 7 Ref [15].

9 Conceptual Site Model

In the context of this report, the conceptual model summarises the potential pollutant linkages identified for the site and forms the basis of the risk assessment for the site. The preliminary model comprises the potential sources of contamination, receptors that could be harmed and exposure pathways identified from the desk study and walkover survey. These potential linkages form the basis upon which the investigation is designed and reported.

9.1 Potential Sources of Contamination

Potential contaminants associated with these uses have been compiled from DoE industry profiles, our experience of such sites and UK CIRIA C552 approach.

9.1.1 On-Site Sources

Potential Source	Potential Contaminants
Made Ground (Earth Bund on site)	Unknown Made Ground although such materials can contain elevated concentrations of Heavy Metals, Polyaromatic Hydrocarbons (PAHs) and Asbestos.
Fly-tipped Materials on site	Unknown composition, but could contain elevated concentrations of Heavy Metals, Asbestos and TPHs.
Historic Infilled Quarry/Worked ground	Unknown fill material: fragments of Asbestos Containing Materials (ACMs), Polycyclic Aromatic Hydrocarbons (PAHs), heavy metals, petroleum hydrocarbons and other contaminants depending on the source.
Former Railway Land	Potential for the presence of ash ballast, which may include contaminants such as heavy metals, sulphates, PAHs and TPHs.
Food Product Manufacturers – Inactive	Contaminants likely associated with the use of a kiln and associated fuels, workshops and disposals.
Ready mixed Concrete & Mortar – Inactive	

The site appears to have been located within an area of industrial use, since at least the late 1800s, and the site itself appears to have been developed in some form or another since at least the 1960s; The site also may have been quarried/worked and backfilled historically. It appears to have been in a similar configuration since approximately the 1980s where it is understood to have comprised a concrete mixing works.

An earth bund of unknown construction/materials is present on site, along with some fly-tipped material.

9.1.2 Off-Site Sources

The site may be impacted by contamination migrating from beyond the site boundary. The following potential off-site sources have been identified.

Potential Source	Distance from Site Boundary	Direction	Potential Contaminants	Likely hazard to Site
Landfill sites	0-200m	SW, SE, W, NE	Ground gas (including methane, carbon dioxide and depleted oxygen)	High
Animal carcass incineration processes	34m	N	VOCs, ash, Petroleum hydrocarbons, heavy metals	Low

9.2 Pollutant Linkages and Conceptual Site Model Summary

The following diagram shows the potential pollutant linkages identified for the site and summarises the preliminary conceptual model:

9.3 Preliminary Conceptual Site Model

The table below assess the risk for the possible potential pollutant linkages that could exist during, and following, the proposed development works. This risk estimation assumes no mitigation has been undertaken.

Source		Pathway	Potential Receptor		Probability	Consequence	Risk Category	Explanation
On site Sources of Contamination in Section 9.1*	Affects Soils: Metals, petroleum hydrocarbons,	Inhalation, Ingestion Dermal Contact & Plant uptake	Humans	Future Site Workers and Maintenance workers	<i>Unlikely</i>	<i>Medium</i>	Low	Although potential onsite sources of contamination have been identified, no private gardens or soft landscaping are to be included within the proposed development. The proposed commercial site usage does somewhat mitigate the risk to the end users, as the entire site is proposed to be covered in hardstanding, which will limit the potential exposure.
				Construction Workers	<i>Low Likelihood</i>	<i>Mild</i>	Low	Exposure to maintenance and construction workers can be mitigated by the use of appropriate PPE/RPE and maintaining good hygiene levels.
		Run-Off Leaching Direct Contact	Controlled Waters	Groundwater – High permeability deposits with preferential pathways (fractures), Secondary Undifferentiated aquifers	<i>Low Likelihood</i>	<i>Mild</i>	Low	Leachable contaminants in the onsite soils may be mobilised by infiltration, although shallow groundwater is not anticipated. There are no groundwater abstraction licenses recorded nearby. However, both the superficial deposits and bedrock strata are designated as moderately to highly permeable aquifers.
				Surface water - None	<i>Unlikely</i>	<i>Mild</i>	Low	The nearest surface water feature is located 58m north of the site, however this is unlikely to be impacted by onsite contaminants via surface runoff owing to the local topography generally sloping north to south.
		Direct Contact	Property	Infrastructure - Water Supply Pipes	<i>Likely</i>	<i>Medium</i>	Moderate	Organic contamination (if present) may permeate into buried water pipes especially if situated in contaminated soils. It may not be possible the depth of the Made Ground at the site, it may not be possible to install pipes in uncontaminated soils. This risk can be mitigated if the pipes are upgraded to mitigate the risk, where standard polyethylene pipes are not suitable in contaminated ground (in accordance with UKWIR guidance). This is common on Brownfield sites.

				Structures - Substructures/ foundations	Likely	Medium	Moderate	Potential impact on buried structures with corrosive contaminants in soil and groundwater. Contaminants that are aggressive to concrete may be found in quarry fill materials.
	Ground gas derived from onsite infilled ground and coal seams	Migration through faults in the underlying geology and subsequent ingress and accumulation Utility routes associated with the proposed building may facilitate lateral migration.	Property	Structures - Substructures/ foundations Future site uses – Build-up of hazardous ground gases into proposed structures which have the potential to cause explosion/asphyxiation	Likely	Severe	High	Potential for ground gas to be derived from both on-site and off-site potential sources, where potential pathways have been identified. The risk associated with the potential accumulation of the identified ground gas risks could have a severe impact on receptors, where the likelihood has been defined as likely associated with the potential sources identified. Caution should be exercised should shallow excavations be undertaken for the proposed development, where ground gas could accumulate in the confined space.
	Groundwater contamination/leachate from mine workings	Preferential pathways in underlying geology	Property, humans		Low likelihood	Medium	Low/Moderate	Unsaturated zone is likely to be significant and unlikely to be shallow enough to impact shallow soils. Additionally, the superficial till deposits will likely impede the lateral migration of groundwater.
	Very Low		Low		Low/Moderate		Moderate	
							High	
								Very High

Conceptual Site Model Key:

PROBABILITY						CONSEQUENCE	
Classification		Definition				Classification	Definition
Unlikely		Circumstances are such that it is improbable that an event would occur even in the very long term.				Minor	- Easily preventable, non-permanent health effect on humans, or no effects. - Minor, low level & localised contamination of onsite soils. - Easily repairable damage to crops/ buildings/property/ infrastructure.
Low Likelihood		Circumstances are such that it is by no means certain that an event would occur even over a longer period, and it is less likely in the short term.				Mild	- Easily preventable, permanent health effects on humans. - Pollution of non-sensitive water resources. - Localised damage to crops/ buildings/property/ infrastructure (on or off site).
Likely		Circumstances are such that such an event is not inevitable, but is possible in the short term and is likely over the long term.				Medium	- Medium/ long-term (chronic) risks to human health. - Medium/ long-term risk of pollution of sensitive water resources or ecosystems. - Significant damage to crops/ buildings/ property/ infrastructure (on or off site). - Contamination of off-site soils.
High Likelihood		Circumstances are such that an event appears very likely in t short term or almost inevitable in the long term. or there is already evidence that such an event has occurred.				Severe	- Short-term (acute) risk to human health. - Short-term risk of pollution of sensitive water resources or ecosystems. - Catastrophic damage to crops/buildings/infrastructure, including off-site soils.
RISK CLASSIFICATION MATRIX						RISK CATEGORY	
Probability		Consequence				Category	Definition & Likely actions required
						Very Low	- Harm to a defined receptor is unlikely, and would be minor at worst. - No liabilities are likely to arise. - Further Investigation is not required at this stage. - Remediation is very unlikely to be required.
						Low	- Harm to a defined receptor is possible, but is likely to be mild at worst. - Liabilities could theoretically arise, but are unlikely. - Further investigation is not required at this stage. - Remediation is unlikely to be required.
						Moderate	- Harm to a defined receptor is possible, but severe harm is unlikely. - Investigation is likely to be required to clarify the level of potential liability & risk. - Some remediation may be required in the longer term.
						High	- Harm to a defined receptor is likely. - The risk, if realised, may result in a substantial liability. - Urgent investigation (if not already undertaken) is likely to be required. - Remediation is likely to be required in the long term, possibly sooner.
						Very High	- Severe hard to a defined receptor is very likely, or has already occurred. - The risk is likely to result in a substantial liability. - Urgent investigation (if not already undertaken) is likely to be required. - Urgent remediation is likely to be required.

10 Desk Study Conclusions and Recommendations

The site is currently a roughly rectangular parcel of disused land covered in hardstanding and an earth bund. It is proposed to develop the site with a new McDonald's, including parking.

This Phase 1 Preliminary Risk Assessment (PRA) has been produced to evaluate the potential risks to the identified receptors and to identify potential constraints associated with the proposed development based on available desk-based information.

The desk study and walkover has identified potential on-site sources of contamination in the form of Made Ground both within the earth bund and from historical development of the site and surrounding area. The site appears to be a backfilled quarry.

The desk study has also identified a potential ground gas risk from made ground on site, landfills within close proximity of the site and coal mining/coal seams.

In order to confirm and assess the risks identified within this desk study, a Phase II intrusive investigation should be undertaken in relation to the current proposed end use. The following scope of works is recommended:

- Soil sampling and chemical testing should be undertaken to assess the potential contamination risks to human health, water supply pipes and controlled water receptors in the underlying soils at the site from identified contamination.
- Drilling of boreholes across the site to assess the potential presence of shallow ground workings, especially targeted in the footprint of the proposed building, with detailed logs to assess the depth of less permeable till deposits and the presence of preferential pathways such as fracture spacing, infilling,
- Installation and subsequent monitoring of ground gas wells, where response zones of the pipework should be designed on site to target potential on and off-site source or migration pathway and to establish the potential source of ground gas on-site. For example, the response zone should be situated within Made Ground, any superficial deposits, in a worked coal seam or in the surrounding Coal Measures strata [13].
- Should significant gross or leachable contamination is identified during the ground investigation, subsequent laboratory groundwater testing (if water is encountered) will be undertaken to assess whether potential contaminants from the onsite sources have impacted underlying groundwater.

The investigation should also be used to assess the ground conditions and to provide geotechnical parameters to support the design of foundations.

It is also recommended that a Coal Mining Risk Assessment is undertaken to review all available information on the coal mining issues which are relevant to the site and to identify and assess the risks to the proposed development from coal mining legacy.

D COAL MINING RISK ASSESSMENT

11 Application

We understand that no application has been submitted for the site, but this report will be provided in support of any future applications.

Southern Testing Laboratories Limited has been commissioned to prepare a coal mining risk assessment report for the proposed new structure, in order to provide the council with information on coal mining and an assessment of its impact on land stability.

11.1 Scope

The purpose of this Coal Mining Risk Assessment Report is to:

- Present a desk-based review of all available information on the coal mining issues which are relevant to the site.
- Use that information to identify and assess the risks to the proposed development from coal mining legacy, including the cumulative impact of issues.
- Set out appropriate mitigation measures to address the coal mining legacy issues affecting the site, including any necessary remedial works and/or demonstrate how coal mining issues have influenced the proposed development.
- Demonstrate to Merthyr Tydfil County Borough Council that the application site is, or can be made, safe and stable to meet the requirement of national planning policy with regard to development on unstable land.

This report presents our desk-based coal mining risk assessment findings and our interpretation of this data.

12 Sources of information used to inform this report

- British Geological Survey Map 1:50,000 scale sheets No. 231 (Merthyr Tydfil)
 - Superficial & Bedrock (1979)
- BGS Geological Map (1972) 1:10,560 Sheet – Glamorgan SO00NE
- BGS Geological Map (1932) 1:10,000 Sheet – Brecknockshire 46SW
- British Geological Survey online mapping.
- British Geological Survey Borehole Records Archive.
- Historic Ordnance Survey mapping of the area.
- A review of the Coal Authority's interactive viewer.
- Consultants Coal Mining Report (ref 51003447079001, August 2024).
- Mine Abandonment Plans.

12.1 Mapped Geology (1:50,000 Maps)

The British Geological Survey Map of the area (Sheet No. 231 – Merthyr Tydfil) together with the BGS online maps, indicates that the site geology consists of Made Ground over Till over South Wales Lower Coal Measures Formation.

The following coal seams are shown outcropping a short distance to the south-east of the site.

- GELLIDEG Coal Seam – 0.60 – 0.91m thick.*
- No. 2 YARD Coal Seam
- AMB (Amman Marine Band)
- BUTE Coal Seam
- LOWER SIX-FEET Coal Seam

- UPPER SIX-FEET Coal Seam
- FOUR FEET Coal Seam
- TWO-FEET NINE Coal Seam

*These seams are shown to lie stratigraphically above the site, however (as reviewed in sections below) CA data infers the Gellideg potentially below site and 1.35m thick. The nearest regional strata dip is shown to be dipping at approximately 16° towards the South, South West.

12.2 BGS 1:50,000 Geology Map Memoir

The accompanying British Geological Survey suggests that the sequence of coal measures between the *GARW Seam* and the *Amman Rider* is approximately 60m in the Merthyr Tydfil area and comprises a sequence of mudstone, silty and several widely worked coals.

The Memoir notes that tabular and nodular ironstone are recorded to be distributed through the measures between the *GARW* and the *Gellideg*, which were formerly worked from patchworks and shallow mines, particularly in the area north of Merthyr Tydfil.

The Memoir states that, in the Taff Valley around Merthyr Tydfil, the *Gellideg* (estimated to be between 0.6-0.91m thick) is the lowest of three closely spaced coals (the upper two forming the standard *Five-Feet*), which make up a composite seam, known formerly as the *Lower Four-Feet*. A typical section from Twyn-Y-Waun, east of Dowlais is listed as: *top coal*; 0.91m, *clod*; 0.2m, *middle coal*; 0.91m, *shale*; 0.08m, *engine coal*; 0.18m, *shale* 0.76m, *bottom coal (Gellideg)* 1.22m (Robertson, 1933).

12.3 Detailed Geological Mapping & Interpretation

A review of the 1:10,000 geological map, Brecknockshire 46SW, 1932, indicates that there are no geological faults present on site. The *Lower Four-Feet* is shown to be mapped to the south/south-east of the site. To the north/north west of the site there is an area of "Old Quarry" which is annotated as "Old Workings in Lower Ironstones" beyond which is a dashed line labelled as "*Base of Coal Measures*".

The presence of the ironstone workings ties up with the description in the BGS Memoir regarding the presence of shallow iron stone mines in the area north of Merthyr Tydfil.

The *Lower Four-Feet Seam*, shown on the 1:10k BGS map, is likely to correspond to the *Gellideg Seam* on the 1:50k and Memoir. It should be noted that the 1:10k mapping is from 1932 and the 1:50k mapping and Memoir are from 1979.

The 1:10,000 BGS map shows the *Lower Four-Feet Seam* to be stratigraphically above the subject site. The *GARW Coal* is stratigraphically below the site but is not mapped locally. The "*Farewell Rock*" is shown to outcrop to the north of the site.

12.4 The Coal Authority's Interactive Map Viewer

The Coal Authorities interactive viewer shows the following.

Coal Authority Category	Yes/No
Mine Entry close to site	Yes – short distance to the south east (nearest)
Development High Risk Area	Yes
Surface Mining (past and current)	No
Past shallow coal mine workings	Yes
Probable shallow coal mine workings (unrecorded)	Yes
Coal Outcrop on site	Yes
Coal Outcrop close to site	Yes

Coal Authority Category	Yes/No
Coal Mining Reporting Area	Yes

12.5 Consultants Coal Mining Report

The full report (ref 51003447079001, August 2024), is included within Appendix E, a summary is present below.

Mining Activity & Geology		
Past underground mining record	Yes – See section 12.6	
Probable unrecorded shallow workings	Yes.	
Spine Roadways at shallow depth	No spine roads recorded at shallow depth.	
Mine Entry	None recorded within 100m of the enquiry boundary.	
Abandoned mine plan catalogue numbers	- SWR2500 - SWR2509 - SWR1577 - 4210 - SWR2508	- SWR2523 - SWR3106 - SWR2510 - SWR2378
Outcrops	Five Foot Gellideg Coal mapped 26.4m to the North	
Geological faults, fissures and breaklines	No faults fissures or breaklines recorded by the CA.	
Opencast mines (within 500m)	Yes – “unlicensed” opencast site shown approximately 100m to the south-east.	
Coal Authority Managed Tips within 500m	None recorded within 500m.	
Investigation or Remedial Activity		
Site investigation	None recorded within 50m of site.	
Remediated sites	None recorded within 50m of site.	
Coal mining subsidence	The Coal Authority has not received a damage notice or claim for the subject property, or any property within 50m of the enquiry boundary, since 31 October 1994.	
Mine gas	None recorded within 500m.	
Mine water treatment schemes	None recorded within 500m.	
Licencing & Future Mining Activity		
Future underground mining	None recorded.	
Coal mining licencing	None recorded within 200m.	
Court orders	None recorded.	
Section 46 notices	No notices have been given, under section 46 of the Coal Mining Subsidence Act 1991, stating that the land is at risk of subsidence.	
Withdrawal of support notices.	The property is not in an area where a notice has been given under section 41 of the Coal Industry act 1994, cancelling the entitlement to withdraw support.	

Payments to owners of former copyhold land

The property is not in an area where a relevant notice has been published under the Coal Industry act 1975/Coal Industry Act 1994.

12.6 Consultants Coal Mining Report – Past Underground Mining

The Coal Authority's Consultants Coal Mining Report (ref 51003447079001, August 2024), lists 8 No. Past Underground Mining entries, these are summarised in the table below. The full report (ref 51003447079001, August 2024), is included within Appendix E.

Seam	Mineral	Coal Authority ref	Depth (m)	Direction to working	Dipping rate of seam (degrees)	Dipped direct of seam	Extraction thickness (cm)	Year Last mined
<i>Five Foot Gellideg</i>	Coal	7H10	11	Beneath Property	5.1	South	135	1830
<i>GARW No. 1 Ironstone</i>	Ironstone	A0UJ	13	Beneath Property	-	-	780	1878
<i>GARW Rider Ironstone</i>	Ironstone	A0UK	17	Beneath Property	5.7	South	447	1878
<i>Bottom Vein Ironstone</i>	Ironstone	A0UL	21	Beneath Property	4.8	South-East	337	1878
<i>Bottom Vein Ironstone</i>	Ironstone	A0UM	24	Beneath Property	-	-	227	1878
<i>Rosser Ironstone</i>	Ironstone	A0UN	31	Beneath Property	-	-	127	1878
<i>Bottom Vein Ironstone</i>	Ironstone	4E5C	43	East	5.7	South	337	1858
<i>Rosser Ironstone</i>	Ironstone	4E5E	55	East	5.7	South	127	1854

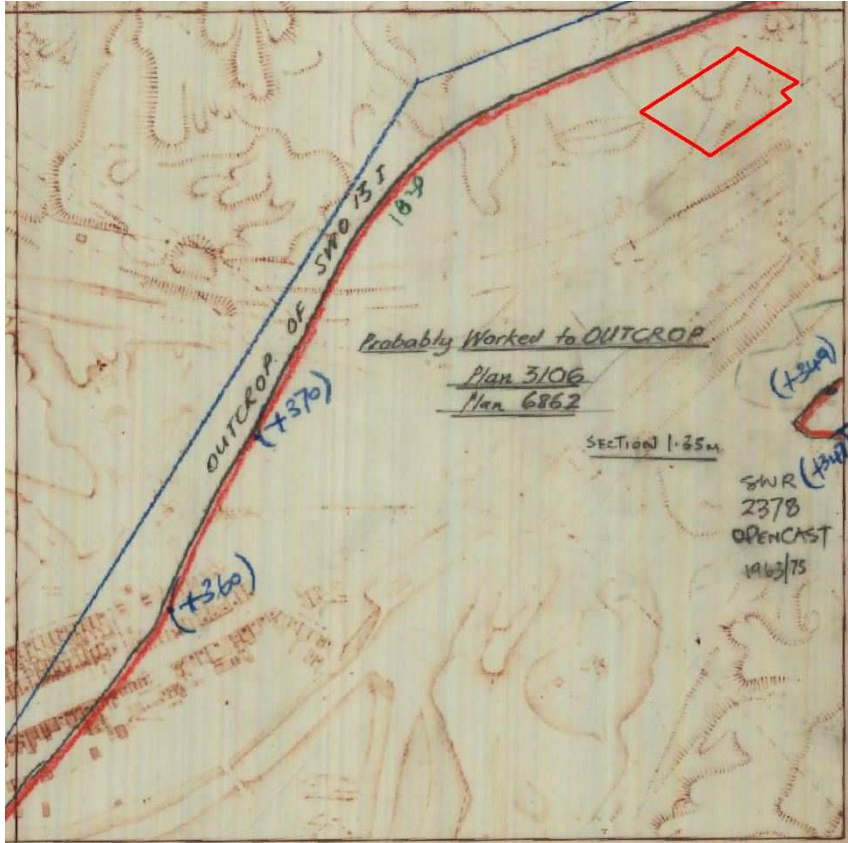
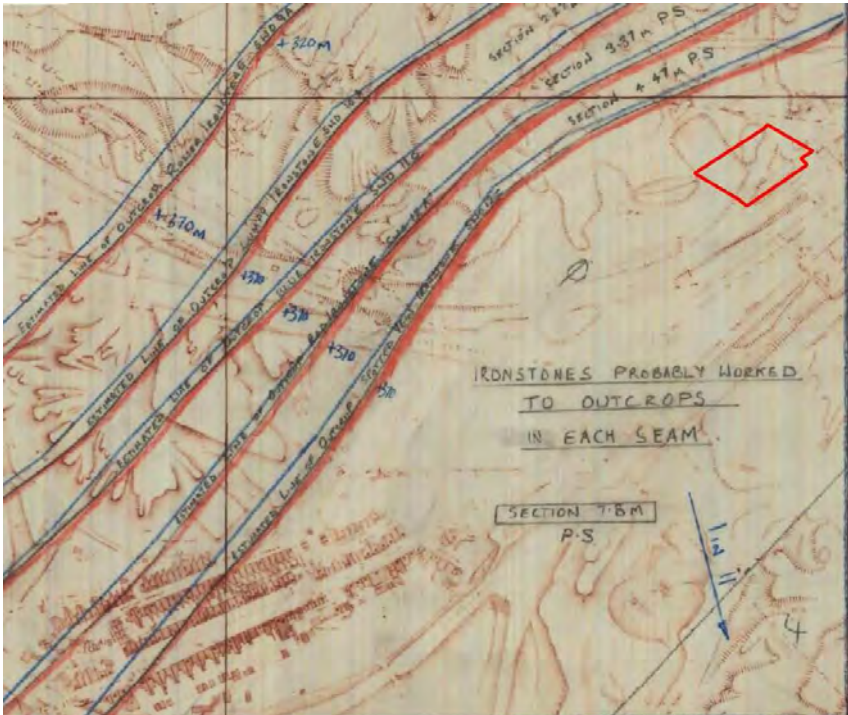
The Gellideg Coal, whilst mapped by the BGS to outcrop to the south of the site, these records indicate that it does in fact outcrop to the north and dip below the site, at shallow depth.

The GARW No1 Ironstone (7.8m thick), appears to be repeated as GARW Rider (447cm) and Bottom Vein Ironstone (337cm). Four other seams area recorded below the site from depths of 24-55m bgl, with thicknesses ranging from 127-337cm.

12.7 Abandoned Mine Catalogue

The results of the Coal Authority's Consultants Coal Mining Report (ref 51003447079001, August 2024), indicated the presence of recorded workings beneath the site. Therefore, a search of the Coal Authority's Abandoned Mine Catalogue was requested to obtain any abandonment plans associated with historical coal mining undertaken beneath the site. The search revealed that the Coal Authority do not appear to hold any plans which show workings beneath the subject site for the depth range specified (0m -30m bgl). However, it is understood that the reason the Consultant Coal Mining Report indicated a positive result for recorded workings is that the rationalised seam plans (historically produced by the National Coal Board), for the site, for both the coal seams and the ironstone seams includes a note stating "*Ironstones/Coal probably worked to outcrop in each seam*". As a result of this note, it is likely that when the information was digitised by the Coal Authority, the recorded workings were extended from the area of recorded workings (to the south/south-east of the site) to the associated outcrop (to the north/north-west of the site), therefore, covering the subject site.

The Coal Authority are unable to provide copies of the associated rationalised plans, although have provided a screenshot of the relevant area of the plans, which include the associated notes, as shown below.

Mine Catalogue	Plan
Coal Authority Plan Five Foot Gellideg Seam	
Coal Authority Plan Ironstones	

13 Identification & assessment of site specific coal mining

The table below summarises the potential risks associated with coal mining legacy for the proposed development on site, identified from the various sources listed above.

13.1 Risk Assessment

Coal Mining Issues	Potential Risk	Risk Assessment
Underground coal mining (recorded at shallow depths)	Yes	There are a number of coal and ironstone seams recorded as having been worked at shallow depth below the site.
Underground coal mining (probable at shallow depths)	Yes	
Underground Ironstone mining (recorded at shallow depths)	Yes	
Underground Ironstone mining (probable at shallow depths)	Yes	
Mine entries (shafts and adits)	No	None recorded within 100m of the enquiry boundary.
Coal mining geology (fissures)	No	Not recorded on Coal Authority data.
Record of past mine gas emissions or potential	No	Not recorded on Coal Authority data.
Recorded coal mining surface hazard	No	Not recorded on Coal Authority data.
Surface mining (opencast workings)	Yes	"Unlicensed" opencast site show approximately 100m to the south east.

The *Five Foot Gellideg Coal Seam* is mapped to the north of the site and is indicated to be present approximately 11m below the site. Although there are no plans showing this seam to have been worked beneath the site, it is suggested that it was worked from the area to the south/south-east to where it outcrops to the north/north-west, therefore, beneath the site.

In addition, a series of ironstone seams are mapped within close proximity of the site; as with the *Five Foot Gellideg Coal Seam*, there are no plans showing the ironstone seams to have been worked beneath the site, although it is understood these seams were worked from an area to the south/south-east of the site to outcrop, which is shown present to the north/north-west of the site, therefore, beneath the site.

By way of comment, further workings or mine entries could exist locally, which have not been recorded.

14 Mitigation Strategy

14.1 Discussion & Recommendations

The site is located within an area of previous mining activity, both in the form of coal mining and ironstone mining. On the basis of the published records, and information obtained from the Coal Authority, it is understood that both Ironstone Seams and a Coal Seam (*Five Foot Gellideg*) are mapped at a shallow depth beneath the site and are shown to outcrop to the north/north-west of the site. It is known that these seams have been worked to the south/south east of the site "to outcrop" therefore, it is probable that they may have been worked beneath the site.

Coal Mining Issues	Potential Risk	Risk Assessment
Underground coal mining (recorded at shallow depths)	Yes	Coal seam shown to outcrop to the north/north-west of the site is known to have been worked "to outcrop" to the south/south-east of the site.
Underground coal mining (probable at shallow depths)	Possible	Coal seam shown to outcrop to the north/north-west of the site is known to have been worked "to outcrop" to the south/south-east of the site.
Underground Ironstone mining (recorded at shallow depths)	Yes	Ironstone seams shown to outcrop to the north/north-west of the site is known to have been worked "to outcrop" to the south/south-east of the site.
Underground Ironstone mining (probable at shallow depths)	Possible	Ironstone seams shown to outcrop to the north/north-west of the site is known to have been worked "to outcrop" to the south/south-east of the site.
Mine entries (shafts and adits)	No	None recorded within 100m of the enquiry boundary.
Coal mining geology (fissures)	No	Not recorded on Coal Authority data.
Record of past mine gas emissions or potential	No	Not recorded on Coal Authority data.
Recorded coal mining surface hazard	No	Not recorded on Coal Authority data.
Surface mining (opencast workings)	Yes	"Unlicensed" opencast site show approximately 100m to the south-east.

15 Conclusions

Based on the findings of the desk based risk assessment, further investigation should be undertaken to establish the likely position and depth of possible coal and/or ironstone workings at shallow depths across the site. The work would look to establish if remedial works are necessary, and confirm an appropriate foundation solution.

Any intrusive investigation could also be used to assess the ground conditions and to provide geotechnical parameters to support the design of foundations and to assess the likely nature and extent of soil, groundwater and soil gas contamination on the site.

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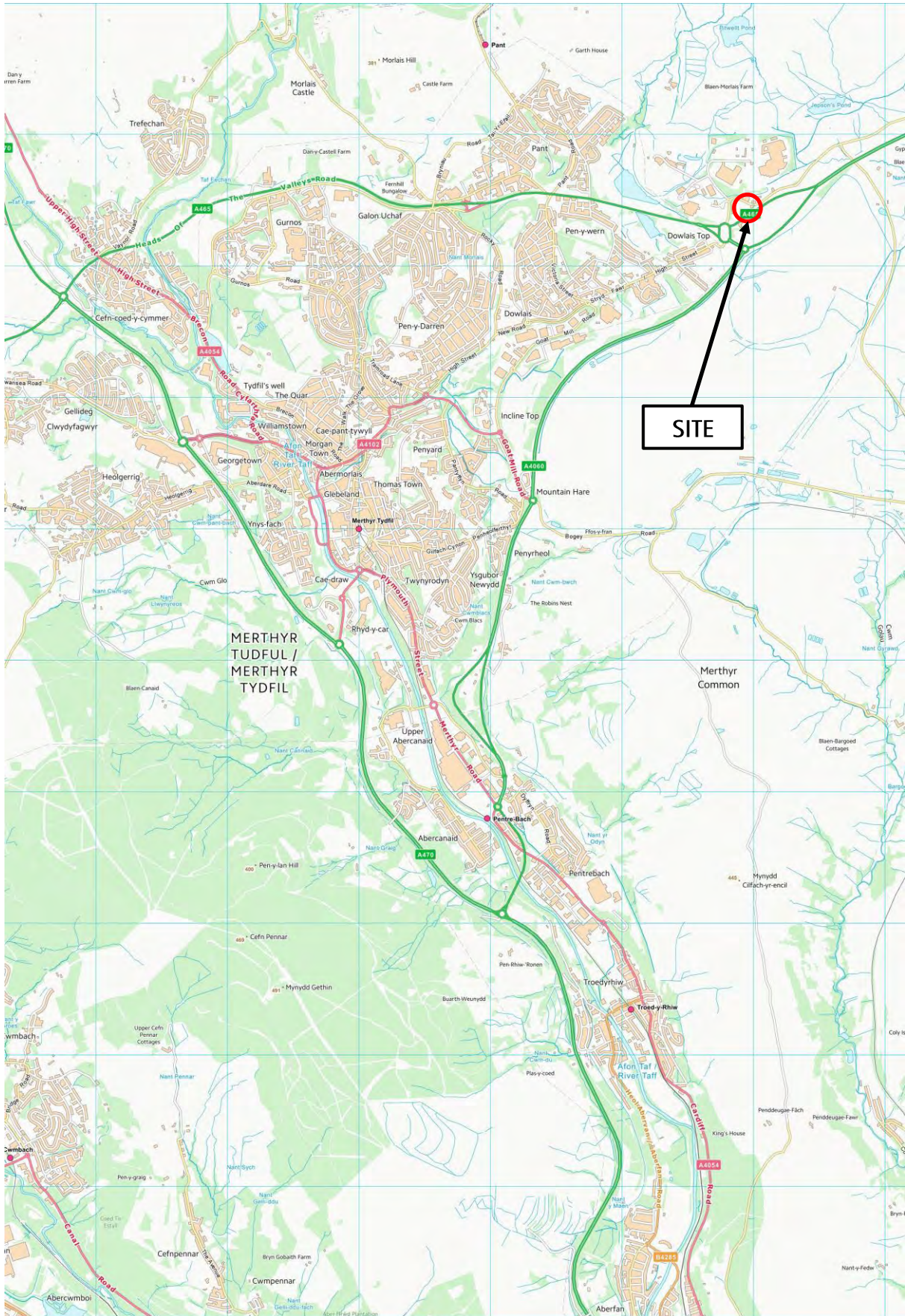
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A collage of six images related to geotechnical engineering. Top left: A large concrete pipe. Top middle: A close-up of a soil sample in a sieve. Top right: A pressure gauge attached to a soil sample. Middle left: A worker in a high-visibility vest operating a machine. Middle right: A red truck with 'Southern' on the side. Bottom right: A person using a tool to work on a soil sample.

APPENDIX A

Site Plans





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Site: Penyarnddu Industrial Estate, Merthyr Tydfil, CF48 2TA

STL: J15809

Fig No: 1

Date: 8th October 2024

Site location plan.



Southern Testing: Keeble House, Stuart Way, East Grinstead, West Sussex RH19 4QA
ST Consult: Twigden Barns, Brixworth Road, Creaton, Northampton NN6 8NN



LIDL



Site: Penygarnddu Industrial Estate, Merthyr Tydfil, CF48 2TA

Date: 8th October 2024

STL: J15809

Fig No: 2

Site plan showing proposed development.

Key to Exploratory Hole Logs, Plans and Sections

Backfill Symbols		Pipe Symbols		Principal Soil Types		Principal Rock Types		Drilling Records	
Arisings		Plain Pipe		Topsoil		Mudstone		Water Strike	
Concrete		Slotted Pipe		Made Ground		Claystone		Depth Water Rose	
Blacktop		Piezometer		Clay		Siltstone		Total Core Recovery (%) [TCR]	
Bentonite		Piezometer Tip		Silt		Sandstone		Solid Core Recovery (%) [SCR]	
Gravel Filter		Filter Tip		Sand		Limestone		Rock Quality Index (%) RQD]	
Sand Filter		Extensometer		Gravel		Chalk		Fracture Index (fractures / m) [FI]	
		Inclinometers		Peat					

All soil and rock descriptions are in general accordance with BS5930 2015, BS EN ISO 14688-1:2002+A1:2013 and BS EN ISO 14689-1:2003. Chalk descriptions are also based on CIRIA C574 and "Logging the Chalk – R.N. Mortimer 2015". The Geology Code is only provided where a positive identification of the sample strata has been made.

Location / Method Identifiers		In-situ Test Location / Method	
BH	Borehole (undefined)	DP	Dynamic Probe
CP	Cable Percussive	CPT	Cone Penetration Test
RC	Rotary Core	CBR	In-situ CBR Test
RO	Rotary Open Hole	DCP	CBR using Dynamic Cone Penetrometer
ODC	Rotary Odex/Symmetrix drilling cased	CBRT	CBR using TRL Probe
CP+RC	Cable Percussive to Rotary Core	PB	Plate Bearing Test
SNC	Sonic	SPT (S)	Standard Penetration Test (Split Barrel Sampler)
CFA	Continuous Flight Auger	SPT (C)	Standard Penetration Test (Solid Cone)
FA	Flight Auger	N	SPT Result
VC	Vibro Core	-/-	Blows/Penetration (mm) after seating drive
WLS+RC	Windowless (Dynamic) Sampler to Rotary Core	-*/-	Total Blows / Penetration (mm)
WLS	Windowless Sampler	()	Extrapolated Value
WS	Window Sampler	PPT	Perth Penetration (In-House Method - Equivalent N Value)
HA	Hand Auger	HP / UCS	Strength from Hand Penetrometer (kN/m ²)
C	Road / Pavement Core	IVN	Strength from Hand Vane ((kN/m ²) P = peak, R = residual
IP	Inspection Pit (Hand Excavation)	PID	Photo Ionisation Detector (ppm)
TP	Trial Pit (Machine Excavated)	MEXE	Mexi-Cone CBR (%)
OP	Observation Pit (Supported Excavation Hand or Machine)		

Samples / Test Type	
B	Bulk Sample
BLK	Block Sample
C	Core Sample
CBRS	CBR Mould Sample
D	Small Disturbed Sample
ES	Environmental Sample (Soil)
EW	Environmental Sample (Water)
GS	Environmental Sample (Gas)

Samples / Test Type	
SPTLS	Standard Penetration Test Split Barrel Sample
TW	Thin Wall Push In Sample (e.g. Shelby Sampler)
U	Undisturbed Open Drive Sample (blows to take)
UT	Thin Wall Undisturbed Open Drive Sample (blows to take)
W	Water Sample (Geotechnical)
SP	Sample from Stockpile
P	Piston Sample
AMAL	Amalgamated Sample

APPENDIX B

Photographs



B



Drainage in east corner of site.



View from eastern corner of site looking south west.



View from eastern corner of site looking north west.



Flooded area in centre of site.



Earth bund in south west of site.



View from south west of site looking north east.



View from south west of site looking south east.



View from south west of site looking north east.



Fly tipped material in south west of site.



View from west corner of site looking north east.



Gabion wall within north west of site.



Retaining wall within north west of site.



View from north of site looking south west.



View from north of site looking south.



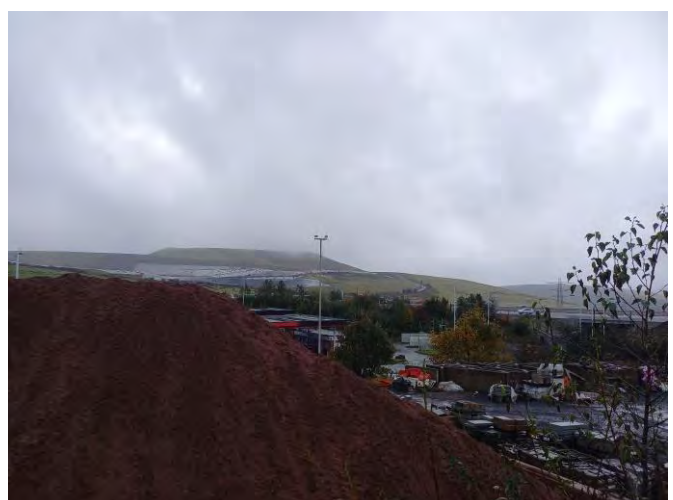
View from north of site looking south east.



View from north of site looking east.



View from north of site looking north west.



View from south west of site looking south.

APPENDIX C

Phase 1 Desk Study – Historical Mapping



Historical Mapping Legends

Ordnance Survey County Series 1:10,560

	Gravel Pit		Sand Pit		Other Pits
	Quarry		Shingle		Orchard
	Osiers		Reeds		Marsh
	Mixed Wood		Deciduous		Brushwood
	Fir		Furze		Rough Pasture
	Arrow denotes flow of water		Trigonometrical Station		
	Site of Antiquities		Bench Mark		
	Pump, Guide Post, Signal Post		Well, Spring, Boundary Post		
	Surface Level				
	Sketched Contour		Instrumental Contour		
	Main Roads		Minor Roads		
	Sunken Road		Raised Road		
	Road over Railway		Railway over River		
	Railway over Road		Level Crossing		
	Road over River or Canal		Road over Stream		
	Road over Stream				
	County Boundary (Geographical)				
	County & Civil Parish Boundary				
	Administrative County & Civil Parish Boundary				
	County Borough Boundary (England)				
	County Burgh Boundary (Scotland)				
	Rural District Boundary				
	Civil Parish Boundary				

Ordnance Survey Plan 1:10,000

	Chalk Pit, Clay Pit or Quarry		Gravel Pit
	Sand Pit		Disused Pit or Quarry
	Refuse or Slag Heap		Lake, Loch or Pond
	Dunes		Boulders
	Coniferous Trees		Non-Coniferous Trees
	Orchard		Scrub
	Bracken		Heath
	Marsh		Reeds
	Building		Glasshouse
	Sloping Masonry		Pylon
	Cutting		Embankment
	Road Under		Road Over
	Level Crossing		Foot Bridge
	Standard Gauge Multiple Track		Standard Gauge Single Track
	Siding, Tramway or Mineral Line		Narrow Gauge
	Geographical County		Administrative County, County Borough or County of City
	Municipal Borough, Urban or Rural District, Burgh or District Council		Borough, Burgh or County Constituency
	Civil Parish		
	Boundary Post or Stone		Police Station
	Church		Post Office
	Club House		Public Convenience
	Fire Engine Station		Public House
	Foot Bridge		Signal Box
	Fountain		Spring
	Guide Post		Telephone Call Box
	Mile Post		Telephone Call Post
	Mile Stone		Well

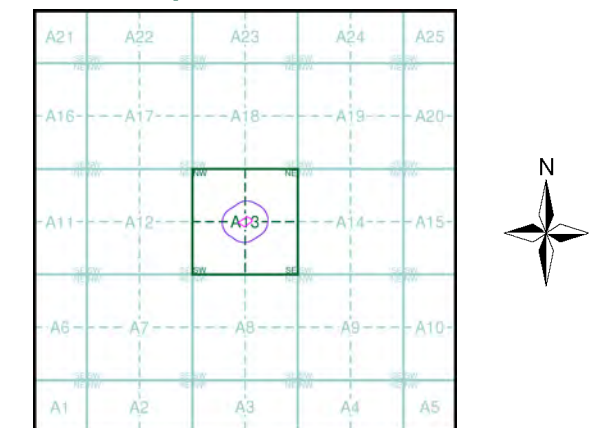
1:10,000 Raster Mapping

	Gravel Pit		Refuse tip or slag heap
	Rock		Rock (scattered)
	Boulders		Boulders (scattered)
	Shingle		Mud
	Sand		Sand Pit
	Slopes		Top of cliff
	General detail		Underground detail
	Overhead detail		Narrow gauge railway
	Multi-track railway		Single track railway
	County boundary (England only)		Civil, parish or community boundary
	District, Unitary, Metropolitan, London Borough boundary		Constituency boundary
	Area of wooded vegetation		Non-coniferous trees
	Non-coniferous trees (scattered)		Coniferous trees
	Coniferous trees (scattered)		Positioned tree
	Orchard		Coppice or Osiers
	Rough Grassland		Heath
	Scrub		Marsh, Salt Marsh or Reeds
	Water feature		Flow arrows
	Mean high water (springs)		Mean low water (springs)
	Telephone line (where shown)		Electricity transmission line (with poles)
	Bench mark (where shown)		Triangulation station
	Point feature (e.g. Guide Post or Mile Stone)		Pylon, flare stack or lighting tower
	Site of (antiquity)		Glasshouse
	General Building		Important Building

Historical Mapping & Photography included:

Mapping Type	Scale	Date	Pg
Monmouthshire	1:10,560	1884	2
Brecknockshire	1:10,560	1884 - 1889	3
Glamorganshire	1:10,560	1885	4
Glamorganshire	1:10,560	1901	5
Brecknockshire	1:10,560	1905	6
Glamorganshire	1:10,560	1922	7
Brecknockshire	1:10,560	1922	8
Glamorganshire	1:10,560	1938 - 1951	9
Brecknockshire	1:10,560	1938 - 1951	10
Historical Aerial Photography	1:10,560	1945	11
Glamorganshire	1:10,560	1951	12
Brecknockshire	1:10,560	1951	13
Ordnance Survey Plan	1:10,000	1965	14
Ordnance Survey Plan	1:10,000	1977	15
Ordnance Survey Plan	1:10,000	1983	16
Ordnance Survey Plan	1:10,000	1992	17
10K Raster Mapping	1:10,000	1999	18
10K Raster Mapping	1:10,000	2006	19
VectorMap Local	1:10,000	2024	20

Historical Map - Slice A



Order Details

Order Number: 356887455_1_1
Customer Ref: J15809 Merthyr Tydfil (SM)
National Grid Reference: 307920, 208450
Slice: A
Site Area (Ha): 0.31
Search Buffer (m): 1000

Site Details

ST2685, Heads of the Valley Road, Merthyr Tydfil

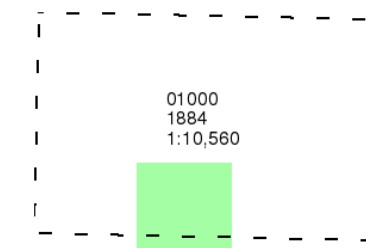
Monmouthshire

Published 1884

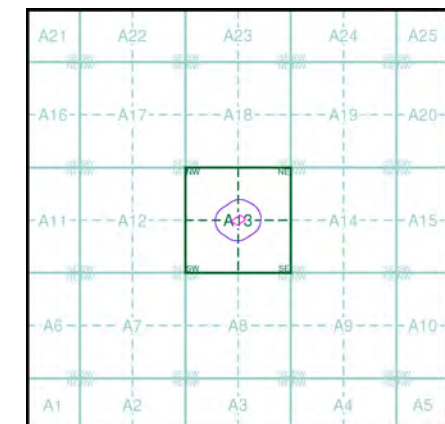
Source map scale - 1:10,560

The historical maps shown were reproduced from maps predominantly held at the scale adopted for England, Wales and Scotland in the 1840's. In 1854 the 1:2,500 scale was adopted for mapping urban areas; these maps were used to update the 1:10,560 maps. The published date given therefore is often some years later than the surveyed date. Before 1938, all OS maps were based on the Cassini Projection, with independent surveys of a single county or group of counties, giving rise to significant inaccuracies in outlying areas. In the late 1940's, a Provisional Edition was produced, which updated the 1:10,560 mapping from a number of sources. The maps appear unfinished - with all military camps and other strategic sites removed. These maps were initially overprinted with the National Grid. In 1970, the first 1:10,000 maps were produced using the Transverse Mercator Projection. The revision process continued until recently, with new editions appearing every 10 years or so for urban areas.

Map Name(s) and Date(s)



Historical Map - Slice A

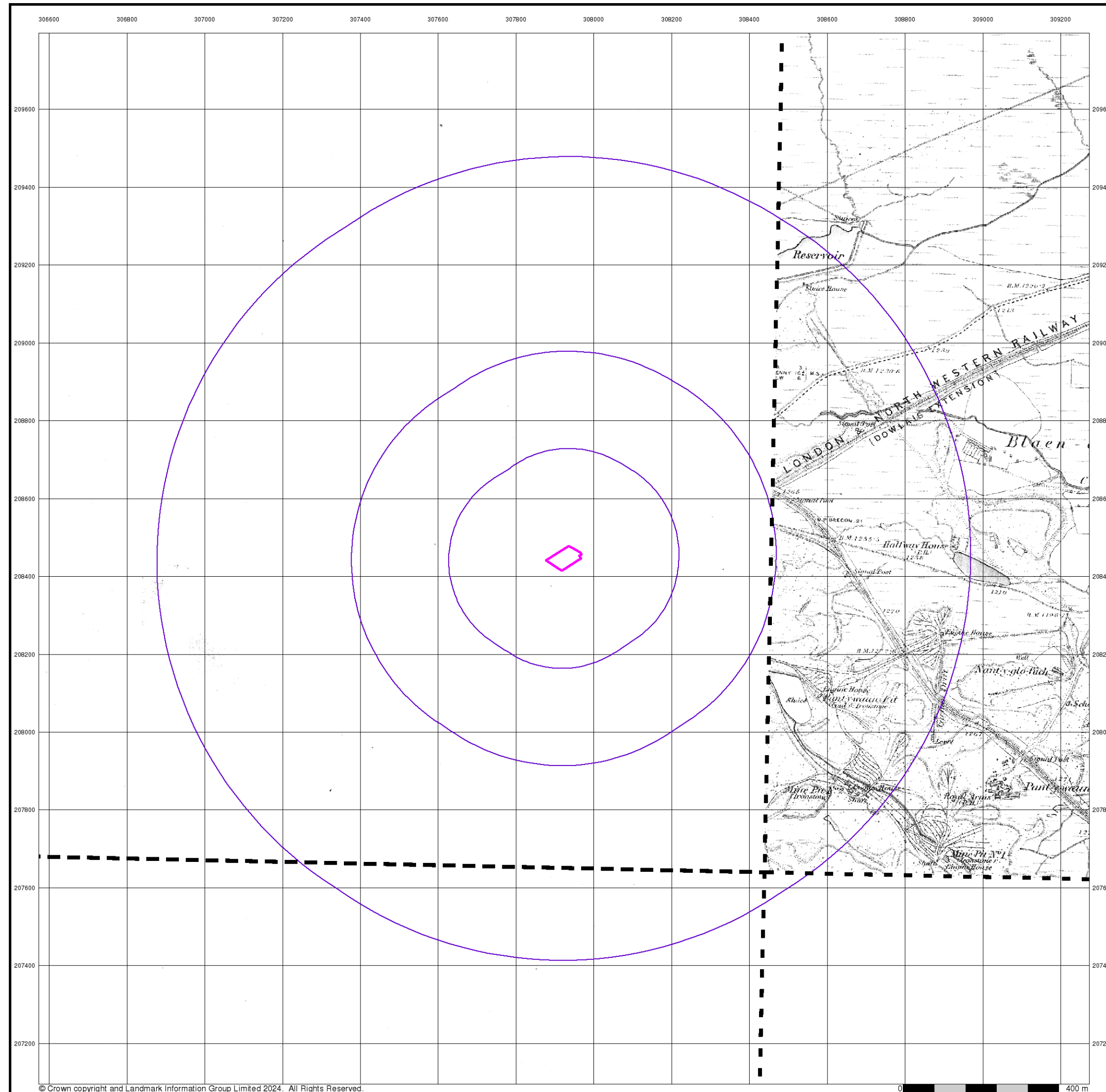


Order Details

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National Grid Reference: 307920, 208450
Slice: A
Site Area (Ha): 0.31
Search Buffer (m): 1000

Site Details

ST2685, Heads of the Valley Road, Merthyr Tydfil



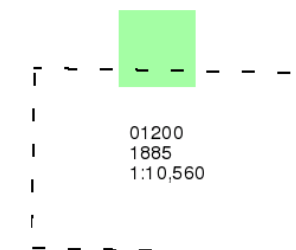
Glamorganshire

Published 1885

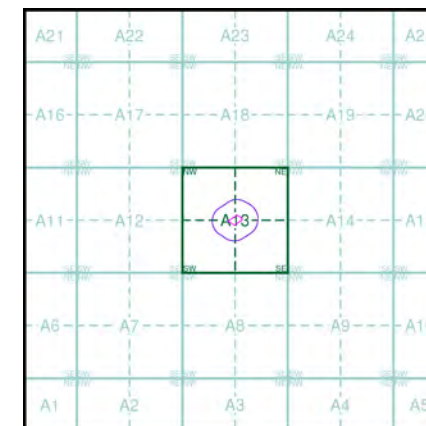
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Map Name(s) and Date(s)



Historical Map - Slice A



Order Details

Order Number: 356887455_1_1
Customer Ref: J15809 Merthyr Tydfil (SM)
National Grid Reference: 307920, 208450
Slice: A
Site Area (Ha): 0.31
Search Buffer (m): 1000

Site Details

ST2685, Heads of the Valley Road, Merthyr Tydfil

Glamorganshire

Published 1901

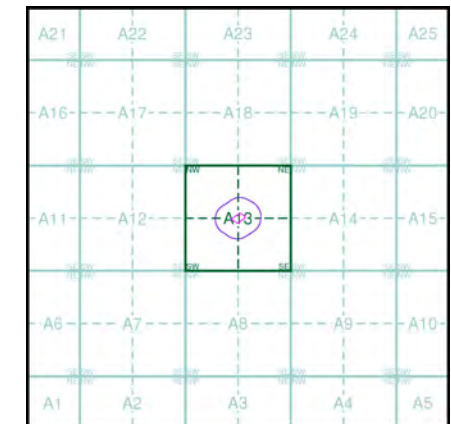
Source map scale - 1:10,560

The historical maps shown were reproduced from maps predominantly held at the scale adopted for England, Wales and Scotland in the 1840's. In 1854 the 1:2,500 scale was adopted for mapping urban areas; these maps were used to update the 1:10,560 maps. The published date given therefore is often some years later than the surveyed date. Before 1938, all OS maps were based on the Cassini Projection, with independent surveys of a single county or group of counties, giving rise to significant inaccuracies in outlying areas. In the late 1940's, a Provisional Edition was produced, which updated the 1:10,560 mapping from a number of sources. The maps appear unfinished - with all military camps and other strategic sites removed. These maps were initially overprinted with the National Grid. In 1970, the first 1:10,000 maps were produced using the Transverse Mercator Projection. The revision process continued until recently, with new editions appearing every 10 years or so for urban areas.

Map Name(s) and Date(s)

006SW 1901 1:10,560	006SE 1901 1:10,560
012NW 1901 1:10,560	012NE 1901 1:10,560

Historical Map - Slice A

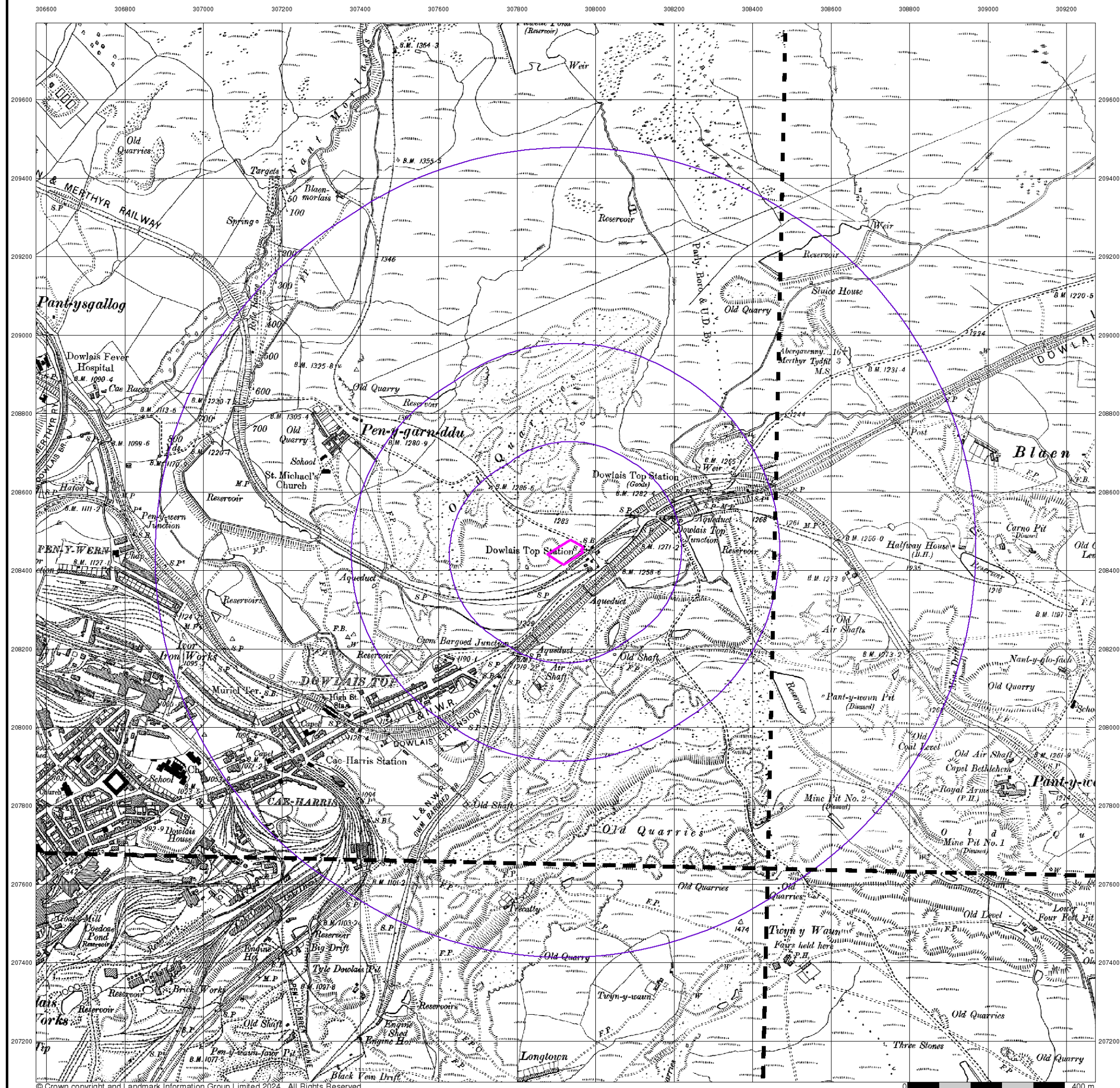


Order Details

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Customer Ref: J15809 Merthyr Tydfil (SM)
National Grid Reference: 307920, 208450
Slice: A
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Search Buffer (m): 1000

Site Details

ST2685, Heads of the Valley Road, Merthyr Tydfil



Brecknockshire

Published 1905

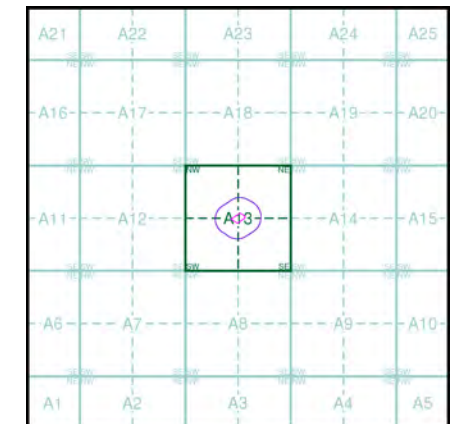
Source map scale - 1:10,560

The historical maps shown were reproduced from maps predominantly held at the scale adopted for England, Wales and Scotland in the 1840's. In 1854 the 1:2,500 scale was adopted for mapping urban areas; these maps were used to update the 1:10,560 maps. The published date given therefore is often some years later than the surveyed date. Before 1938, all OS maps were based on the Cassini Projection, with independent surveys of a single county or group of counties, giving rise to significant inaccuracies in outlying areas. In the late 1940's, a Provisional Edition was produced, which updated the 1:10,560 mapping from a number of sources. The maps appear unfinished - with all military camps and other strategic sites removed. These maps were initially overprinted with the National Grid. In 1970, the first 1:10,000 maps were produced using the Transverse Mercator Projection. The revision process continued until recently, with new editions appearing every 10 years or so for urban areas.

Map Name(s) and Date(s)

046SW	1905	1:10,560
051NW	1905	1:10,560

Historical Map - Slice A



Order Details

Order Number: 356887455_1_1
Customer Ref: J15809 Merthyr Tydfil (SM)
National Grid Reference: 307920, 208450
Slice: A
Site Area (Ha): 0.31
Search Buffer (m): 1000

Site Details

ST2685, Heads of the Valley Road, Merthyr Tydfil