



LanzaTech UK Limited

**Project Dragon – Sustainable Aviation Fuel
(SAF) Production Facility:
Temporary Construction Area at Margam
Wharf**

Desk Study





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Project Dragon – Sustainable Aviation Fuel (SAF) Production Facility: Temporary Construction Area at Margam Wharf

Desk Study

ISSUE RECORD					
Report Reference: 2111006.006.01					
Version	Date	Amendments Record	Prepared by	Checked by	Authorised by
-	June 2023	-			
			Hannah Jeffery	Richard Evans	Ruth Easterbrook
A	July 2023	Further minor amendments following comments from Turley			
			Richard Evans	Claire Hooley	Richard Evans
B	August 2023	Further minor amendments following comments from Turley			
			Amy Butler	Richard Evans	Claire Hooley
C	October 2023	Updated UXO Reports Included			
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Report Liability Date: June 2023					

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	- Stage 2 Detailed UXO Risk Assessment – Brimstone Report No. DRA-23-1532 (rev 2), dated September 2023

EXECUTIVE SUMMARY

SITE INFORMATION	Client	LanzaTech UK Limited
	Site Details	The site currently comprises a disused parcel of land, partially owned by Associated British Ports (ABP) and partially owned by TATA Steel, in the docks area of Port Talbot. The site covers an area of approximately 4.24 hectares, with the centre of the site situated at National Grid Reference 277010, 188760. The nearest postcode is SA13 1RA.
	Current Land Use and Description	The site currently comprises a disused plot of largely scrub land, with remnants of infrastructure, associated with Margam Wharf (concrete slabs and access roads) present across the site.
	Proposed Development	Whilst full details of the proposed development have not been provided to TEC at this stage, it is understood that it is to comprise a temporary construction facility which is likely to be temporarily capped with granular material to allow it to be used for the duration of the construction of the nearby proposed sustainable jet fuel production facility.
BACKGROUND INFORMATION	Geology	The site is recorded to be underlain by superficial Tidal Flat Deposits typically described by the BGS as older Coastal Zone Deposits – clay, silt, sand and peat (including ‘submerged forest’). The underlying bedrock geology is recorded as the South Wales Middle Coal Measures Formation, described by the BGS as grey, (productive) coal-bearing mudstones/siltstones, with seatearths and minor sandstones. In addition, BGS reports the site and surrounding area comprises ‘Landscaped Ground’, described as mainly redeveloped areas and others where extensive earth moving has occurred.
	Coal Mining	The Envirocheck report for the site records that the site lies within an area which may be affected by coal mining activity, with inconclusive coal mining reported. As it is understood that no development structures are proposed at the site (it is to be used as a lay-down area only, temporarily capped with granular material), a coal mining report is not considered necessary at this stage.
	Hydrogeology	The superficial deposits recorded on site are reported as a Secondary (Undifferentiated) Aquifer of high groundwater vulnerability. The underlying solid geology is designated as a Secondary Aquifer A of high groundwater vulnerability. There are no groundwater abstractions or Environment Agency Source Protection Zones within 1km of the site. There are two discharge consents to groundwater reported within 1km, with the nearest reported approximately 295m north of site. The site is reported to be within an area with potential for groundwater flooding to occur at the surface.
	Hydrology	The nearest surface water feature is the on site River Ffrwd-Wyllt, along with the adjacent (tidal) docks. There are 13No. reported surface water abstraction records within 500m and 3No. reported discharge consents within 500m of the site. 4No. pollution incidents to controlled waters are reported within 500m of the site. The site is reported to lie within an area within the extent of flooding and extreme flooding from rivers or sea without defences, as well as an area benefitting from flood defences.
	Site History	Earliest historic mapping (1877) indicates the site comprised an undeveloped parcel of land and water on the tidal flats of Port Talbot, comprising a combination of rough grassland, shingle and marsh. It is noted that the Ffrwd-Wyllt (stream/river) is present in the north of the site, flowing into the sea. A small peninsular of land is present in the western site area, with a structure depicted on the peninsula just off site to the west. Although no structures are depicted on site, the eastern site area is depicted as forming part of the Margam Copper Works., with a number of access roads/tracks depicted on site. By 1899, a railway siding is depicted extending into the northern site area, with a number of small structures depicted in the northeast of site and the route of the Ffrwd-Wyllt (stream/river) has been diverted slightly north. By 1940, the entire site has been infilled, with Margam Wharf now present at the western site boundary (current site boundary). The site now comprises multiple buildings and infrastructure (including railway sidings, tanks, settling tanks, travelling cranes, overhead pipes, chimneys, reservoirs, conveyors, hoppers and Margam Wharf) of the wider Margam (Iron and Steel) Works site. The 1953 and 1991 mapping depicted slight alterations to the building layouts in the eastern half of the site. By 2009, no buildings are depicted on site (current site layout). A single concrete slab is present in the centre of the site and access tracks are depicted around the site periphery. A concrete ‘overflow’ structure is depicted in the north of the site, understood to allow the River Ffrwd-Wyllt to flow into the adjacent docks.

	UXO	The Margam Steelworks, within which the site is located, were involved in the production of steel for munitions, tanks, ships, and other war materials and was consequently a target for German air raids carried out by the Luftwaffe. No evidence of bomb damage to the section of the steelworks within the site boundary has been identified within historical aerial imagery and OS mapping. Given recorded bombing to the steelworks, the risk from German UXBs is slightly elevated and has been assessed as Low-Moderate. 16No permanent Heavy Anti-Aircraft batteries were active within range of the site during WWII. In addition, Light Anti-Aircraft guns are likely defended Port Talbot. While Luftwaffe activity in the region was relatively infrequent, it is possible that an unexploded anti-aircraft shell struck the site. However, Brimstone considers the risk to be analogous to that of German UXBs.
CONCLUSIONS	Land Contamination	Potential pollutant linkages that have been identified as part of this assessment include: - Human Health (future (temporary) site users and construction workers) – exposure to contaminants associated with potential made ground/infilled ground and potentially contaminative historic industrial processes on and in proximity to site through ingestion, inhalation and dermal contact pathways. - Controlled Waters - Leaching of potential contaminants from potential made ground/shallow soils and vertical and lateral migration through the saturated zone to controlled waters. It should be noted that while a risk from ground gas may exist at the site from the anticipated thicknesses of made ground and the likely presence of peat within the natural soils, it is understood that the temporary development does not include the construction of any structures, or confined spaces and therefore the assessment of risk from ground gas has not been considered here.
	Ground Engineering	The site and surrounding area are reported to comprise ‘Landscaped Ground’ (mainly redeveloped areas and others where extensive earth moving has occurred). In addition, the Envirocheck report for the site indicates the presence of potentially infilled land on site. Site walkover information, along with historic mapping indicates the presence of remnants of infrastructure associated with former use of the site (including concrete slabs and access roads) consideration to the features and potential obstructions will be needed, as appropriate. A previous exploratory site investigation of the land ~275m to the west reported a significant thickness of made ground (>5.0mbgl). In addition, peat beds were observed within the superficial Tidal Flat Deposits, which varied from plastic dark grey amorphous peat to firm dark grey mottled brown pseudo-fibrous peat. Furthermore, shallow (potentially tidally influenced) perched and groundwater strikes were recorded.
RECOMMENDED FURTHER WORKS		Given the assessment presented within this report, additional works would be recommended to fully define the geoenvironmental and geotechnical issues associated with the site in relation to the proposed (temporary) development. This phase of assessment would involve the refinement of the site conceptual model developed as part of this preliminary risk assessment based on the findings of the exploratory intrusive investigation, as well as determining the underlying ground profile to ascertain the parameters for appropriate pavement/road/capping design parameters for the proposed temporary use of the site. The results from the recommended further ground investigations/survey work and associated assessments will be provided for inclusion within the planning application for development at the site.

1 INTRODUCTION

1.1 Terms of Reference

1.1.1 TEC has been appointed by LanzaTech to undertake a preliminary land contamination and geotechnical assessment of a Temporary Construction Area site off Margam Wharf, Port Talbot. All works were undertaken in accordance with our proposal letter dated 14 March 2023 and referenced RE.2111006.005 and revised in our letter dated 16 June 2023 and referenced RE.2111006.006.

1.2 Background

1.2.1 The site currently comprises a disused parcel of land (formerly Margam Wharf), partially owned by Associated British Ports (ABP) and partially owned by TATA Steel, in the docks area of Port Talbot (Figure 2).

1.2.2 The site covers a total area of approximately 4.24 hectares, with the centre of the site situated at National Grid Reference 277010, 188760. The nearest postcode is SA13 1RA (Figure 1). The site currently comprises a disused plot of largely scrub land, with remnants of infrastructure associated with Margam Wharf (including concrete slabs and access roads) present across the site area.

1.2.3 Whilst full details of the proposed development have not been provided to TEC at this stage, it is understood that it is to comprise a temporary construction facility to be capped with granular material to allow it to be used for the duration of the construction of the nearby proposed sustainable jet fuel production facility at land off Crown Wharf.

1.2.4 A Desk Study and a Ground Investigation Report of the nearby proposed sustainable jet fuel production facility site (located approximately 275m west) were undertaken in May 2022 and June 2022 by TEC, as detailed within the following documents:

- *'Project Dragon – Sustainable Aviation Fuel (SAF) Production Facility: Production Development Zone (PDZ) – Desk Study', report ref.: 2111006.002.01 Rev. G. Prepared for LanzaTech UK Limited, dated May 2022 and revised October 2023; and*
- *'Project Dragon – Sustainable Aviation Fuel (SAF) Production Facility: Production Development Zone (PDZ) – Ground Investigation Report', report ref.: 2111006.003.01. Rev. D. Prepared for LanzaTech UK Limited, dated June 2022 and revised August 2023.*

1.2.5 Reference should be made to these documents for full details, although salient summary information in relation to this site is summarised in Section 2.10 of this report.

1.2.6 The aim of the current works is to provide preliminary information on land contamination risk and the ground engineering conditions and constraints associated with the site with regard to the proposed development.

1.3 Scope of Works

1.3.1 The scope of work undertaken as part of this report is presented below:

- **Preliminary Risk Assessment:** this phase of assessment involves development of an initial site conceptual model, based on desk study research and a site reconnaissance survey, in order to establish whether or not there are potentially unacceptable risks.
- **Preliminary Geotechnical assessment:** this phase of assessment comprises a review of publicly available ground engineering and geological information for the site to determine likely preliminary geotechnical parameters.

1.3.2 The above scope of work has been undertaken in accordance with current guidance such as LCRM - *Land contamination: risk management* (Environment Agency, 2021) and BS10175+A2:2017 (Investigation of potentially contaminated sites, Code of Practice).

2 PRELIMINARY RISK ASSESSMENT

2.1 Introduction

2.1.1 Information for this preliminary risk assessment (PRA) has been obtained from a site reconnaissance survey and a review of an Envirocheck® report obtained for the site (Appendix B and Appendix C) together with published available information where relevant.

2.2 Site Setting

2.2.1 A site reconnaissance survey was undertaken on 29 April 2023 and 25 May 2023. A summary of the observations is presented in Table 2.1. Photographs taken during the site reconnaissance survey are presented in Appendix A.

Table 2.1: Site Details

Feature	Description
Current Site Use	The site currently comprises a roughly triangular disused plot of largely scrub land, with remnants of infrastructure associated with Margam Wharf (concrete slabs and access roads) present across the site area.
Site Context	The site is located with a predominantly industrial area.
Site Boundary Features	North Harbour Way (A4241), with residential properties beyond.
	East Access road with additional disused scrub land beyond.
	South TATA Steel works
	West Port Talbot Docks
Site Topography	The site is predominantly flat and situated approximately 7.6m above ordnance datum (AOD).
Hard and Soft Landscaping	The site was noted to comprise a combination of both hard and soft landscaping, with a central concrete slab observed and additional remnants of former infrastructure such as access roads. The remainder of the site is covered in dense scrub vegetation.
Ecology	It is understood that oxtongue broomrape is present over a large part of the site area and is particularly prevalent within the northern part of the site. Oxtongue broomrape is understood to be fully protected under WCA Schedule 8 and it is an offence to intentionally pick, uproot or destroy any of these plants.
Trees	The site is predominantly covered with dense scrub (<i>Appendix A</i>).
Fuel, Hazardous Chemicals and Waste Materials Storage	No AST, USTs, contents, or containers etc. has been observed on site. A number of stockpiles, comprising building rubble and other waste materials have been observed close to the access route along the front of the wharf. In addition, to a lesser extent localised areas have been observed to comprise materials from recent fly tipping. (<i>Appendix A</i>)
Asbestos Containing Materials	No potential ACM has been observed on the ground surface during the site reconnaissance.
Site Drainage	Surface water drains have been recorded within the road located south-west of the site. This was observed to merge to the south-western site boundary towards a pollution control valve also located at the south-western site boundary which flows through to a cofferdam immediately north-west (<i>Appendix A - Photographs 9 to 12</i>). Within the central site area, an area observed to have been fenced off with heras fencing comprised large metal manhole covers, which suggests the presence of a large drainage/service chamber - National Grid Reference: 277059, 188726 (<i>Appendix A - Photograph 13</i>). Located within the south-eastern site area, an exposed plastic pipe was noted, generally being above ground level and running the south-eastern onsite boundary. Furthermore, the entire western site boundary was observed to boarder a harbour wall forming the wharf (<i>Appendix A - Photograph 14</i>).

Feature	Description
Evidence of Potential Contamination	No visual/olfactory evidence of gross contamination (stressed vegetation, stained ground etc) has been observed. However, localised areas have been observed to comprise materials from recent fly tipping (<i>Appendix A - Photograph 15</i>).
Ground Stability Hazards	No visual evidence of ground subsidence/ movement observed or any areas of sunken ground noted / cracks in retaining walls/ landslip evidence/ creep etc. note on the site itself. In addition, located south-west offsite, the retaining wall of the wharf were observed to have a partial collapsed retaining wall and gradual tilting of remaining stone columns within the cofferdam (<i>Appendix A - Photographs 10 to 12</i>).
General	BT Services with marked service covers were recorded parallel to the entire access road starting from the north and ending at the southern site boundary (<i>Appendix A - Photographs 3 & 4</i>). A number of recently filled in gullies were observed within the site reconnaissance, generally filled with concrete and slag. Located immediately offsite within the north-eastern site area, large interlocking concrete blocks, forming a former access road, have been observed which ran parallel to the site boundary and connected to the northernmost site boundary at a former entry/egress gate (<i>Appendix A - Photographs 5 & 6</i>).

2.3

Site History

2.3.1

Details of the history of the site and surrounding area, relevant to this preliminary risk assessment, have been obtained through the review of historical Ordnance Survey (OS) mapping. A summary of potentially significant features is recorded in Table 2.2, which should be read in conjunction with the full map extracts contained within Appendix B.

Table 2.2: Historical Features Summary

On Site Features	OS Dates
The site is an undeveloped parcel of land and water on the tidal flats of Port Talbot, comprising a combination of rough grassland, shingle and marsh. It is noted that the Ffrwd-Wyllt (stream/river) is present in the north of the site, flowing into the sea. A small peninsular of land is present in the western site area, with a structure depicted on the peninsula just off site to the west. Although no structures are depicted on site, the eastern site area is depicted as forming part of the Margam Copper Works, with a number of access roads/tracks depicted on site. By 1899, a railway siding is depicted extending into the northern site area, with a number of small structures depicted in the northeast of site and the route of the Ffrwd-Wyllt (stream/river) is shown to have been diverted slightly north.	1877 - 1900
By the 1917 survey, part of the southern site area (previously shown as open water) has been infilled and a branch of the Port Talbot Dock Railway has been constructed across the south and east of the site. In addition, an access road ('Military Road') has been constructed north to south through the centre of the site.	1917 - 1921
By 1940, the entire site has been infilled, with Margam Wharf present at the western site boundary (current site boundary). The site includes multiple buildings and infrastructure (including railway sidings, tanks, settling tanks, travelling cranes, overhead pipes, chimneys, reservoirs, conveyors, hoppers and Margam Wharf) of the wider Margam (Iron and Steel) Works site. The 1953 and 1991 mapping depicted slight alterations to the building layouts in the eastern half of the site.	1940 - 2006
By 2009, no buildings are depicted on site (current site layout). A single concrete slab is present in the centre of the site and access tracks are depicted around the site periphery. A concrete 'overflow' structures is depicted in the north of the site, understood to allow the River Ffrwd-Wyllt to flow into the adjacent docks.	2009 - 2023

Surrounding Features	Distance	Direction	OS Dates
Margam Copper Works	On site/ adjacent	East	1877 – 1921
(Main works building, later ‘Blackplate Works’ and ‘Works’)	~220m	East	1877 - 1964
Limekilns	~10m	East	1877 - 1900
Gas Works	~215m ~460m	East South-east	1877 – 1921 1921 - 1954
Railway Sidings	Adjacent	East	1877 - 1900
Coke Ovens	~100m	East	1877 - 1900
Tin Plate Works	~100m ~350m	North North	1899 - 1953 1899 - 1952
Port Talbot Docks Railway	~190m	South	1899 - 1978
Crown Preserved Coal Works	~400m	West	1917 - 1921
Rio Tinto Copper Works, later Works, then Warehouse	~480m	West	1917 - 1982
Port Talbot Steel Works, later Chemical/Engineering Works	~575m	North	1921 - 1964
Margam (Iron and Steel) Works (layout changes by 1993), later TATA Steel	On site/ adjacent	East/ South/ North	1940 - 2023
Metal Refinery Works (with tanks), later Works	~465m	West	1940 - 2006
Phoenix Briquetting Works, later Works	~70m	West	1952 - 1964
Works, with associated Electricity Sub Station	~15m	West	1968 - 2023
Oil Storage Tanks	~220m	West	1968 - 2023
Liquid Oxygen Plant, later Works	~260m	West	1968 - 2016

2.4

Geology

2.4.1

A summary of available geological information for the area is provided in Table 2.3.

Table 2.3: Geological Setting

<i>BGS Geological Mapping (Ref. Solid and Drift 1:50,000 (2011) map – Swansea, Sheet 247)</i>		
Geological Unit	Thickness	BGS Description
Landscaped Ground	Unknown	Mainly redeveloped areas and others where extensive earth moving has occurred.
Superficial Deposits: Tidal Flat Deposits	Unknown	Older Coastal Zone Deposits – clay, silt, sand and peat (including ‘submerged forest’)
Solid Geology: South Wales Middle Coal Measures Formation	Up to 480m	Grey, (productive) coal-bearing mudstones/siltstones, with seatearths and minor sandstones
Faults:	A fault (Morfa Fault) is recorded to bisect the southwestern corner of the site, aligned approximately northwest-southeast.	

BGS Borehole Records			
BGS Reference	Distance/ Direction	Depth below ground level	Recorded Strata
SS78NE88	~260m / NW	0.0 to 18ft/5.5m 18ft/5.5m to 20.6ft/6.3m 20.6ft/6.3m to 21.2ft/6.5m 21.2ft/6.5m to 22ft/6.7m 22ft/6.7m to 22.6ft/6.9m 22.6ft/6.9m to 36ft/11m 36ft/11m to 44ft/13.4m 44ft/13.4m to 61ft/18.6m 61ft/18.6m to 65ft/19.8m	Made Ground consisting of hardcore Soft brown sandy clay and stones Soft brown sandy clay Soft black peat Soft blue very sandy silty clay Soft blue very sandy silty clay Fine to medium gravel Fine to medium sand and gravel Fine to medium gravel with boulders Medium density brown stoney clayey sand
SS78NE104	~340m / E	0.0 to 1.5m 1.5m to 2.0m 2.0m to 2.5m 2.5m to 9.15m	Made Ground: Clay, ash brick, slag Made Ground: Firm brown mottled clay Made Ground: Clay, stones and sandstone fragments Dense to very dense brown sandy gravel with cobbles and boulders
SS78NE103	~375m / E	0.0 to 0.07m 0.07m to 0.6m 0.6m to 1.05m 1.05m to 2.45m 2.45m to 13.7m	Concrete Made Ground: Clayey ash and brick Made Ground: Firm brown mottled sandy clay Made Ground: Clay-bound broken sandstone Dense to very dense brown sandy gravel with cobbles and boulders
BGS Estimated Soil Chemistry			
Element		Estimated Concentration	
Arsenic		25 - 35 mg/kg	
Cadmium		<1.8 mg/kg	
Chromium		60 - 90 mg/kg	
Lead		<100 mg/kg	
Nickel		15 - 30 mg/kg	
Radon			
Radon Potential		Radon Protection Requirement	
Lower Probability Radon Area (less than 1% of homes are estimated to be at or above the Action Level)		None reported to be required	

2.5 Hydrogeology

2.5.1 The Envirocheck® report and Environment Agency information records the following hydrogeological setting of the site.

Table 2.4: Hydrogeological Setting

Aquifer Status			
Geological Unit	Groundwater Vulnerability/ Aquifer Designation	Environment Agency Aquifer Classification	Potential Hydraulic Gradient Direction
South Wales Middle Coal Measures Formation	High Vulnerability/ Secondary A Aquifer	Permeable layers capable of supporting water supplies at a local rather than strategic scale, and in some cases forming an important source of base flow to rivers. These are generally aquifers formerly classified as minor aquifers.	-
Tidal Flat Deposits	High Vulnerability / Secondary (Undifferentiated) Aquifer	Assigned in cases where it has not been possible to attribute either Category A or B to a rock type. In most cases, this means that the layer in question has previously been designated as both minor and non-aquifer in different locations due to the variable characteristics of the rock type.	Potentially tidally influenced
Source Protection Zones			
None recorded within 1km			
Groundwater Abstractions			
None recorded within 1km			
Discharge Consents to Groundwater			
2No. recorded within 1km			
Receiving Water	Effluent Type	Distance/ Direction from Site	
Soakaway / To land	Unspecified (consent expired)	~295m north, ~325m northwest	
BGS Groundwater Flooding Susceptibility			
On site - Potential for groundwater flooding to occur at the surface.			

2.6 Hydrology

2.6.1 The hydrological setting of the site is summarised in Table 2.5:

Table 2.5: Hydrological Setting

Nearest Surface Water Features		
Feature	River Quality (GQA Grade)	Distance/ Direction from Site
River Ffrwdwyllt	A	On site (north)
Port Talbot Docks	-	Adjacent, west

Surface Water Abstractions		
13No. recorded within 500m		
Details	Abstraction Use	Distance/ Direction from Site
Costain Ltd	Construction – Dust Suppression	~20m north
Corus UK Strip Products	Metal – Process Water	~40m southwest, ~55m northeast
	Metal – Non-evaporative Cooling	~45m southwest, ~50m northeast
TATA Steel UK Ltd	Metal – Non-evaporative Cooling	2No. at ~45m southwest, 2No. at ~55m northeast
	Metal – Process Water	2No. at ~45m southwest, 2No. at 55m northeast
Licensed Discharge Consents		
33No. recorded within 500m		
Receiving Water	Effluent Type	Distance/ Direction from Site
Port Talbot Docks	Trade Effluent	On site
	Unspecified	5No. at ~35m southwest, 4No. at ~135m southwest, ~250m west, 2No. at ~345m west, 3No. at ~460m northwest
	Not supplied	8No. at ~460m west, ~495m northwest
Culverted River Ffrwd Wylt	Trade Effluent	2No. at ~25m northeast
River Ffrwd Wylt	Unspecified	~40m northeast, ~85m northwest, 2No. at ~100m northwest
Swansea Bay	Sewage Discharges – Unspecified – Water Company	~260m west
Arnallt Brook	Sewage Discharges – Stw Storm overflow/storm tank – Water Company	2No. at ~395m south
Pollution Incidents		
4No. recorded within 500m		
Receiving Water	Pollutant/ Incident	Distance/ Direction from Site
Not given	Crude Sewage – Category 3/Minor Incident	~165m west
	Oils – Diesel (including agricultural) – Category 3/Minor Incident	~195m northeast, ~200m northeast, ~330m southeast
Flooding from Rivers or Seas		
On Site Designation	Off Site Areas of Flooding	
Extent of flooding and extreme flooding from rivers or sea without defences. Area benefitting from flood defences.	~2 to ~250m - Extent of flooding and extreme flooding from rivers or sea without defences. ~50m northeast – Flood Defences	

2.7 Environmental Data

2.7.1 Additional relevant environmental data from the Envirocheck® report for the site is summarised in Table 2.6.

Table 2.6: Additional Environmental Data Summary

Landfill Sites		
No current or historical landfills recorded within 500m		
Potentially Infilled Land (Water)		
10No. recorded within 500m		
Type	Distance/ Direction from Site	Date on Mapping
Unknown filled Ground (pond, marsh, river, stream, dock etc)	On site	1921
	On site	1900
	On site	1900
	~10m / SW	1921
	~45m / E	1921
	~45m / NW	1965
	~265m / S	1951
	~315m / SW	1965
	~335m / SE	1900
Potentially Infilled Land (Non-Water)		
1No. recorded within 500m		
Type	Distance/ Direction from Site	Date on Mapping
Unknown Filled Ground (pit, quarry etc)	~285m / SE	1993
Commercial/ Industrial Land Use (Active Contemporary Trade Directories)		
5No. significant land uses identified within 250m		
Classification	No. within 250m	Distance/ Direction from Site
Mechanical Engineers	2	~165m / SW, ~245m / NW
Garage Services	1	~200m / N
Dry Cleaners	1	~285m / N
Pumps – Sales, Servicing, Repairs	1	~245m / NW
Hazardous Substances (Authorisations, Consents, Incidents)		
5No. recorded within 500m		
Category	Details	Distance/ Direction from Site
Integrated Pollution Controls (IPC)	Bitmac Ltd – Carbonisation and associated processes within the Fuel and Power Industry	~270m / W
Integrated Pollution Prevention and Control (IPPC)	Port Talbot Power Ltd – Combustion – any fuel greater or equal to 50MW	~265m / W
Substantiated Pollution Incident Register	Pollutant: Noise Water Impact: Category 4 No Impact Air Impact: Category 2 Significant Impact Land Impact: Category 4 No Impact	~180m / S
	Pollutant: Oils and Fuel: Gas and Fuel Oils Water Impact: Category 2 Significant Impact Air Impact: Category 4 No Impact Land Impact: Category 2 Significant Impact	~190m / SW
	Pollutant: Noise Water Impact: Category 4 No Impact Air Impact: Category 2 Significant Impact Land Impact: Category 4 No Impact	~295m / E

Sensitive Land Uses
None recorded within 500m

2.8 Engineering Considerations

2.8.1 Engineering considerations identified from the Envirocheck® report for the site are summarised in Table 2.7:

Table 2.7: Engineering Considerations

Ground Stability Hazards						
Hazard	Hazard Potential					
	No Hazard	Negligible	Very Low	Low	Moderate	High
Collapsible ground			X			
Compressible ground	X					
Ground dissolution	X					
Landslide			X			
Running sand	X					
Shrink/swell clays			X			
Coal mining					X	
Non-coal mining	X					
BGS Recorded Mineral Sites						
5No. recorded within 1km						
Site Name	Type/Commodity		Status	Distance/ Direction from Site		
Port Talbot Steel Slag Aggregates	Steel Works / Blast Furnace Slag		Active	~670m / W		
Gwar-Y-Caeau	Opencast / Sandstone		Ceased	~705m / N		
Taibach Quarry	Opencast / Sandstone		Ceased	~805m / E		
Tir Caradoc	Opencast / Sandstone		Ceased	~875m / NE		
Taibach Quarries	Opencast / Sandstone		Ceased	~885m / E		

2.9 Coal Mining

2.9.1 The Envirocheck report for the site records that the site lies within an area which may be affected by coal mining activity, with inconclusive coal mining reported. It is recommended within the Envirocheck that a coal mining report is obtained from the Coal Authority. However, as it is understood that no development structures are proposed at the site (it is to be used as a lay-down area only, temporarily capped with granular material), a coal mining report is not considered necessary at this stage.

2.10 Previous Site Report Summary

2.10.1 A Desk Study and a Ground Investigation Report of the nearby proposed sustainable jet fuel production facility site (located approximately 275m west) were undertaken in May 2022 and June 2022 by TEC, as detailed within the following documents:

- *Project Dragon – Sustainable Aviation Fuel (SAF) Production Facility: Production Development Zone (PDZ) – Desk Study*, report ref.: 2111006.002.01 Rev. G. Prepared for LanzaTech UK Limited, dated May 2022 and revised October 2023; and
- *‘Project Dragon – Sustainable Aviation Fuel (SAF) Production Facility: Production Development Zone (PDZ) – Ground Investigation Report*, report ref.: 2111006.003.01. Rev. D. Prepared for LanzaTech UK Limited, dated June 2022 and revised August 2023.

2.10.2 A summary of relevant information from these previous reports, in relation to this assessment, is summarised in Table 2.8. Reference should be made to these previous reports for full information.

Table 2.8: Previous TEC Reports Summary (for adjacent site ~275m west)

Site History	Earliest available historical mapping shows this site remained undeveloped until 1917 when a centrally located large factory building is identified on maps as ‘Crown Preserved Coal Works’. This was demolished and replaced by factory buildings identified as ‘Metal Refinery Works’ by 1939 and later as ‘Steel Ceilings Factory’ and ‘Wagon Repair Shop’ with associated railway tracks. By 1939, additional railway lines were constructed on an embankment in the south of the site on the area previously recorded as ‘sand’. By 1949, a large pond is present in the west of the site, along with a number of heaped areas of unknown constituents. Additional industrial buildings have been constructed along the northern perimeter, with three rectangular warehouse buildings constructed to the east on mapping dating to 1964. All buildings on site appear to have been demolished as of 2009.
Encountered Ground Conditions	The exploratory investigation recorded the following ground conditions at the site: <u>Made Ground</u> Made ground was encountered across the majority of the site to a maximum observed depth of >5.0mbgl. The made ground generally comprised dark brown silty gravelly sand with gravel of vesicular slag, concrete and rare clinker, brick and mudstone. <u>Superficial Deposits (BLOWN SAND)</u> Wind-blown sand was encountered in four exploratory locations, generally observed as very loose becoming medium dense yellowish brown fine to medium sand, recorded to depths of between 1.2 and >6.5mbgl. <u>Superficial Deposits (TIDAL FLAT DEPOSITS)</u> Tidal Flat Deposits were encountered across the site and found to vary in composition, but typically comprised either loose dark grey and black mottled silty sand, very soft dark grey slightly sandy slightly gravelly silt, or soft to firm dark grey slightly sandy gravelly clay. Peat beds were observed within the cable percussive boreholes, which varied from plastic dark grey amorphous peat to firm dark grey mottled brown pseudo-fibrous peat. <u>Superficial Deposits (ALLUVIAL FAN DEPOSITS)</u> Below the fine grained Tidal Flat Deposits either dense becoming very dense dark grey, greyish brown and brownish grey mottled gravelly sand and slightly sandy gravel with medium cobble content or medium dense to very dense greyish brown slightly sandy gravel with low cobble content was recorded at depths below 9.5m to 14.2mbgl. Gravel and cobbles were consistently observed to be mudstone and sandstone. <u>Solid Geology (SOUTH WALES MIDDLE COAL FORMATION)</u> The solid geology was recorded at BH04 only, at a depth of 17.7mbgl, comprising dark grey sandstone to a maximum recorded depth of 20.35mbgl.
Groundwater	Perched groundwater was recorded within the made ground materials across the site, with a shallow groundwater body recorded within the superficial Tidal Flat Deposits, as well as a deeper groundwater body encountered in the Alluvial Fan Deposits at BH01 and BH03A
Contamination and Ground Gas	The following CoPCs were identified within the sampled made ground materials at the nearby site, in relation to the anticipated commercial site end use: • PAHs – benzo(a)anthracene, chrysene, benzo(b)fluoranthene, benzo(a)pyrene, and dibenz(a,h)anthracene Further, crocidolite, chrysotile and amosite loose fibres and loose fibrous debris were encountered within made ground materials at 7No. locations. Leachable CoPCs (heavy metals) were identified within sampled made ground. In addition, CoPCs (heavy metals, heavy end TPH fractions, PAHs and sulphate) were recorded within the sampled perched water/upper groundwater. Marginally elevated contaminant concentrations (heavy metals and sulphate) were recorded within the deeper groundwater in relation to conservative EQS values. Based on the limited investigation and initial ground gas monitoring undertaken as part of the previous TEC works, it was possible that the site may potentially be considered as Characteristic Situation 3. However further monitoring was required to confirm this regime.

Relevant Pollutant Linkages	The relevant pollutant linkages identified by TEC for the nearby site comprised: • Human health (end users and construction workers) – potential exposure to CoPCs and asbestos within the shallow made ground via ingestion, inhalation and dermal contact. • Human health (end users and construction workers) – potential ingress and accumulation of bulk ground gas into proposed structures and chronic inhalation by future site end users. • Controlled Waters (Secondary Aquifers and docks) – potential vertical and horizontal migration of identified leachable contaminants within groundwater, along preferential pathways
Recommendations	TEC recommended that additional ground investigation and monitoring works would be required at the proposed development in order to fully characterise the site and determine the requirement for any remedial works in relation to human health and controlled water receptors.

2.11 UXO

2.11.1 Following a Preliminary Risk Assessment, a Detailed UXO Desk Study and Risk Assessment has been completed by Brimstone Site Investigations (ref: PRA-23-2043, dated 22 February 2023; and DRA-23-1532 rev2, dated 6th September 2023) to assess the risk from Unexploded Ordnance (UXO). A summary of the main finding of this assessment in relation to the Margam Wharf site is presented in the following sections. The full stage 1 and 2 UXO Risk Assessments can be found in Appendix E.

German UXO

2.11.2 The Margam Steelworks, within which the site is located, were involved in the production of steel for munitions, tanks, ships, and other war materials and was consequently a target for German air raids carried out by the Luftwaffe.

2.11.3 No evidence of bomb damage to the section of the steelworks within the site boundary has been identified within historical aerial imagery and OS mapping, i.e. areas of clearance, missing roofs, repair works etc. The presence of significant and important infrastructure in these locations indicate that a UXB strike will likely have been observed and dealt with at the time. However, given recorded bombing to the steelworks, the risk from German UXBs is slightly elevated and has been assessed as Low-Moderate.

British / Allied UXO

2.11.4 Evidence indicates that the Margam Steelworks was purpose built during WWI for war production. Further research suggests that the steelworks produced steel utilised for munitions, tanks, ships and other war materials. Three WWII-era bombs/shells have been uncovered at Tata Steel in the 21st century (none have been recorded on the site, although specific locations are unknown). No evidence has been found to suggest that shells were filled at the steelworks in Port Talbot. It is likely that the aforementioned shells consisted solely of the outer casing, given that each of them was certified inert and no mention was made of a high-explosive fill. Therefore, the risk from Allied UXO is assessed to be Low across the site.

2.11.5 16No permanent Heavy Anti-Aircraft batteries were active within range of the site during WWII. Light Anti-aircraft guns likely defended Port Talbot. While Luftwaffe activity in the region was relatively infrequent, it is possible that an unexploded AA shell struck the site. Brimstone consider the risk to be analogous to that of German UXBs.

2.12 Regulatory Consultations

2.12.1 Regulatory consultations have been undertaken with Neath and Port Talbot Council with respect to possible environmental issues and ground conditions on-site and in the surrounding area. At the time of writing, no response had been received regarding our enquiry. Any pertinent information received in due course will be issued under separate cover.

2.13 Outline Conceptual Model

- 2.13.1 In accordance with the Environment Agency Land contamination: risk management guidance, potential source-pathway-receptor pollutant linkages identified from the desk study phase are summarised in the following sections.

2.14 Potential Sources

- 2.14.1 Potential sources of contamination identified on and within the vicinity of the site are summarised below:

On Site Sources

- Made ground of unknown chemical composition; and
- Previous/current on-site activities/processes – including potentially infilled land and industrial use as part of the wider Copper, Iron and Steel Works.

- 2.14.2 It should be noted that while potential ground gas generation from the anticipated thicknesses of made ground and the likely presence of peat within the natural soils, may occur at the site, it is understood that the temporary development does not include the construction of structures, or confined spaces and therefore the assessment of risk from ground gas has not been considered further.

Off Site Sources

- Potentially contaminative current and historic land uses/processes – including wider Iron and Steel Works, industrial docks area, copper works, gas works, railway sidings.

2.15 Potential Receptor Pathways

- 2.15.1 Potential receptors identified as part of this preliminary risk assessment are:

- Future (temporary) site users;
- Construction workers; and
- Controlled waters (Secondary Aquifers and surface waters (River Ffrwdwyllt and Port Talbot Docks).

2.16 Potential Pathways

- 2.16.1 Potential contaminant pathways relating to the identified receptors and contaminants of concern include:

- Dermal contact – contact with soil, dust or water;
- Ingestion - ingestion of soil, dust or water;
- Inhalation – inhalation of soil, dust or vapours;
- Vertical migration –leaching of contaminants within the unsaturated zone resulting in vertical contaminant migration; and
- Horizontal migration – lateral migration of contaminants within the saturated zone and along preferential pathways.

2.17 Hazard Assessment and Risk Estimation

- 2.17.1 Potential pollutant linkages identified as part of this preliminary risk assessment are summarised in the Outline Site Conceptual Model presented in Table 2.9. References to risk estimations are made in accordance with the methodology presented in CIRIA publication C552 (2001) titled 'Contaminated Land Risk Assessment: A Guide to Good Practice' and summarised in Appendix D.

Table 2.9: Outline Conceptual Model

Potential Hazard/ Source	Potential Receptor	Potential Pathway to Receptors	Potential Consequence of Source-Receptor Linkage	Potential Likelihood for Significant Source-Receptor Linkage	Risk Classification
Made ground, potentially infilled land and potentially contaminative historic processes – on site	Future (temporary) site users and construction workers	Exposure to potential contaminants through ingestion, inhalation and dermal contact.	Medium	Low Likelihood to Likely: Given the development history recorded on site, and observations made during the site reconnaissance, the presence of made ground of unknown thickness and chemical composition, and/or shallow contaminants associated with the historic processes/land use of the site cannot be discounted at this stage. Notwithstanding this, it is understood that no development structures are proposed on site, the site is to be capped with imported granular fill materials and the proposed use is to be temporary. Therefore, the exposure risk to site end users is likely to be limited	Low to Moderate Risk
	Controlled waters (Secondary Aquifers and surface waters)	Leaching of potential contaminants from made ground and vertical and lateral migration through the saturated zone to controlled waters.	Medium	Low Likelihood to Likely: Given the potential presence of made ground/potentially infilled land of unknown chemical composition, the recorded aquifer status of the underlying strata (Secondary Aquifers) and the presence of surface waters adjacent to the site boundary (tidal waters), a potential risk to controlled waters, cannot be fully discounted. Notwithstanding this, it is understood that no development structures are to be constructed on site and the site is to be temporarily capped with a granular material and used temporarily only. It is considered that these activities are unlikely to cause significant mobilisation of potential contaminants potentially present on site over and above risks that may already exist at the site. However, the risk to controlled waters cannot be fully discounted at this stage.	Low to Moderate Risk
Potentially contaminative current and historic processes –off site	Future (temporary) site users, construction workers and controlled waters	Potential on-site contaminant migration from off-site sources. Exposure to potential contaminants through ingestion, inhalation and dermal contact.	Medium	Low Likelihood: Potentially contaminative current and historic processes have been identified in proximity to the site, including adjacent wider Iron and Steel Works, industrial docks area, copper works, gas works and railway sidings. However, given the industrial nature of the site and wider area and the proposed temporary use of the site, the risk to site end users/construction workers is likely to be limited. Notwithstanding this, risk to identified receptors from on site migration of contaminant from these off site features cannot be fully discounted at this stage.	Low to Moderate Risk

3 PRELIMINARY GEOTECHNICAL ASSESSMENT

3.1 Proposed Development

- 3.1.1 The site currently comprises a disused plot of largely scrub land, with remnants of infrastructure associated with Margam Wharf (including concrete slabs and access roads) present across the site area.
- 3.1.2 Whilst full details of the proposed development have not been provided to TEC at this stage, it is understood that it is to comprise a temporary construction facility to be capped with granular material to allow it to be used for the duration of the construction of the nearby proposed sustainable jet fuel production facility at Phoenix Wharf.

3.2 Potential Geotechnical Hazards

- 3.2.1 The published geological mapping indicates the site to be underlain by superficial deposits comprising of Tidal Flat Deposits across the site. The bedrock geology is reported as the South Wales Middle Coal Measures Formation. In addition, it is noted that BGS mapping identify the site and surrounding area to comprise 'Landscaped Ground' (Mainly redeveloped areas and others where extensive earth moving has occurred). In addition, the Envirocheck report for the site indicates the presence of potentially infilled land on site.
- 3.2.2 Site walkover information, along with historic mapping indicates the presence of remnants of infrastructure associated with former use of the site (including concrete slabs and access roads) consideration to the features and potential obstructions will be needed, as appropriate.
- 3.2.3 The previous TEC site investigation of the land ~275m to the west reported a significant thickness of made ground (>5.0mbgl). In addition, peat beds were observed within the superficial Tidal Flat Deposits within the TEC cable percussive boreholes, which varied from plastic dark grey amorphous peat to firm dark grey mottled brown pseudo-fibrous peat. Further shallow (potentially tidally influenced) perched and groundwater strikes were recorded by TEC at the nearby site. Consideration to the presence of shallow groundwater on site should be given.
- 3.2.4 The Envirocheck® report indicates a very low hazard rating for collapsible hazards, landslide ground stability and shrinking or swelling clay, whilst no hazard is recorded for compressible ground, ground dissolution and running sands.
- 3.2.5 The Envirocheck report for the site records that the site lies within an area which may be affected by coal mining activity, with inconclusive coal mining reported. It is recommended that a coal mining report is obtained from the Coal Authority. However, as it is understood that no development structures are proposed at the site (it is to be used as a lay-down area only, temporarily capped with granular material), a coal mining report is not considered necessary at this stage.

3.3 Preliminary Geotechnical Recommendations

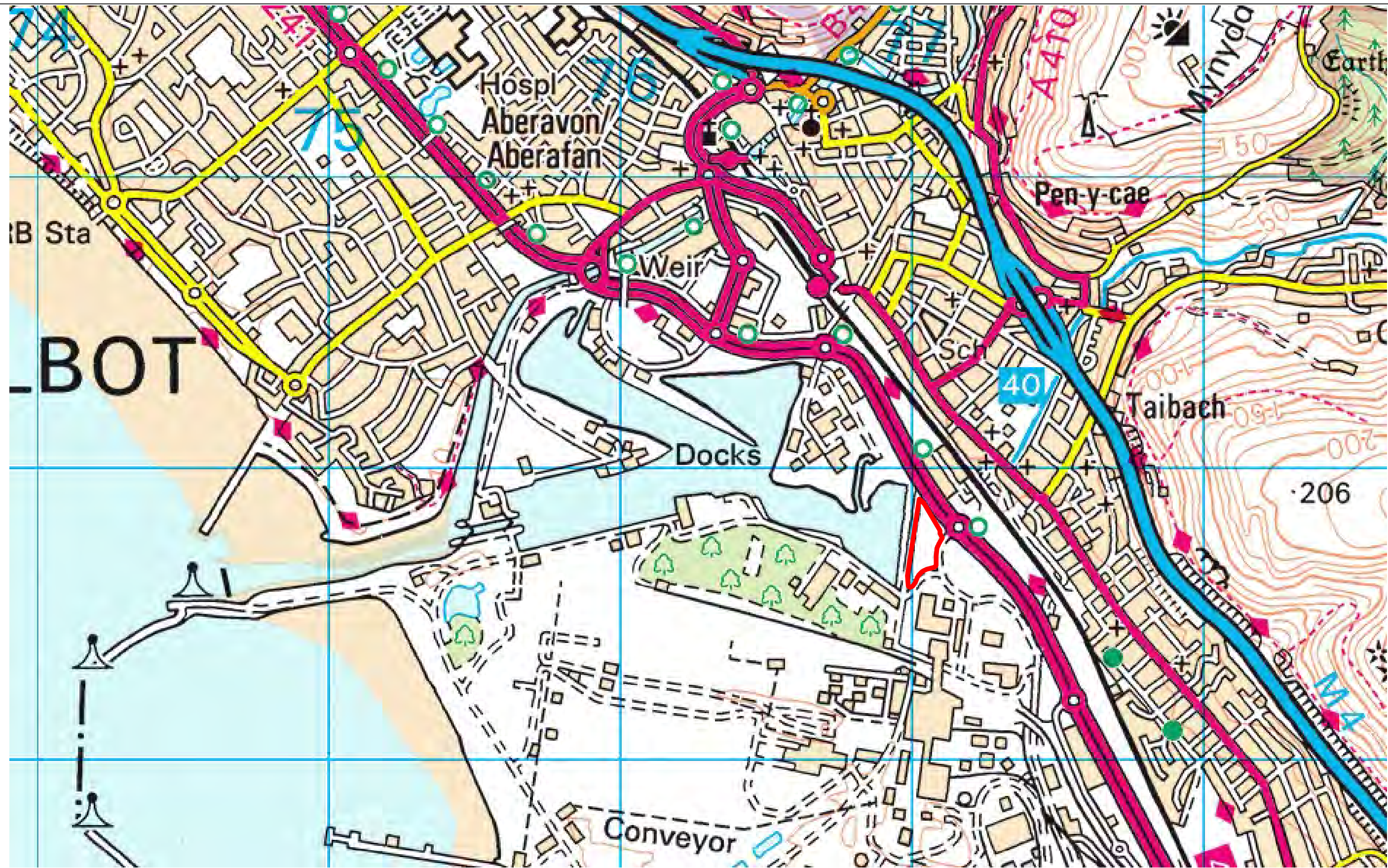
- 3.3.1 Given the identified potential geotechnical hazards, it is recommended that an appropriate geotechnical investigation be undertaken to ascertain underlying general ground conditions and appropriate pavement/road/capping design parameters for the proposed temporary use of the site.

4 RECOMMENDED FURTHER WORKS

- 4.1.1 Based upon our current conceptual understanding of the site and the proposed end use, the potential for significant pollutant linkages to be present is considered to be of low to moderate likelihood. Plausible pollutant linkages that have been identified as part of this assessment include:
- Human Health (future (temporary) site users and construction workers) – exposure to contaminants associated with potential made ground and potentially contaminative historic industrial processes on and in proximity to site through ingestion, inhalation and dermal contact pathways.
 - Controlled Waters (Secondary Aquifers and surface waters) - Leaching of potential contaminants from made ground/shallow soils and vertical and lateral migration through the saturated zone to controlled waters.
- 4.1.2 Given the assessment presented within this report, additional works would be recommended to fully define the geoenvironmental issues associated with the site in relation to the proposed (temporary) development. This phase of assessment would involve refinement of the site conceptual model developed as part of the preliminary risk assessment based on the findings of an exploratory intrusive investigation.
- 4.1.3 Given the potential for historic infrastructure on site (concrete slabs and former access road) as well as made ground/potentially infilled land and pockets of soft peat, an intrusive investigation would be recommended to ascertain the ground profile for site and to determine the engineering conditions and constraints in relation to the proposed temporary capping of the site.
- 4.1.4 The results from the recommended further ground investigations/survey work and associated assessments will be provided for inclusion within the planning application for development at the site.

TEC

Figures and Drawings



 Approximate Site Boundary

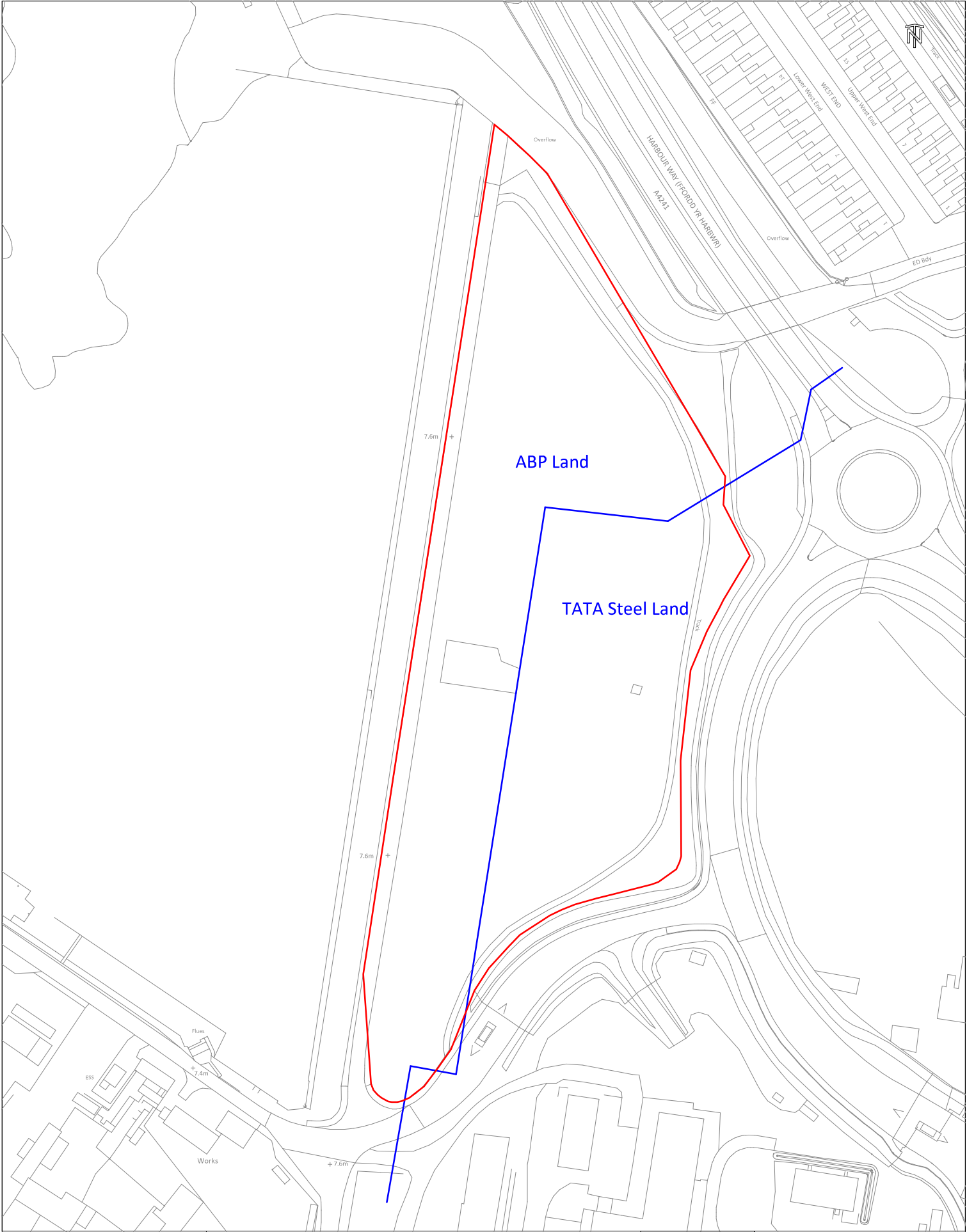
PROJECT DRAGON

Margam Wharf:
Site Location Plan

DATE: June 2023		
SCALE: N/A	DRN: RJE	CHKD: CH
PROJECT No: 2111006.006	DATE: 22-06-2023	DATE: 27-06-2023

FIGURE 1

Rew



- Ownership Boundary
- Approximate Site Boundary



PROJECT DRAGON			
Margam Wharf: Land Ownership Boundary			
DATE: June 2023			
SCALE: N/A	DRN: RJE	CHKD: CH	
PROJECT No: 2111006.006	DATE: 22-06-2023	DATE: 27-06-2023	Rev.
FIGURE 2			

Appendix A

Site Photographs



Photograph 1: View across site facing north.



Photograph 2: View towards access road located within the western site area, facing north.



Photograph 3: View facing south, towards BT service cover located parallel to existing access road.



Photograph 4: View facing south, towards BT service cover located parallel to existing access road.



Photograph 5: View facing north, towards a gated entrance of a former access road.



Photograph 6: Interlocking concrete blocks, located north and north-east of the site, formally used as an access road leading to the northern gate.



Photograph 7: View facing north-west towards neighbouring harbour wall made up of combined sheet piled wall.



Photograph 8: View from northern site area, facing south-west across the wharf.



Photograph 9: A pollution control valve situated at the south-western site boundary.



Photograph 10: View from southern site area, facing south-west towards existing cofferdam and remaining stone columns.



Photograph 11: View from harbour wall, facing south-west towards damaged retaining wall – *Photograph taken 29 April 2023.*



Photograph 12: View from harbour wall, facing south-west towards damaged retaining wall (now covered with dense vegetation) – *Photograph taken 25 May 2023.*



Photograph 13: View of large metal covers currently fenced off and located within the western site area.



Photograph 14: View across southern site area, facing east.



Photograph 15: Observed fly tipping within the southern site area.



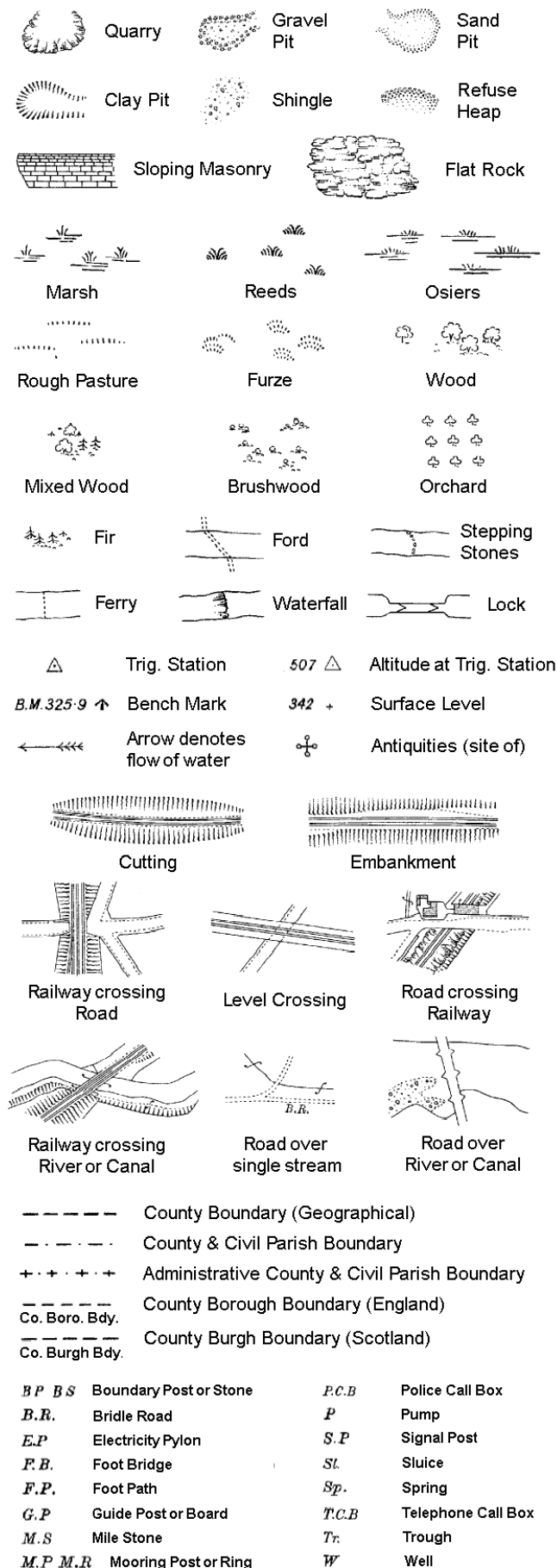
Photograph 16: Stockpiles of waste materials observed close to the access road along the front of the wharf.

Appendix B

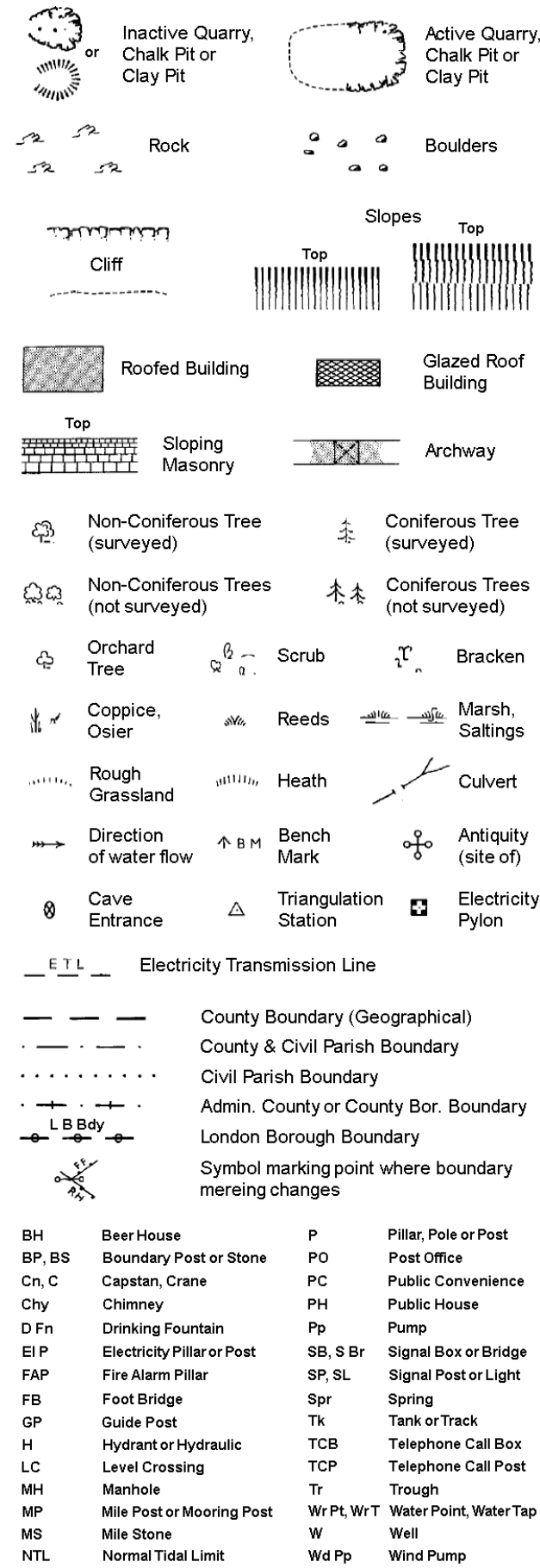
Historical Maps

Historical Mapping Legends

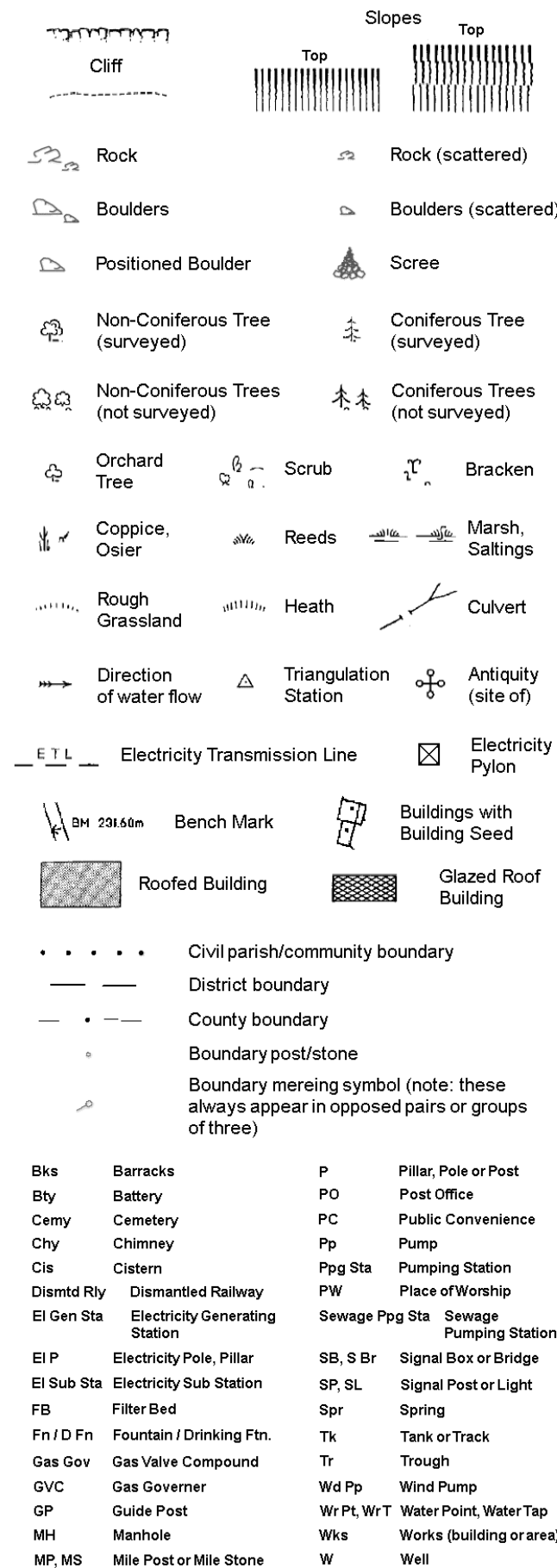
Ordnance Survey County Series and Ordnance Survey Plan 1:2,500



Ordnance Survey Plan, Additional SIMs and Supply of Unpublished Survey Information 1:2,500 and 1:1,250



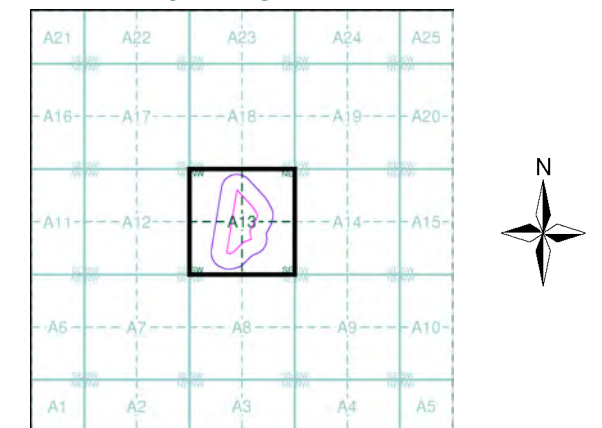
Large-Scale National Grid Data 1:2,500 and 1:1,250



Historical Mapping & Photography included:

Mapping Type	Scale	Date	Pg
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Glamorganshire	1:2,500	1899	3
Glamorganshire	1:2,500	1917	4
Glamorganshire	1:2,500	1939 - 1940	5
Ordnance Survey Plan	1:1,250	1950 - 1953	6
Ordnance Survey Plan	1:1,250	1952 - 1962	7
Ordnance Survey Plan	1:2,500	1953 - 1954	8
Ordnance Survey Plan	1:2,500	1964 - 1969	9
Ordnance Survey Plan	1:1,250	1967 - 1970	10
Ordnance Survey Plan	1:2,500	1969	11
Ordnance Survey Plan	1:1,250	1974	12
Additional SIMs	1:1,250	1978 - 1991	13
Additional SIMs	1:1,250	1991	14
Large-Scale National Grid Data	1:1,250	1993	15
Large-Scale National Grid Data	1:1,250	1995	16
Historical Aerial Photography	1:2,500	2001	17

Historical Map - Segment A13



Order Details

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Site Area (Ha): 4.24
Search Buffer (m): 100

Site Details

Civil & Marine Ltd, Docks Road, The Docks, PORT TALBOT, SA13 1RA

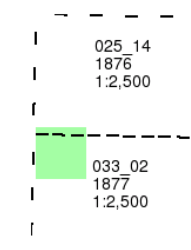


Tel: 0844 844 9952
Fax: 0844 844 9951
Web: www.envirocheck.co.uk

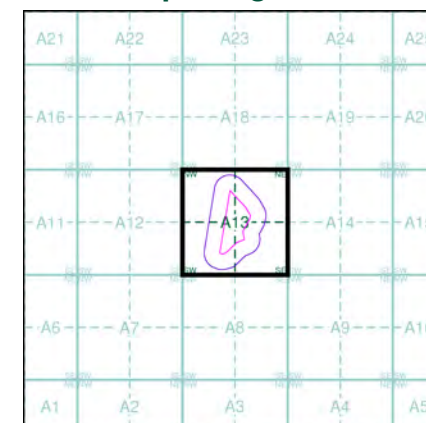


The historical maps shown were reproduced from maps predominantly held at the scale adopted for England, Wales and Scotland in the 1840's. In 1854 the 1:2,500 scale was adopted for mapping urban areas and by 1896 it covered the whole of what were considered to be the cultivated parts of Great Britain. The published date given below 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.

Map Name(s) and Date(s)



Historical Map - Segment A13



Order Details

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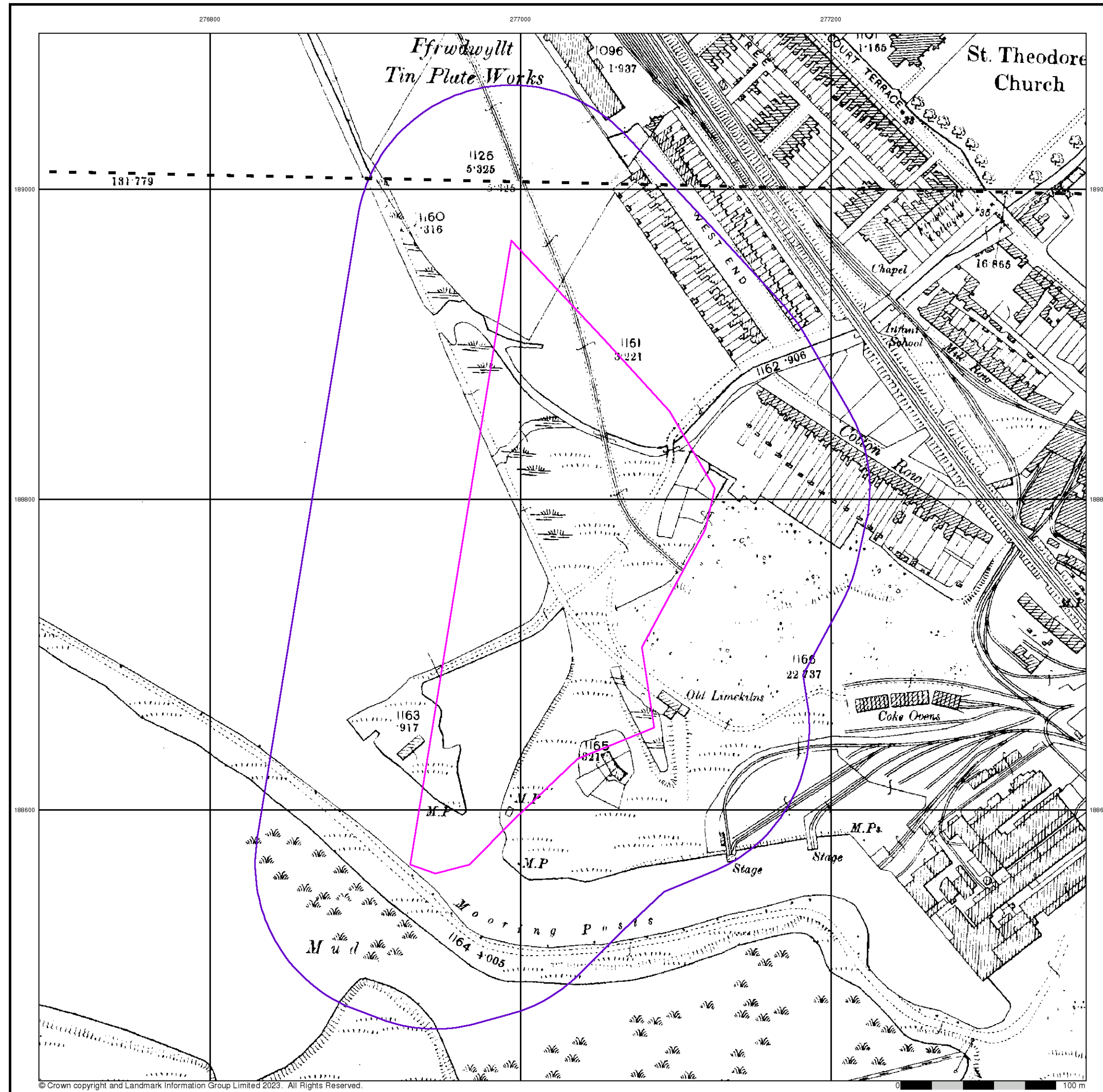
Site Details

Civil & Marine Ltd, Docks Road, The Docks, PORT TALBOT,
SA13 1RA

Landmark
INFORMATION GROUP

Tel: 0844 844 9952
Fax: 0844 844 9951
Web: www.envirocheck.co.uk





Glamorganshire

Published 1899

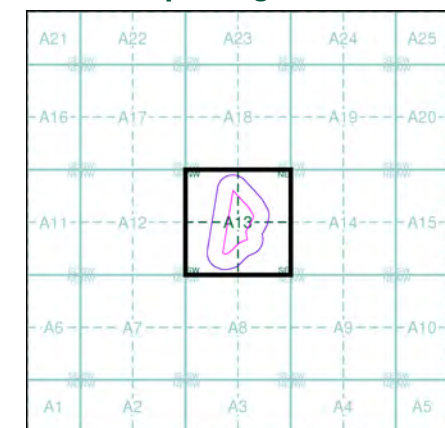
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Map Name(s) and Date(s)

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1:2,500
033_02
1899
1:2,500

Historical Map - Segment A13



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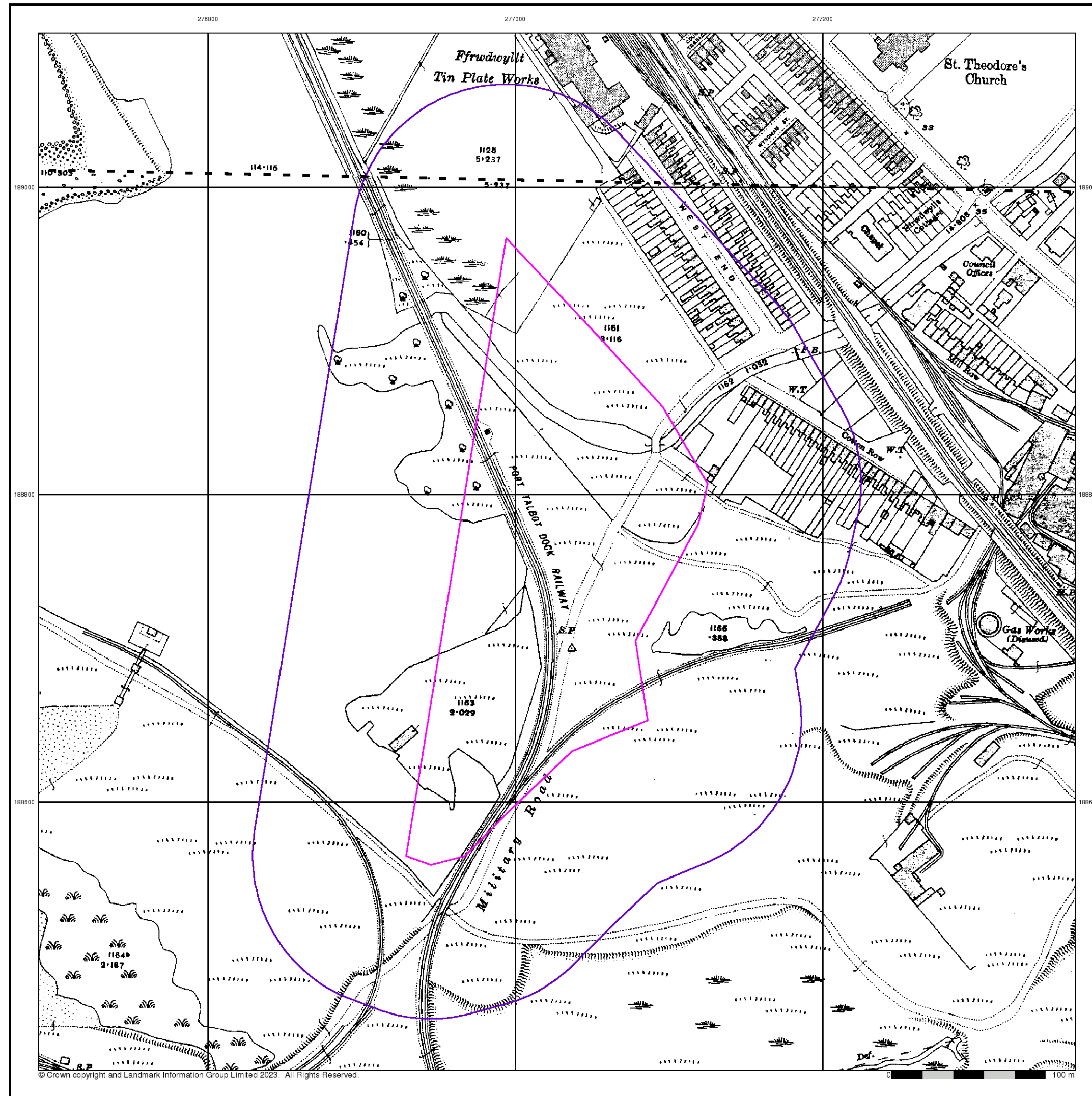
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Site Area (Ha): 4.24
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Glamorganshire

Published 1917

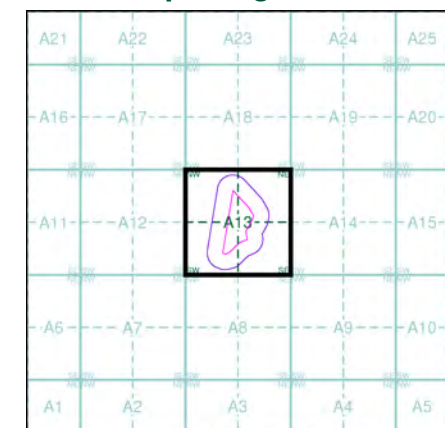
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Map Name(s) and Date(s)

025_14
1917
1:2,500
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1917
1:2,500

Historical Map - Segment A13



Order Details

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Customer Ref: 2111006.005
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Slice: A
Site Area (Ha): 4.24
Search Buffer (m): 100

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