



LanzaTech UK Limited

**Project Dragon – Sustainable Aviation Fuel
(SAF) Production Facility:
Production Development Zone (PDZ)**

Desk Study





This report has been prepared for **LanzaTech UK Limited** in accordance with the terms and conditions of appointment for **Project Dragon – Sustainable Aviation Fuel (SAF) Production Facility: Production Development Zone (PDZ)**. Tweedie Evans Consulting Limited (TEC) cannot accept any responsibility for any use of or reliance on the contents by a third party.

Project Dragon – Sustainable Aviation Fuel (SAF) Production Facility: Production Development Zone (PDZ)

Desk Study

ISSUE RECORD					
Report Reference: 2111006.002.01					
Version	Date	Amendments Record	Prepared by	Checked by	Authorised by
-	May 2022	-			
			Mitchell Tucker	Hannah Jeffery	Richard Evans
A	May 2022	Minor amendments following comments from Turley			
			Richard Evans	Alex Flint	Richard Evans
B	October 2022	Removal of site photographs as requested by LanzaTech			
			Richard Evans	Claire Hooley	Richard Evans
C	June 2023	Inclusion of up-dated UXO Risk Assessment and minor changes to the text			
			Richard Evans	Claire Hooley	Richard Evans
D	July 2023	Further minor amendments following comments from Turley			
			Richard Evans	Claire Hooley	Richard Evans
E	August 2023	Further minor amendments following comments from Turley			
			Amy Butler	Richard Evans	Claire Hooley
F	August 2023	Further minor amendments following comments from Turley			
			Reinier van der Kuip	Sophie Thomas	Richard Evans
G	October 2023	Updated UXO Reports Added			
			Reinier van der Kuip	Sophie Thomas	Claire Hooley
Report Liability Date: May 2022					

TEC is ISO 9001:2015 and ISO 14001:2015 certified by Advanced Certification Limited, a UKAS Accredited Certification Body (number 8872) and ISO 45001:2018 certified by QMS International Ltd for the scope of 'Specialist consultancy services across the UK in contaminated land assessment, ground engineering, waste management and construction phase monitoring'.

TEC
The Old Chapel
35a Southover
Wells
Somerset
BA5 1UH
Tel: 01749 677760
Email: info@tecon.co.uk



TABLE OF CONTENTS

Executive Summary

1	Introduction	1
2	Preliminary Risk Assessment	3
3	Preliminary Geotechnical Assessment	17
4	Recommended Further Works	19

Figures and Drawings

Figure 1	Site Location Plan
----------	--------------------

Appendices

Appendix A	Historical Maps
Appendix B	Envirocheck®
Appendix C	Coal Mining Consultants Report
Appendix D	Risk Methodologies and Evaluation
Appendix E	UXO Risk Assessment
	- Stage 1 Preliminary UXO Risk Assessment – Brimstone Report No. PRA-23-2043, dated February 2023
	- 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 is a disused parcel of land situated off Crown Wharf, part of the dock area owned by Associated British Ports (ABP) in Port Talbot. The site covers an area of approximately 9.12 hectares, with the centre situated at approximately National Grid Reference 276420, 188660. The nearest postcode is SA13 1RA.
	Current Land Use and Description	The site currently comprises a disused plot with a large central concrete slab and several smaller slabs to the northeast. The rest of the site is overgrown with dense scrub vegetation, with extensive Japanese Knotweed contamination observed across the southern half of the site.
	Proposed Development	While full details have not been provided to TEC at this stage, it is understood that the proposed development is to comprise a new facility for the production of synthetic jet fuel.
BACKGROUND INFORMATION	Geology	The site is recorded to be underlain by superficial Tidal Flat Deposits typically described by the British Geological Survey (BGS) as a consolidated soft silty clay with layers of sand, gravel and peat. The underlying bedrock geology is recorded as the South Wales Middle Coal Measures and is described as grey coal bearing mudstones/siltstones with seatearths and minor sandstones. In addition, the BGS reports the site and surrounding area to comprise 'Landscaped Ground', described as mainly redeveloped areas and others where extensive earth moving has occurred. Previous ground investigations at an adjacent site record made ground up to 5.5mbgl.
	Coal Mining	It is reported that the site is located within an area which may be affected by coal mining activity, although is not located within a Development High Risk Area. The Coal Authority report states that there are historical records of underground coal mining at Morfa colliery located approximately 300m to the southeast, but holds no records of any current underground workings, nor any current or historical opencast mines in the vicinity. A previous site investigation on land to the west of the LanzaTech site, found coal beds at varying depths between 31 and 47.3mbgl in 10No. exploratory holes, with one of the boreholes described by the drillers as having a coal seam between 34 and 36mbgl followed by backfilled workings of coal to 37.5mbgl.
	Hydrogeology	The superficial deposits recorded on site are reported as a Secondary (Undifferentiated) Aquifer of medium groundwater vulnerability. The underlying solid geology is designated as a Secondary Aquifer A of medium groundwater vulnerability. There are no groundwater abstractions reported within 500m of the site. There are two discharge consents to groundwater reported within 500m of the site. The northern half of the site is reported to be located in an area with potential for groundwater flooding to occur at the surface, whilst the rest of the site having potential for groundwater flooding of property situated below ground level.
	Hydrology	The nearest surface water features are the small ponds located on the site, followed by the adjacent docks. There are 19No. reported surface water abstraction records within 500m and 27No. reported discharge consents within 250m of the site. The site is not reported to be located within an area of extent of flooding from rivers and seas without defences (Flood Zone 1).
	Unexploded Ordnance	The ground conditions across the majority of the site it considered to have been uncondusive to the detection of UXO during WWII. Bombs, including those with delayed-action fuzes, are recorded across the southern part of the docks, ie potentially within the site boundary. Potential repair works, indicative of bomb damage, have been observed to the metal refinery adjacent to the site. This, together with the recorded bombing to the copper works and the nearby steelworks, has resulted in the majority of the site being assessed at a Moderate Risk from German UXBs.
	Site History	Earliest available historical mapping shows the 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.

CONCLUSIONS	Identified Pollutant Linkages	Potential pollutant linkages that have been identified as part of this assessment include: - Human Health (current and future site users) – 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. - Human Health (future site users and proposed structures) – migration, ingress and accumulation of ground gases. - Controlled Waters - Leaching of potential contaminants from potential made ground/shallow soils and vertical and lateral migration through the saturated zone to controlled waters.
	Ground Engineering	Multiple records of potential excavations or extractive industry usage are reported on site, including unspecified deposited materials, unspecified pits, railway embankments and railway cuttings. In addition, current and historical ponds are reported on site. Potentially soft, compressible clay/silt/sand tidal flat deposits which could include peat as indicated from BGS borehole records, and/or potentially significant thicknesses of made ground, may yield low CBR and design subgrade surface modulus values requiring improvement of the subgrade to support the construction of a pavement foundation. Similarly, it is anticipated that the anticipated ground conditions would require a piled foundation solution to support the proposed structures. The potential for a high-water table may need consideration within the pavement design based on proximity to the docks and seasonal ponds observed on site.
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 development. This phase of assessment would involve the refinement of the site conceptual model developed as part of the preliminary risk assessment based on the findings of exploratory and detailed intrusive investigations, as well as confirming the underlying ground profile to ascertain the most appropriate foundation solutions for the proposed development. It is reported that the site is located within an area which may be affected by coal mining activity and while not within a Development High Risk Area, the geotechnical assessment should include an assessment of the potential impact of any mining legacy at 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 Costain on behalf of LanzaTech UK Limited to undertake a preliminary land contamination and geotechnical assessment of land at Crown Wharf, Port Talbot, referred to as the Production Development Zone (PDZ). All works were undertaken in accordance with our proposal letter dated 07 March 2022 and referenced RE.2111006.001_004C.

1.2 Background

1.2.1 The site currently comprises a roughly rectangular disused parcel of land that features a large central concrete slab surrounded by dense overgrown vegetation, situated in part of the dock area owned by Associated British Ports (ABP), in Port Talbot (Figure 1). The site covers an area of approximately 9.12 hectares, with the centre situated at approximately National Grid Reference 276420, 188660. The nearest postcode is SA13 1RA.

1.2.2 While full details have not been provided to TEC, it is understood that the proposed development is to comprise a new facility for the production of sustainable jet fuel. Notwithstanding this, the Production Development Zone (PDZ) will include process/production plant and equipment, administration buildings, process control room, warehouse, workshop, laboratory, car and cycle parking provision and a new electrical substation.

1.2.3 A number of previous assessments have been undertaken on a site located approximately 175m to the west. These include the following reports:

- Port Talbot Renewable Energy Plant Environmental Desk Study Report by Sinclair Knight Merz (SKM). Prepared for PrenergyPower, dated May 2006.
- Port Talbot Renewable Energy Plant Phase II Geo-Environmental Investigation by Sinclair Knight Merz (SKM). Prepared for PrenergyPower, dated May 2007.
- Port Talbot Renewable Energy Plant, Port Talbot Docks, Factual Report on Ground Investigation. Report ref: H8090, prepared for Atkins Limited on behalf of PrenergyPower, dated March 2009.

1.2.4 These previous reports have been provided to TEC and reviewed in Section 2.10 of this report. As public domain information, it is assumed that the data held within these previous reports can be utilised, although TEC hold no responsibility for the validity of third-party information. Reference should be made to the reports for full information.

1.2.5 In addition, a Desk Study for one the nearby proposed temporary construction areas (located approximately 275m east of the PDZ) has been prepared for the scheme by TEC, as detailed within the following document:

- Project Dragon – Sustainable Aviation Fuel (SAF) Production Facility: Temporary Construction Area at Margam Wharf – Desk Study, report ref.: 2111006.006.01 Rev. C. Prepared for LanzaTech UK Limited, dated June 2023 and revised October 2023.

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 to assess the feasibility of 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, 2023), BS10175+A2 (2017) and BS10175+A2:2017 (Investigation of potentially contaminated sites, Code of practice), BS5930:2015+A1:2020 and, where appropriate, Eurocode 7 and NHBC/ LABC.

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 A and Appendix B) together with published available information where relevant.

2.2 Site Setting

2.2.1 A site reconnaissance survey was undertaken on 28th March 2022. A summary of the observations is presented in Table 2.1.

Table 2.1: Site Details

Feature	Description
Current Site Use	The site is a disused plot of land comprising of a large central concrete slab, as well as several smaller concrete slabs in the northeast of the site. The remainder of the site is overgrown with dense scrub vegetation, with several areas of waterlogged ground observed, notably towards the northern perimeter. Evidence of Japanese Knotweed was observed extensively across the site, and notably in the southern half of site. It is understood from the client that the observed stems are the remains of clearing efforts undertaken to allow access for the main ground investigation works. An electricity sub-station is located in the north-eastern corner of site and is situated on a concrete slab.
Site Context	The site is located within a predominantly industrial area.
Site Boundary Features	North Industrial buildings associated with Hanson Cement, beyond which Port Talbot docks
	East Industrial properties
	South East-west trending railway tracks, beyond which is Port Talbot Steelworks
	West Industrial properties and disused overgrown land
Site Topography	The site is predominantly flat and situated at approximately 7.0m above ordnance datum (AOD).
Hard and Soft Landscaping	The site was noted to comprise a combination of both hard and soft landscaping, with a large concrete slab observed in the centre of the site, with additional smaller slabs to the northeast, whilst the remainder of the site is covered with dense vegetation.
Trees and Vegetation	The site is predominantly covered with dense scrub vegetation although some reeds were observed to the north along areas of waterlogged ground. Japanese Knotweed stems were identified to the south. Based upon information provided by the client, it is understood that Japanese Knotweed once covered up to approximately 2Ha of the site, much of which has recently been removed. Additionally, several mature deciduous trees were identified along the southern perimeter.
Fuel, Hazardous Chemicals and Waste Materials Storage	No evidence of fuel storage or waste material storage was observed on site at the time of inspection. However, it is noted that in the north-eastern corner of the site several discarded gas bottles as well as four 'Castrol' oil drums were observed near to the electricity sub-station.
Asbestos Containing Materials	No potential asbestos containing materials were observed on the ground surface during the site reconnaissance.
Site Drainage	No formalised drainage was observed on site; however, several small patches of waterlogged ground/standing water was observed, notably towards the north.
Evidence of Potential Contamination	No visual or olfactory evidence of potential contamination was noted on the ground surface during the site reconnaissance.
Ground Stability Hazards	No visual evidence of ground subsidence/movement was observed.

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 A.

Table 2.2: Historical Features Summary

On Site Features	OS Dates
The site is an undeveloped parcel of land on the tidal flats of Port Talbot with the high-water mark running broadly north-south through the site, such that the eastern half of the site is covered by tidal mud and the western half is depicted as marsh/osiers.	1876 - 1900
A large factory building, and several smaller buildings are centrally located on the site and recorded as part of 'Crown Preserved Coal Works'. Several railway lines run from these works west across the site and join the Port Talbot Railway docks branch located offsite to the southwest. The corner of a large factory building, as part of 'Rio Tinto Copper Works', is located centrally on the northern perimeter, with additional railway tracks from these works also crossing the site and exiting off site from the western perimeter. The southern half of the site is recorded as 'sand'.	1917 - 1921
The former 'Crown Preserved Coal Works' have been demolished and replaced with a large rectangular building as well as two small rectangular outbuildings and a tank and is now recorded as being a 'Metal Refinery Works'. The railway tracks have been shortened and their orientation slightly adjusted to accommodate the new building. Additionally, several smaller rectangular buildings are located along the northern perimeter. A small pond is recorded in the western half of site and all railway lines and buildings associated with the Rio Tinto Copper Works remain unchanged from their previous layout. Additional railway lines have been constructed on an embankment in the south of the site on the area previously recorded as 'sand'.	1939 - 1940
Infrastructure associated with the 'Metal Refinery Works' are now referred to as 'Steel Ceilings Factory', with an electricity sub-station recorded to the southeast of these buildings, and a second, larger pond also recorded to the west, along with heaped areas of unknown constituents. The railway tracks serving the factory building appear to have been extended to the northeast, and a large warehouse building is now located towards the eastern perimeter.	1949 - 1951
Three additional rectangular warehouse buildings are now located to the east of central factory.	1964 - 1965
The central factory building is now referred to as a 'Wagon Repair Shop', with the associated railway tracks now listed as dismantled. The four warehouse buildings to the east have been demolished and replaced with three square buildings with hoppers on the exterior and roads leading to the north-eastern corner. The buildings along the northern perimeter are now referred to as 'Engineering Works'. The corner of the former 'Rio Tinto Copper Works' building to the north is now referred to as a 'warehouse' and a 'repair depot'. The ponds and heaped areas remain present in the western half of the site.	1968 - 1978
The central factory building remains present. Only one building to the east of site remains, all others appear to have been demolished. No ponds are recorded on site.	1980 - 1982
All buildings and infrastructure associated with former 'Rio Tinto Copper Works' in the northern area of the site have been demolished.	1991 - 1996
Small pond recorded to the west of central factory buildings, as well as a small electricity sub-station present in the north-eastern corner of site.	1999 - 2000
Central factory buildings no longer present on mapping, as is sub-station that was located in the southeast of site.	2009
Buildings associated with the 'works' along the northern perimeter appear to have been demolished. The pond in the west of the site remains present.	2013 - 2022

Surrounding Features	Distance	Direction	OS Dates
Port Talbot Docks and associated quays and wharfs	From ~20m	North	1876 - 2022
Port Talbot Railway Docks Branch (multiple lines)	From ~10m	South, west and north	1899 - 2022
Rio Tinto Copper Works (Later Warehouse/Depot buildings)	Adjacent	North	1917 - 1991
Hydraulic Power Station	~275m	West	1917 - 1965
Talbot Wharf with associated tanks/railway infrastructure and coal tips	~350m	North	1900 - 2022
Margam Works (originally Copper, later Iron & Steel Works) and associated tanks, electricity sub-stations and conveyors (now owned/operated by Tata Steel)	~400m	East	1876 - 2022
	~430m	Southeast	1952 - 2022
	~320m	Southwest	1968 - 2022
Electricity Sub-Station	~350m	East	1949 - 2000
	~75m	North	1978 - 2006
Phoenix Briquetting Works	~160m	East	1949 - 1965
Talbot Wharf Chemical Works	~450m	Northeast	1949 - 1996
Works (including Liquid Oxygen Plant, oil storage tanks and electricity sub-stations)	From ~10m	East	1968 - 2022
Engineering Works	~150m	Northwest	1968 - 2022
Port Talbot Industrial Estate	~270m	Northeast	1978 - 2022

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

BGS Geological Mapping (Ref. Solid and Drift 1:10,000 map – Swansea Sheet 247)			
Geological Unit		Thickness	BGS Description
Landsaped Ground		Unknown	Mainly redeveloped areas and others where extensive earth moving has occurred
Superficial Deposits: Tidal Flat Deposits		Unknown	Consolidated soft silty clay, with layers of sand, gravel and peat (including ‘submerged forest’).
Solid Geology: South Wales Middle Coal Measures Formation		>120m	Grey, productive coal-bearing mudstones/siltstones with seatearths and minor sandstones.
BGS Borehole Records			
BGS Reference	Distance/ Direction	Depth	Recorded Strata
SS78NE86	~310m/N	18ft/~5.5m	Made ground
		20.6ft/~6.3m	Soft brown sandy clay and stones
		21.2ft/~6.5m	Soft brown sandy clay
		22ft/~6.7m	Soft black peat
		22.6ft/~6.8m	Soft blue very sandy silty clay
		36ft/~11m	Fine to medium gravel
		44ft/~13.4m	Fine to medium sand and gravel
		61ft/~18.6m	Fine to medium gravel with boulders
		65ft/~19.8m	Medium density brown stoney clayey sand

BGS Reference	Distance/ Direction	Depth	Recorded Strata
SS78NE87	~310m/N	8ft/~2.4m	Made Ground
		13ft/~4.0m	Coarse sand with stones
		14ft/~4.3m	Soft black silty clay
		18ft/~5.5m	Soft grey clay
		53ft/~16.2m	Coarse to fine gravel and boulders
		63ft/~19.2m	Stiff blue very sandy clay with stones
		63.6ft/~19.4m	Firm brown sandy clay with stones and coal
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		30 - 45 mg/kg	
Radon			
Radon Potential		Radon Protection Requirement	
Intermediate Probability Radon Area (1% to 3% 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	Medium 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	Medium 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			

Current Discharge Consents to Groundwater		
2No. recorded within 500m		
Receiving Water	Effluent Type	Distance/ Direction from Site
Groundwater via infiltration system	Not supplied	2No. at ~370m northwest
BGS Groundwater Flooding Susceptibility		
On site – The majority of the site is categorised as having the potential for groundwater flooding of property situated below ground level, with small sections of the site along the northern boundary categorised as having the 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
Pond	-	On Site
Port Talbot Docks	-	~25m north
River Ffrwdwyllt	A	~325m east
Surface Water Abstractions		
19No. recorded within 500m		
Details	Abstraction Use	Distance/ Direction from Site
Civil and Marine Ltd	Other Industrial/Commercial/Public Services: Dust Suppression	2No. at ~110m northwest
	Other Industrial/Commercial/Public Services: Process Water	4No. at ~130m northwest
Tata Steel UK Limited	Metal: Non-Evaporative Cooling	5No. at ~240m east
	Metal: Process Water	
Corus UK Strip Products	Metal: Process Water	~245m east
Costain Limited	Construction: Dust Suppression	~365m northeast
Tata Steel UK Limited	Metal: Evaporative Cooling	6No. at ~495m east
Licensed Discharge Consents		
27No. recorded within 250m		
Receiving Water	Operator/Effluent Type	Distance/ Direction from Site
Phoenix Wharf Docks	Associated British Ports: Not Supplied (Status: Expired)	0m
	Associated British Ports: Not Supplied (Status: Revoked)	0m
Swansea Bay	Dwr Cymru Cyfyngedig: Sewage Discharges	~10m east
Port Talbot Docks	British Steel PLC: Not Supplied (Status: Expired)	~20m east
		2No. at ~245m east
	British Steel PLC: Unspecified (Status: Revoked)	~245m east
	British Steel PLC: Unspecified (Status: Revoked and Replaced by IPC Authorisation)	~245m east
	Associated British Ports: Not Supplied	2No. at ~15m north
		2No. at ~35m northeast

	Associated British Ports: Unspecified (Status: Revoked)	~15m north
		~35m northeast
		~230m north
	Associated British Ports: Unspecified (Status: Expired)	5No. at ~35m northeast
		~95m northwest
		~115m north
		4No. at ~160m east
Pollution Incidents		
2No. recorded within 500m		
Receiving Water	Pollutant/ Incident	Distance/ Direction from Site
Not Given	Crude Sewage, Category 3 – Minor incident	~150m east
	Oils – Diesel (including agricultural), Category 3 – Minor incident	~470m west
Flooding from Rivers or Seas		
On Site Designation	Off Site Areas of Flooding	
Flood Zone 1	~25m north: Flood Zone 3 – at risk from Flooding from Rivers or Sea without 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)		
15No. 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	1965
	~40m south	1965
	~75m north	1985
	~185m north	1965
	~255meast	1921
	~260meast	1900
	~260m east	1921
	~295m south	1965
	~320m east	1900
	~350m northeast	1921
	~360msoutheast	1951
	~375m southeast	1951
	~385m southeast	1921
	~450m east	1921
Potentially Infilled Land (Non-Water)		
None recorded within 500m		
Hazardous Substances (Authorisations, Consents, Incidents)		
6No. recorded within 500m		

Type/Details		Distance/ Direction from Site
<i>Integrated Pollution Controls:</i> Bitmac Ltd – Carbonisation and Associated Processes within the fuel and power industry		~1m east
<i>Integrated Pollution Prevention and Control:</i> Port Talbot Power Ltd – Combustion , any fuel greater or equal to 50Mw		~40m east
<i>Local Authority Integrated Pollution and Prevention Control:</i> Civil & Marine Slag Cement Ltd – SG6: Mineral Industries		~70m northwest
<i>Local Authority Integrated Pollution and Prevention Control:</i> Civil & Marine Slag Cement Ltd – PG3: Blending, packing, loading and use of bulk cement		~70m northwest
<i>Substantiated Pollution Incident Register:</i> Pollutant: Oils & fuel – gas and fuel oil (August 2016)		~175m southeast
<i>Substantiated Pollution Incident Register:</i> Pollutant: atmospheric pollutants and effects: noise (July 2020)		~500m east
Commercial/ Industrial Land Use (Active Contemporary Trade Directories)		
29No. Significant land uses identified within 500m		
Classification	No. within 500m	Distance/ Direction from Site
Metal Products – Fabricated (Inactive)	1	On site
Precision Engineers (Inactive)	1	On site
General Engineering Services/Materials	3	~35m east ~405m northeast ~410m northeast
Air compressors	1	~55m northwest
Coal & Smokeless Fuel Merchants & Distributors	1	~55m northwest
Mechanical Engineers	3	~130m east 2No. at ~315m northeast
Clothing & Fabrics	2	~285m northeast ~400m northeast
Pump Supplies	2	2No at ~315m northeast
Coating Specialists	1	~315m northeast
Paint Spraying Equipment & Accessories	1	~285m northeast
Road Haulage Services	1	~325m northeast
Metal Finishing Services	1	~335m northwest
Garage Services	2	~340m northwest ~410m northeast
Lifting Equipment	1	~390m northeast
Commercial Cleaning Services	2	2No. at ~390m northeast
Machine Shops	1	~390m northeast
Hydraulic Equipment & Accessories	2	2No. at ~400m northeast
Concrete Reinforcements	1	~420m northwest
Railways	1	~470m northeast
Sensitive Land Uses		
None recorded within 1km		

2.8 Engineering Considerations

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

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						
2No. recorded within 1km						
Site Name	Type/Commodity			Status	Distance/ Direction from Site	
Port Talbot Steel Slag Aggregates	Steel Works – Ground Granulated Blast Furnace Slag			Active	~50m northwest	
Margam Sand Pit	Opencast – Blown Sand			Ceased	~695m west	
Potential Mining Areas						
3No. recorded within 1km						
Site Name	Type/Commodity			Status	Distance/ Direction from Site	
Morfa	Coal			Unknown	~310m southeast	
				Ceased: 1914	~310m southeast	
				Ceased: 1911	~700m south	
Historic Land Use - Extractive Industries or Potential Excavations						
20No. recorded on site						
Type				First Map Published Date		
Unspecified Deposited Material				1899		
				1919 (2No. records)		
				1952 (5No. records)		
Unspecified Pit				1899		
				1919 (2No. records)		
New Dock				1917		
				1939		
				1952		
Railway Embankment				1940		
				1952		
Railway Cutting				1952		
				1952		
Pond				1952 (2No. records)		

2.9 Coal Mining

2.9.1 The mining and ground stability Envirocheck® report obtained for the site suggests that the site may have been used for the mining of coal and lignite on mapping dating to 1921, although the exact nature of the usage is not reported. The location indicated in this Envirocheck® report corresponds to the location of the Crown Preserved Coal Works that appears on historical mapping dating up until to 1921.

2.9.2 It is reported that the site is located within an area which may be affected by coal mining activity and a Coal Authority Consultant's report has been obtained for the site. The full report is presented as Appendix C and summarised as follows:

- The site could have been affected by past underground coal mining, with two seams at Morfa historically having been worked to the southeast. The seams both dipped approximately 18.5 degrees to the north and north-east respectively, with total thickness extracted recorded as 240cm and 180cm. The final depths of these mines are reported as 747m and 767mbgl at the time of their closure in 1906.
- The property is not within a surface area that could be affected by present underground mining.
- The property is not in an area where a license has been granted to remove or otherwise work coal using underground methods. The property is not in an area likely to be affected from any planned future underground coal mining.
- No notices have been given, under section 46 of the Coal Mining Subsidence Act 1991, stating that land is at risk of subsidence.
- The Coal Authority is not aware of any damage due to geological faults or other lines of weakness that have been affected by coal mining.
- The property is not within the boundary of an opencast site from which coal has been removed by opencast methods.
- There are no license requests outstanding to remove coal by opencast methods within 800m of the boundary.
- The Coal Authority has not received a damage notice or claim for the subject property, or any property within 50 metres of the enquiry boundary, since 31 October 1994. There is no current Stop Notice delaying the start of remedial works or repairs to the property.
- The Coal Authority has no record of a mine gas emission requiring action.
- The property has not been subject to remedial works, by or on behalf of the Coal Authority, under its Emergency Surface Hazard Call Out procedures.
- The property is not in an area where a notice to withdraw support has been given.
- The property is not in an area where a relevant notice has been published under the Coal Industry Act 1975/Coal Industry Act 1994.

2.10 Previous Site Report Summary

2.10.1 Information has also been obtained through a review of the following reports which were undertaken on land ~175m to the west and southwest of the site:

- Port Talbot Renewable Energy Plant Environmental Desk Study Report by Sinclair Knight Merz (SKM). Prepared for PrenergyPower, dated May 2006.
- Port Talbot Renewable Energy Plant Phase II Geo-Environmental Investigation by Sinclair Knight Merz (SKM). Prepared for PrenergyPower, dated May 2007.
- Port Talbot Renewable Energy Plant, Port Talbot Docks, Factual Report on Ground Investigation by Soil Mechanics. Report ref: H8090, prepared for Atkins Limited on behalf of PrenergyPower, dated March 2009.

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 Reports Information Summary

Site History	A review of the historical mapping provided in the Desk Study report by SKM in May 2006, reveal that the LanzaTech site was previously used as Rio Tinto Copper Works and Crown Preserved Coal Works, as well as for various factories and works, consistent with the history detailed in Section 2.3 above. To the west of the LanzaTech site, the area was reported to be covered by dunes and rough pasture on earliest available mapping (1877), with a series of railway tracks present along the eastern perimeter as well as the northern boundary present on maps dating to 1899. A sand pit is marked on maps between 1919 and 1940, whilst several unmarked buildings and infrastructure such as tanks and substations as well as conveyors are present between 1953 and 1981. Various changes to the configuration of railway tracks and small buildings occur up to mapping dating to 2006.
Environmental Setting	The bedrock geology of the site is reported to comprise of the South Wales Middle Coal Measures overlying the Lower Coal Measures, with coal seam named 'two-feet-nine' trending northwest-southeast through the middle of the PrenergyPower site, with two north-northwest to south-southeast trending faults also present in the surrounding area. The overlying superficial deposits are reported to comprise of tidal flat deposits and blown sands. The SKM reports suggest that the Middle Coal Measures are classed as a Minor Aquifer and that the nearest surface water feature is the River Afan which flows into the sea to the southwest. One Local Authority recorded landfill is reported approximately 550m east of the PrenergyPower site.
Encountered Ground Conditions	<u>Ground Conditions – SKM May 2007</u> The encountered ground conditions of the adjacent site were generally recorded to comprise of made ground materials of sandy topsoil underlain by sandy gravel, cobbles and boulders of grey iron slag and clinker, to a maximum depth of 5.5mbgl. Superficial Blown Sands overlying Alluvium were encountered to a maximum depth of 23.7mbgl and generally described as loose to dense sands, underlain by sands interbedded with thick horizons of silt, clayey silt and silty clays. Horizons of fibrous peat were encountered at five exploratory hole locations between depths of 7.4m and 22.5mbgl. At the base of one exploratory hole location (BH9) very dense sand, gravel with occasional boulder of mudstone were encountered to a depth of 28.95mbgl and considered to be representative of weathered bedrock. <u>Ground Conditions – Soil Mechanics March 2009</u> The encountered ground conditions were generally found to comprise of made ground materials consisting of slightly silty sandy gravel or slightly silty gravelly sand, with gravel of brick, concrete and slag to a maximum depth of 5.3mbgl. Superficial deposits consisting of slightly silty sand interbedded with slightly sandy silty clay and occasional lenses of peat to a maximum depth of 24.1mbgl. The bedrock geology was encountered as slightly sandy gravel of sandstone, quartzite and mudstone beneath which thinly bedded dark grey siltstone and mudstone were observed to a maximum depth of 44.0mbgl. Notably, in 10No. of the exploratory hole locations, coal beds were recorded at depths varying between 31.0 and 47.3mbgl, and on average approximately 200mm thick, although in BH104R the coal is reported between 41.3 and 47.3mbgl. Additionally, in BHC5 the drillers describe coal between 34.0 and 36.0mbgl, followed by backfilled workings of coal to 37.5mbgl.
Groundwater	Groundwater was encountered at depths of between 0.8 and 3.4mbgl within the Made Ground and Alluvium deposits during drilling activities, with standing levels observed varying between 2.2 to 3.45 within the made ground and 1.1 to 4.4mbgl within the superficial deposits.

Contamination	A semi-quantitative risk assessment completed for the adjacent site to the west by SKM in May 2007 recorded exceedances of adopted generic assessment criteria for a commercial site end use for Total Cyanide and TPH Aliphatic C12 – C16. In line with guidance presented in CLR7, statistical analysis suggested that the population mean for both contaminants of potential concern was less than the screening level once statistical outliers had been removed. However, the outliers or hotspots exceedances of both Total Cyanide and TPH Aliphatic C12-C16 would require a detailed human health risk assessment to assess the risks to site end users.
Ground Gas/ Radon	Given the presence of made ground materials across the site and underlying organic deposits such as peat and coal, six gas monitoring visits were conducted as part of SKM Phase II Geo-Environmental Investigation in May 2007. Based on the collected data, it was concluded that the site was generally characterised as Characteristic Situation 1, however, elevated carbon dioxide values recorded during one monitoring visit would necessitate the site being classified as Characteristic Situation 2.
Relevant Pollutant Linkages	The relevant pollutant linkages identified for the southern area of land were limited to: • Human health (future site users) – exposure to potential contaminants through ingestion, inhalation and dermal contact. • Human health (future site users) – ingress and inhalation of ground gas.
Ground Engineering	Based on the thickness of made ground and soft alluvial silts and clays SKM concluded that a piled foundation solution would be required, founding in the competent sands and gravels encountered from approximately 23.7mbgl. Suspended or precast concrete floors were considered to be required for all structures based on the thickness of made ground deposits. Preliminary CBR values of 3% were considered appropriate for the made ground, improved up to 5% through proof rolling during construction.

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 Crown 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 During WWII, Port Talbot was a strategic target due to the steelworks and coal production facilities that played a vital rôle in supporting the war effort. During WWII the site comprised a metal refinery, a section of a copper works and railway infrastructure. However, the majority of the area was undeveloped open ground.

2.11.3 The proximity of Margam Steelworks, railway yards and iron foundry etc in close proximity to the site as well as the copper works within the site boundary and hard coal briquettes factory immediately to the east of the site, were identified as Luftwaffe bombing targets.

2.11.4 No evidence of bomb damage to the former copper works, located within the site boundary, is identified within historical aerial imagery and OS mapping. Similarly, no obvious evidence of bomb damage is evident in the areas of open/undeveloped ground. However, evidence of repair works to the metal refinery within can be observed on 1940 and 1946 aerial imagery, suggestive of potential bomb damage. The aerial and oblique imagery indicates that the coal briquette works, located to the east of the site may have sustained serious damage. Further, a possible bomb crater has been identified approximately 30m south-west of the PDZ.

2.11.5 The ground conditions across the majority of the site was uncondusive to the detection of UXO. Bombs, including those with delayed-action fuzes, are recorded across the southern part of the docks, ie within the PDZ. Potential repair works, indicative of bomb damage, have been observed to the metal refinery. This, together with the recorded bombing to the copper works and the nearby steelworks, has resulted in the majority of the site being assessed at a Moderate Risk from German UXBs.

British / Allied UXO

- 2.11.6 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.
- 2.11.7 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 were undertaken with the relevant departments at Neath Port Talbot Council with respect to possible environmental issues and ground conditions on-site and in the surrounding area. At the time of issue, a response has not yet been received. 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 overleaf:

On Site Sources

- Made ground/unspecified deposited material of unknown chemical composition;
- Potentially contaminative current and historical land uses including various industrial processes, potentially infilled ground and an electricity sub-station;

Off Site Sources

- A number of potentially contaminative current and historical processes have been identified in proximity to the site, including copper works, iron and steel works, warehouses, factories, depots, engineering works and railway sidings/mineral tramways.

2.15 Potential Receptor Pathways

- 2.15.1 Potential receptors identified as part of this preliminary risk assessment are:
- Current/future site users;
 - Construction workers;
 - Ecological receptors;
 - Controlled waters (Secondary A and Secondary (Undifferentiated) Aquifers and surface waters)
 - Proposed development/ structures.

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 – e.g. seepage of contaminants at the ground surface (i.e. leakage/spillage of hydrocarbons) through cracks in hardstanding and/or leaching of contaminants within the unsaturated zone resulting in vertical contaminant migration; and
- Horizontal migration – e.g. lateral migration of contaminants within the saturated zone and along preferential pathways such as drainage pipe bedding.

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, unspecified deposited materials, potentially infilled ground and potentially contaminative processes – on site	Current and future site users and construction workers	Exposure to potential contaminants through ingestion, inhalation and dermal contact.	Medium	Likely: Given the industrial development history recorded on site, observations made during the site reconnaissance and the reported presence of unspecified deposited materials and potentially infilled land on site, the presence of made ground of unknown thickness and chemical composition on site cannot be discounted at this stage.	Moderate Risk
	Controlled waters (Secondary Aquifers and ecological receptors)	Leaching of potential contaminants from made ground/shallow soil and vertical and lateral migration through the saturated zone to controlled waters.	Medium	Low Likelihood: Given the potential presence of made ground of unknown chemical composition and the recorded aquifer status of the underlying strata (Secondary A and Secondary (Undifferentiated) Aquifers), a potential risk to controlled waters cannot be fully discounted.	Low to Moderate Risk
	Current and future site users, construction workers and proposed development	Migration, ingress and accumulation of ground gasses.	Severe	Low Likelihood: Made ground, if present, may act as a potential source of ground gas, subject to thickness and chemical composition.	Low to Moderate Risk
Potentially contaminative current and historic processes –off site	Current and future site users, construction workers, controlled waters and proposed development.	Potential on-site contaminant migration from off-site sources. Exposure to potential contaminants through ingestion, inhalation and dermal contact.	Medium to Severe	Unlikely to Low Likelihood: Potentially contaminative current and historic processes have been identified in proximity to the site, including adjacent dock yard, iron & steel works, other industrial uses. The potential for on-site contamination migration from these off-site sources cannot be discounted at this stage. Notwithstanding this, given the anticipated cohesive nature of the reported underlying natural ground, the potential likelihood for significant contaminant migration on to site from these off-site sources is considered to be unlikely to low at this stage.	Low to Moderate Risk
Organic rich natural ground – on site	Current and future site users, construction workers, controlled waters and proposed development/structures.	Migration, ingress and accumulation of ground gasses.	Severe	Unlikely to Low Likelihood: The underlying superficial deposits are reported to potentially contain organic rich layers, which may provide a potential source of ground gas generation.	Low to Moderate Risk

3 PRELIMINARY GEOTECHNICAL ASSESSMENT

3.1 Proposed Development

3.1.1 While full details have not been provided to TEC at this stage, it is understood that the proposed development is to comprise a new facility for the production of sustainable jet fuel.

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 and Blown Sands adjacent to the west. 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).

3.2.2 Historic nearby BGS borehole records indicate layers of sandy clay and peat to a depth of approximately 7mbgl, beneath which sands and gravels to approximately 20mbgl. Previous site investigations of the land ~175m to the west reported similar ground conditions, also noting a significant thickness of made ground (maximum depth of 5.5mbgl), as well as coal seams between 31.0 and 47.3mbgl.

3.2.3 The Envirocheck® report indicates a very low hazard rating for landslide ground stability and shrinking or swelling clay, whilst no hazard is recorded for compressible ground, ground dissolution and running sands.

3.2.4 The Envirocheck® report indicates that the site is in an area which may be affected by coal mining activity, with 3No. potential coal mining areas within 1km, the nearest of which named Morfa located ~310m southeast.

3.2.5 In addition, 20No. records of potential excavations or extractive industry usage of the site are reported, noted to include unspecified deposited materials, unspecified pits, railway embankments and railway cuttings. In addition, appropriate consideration should be given to the current and historical ponds reported on site.

3.2.6 The northern half of the site is reported as being located within an area that has the potential for groundwater flooding to occur at the surface and groundwater flooding of property situated below ground level.

3.2.7 Radon protection measures are not reported to be required on site.

3.3 UXO

3.3.1 The ground conditions across the majority of the PDZ was uncondusive to the detection of UXO. Bombs, including those with delayed-action fuzes, are recorded across the southern part of the docks, ie within the PDZ. Potential repair works, indicative of bomb damage, have been observed to the metal refinery. This, together with the recorded bombing to the copper works and the nearby steelworks, has resulted in the majority of the site being assessed at a Moderate Risk from German UXBs.

Mitigation Measures

3.3.2 It is concluded that a moderate risk from UXO exists for the area of the PDZ and appropriate UXO mitigation measures will be required to be in place during the investigation/construction phases of the works:

Table 3.1: UXO Risk Mitigation Measures

Risk Mitigation Measure	Recommendation
UXO Safety Awareness Briefings	Prior to all intrusive works commencing
Non-Intrusive Magnetometer Probe Survey	Open excavations on greenfield land within the Moderate Risk zone
Intrusive Magnetometer Probe Survey	Of all pile positions within the Moderate Risk zone
EOD Engineer - On Site Supervision	Watching brief of all open excavations and magnetometer survey of all excavations within the Moderate Risk zone.

3.4 Preliminary Geotechnical Recommendations

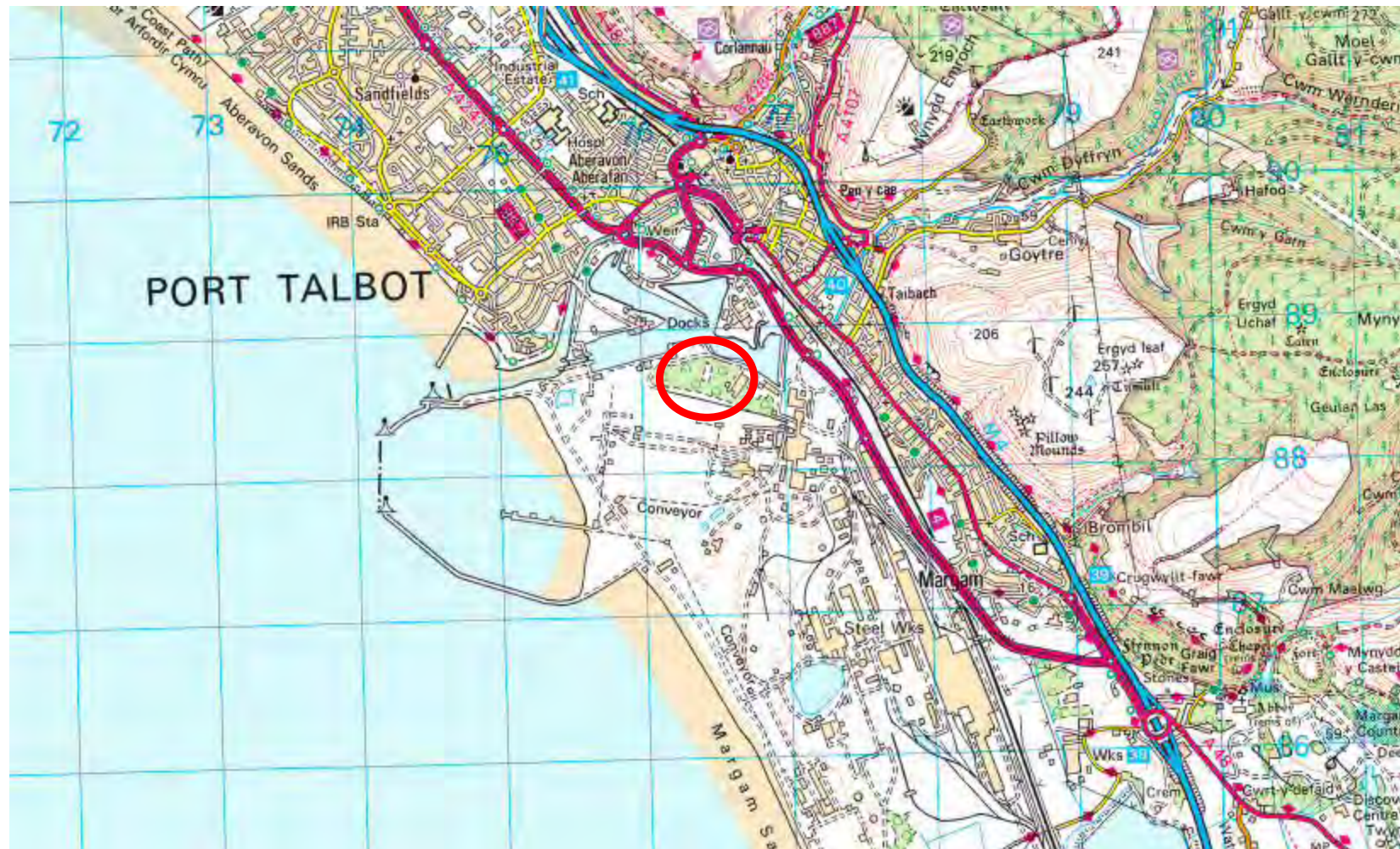
- 3.4.1 Potentially soft, compressible clay/silt/sand tidal flat deposits which could include peat as indicated from BGS borehole records and/or potentially significant thicknesses of made ground, may yield low CBR and design subgrade surface modulus values requiring improvement of the subgrade to support the construction of a pavement foundation. Similarly, it is anticipated that the anticipated ground conditions would require a piled foundation solution to support the proposed structures.
- 3.4.2 The potential for a high-water table may need consideration within the pavement design based on proximity to the docks and seasonal ponds observed on site.
- 3.4.3 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 and foundation design parameters for the proposed on-site development.
- 3.4.4 In addition, it is reported that the site is located within an area which may be affected by coal mining activity. It is recommended that a coal mining report for the site is obtained from the Coal Authority.

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 (current and future site users) – 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.
 - Human Health (future site users and proposed structures) – migration, ingress and accumulation of ground gases.
 - 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 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 exploratory and detailed intrusive investigations.
- 4.1.3 Given the potential for earthworks on site (including potential unspecified pits, unspecified deposited materials and railway embankments/cuttings), localised thicknesses of made ground and pockets of peat, an intrusive investigation would be recommended to ascertain the ground profile for the most suitable founding options and to determine the engineering conditions and constraints in relation to the proposed development.
- 4.1.4 It is reported that the site is located within an area which may be affected by coal mining activity and while not within a Development High Risk Area, the geotechnical assessment should include an assessment of the potential impact of any mining legacy at the site.
- 4.1.5 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 Location:



Ordnance Survey © Crown Copyright [2021] All rights reserved.
Licence number 100043301



TEC
The Old Chapel
35a Southover
Wells, Somerset
BAS 1UH

Tel: 01749 677760
Email: info@tecon.co.uk
Web: www.tecon.co.uk

Site Name:

Phoenix Wharf, Port Talbot

Drawing Name:

Site Location Plan

Client Name:

LanzaTech

Project No:

2111006.002

Figure No:

1

Date:

May 2022

Scale:

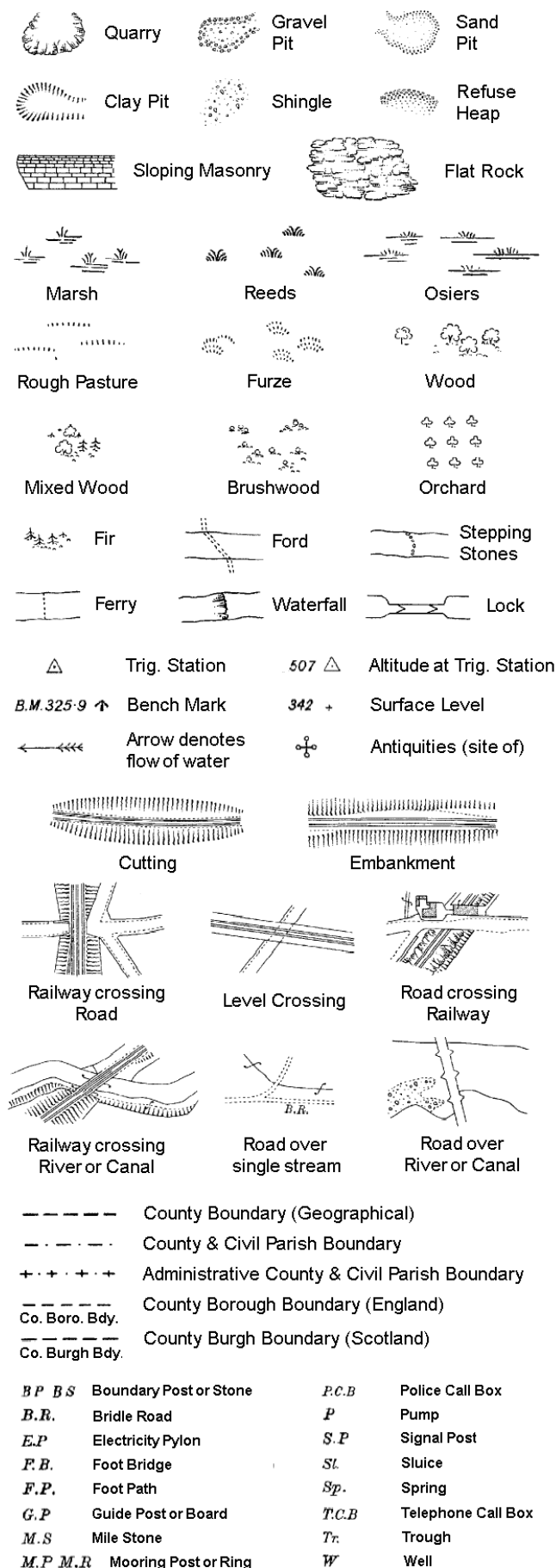
NTS

Appendix A

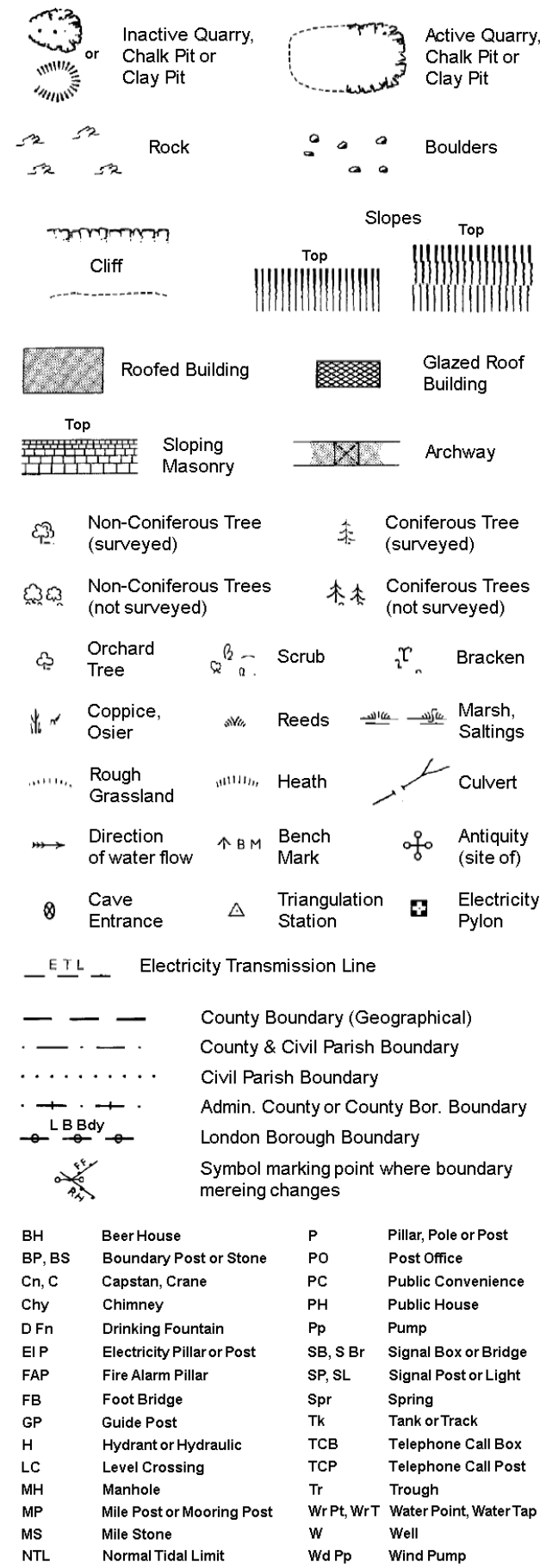
Historical Maps

Historical Mapping Legends

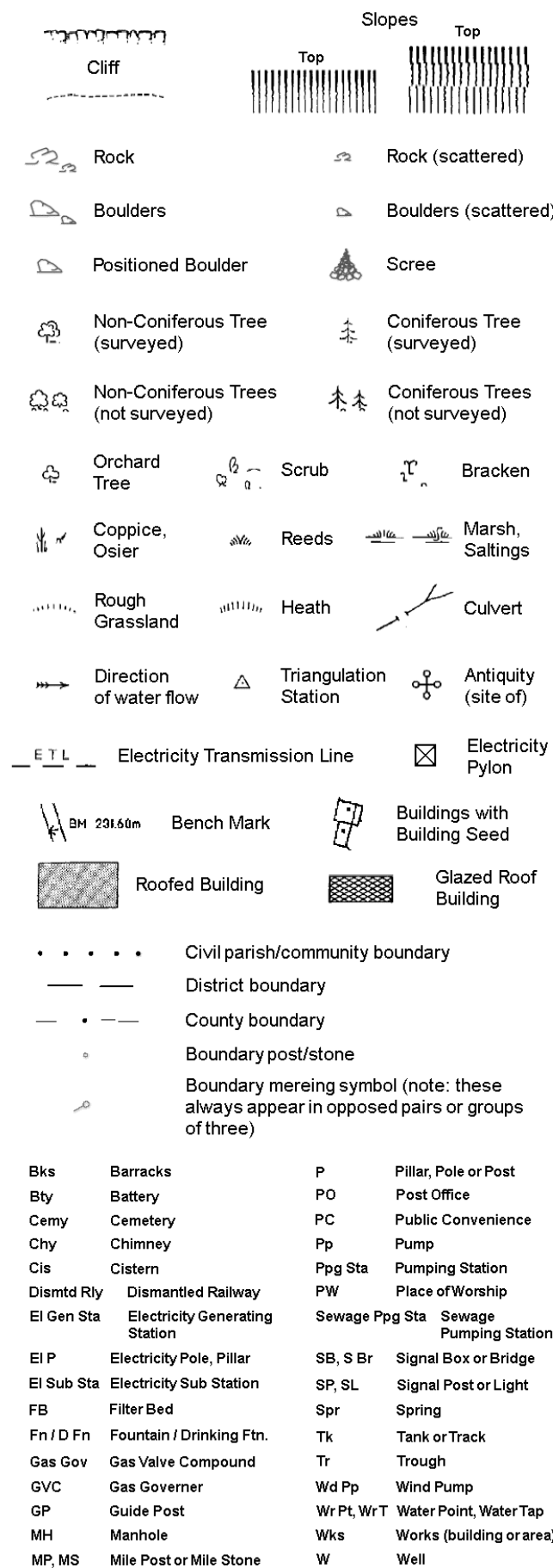
Ordnance Survey County Series and Ordnance Survey Plan 1:2,500



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



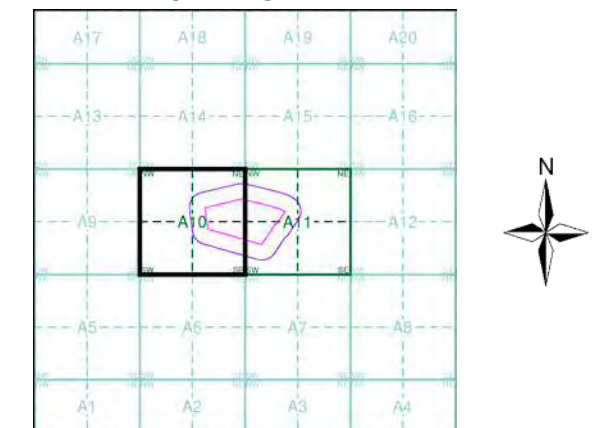
Large-Scale National Grid Data 1:2,500 and 1:1,250



Historical Mapping & Photography included:

Mapping Type	Scale	Date	Pg
Glamorganshire	1:2,500	1877	2
Glamorganshire	1:2,500	1899	3
Glamorganshire	1:2,500	1919	4
Glamorganshire	1:2,500	1940	5
Ordnance Survey Plan	1:1,250	1952	6
Ordnance Survey Plan	1:2,500	1953	7
Ordnance Survey Plan	1:2,500	1964	8
Ordnance Survey Plan	1:1,250	1968	9
Ordnance Survey Plan	1:2,500	1969 - 1982	10
Additional SIMs	1:1,250	1978	11
Additional SIMs	1:1,250	1991	12
Large-Scale National Grid Data	1:1,250	1993	13
Historical Aerial Photography	1:2,500	2001	14

Historical Map - Segment A10



Order Details

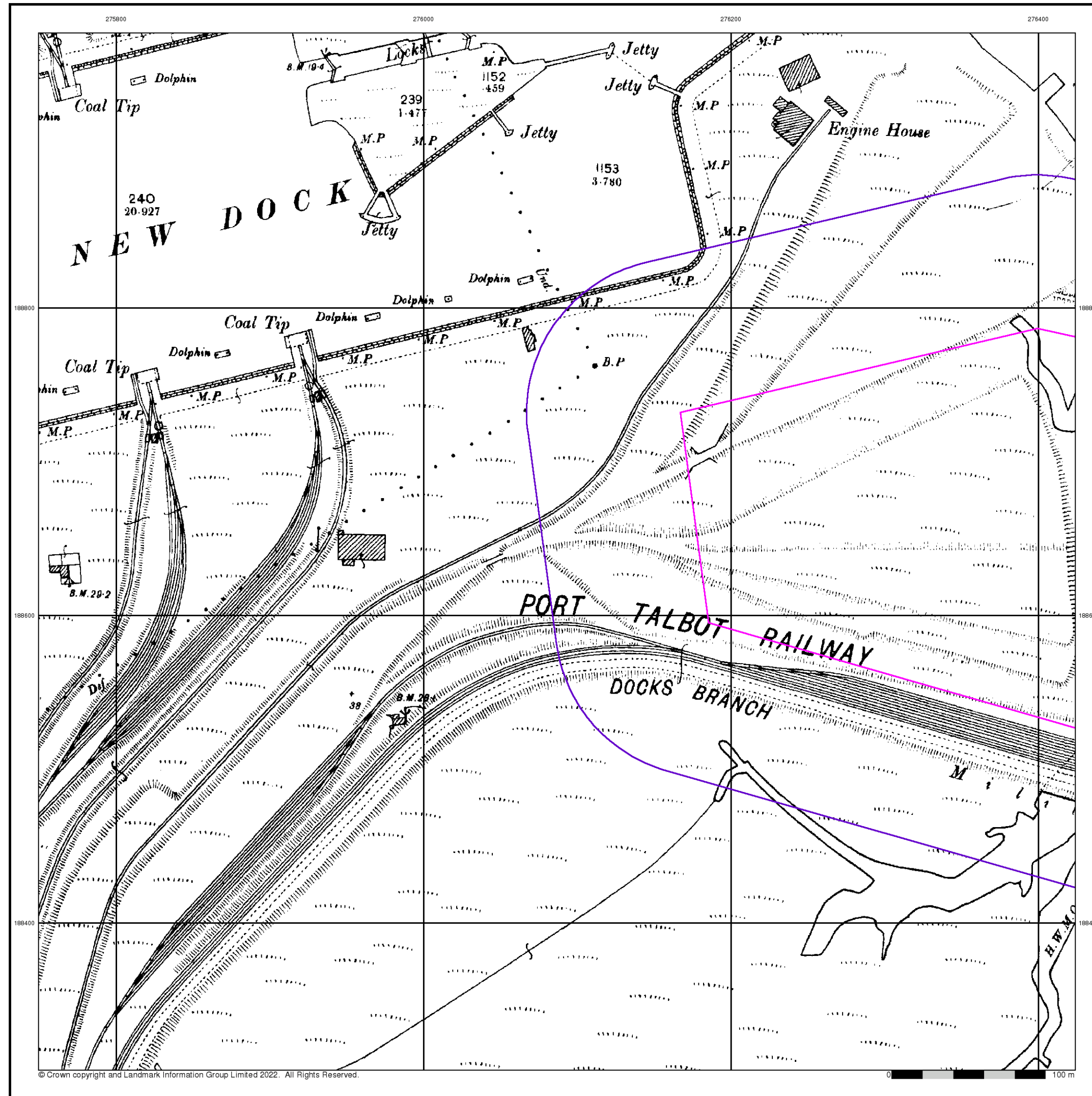
Order Number: 293349570_1_1
Customer Ref: 2111006.002
National Grid Reference: 276420, 188660
Slice: A
Site Area (Ha): 9.68
Search Buffer (m): 100

Site Details

Site at 276440, 188700



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



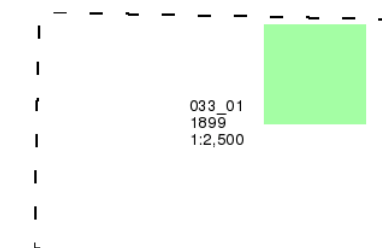
Glamorganshire

Published 1899

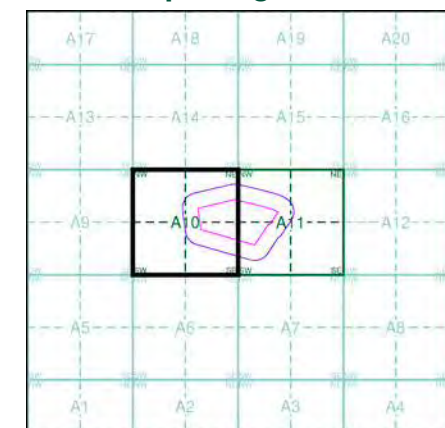
Source map scale - 1:2,500

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 A10



Order Details

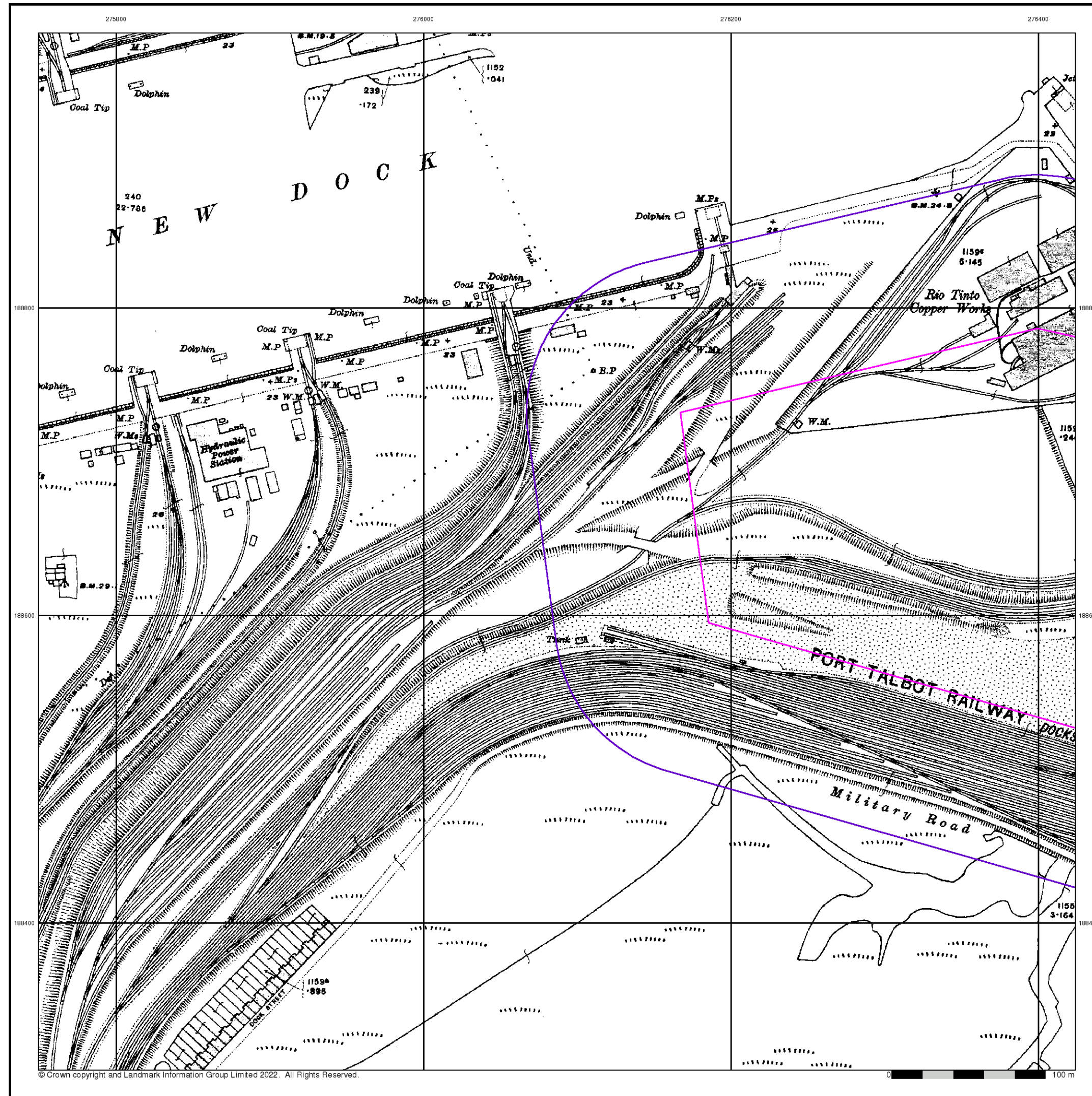
Order Number: 293349570_1_1
Customer Ref: 2111006.002
National Grid Reference: 276420, 188660
Slice: A
Site Area (Ha): 9.68
Search Buffer (m): 100

Site Details

Site at 276440, 188700



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



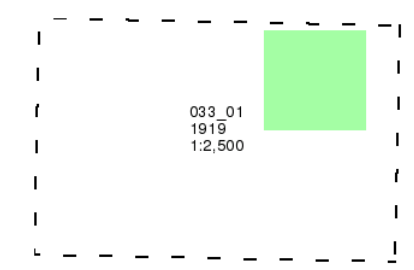
Glamorganshire

Published 1919

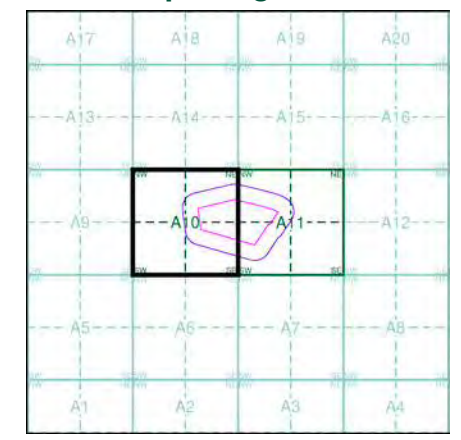
Source map scale - 1:2,500

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 A10



Order Details

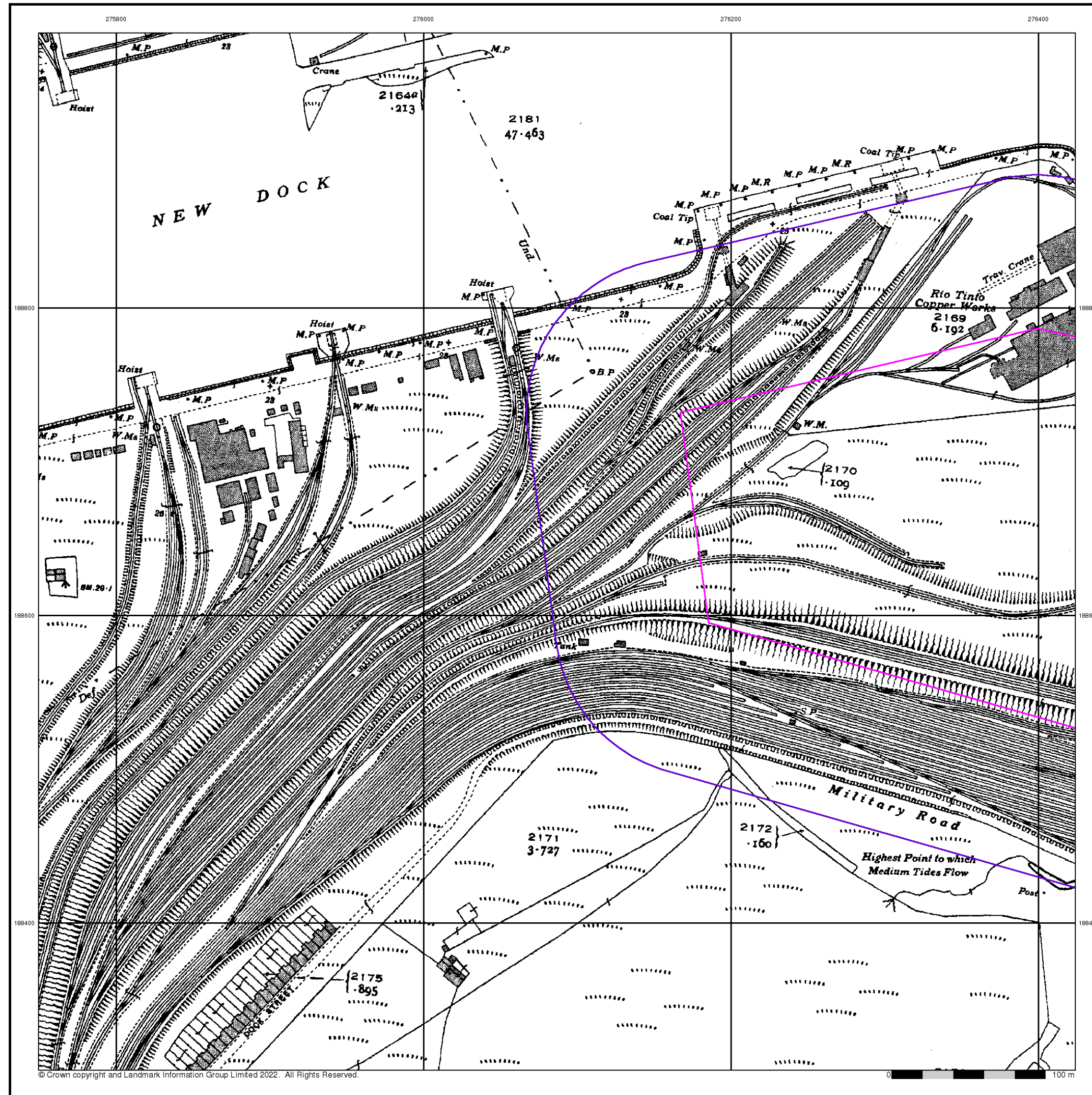
Order Number: 293349570_1_1
Customer Ref: 2111006.002
National Grid Reference: 276420, 188660
Slice: A
Site Area (Ha): 9.68
Search Buffer (m): 100

Site Details

Site at 276440, 188700



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



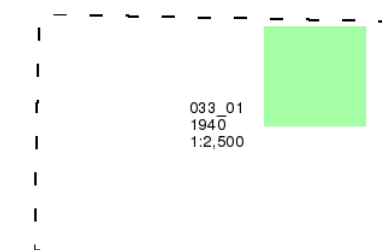
Glamorganshire

Published 1940

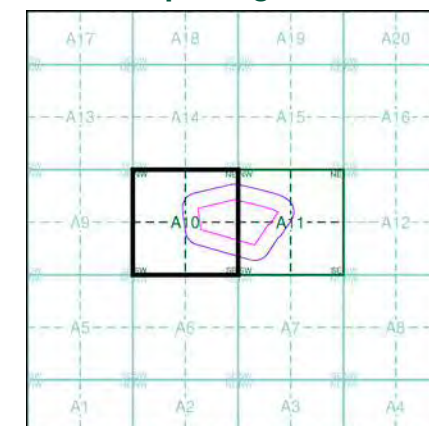
Source map scale - 1:2,500

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 A10



Order Details

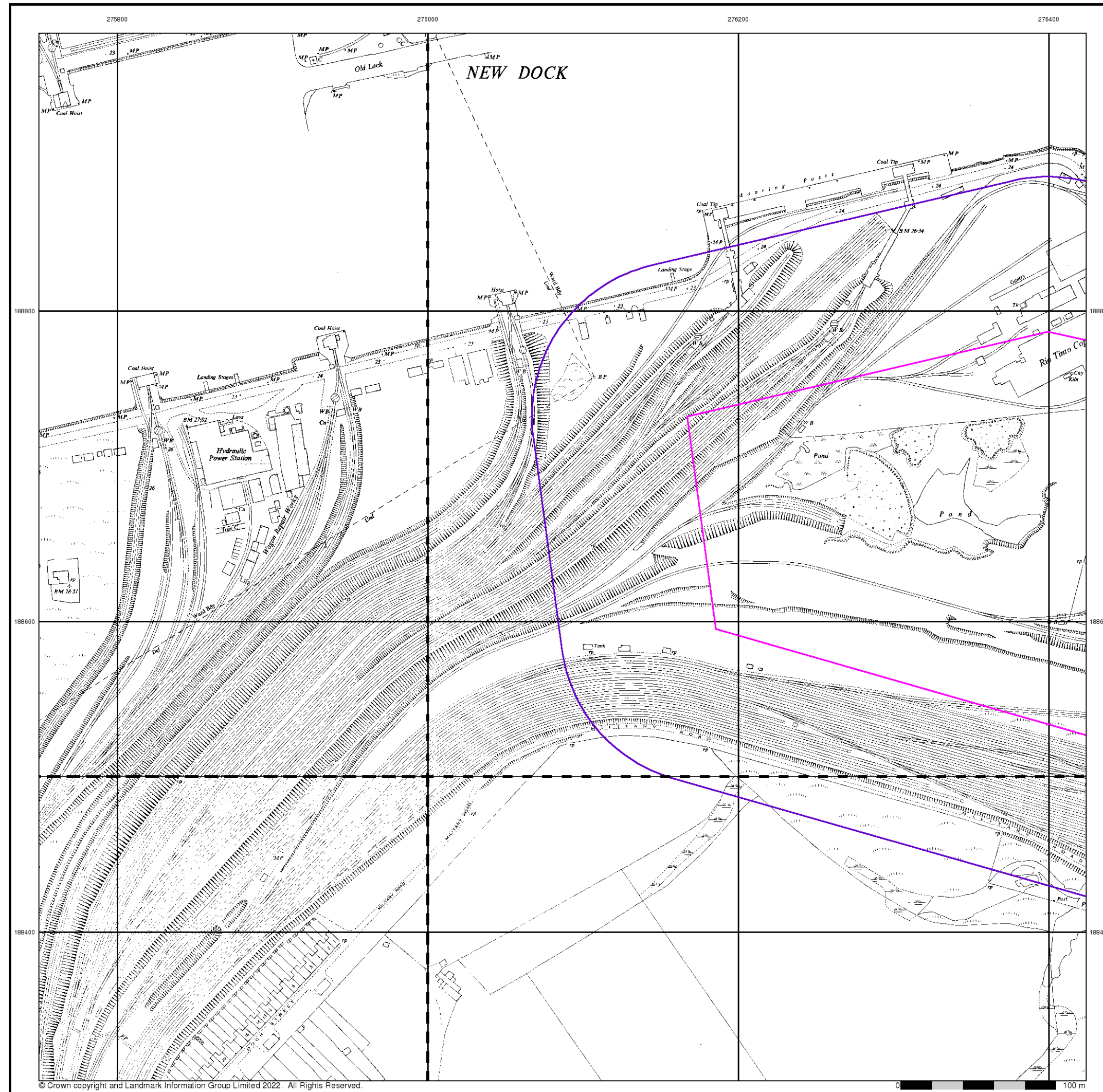
Order Number: 293349570_1_1
Customer Ref: 2111006.002
National Grid Reference: 276420, 188660
Slice: A
Site Area (Ha): 9.68
Search Buffer (m): 100

Site Details

Site at 276440, 188700

Landmark
INFORMATION GROUP

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



© Crown copyright and Landmark Information Group Limited 2022. All Rights Reserved.



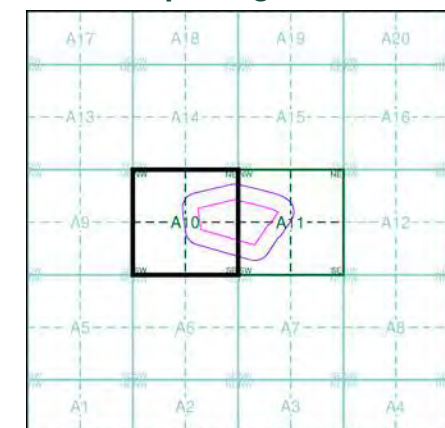
Ordnance Survey Plan
Published 1952
Source map scale - 1:1,250

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)

SS7588NE	SS7688NW
1952	1952
1:1,250	1:1,250
SS7588SE	SS7688SW
1952	1952
1:1,250	1:1,250

Historical Map - Segment A10



Order Details

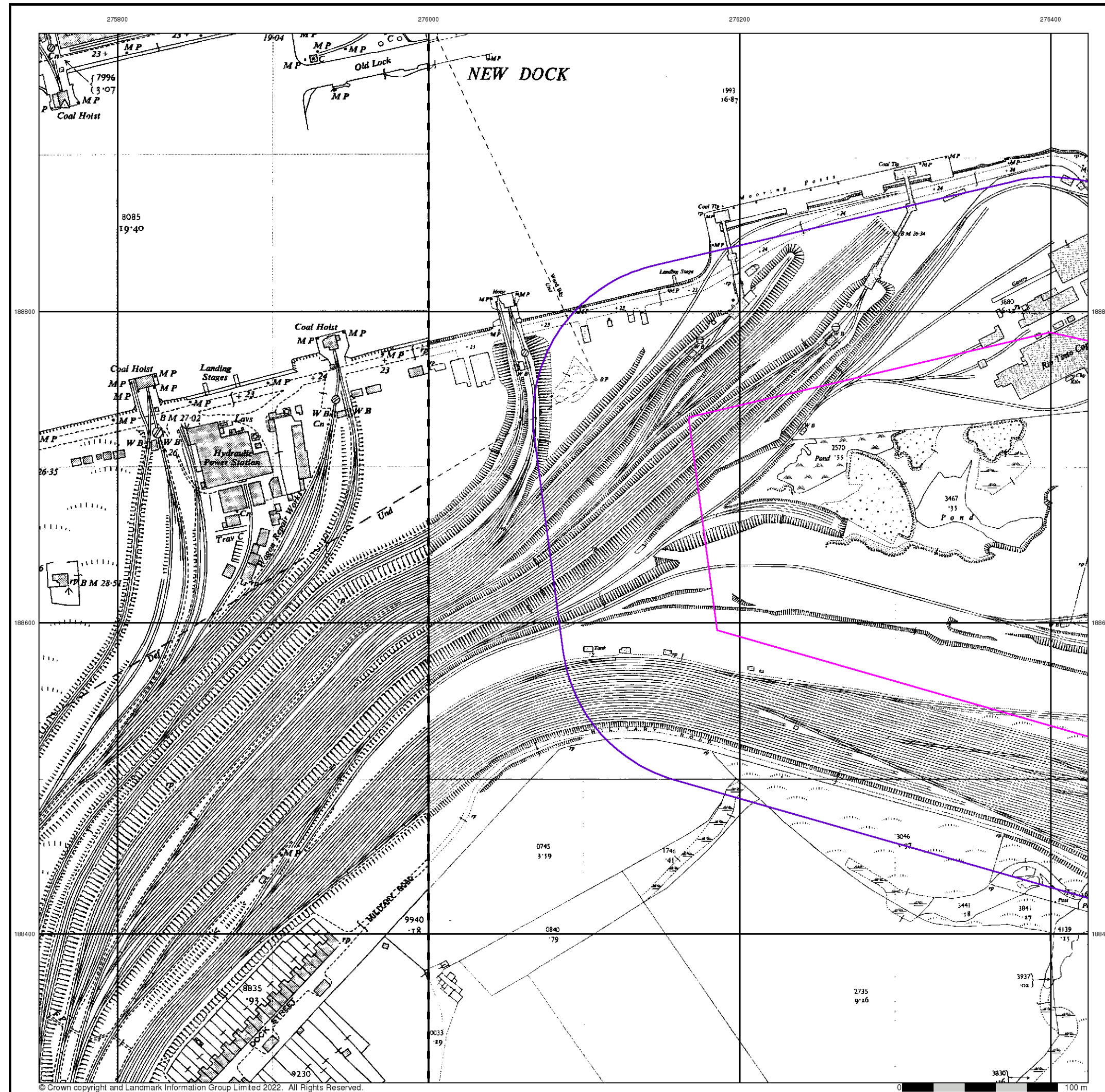
Order Number: 293349570_1_1
Customer Ref: 2111006.002
National Grid Reference: 276420, 188660
Slice: A
Site Area (Ha): 9.68
Search Buffer (m): 100

Site Details

Site at 276440, 188700



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



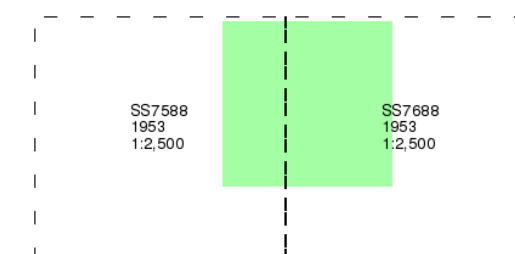
Ordnance Survey Plan

Published 1953

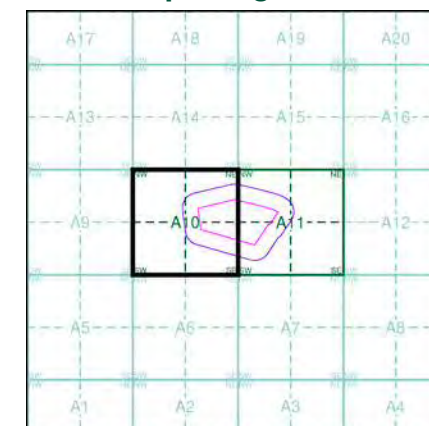
Source map scale - 1:2,500

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 A10



Order Details

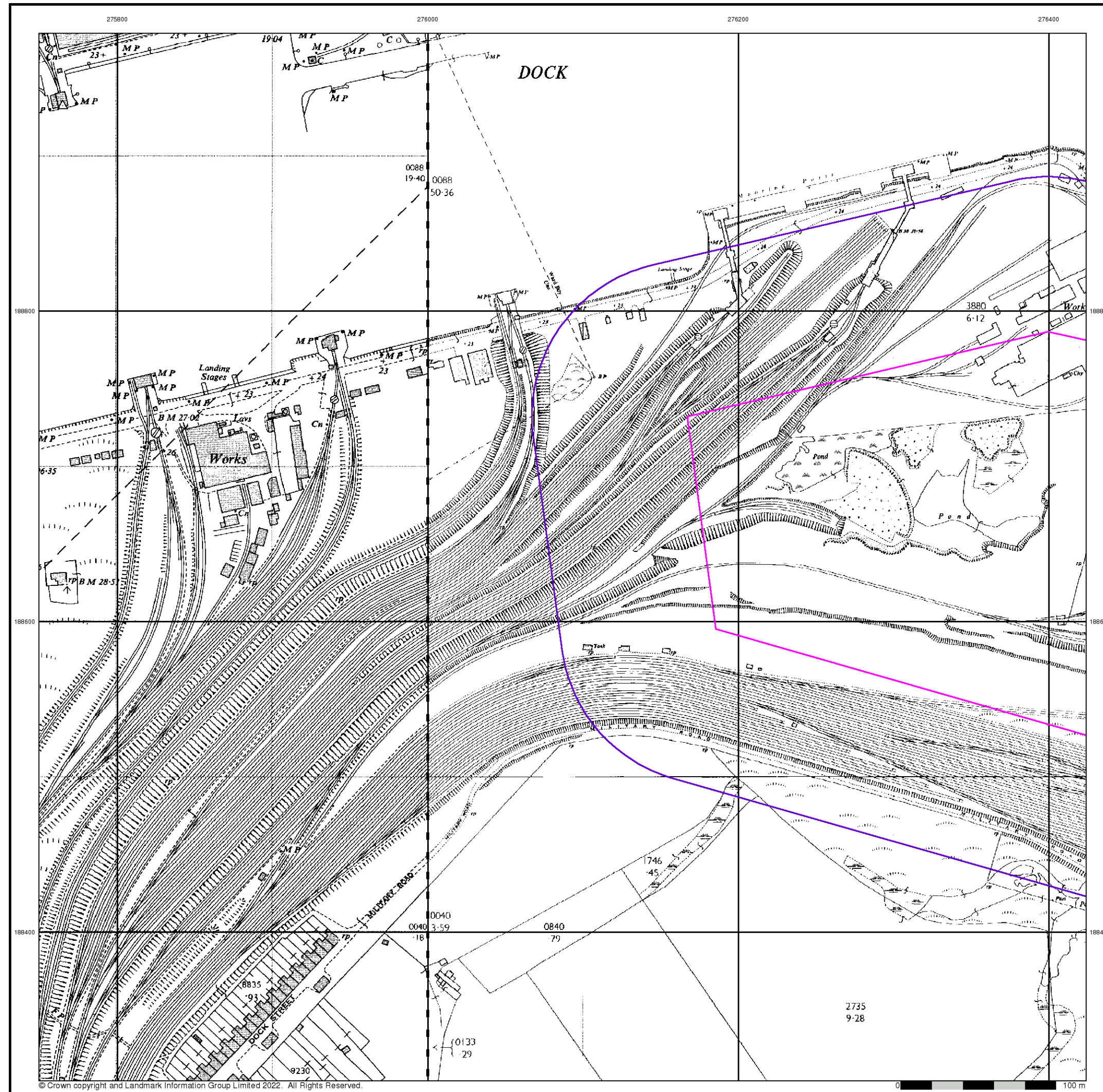
Order Number: 293349570_1_1
Customer Ref: 2111006.002
National Grid Reference: 276420, 188660
Slice: A
Site Area (Ha): 9.68
Search Buffer (m): 100

Site Details

Site at 276440, 188700

Landmark
INFORMATION GROUP

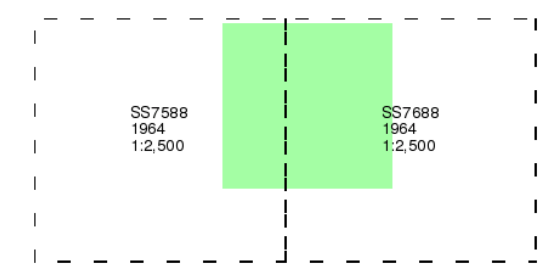
Tel: 0844 844 9952
Fax: 0844 844 9951
Web: www.envirocheck.co.uk



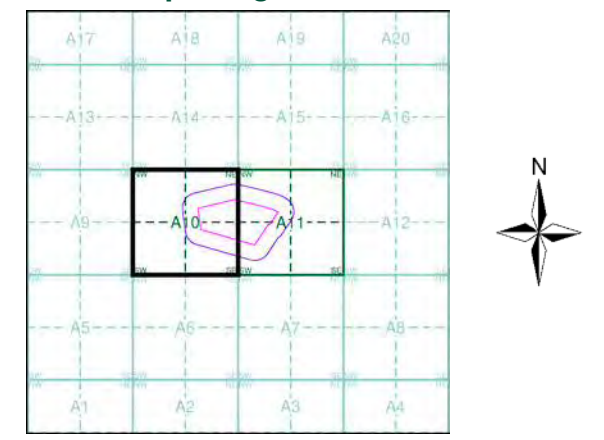
Ordnance Survey Plan
Published 1964
Source map scale - 1:2,500

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 A10



Order Details

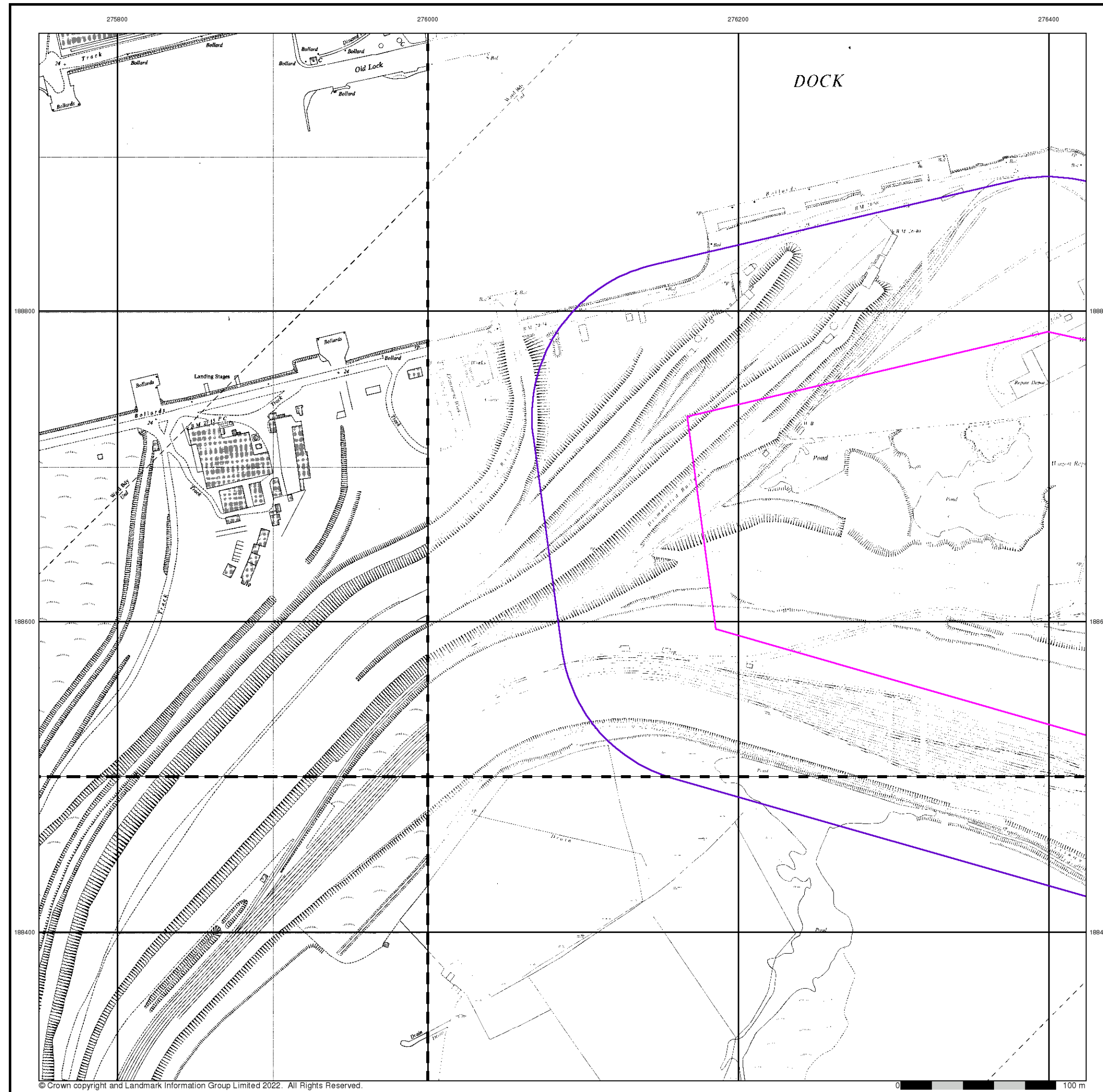
Order Number: 293349570_1_1
Customer Ref: 2111006.002
National Grid Reference: 276420, 188660
Slice: A
Site Area (Ha): 9.68
Search Buffer (m): 100

Site Details

Site at 276440, 188700



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



© Crown copyright and Landmark Information Group Limited 2022. All Rights Reserved.

0 100 m



Ordnance Survey Plan

Published 1968

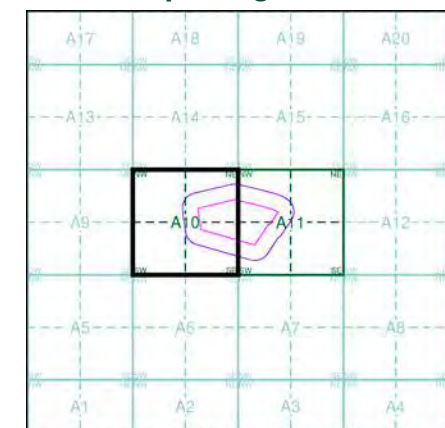
Source map scale - 1:1,250

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)

SS7588NE 1968 1:1,250	SS7688NW 1968 1:1,250
SS7588SE 1968 1:1,250	SS7688SW 1968 1:1,250

Historical Map - Segment A10



Order Details

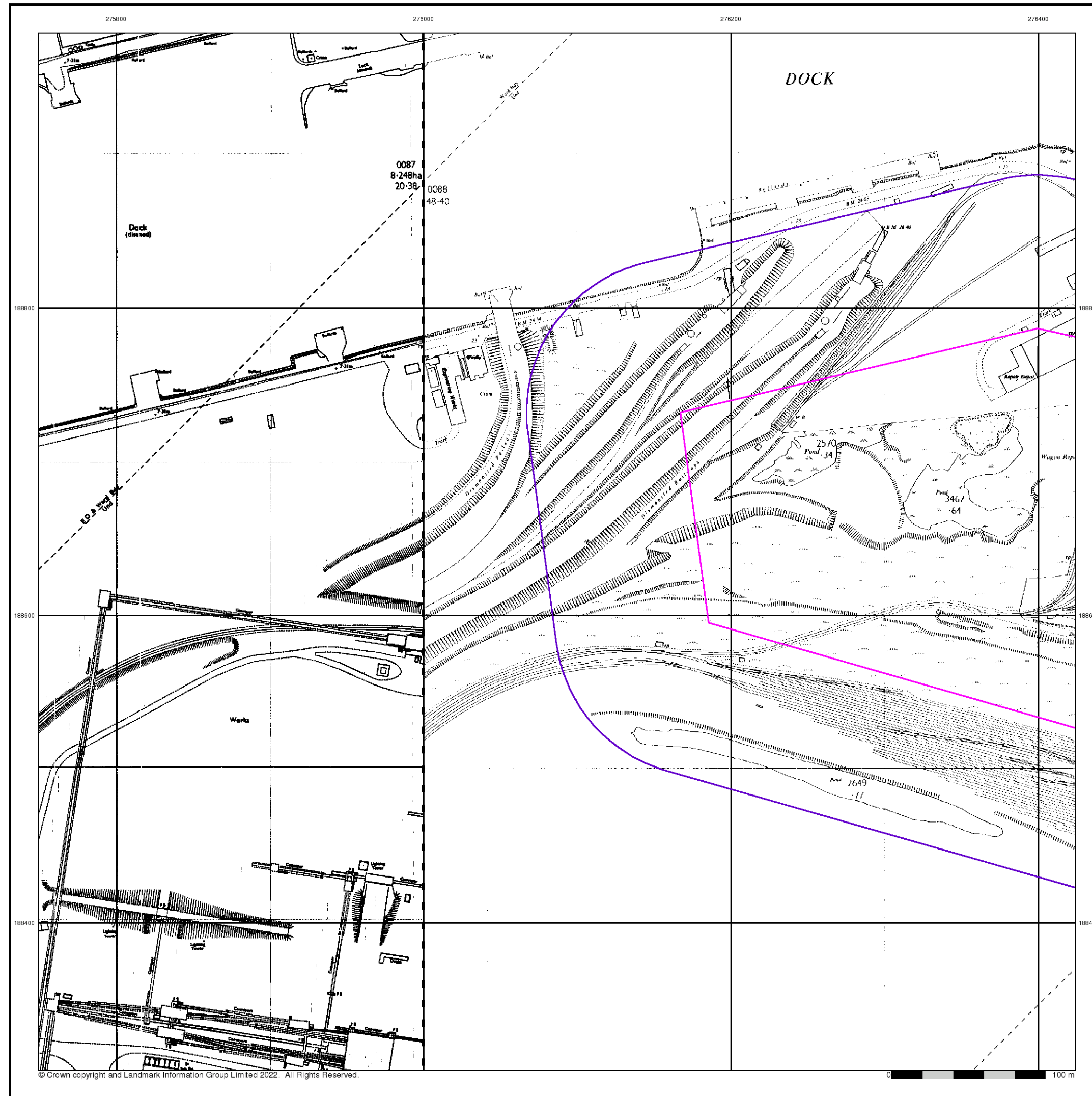
Order Number: 293349570_1_1
Customer Ref: 2111006.002
National Grid Reference: 276420, 188660
Slice: A
Site Area (Ha): 9.68
Search Buffer (m): 100

Site Details

Site at 276440, 188700



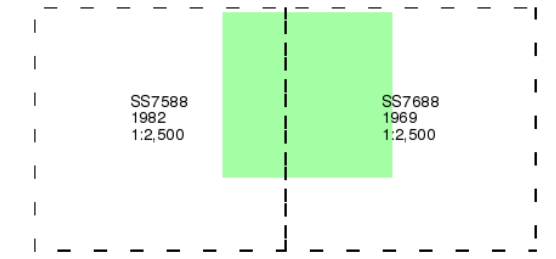
Tel: 0844 844 9952
Fax: 0844 844 9951
Web: www.envirocheck.co.uk



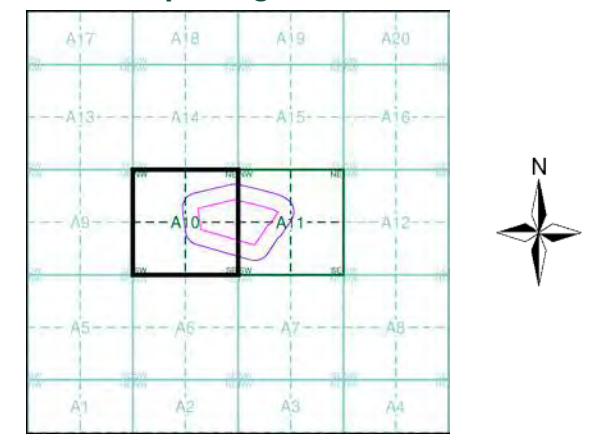
Ordnance Survey Plan
Published 1969 - 1982
Source map scale - 1:2,500

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)

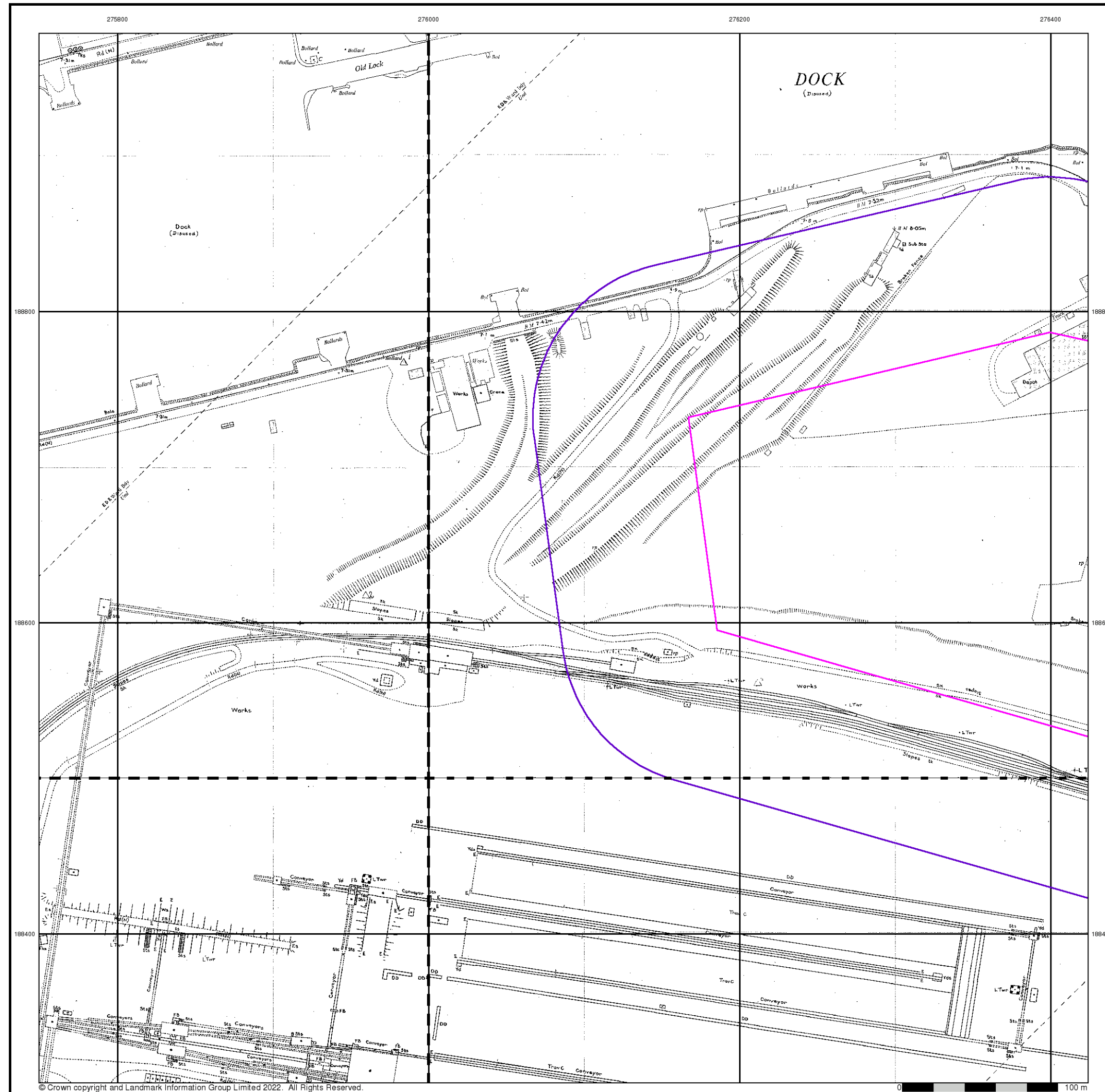


Historical Map - Segment A10



Order Details
Order Number: 293349570_1_1
Customer Ref: 2111006.002
National Grid Reference: 276420, 188660
Slice: A
Site Area (Ha): 9.68
Search Buffer (m): 100

Site Details
Site at 276440, 188700



Additional SIMs

Published 1978

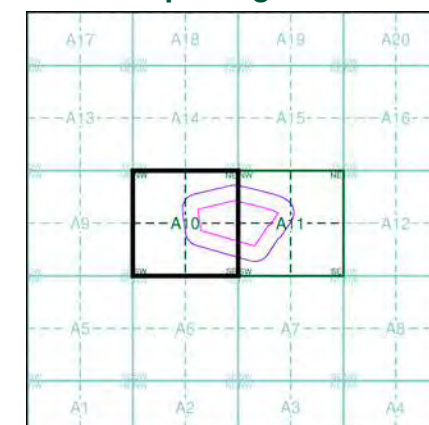
Source map scale - 1:1,250

The SIM cards (Ordnance Survey's 'Survey of Information on Microfilm') are further, minor editions of mapping which were produced and published in between the main editions as an area was updated. They date from 1947 to 1994, and contain detailed information on buildings, roads and land-use. These maps were produced at both 1:2,500 and 1:1,250 scales.

Map Name(s) and Date(s)

SS7588NE 1978 1:1,250	SS7688NW 1978 1:1,250
SS7588SE 1978 1:1,250	SS7688SW 1978 1:1,250

Historical Map - Segment A10



Order Details

Order Number: 293349570_1_1
Customer Ref: 2111006.002
National Grid Reference: 276420, 188660
Slice: A
Site Area (Ha): 9.68
Search Buffer (m): 100

Site Details

Site at 276440, 188700



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



Additional SIMs

Published 1991

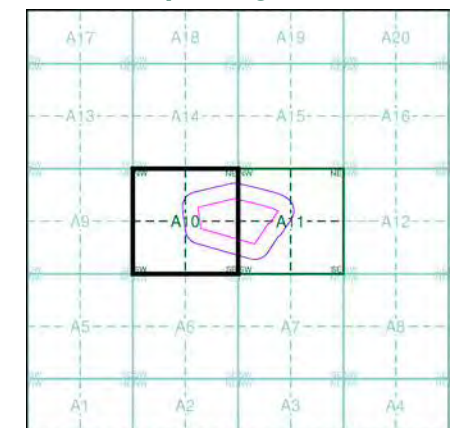
Source map scale - 1:1,250

The SIM cards (Ordnance Survey's 'Survey of Information on Microfilm') are further, minor editions of mapping which were produced and published in between the main editions as an area was updated. They date from 1947 to 1994, and contain detailed information on buildings, roads and land-use. These maps were produced at both 1:2,500 and 1:1,250 scales.

Map Name(s) and Date(s)

SS7588NE	SS7688NW
1991	1991
1:1,250	1:1,250
SS7588SE	SS7688SW
1991	1991
1:1,250	1:1,250

Historical Map - Segment A10



Order Details

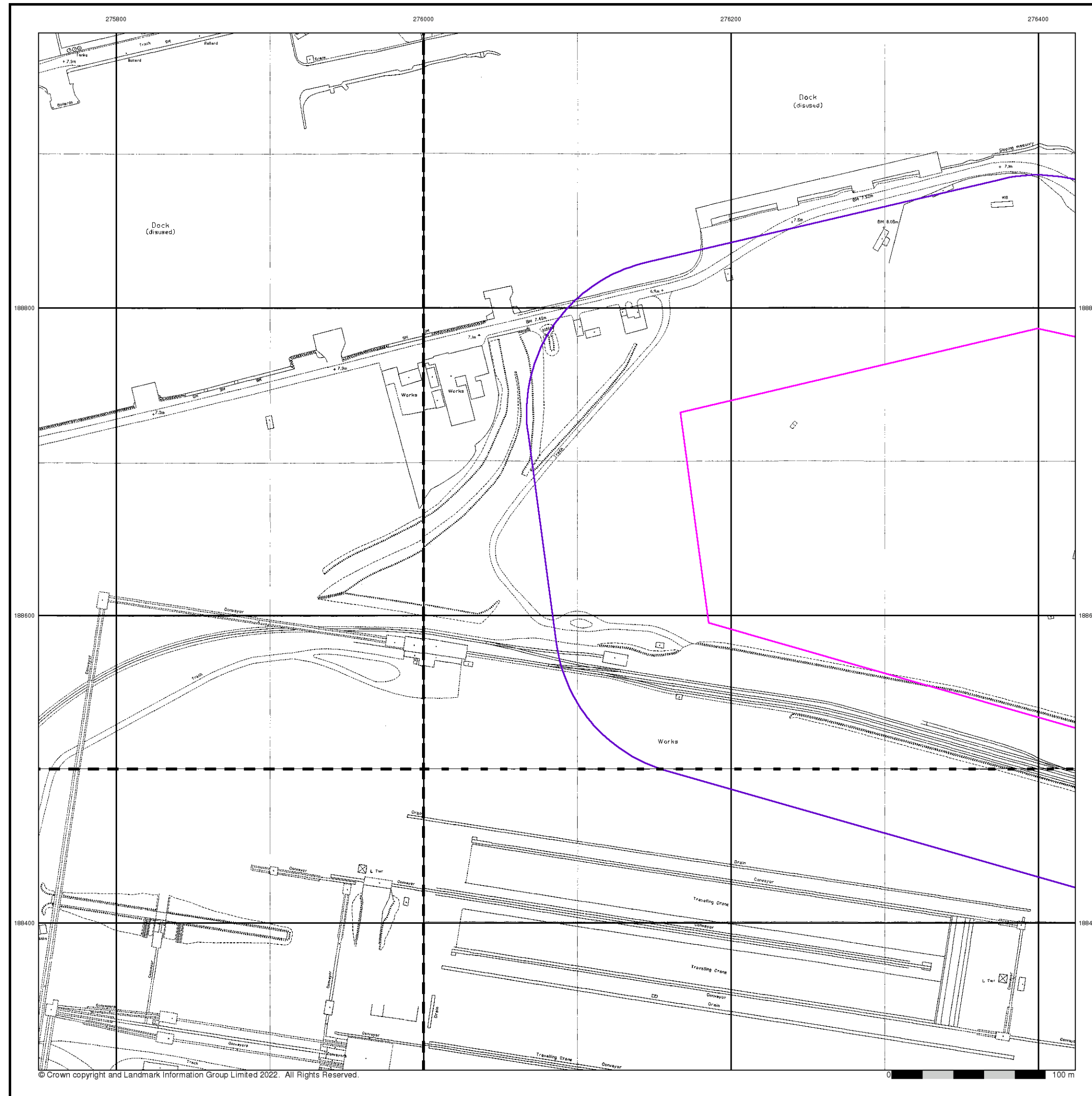
Order Number: 293349570_1_1
 Customer Ref: 2111006.002
 National Grid Reference: 276420, 188660
 Slice: A
 Site Area (Ha): 9.68
 Search Buffer (m): 100

Site Details

Site at 276440, 188700



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



Large-Scale National Grid Data

Published 1993

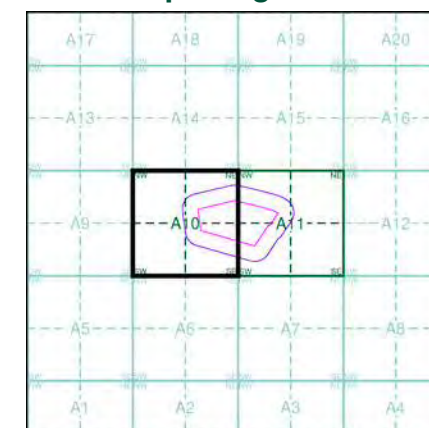
Source map scale - 1:1,250

'Large Scale National Grid Data' superseded SIM cards (Ordnance Survey's 'Survey of Information on Microfilm') in 1992, and continued to be produced until 1999. These maps were the fore-runners of digital mapping and so provide detailed information on houses and roads, but tend to show less topographic features such as vegetation. These maps were produced at both 1:2,500 and 1:1,250 scales.

Map Name(s) and Date(s)

SS75888NE 1993 1:1,250	SS76888NW 1993 1:1,250
SS75888SE 1993 1:1,250	SS76888SW 1993 1:1,250

Historical Map - Segment A10



Order Details

Order Number: 293349570_1_1
Customer Ref: 2111006.002
National Grid Reference: 276420, 188660
Slice: A
Site Area (Ha): 9.68
Search Buffer (m): 100

Site Details

Site at 276440, 188700



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

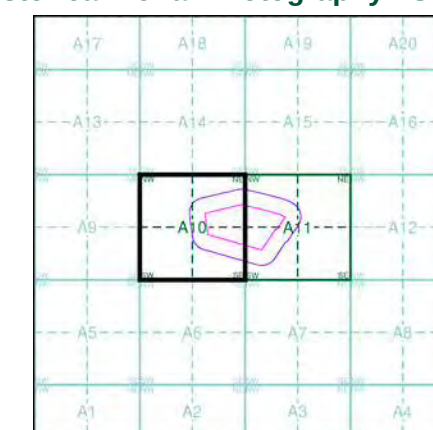


Historical Aerial Photography

Published 2001

This aerial photography was produced by Getmapping, these vertical aerial photographs provide a seamless, full colour survey of the whole of Great Britain

Historical Aerial Photography - Segment A10



Order Details

Order Number: 293349570_1_1
Customer Ref: 2111006.002
National Grid Reference: 276420, 188660
Slice: A
Site Area (Ha): 9.68
Search Buffer (m): 100

Site Details

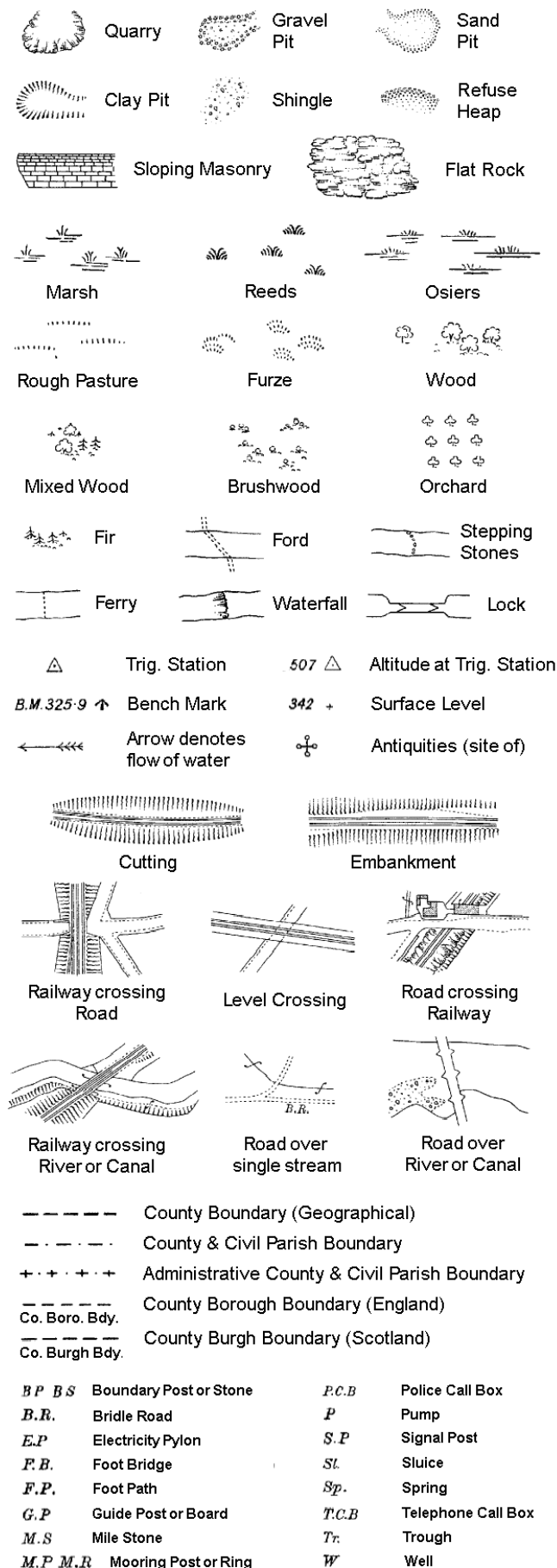
Site at 276440, 188700

Landmark
INFORMATION GROUP

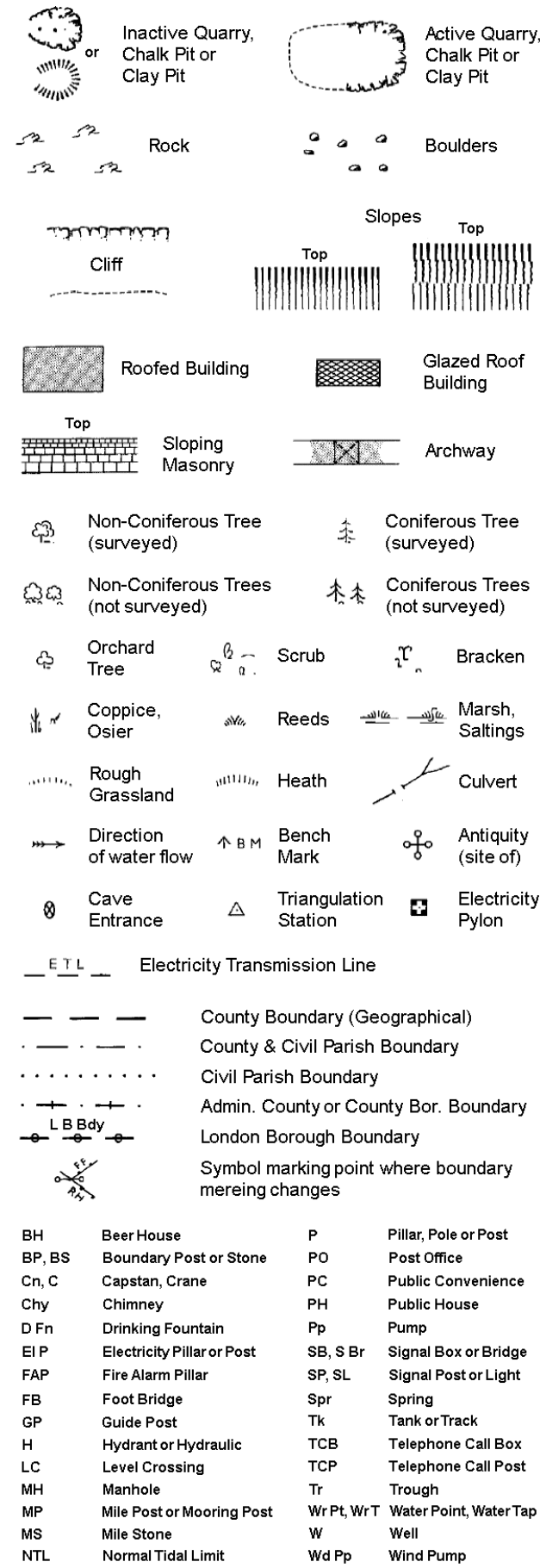
Tel: 0844 844 9952
Fax: 0844 844 9951
Web: www.envirocheck.co.uk

Historical Mapping Legends

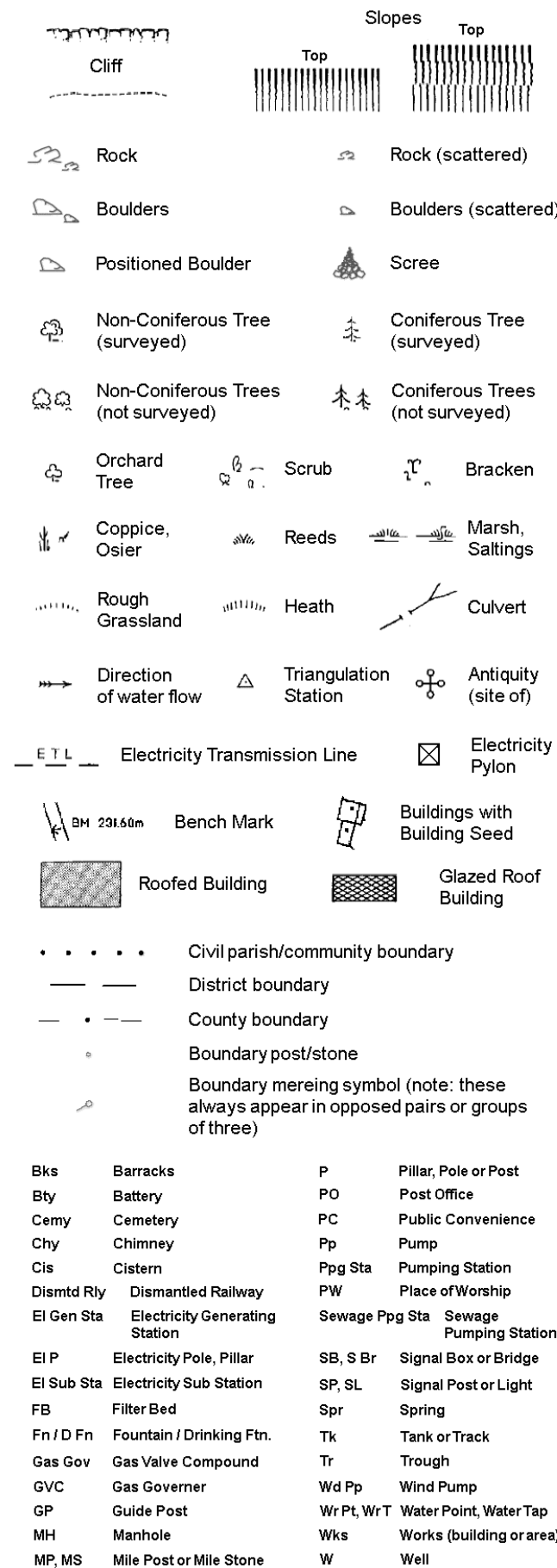
Ordnance Survey County Series and Ordnance Survey Plan 1:2,500



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



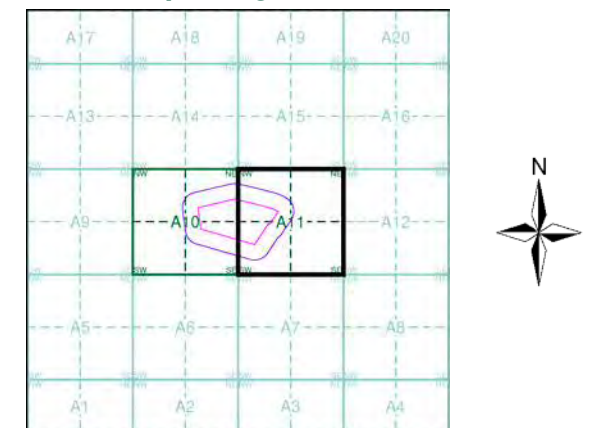
Large-Scale National Grid Data 1:2,500 and 1:1,250



Historical Mapping & Photography included:

Mapping Type	Scale	Date	Pg
Glamorganshire	1:2,500	1877	2
Glamorganshire	1:2,500	1899	3
Glamorganshire	1:2,500	1917 - 1919	4
Glamorganshire	1:2,500	1940	5
Ordnance Survey Plan	1:1,250	1952 - 1953	6
Ordnance Survey Plan	1:2,500	1953 - 1954	7
Ordnance Survey Plan	1:1,250	1960 - 1968	8
Ordnance Survey Plan	1:2,500	1964	9
Ordnance Survey Plan	1:1,250	1968 - 1970	10
Ordnance Survey Plan	1:2,500	1969	11
Additional SIMs	1:1,250	1978 - 1991	12
Additional SIMs	1:1,250	1991	13
Large-Scale National Grid Data	1:1,250	1993	14
Large-Scale National Grid Data	1:1,250	1995	15
Historical Aerial Photography	1:2,500	2001	16

Historical Map - Segment A11



Order Details

Order Number: 293349570_1_1
Customer Ref: 2111006.002
National Grid Reference: 276420, 188660
Slice: A
Site Area (Ha): 9.68
Search Buffer (m): 100

Site Details

Site at 276440, 188700



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



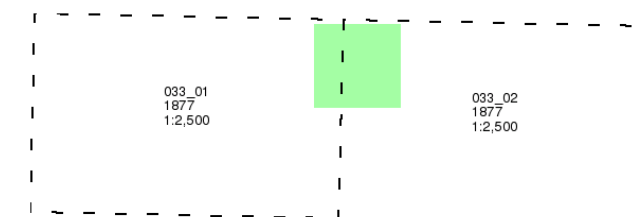
Glamorganshire

Published 1877

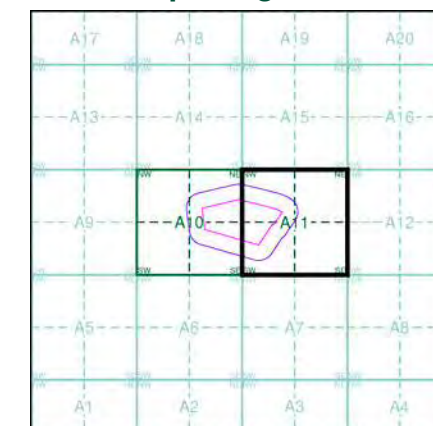
Source map scale - 1:2,500

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 A11



Order Details

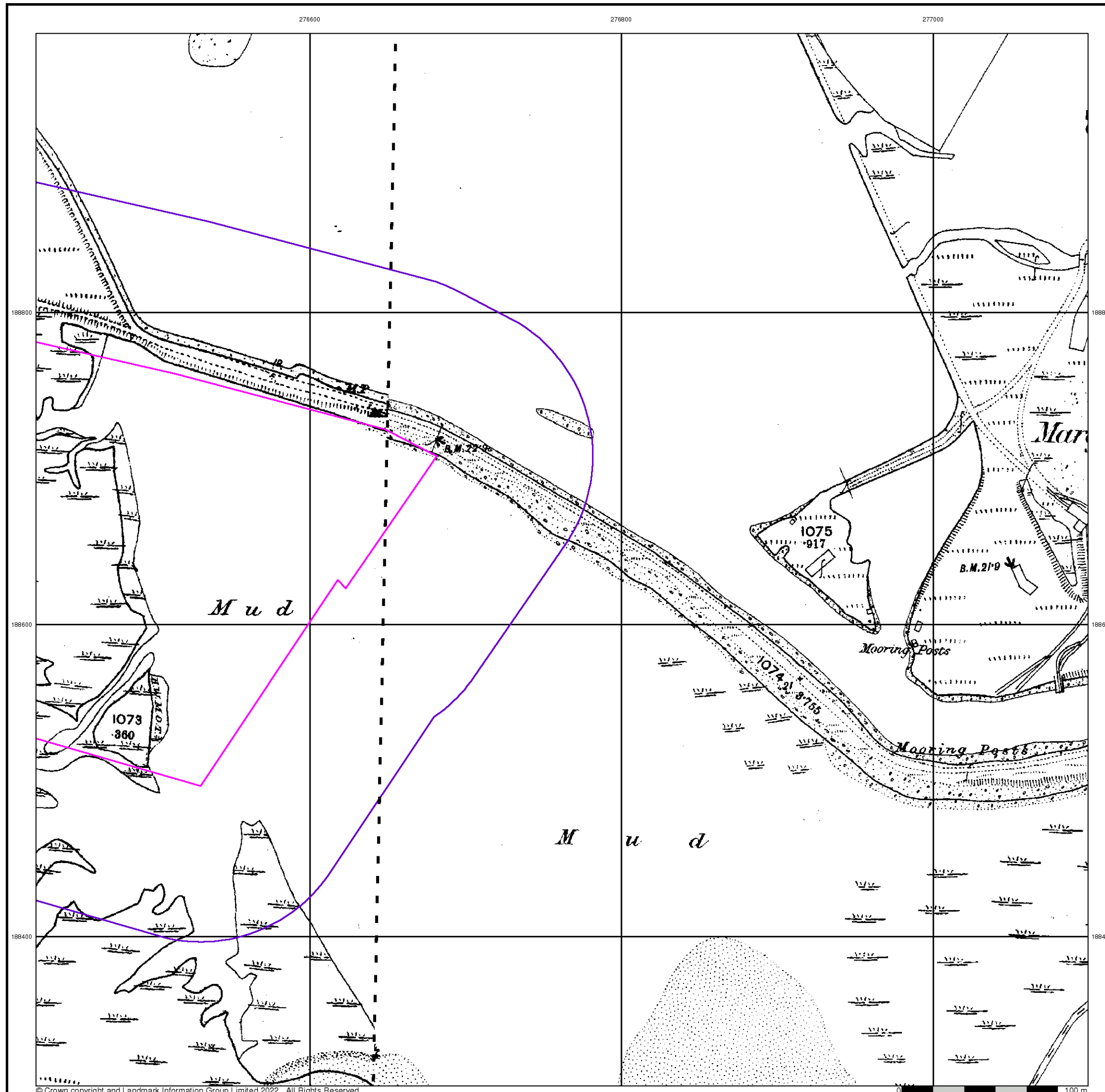
Order Number: 293349570_1_1
Customer Ref: 2111006.002
National Grid Reference: 276420, 188660
Slice: A
Site Area (Ha): 9.68
Search Buffer (m): 100

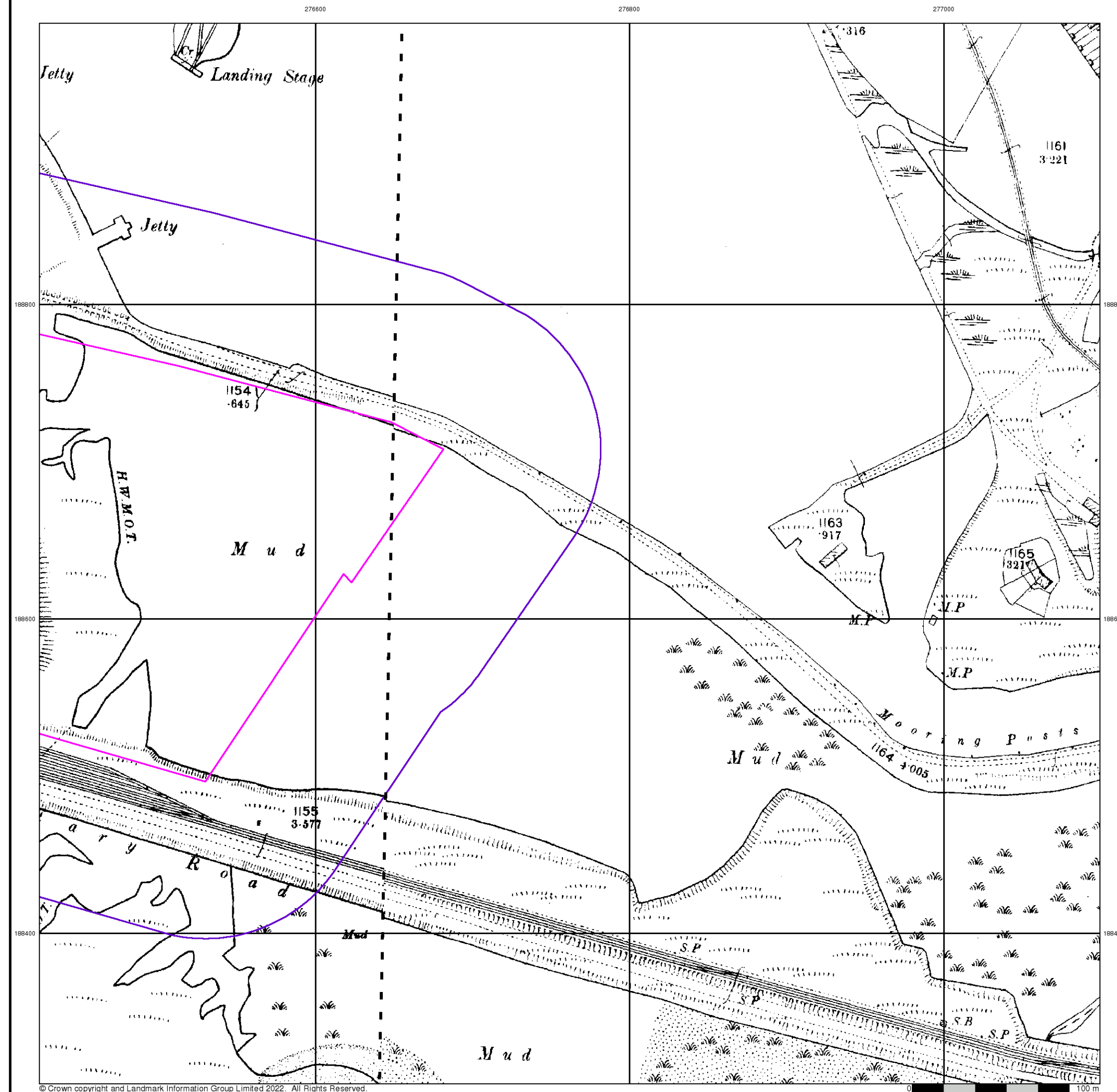
Site Details

Site at 276440, 188700



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





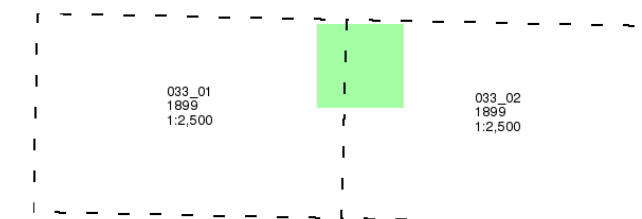
Glamorganshire

Published 1899

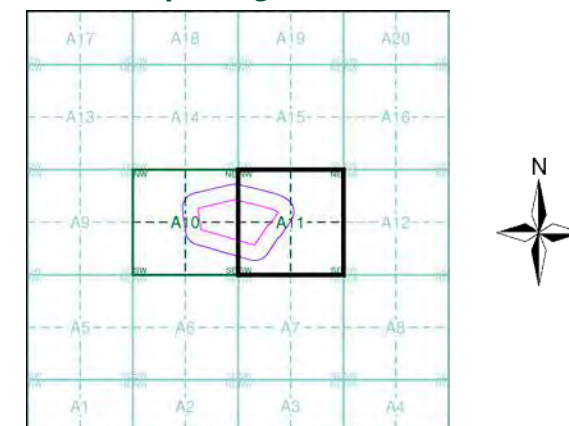
Source map scale - 1:2,500

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 A11



Order Details

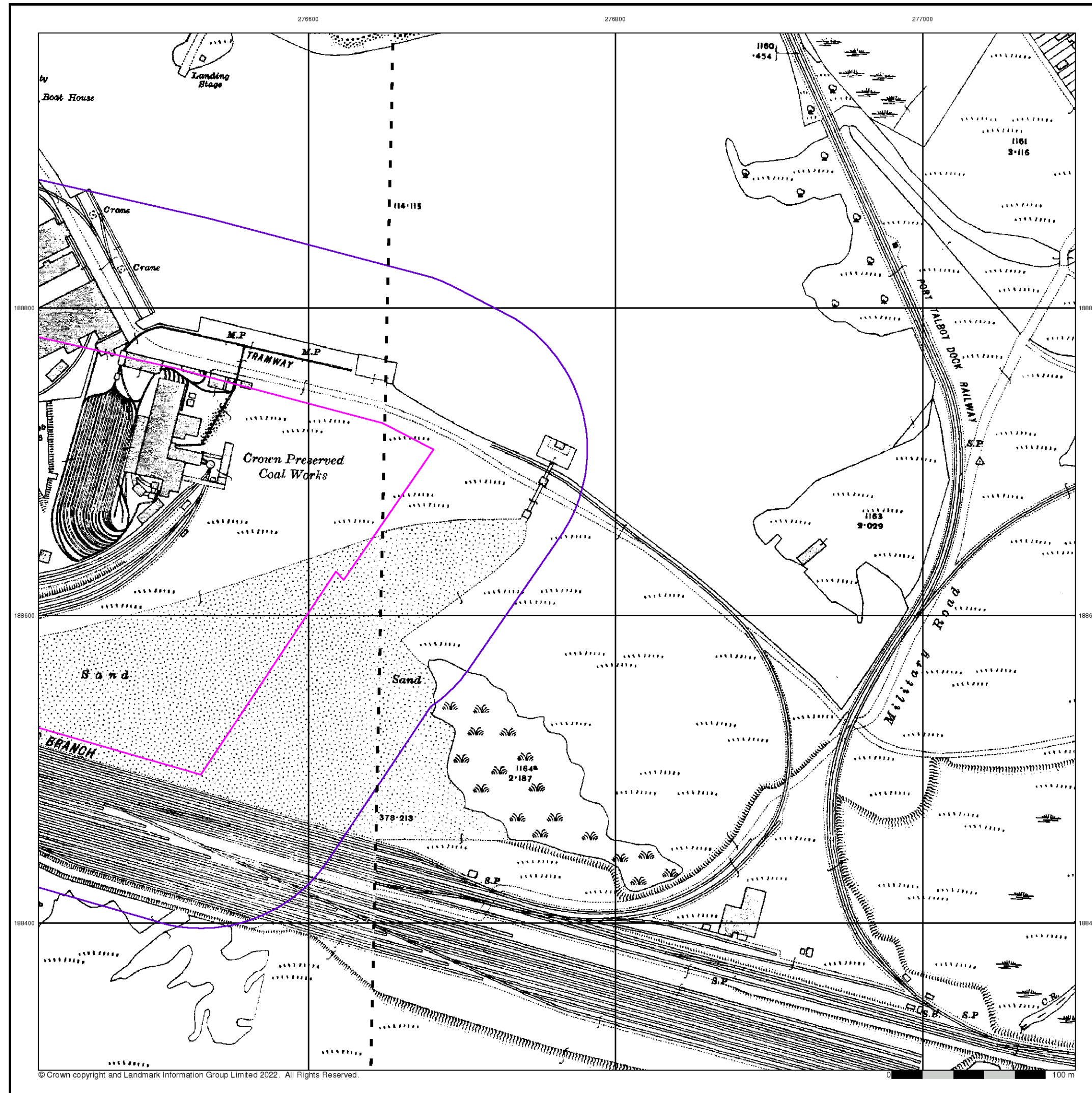
Order Number: 293349570_1_1
Customer Ref: 2111006.002
National Grid Reference: 276420, 188660
Slice: A
Site Area (Ha): 9.68
Search Buffer (m): 100

Site Details

Site at 276440, 188700

Landmark
INFORMATION GROUP

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



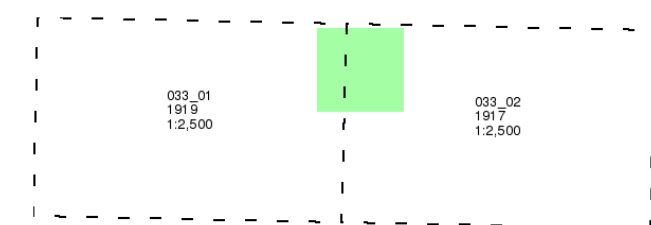
Glamorganshire

Published 1917 - 1919

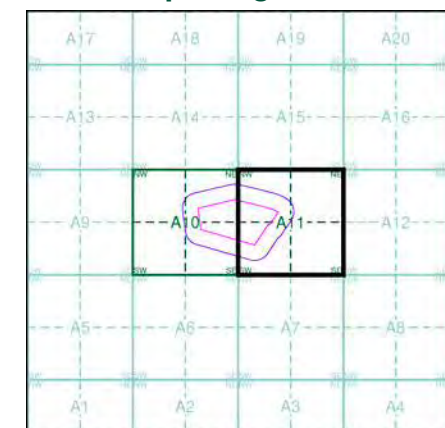
Source map scale - 1:2,500

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 A11



Order Details

Order Number: 293349570_1_1
Customer Ref: 2111006.002
National Grid Reference: 276420, 188660
Slice: A
Site Area (Ha): 9.68
Search Buffer (m): 100

Site Details

Site at 276440, 188700



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



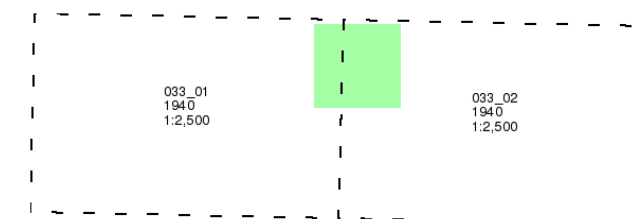
Glamorganshire

Published 1940

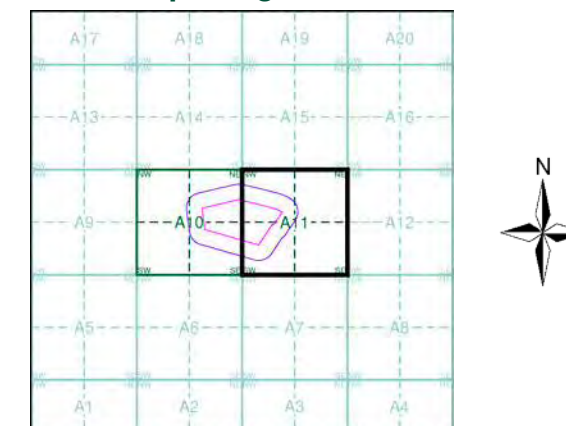
Source map scale - 1:2,500

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 A11



Order Details

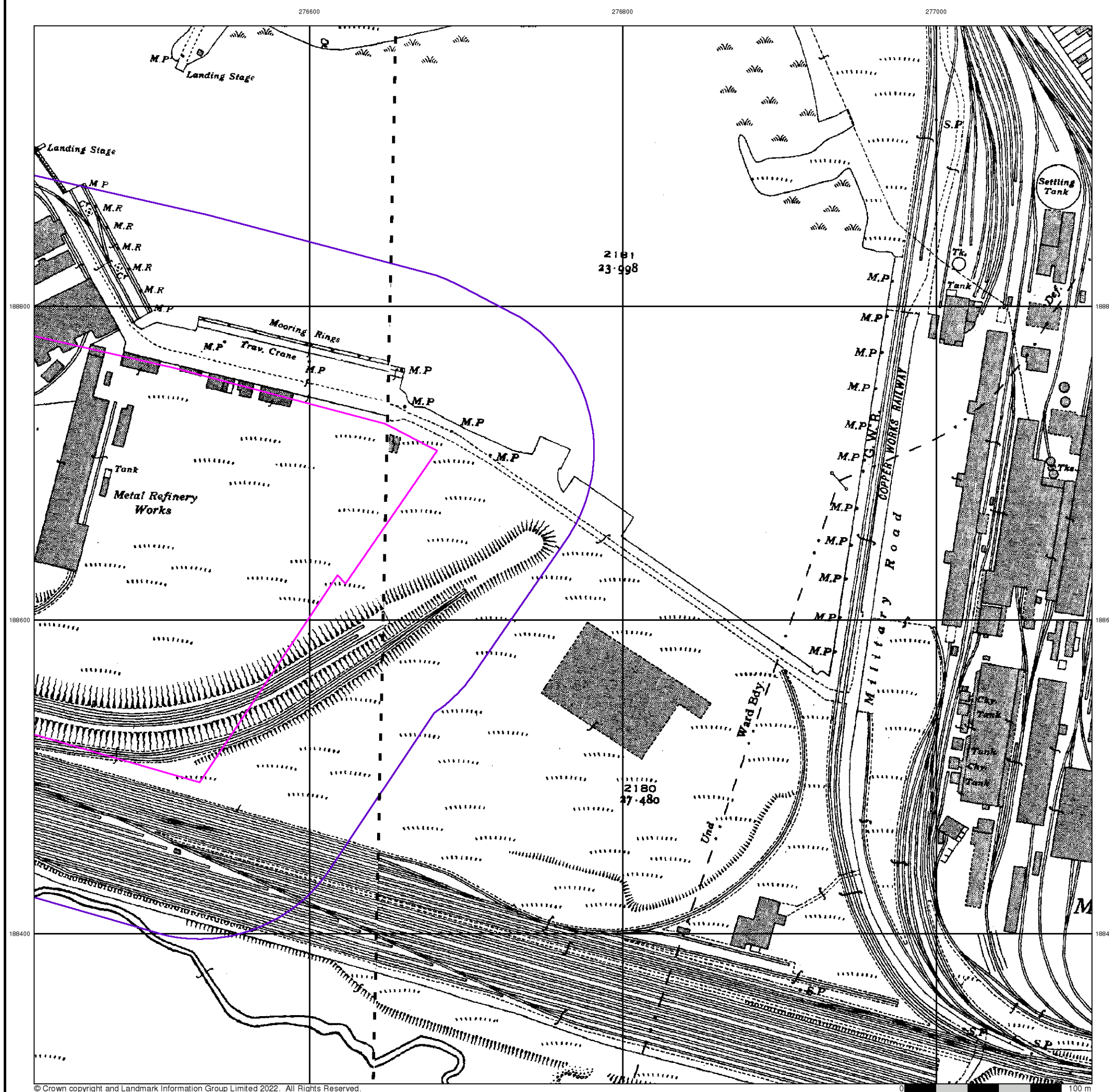
Order Number: 293349570_1_1
Customer Ref: 2111006.002
National Grid Reference: 276420, 188660
Slice: A
Site Area (Ha): 9.68
Search Buffer (m): 100

Site Details

Site at 276440, 188700

Landmark
INFORMATION GROUP

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



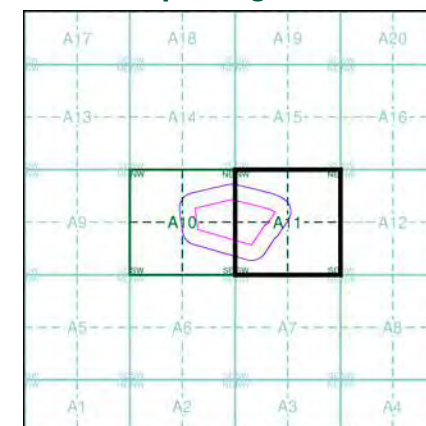


The historical maps shown were reproduced from maps predominantly held at the scale adopted for England, Wales and Scotland in the 1840's. In 1854 the 1:2,500 scale was adopted for mapping urban areas and by 1896 it covered the whole of what were considered to be the cultivated parts of Great Britain.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

SS7688NW 1952 1:1,250	SS7688NE 1952 1:1,250	SS7788NW 1953 1:1,250
SS7688SW 1952 1:1,250	SS7688SE 1952 1:1,250	SS7788SW 1953 1:1,250

Historical Map - Segment A11



Order Details

Order Number: 293349570_1_1
Customer Ref: 2111006.002
National Grid Reference: 276420, 188660
Slice: A
Site Area (Ha): 9.68
Search Buffer (m): 100

Site Details

Site at 276440, 188700

Landmark
INFORMATION GROUP

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