

GEOTECHNICAL & GEOENVIRONMENTAL REPORT

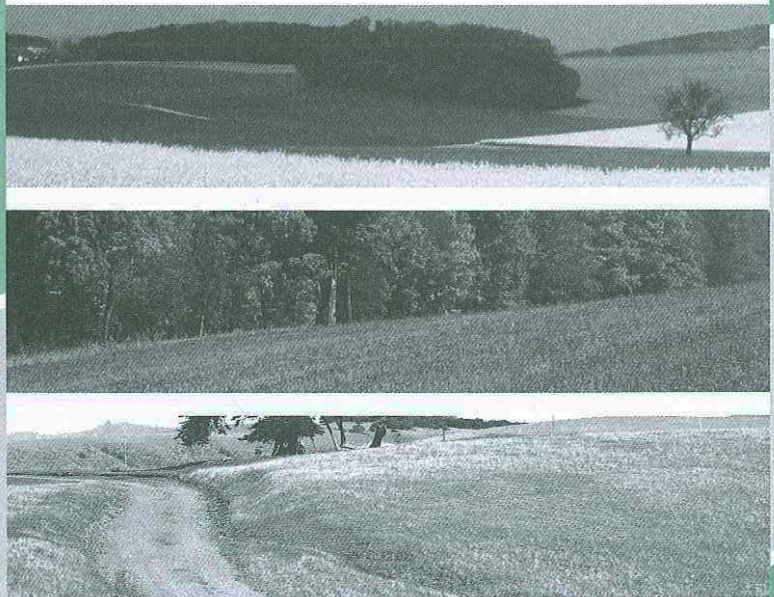
Proposed Residential Development,
Main Road, Dyffryn Cellwen, Neath

Prepared for:

DJD Builders Ltd

July 2018

Job No: 14753




terrafirma

**Geotechnical and Geo-Environmental
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Report: Proposed Residential
Development,
Main Road, Dyffryn Cellwen, Neath**

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Executive Summary

Site Location and Proposed Development	<i>DJD Builders Ltd are proposing the development of residential housing at land off Main Road, Dyffryn Cellwen, Neath.</i>
Site History	<i>Historically the site has had a mixed use including a surgery and residential development.</i>
Geology	<i>The site is underlain by rocks of the Lower Coal Measures strata.</i> <i>No superficial soils are shown to overly the solid geology.</i> <i>Made ground is also shown to overly the boulder clays.</i>
Mining	<i>An intrusive coal mining investigation consisting of three rotary probe holes has been undertaken on the site. No evidence of coal mining was observed where intact sequences of coal was recorded. The depths and thicknesses of the seams pose an insignificant risk to the site should they be worked in areas not covered by the investigation. The site is therefore not at risk from shallow mining.</i>
Ground Conditions	<i>The ground conditions consists of made ground overlying coal measures bedrock.</i>
Laboratory Chemical Testing	<i>All substances tested for were found at concentrations below their respective residential guidelines.</i>
Proposed Remediation	<i>Not required.</i>
Foundation Solution	<i>Given the extent and depth of made ground encountered across the site, it is recommended that reinforced strip and trench fill foundations are adopted for the proposed scheme. The reinforced should be designed to cater for differential settlements across the length of the strip.</i> <i>For the above strip foundation, an allowable bearing capacity of 100 kPa may be used for design purposes where settlements will not exceed 25mm.</i> <i>Floor slabs should be designed as ground bearing.</i>

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SECTION 1 Introduction and Proposed Development

DJD Builders Ltd are proposing the development of residential housing at land off Main Road, Dyffryn Cellwen, Neath.

Terra Firma (Wales) Limited have been commissioned by DJB Builders Ltd to undertake a geo-environmental assessment and geotechnical investigation of the site.

The main objectives of the geo-environmental assessment programme were to:

- Investigate the potential environmental liabilities at the site associated with any soil contamination
- Provide a summary of the environmental conditions at the site, together with any necessary further intrusive works and / or remediation works to render the site fit for its intended use

The main objectives of the geotechnical site investigation were to:

- Determine the type, strength and bearing characteristics of the shallow superficial and underlying solid geology
- Provide engineering foundation and floor slab recommendations for the development
- Provide recommendations with regard to any other geotechnical aspects pertaining to the development

In order to achieve the above objectives, Terra Firma (Wales) Limited carried out an assessment programme including a site walkover, a review of existing data, followed by a field investigation to collect geotechnical and environmental data from selected locations.

1.1 Limitations and Exceptions of Investigation

DJD Builders Ltd has requested that a Geo-environmental Site Assessment (GSA) and Geotechnical Investigation (GI) be performed in order to determine if contamination is present beneath the site and to determine an appropriate foundation and floor slab solution for the proposed development.

The GSA and GI were conducted, and this report has been prepared for the sole internal reliance of DJD Builders Ltd and its design and construction team. This report shall not be relied upon or transferred to any other parties without the express written authorisation of Terra Firma (Wales) Limited. If an unauthorised third party comes into possession of this report they rely on it at their peril and the authors owe them no duty of care and skill. The report represents the findings and opinions of experienced geo-environmental and geotechnical consultants. Terra Firma (Wales) Limited does not provide legal advice and the advice of lawyers may be required.

The subsurface geological profiles, any contamination and other plots are generalised by necessity and have been based on the information found at the locations of the exploratory holes and depths sampled and tested.

The site investigation was limited by underground services.

SECTION 2 Review of Existing Data

2.1 Physical Setting and Current Site Use

The development site is an irregular pentagon shape and centres on an approximate National Grid Reference of 285070 210190, occupying a plan area of approximately 0.52 Hectares.

Heol Gaer road runs east to west adjacent to the northern boundary of the site and main road runs adjacent to the southern and western boundary of the site. Residential housing is situated adjacent to the eastern and south eastern boundary of the site.

Until recently a surgery and attached residential flats occupied the majority of the site. These structures have been demolished leaving a large degraded hardstanding area. The parking areas for the buildings are still visible. A public convenience is shown to be situated within the site near the entrance. Access to the site is situated off Main Road on the south western boundary of the site.

The majority of Dyffryn Cellwen is situated east of the site. The residential buildings adjacent east of the site are recently constructed. A large area where past opencast coal mining was undertaken is situated 170m North West of the site. This area is still in use and is now Onllwyn washery and distribution centre.

The site level is between 240-250m AOD and shallowly descending towards the north.

The site location can be seen in **Figure 2.1**.

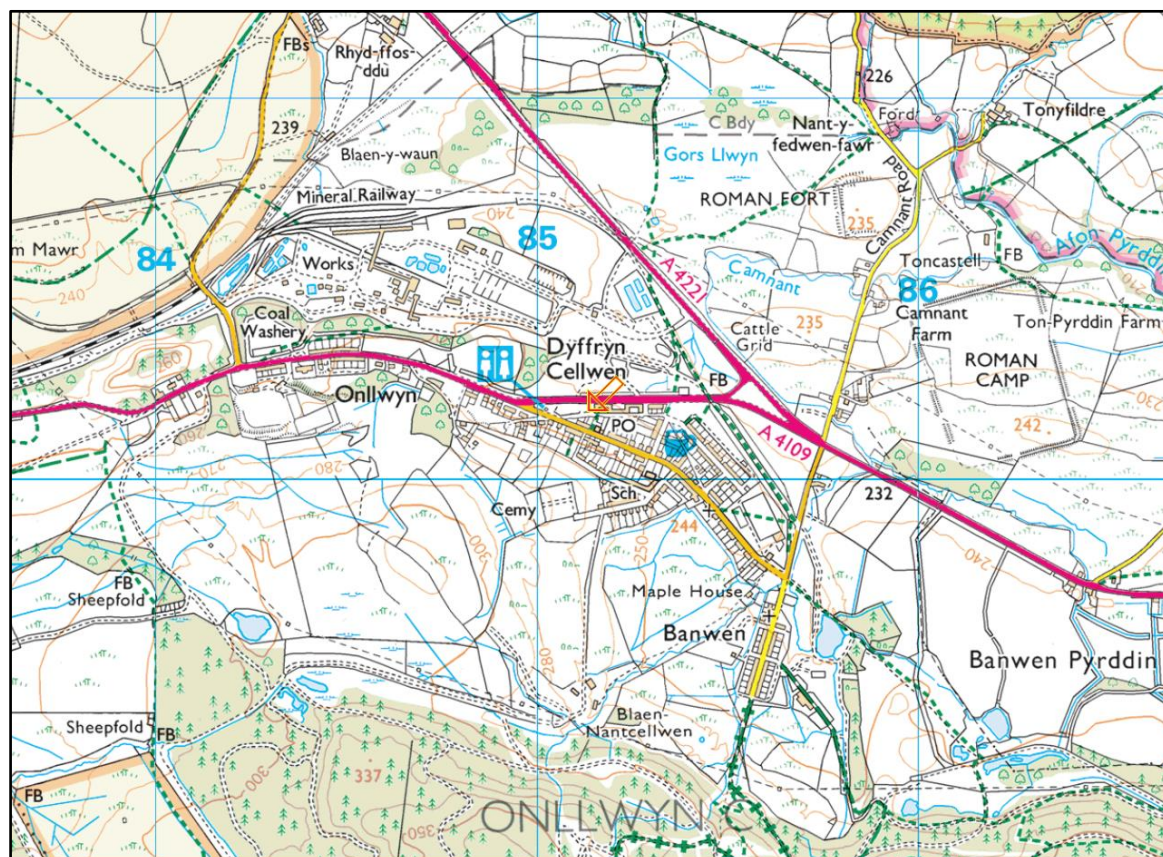


Figure 2.1 Site Location

2.2 Site History

Historical maps of the site have been obtained from the Landmark Information Group and are presented in **Annex A**. The most relevant history maps are summarised in **Table 2.1**. It should be noted that distances, where quoted are approximate.

Table 0.1 Historical Development from Map Information		
Map Edition and Scale	Key Features on Site	Key Features off Site
1876-1878 1:2500	The site is empty green field. A road runs through the centre of the site in an east to west trajectory.	The majority of the surrounding area is field land or coal mining areas. The site is surrounded by multiple old coal levels, and old coal quarries. Onllywn Colliery is situated to the east of the site which includes a very large area of old quarries. An old coal pit is situated 230m east of the site. A tramway runs in a north west – south east trajectory 310m east of the site.
1904-1905 1:2500	The site remains unchanged.	No significant changes have occurred in the surrounding area.
1918-1919 1:2500	The site remains unchanged.	The majority of Dyffryn Cellwen has been constructed south and south east of the site.
1953 1:10,560	The site remains unchanged.	Residential development has occurred to the northeast, west and southwest of the site.
1954 1:10560	The site remains unchanged.	Substantial mining infrastructure including multiple railways has been constructed 520m north west of the site including Brickworks. Further residential development has occurred to the south west edge of Dyffryn Cellwen. Residential houses have been constructed adjacent southwest of the site.
1962-1964 1:2500	The site remains unchanged	Mining activity has continued at Onllywn and further development of the infrastructure has occurred. The Mine entry is visible 860m west of the site the mining infrastructure surrounds this Mine spanning a large area. Multiple slag heaps are mapped in the surrounding area east of the site.
1978-1992 1:2500	A few small structures are now visible within the site including a lavatory. A stream is shown to run along the south eastern border of the site	Opencast workings are now labelled 320m north of the site. Slag heaps to the south west are now described as Tips(disused)
1989 1:2500	Construction has taken place within the site including a public convenience, a Surgery, parking areas and residential flats named Ty Maes Marchog.	The surrounding area remains largely unchanged

2.2 Site History (Continued)

Table 0.2 Historical Development from Map Information (Continued)		
	Key Features on Site	Key Features off Site
1993 1:2500	The site remains unchanged.	The surrounding area remains largely unchanged
2009 1:10000	The site remains unchanged.	The coal mining area to the north is now a coal washery. Workings are labelled in the wider south western area.
2018 1:10000	The structures within the site excluding the public convenience have been demolished. Satellite images show the site to be weathered hardstanding areas and carparks. A few shrub areas are also visible within the site	Residential houses have been constructed in the land adjacent east to the site. The wider surrounding area has remained relatively unchanged.

2.3 Environmental Setting

2.3.1 Geology

The 1:50,000 scale geological map of the area (Sheet 231) was consulted for geology underlying the site. The site is shown to be underlain by the South Wales Lower Coal Measures of which is Carboniferous in age. The rocks comprise coal-bearing mudstones/siltstones, with seatearths and minor sandstones.

The conjectural outcrop of the “Lower Bluers” coal seam is shown to outcrop on the central portion of the site. The conjectural outcrop of the “Rhyd” coal seam is shown along the site's north east corner with conjectural outcrops of the “Grey” and “Lower” coal seams to the north. The strata in this area are shown to dip in a southerly direction at approximately 4° to 5° in a southerly direction. The above seams will, therefore, underlie part or the whole of the site at shallow to moderate depth.

Superficial deposits are not recorded at the site.

Made ground is expected at the site.

2.3.2 Radon

The Envirocheck Report (**Annex A**) details that the site is in an intermediate probability radon area, as 1 to 3% of homes are estimated to be at or above the action level. **No** radon protective measures are required for new developments on the investigation site.

2.3.3 Mining

A Coal Authority Mining Report was ordered for the site which states. The site is not within a surface area that could be affected by past underground mining. However the property is in an area where the Coal Authority believes there is coal at or close to the Surface. This coal may have been worked at some time in the past.

The Coal Authority does not hold records of mine entries within the site or within 20m of the site's boundary.

2.3.4 Hydrogeology and Hydrology

The Envirocheck Report records the nearest river network locates 147m to the east. This feature is an unnamed drainage ditch flowing to the north east.

Generally the topography of the site shallowly descends towards the north Surface water runoff is likely to be in this direction

Deeper groundwater flow within the underlying bedrock will be controlled by the strata dip and any fractures or bedding planes within the rock units.

The hydraulic gradient will be at its steepest during periods of heavy rainfall and aquifer recharge.

The bedrock deposits beneath the site have an aquifer designation of 'Secondary A'. These are permeable layers capable of supporting water supplies at a local rather than strategic scale, and in some cases forming an important source of base flow to rivers.

The site does not lie within influencing distance of a groundwater source protection zone.

2.3.5 Flooding

The NRW online flood maps were consulted to evaluate the risk from flooding. The maps show that the site is not at risk of flooding from rivers and the sea.

2.3.6 Waste

The Envirocheck report holds no records of historic or current landfills within influencing distance of the site.

SECTION 3 Preliminary Risk Assessment

The following sub-sections detail a preliminary risk assessment, based upon the desk study information.

3.1 General

The contaminated land regime is set out in Part IIA of the Environmental Protection Act (EPA) 1990 and was introduced on the 1st April 2000 in England and 1st July 2001 in Wales. A similar regime was introduced in Scotland on 14th July 2000.

Part IIA was introduced to achieve two aims:

- (1) The identification of contaminated land
- (2) The remediation of contaminated land that poses an unacceptable risk to human health and/or the environment

Under Part IIA the statutory definition of 'contaminated land' is:

"any land which appears to the local authority in whose area it is situated, to be in such a condition, by reason of substances in, on, or under the land, that:

- (a) Significant harm is being caused or there is a significant possibility of such harm being caused; or
- (b) Pollution of controlled waters is being, or is likely to be, caused."

For land to be classified as 'Contaminated Land' there must be a '**pollutant linkage**'. A pollutant linkage requires three essential elements:

- (1) A **CONTAMINANT** (hazard) – a substance that is in, on or under the land and has the potential to cause harm or to cause pollution of **controlled waters**
- (2) A **RECEPTOR** (target) – something which could be adversely affected by a contaminant
- (3) A **PATHWAY** – a route or means which either allows the contaminant to cause significant harm to that receptor, or that there is a significant possibility of such harm being caused to the receptor, or that pollution of controlled waters is being or likely to be caused.

The term 'Risk' is widely used in different contexts and situations, but a prescriptive definition is given by the Guidelines for Environmental Risk Assessment and Management (DEFRA *et al*, 2000):

'Risk is a combination of the probability, or frequency, of occurrence of a defined hazard and the magnitude of the consequences of the occurrence'.

A 'Hazard' is defined as '*a property or situation that in particular circumstances could lead to harm*'.

The classification of consequences and probability and determining the risk category are defined in the following sections.

3.2 Classification of Consequence

Table 3.1 Classification of Consequence	
Classification	Definition
Severe	• Short term (acute) risk to human health likely to result in significant harm • Short term risk to controlled waters • Catastrophic damage to buildings/structures • Short term risk to an ecosystem or organism within the particular ecosystem
Medium	• Chronic damage to human health (long term risk) • Pollution of a sensitive water resource • A significant change in an ecosystem or organism within the ecosystem
Mild	• Pollution of non-sensitive water resources • Significant damage to buildings/structures
Negligible	• Harm (not necessarily significant) which may result in financial loss • Non-permanent health effects to humans (easily prevented by PPE for example) • Easily repairable effects of structural (building) damage

3.3 Classification of Probability

Table 3.2 Classification of Probability	
Classification	Definition
High	• There is a complete pollution linkage and an event appears very likely to occur in the short term and is inevitable in the long term. • Evidence of harm to the receptor
Medium	• There is a complete pollution linkage which means that it is probable that an event will occur • The event is not inevitable but possible in short term and likely in the long term
Low	• There is a complete pollution linkage and circumstances are possible under which an event could occur • It is not certain that an event will occur in the long term, and it is less likely to occur in the short term
Negligible	• There is a complete pollution linkage but circumstances are such that it is improbable that an event would occur even in the long term

3.4 Risk Assessment Matrix

By comparing the consequences of a risk and the probability of the risk of a pollution linkage, the likely risk category can be determined as shown in **Table 4.3** below.

Table 3.3 Risk Assessment Matrix					
Increasing acceptability ↘		Consequence			
		Severe	Medium	Mild	Negligible
Probability	High	High	High	Medium / Low	Near zero
	Medium	High	Medium	Low	Near zero
	Low	High / medium	Medium / Low	Low	Near zero
	Negligible	High / medium / Low	Medium / Low	Low	Near zero

High Risk

There is a high probability that severe harm could risk a receptor, or there is evidence that a receptor is being harmed. The risk if realised is likely to result in liability, and urgent investigation or remediation will be required.

Medium Risk

It is probable that harm will arise to a receptor. However it is relatively unlikely that such harm would be severe, or if harm does occur the harm is likely to be relatively mild. Investigation will be required to determine the liability, and some remedial works may be required in the long term.

Low Risk

It is possible that harm may arise to a receptor, but it is likely that the harm would be mild.

Near Zero Risk

There is a very low risk of harm to the receptor. In the event of harm being realised the harm is not likely to be severe.

3.5 Preliminary Site Conceptual Model

The preceding sections enable a preliminary conceptual model of the site to be drawn up, to illustrate the likely ground conditions beneath the site together with a preliminary assessment of the nature of any underlying aquifers and groundwater movement. The preliminary site conceptual model is used as a model for the design and implementation of the site investigation, whereby areas of potential contamination can be targeted as well as investigating the site as a whole.

3.5.1 Potential Sources of Contamination and Gas

The potential contamination beneath the site, whether in the matrix of soil or any groundwater will be related to sites past use and the history of the surrounding area.

The desk study has shown the site to be previously occupied by a surgery, and residential properties and parking areas which have been demolished. Demolition waste if present is a potential source of contamination.

Contaminants of concern associated with the potential contamination sources are provided in **Table 3.4**.

3.5.1 Potential Sources of Contamination and Gas (Continued)

Table 3.4 Contaminants of Concern	
Source	Contaminant
Demolition waste	Asbestos, PAH, TPH

3.5.2 Potential Receptors

There are both human and hydrological receptors to any contamination that may be present on site.

Construction workers/maintenance personnel will be excavating in soils and are considered to be a potential receptor to contamination.

A residential end use is currently in place. Current and future site users are also a potential receptor to contamination.

Neighbouring site users and passers-by are also considered to be a potential receptor to contamination, though this can be managed through good site practice and due diligence.

Controlled water receptors are considered to be the Secondary A Aquifers beneath the site.

3.5.3 Potential Pathways

A pathway is a route by which a receptor may be affected by contamination. The exposure pathways associated with the site are:

- Inhalation of vapours and dust
- Ingestion of soil and dust
- Dermal contact with soil and dust
- Consumption of home grown produce
- Leaching of contamination from soils into underlying aquifer

3.5.4 Summary of Site Conceptual Model

A qualitative preliminary Human Health and Environmental Risk Assessment summarises the previous sections and is detailed in **Tables 3.5 and 3.6** on the following pages.

3.5.2 Potential Receptors, Pathways and Risks (Continued)

Table 3.5 - Qualitative Preliminary Human Health Risk Assessment					
Potential Source	Pathway	Receptor During Construction	Level of Risk	Current Receptor / Post Construction	Level of Risk
Inorganic contaminants, metals and metalloids	Ingestion, inhalation and dermal contact with soil and soil dust	Construction / maintenance workers	Low with good site practice	Site Residents	Medium
		Neighbouring Site Users	Low with good site practice	Neighbouring site users	Medium
Inorganic contaminants, metals and metalloids	Consumption of home grown produce	N/A	N/A	Site Residents	Medium
Organic Contaminants, PAHs, hydrocarbons					
Asbestos	Inhalation of asbestos fibres	Construction / maintenance workers	Medium	Site Residents	Medium
		Neighbouring Site Users	Low	Neighbouring site users	Low
Organic Contaminants, PAHs, , hydrocarbons	Ingestion, Inhalation of vapours and dust, dermal contact with soil and soil dust	Construction / maintenance workers	Low with good site practice	Site End Users	Medium
Radon Gas	Inhalation	N/A	N/A	Site End Users	Near Zero
Ground Gas	Inhalation	N/A	N/A	Site End Users	Low
Organic Contaminants, PAHs, hydrocarbons	Ingestion of potable water <i>Absorption of contamination from made ground into potable water pipes</i>	N/A	N/A	Site End Users	Medium

3.5.2 Potential Receptors, Pathways and Risks (Continued)

Table 3.6 – Qualitative Preliminary Environmental Risk Assessment					
Potential Source	Pathway	Receptor During Construction	Level of Risk	Current Receptor / Post Construction	Level of Risk
Surface Water	Run-off	Site and Adjacent Sites Shallow/Perched Groundwater	Medium	Controlled waters	Low
Accidental spillage	Run-off, moving contaminated soil, drainage misconnections, discharges to local surface waters or the ground, construction materials and/or exposed ground, wheel washings, oil or chemical spills	Site and Adjacent Sites	Low with good site practice	N/A	N/A
Inorganic contaminants, metals and metalloids	Leaching of contamination Direct migration of spit fuel	Shallow/Perched Groundwater	Medium	Controlled waters	Low
Organic Contaminants, PAHs, hydrocarbons,					

SECTION 4 Field Investigation

4.1 Site Works

A geotechnical and geo-environmental site investigation was carried out on the 22nd May and between the 23rd and 24th July 2018 comprising six machine excavated trial pits, three rotary boreholes and three sokaway tests.

The rotary boreholes were drilled using a Fraste PLG Multidrill rig.

The trial pits were excavated using a JCB 3CX excavator.

The trial pits were logged to the requirements of BS5930:2015.

The fieldworks were supervised by Terra Firma (Wales) Limited.

The trial pit and rotary borehole logs are presented in **Annex D and E** respectively and their positions are shown on **Drawing 01**.

4.2 Ground Conditions

The ground conditions encountered can in general be summarised as shown in **Table 4.1**.

Table 4.1 General Summary of Ground Conditions		
Depth (m)	Thickness (m)	Stratum
GL - >3.0	-	MADE GROUND: firm to stiff dark brown sandy very gravelly CLAY with inclusions of brick
3.2/3.4 - 19.5/21.0	16.3/17.6	MUDSTONE
19.5/21.0 - 20.3/21.5	0.8/0.5	COAL
20.3/21.5 - 22.5/21.0	1.0/0.7	MUDSTONE
22.5/21.0 - 23.0/22.0	0.5/1.0	COAL
23.0/22.0 - 30.0/28.2	5.9/4.2	MUDSTONE
30.0/28.2 - 30.5/28.7	0.5	COAL

4.2.1 Groundwater

No groundwater was encountered during the investigation.

4.2.2 Pit Stability

The sides of the trial pits were marginally unstable during excavation within the made ground.

4.3 Laboratory Soil Chemical Testing

4.3.1 Exploratory Strategy and Sampling Regime

During the intrusive investigation, small disturbed soil samples were collected. The sampling regime was conducted in accordance with BS10175:2011. The sample strategy consisted of targeted sampling of the former fuel station infrastructure where insufficient information was recovered during the desk study with regards to remedial measures taken during the decommissioning of the former fuel stations.

Samples were taken of both shallow made ground and deeper natural soils.

The sample locations and depths are listed in the **Table 4.2**. The sample locations are presented in **Drawing 01**.

Table 4.2 Soil Chemical Test Sample Locations and Depths		
Sample	Depth (m)	Sample Description
TP1	0.2	Dark brown gravelly, sandy CLAY
TP2	0.4	Dark brown clayey, sandy GRAVEL (sample matrix outside MCERTS scope of accreditation)
TP3	0.3	Dark brown gravelly, sandy CLAY
TP4	0.2	Dark brown sandy GRAVEL (sample matrix outside MCERTS scope of accreditation)
TP5	0.6	Dark brown sandy, GRAVEL (sample matrix outside MCERTS scope of accreditation)
TP6	0.2	Dark brown clayey, sandy GRAVEL including odd rootlets (sample matrix outside MCERTS scope of accreditation)

Care was taken to ensure that sampling quality assurance occurred during site works. This included the following measures:

- The use of nitrile gloves at each sampling point
- Stainless steel shovels were used to collect soil samples. The tool was cleaned with distilled water between each sample point
- Soil samples were stored at a temperature below 4 degrees
- Soil samples were stored within sample containers according to the chemical testing required
- No head space was left in sample containers

4.3.2 Soil and Groundwater Laboratory Analysis

The soil samples taken were despatched to the UKAS and Mcerts accredited laboratories of Derwentside Environmental Testing Services Ltd (DETS) within twenty four hours of collection. The following soil and groundwater chemical tests were undertaken:

4.3.2 Soil and Groundwater Laboratory Analysis (Continued)**Metals and Metalloids**

Lead
Arsenic
Mercury
Cadmium
Chromium
Copper
Nickel
Zinc
Selenium

In-Organics

Cyanide
Sulphate

Others

pH (acidity)
Organic Matter
Asbestos

Organic Chemicals

Phenols
Polycyclic Aromatic Hydrocarbons (Speciated)
Petroleum hydrocarbons

The laboratory soil chemical test results are presented in **Annex F**.

SECTION 5 Evaluation of Soil Analytical Results

5.1 Soil Analysis Methodology

Comparison of the analytical results has been made with Soil Guideline Values for a residential scenario, sourced from the Land Quality and Management Limited and the Chartered Institute of Environmental Health Suitable 4 Use Levels (S4ULs) for Human Health Risk Assessment. Where S4ULs are not available reference has been made to the Category 4 Screening Levels (C4SLs) and in the absences of this for Cyanide, the Environment Agency Contaminated Land Exposure Assessment (CLEA).

5.2 Soil Test Results

For Tier 1, the site itself is considered to be the receptor. Therefore, attenuation of contaminants between the source and receptor is not considered. A summary of the chemical test results which include the regulatory soil guideline values used in the Tier 1 assessment are given in **Table 5.1 - 5.4**.

Table 5.1 Summary of Soil Chemical Test Results: Standard Suite						
Substance	SGV/GAC (mg/kg)	Source	Measured Concentrations (mg/kg)		95% UCL	Number of Exceedences
			Minimum	Maximum		
Arsenic	37	LQM/CIEH	3.8	9.3	*	0
Cadmium	11	LQM/CIEH	<0.1	0.1	*	0
Chromium III	910	LQM/CIEH	4.6	15	*	0
Chromium VI	6	LQM/CIEH	<1.0	<1.0	*	0
Copper	2400	LQM/CIEH	4.5	30	*	0
Lead	200	C4SL	6.7	26	*	0
Mercury	40	LQM/CIEH	<0.05	<0.05	*	0
Nickel	180	LQM/CIEH	5.4	30	*	0
Selenium	250	LQM/CIEH	<0.5	<0.5	*	0
Zinc	3700	LQM/CIEH	29	95	*	0
Cyanide	8	CLEA	<0.1	<0.1	*	0
Phenols	120	LQM/CIEH	<0.3	<0.3	*	0
Sulphate	-	-	200	2900	*	0
Organic Matter	-	-	2.8	13	*	-
pH	-	-	7.8	11.2	*	-

Notes:

- CLEA-Soil guideline values for a residential development with plant uptake
- LQM/CIEH - Generic Assessment Criteria for a residential development with plant uptake
- C4SL - Category four screening level for a residential development with plant uptake
- BRE - British Research Establishment
- A total of six samples were tested
- - no available guideline
- * - Insufficient samples for accurate statistical analysis

5.2 Soil Test Results (Continued)

Table 5.2 Summary of Soil Chemical Test Results: Speciated PAH						
Substance	GAC (mg/kg)	Source	Measured Concentrations of Tested Substances (mg/kg)		95% UCL	Number of Exceedences
			Minimum	Maximum		
Naphthalene	2.3	LQM/CIEH	<0.03	<0.03	*	0
Acenaphthylene	170	LQM/CIEH	<0.03	<0.03	*	0
Acenaphthene	210	LQM/CIEH	<0.03	<0.03	*	0
Fluorene	170	LQM/CIEH	<0.03	<0.03	*	0
Phenanthrene	95	LQM/CIEH	<0.03	0.14	*	0
Anthracene	2400	LQM/CIEH	<0.03	0.04	*	0
Fluoranthene	280	LQM/CIEH	<0.03	0.49	*	0
Pyrene	620	LQM/CIEH	<0.03	0.38	*	0
Benzo(a)anthracene	7.2	LQM/CIEH	<0.03	0.28	*	0
Chrysene	15	LQM/CIEH	<0.03	0.42	*	0
Benzo(b)fluoranthene	2.6	LQM/CIEH	<0.03	0.57	*	0
Benzo(k)fluoranthene	77	LQM/CIEH	<0.03	0.19	*	0
Benzo(a)pyrene	2.2	LQM/CIEH	<0.03	0.37	*	0
Indeno(123cd)pyrene	27	LQM/CIEH	<0.03	0.27	*	0
Dibenzo(ah)anthracene	0.24	LQM/CIEH	<0.03	0.05	*	0
Benzo(ghi)perylene	320	LQM/CIEH	<0.03	0.29	*	0
Total PAH	-	-	<0.3	3.6	*	-

Notes:

- LQM/CIEH - Generic Assessment Criteria for a residential development with plant uptake.
- Guidelines for a residential land use with plant uptake.
- Thresholds based on 1.0% SOM
- Six samples were tested for Speciated PAH

5.2 Soil Test Results (Continued)

Table 5.3 Summary of Soil Chemical Test Results: Petroleum Hydrocarbons

Substance	SGV/GAC (mg/kg)	Source	Measured Concentrations (mg/kg)		95% UCL	Number of Exceedences
			Minimum	Maximum		
Aliphatic						
PH C5 – C6 Ali	42	LQM/CEIH	<0.01	<0.01	*	0
PH C6 – C8 Ali	100	LQM/CEIH	<0.01	<0.01	*	0
PH C8 – C10 Ali	27	LQM/CEIH	<0.01	<0.01	*	0
PH C10 – C12 Ali	130	LQM/CEIH	<1.5	<1.5	*	0
PH C12 – C16 Ali	1100	LQM/CEIH	<1.2	<1.2	*	0
PH C16 – C21 Ali	65000#	LQM/CEIH	<1.5	<1.5	*	0
PH C21 – C35 Ali	65000#	LQM/CEIH	<3.4	<3.4	*	0
PH C35 – C40 Ali	65000	LQM/CEIH	<3.4	<3.4	*	0
Aromatic						
PH C5 – C7 Arom	70	LQM/CEIH	<0.01	<0.01	*	0
PH C7 – C8 Arom	130	LQM/CEIH	<0.01	<0.01	*	0
PH C8 – C10 Arom	34	LQM/CEIH	<0.01	<0.01	*	0
PH C10 – C12 Arom	74	LQM/CEIH	<0.9	<0.9	*	0
PH C12 – C16 Arom	140	LQM/CEIH	<0.5	<0.5	*	0
PH C16 – C21 Arom	260	LQM/CEIH	<0.6	4.6	*	0
PH C21 – C35 Arom	1100	LQM/CEIH	<1.4	44	*	0
PH C35 – C44 Arom	1100	LQMCEIH	<1.4	<1.4	*	0

Notes:

- LQM/CEIH - Generic Assessment Criteria for a residential development with plant uptake
- CLEA - Soil guideline values for a residential development with plant uptake
- A total of six soil samples were tested for Petroleum Hydrocarbons
- Ali - Aliphatic Hydrocarbon
- Arom - Aromatic Hydrocarbon
- LQM/CEIH Based on 1.0% SOM
- # - LQM for Ali C16 - 21 and C21 - C35 based on LQM for EC >16 - 35
- * - Insufficient samples for accurate statistical analysis

Asbestos testing was undertaken all six samples taken from the site. **Table 5.4** summarises the findings:

Table 5.4 Summary of Soil Chemical Test Results: Asbestos Screen

Substance	Location	Depth (m)	Result
Asbestos	TP1	0.2	Asbestos Not Detected
	TP2	0.4	Asbestos Not Detected
	TP3	0.3	Asbestos Not Detected
	TP4	0.2	Asbestos Not Detected
	TP5	0.6	Asbestos Not Detected
	TP6	0.2	Asbestos Not Detected

SECTION 6 Risk Assessment/Mitigation Measures

6.1 Contaminants of Concern

6.1.1 Contaminants of Concern in Soil

All substances tested were found below their respective residential guidelines.

6.1.2 Leachable Contaminants of Concern

None of the substances tested for pose a risk from leaching.

6.2 Ground Gas

There is no risk from radon or ground gas.

6.3 Potential Receptors and Pathways

6.3.1 Human Receptors

Given the absence of contamination, there are no human receptors.

6.3.2 Aquatic Environment

There is not considered to be a risk to the aquatic environment.

6.4 Mitigation and Remedial Measures

No remedial measures are required for the development.

During the works the Contractor should adhere to all relevant legislation, good practise, construction workers should adhere to good site management, COSHH, good standards of hygiene and appropriate health & safety on site, with personal protection equipment (PPE) and dust suppression where appropriate.

Any soils imported on to site as part of the development should be suitably validated as suitable prior to use in accordance with 'Requirements for the Chemical Testing of Imported Materials for Various End Uses and Validation Cover Systems' published by the Welsh Land Contamination Working Group.

If during development works any other unexpected ground conditions or evidence of contamination is found inspection by a geo-environmental engineer should be made, and any required testing or investigation carried out prior to continuation of works.

SECTION 7 Assessment of the Risk from Shallow Mining

Based upon the desk study information the stratigraphical sequence within 30m of the ground surface of the site could be:

- Made ground
- Coal Measures
- **Coal (Lower Bluers coal seam)**
- Coal Measures
- **Coal (Rhyd coal seam)**
- Coal Measures
- **COAL (Grey Coal Seam)**
- Coal Measures

No coal mining was identified during the probe drilling.

There are no known mine entries within the site.

When assessing the risks from shallow mine workings, as a rule of thumb to prevent the future collapse of mine workings migrating to the surface and forming crown holes there should be a 10:1 rock head to void ratio.

No evidence of coal mining was observed during the probe drilling where intact coal was identified. Based upon the depths and thicknesses of the identified coal seams, it is considered that there is sufficient rock cover should the seams be worked under parts of the site that have not been investigated. It is therefore considered that there is a low risk to the development should potential workings beneath the site collapse in the future.

SECTION 8 Engineering Recommendations

8.1 Preparation of Site

Prior to construction, all service vegetation and hard standing areas should be excavated and removed from underneath the proposed building and car park locations.

Any reduced levels should be brought up to the required levels with well, compacted imported granular materials. Department of Transport (DoT) Type 2 sub-base or similar may be used and should be compacted in layers, in accordance with the Specification for Highway Works. Alternatively, appropriate selected inert imported fill could be used.

Allowances should be made for removing any 'soft spots/area' and their replacement with well compacted granular materials.

Contingencies should be allowed for any necessary temporary and/or permanent support works to any existing services and adjacent buildings made necessary as a result of the proposed works.

Further contingencies should be made for the removal/diversion of any existing underground/overhead services made necessary as a result of the proposed works.

All materials to be removed from site should be taken to an appropriately licensed tip.

In accordance with EC Regulation 1272/2008 and Environment Agency Guidance WM3 (v. 2.3/2011) soils and other materials destined for off-site disposal should be classified on the basis of their hazard phrases prior to disposal. Soils are classified as a mirror entry waste and should be classified on the basis of their specific chemical properties.

8.3 Foundation and Floor Slab Solution

Given the extent and depth of made ground encountered across the site, it is recommended that reinforced strip and trench fill foundations are adopted for the proposed scheme. The reinforced should be designed to cater for differential settlements across the length of the strip.

Foundations should be taken down to a minimum of 0.9m below finished ground level to protect against the effects of frost heave / thermal shrinkage.

For the above strip foundation, an allowable bearing capacity of 100 kPa may be used for design purposes where settlements will not exceed 25mm.

Allowances should be made for removing any 'soft spots/areas' and their replacement with well-compacted imported granular materials as previously described.

The foundation formations should be inspected before concreting by a suitably qualified geotechnical engineer.

During the investigation samples of the in-situ clays were taken and submitted for plasticity testing (**Annex G**). In line with the NHBC (Chapter 4.2), the modified plasticity index for the sample was calculated and are presented in **Table 8.1**.

8.3 Foundation and Floor Slab Solution (Continued)

Table 8.1 Plasticity Test Results					
Sample	Depth (m)	Plasticity Index (%)	Plasticity	Modified Plasticity Index (%)	Volume Change Potential
TP1	1.2	12	Low plasticity	11.04	Low
TP3	1.2	12	Low plasticity	10.32	Low
TP5	1.2	16	Low plasticity	14.24	Low

8.4 Excavations and Formations

All of the shallow excavations will be possible with normal soil excavating machinery.

The shallow excavations may encounter groundwater. Groundwater inflows should be dealt with using conventional pumping techniques.

The sub-formations/formations will be extremely susceptible to loosening, softening and deterioration by exposure to weather (rain, frost and drying conditions), the action of water (flood water or removal of groundwater) and site traffic.

Formations should never be left unprotected and continuously exposed to rain causing degradation, or left exposed/uncovered overnight, unless permitted by a qualified engineer.

Construction plant and other vehicular traffic should not be operated on unprotected formations.

As a minimum the formation/excavation surfaces must be protected by blinding concrete or a minimum thickness of 300mm of hard cover immediately after exposure.

Allowances should be made for the removal of soft spots/areas and their replacement with well compacted granular materials.

8.5 Protection of Buried Concrete

Allowances should be made for special precautions to prevent formation deterioration in addition to the above.

The laboratory soil chemical tests revealed total sulphate content of between 200mg/kg and 2900 mg/kg. The pH values of between 7.8 and 11.2 were recorded.

With reference to the definitions detailed in Section C3 of BRE-Digest 1:2005 groundwater conditions can be defined as 'mobile'.

Based upon the above results and with reference to Table C2 (Aggressive Chemical Environment for Concrete Classification for Brownfield Locations) all buried concrete should conform to Design Class DS-2, ACEC Class AC-1, of BRE Digest 1:2005.

8.6 Sustainable Drainage

During the investigation, three soakaway tests were undertaken within TP1, TP3 and TP6. Insufficient infiltration was recorded to calculate infiltration rates. Based upon the testing, soakaway drainage is not considered feasible for the development.

8.7 Retaining Walls

Due to the sloping nature of the site, retaining walls may be required. The existing steepness of any embankments should not be increased. Any cuts should be undertaken in small sections and in such a way so as not to induce any instability to the ground.

Effective shear parameters for retaining wall design are presented in **Table 8.2**.

Table 8.2 Effective Shear Stress Parameters			
Stratum Description	Bulk Unit Weight (γ) kN/m³	Effective Cohesion (c') kN/m²	Effective Angle of Shearing Resistance (ϕ') degrees
Made ground	18	0	26
Firm cohesive soils	19-21	0	28
Well compacted, granular materials, compacted as per Specification for Highway Works and other relevant guidance such as British Standards (BS) 6031: 1981. Code of Practice for Earthworks.	19 – 20	0	35

The parameters are based on experience in similar ground conditions.

The materials to be in-filled behind the retaining wall should be placed at or close to its optimum moisture content/maximum dry density and compacted in layers as per the requirements of the Specification for Highway Works. During the earthworks suitable in-situ testing should be carried out to ensure that the compaction process is achieving the required maximum dry density to achieve at least 95% compaction.

The acceptability of the filling works should be verified by appropriate on site testing. A certification report should also be prepared on the earthworks by a suitably qualified Geotechnical Engineer.

Appropriate drainage should be incorporated in to the design to prevent the build-up of hydrostatic pressure.

Appropriate cutting and benching of the existing slope should be conducted prior to the replacement of any imported fill to minimise the risk of any slip surfaces forming on the interface between the existing imported materials.

ANNEX A
Landmark Historical Maps

Historical Mapping Legends

Ordnance Survey County Series 1:10,560

Ordnance Survey Plan 1:10,000

1:10,000 Raster Mapping

Gravel Pit

Pit

Sand Pit

Other Pits

Quarry

Shingle

Orchard

Ostlers

Reeds

Marsh

Mixed Wood

Deciduous

Brushwood

Fir

Furze

Rough Pasture

Arrow denotes flow of water

Site of Antiquities

Bench Mark

Pump, Guide Post, Signal Post

Well, Spring, Boundary Post

Surface Level

Sketches Contour

Instrumental Contour

Main Roads

Minor Roads

Sunken Road

Raised Road

Road over Railway

Railway over Road

Road over River or Canal

Stream

Road over Stream

County Boundary (Geographical)

County & Civil Parish Boundary

Administrative County & Civil Parish Boundary

County Borough Boundary (England)

County Borough Boundary (Scotland)

Rural District Boundary

Civil Parish Boundary

Chalk Pit, Clay Pit or Quarry

Gravel Pit

Disused Pit or Quarry

Sand Pit

Refuse or Slag Heap

Lake, Loch or Pond

Dunes

Confiferous Trees

Non-Confiferous Trees

Orchard

Scrub

Copse

Bracken

Heath

Rough Grassland

Marsh

Reeds

Saltings

Building

Glasshouse

Direction of Flow of Water

Shingle

Sand

Pylon

Electricity Transmission Line

Sloping Masonry

Pole

Cutting

Embankment

Standard Gauge Multiple Track

Standard Gauge Single Track

Road Under

Road Over

Foot Crossing

Foot Bridge

Sliding, Tramway or Mineral Line

Narrow Gauge

Geographical County

Administrative County, County Borough or County of City

Municipal Borough, Urban or Rural District, Borough, Burgh or County Constabulary

Shown only when not coincident with other boundaries

Civil Parish

Shown alternately when coincidence of boundaries occurs

BP, BS

Boundary Post or Stone

Church

Club House

Post Office

Police Station

PC

Public Convenience

F E Sta

Public House

Foot Bridge

SB

Signal Box

Fm

Fountain

Spr

Spring

Guide Post

TCP

Telephone Call Box

MP

Mile Post

W

Mile Stone

Gravel Pit

Refuse tip or slag heap

Rock

Rock (scattered)

Boulders

Boulders (scattered)

Shingle

Mud

Sand

Sand Pit

Slopes

Top of cliff

General detail

Overhead detail

Narrow gauge railway

Multi-track railway

Single track railway

County boundary (England) only

District, Unitary, Metropolitan, London Borough boundary

Civil, parish or community boundary

Constituency boundary

Area of wooded vegetation

Non-confiferous trees (scattered)

Confiferous trees (scattered)

Orchard

Rough Grassland

Scrub

Water feature

Mean high water (springs)

Telephone line (where shown)

Bench mark (where shown)

Point feature (e.g. Guide Post or Mile Stone)

Site of (antiquity)

General Building

Important Building

Flow arrows

Mean low water (springs)

Electricity transmission line (with poles)

Triangulation station

Pylon, flare stack or lighting tower

Glasshouse

Marsh, Salt Marsh or Reeds

Health

Copse or Ostlers

Positioned tree

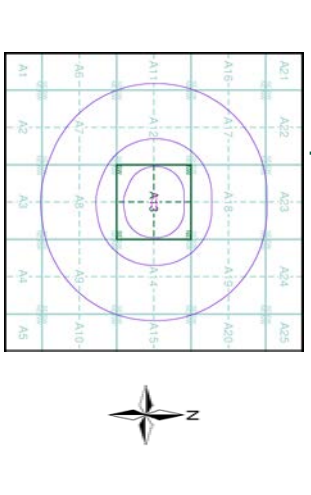
Confiferous trees

Non-confiferous trees

Historical Mapping & Photography included:

Mapping Type	Scale	Date	Pg
Glanoganshire	1:10,560	1883	2
Brecknockshire	1:10,560	1888	3
Glamorganshire	1:10,560	1890 - 1901	4
Brecknockshire	1:10,560	1905	5
Brecknockshire	1:10,560	1921	6
Brecknockshire	1:10,560	1921	7
Brecknockshire	1:10,560	1953	8
Ordnance Survey Plan	1:10,000	1964 - 1965	9
Ordnance Survey Plan	1:10,000	1979	10
Ordnance Survey Plan	1:10,000	1980 - 1988	11
Ordnance Survey Plan	1:10,000	1983	12
10K Raster Mapping	1:10,000	2000	13
10K Raster Mapping	1:10,000	2006	14
VectorMap Local	1:10,000	2018	15

Historical Map - Slice A



Order Details

Order Number: 172177631_1
Customer Ref: 14753 dyffryn celliwn
National Grid Reference: 285070, 210190
Slice: A
Site Area (Ha): 0.52
Search Buffer (m): 1000

Site Details

Site at, Dyffryn Celliwn, Neath Port Talbot

A Landmark Information Group Service V50.0 04-Jul-2018 Page 1 of 15

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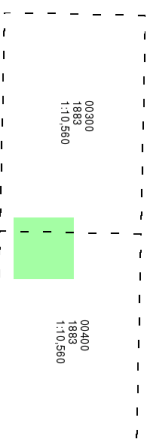
Glamorganshire

Published 1883

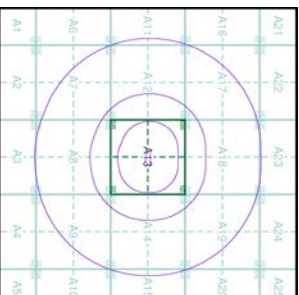
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The historic maps shown were reproduced from maps predominantly held at the time adopted for England, Wales and Scotland in the 1940's. In 1854 the 1:2500 scale was adopted for mapping urban areas; these maps were used to update the 1:10,560 maps. The published data given thereafter is often some years later than the surveyed data. Before 1938, all OS maps were based on the Cassini Projection, with independent surveys of a single county or group of counties, giving rise to significant inaccuracies in outlying areas. In the late 1940's, a Provisional Index was produced, which updated the 1:10,560 mapping from a number of sources. The maps appear unfinished – with all military camps and other strategic sites removed. These maps were initially produced with the National Grid. In 1970, the first 1:10,000 maps were produced using the Transverse Mercator Projection. The revision process continued until recently, with new editions appearing every 10 years or so for urban areas.

Map Name(s) and Date(s)



Historical Map - Slice A



Order Details

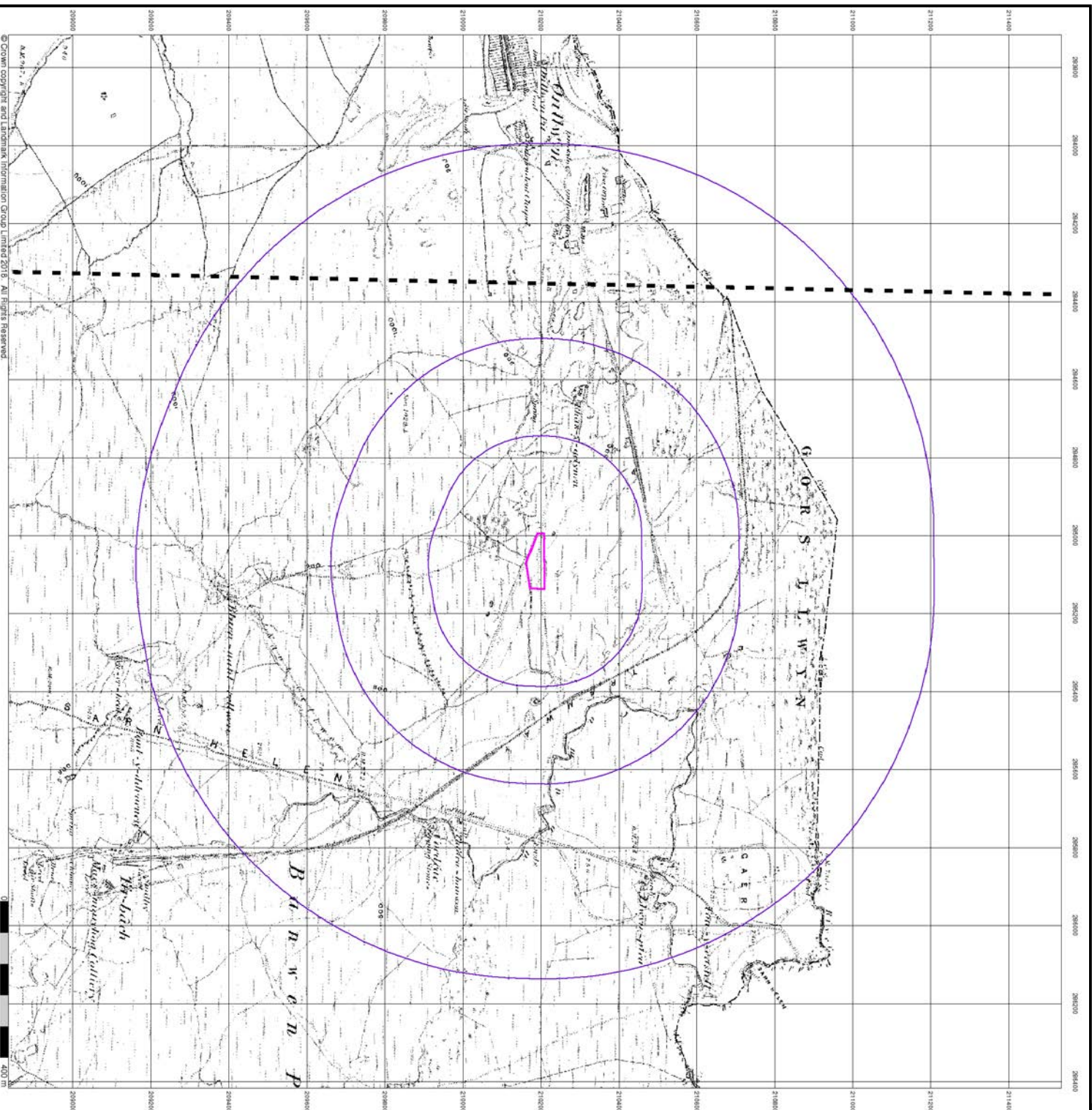
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Brecknockshire

Published 1888

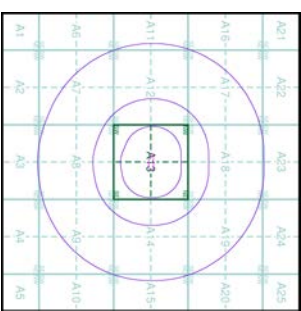
Source map scale - 1:10,560

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Map Name(s) and Date(s)

043NE 1888 1:10,560	044NW 1888 1:10,560
043SE 1888 1:10,560	044SW 1888 1:10,560

Historical Map - Slice A



Order Details

Order Number: 172177631_11
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National Grid Reference: 285070, 210190
Slice: A
Site Area (Ha): 0.52
Search Buffer (m): 1000

Site Details

Site at: Dyffryn Ceilwen, Neath Port Talbot



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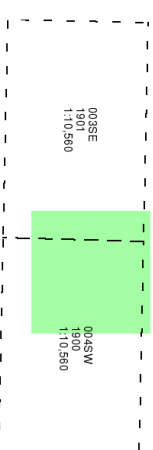
Glamorganshire

Published 1900 - 1901

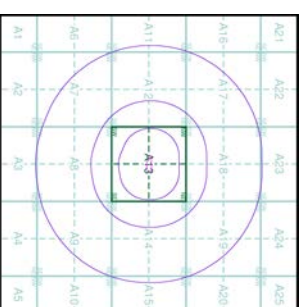
Source map scale - 1:10,560

The historical maps shown were reproduced from maps predominantly held at the scale adopted for England, Wales and Scotland in the 1840's. In 1854 the 1:2,500 scale was adopted for mapping urban areas; these maps were used to update the 1:25,000 maps. In 1890 the 1:10,560 scale was adopted for mapping rural areas. The 1:10,560 maps were produced by the Ordnance Survey, which were based on the Cassini Projection with independent surveys of a single county or group of counties, giving rise to significant inaccuracies in outlying areas. In the late 1940's, a Provisional Edition was produced which updated the 1:10,560 mapping from a number of sources. The maps appear unaltered, with all military camps and other strategic sites removed. These maps were initially overlaid with the National Grid. In 1970, the first 1:10,000 maps were produced using the Transverse Mercator Projection. The revision process continued until recently, with new editions appearing every 10 years or so for urban areas.

Map Name(s) and Date(s)



Historical Map - Slice A



Order Details

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Customer Ref: 14753 dyffryn cellwyn
National Grid Reference: 285070, 210190
Slice: A
Site Area (Ha): 0.52
Search Buffer (m): 1000

Site Details

Site at: Dyffryn Cellwyn, Neath Port Talbot



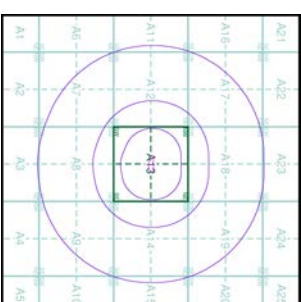
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The historical maps shown were reproduced from maps predominantly held at the scale adopted for England, Wales and Scotland in the 1840's. In 1854 the 1:2,500 scale was adopted for mapping urban areas, these maps were used to update the 1:10,560 maps. The 1905 maps were produced by the Ordnance Survey, based on the Cassini Projection with independent surveys of a single county or group of counties, giving rise to significant inaccuracies in outlying areas. In the late 1940's a Provisional Edition was produced which updated the 1:10,560 mapping from a number of sources. The maps appear unaltered - with all military camps and other strategic sites removed. These maps were initially overlaid with the National Grid. In 1970, the first 1:10,000 maps were produced using the Transverse Mercator Projection. The revision process continued until recently, with new editions appearing every 10 years or so for urban areas.

Map Name(s) and Date(s)

043NE 1905 1:10,560	044NW 1905 1:10,560
043SE 1905 1:10,560	044SW 1905 1:10,560

Historical Map - Slice A



Order Details

Order Number: 172177631_1
Customer Ref: 14753 dyffryn celiwyn
National Grid Reference: 285070, 210190
Slice: A
Site Area (Ha): 0.52
Search Buffer (m): 1000

Site Details

Site at: Dyffryn Celiwen, Neath Port Talbot



Brecknockshire

Published 1921

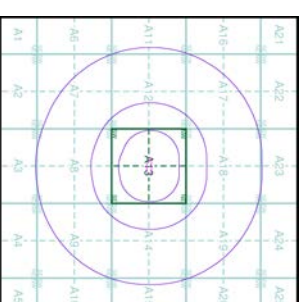
Source map scale - 1:10,560

The historical maps shown were reproduced from maps predominantly held at the scale adopted for England, Wales, and Scotland in the 1840's. In 1854 the 1:2,500 scale was adopted for mapping urban areas, these maps were used to update the 1:10,560 maps. Prior to the 1921 edition, 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 adjoining areas. In the late 1940's, a Provisional Edition was produced which updated the 1:10,560 mapping from a number of sources. The maps appear unfinished - with all military camps and other strategic sites removed. These maps were initially overprinted with the National Grid. In 1970, the first 1:10,000 maps were produced using the Transverse Mercator Projection. The revision process continued until recently, with new editions appearing every 10 years or so for urban areas.

Map Name(s) and Date(s)

043NE 1921 1:10,560	044NW 1921 1:10,560
043SE 1921 1:10,560	044SW 1921 1:10,560

Historical Map - Slice A



Order Details

Order Number: 172177631_1
Customer Ref: 14753 dyffryn celiwyn
National Grid Reference: 285070, 210190
Slice: A
Site Area (Ha): 0.52
Search Buffer (m): 1000

Site Details

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Brecknockshire

Published 1921

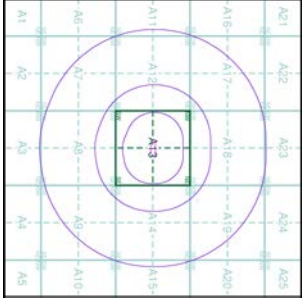
Source map scale - 1:10,560

The historical maps shown were reproduced from maps predominantly held at the scale adopted for England, Wales and Scotland in the 1840's. In 1854 the 1:2,500 scale was adopted for mapping urban areas; these maps were then updated in 1:10,560 maps. The 1:10,560 maps were produced by the Ordnance Survey in 1921, but these maps were based on the Cassini Projection with independent surveys of a single county or group of counties, giving rise to significant inaccuracies in outlying areas. In the late 1940's, a Provisional Edition was produced which updated the 1:10,560 mapping from a number of sources. The maps appear unfinished - with all military camps and other strategic sites removed. These maps were initially overprinted with the National Grid. In 1970, the first 1:10,000 maps were produced using the Transverse Mercator Projection. The revision process continued until recently, with new editions appearing every 10 years or so for urban areas.

Map Name(s) and Date(s)

043NE 1921 1:10,560	044NW 1921 1:10,560
043SE 1921 1:10,560	

Historical Map - Slice A



Order Details

Order Number: 172177631_11
Customer Ref: 14753 dyffryn cellwyn
National Grid Reference: 285070, 210190
Slice: A
Site Area (ha): 0.52
Search Buffer (m): 1000

Site Details

Site at: Dyffryn Cellwren, Neath Port Talbot



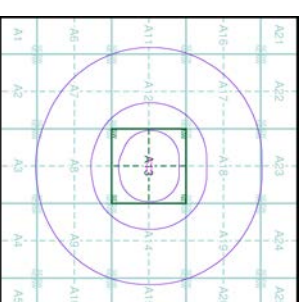
Tel: 0844 844 9952
Fax: 0844 844 9951
Web: www.envirotech.co.uk

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, these maps were used to update the 1:10,560 maps. The 1:2,500 scale maps were produced by the Ordnance Survey, the first edition of the 1:2,500 scale maps was published in 1854. The 1:10,560 maps were based on the Cassini Projection with independent surveys of a single county or group of counties, giving rise to significant inaccuracies in outlying areas. In the late 1940's, a Provisional Edition was produced which updated the 1:10,560 mapping from a number of sources. The maps appear unaltered, with all military camps and other strategic sites removed. These maps were initially overlaid with the National Grid. In 1970, the first 1:10,000 maps were produced using the Transverse Mercator Projection. The revision process continued until recently, with new editions appearing every 10 years or so for urban areas.

Map Name(s) and Date(s)

043NE 1953 1:10,560	044NW 1953 1:10,560
043SE 1953 1:10,560	044SW 1953 1:10,560

Historical Map - Slice A



Order Details

Order Number: 17277631_1
Customer Ref: 14753 dyffryn celiwyn
National Grid Reference: 285070, 210190
Slice: A
Site Area (Ha): 0.52
Search Buffer (m): 1000

Site Details

Site at: Dyffryn Celiwyn, Neath Port Talbot



Ordnance Survey Plan

Published 1964 - 1965

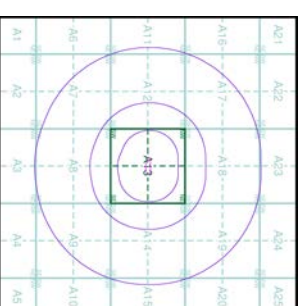
Source map scale - 1:10,000

The historical maps shown were reproduced from maps predominantly held at the scale adopted for England, Wales and Scotland in the 1840's. In 1854 the 1:2,500 scale was adopted for mapping urban areas; these maps were used to update the 1:10,000 maps. The 1:10,000 maps were first published in 1890 and were based on the Cassini Projection with independent surveys of a single county or group of counties, giving rise to significant inaccuracies in cutting areas. In the late 1940's, a Provisional Edition was produced which updated the 1:10,000 mapping from a number of sources. The maps appear unaltered - with all military camps and other strategic sites removed. These maps were initially overprinted with the National Grid. In 1970, the first 1:10,000 maps were produced using the Transverse Mercator Projection. The revision process continued until recently, with new editions appearing every 10 years or so for urban areas.

Map Name(s) and Date(s)

SN81SW	SN81SE
1965	1964
1:10,560	1:10,560
SN80NW	SN80NE
1964	1964
1:10,560	1:10,560

Historical Map - Slice A



Order Details

Order Number: 172177631_11
Customer Ref: 14753 dyffryn cellwyn
National Grid Reference: 285070, 210190
Slice: A
Site Area (Ha): 0.52
Search Buffer (m): 1000

Site Details

Site at: Dyffryn Cellwyn, Neath Port Talbot



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Fax: 0844 844 9951
Web: www.environment.co.uk



Ordnance Survey Plan

Published 1979

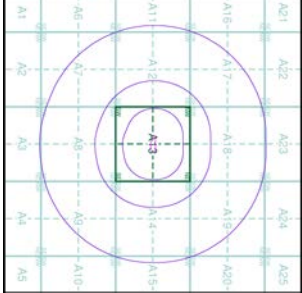
Source map scale - 1:10,000

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

Map Name(s) and Date(s)

SN61SE
SN61SE
1:10,000

Historical Map - Slice A



Order Details

Order Number: 172177631_11
Customer Ref: 14753 dyffryn cellwyn
National Grid Reference: 285070, 210190
Slice: A
Site Area (ha): 0.52
Search Buffer (m): 1000
Site at: Dyffryn Cellwen, Neath Port Talbot

Site Details



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Ordnance Survey Plan

Published 1980 - 1988

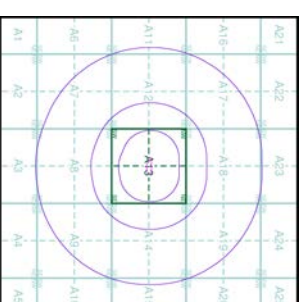
Source map scale - 1:10,000

The historical maps shown were reproduced from maps predominantly held at the scale adopted for England, Wales and Scotland in the 1840's. In 1854 the 1:2,500 scale was adopted for mapping urban areas, these maps were used to produce the 1:10,000 scale maps. The 1:10,000 scale maps were first published in 1947 and were updated in 1980. The 1:10,000 scale maps were based on the Cassini Projection with independent surveys of a single county or group of counties, giving rise to significant inaccuracies in outlying areas. In the late 1940's a Provisional Edition was produced which updated the 1:10,000 mapping from a number of sources. The maps appear unfinished - with all military camps and other strategic sites removed. These maps were initially overprinted with the National Grid. In 1970, the first 1:10,000 maps were produced using the Transverse Mercator Projection. The revision process continued until recently, with new editions appearing every 10 years or so for urban areas.

Map Name(s) and Date(s)

SN81 SW	1988
1:10,000	
SN80 NW	1980
1:10,000	1:10,560

Historical Map - Slice A



Order Details

Order Number: 172177631_1.1
Customer Ref: 14753 dyffryn cellwyn
National Grid Reference: 285070, 210190
Slice: A
Site Area (Ha): 0.52
Search Buffer (m): 1000

Site Details

Site at: Dyffryn Cellwyn, Neath Port Talbot



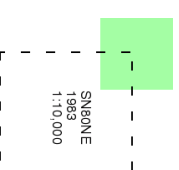
Tel: 0844 844 9952
Fax: 0844 844 9951
Web: www.envirotech.co.uk



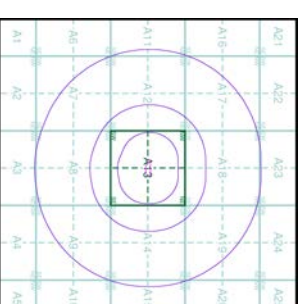
Published 1983

Source map scale - 1:10,000

Map Name(s) and Date(s)



Historical Map - Slice A



Order Details

Order Number:	172177631_1_1
Customer Ref:	14753 dyffryn cellwyn
National Grid Reference:	285070, 210190
Slice:	A
Site Area (Ha):	0.52
Search Buffer (m):	1000

Site Details

Site at, Dyffryn Cellwen, Neath Port Talbot



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



10k Raster Mapping Published 2000

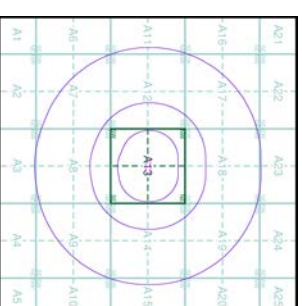
Source map scale - 1:10,000

The historical maps shown were produced from the Ordnance Survey's 1:10,000 colour raster mapping. These maps are derived from cartographic data which replaced the old 1:10,000 maps originally published in 1970. The data is derived from aerial photography and is not a vector map. The data is as all single tracked street names are included together with the relevant road number and classification. Boundary information depiction includes county, unitary authority, district, civil parish and consistency.

Map Name(s) and Date(s)

SN81SW	2000	1:10,000
SN80NW	2000	1:10,000
SN80NE	2000	1:10,000

Historical Map - Slice A



Order Details

Order Number: 172177631_1
Customer Ref: 14753 dyffryn cellwyn
National Grid Reference: 285070, 210190
Site Area (Ha): 0.52
Search Buffer (m): 1000

Site Details

Site at: Dyffryn Cellwyn, Neath Port Talbot



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Fax: 0844 844 9951
Web: www.environment.co.uk



10k Raster Mapping

Published 2006

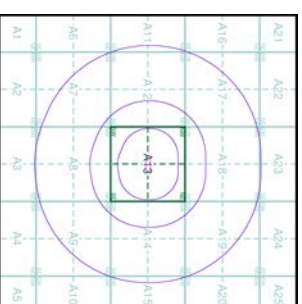
Source map scale - 1:10,000

The historical maps shown were produced from the Ordnance Survey's 1:10,000 colour raster mapping. These maps are derived from cartographic data which replaced the old 1:10,000 maps originally published in 1970. The data is single tracked and single road maps are included together with the relevant road number and classification. Boundary information depiction includes county, unitary authority, district, civil parish and consistency.

Map Name(s) and Date(s)

SN81SW	2006	SN81SE	2006
1:10,000	1:10,000	1:10,000	1:10,000
SN80NW	2006	SN80NE	2006
1:10,000	1:10,000	1:10,000	1:10,000

Historical Map - Slice A



Order Details

Order Number: 172177631_1
Customer Ref: 14753 dyffryn cellwyn
National Grid Reference: 285070, 210190
Slice: A
Site Area (Ha): 0.52
Search Buffer (m): 1000

Site Details

Site at: Dyffryn Cellwyn, Neath Port Talbot



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VectorMap Local

Published 2018

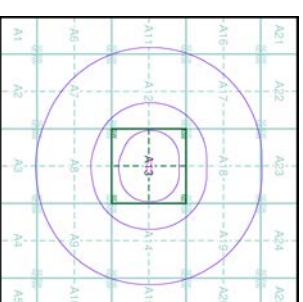
Source map scale - 1:10,000

VectorMap Local (Raster) is Ordnance Survey's highest detailed 'background' mapping product. These maps are produced from OS's VectorMap Local, a single vector dataset at a nominal scale of 1:10,000, covering the whole of Great Britain. VectorMap Local is designed to support graphical mapping. VectorMap Local is derived from a single source map scale of 1:1250 scale (covering major towns and cities), 1:2500 scale (smaller towns, villages and developed rural areas), and 1:10,000 scale (mountain, moorland and river estuary areas).

Map Name(s) and Date(s)

SN81SW	SN81SE
2018	2018
Variable	Variable
SN80NW	SN80NE
2018	2018
Variable	Variable

Historical Map - Slice A



Order Details

Order Number: 172177631_11
Customer Ref: 14753 dyffryn cellwyn
National Grid Reference: 285070, 210190
Slice: A
Site Area (Ha): 0.52
Search Buffer (m): 1000

Site Details

Site at: Dyffryn Cellwyn, Neath Port Talbot



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

terrafirma

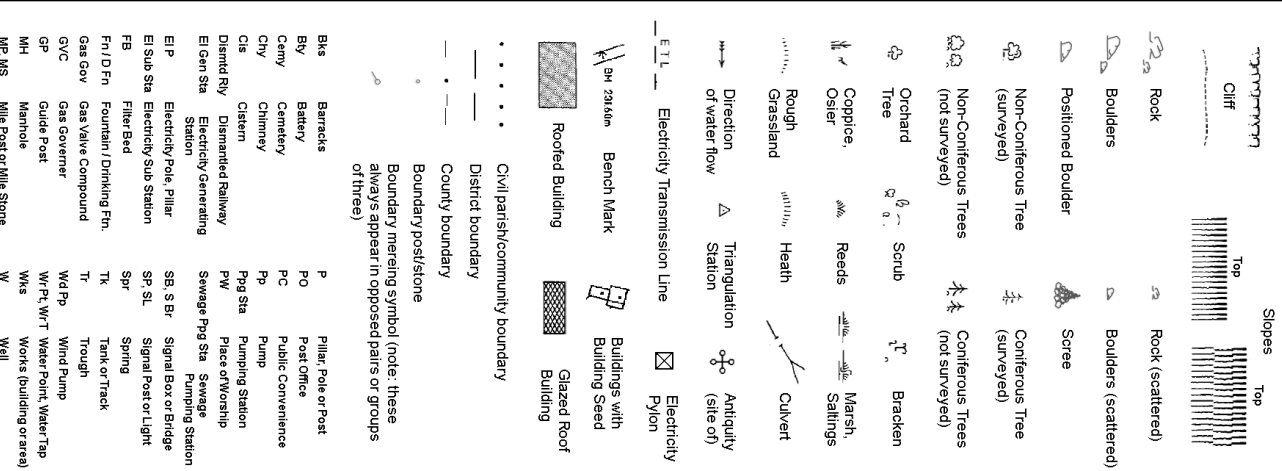
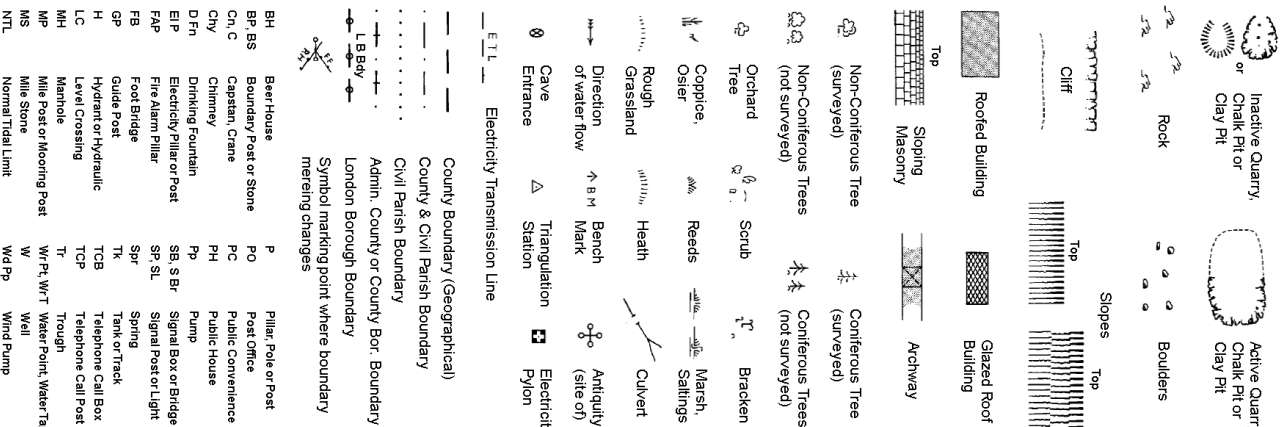
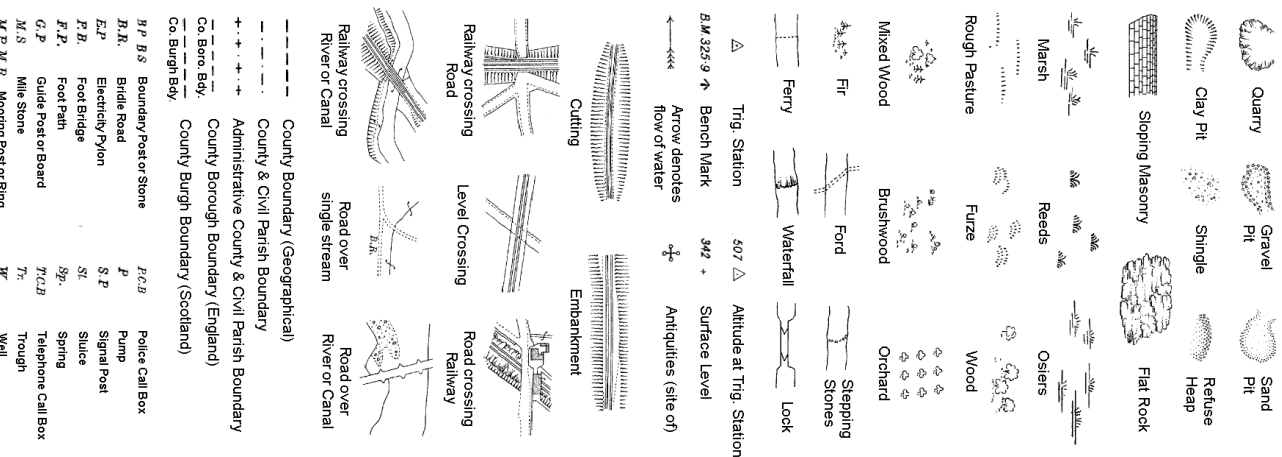
Historical Mapping & Photography included:

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

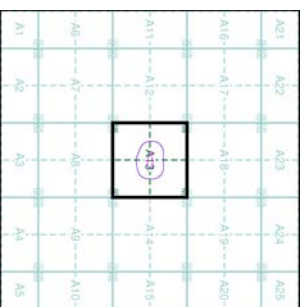
Ordnance Survey Plan, Additional SIMs and Supply of Unpublished Survey Information
1:2,500 and 1:1,250

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

Mapping Type	Scale	Date	Proj
Brecknockshire	1:2,500	1878	2
Brecknockshire	1:2,500	1878	3
Glamorganshire	1:2,500	1878	3
Brecknockshire	1:2,500	1904	4
Brecknockshire	1:2,500	1919	5
Ordnance Survey Plan	1:2,500	1962	6
Additional SUs	1:2,500	1978 - 1992	7
Additional SUs	1:2,500	1989	8
Large-Scale National Grid Data	1:2,500	1983	9
Large-Scale National Grid Data	1:2,500	1986	10
Historical Aerial Photography	1:2,500	2001	11



Historical Map - Segment A13



Order Details

Order Number:	172177631_11
Customer Ref:	14753 dyffryn_cellywryn
National Grid Reference:	285070, 210190
Slice:	A
Site Area (Ha):	0.52
Search Buffer (m):	100

Site Details

Site at, Dyffryn Cellwen, Neath Port Talbot



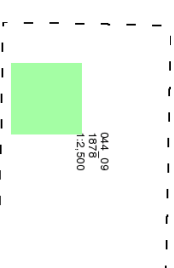
Brecknockshire

Published 1878

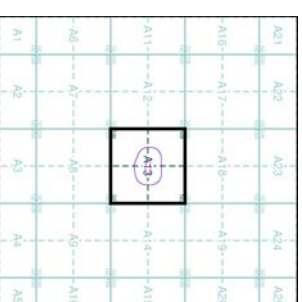
Source map scale - 1:2,500

The historical maps shown were reproduced from maps predominantly held at the scale adopted for England, Wales and Scotland in the 1840s. In 1854 the 1:2,500 scale was adopted for mapping urban areas and by 1859 for Great Britain. The published date refers to the date the map was published, not the date the map was surveyed. Before 1898 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

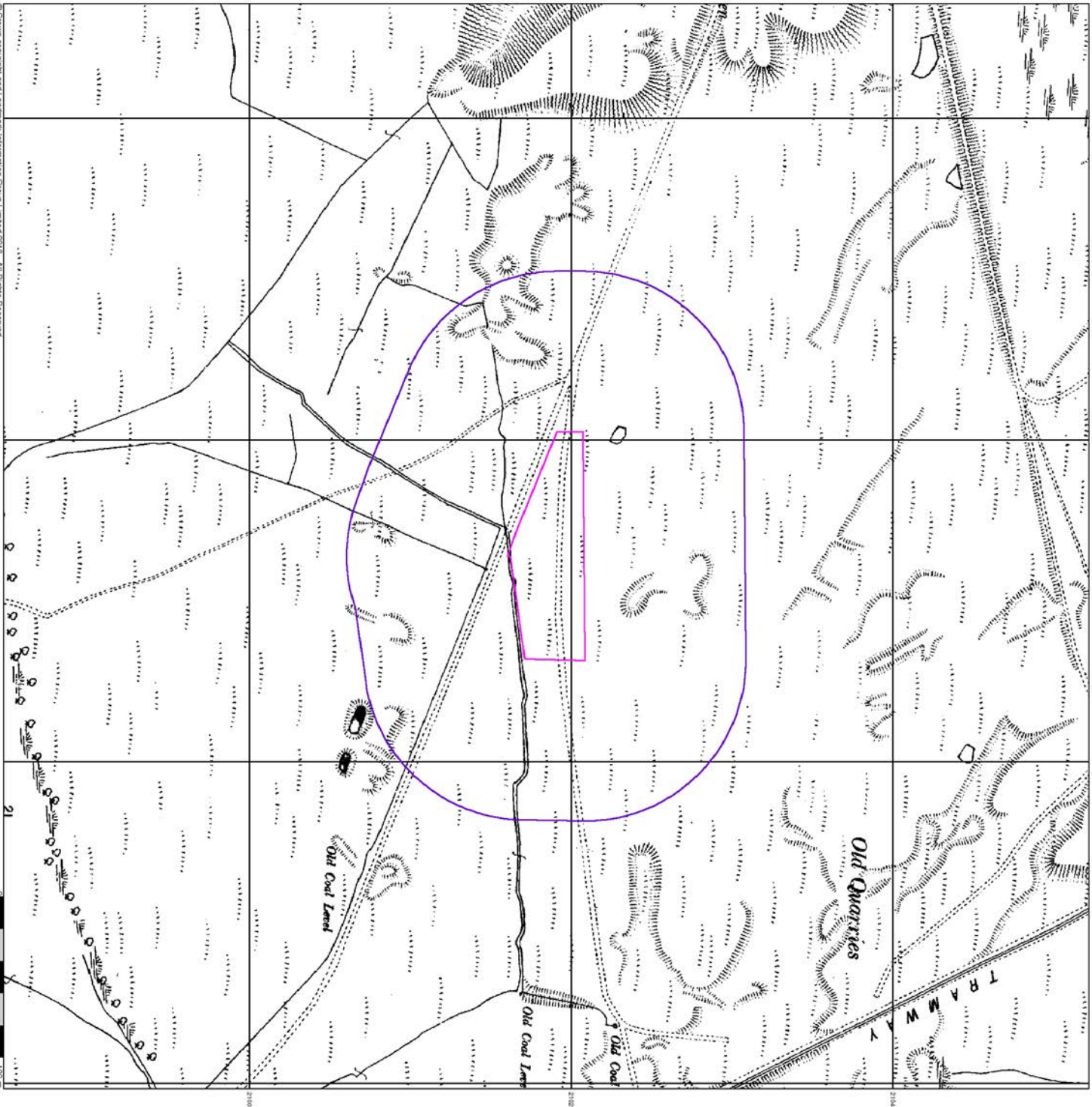
Order Number: 172177631_1
Customer Ref: 14753 dyffryn cellwyn
National Grid Reference: 285070, 210190
Slice: A
Site Area (Ha): 0.52
Search Buffer (m): 100

Site Details

Site at: Dyffryn Cellwyn, Neath Port Talbot



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Web: www.envirock.co.uk





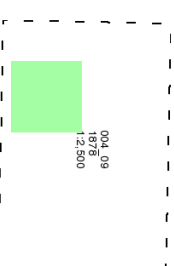
Glamorganshire

Published 1878

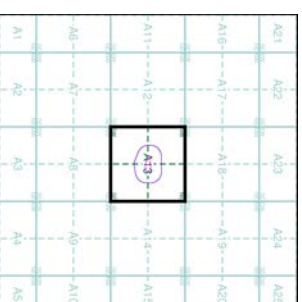
Source map scale - 1:2,500

The historical maps shown were reproduced from maps predominantly held at the scale adopted for England, Wales and Scotland in the 1840s. In 1854 the 1:2,500 scale was adopted for mapping urban areas and by 1856 for Great Britain. The published date refers to the date the map was published, not the surveyed date. Before 1898 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

Order Number: 172177631_1
Customer Ref: 14753 dyffryn ceilwyn
National Grid Reference: 285070, 210190
Slice: A
Site Area (Ha): 0.52
Search Buffer (m): 100

Site Details

Site at: Dyffryn Ceilwen, Neath Port Talbot



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Web: www.envirotek.co.uk



Brecknockshire

Published 1904

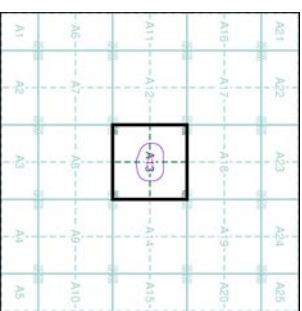
Source map scale - 1:2,500

The historical maps shown were reproduced from maps predominantly held at the scale adopted for England, Wales and Scotland in the 1840s. In 1854 the 1:2,500 scale was adopted for mapping urban areas and by 1856 for Great Britain. The published date refers to the date the map was published, not the date the data was collected. The data was collected in the years immediately preceding the publication date. Before 1898 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)

044_09
1904
1:2,500

Historical Map - Segment A13



Order Details

Order Number: 172177631_1
Customer Ref: 14753 dyffryn cellwyn
National Grid Reference: 285070, 210190
Slice: A
Site Area (Ha): 0.52
Search Buffer (m): 100

Site Details

Site at: Dyffryn Cellwen, Neath Port Talbot



Tel: 0944 844 9952
Fax: 0944 844 9951
Web: www.envirock.co.uk



Brecknockshire

Published 1919

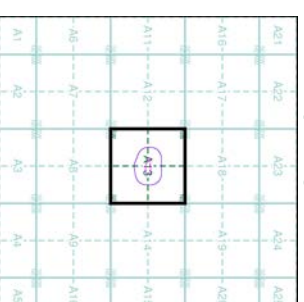
Source map scale - 1:2,500

The historical maps shown were reproduced from maps predominantly held at the scale adopted for England, Wales and Scotland in the 1840s. In 1854 the 1:2,500 scale was adopted for mapping urban areas and by 1886 of Great Britain. The published date refers to the year the map was first published in Great Britain. The published date does not necessarily reflect the date of the original survey. Before 1889 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)

044.09
1919
1:2,500

Historical Map - Segment A13



Order Details

Order Number: 172177631_1
Customer Ref: 14753 dyffryn cellwyn
National Grid Reference: 285070, 210190
Slice: A
Site Area (Ha): 0.52
Search Buffer (m): 100

Site Details

Site at: Dyffryn Cellwen, Neath Port Talbot



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Ordnance Survey Plan Published 1962

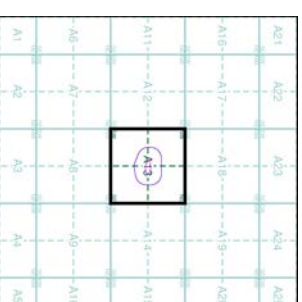
Source map scale - 1:2,500

The historical maps shown were reproduced from maps predominantly held at the scale adopted for England, Wales and Scotland in the 1840s. In 1854 the 1:2,500 scale was adopted for mapping urban areas and by 1890 of Great Britain. The published date above, however, is often many years later than the surveyed date. Before 1989 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)

SN8410	SN8510
1982	1982
12,500	12,500
SN8409	SN8509
1982	1982
12,500	12,500

Historical Map - Segment A13



Order Details

Order Number: 172177631_1
Customer Ref: 14753 dyffryn ceilwyn
National Grid Reference: 285070, 210190
Slice: A
Site Area (Ha): 0.52
Search Buffer (m): 100

Site Details

Site at: Dyffryn Ceilwen, Neath Port Talbot



Tel: 0844 844 9952
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Web: www.envirock.co.uk



Additional SIMS

Published 1978 - 1992

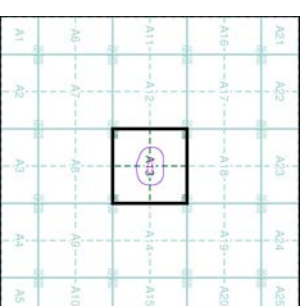
Source map scale - 1:2,500

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)

SN8410	SN8510
1986	1978
12,500	12,500
SN8409	SN8509
1982	1986
12,500	12,500

Historical Map - Segment A13



Order Details

Order Number: 172177631_11
Customer Ref: 14753 dyffryn cellwyn
National Grid Reference: 285070, 210190
Slice: A
Site Area (Ha): 0.52
Search Buffer (m): 100

Site Details

Site at: Dyffryn Cellwyn, Neath Port Talbot



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



Additional SIMS

Published 1989

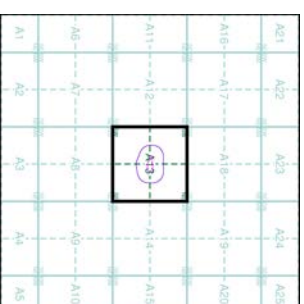
Source map scale - 1:2,500

The SIM cards (Ordnance Survey's Survey of Information on Microfilm) are further, minor editions of mapping which were produced and published in 1984. The main editions of the area were updated. They date from 1947 to 1984, and contain detailed information on the area and its land-use. These maps were produced at both 1:2,500 and 1:1,250 scales.

Map Name(s) and Date(s)

SN8510	1989
1:2,500	

Historical Map - Segment A13



Order Details

Order Number: 172177631_11
Customer Ref: 14753 dyffryn cellwyn
National Grid Reference: 285070, 210190
Slice: A
Site Area (Ha): 0.52
Search Buffer (m): 100

Site Details

Site at: Dyffryn Cellwen, Neath Port Talbot



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Web: www.envirock.co.uk



Large-Scale National Grid Data Published 1993

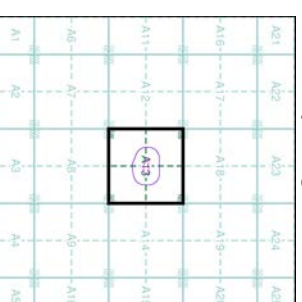
Source map scale - 1:2,500

Large Scale National Grid Data superseded SIM cards (Ordnance Survey's Survey of Information on Microfilm) in 1992, and continued to be produced until 1993. These maps were the forerunners of digital mapping and so provided a more detailed view of the terrain, including features such as roads, railways, and vegetation. These maps were produced at both 1:2,500 and 1:1,250 scales.

Map Name(s) and Date(s)

SN8410	1993	12.500	SN8510	1993	12.500
SN8409	1993	12.500	SN8509	1993	12.500

Historical Map - Segment A13



Order Details

Order Number: 172177631_11
Customer Ref: 14753 dyffryn celliwn
National Grid Reference: 285070, 210190
Slice: A
Site Area (Ha): 0.52
Search Buffer (m): 100

Site Details

Site at: Dyffryn Celliwn, Neath Port Talbot



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



Large-Scale National Grid Data Published 1996

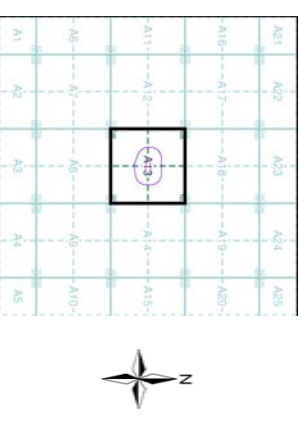
Source map scale - 1:2,500

Large Scale National Grid Data superseded SIM cards (Ordnance Survey's Survey of Information on Microfilm) in 1992, and continued to be produced until 1996. These maps were the forerunners of digital mapping and so provided a valuable source of information on 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)

SN6509
1996
1:2,500

Historical Map - Segment A13



Order Details

Order Number: 172177631_1_1
Customer Ref: 14753 dyffryn cellwyn
National Grid Reference: 285070, 210190
Slice: A
Site Area (Ha): 0.52
Search Buffer (m): 100

Site Details

Site at: Dyffryn Celliwen, Neath Port Talbot



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

284800

285000

285200

285400



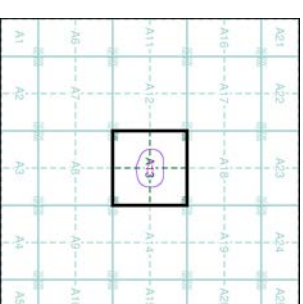
© Copyright Gernmapping plc



Historical Aerial Photography Published 2001

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

Historical Aerial Photography - Segment A13



Order Details

Order Number: 172177631_1_1
 Customer Ref: 14753 dyffryn cellwyn
 National Grid Reference: 285070, 210190
 Slice: A
 Site Area (Ha): 0.52
 Search Buffer (m): 100

Site Details

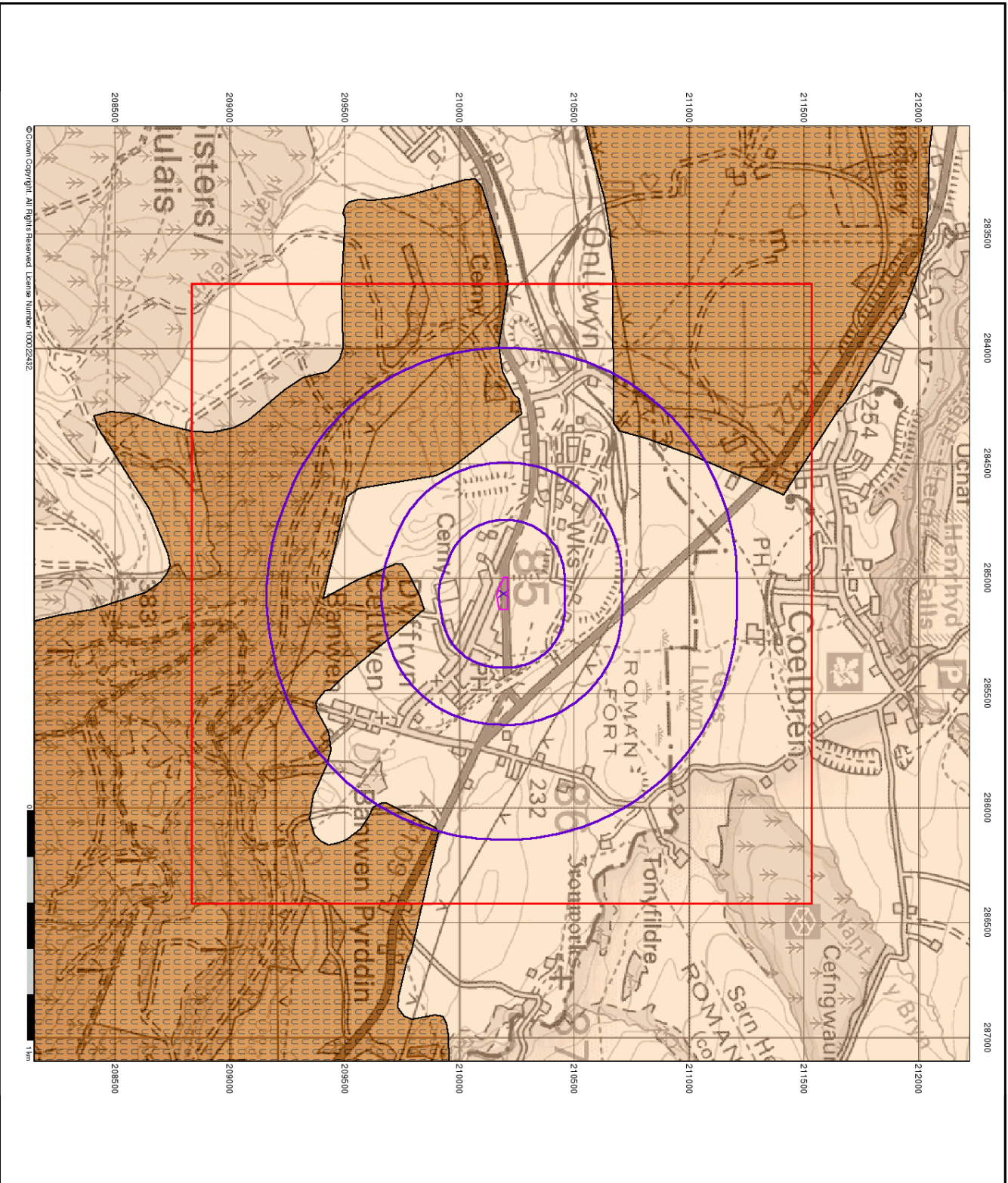
Site at: Dyffryn Cellwen, Neath Port Talbot



A Landmark Information Group Service

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

ANNEX B
Envirocheck Report



Groundwater Vulnerability

General

- Specified Site
- Slice
- Specified Buffer(s)
- Map ID
- Bearing Reference Point

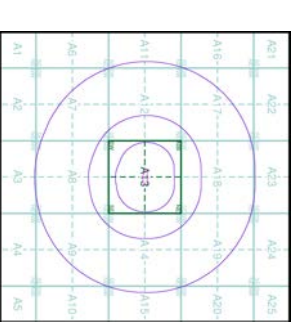
Agency and Hydrological

Geological Classes

Soil Classes

- Major Aquifer (Highly Permeable)
 - High (H) 1, 2, 3, U
 - Intermediate (I) 1, 2
 - Low
- Minor Aquifer (Variably Permeable)
 - High (H) 1, 2, 3, U
 - Intermediate (I) 1, 2
 - Low
- Non Aquifer (Negligibly Permeable)
- Water or Sea
- Drift Deposit

Site Sensitivity Context Map - Slice A



Order Details

Order Number: 17217631.1.1
 Customer Ref: 14753 dyffryn cellynn
 National Grid Reference: 285070, 210190
 Slice: A
 Site Area (Ha): 0.52
 Search Buffer (m): 1000

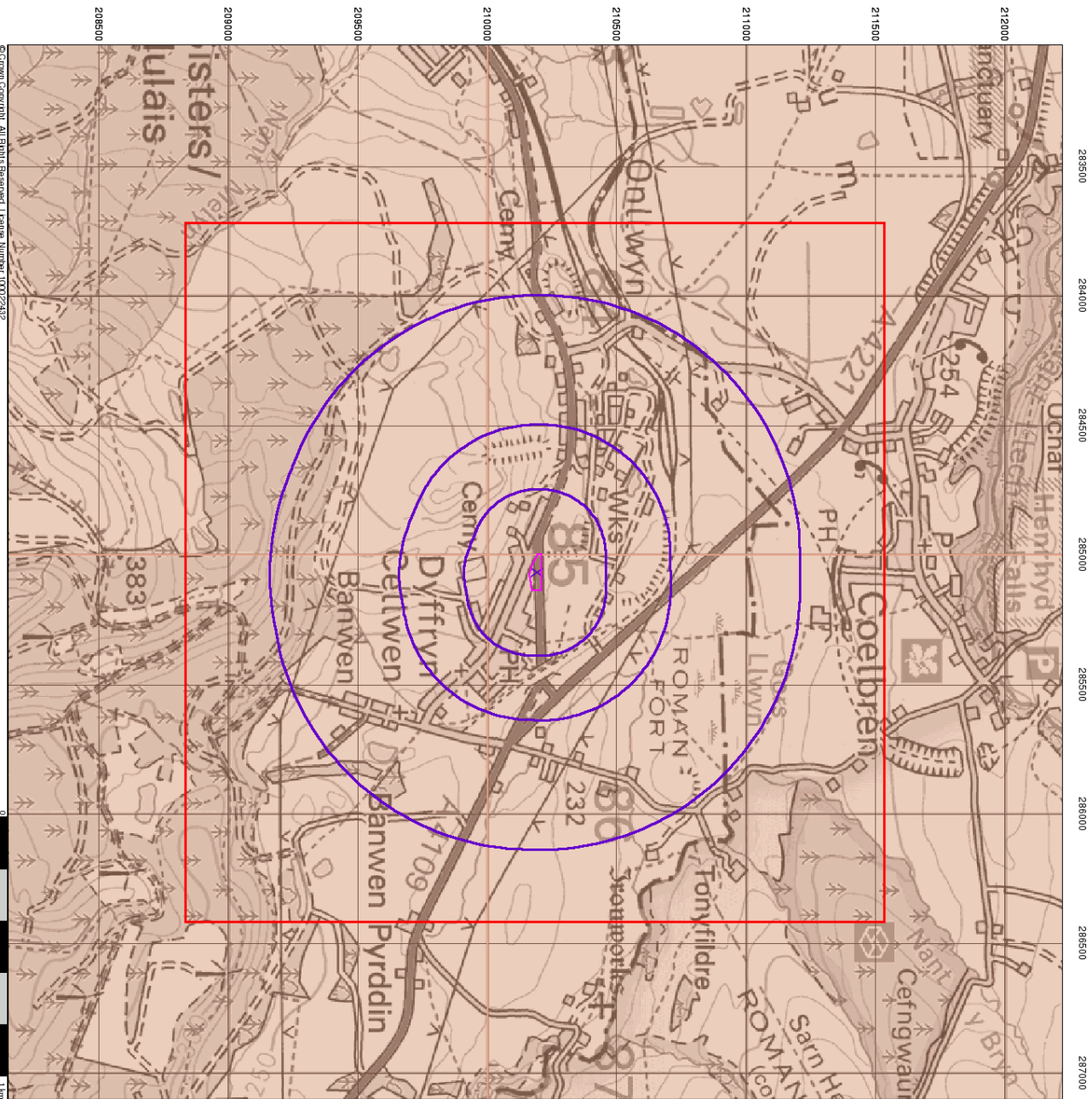
Site Details

Site at: Dyffryn Cellynn, Neath Port Talbot



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

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Bedrock Aquifer Designation

General

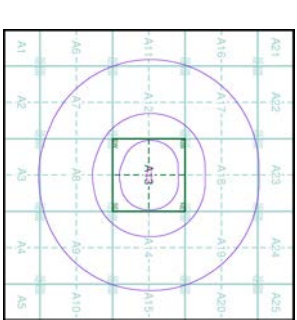
- Specified Site
- Specified Buffer(s)
- Site
- Map ID
- Bearing Reference Point

Agency and Hydrological

Geological Classes

- Principal Aquifer
- Secondary A Aquifer
- Secondary B Aquifer
- Secondary Undifferentiated
- Unproductive Strata
- Unknown
- Unknown (Lakes and Landslip)

Site Sensitivity Context Map - Slice A



Order Details

Order Number: 17217631.1.1
 Customer Ref: 14753 dyffryn cellyn
 National Grid Reference: 285070, 210190
 Slice: A
 Site Area (Ha): 0.52
 Search Buffer (m): 1000

Site Details

Site at: Dyffryn Cellyn, Neath Port Talbot



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Superficial Aquifer Designation

General

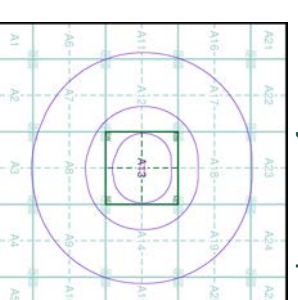
-  Specified Site
-  Site
-  Map ID
-  Bearing Reference Point

Agency and Hydrological

Geological Classes

-  Principal Aquifer
-  Secondary A Aquifer
-  Secondary B Aquifer
-  Secondary Undifferentiated
-  Unproductive Strata
-  Unknown
-  Unknown (Lakes and Landslip)

Site Sensitivity Context Map - Slice A

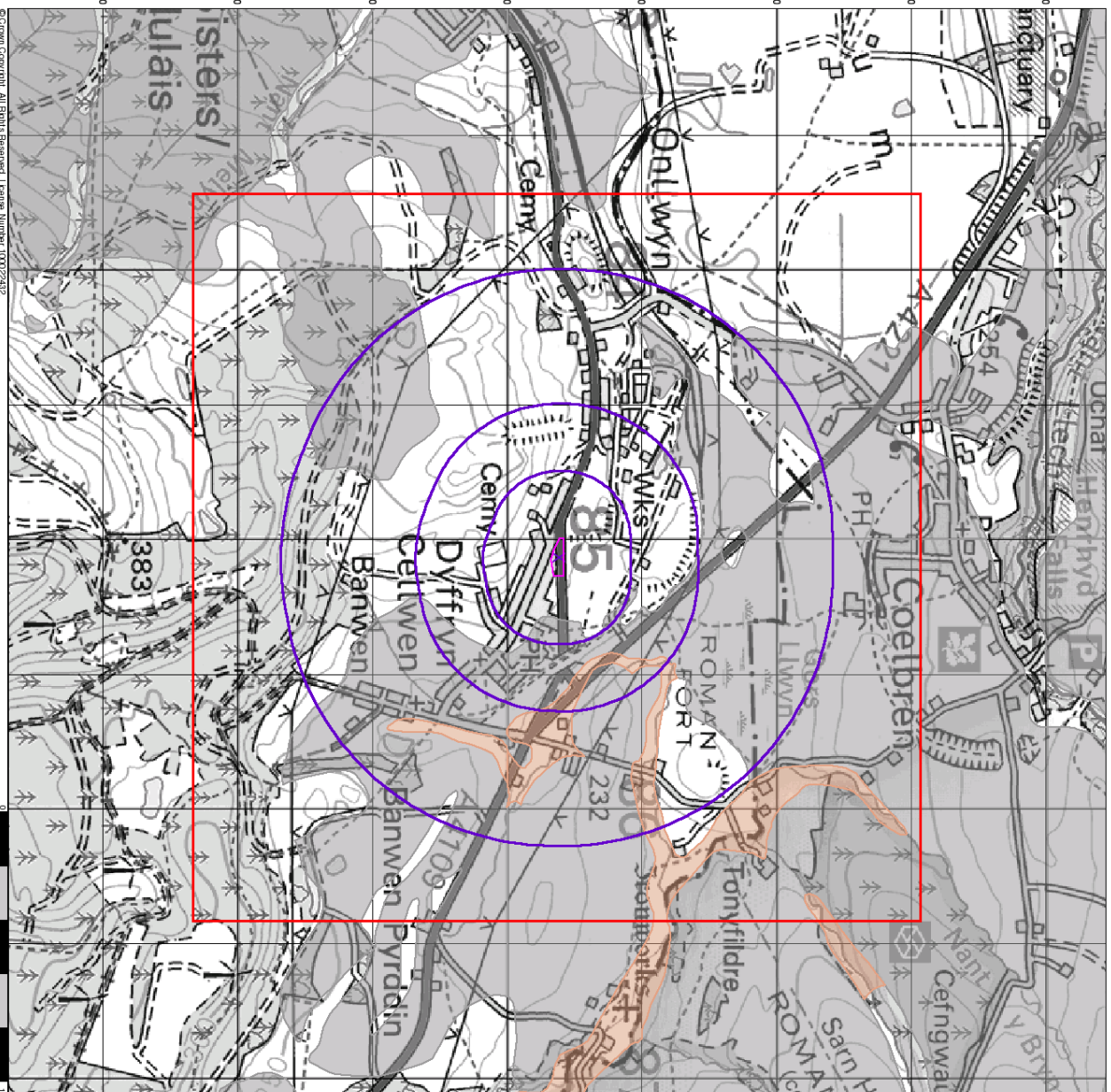


Order Details

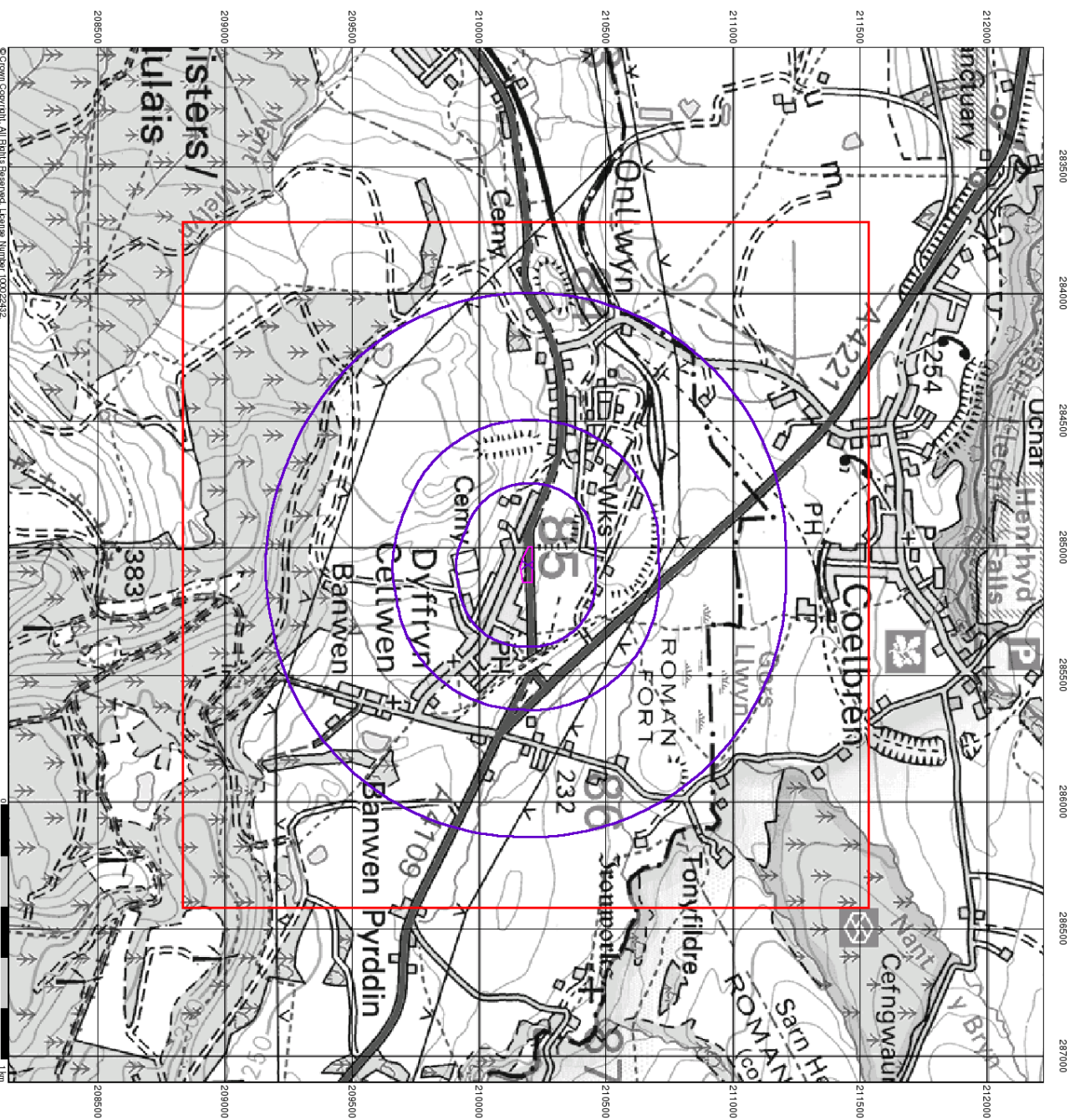
Order Number: 17217631.1.1
 Customer Ref: 14753 dyffryn cellwyn
 National Grid Reference: 285070, 210190
 Slice: A
 Site Area (Ha): 0.52
 Search Buffer (m): 1000

Site Details

Site at: Dyffryn Cellwyn, Neath Port Talbot



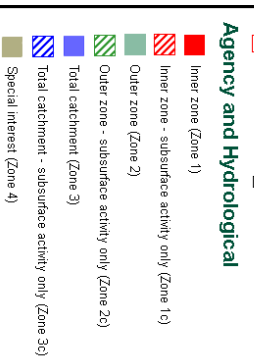
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Source Protection Zones

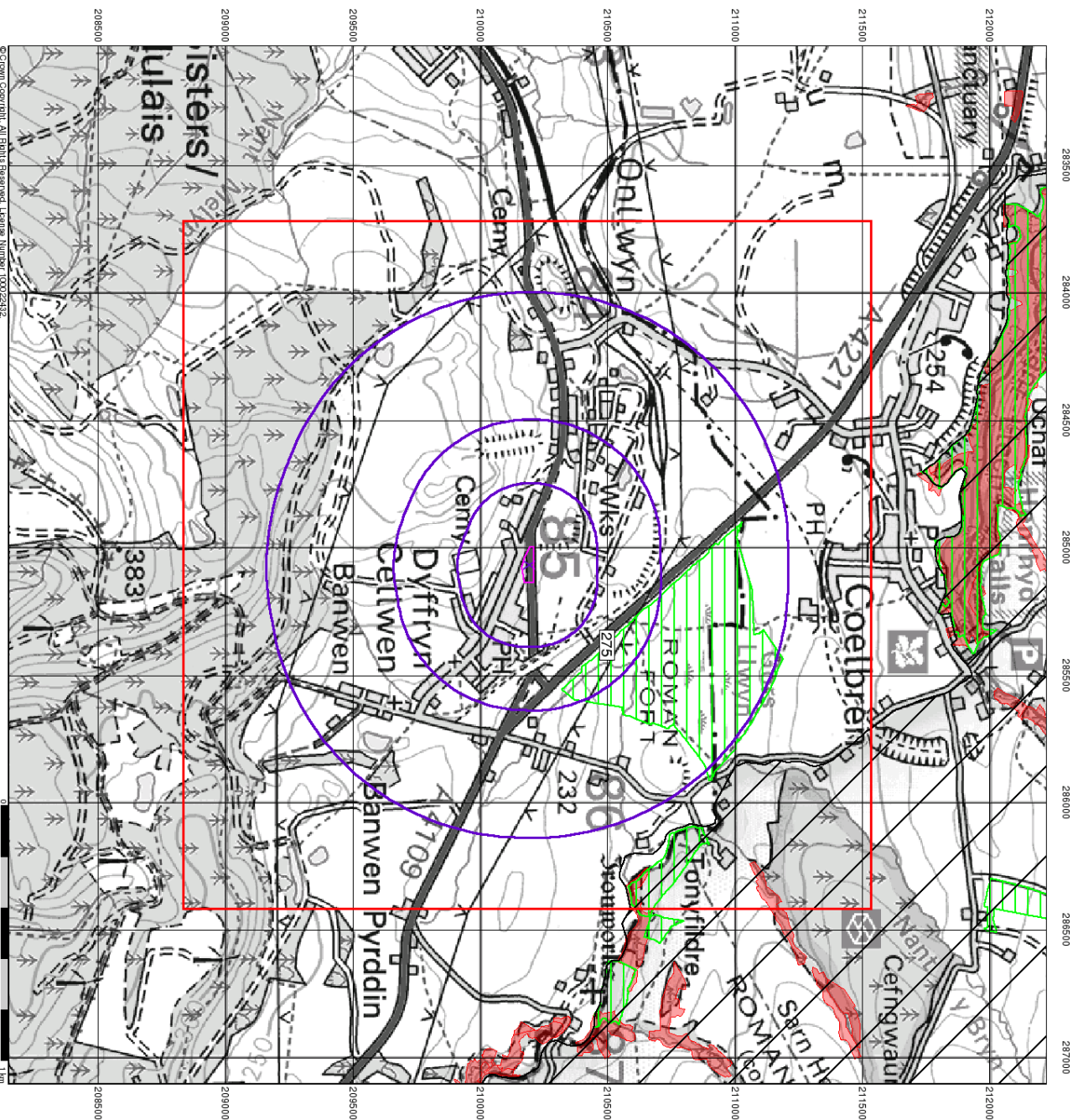
General

- | Specified Site | Specified Buffer(s) | Bearing Reference Point |
|---|--|---|
|  Slice |  Map ID |  |



Site Sensitivity Context Map - Slice A

Order Number:	172177631_1_1
Customer Ref:	14753 dyffryn cellwyn
National Grid Reference:	285070, 210190
Slice:	A
Site Area (Ha):	0.52
Search Buffer (m):	1000



Sensitive Land Uses

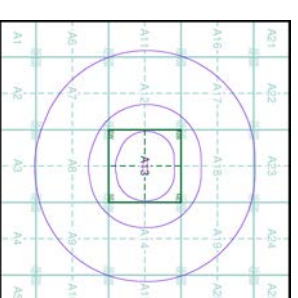
General

- Specified Site
- Specified Buffer(s)
- Site
- Map ID
- Bearing Reference Point

Sensitive Land Uses

- Ancient Woodland
- National Park
- Area of Adopted Green Belt
- Nitrate Sensitive Area
- Area of Unadopted Green Belt
- Nitrate Vulnerable Zone
- Area of Outstanding Natural Beauty
- Ramsar Site
- Environmentally Sensitive Area
- Site of Special Scientific Interest
- Forest Park
- Special Area of Conservation
- Local Nature Reserve
- Special Protection Area
- Marine Nature Reserve
- World Heritage Sites
- National Nature Reserve

Site Sensitivity Context Map - Slice A



Order Details

Order Number: 17217631.1.1
 Customer Ref: 14753 dyffryn cellwyn
 National Grid Reference: 285070, 210190
 Site: A
 Site Area (Ha): 0.52
 Search Buffer (m): 1000

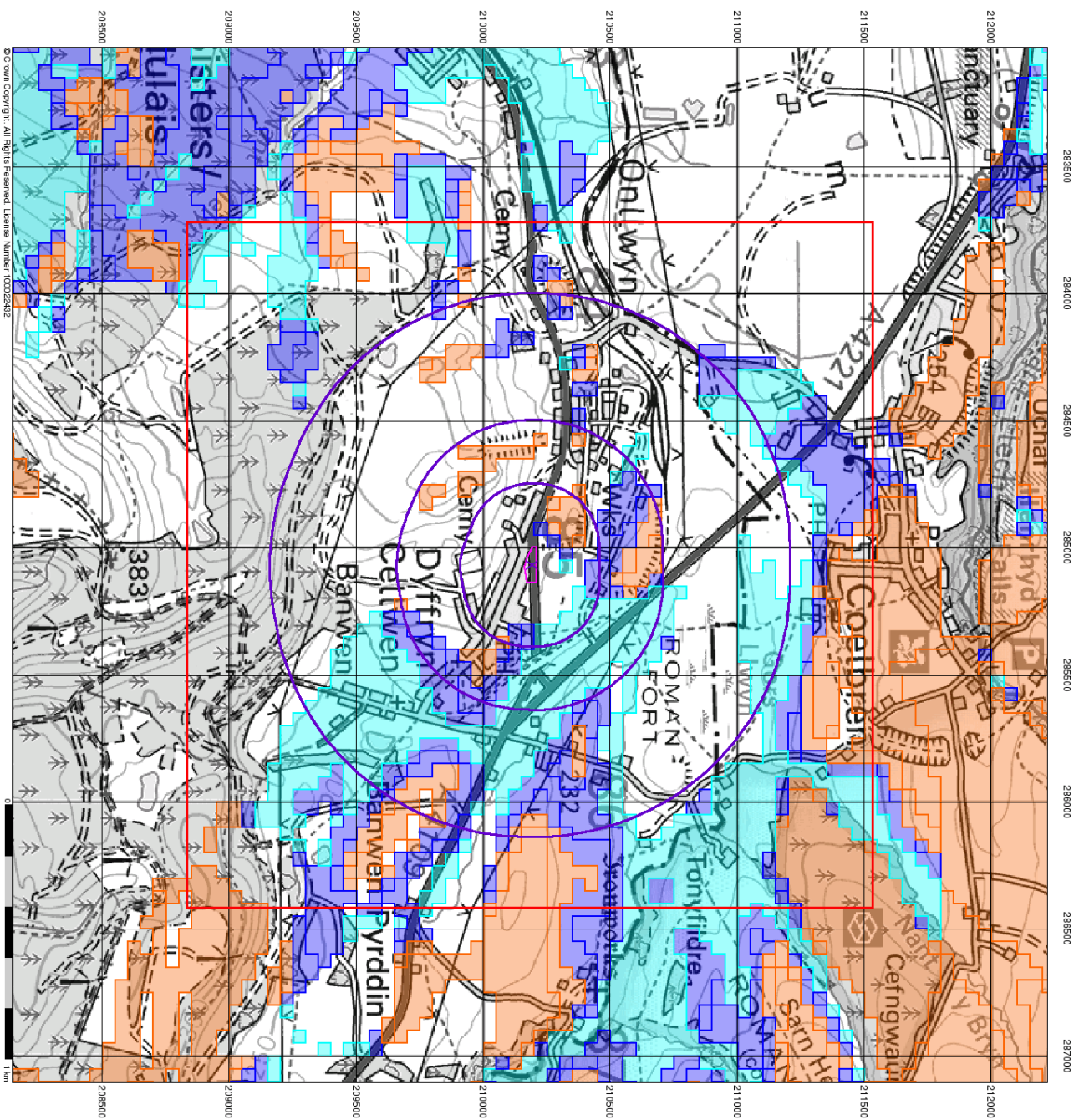
Site Details

Site at: Dyffryn Cellwen, Neath Port Talbot



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

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BGS Flood GFS Data

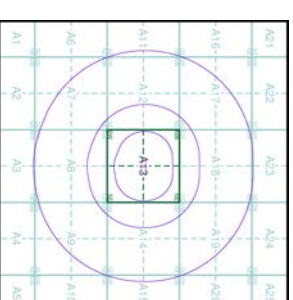
General

- | Specified Site | Specified Butter(s) | Bearing Reference Point |
|----------------|---------------------|-------------------------|
| Slice | | |

Agency and Hydrological (Flood)

- Limited Potential for Groundwater Flooding to Occur
- Potential for Groundwater Flooding of Property Situated Below Ground Level
- Potential for Groundwater Flooding to Occur at Surface

Site Sensitivity Context Map - Slice A



Order Details

Order Number:	172177631_1_1
Customer Ref:	14753 dyffryn coeliwyn
National Grid Reference:	285070, 210190
Slice:	A
Site Area (Ha):	0.52
Search Buffer (m):	1000

Site Details

Site at, Dyffryn Cellwen, Neath Port Talbot

