

**GEOTECHNICAL &
GEO- ENVIRONMENTAL REPORT
PROPOSED ANAEROBIC DIGESTER
CRUGMORE FARM
PENPARC
CARDIGAN**

**Prepared for:
Syrus Energy Limited**

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Job No: 12226B

REPORT TITLE : **Geotechnical and Geo-environmental
Report: Proposed Anaerobic Digester,
Crugmore Far, Penparc, Cardigan**

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Executive Summary

Syrus Energy Limited is proposing the construction of an anaerobic digester plant at Crugmore Farm near Cardigan.

The historical plans show that the area where the proposed anaerobic digester and supporting infrastructure is to be constructed has remained field land throughout since first recorded in 1889.

The British Geological Survey shows the site to be underlain by rocks of the Nantmel Mudstone Formation, which date to the Ordovician Period. Superficial till deposits are reported to overlie the solid geology.

In order to confirm shallow ground conditions, a geotechnical and geo-environmental site investigation was carried out comprising six trial pits. Below a surface layer of topsoil, superficial stiff to very stiff clay deposits, and medium dense sandy and gravel deposits in some areas, were found to overlie grey shale (Nantmel Mudstone Formation). The mudstone was noted at between 2.0m in the northeast of the site and at 3.2m centrally. The depth of the shale was not confirmed in the southwest, being deeper than the maximum investigated depth of 3.2m.

The proposed office may be founded with reinforced mass concrete strip foundations within the underlying stiff clay, medium dense granular deposits or weathered shale. Alternatively the foundations may be founded in an individual stratum to avoid differential settlements. An allowable bearing pressure of 100kN/m² may be used for design purposes. For the given foundation solution and bearing pressure, maximum total settlements of 30mm should result with differential movements of the superstructure not exceeding 1:750. The foundations should extend to a minimum depth of 0.9m to avoid the effects of frost heave and/or thermal shrinkage. Floor slabs may be designed as ground bearing provided all topsoil is removed.

Mass concrete strip/trench foundations are recommended for the new reception building. Given the dip of the shale rockhead level (Nantmel Mudstone Formation) towards the southwest these foundations should be designed as strongly reinforced to span across both the shale and stiff clay deposits where the depth to shale bedrock increases. The depth of foundations is anticipated to be ≥ 1.5 m depth, and the foundations must sit at least 200mm within the founding horizon(s). Alternatively the foundations may be founded entirely within the shale to avoid differential settlements. An allowable bearing pressure of 100kN/m² may be used for design purposes. For the given foundation solution and bearing pressure, maximum total settlements of 30mm should result with differential movements of the superstructure not exceeding 1:750. Floor slabs may be designed as ground bearing provided all topsoil is removed.

Given the size and anticipated variable loads of the anaerobic digester tanks it is recommended that their foundations be designed as piled, extending down into the underlying shale bedrock. This will ensure that total and differential settlements are limited, i.e. near zero. Driven precast concrete hard drive piles would be appropriate. The depth to bedrock has not been proved at the tank locations, and is known to be in excess of 3.0m, which was the maximum excavatable depth during the site investigation. In order to determine the depth to a competent founding horizon and to determine a suitable safe working load it is recommended that four cable percussive boreholes be sunk, one beneath each of the proposed tank locations.

During the investigation samples of site soils were retrieved for chemical screening. All substances tested for were found to be present at concentrations below their respective human health threshold levels. As such the site can be classed as uncontaminated.

There are not considered to be any risks to the aquatic environment.

Full radon protection will be required for all new buildings on site.

There are no risks from landfill gas or ground gas.

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SECTION 1 Introduction and Proposed Development

Syrus Energy Limited is proposing the construction of an anaerobic digester plant at Crugmore Farm near Cardigan. The development will include digester tanks, reception building, site office, digestate storage tank and waste mixing preholding tank.

Terra Firma (Wales) Limited has been commissioned by Syrus Energy Limited to undertake a geo-environmental assessment and geotechnical investigation of the site.

Bay Associates Limited is the Civil and Structural Engineer for the project.

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

- Identify the potential environmental liabilities at the site associated with any soil and groundwater contamination from past site uses.
- Provide a summary of the environmental conditions at the site, together with any necessary remediation works to render the site fit for its intended use.
- Provide recommendations with regard to any other geo-environmental aspects pertaining to the development such as radon emissions.

The main objectives of the geotechnical site investigation were to:

- Determine the type, strength and bearing characteristics of the shallow superficial deposits and underlying solid geology.
- Provide recommendations for a suitable and economic foundation/floor slab solution 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 review of existing data, followed by a field investigation to determine the prevailing ground conditions and also to collect and analyse soil samples from selected locations around the site.

1.1 Limitations and Exceptions of Investigation

The geo-environmental and geotechnical investigation was conducted and this report has been prepared for the sole internal reliance of Syrus Energy Limited 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 also 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 not limited by any site constraints.

SECTION 2 Review of Existing Data

2.1 Physical Setting, Current Use and Site Conditions

The proposed development approximately on a National Grid Reference of 242770 89620, see **Figure 2.1**.

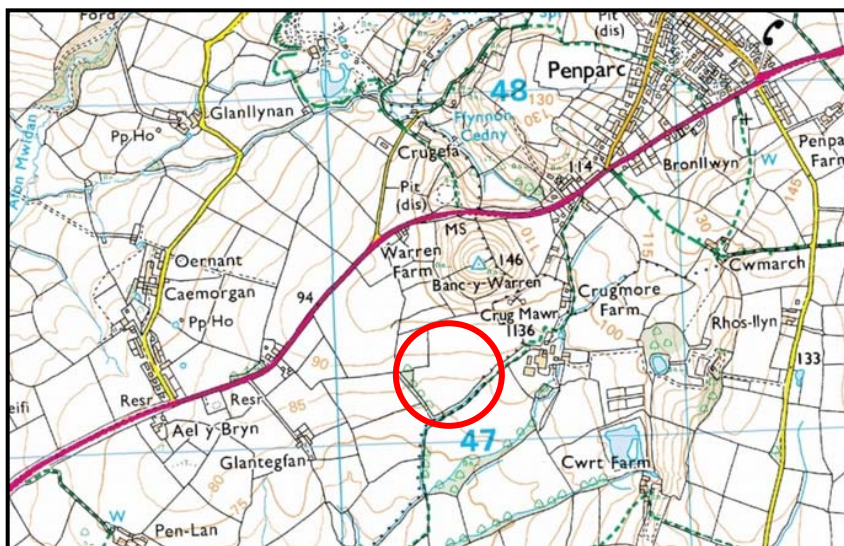


Figure 2.1: Site Location – OS Map 198 Cardigan and Newquay (Not to Scale)

The location of the proposed anaerobic digester is currently a disused grassed farm field. Field boundaries are defined by trees and fencing to the southeast and southwest. The northern and eastern edges of the site are currently open.

2.2 Site History

The history of the site has been traced from plans obtained from Landmark Information Group, which are presented in **Annex A**.

The historical plans show that the area where the proposed anaerobic digester and supporting infrastructure is to be constructed has remained field land throughout since first recorded in 1889. A stream is seen to issue and flow along the south-eastern edge of the site in a south-westerly direction. Crug-mawr, later known as Crugmore Farm, sits 110m east of the development site.

2.3 Geology

The British Geological Survey shows the site to be underlain by rocks of the Nantmel Mudstone Formation, which date to the Ordovician Period. The Nantmel Mudstone Formation comprises silty mudstones with dark burrow mottles, Several thick units of laminated hemipelagite, scattered packets with thin sandstones. A thick unit of interbedded conglomerates, sandstones, pebbly mudstones and mudstones known as Doldowlod Conglomerate (Member) is locally present.

Superficial till deposits are reported to overlie the solid geology.

Given that the site has remained field land throughout, no made ground is anticipated to be present.

2.4 Hydrogeology

The Environment Agency Aquifer Designation Maps show that the underlying Nantmel Mudstone Formation is classified as a Secondary B Aquifer. These are described as predominantly lower permeability layers which may store and yield limited amounts of groundwater due to localised features such as fissures, thin permeable horizons and weathering. These are generally the water-bearing parts of the former non-aquifers.

2.5 Hydrology

Surface and shallow groundwater flows on site are likely to follow the natural topography of the site in a southerly direction.

The nearest water feature to the site is the stream shown along the south-eastern site boundary.

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

2.6 Radon

Radon is a naturally occurring radioactive gas which is produced by the radioactive decay of radium, which in turn is derived from the radioactive decay of uranium. Uranium is found in small quantities in all soils and rocks. Radon released from rocks and soils is quickly diluted in the atmosphere. However radon that enters enclosed spaces such as buildings can reach high concentrations and pose a hazard to human health. The Government has adopted an Action Level for radon in homes of 200 Becquerels per cubic metre (Bq m³). Where the radon levels exceed the Action Level, remedial measures are required to reduce the concentration.

A report was procured for the site from the British Geological Survey.

The report concludes that the site situates within a radon affected area as defined by the Health Protection Agency.

Full radon protection will therefore be required for any structures containing confined spaces likely to be accessible to human users.

The radon report is presented in **Annex B**.

2.7 Environmental

The Environment Agency online 'What's in Your Back Yard' database was consulted. The relevant information is summarised below.

2.7.1 Pollution

The EA regulate the amount and type of pollution that business and industry produce under the EC Integrated Pollution Prevention and Control Directive (IPPC) and EP OPRA (Environmental Protection Operator and Pollution Risk Appraisal scores).

There are no such sites listed within 250m of the site.

2.7.2 Landfills

There are no current or historical landfill sites recorded within a 250m radius of the site.

2.7.3 Flooding

The site does not locate in an area shown to be affected by flooding.

2.7.4 Groundwater Source Protection Zones

The site does not position within a groundwater protection zone.

SECTION 3 Preliminary Risk Assessment

3.1 General

The contaminated land regime is set up 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**’.

For our definitions of pollution linkage and how we define risk please refer to **Annex C** which includes our classifications of consequence and probability and risk assessment matrix.

3.2 Potential Sources of Contamination

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

No historical potentially contaminative use of the site or neighbouring land of has been identified.

3.3 Summary of Potential Receptors and Risks

The qualitative preliminary Human Health and Environmental Risk Assessment and site conceptual model are based on findings of the desk study and site walk over and include all potential sources, pathways and receptors that may be present on site.

The risk assessment and site conceptual model will be evaluated and modified in accordance with the findings from the site investigation and chemical testing.

Table 3.1 – Qualitative Preliminary Human Health Risk and Environmental Risk Assessment

Source	Pathway	Receptor During Construction	Level of Risk	Receptor Post Construction	Level of Risk
Site Soils	Ingestion, inhalation and dermal contact with soil and soil dust	Construction Workers	Low	Employees of Anaerobic Digester Plant	Low
Radon Gas	Inhalation	N/A	Moderate	Employees of Anaerobic Digester Plant	Full Radon Protection Required
Ground Gas/Landfill Gas	Inhalation	N/A	N/A	Employees of Anaerobic Digester Plant	No Risk No nearby landfills and no fill material anticipated on site
Surface Water	Run-off	Site and Adjacent Sites	Low	Site and Adjacent Sites	Low
Accidental spillage	Run-off - risk from de-watering, digging foundations, moving contaminated soil, drainage misconnections, discharges to local surface waters or the ground, construction materials and/or exposed ground, wheel washings and oil or chemical spills	Site and Adjacent Sites	Low	N/A	N/A
Site Soils	Leaching	Site	Low		Low
Site Soils	Groundwater migration	Stream to Southeast of Site	Low	Stream to Southeast of Site	Low
Site Soils and Groundwater	Leaching and groundwater migration	Nantmel Mudstone Formation Secondary B Aquifer	Low	Nantmel Mudstone Formation Secondary B Aquifer	Low
Site Soils	Aggressive Ground Conditions - Building materials are potentially at risk from sulphates, sulphides, magnesium ions, ammonium ions, carbon dioxide, chloride ions and phenols.	Building materials	Low	Building materials	Low

SECTION 4 Field Investigation

4.1 Site Works

A geotechnical and geo-environmental site investigation comprising six machine excavated trial pits was undertaken in June 2013.

The fieldworks were supervised by Terra Firma (Wales) Limited and the trial pits were logged to the requirements of BS5930:1999 / EC7.

The trial pit logs are presented in **Annex D**. Their positions are shown on **Drawing 01**.

4.2 Ground Conditions

The ground conditions encountered can in general be summarised as shown in the following tables.

Table 4.1 Summary of Ground Conditions				
Depth (m)		Thickness (m)		Stratum
GL	-	0.15/0.6	0.15/0.6	TOPSOIL: Soft dark brown CLAY . Fine roots.
0.15/0.6	-	0.7/1.1	0.5/0.95	Stiff grey and brown mottled CLAY . Occasional fine to coarse angular to sub-angular gravel
0.7/1.5	-	2.3/>3.3	0.8>2.2	Stiff to very stiff grey and red brown mottled CLAY
2.0/3.2	-	2.3/3.4	-	Grey SHALE retrieved as fine to coarse angular GRAVEL and COBBLE (TP1, TP5) (NANTYMEL MUDSTONE FORMATION)

Within TP1 a band of medium dense brown and orange brown mottled sand and fine to coarse angular to sub-rounded gravel and cobble was noted between 0.6m and 1.5m depth.

Within TP6 firm orange brown and orange brown mottled sandy silty clay underlain by medium dense brown and orange brown mottled sand and fine to coarse angular to sub-rounded gravel and cobble was observed between 0.3m and 1.0m depth.

Highly weathered shale retrieved as clayey gravel was observed in TP6, overlying the more competent weathered bedrock, from 1.0m to 2.0m depth.

Groundwater inflow was noted within the mudstone bedrock.

4.3 Laboratory Soil Chemical Testing

4.3.1 Sampling Regime

During the intrusive investigation, small disturbed soil samples were collected.

The sample locations and depths are listed in the following table.

Table 4.2 Sample Locations and Depths		
Sample	Depth (m)	MCerts Sample Description
TP1	0.3	Brown gravelly sandy CLAY
TP2	0.5	Brown gravelly sandy CLAY
TP3	0.4	Brown gravelly sandy CLAY
TP4	0.15	Brown gravelly sandy CLAY with numerous roots
TP5	0.3	Brown gravelly sandy CLAY
TP6	0.4	Brown gravelly sandy CLAY

4.3.2 Laboratory Analysis

The soil samples taken were despatched to the laboratories of Derwentside Environmental Testing Services Limited for laboratory chemical testing. The following chemical tests were undertaken:

Metals and Metalloids

Lead
Arsenic
Mercury
Cadmium
Chromium
Copper
Nickel
Zinc
Selenium

In-Organics

Cyanide
Sulphate

Others

pH (acidity)
Organic Matter

Organic Chemicals

Phenol
Polycyclic Aromatic Hydrocarbons (PAHs)

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

SECTION 5 Soil Analytical Results

5.1 Soil Assessment Methodology

Comparison of the analytical results obtained from the site investigation with Soil Guideline Values (SGVs) obtained from The Environment Agency Contaminated Land Exposure Assessment (CLEA) Guidelines has been undertaken. Where SGV values are not available reference has been made to Generic Assessment Criteria (GAC) provided by Land Quality Management Limited (LQM) and the Chartered Institute of Environmental Health (CIEH).

5.2 Soil Test Results

A summary of the soil chemical test results is given in the table below.

Table 5.1 Summary of Soil Chemical Test Results Standard Suite					
Substance	SGV/ GAC (mg/kg)	Source	Measured Concentrations of Tested Substances (mg/kg)		Number of exceedences
			Minimum	Maximum	
Arsenic	640	CLEA	14	21	0
Cadmium	230	CLEA	0.6	1.0	0
Chromium III	30400	CIEH	27	46	0
Chromium VI	35	CIEH	1.0	<1.0	0
Copper	71700	CIEH	8.4	25	0
Lead	750	CLEA	11	21	0
Mercury	3600	CLEA	<0.05	<0.05	0
Nickel	1800	CLEA	13	35	0
Selenium	13000	CLEA	<0.5	<0.5	0
Zinc	665000	CIEH	43	71	0
Cyanide	480	CLEA	<0.1	0.3	0
Organic matter	-	-	1.0	3.2	-
Sulphate	2400	BRE	200	500	0
pH	-	-	6.3	7.4	-
Phenol	3200	CLEA	<0.3	0.4	0
Total PAH	13*	CLEA	<1.6	<1.6	0

Notes:

- CIEH - Generic Assessment Criteria (GAC) for PAH for commercial land use based on >1% soil organic matter
- CLEA-Soil Guideline Values (SGV) for commercial development
- BRE - British Research Establishment (buried concrete risk assessment only, not human health related)
- A total of 6 samples were tested
- CIEH Chromium, copper and zinc thresholds based on 6% organic matter
- BLDL – Below Laboratory Detection Limit
- * Threshold for dibenzo(a,h)anthracene

SECTION 6 Quantitative Risk Assessment/Mitigation Measures

6.1 Contaminants

The site soils were confirmed to be uncontaminated.

6.2 Potential Receptors

Potential receptors are considered to be construction workers and employees of the anaerobic digester plant.

As the site soils are uncontaminated there are not considered to be any risks to human health.

However, good site management, COSHH, good standards of hygiene and appropriate health & safety on site should be adhered to, with personal protection equipment (PPE) and dust suppression used where appropriate.

There are not considered to be any risks to the aquatic environment from site soils.

During the construction period, there is a risk to the environment/adjacent sites from de-watering, digging foundations, moving contaminated soil, drainage misconnections, discharges to local surface waters or the ground, runoff from construction materials and/or exposed ground, wheel washings and oil or chemical spills.

The risk is considered to be negligible as any adverse effects will be easily preventable by due diligence to good construction practise and housekeeping in preventing surface runoff and the spillage of materials. The basic measures that should be taken are as follows:

- Prepare a drainage plan and mark the manholes to prevent pollutants accidentally reaching the surface water sewers;
- carry out any activities that could cause pollution in a designated, bunded area, away from rivers or boreholes. Where possible it should drain to the foul sewer;
- use settlement ponds to remove silty water;
- store all oils and chemicals in a fully bunded area to prevent leaks or spills;
- get advice on whether you need an environmental permit and apply in good time

SECTION 7 Engineering Recommendations

7.1 Preparation of Site

Surface vegetation beneath the proposed development area, including all roots, should be grubbed up and removed from site.

Allowances should be made for removing any 'soft spots/areas'.

All 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.

Contingencies should be made for the protection/diversion of any underground services present beneath the site brought about as a result of the proposed works.

In accordance with EC Regulation 1272/2008 and Environment Agency Guidance WM2 (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. Terra Firma (Wales) Ltd offer this service if required.

7.2 Foundation and Floor Slab Solution

Proposed Site Office

The proposed office may be founded with reinforced mass concrete strip foundations within the underlying stiff clay, medium dense granular deposits or weathered shale. Alternatively the foundations may be founded in an individual stratum to avoid differential settlements.

An allowable bearing pressure of 100kN/m² may be used for design purposes. For the given foundation solution and bearing pressure, maximum total settlements of 30mm should result with differential movements of the superstructure not exceeding 1:750.

The foundations should extend to a minimum depth of 0.9m to avoid the effects of frost heave and/or thermal shrinkage.

Floor slabs may be designed as ground bearing provided all topsoil is removed.

Proposed Reception Building

Mass concrete strip/trench foundations are recommended for the new reception building.

Given the dip of the shale rockhead level (Nantmel Mudstone Formation) towards the southwest these foundations should be designed as strongly reinforced to span across both the shale and stiff clay deposits where the depth to shale bedrock increases.

The depth of foundations is anticipated to be ≥ 1.5 m depth, and the foundations must sit at least 200mm within the founding horizon(s).

Alternatively the foundations may be founded entirely within the shale to avoid differential settlements.

An allowable bearing pressure of 100kN/m² may be used for design purposes. For the given foundation solution and bearing pressure, maximum total settlements of 30mm should result with differential movements of the superstructure not exceeding 1:750.

Floor slabs may be designed as ground bearing provided all topsoil is removed.

7.2 Foundation and Floor Slab Solution (Continued)

In order to avoid damage from possible frost heave and/or thermal shrinkage the foundations should be a minimum depth below the finished ground level of 0.9m. Alternatively, the non-frost susceptible materials should extent down to the above quoted depths.

Allowances should be made for the removal of any ‘soft spots’ and their replacement with well-compacted granular materials. Department of Transport (DoT) Type 2 materials or similar could be used and should be compacted in layers to the specification for Highway Works. Allowances should also be made for buried obstructions, as previously described.

During the investigation a samples of the in-situ clay were taken and submitted for plasticity testing (**Annex F**). In line with the NHBC (Chapter 4.2), the modified plasticity index for the sample was calculated.

Table 7.1 Plasticity Test Results						
Sample	Depth (m)	Soil Type	Plasticity Index (%)	Plasticity	Modified Plasticity Index (%)	Volume Change Potential
TP1	1.8	CLAY	36	High	34	Medium
TP2	1.0	CLAY	27	High	25	Medium
TP5	1.7	CLAY	32	High	30	Medium

The National House Building Council (NHBC) Chapter 4.2 gives guidelines as to the appropriate depth of foundation based on the type of tree, distance of the foundation from the tree and the plasticity index of the in-situ materials.

Digesters and Storage Tanks

Given the size and anticipated variable loads of the anaerobic digester tanks it is recommended that their foundations be designed as piled, extending down into the underlying shale bedrock.

This will ensure that total and differential settlements are limited, i.e. near zero.

Driven precast concrete hard drive piles would be appropriate.

The depth to bedrock has not been proved at the tank locations, and is known to be in excess of 3.0m which was the maximum excavatable depth during the site investigation.

In order to determine the depth to a competent founding horizon and to determine a suitable safe working load it is recommended that four cable percussive boreholes be sunk, one beneath each of the proposed tank locations.

All foundation formations should be inspected by a suitably qualified Engineer before being concreted.

7.3 Excavations and Formations

Allowances should be made for specific machinery to enable the breaking out of weathered bedrock.

Groundwater flow may be expected when excavating the shale bedrock and specialist pumping techniques may be required.

Any inflows together with rainwater infiltration should be dealt with by conventional pumping techniques. In this instance allowances should be made for running sand conditions.

The sides of any excavations deeper than 1.0m should be supported by planking and strutting or other proprietary means.

The sub-formations/formations will be 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. Allowances should be made for special precautions to prevent formation deterioration in addition to the above.

7.4 Access Road

A CBR value of 1-2% should be used for design purposes.

The access road should be newly constructed with imported fill.

It is recommended that field testing be carried out to confirm the California Bearing Ratio of all new formations.

7.5 Storm Drainage

Given the cover of the site in stiff clay, which can be considered to be largely impermeable, and underlying shale bedrock where groundwater was noted, the use of soakaways on site is not recommended.

7.6 Protection of Buried Concrete

The laboratory soil chemical tests revealed total sulphate content of between 200mg/kg and 500mg/kg and pH levels of between 6.3 and 7.4.

When these results are compared with Table C1 of BRE Digest 1:2005, it indicates that all buried concrete should most likely as a minimum conform to Class AC-1.

ANNEX A
Landmark Historical Plans

Historical Mapping Legends

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

Quarry **Gravel Pit** **Sand Pit**
Clay Pit **Shingle** **Refuse Heap**
Sloping Masonry **Flat Rock**
Marsh **Reeds** **Osiers**
Rough Pasture **Furze** **Wood**
Mixed Wood **Brushwood** **Orchard**
Fir **Ford** **Stepping Stones**
Ferry **Waterfall** **Lock**
Trig. Station **Altitude at Trig. Station**
B.M. 325.9 **Bench Mark** **Surface Level**
Arrow denotes flow of water **Antiquities (site of)**
Cutting **Embankment**
Railway crossing Road **Level Crossing** **Road crossing Railway**
Railway crossing River or Canal **Road over single stream** **Road over River or Canal**
County Boundary (Geographical)
County & Civil Parish Boundary
Administrative County & Civil Parish Boundary
County Borough Boundary (England)
County Burgh Boundary (Scotland)
Co. Boro. Bdy.
Co. Burgh Bdy.
BP BS Boundary Post or Stone **P.C.B** Police Call Box
B.R. Bridle Road **P** Pump
E.P Electricity Pylon **S.P** Signal Post
F.B. Foot Bridge **SL** Sluice
F.P. Foot Path **Sp.** Spring
G.P Guide Post or Board **T.C.B** Telephone Call Box
M.S Mile Stone **Tr.** Trough
M.P M.R Mooring Post or Ring **W** Well

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

Inactive Quarry, Chalk Pit or Clay Pit **Active Quarry, Chalk Pit or Clay Pit**
Rock **Boulders**
Cliff **Slopes** **Top**
Roofed Building **Glazed Roof Building**
Sloping Masonry **Archway**
Non-Coniferous Tree (surveyed) **Coniferous Tree (surveyed)**
Non-Coniferous Trees (not surveyed) **Coniferous Trees (not surveyed)**
Orchard Tree **Scrub** **Bracken**
Coppice, Osier **Reeds** **Marsh, Saltings**
Rough Grassland **Heath** **Culvert**
Direction of water flow **Bench Mark** **Antiquity (site of)**
Cave Entrance **Triangulation Station** **Electricity Pylon**
Electricity Transmission Line
County Boundary (Geographical)
County & Civil Parish Boundary
Civil Parish Boundary
Admin. County or County Bor. Boundary
London Borough Boundary
Symbol marking point where boundary mereing changes
BH Beer House **P** Pillar, Pole or Post
BP, BS Boundary Post or Stone **PO** Post Office
Cn, C Capstan, Crane **PC** Public Convenience
Chy Chimney **PH** Public House
D Fn Drinking Fountain **Pp** Pump
EI P Electricity Pillar or Post **SB, S Br** Signal Box or Bridge
FAP Fire Alarm Pillar **SP, SL** Signal Post or Light
FB Foot Bridge **Spr** Spring
GP Guide Post **Tk** Tank or Track
H Hydrant or Hydraulic **TCB** Telephone Call Box
LC Level Crossing **TCP** Telephone Call Post
MH Manhole **Tr** Trough
MP Mile Post or Mooring Post **Wr Pt, Wr T** Water Point, Water Tap
MS Mile Stone **W** Well
NTL Normal Tidal Limit **Wd Pp** Wind Pump

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

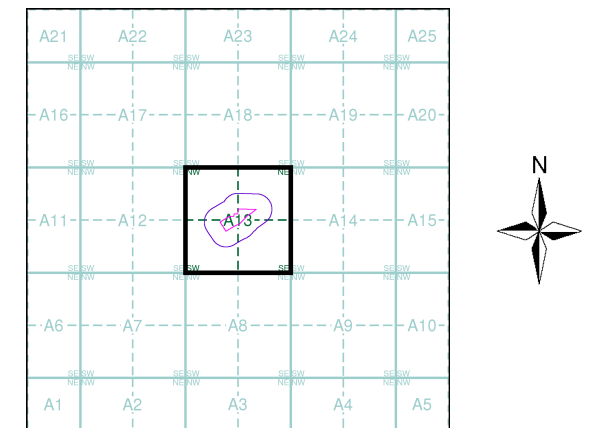
Cliff **Slopes** **Top**
Rock **Rock (scattered)**
Boulders **Boulders (scattered)**
Positioned Boulder **Scree**
Non-Coniferous Tree (surveyed) **Coniferous Tree (surveyed)**
Non-Coniferous Trees (not surveyed) **Coniferous Trees (not surveyed)**
Orchard Tree **Scrub** **Bracken**
Coppice, Osier **Reeds** **Marsh, Saltings**
Rough Grassland **Heath** **Culvert**
Direction of water flow **Triangulation Station** **Antiquity (site of)**
Electricity Transmission Line **Electricity Pylon**
B.M. 231.60m Bench Mark **Buildings with Building Seed**
Roofed Building **Glazed Roof Building**
Civil parish/community boundary
District boundary
County boundary
Boundary post/stone
Boundary mereing symbol (note: these always appear in opposed pairs or groups of three)
Bks Barracks **P** Pillar, Pole or Post
Bty Battery **PO** Post Office
Cemy Cemetery **PC** Public Convenience
Chy Chimney **Pp** Pump
Cis Cistern **Ppg Sta** Pumping Station
Dismtd Rly Dismantled Railway **PW** Place of Worship
EI Gen Sta Electricity Generating Station **Sewage Ppg Sta** Sewage Pumping Station
EI P Electricity Pole, Pillar **SB, S Br** Signal Box or Bridge
EI Sub Sta Electricity Sub Station **SP, SL** Signal Post or Light
FB Filter Bed **Spr** Spring
Fn / D Fn Fountain / Drinking Ftn. **Tk** Tank or Track
Gas Gov Gas Valve Compound **Tr** Trough
GVC Gas Governor **Wd Pp** Wind Pump
GP Guide Post **Wr Pt, Wr T** Water Point, Water Tap
MH Manhole **Wks** Works (building or area)
MP, MS Mile Post or Mile Stone **W** Well



Historical Mapping & Photography included:

Mapping Type	Scale	Date	Pg
Cardiganshire	1:2,500	1889	2
Cardiganshire	1:2,500	1905	3
Ordnance Survey Plan	1:2,500	1977 - 1978	4
Additional SIMs	1:2,500	1991	5
Large-Scale National Grid Data	1:2,500	1995	6

Historical Map - Segment A13



Order Details

Order Number: 47000364_1_1
 Customer Ref: 12226b
 National Grid Reference: 220350, 247160
 Slice: A
 Site Area (Ha): 1.33
 Search Buffer (m): 100

Site Details

Crugmore Farm, Penparc, CARDIGAN, Dyfed, SA43 1RD



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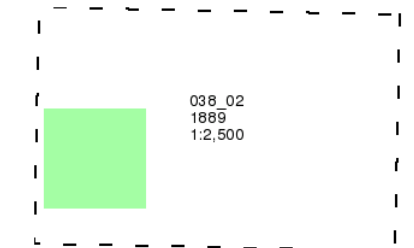


**Cardiganshire
Published 1889**

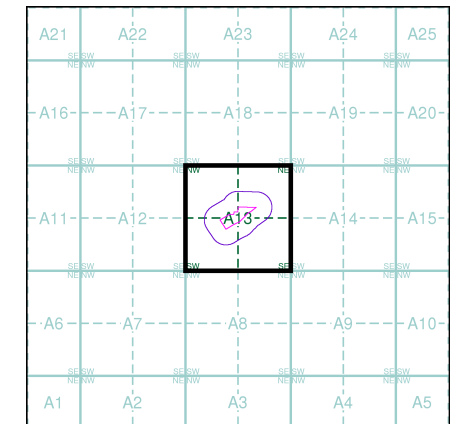
Source map scale - 1:2,500

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 A13



Order Details

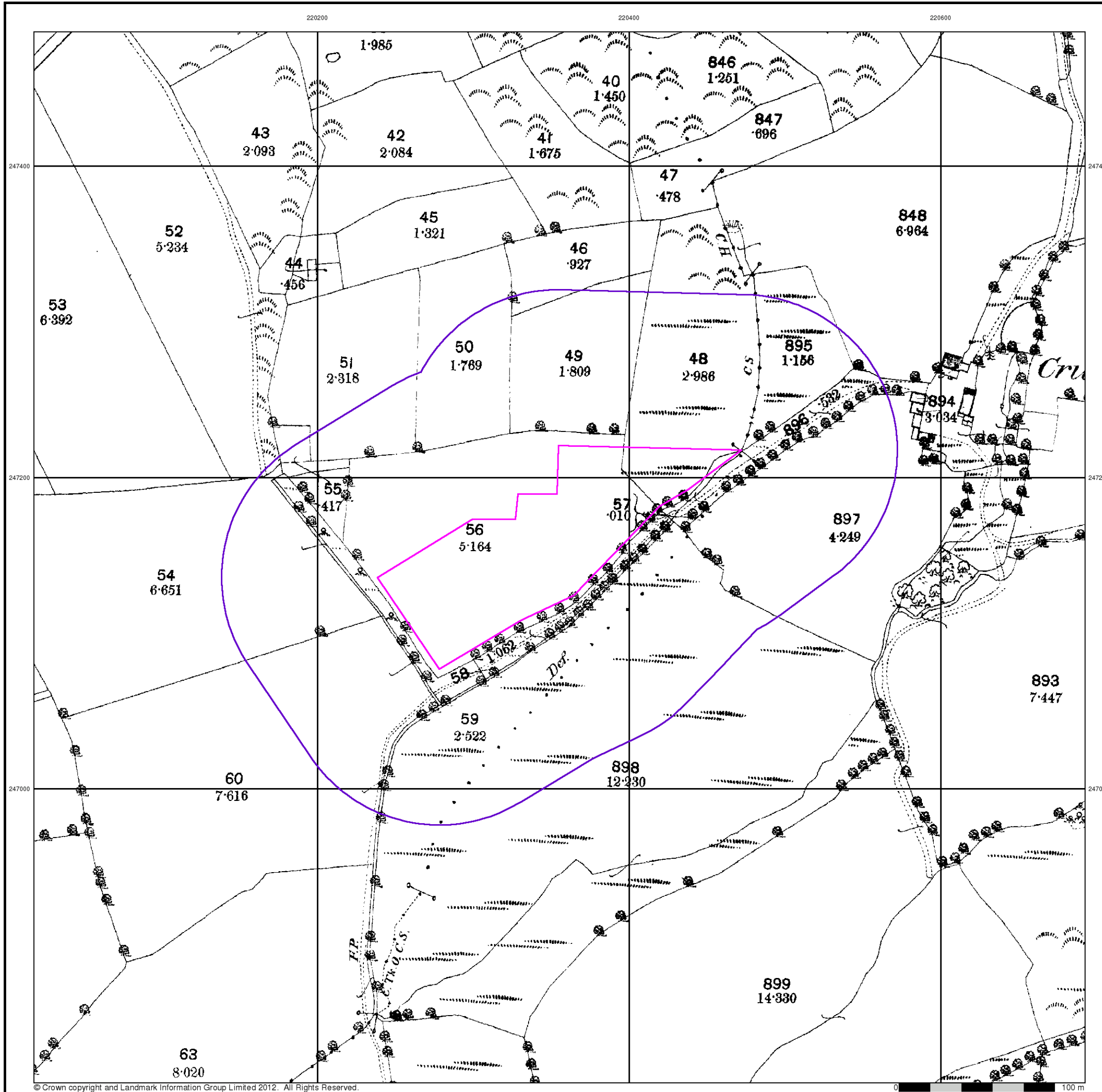
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Customer Ref: 12226b
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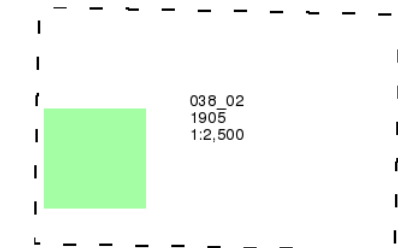


Cardiganshire Published 1905

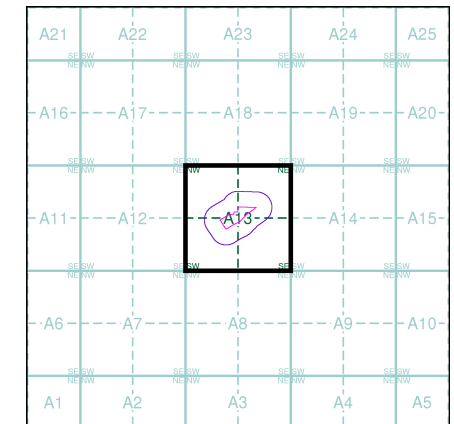
Source map scale - 1:2,500

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 A13



Order Details

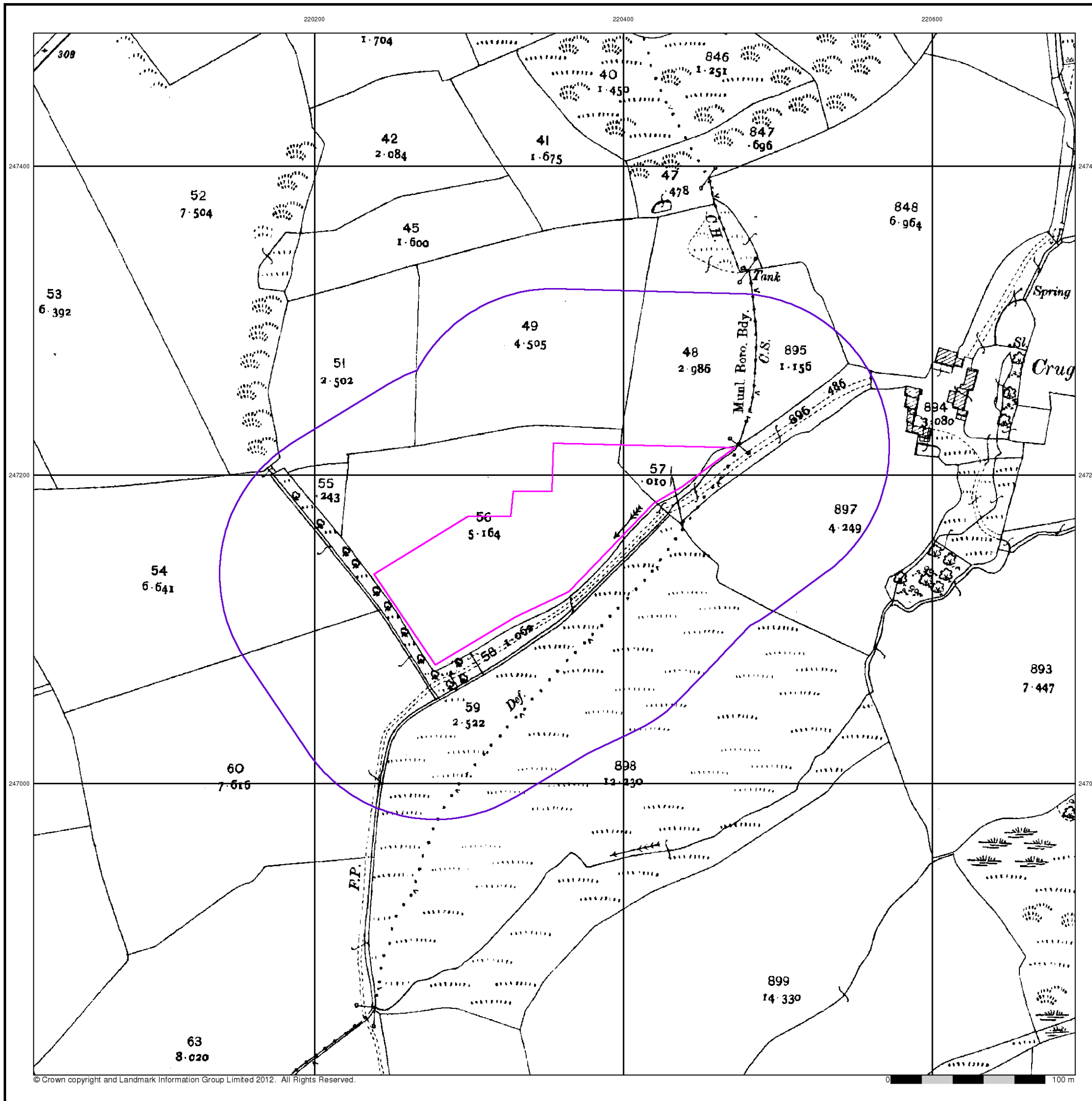
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National Grid Reference: 220350, 247160
Slice: A
Site Area (Ha): 1.33
Search Buffer (m): 100

Site Details

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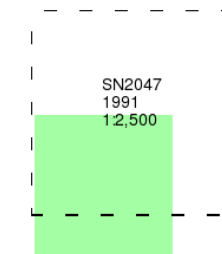
Additional SIMs

Published 1991

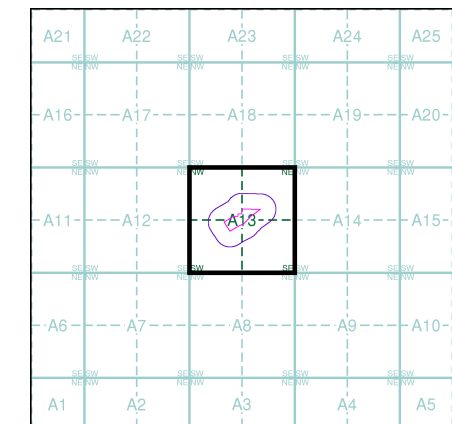
Source map scale - 1:2,500

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)



Historical Map - Segment A13



Order Details

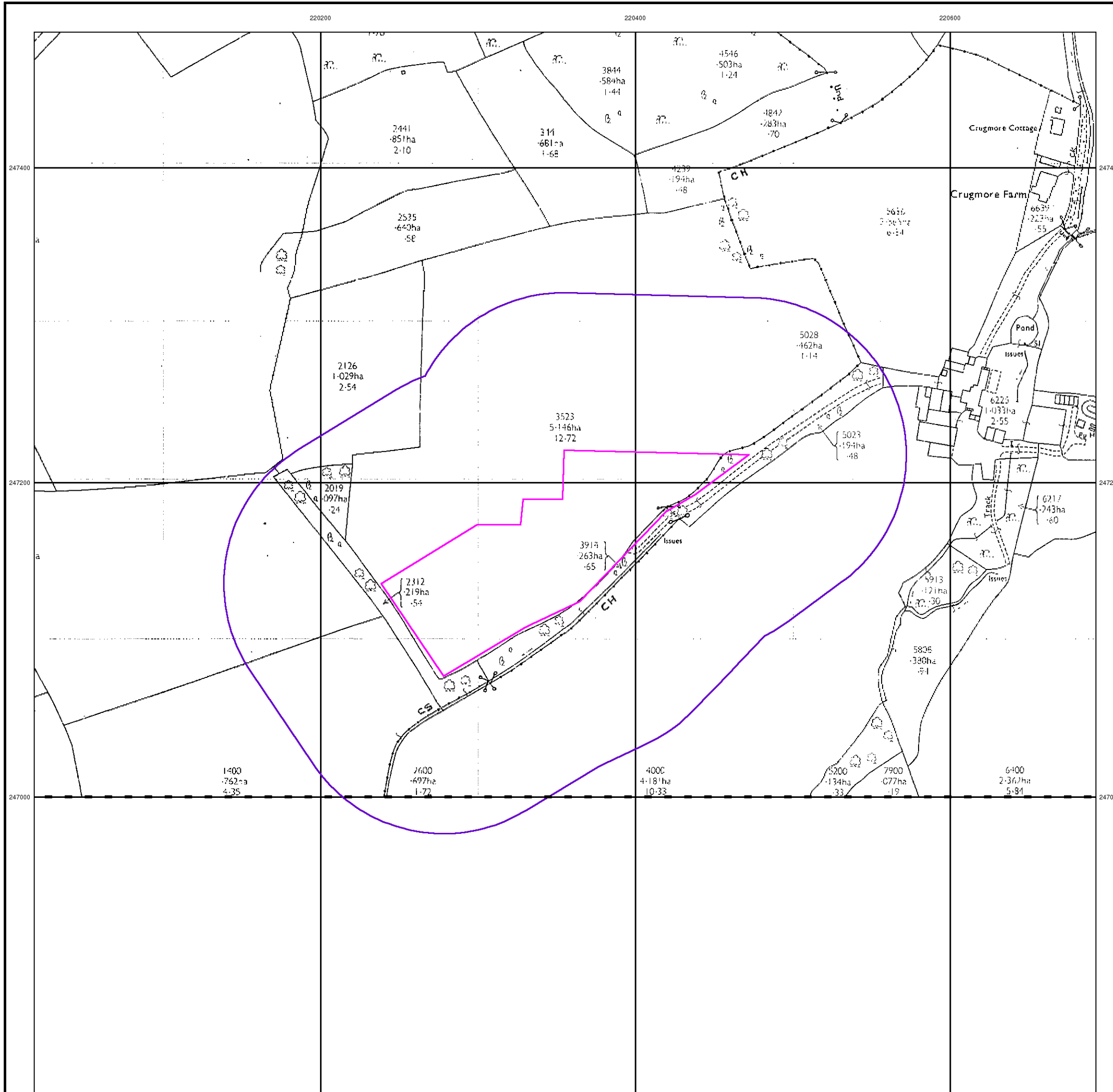
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Customer Ref: 12226b
National Grid Reference: 220350, 247160
Slice: A
Site Area (Ha): 1.33
Search Buffer (m): 100

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Historical Mapping Legends

Ordnance Survey County Series 1:10,560

	Gravel Pit		Sand Pit		Other Pits
	Quarry		Shingle		Orchard
	Osiers		Reeds		Marsh
	Mixed Wood		Deciduous		Brushwood
	Fir		Furze		Rough Pasture
	Arrow denotes flow of water		Trigonometrical Station		
	Site of Antiquities		Bench Mark		
	Pump, Guide Post, Signal Post		Well, Spring, Boundary Post		
	-285 Surface Level				
	Sketched Contour		Instrumental Contour		
	Main Roads		Minor Roads		
	Sunken Road		Raised Road		
	Road over Railway		Railway over River		
	Railway over Road		Level Crossing		
	Road over River or Canal		Road over Stream		
	Road over Stream				
	County Boundary (Geographical)				
	County & Civil Parish Boundary				
	Administrative County & Civil Parish Boundary				
	County Borough Boundary (England)				
	County Burgh Boundary (Scotland)				
	Rural District Boundary				
	Civil Parish Boundary				

Ordnance Survey Plan 1:10,000

	Chalk Pit, Clay Pit or Quarry		Gravel Pit
	Sand Pit		Disused Pit or Quarry
	Refuse or Slag Heap		Lake, Loch or Pond
	Dunes		Boulders
	Coniferous Trees		Non-Coniferous Trees
	Orchard		Scrub
	Coppice		Heath
	Rough Grassland		Marsh
	Reeds		Saltings
	Building		Glasshouse
	Sloping Masonry		Pylon
	Electricity Transmission Line		Pole
	Cutting		Embankment
	Standard Gauge Multiple Track		Standard Gauge Single Track
	Siding, Tramway or Mineral Line		Narrow Gauge
	Geographical County		
	Administrative County, County Borough or County of City		
	Municipal Borough, Urban or Rural District, Burgh or District Council		
	Borough, Burgh or County Constituency Shown only when not coincident with other boundaries		
	Civil Parish Shown alternately when coincidence of boundaries occurs		
	BP, BS Boundary Post or Stone		Pol Sta Police Station
	Ch Church		PO Post Office
	CH Club House		PC Public Convenience
	F E Sta Fire Engine Station		PH Public House
	FB Foot Bridge		SB Signal Box
	Fn Fountain		Spr Spring
	GP Guide Post		TCB Telephone Call Box
	MP Mile Post		TCP Telephone Call Post
	MS Mile Stone		W Well

1:10,000 Raster Mapping

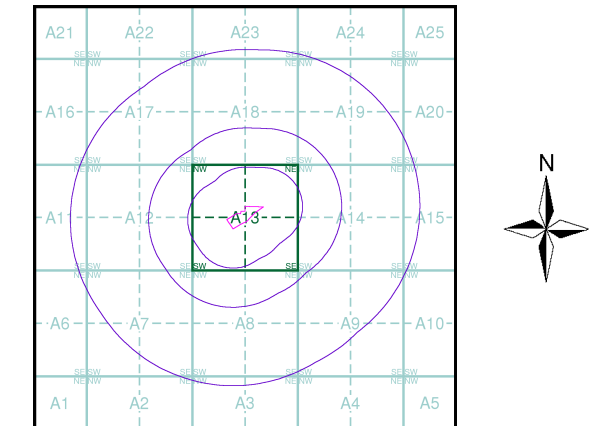
	Gravel Pit		Refuse tip or slag heap
	Rock		Rock (scattered)
	Boulders		Boulders (scattered)
	Shingle		Mud
	Sand		Sand Pit
	Slopes		Top of cliff
	General detail		Underground detail
	Overhead detail		Narrow gauge railway
	Multi-track railway		Single track railway
	County boundary (England only)		Civil,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



Historical Mapping & Photography included:

Mapping Type	Scale	Date	Pg
Pembrokeshire	1:10,560	1888	2
Cardiganshire	1:10,560	1889	3
Cardiganshire	1:10,560	1906	4
Pembrokeshire	1:10,560	1907	5
Cardiganshire	1:10,560	1938 - 1953	6
Pembrokeshire	1:10,560	1953	7
Cardiganshire	1:10,560	1953	8
Ordnance Survey Plan	1:10,000	1963	9
Ordnance Survey Plan	1:10,000	1980 - 1984	10
Ordnance Survey Plan	1:10,000	1993	11
10K Raster Mapping	1:10,000	2006	12
10K Raster Mapping	1:10,000	2013	13

Historical Map - Slice A



Order Details

Order Number: 47000364_1_1
 Customer Ref: 12226b
 National Grid Reference: 220350, 247160
 Slice: A
 Site Area (Ha): 1.33
 Search Buffer (m): 1000

Site Details

Crugmore Farm, Penparc, CARDIGAN, Dyfed, SA43 1RD



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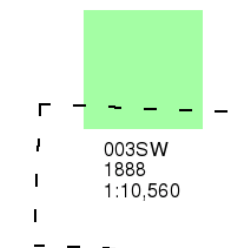
Pembrokeshire

Published 1888

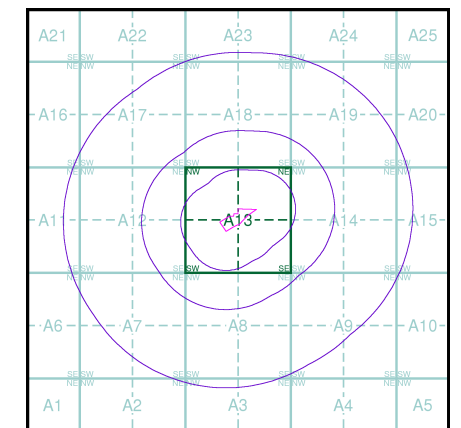
Source map scale - 1:10,560

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

Map Name(s) and Date(s)



Historical Map - Slice A



Order Details

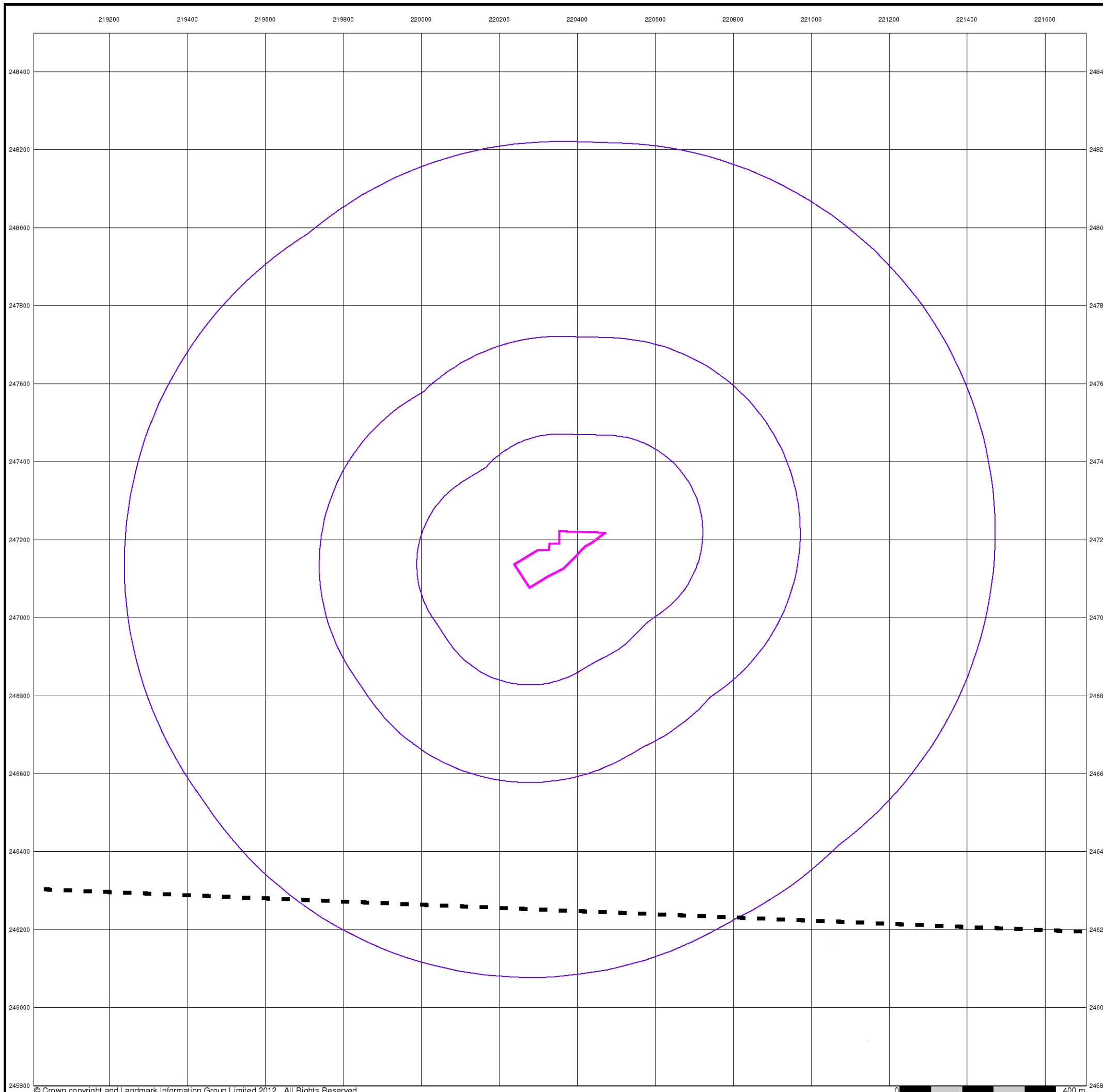
Order Number: 47000364_1_1
Customer Ref: 12226b
National Grid Reference: 220350, 247160
Slice: A
Site Area (Ha): 1.33
Search Buffer (m): 1000

Site Details

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Cardiganshire

Published 1889

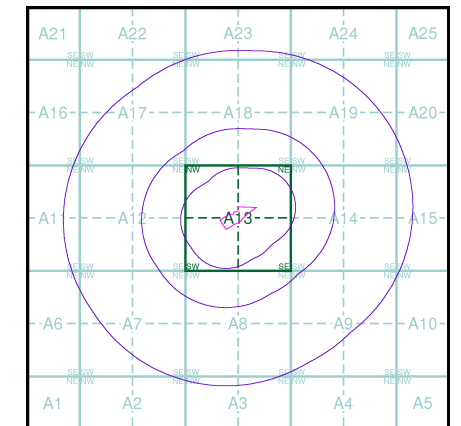
Source map scale - 1:10,560

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

Map Name(s) and Date(s)

030SW	1889	1:10,560
038NW	1889	1:10,560

Historical Map - Slice A



Order Details

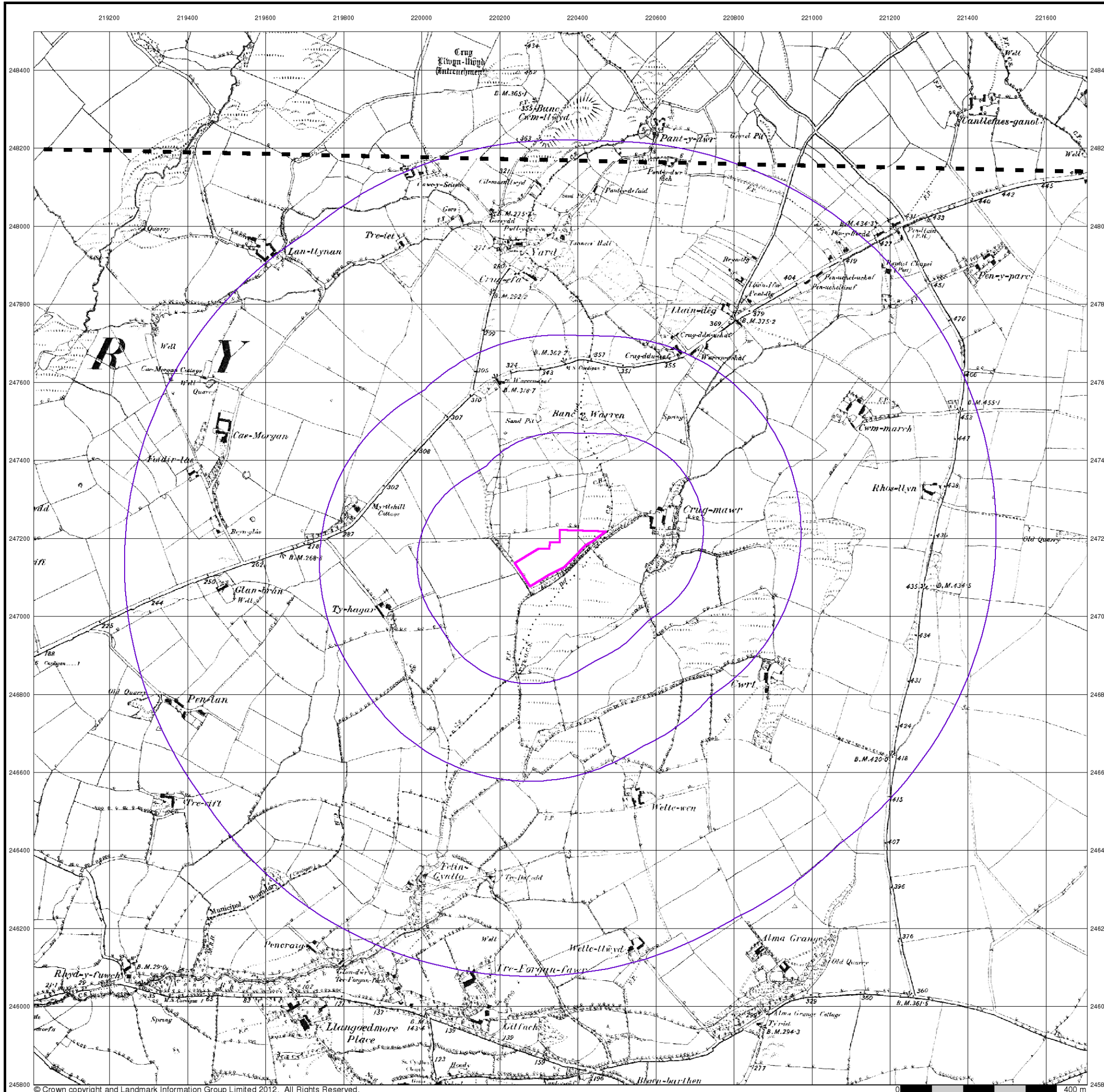
Order Number: 47000364_1_1
 Customer Ref: 12226b
 National Grid Reference: 220350, 247160
 Slice: A
 Site Area (Ha): 1.33
 Search Buffer (m): 1000

Site Details

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Cardiganshire

Published 1906

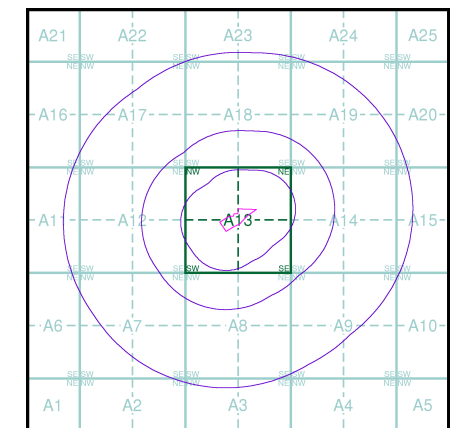
Source map scale - 1:10,560

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

Map Name(s) and Date(s)

030SW	1906	1:10,560
038NW	1906	1:10,560

Historical Map - Slice A



Order Details

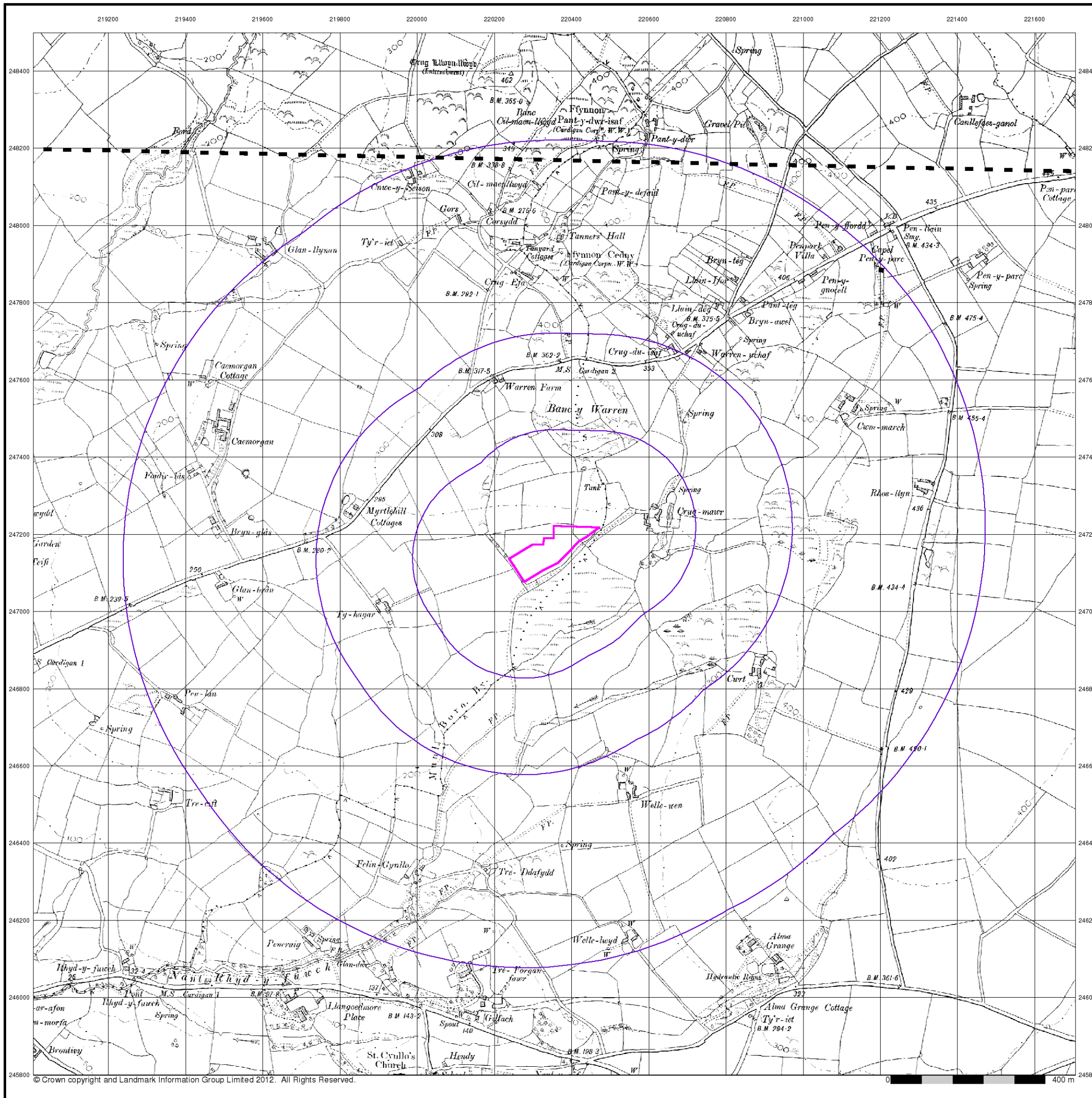
Order Number: 47000364_1_1
 Customer Ref: 12226b
 National Grid Reference: 220350, 247160
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 Site Area (Ha): 1.33
 Search Buffer (m): 1000

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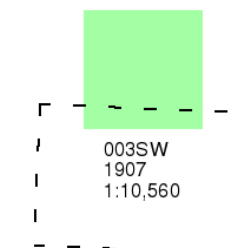
Pembrokeshire

Published 1907

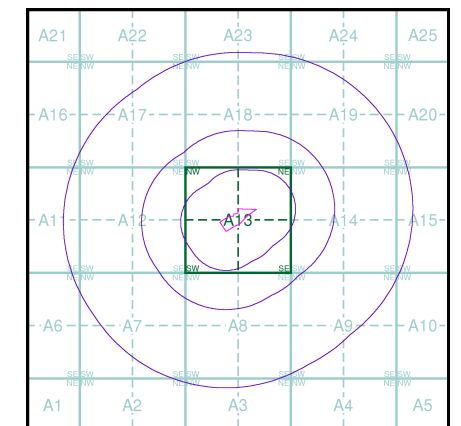
Source map scale - 1:10,560

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

Map Name(s) and Date(s)



Historical Map - Slice A



Order Details

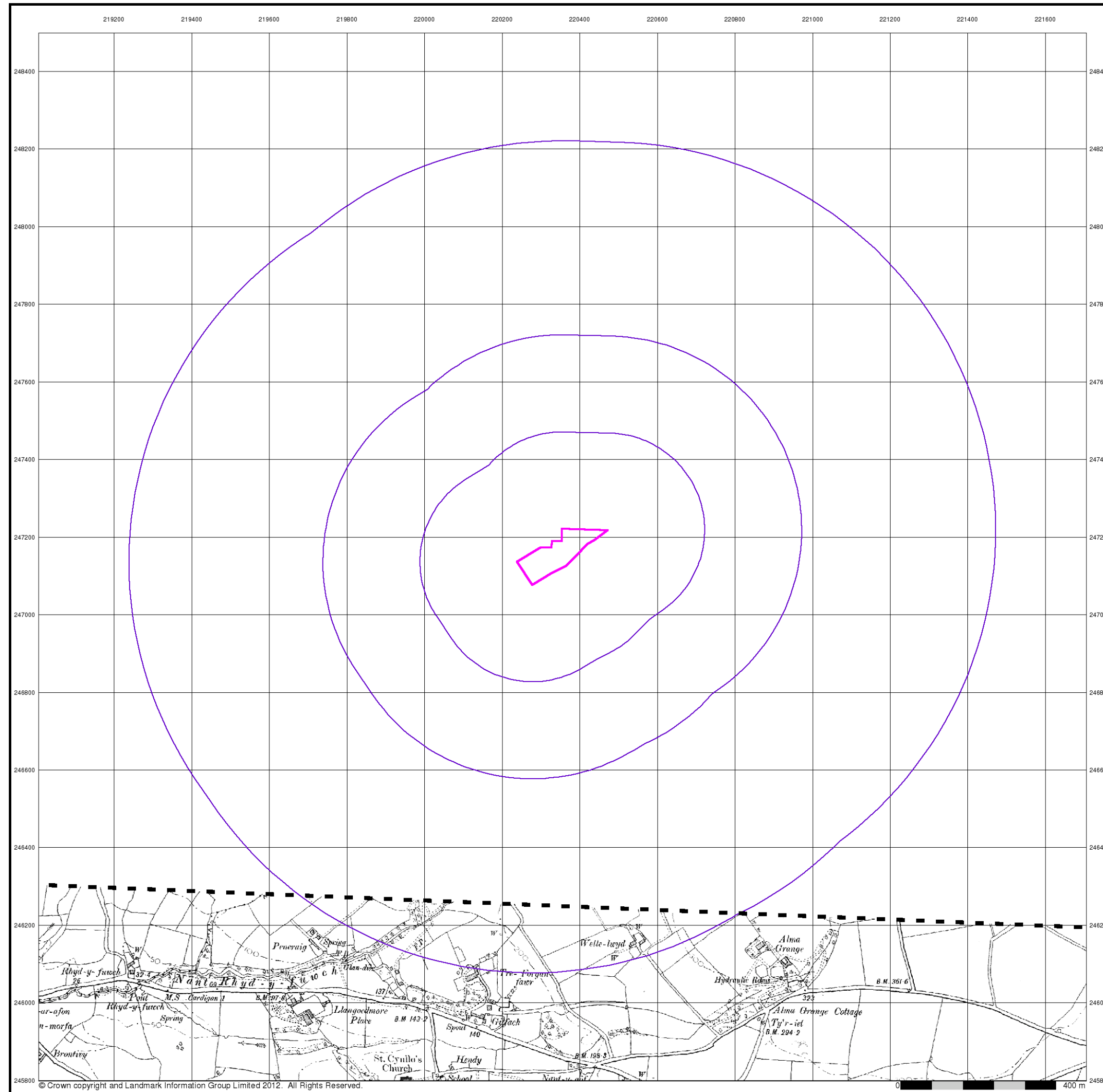
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National Grid Reference: 220350, 247160
Slice: A
Site Area (Ha): 1.33
Search Buffer (m): 1000

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Cardiganshire

Published 1938 - 1953

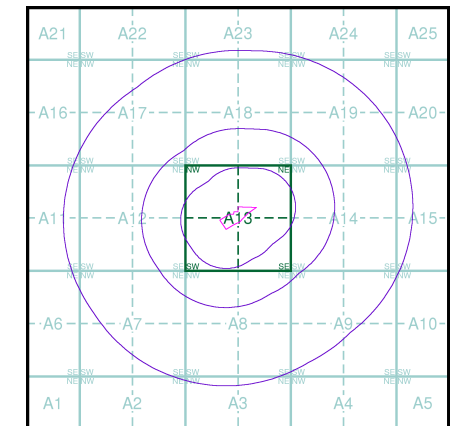
Source map scale - 1:10,560

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

Map Name(s) and Date(s)

030SW	1953	1:10,560
038NW	1938	1:10,560

Historical Map - Slice A



Order Details

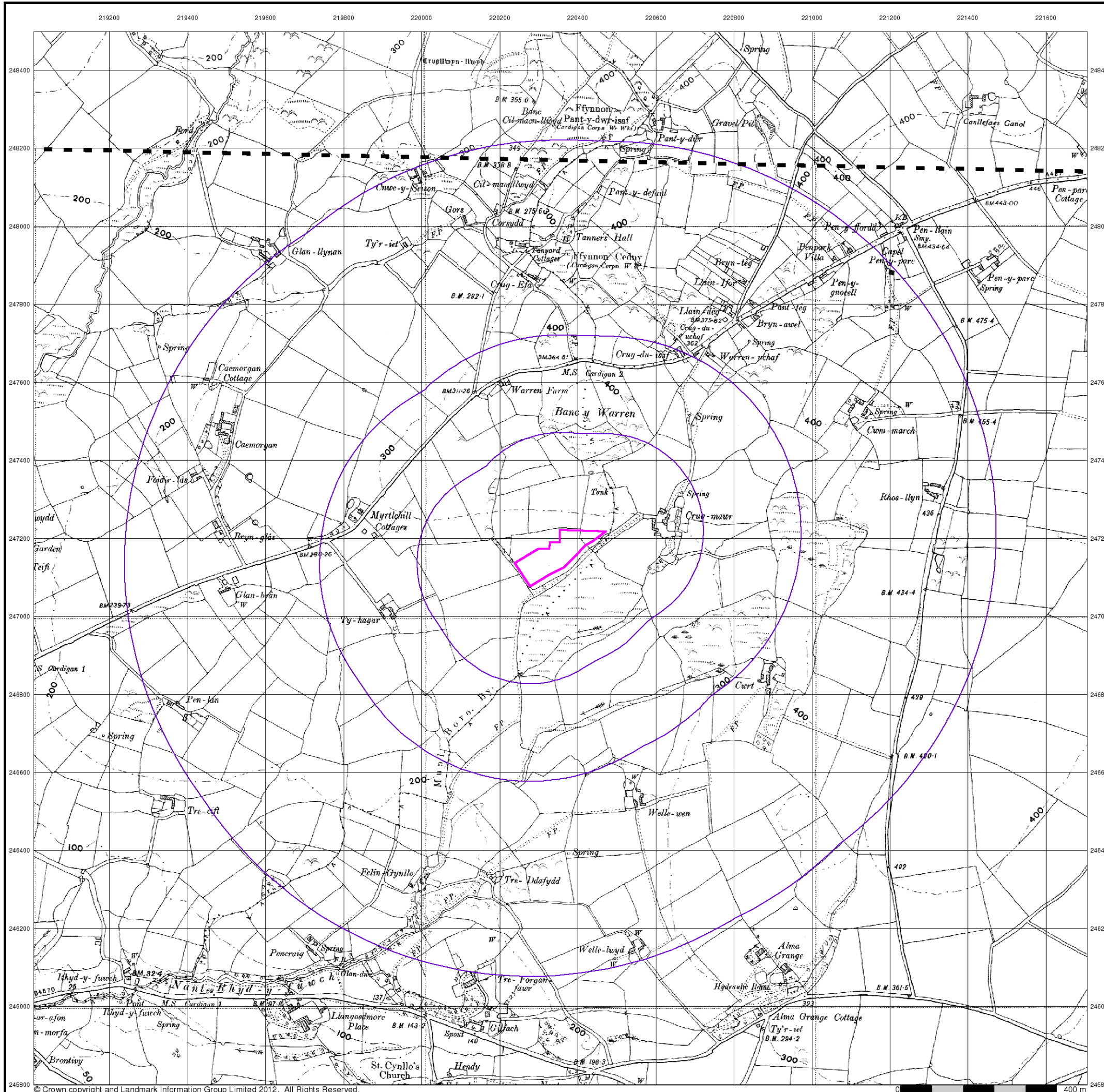
Order Number: 47000364_1_1
 Customer Ref: 12226b
 National Grid Reference: 220350, 247160
 Slice: A
 Site Area (Ha): 1.33
 Search Buffer (m): 1000

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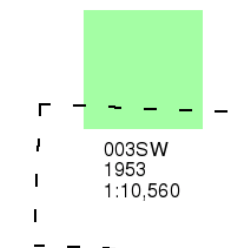
Pembrokeshire

Published 1953

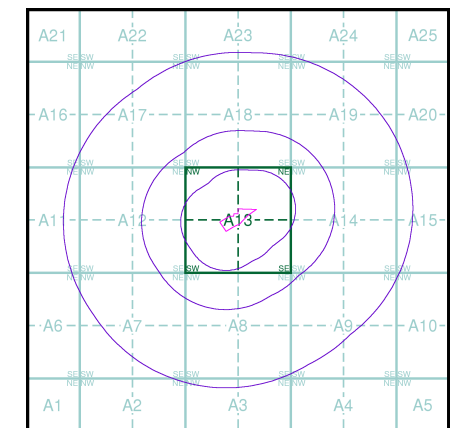
Source map scale - 1:10,560

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

Map Name(s) and Date(s)



Historical Map - Slice A



Order Details

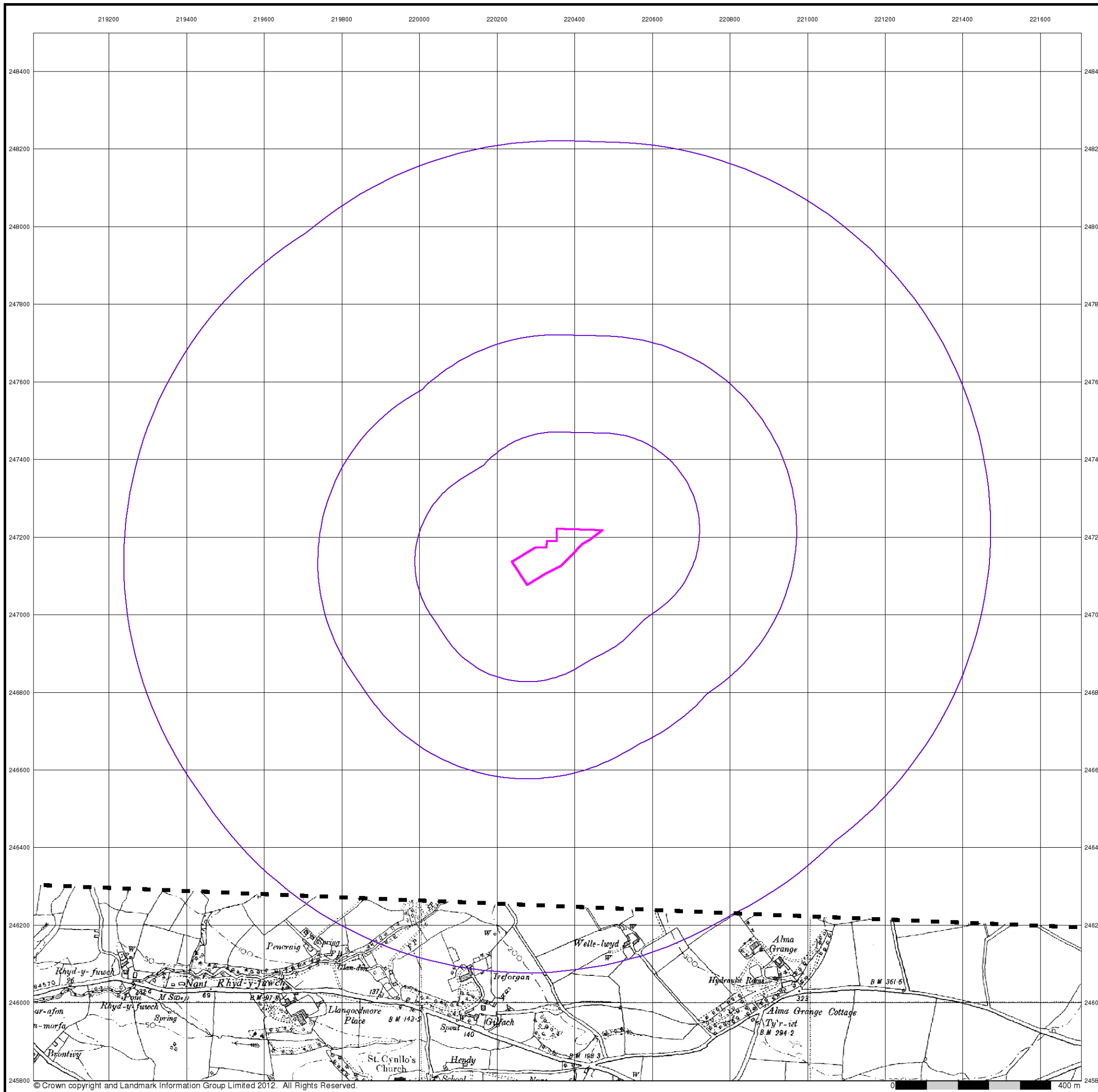
Order Number: 47000364_1_1
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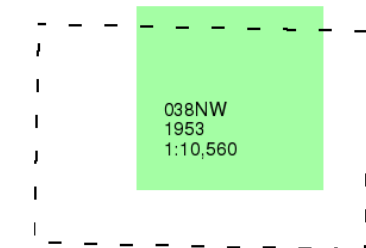
Cardiganshire

Published 1953

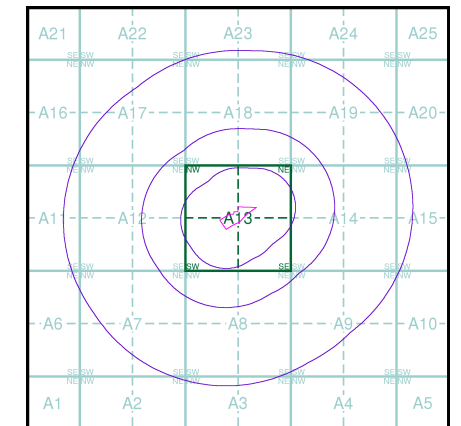
Source map scale - 1:10,560

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Map Name(s) and Date(s)



Historical Map - Slice A

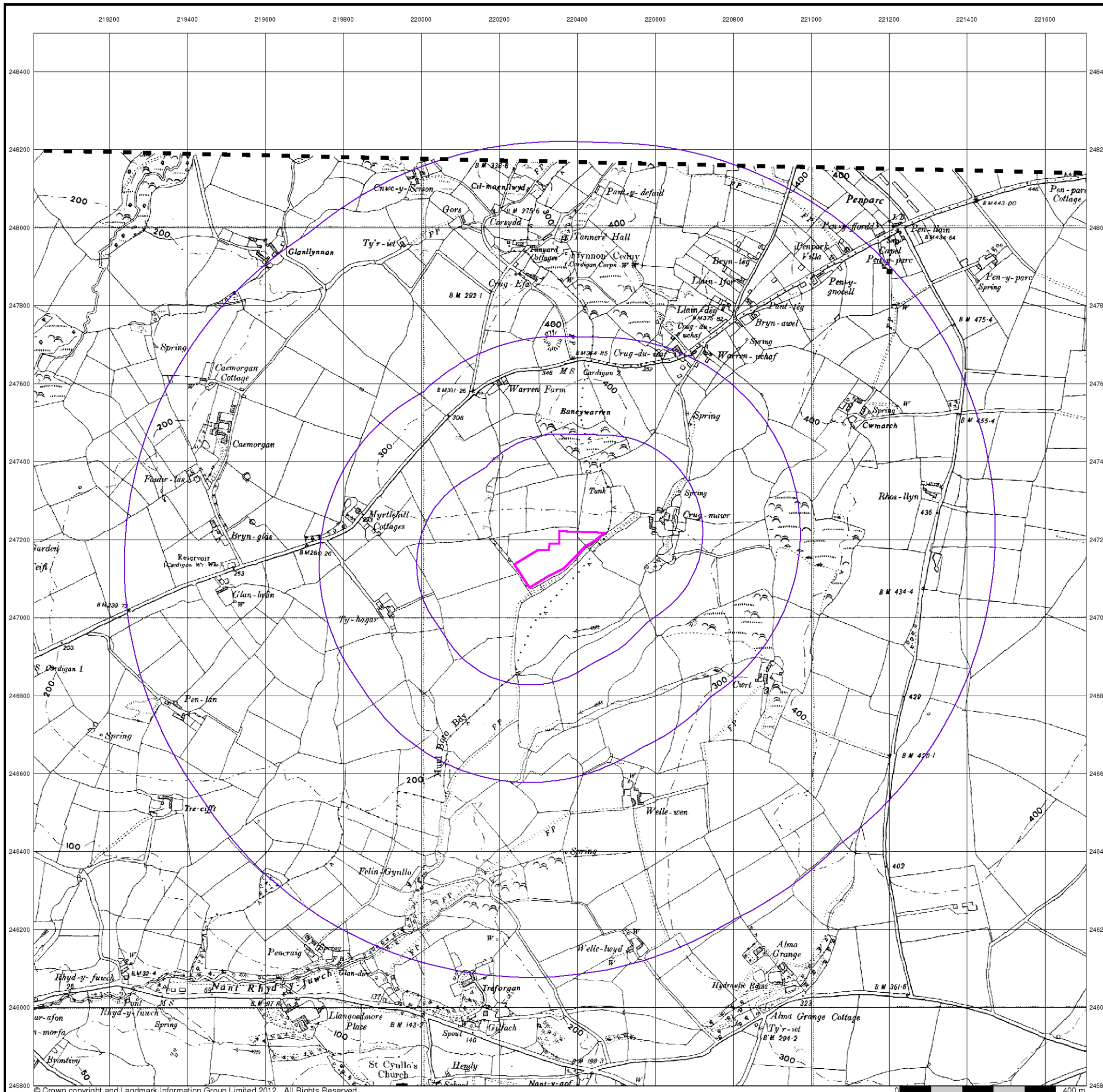


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 National Grid Reference: 220350, 247160
 Slice: A
 Site Area (Ha): 1.33
 Search Buffer (m): 1000

Site Details

Crugmore Farm, Penparc, CARDIGAN, Dyfed, SA43 1RD





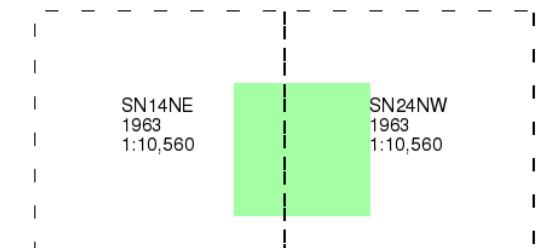
Ordnance Survey Plan

Published 1963

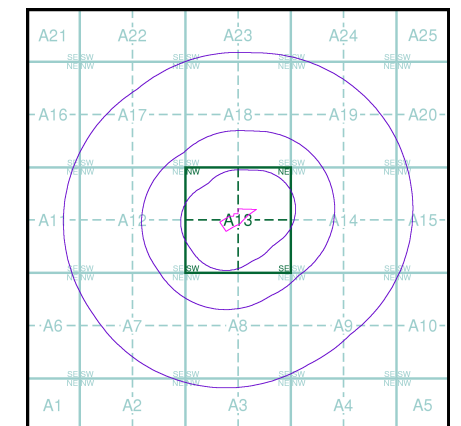
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The historical maps shown were reproduced from maps predominantly held at the scale adopted for England, Wales and Scotland in the 1840's. In 1854 the 1:2,500 scale was adopted for mapping urban areas; these maps were used to update the 1:10,560 maps.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

Map Name(s) and Date(s)



Historical Map - Slice A



Order Details

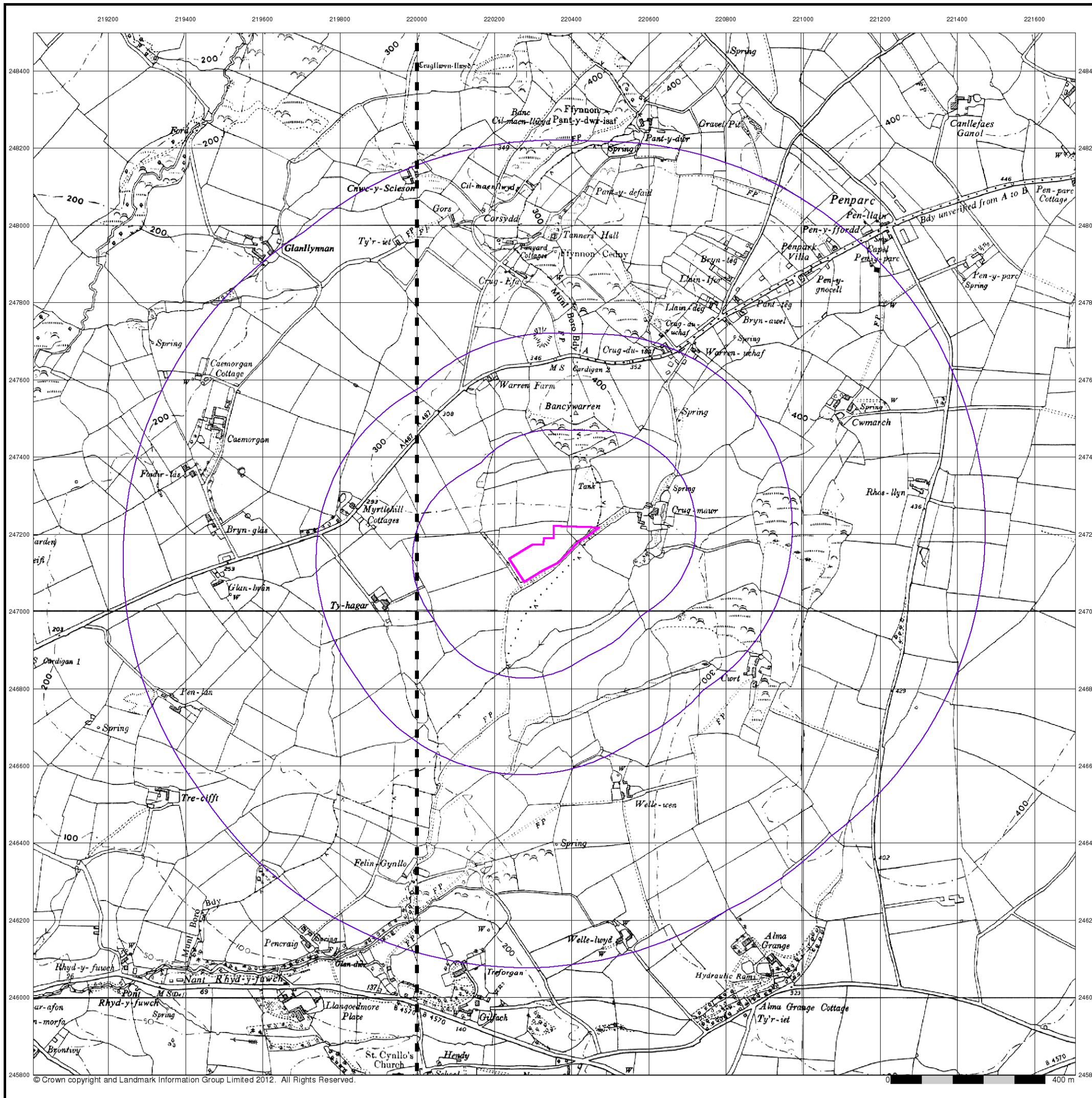
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Customer Ref: 12226b
National Grid Reference: 220350, 247160
Slice: A
Site Area (Ha): 1.33
Search Buffer (m): 1000

Site Details

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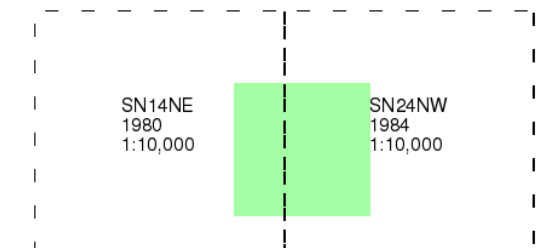
Ordnance Survey Plan

Published 1980 - 1984

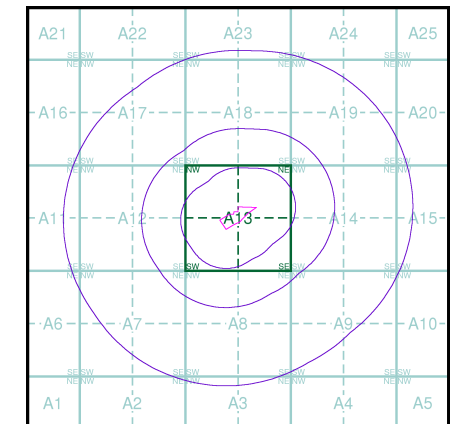
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Map Name(s) and Date(s)



Historical Map - Slice A



Order Details

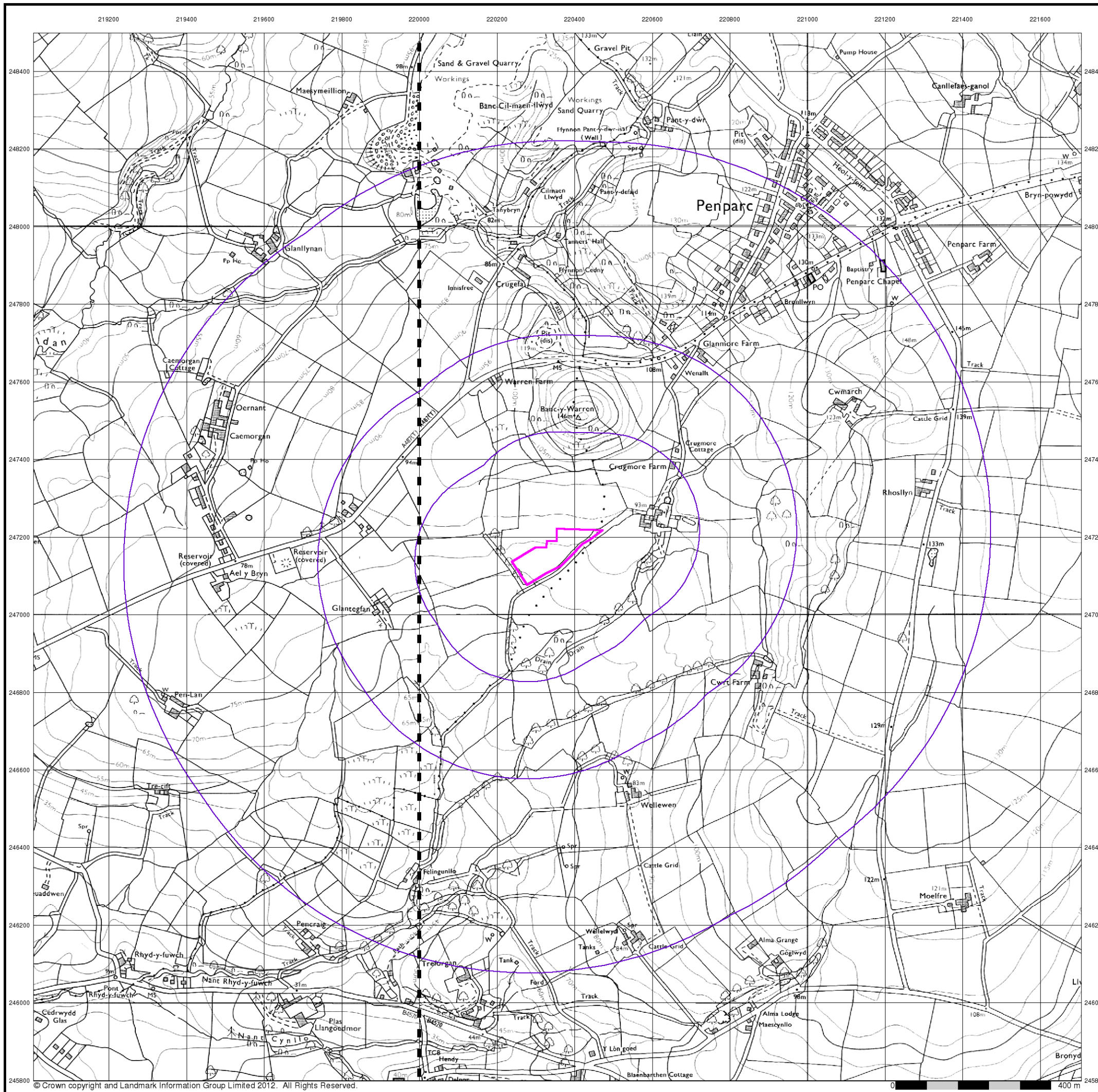
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Search Buffer (m): 1000

Site Details

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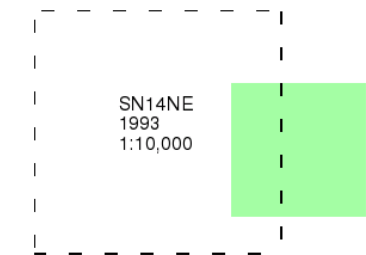
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Published 1993

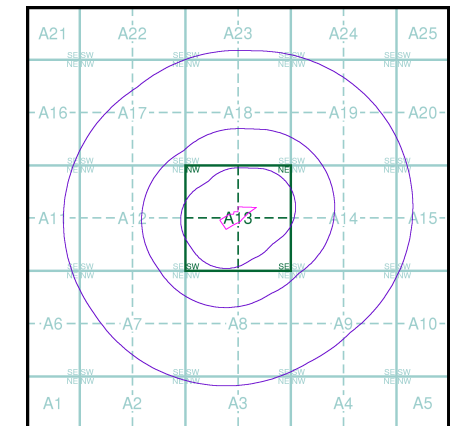
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Map Name(s) and Date(s)



Historical Map - Slice A



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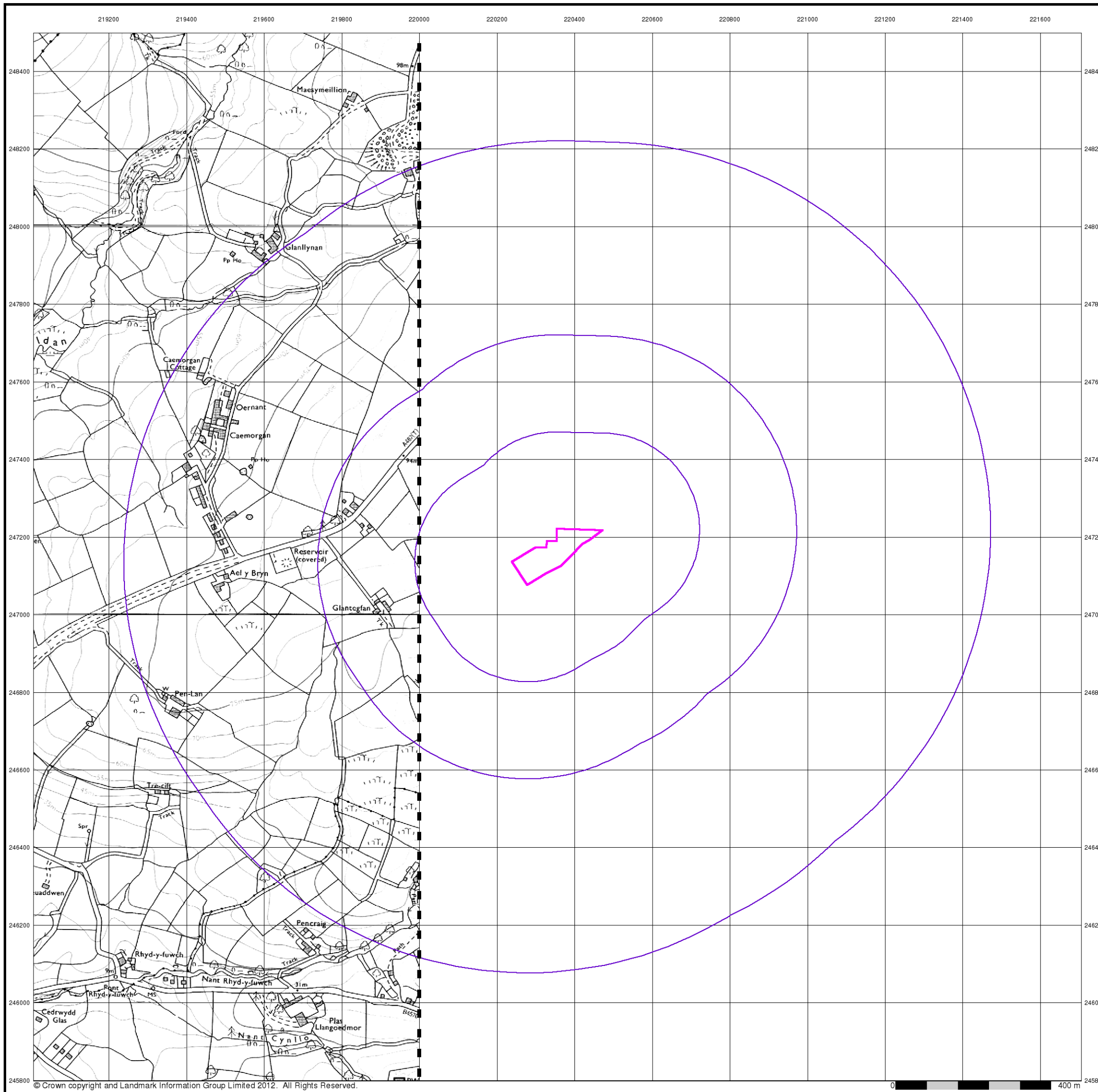
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Customer Ref: 12226b
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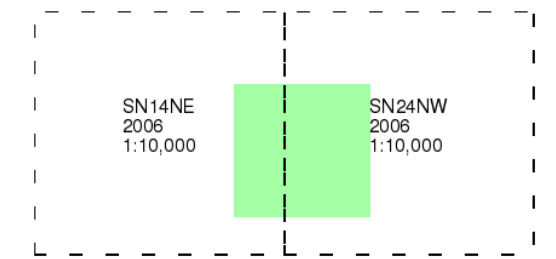
10k Raster Mapping

Published 2006

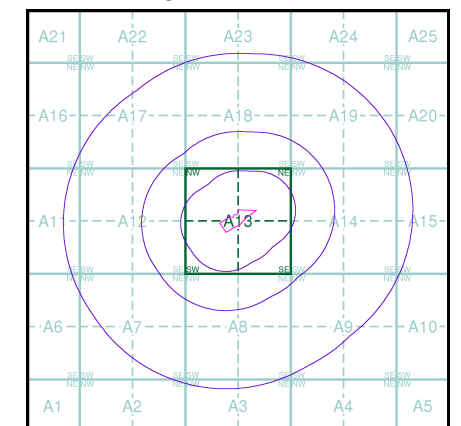
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The historical maps shown were produced from the Ordnance Survey's 1:10,000 colour raster mapping. These maps are derived from Landplan which replaced the old 1:10,000 maps originally published in 1970. The data is highly detailed showing buildings, fences and field boundaries as well as all roads, tracks and paths. Road names are also included together with the relevant road number and classification. Boundary information depiction includes county, unitary authority, district, civil parish and constituency.

Map Name(s) and Date(s)



Historical Map - Slice A



Order Details

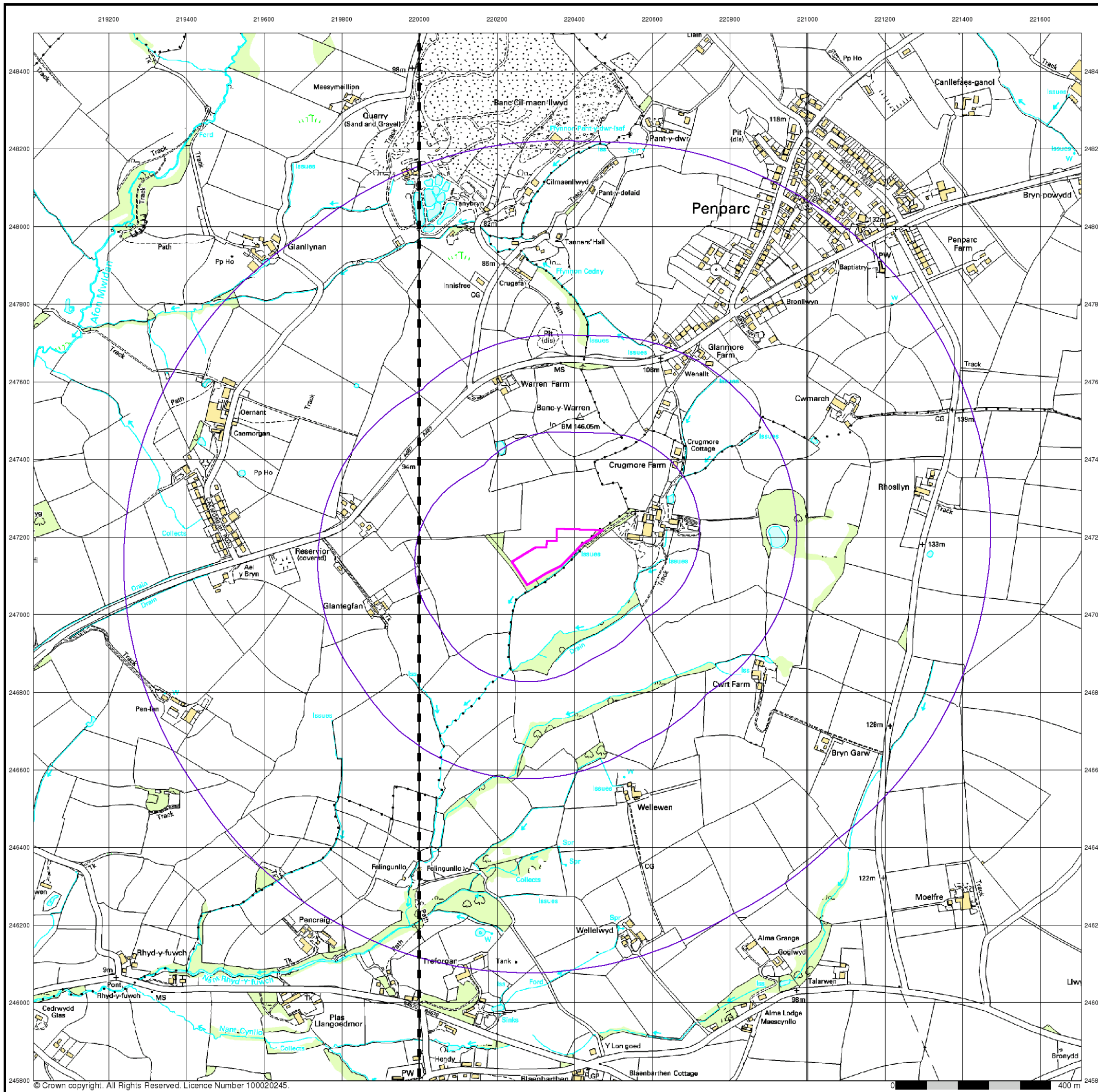
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Slice: A
Site Area (Ha): 1.33
Search Buffer (m): 1000

Site Details

Crugmore Farm, Penparc, CARDIGAN, Dyfed, SA43 1RD



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



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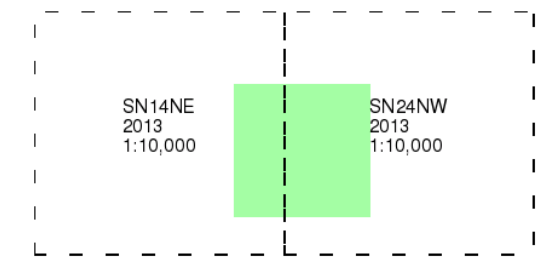
10k Raster Mapping

Published 2013

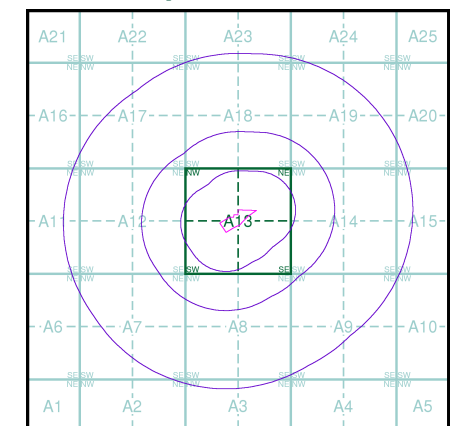
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Map Name(s) and Date(s)



Historical Map - Slice A



Order Details

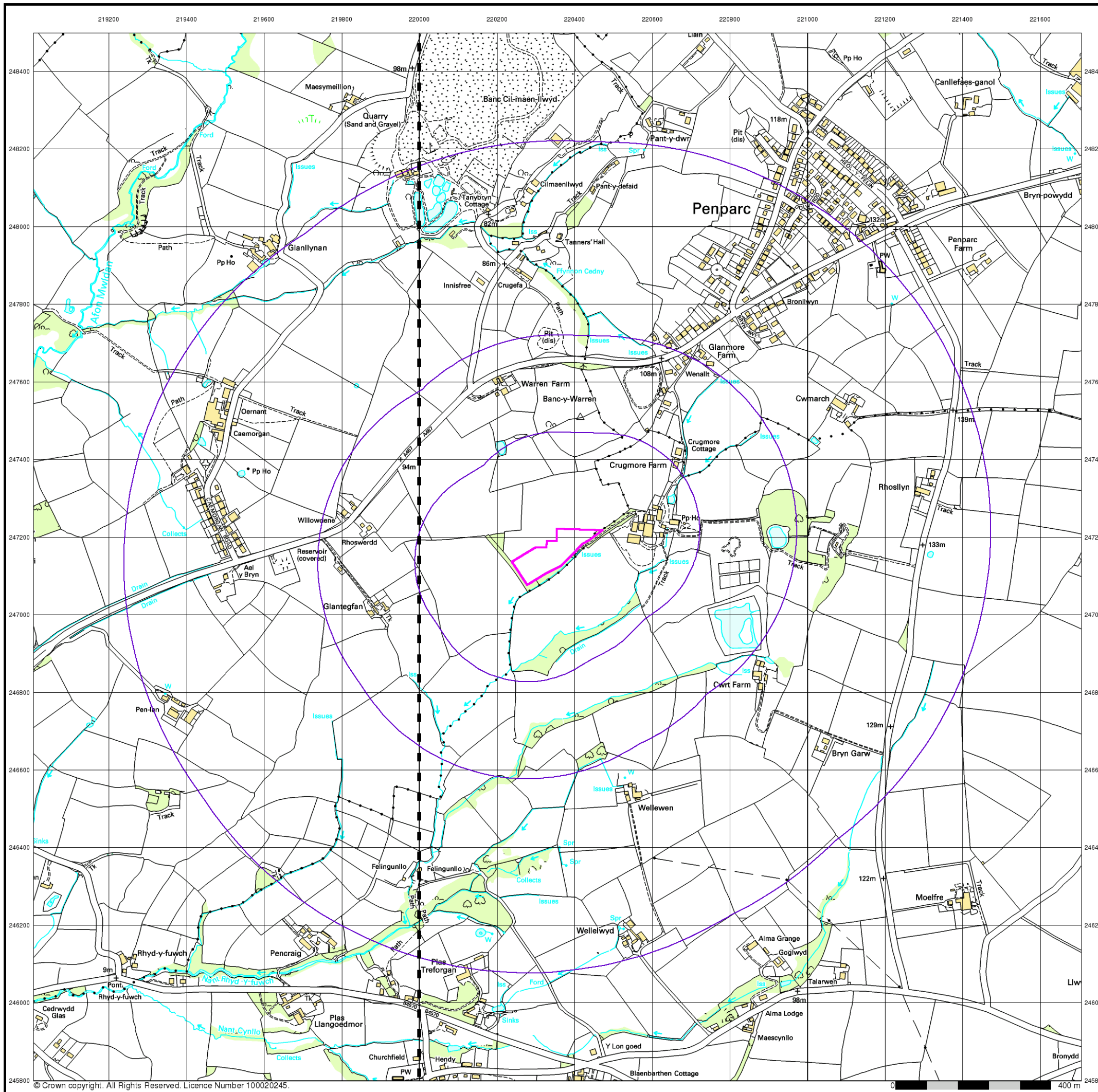
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National Grid Reference: 220350, 247160
Slice: A
Site Area (Ha): 1.33
Search Buffer (m): 1000

Site Details

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ANNEX B
Radon Report



**British
Geological Survey**
NATURAL ENVIRONMENT RESEARCH COUNCIL

GeoReports

**Ruth Liley
Terra Firma Wales Limited
5 Deryn Court
Wharfedale Road
Pentwyn
Cardiff
CF23 7HA**

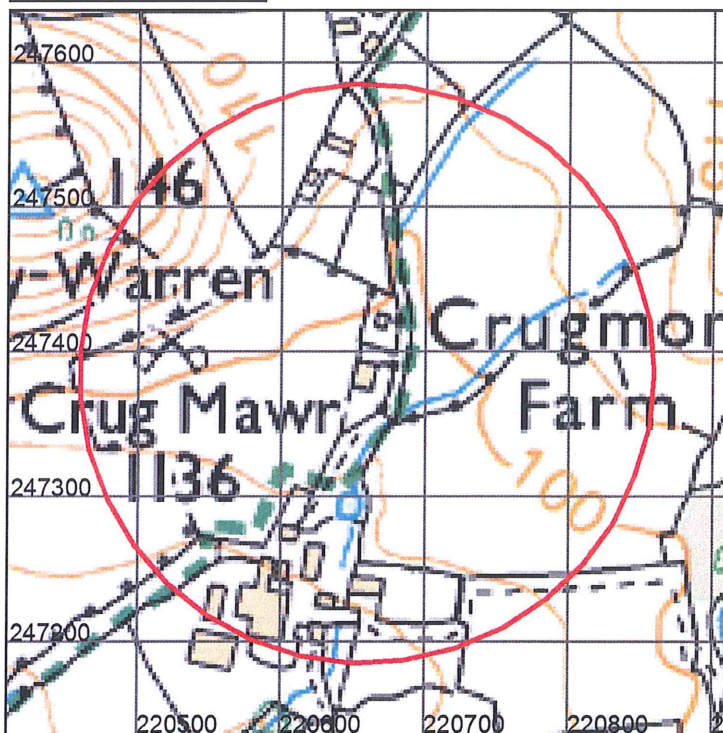
Radon Report: England and Wales

Advisory report on the requirement for radon protective measures in new buildings, conversions and extensions to existing buildings. The report also indicates whether a site is located within a radon Affected Area

Report Id: *GR_206834/1*

Client reference:

Search location



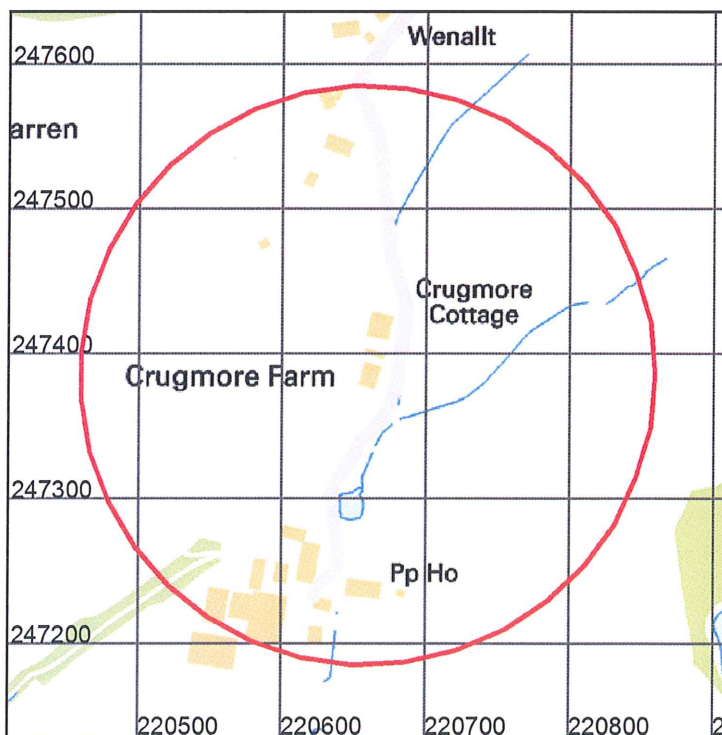
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Scale: 1:5 000 (1cm = 50 m)

Site Address:
Crugmore Farm
Penparc
Cardigan
Dyfed
SA43 1RD
United Kingdom

This report describes a site located at the National Grid Reference obtained from Ordnance Survey AddressPoint.

Note that for sites of irregular shape, this point may lie outside the site boundary. Where the client has submitted a site plan the assessment will be based on the area given.

Search location indicated in red



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OS Street View: Scale: 1:5 000 (1cm = 50 m)



Radon Report: England and Wales

This is an advisory report on the requirement for radon protective measures in new buildings, conversions and extensions. The report also indicates whether a site is located within a radon Affected Area

Requirement for radon protective measures

The determination below follows advice in *BR211 Radon: Guidance on protective measures for new buildings (2007 edition)*, which also provides guidance on what to do if the result indicates that protective measures are required.

FULL RADON PROTECTIVE MEASURES ARE REQUIRED FOR THE REPORT AREA.

The BGS is not able to provide advice on the technical specifications of 'basic' and 'full' radon protective measures. This information is detailed in **BRE Report BR211 Radon: guidance on protective measures for new buildings** which may be purchased from brebookshop.com. This report offers guidance on the technical solutions that are required to satisfy Building Regulations requirements.

Technical solutions to radon protection in new build and existing dwellings in radon affected areas are available on the BRE web site at: <http://www.bre.co.uk/page.jsp?id=1626> and <http://www.bre.co.uk/radon/> and in a range of technical reports available from brebookshop.com; Tel: 01923 664262, email: bookshop@bre.co.uk.

Summary guidance is available on the web at: <http://www.bre.co.uk/radon/protect.html>.

If you require further information or guidance, you should contact your local authority building control officer or approved inspector.



Radon in existing buildings

Is this property in a radon affected area – **YES**

The answer to the standard enquiry on house purchase known as **CON29 Standard Enquiry of Local Authority 3.13 Radon Gas: Location of the Property in a radon Affected Area** is **YES** this property is in a Radon Affected Area as defined by Public Health England (PHE).

The estimated probability of the property being above the Action Level for radon is:
10-30% (HIGHER PROBABILITY).

The result informs you of the estimated probability that this particular property is above the Action Level for radon. This does not necessarily mean there is a radon problem in the property. The only way to determine whether it is above or below the Action Level is to carry out a radon measurement within the existing property.

Radon Affected Areas are designated by Public Health England. They advise that radon gas should be measured in all properties within Radon Affected Areas.

If you are buying a new build property in a Radon Affected Area, you should ask the builder whether radon protective measures were incorporated in the construction of the property.

If you are buying a currently occupied property in a Radon Affected Area you should ask the present owner whether radon levels have been measured in the property. If they have, ask whether the results were above the Radon Action Level and if so whether remedial measures were installed, radon levels were retested, and the that the results of re-testing confirmed the effectiveness of the measures.

In radon affected homes, the problem of radon can usually be tackled with simple, effective and relatively inexpensive measures. These measures are comparable in cost to work such as damp-proofing and timber treatment. You can get practical advice about construction work to reduce radon levels from the Building Control Officer at your local council.

For further information, advice about radon, its health risks and details of how to order the radon test, please contact the PHE Radon Helpline on 01235 822622 or go online at www.ukradon.org or write to Radon Survey, Public Health England, Centre for Radiation, Chemical and Environmental Hazards, Chilton, Didcot, Oxon, OX11 0RQ, email: radon@hpa.org.uk. You can obtain an information pack from the PHE free Radon answerphone on 0800 614529



What is radon?

Radon is a naturally occurring radioactive gas, which is produced by the radioactive decay of radium which, in turn, is derived from the radioactive decay of uranium. Uranium is found in small quantities in all soils and rocks, although the amount varies from place to place. Radon released from rocks and soils is quickly diluted in the atmosphere. Concentrations in the open air are normally very low and do not present a hazard. Radon that enters enclosed spaces such as some buildings (particularly basements), caves, mines, and tunnels may reach high concentrations in some circumstances. The construction method and degree of ventilation will influence radon levels in individual buildings. A person's exposure to radon will also vary according to how particular buildings and spaces are used.

Inhalation of the radioactive decay products of radon gas increases the chance of developing lung cancer. If individuals are exposed to high concentrations for significant periods of time, there may be cause for concern. In order to limit the risk to individuals, the Government has adopted an Action Level for radon in homes of 200 becquerels per cubic metre (Bq m^{-3}). The Government advises householders that, where the radon level exceeds the Action Level, measures should be taken to reduce the concentration.

Radon in workplaces

The Ionising Radiation Regulations, 1999, require employers to take action when radon is present above a defined level in the workplace. Advice may be obtained from your local Health and Safety Executive Area Office or the Environmental Health Department of your local authority. The BRE publishes a guide (BR293): **Radon in the workplace**. BRE publications may be obtained from the BRE Bookshop, Tel: 01923 664262, email: bookshop@bre.co.uk website: www.brebookshop.com



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Fax: 0131 650 0252
Email: enquiry@bgs.ac.uk



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- Detail, which is clearly defined and accurately depicted on large-scale maps, may be lost when small-scale maps are derived from them.
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Report issued by
BGS Enquiry Service

ANNEX C
Risk Assessment Definitions

Risk Assessment Definitions

Environmental risk assessment evaluates the risk to receptors via an analysis of the ‘source-pathway-receptor’ linkage.

- (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.

Table 1 Classification of Consequence	
Classification	Definition
Severe	<ul style="list-style-type: none"> • 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	<ul style="list-style-type: none"> • 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	<ul style="list-style-type: none"> • Pollution of non-sensitive water resources • Significant damage to buildings/structures
Negligible	<ul style="list-style-type: none"> • 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

Table 2 Classification of Probability	
Classification	Definition
High	<ul style="list-style-type: none"> • 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	<ul style="list-style-type: none"> • There is a complete pollution linkage which means that is it probable that an event will occur • The event is not inevitable but possible in short term and likely in the long term
Low	<ul style="list-style-type: none"> • 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	<ul style="list-style-type: none"> • There is a complete pollution linkage but circumstances are such that it is improbable that an event would occur even in the long term

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 3** below.

Table 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


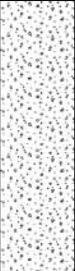


It is possible that harm may arise to a receptor, but it is likely that the harm would be mild.

Near Zero Risk

There is a very low risk of harm to the receptor. In the event of harm being realised the harm is

ANNEX D
Trial Pit Logs

Project Name Crugmore Farm	Project No. 12226b	Co-ords: - Level: -	Date 20/06/2013
Location: Cardigan		Dimensions: - Depth 2.90m	Scale 1:25
Client: Syrus Energy			Logged By RL

Samples & In Situ Testing			Depth (m)	Level (m AOD)	Legend	Stratum Description
Depth (m)	Type	Results				
0.30	D		0.60			TOPSOIL: Soft to firm brown silty CLAY. Fine roots.
			1.50			Medium dense brown and orange brown mottled SAND and fine to coarse angular to sub-rounded GRAVEL and COBBLE
			2.30			Stiff grey and red brown mottled CLAY. Silt inclusions.
			2.90			Grey SHALE retrieved as fine to coarse angular GRAVEL and COBBLE (Nantmel Mudstone Formation)
Trialpit Complete at 2.90 m						




Remarks:

Groundwater: Groundwater seepage within shale mudstone



Project Name Crugmore Farm	Project No. 12226b	Co-ords: - Level: -	Date 20/06/2013
-------------------------------	-----------------------	------------------------	--------------------

Location: Cardigan	Dimensions: -	Scale 1:25
Client: Syrus Energy	Depth 3.30m	Logged By RL

Samples & In Situ Testing			Depth (m)	Level (m AOD)	Legend	Stratum Description
Depth (m)	Type	Results				
0.50	D		0.15			TOPSOIL: Soft brown sandy CLAY. Fine roots.
			1.10			Stiff grey and orange brown mottled CLAY with inclusions of silt. Occasional fine to coarse angular to sub-rounded gravel and cobble.
			3.30			Very stiff grey and red brown mottled CLAY
						Trialpit Complete at 3.30 m




Remarks:

Groundwater: No groundwater encountered



Project Name Crugmore Farm	Project No. 12226b	Co-ords: - Level: -	Date 20/06/2013
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Location: Cardigan	Dimensions: -	Scale 1:25
Client: Syrus Energy	Depth 3.20m	Logged By RL

Samples & In Situ Testing			Depth (m)	Level (m AOD)	Legend	Stratum Description
Depth (m)	Type	Results				
0.40	D		0.20			TOPSOIL: Soft dark brown CLAY. Fine roots.
			1.10			Stiff grey and brown mottled CLAY with silty inclusions. Occasional fine to coarse angular to sub-angular gravel.
			3.20			Stiff to very stiff grey and red brown mottled CLAY
						Trialpit Complete at 3.20 m





Remarks:

Groundwater: No groundwater encountered



Project Name Crugmore Farm	Project No. 12226b	Co-ords: - Level: -	Date 20/06/2013
-------------------------------	-----------------------	------------------------	--------------------

Location: Cardigan	Dimensions: -	Scale 1:25
Client: Syrus Energy	Depth 2.80m	Logged By RL

Samples & In Situ Testing			Depth (m)	Level (m AOD)	Legend	Stratum Description
Depth (m)	Type	Results				
0.14	D		0.20			TOPSOIL: Soft grey brown CLAY with orange brown inclusions and fine roots
						Stiff brown and orange brown mottled CLAY
			1.00			Stiff and red brown mottled CLAY. Occasional fine to coarse angular GRAVEL of mudstone
			2.80			Trialpit Complete at 2.80 m





Remarks:

Groundwater: No groundwater encountered



Project Name Crugmore Farm	Project No. 12226b	Co-ords: - Level: -	Date 20/06/2013
-------------------------------	-----------------------	------------------------	--------------------

Location: Cardigan	Dimensions: -	Scale 1:25
Client: Syrus Energy	Depth 3.40m	






Samples & In Situ Testing			Depth (m)	Level (m AOD)	Legend	Stratum Description
Depth (m)	Type	Results				
0.30	D		0.20			TOPSOIL: Soft dark brown CLAY. Fine roots.
						Stiff brown and orange brown mottled CLAY
			0.70			Very stiff grey and red brown CLAY
			3.20			Dark grey SHALE retrieved as fine to coarse angular GRAVEL and COBBLE (Nantmel Mudstone Formation)
			3.40			Trialpit Complete at 3.40 m

Remarks:

Groundwater: Groundwater seepage within shale bedrock



Project Name Crugmore Farm	Project No. 12226b	Co-ords: - Level: -	Date 20/06/2013
Location: Cardigan		Dimensions: - Depth 2.30m	Scale 1:25
Client: Syrus Energy			Logged By RL

Samples & In Situ Testing			Depth (m)	Level (m AOD)	Legend	Stratum Description	
Depth (m)	Type	Results					
0.40	D		0.30			TOPSOIL: Soft dark brown CLAY. Fine roots	
			0.60			Firm orange brown and brown mottled sandy gravelly CLAY. Gravel is fine to coarse angular to sub-angular.	
			1.00			Medium dense orange brown/brown slightly clayey SAND and fine to coarse angular to sub-rounded GRAVEL and COBBLE	
			2.00			Grey clayey fine to coarse angular GRAVEL of SHALE	1
			2.30			Grey SHALE retrieved as fine to coarse angular GRAVEL and COBBLE (Nantmel Mudstone Formation)	2
						----- Trialpit Complete at 2.30 m	
3							
4							

Remarks:

Groundwater: Groundwater seepage in shale bedrock



ANNEX E
Laboratory Soil Chemical Test
Results



2139

Certificate of Analysis



Date: 01/07/2013

Certificate Number: 13-83653

Client: Terra Firma (Wales) Ltd
5 Deryn Court
Wharfdale Road
Pentwyn
Cardiff
CF23 7HB

Our Reference: 13-83653

Client Reference: 12226B

Contract Title: Crugmore

Description: 6 soil samples


Date Received: 24 June 2013

Date Started: 24 June 2013

Date Completed: 01 July 2013

Test Procedures: Identified by prefix DETSn, details available upon request.

Notes: Observations and interpretations are outside the scope of UKAS accreditation

Approved By: 
Rob Brown, Business Manager

This certificate is issued in accordance with the accreditation requirements of the United Kingdom Accreditation Service. The results reported herein relate only to the material supplied to the laboratory. This certificate shall not be reproduced except in full, without the prior written approval of the laboratory.

Information in Support of the Analytical Results

Analysis

Inorganic soil analysis was carried out on a dried sample, crushed to pass a 425um sieve, in accordance with BS1377.

Organic soil analysis was carried out on an 'as received' sample. Organics results are corrected for moisture and expressed on a dry weight basis.

The Loss on Drying, used to express organics analysis on an air dried basis, is carried out at a temperature of 28oC +/-2oC.

Key

- * Denotes test not included in laboratory scope of accreditation
- # Denotes test that holds MCERTS accreditation, however, MCERTS accreditation is only implied if the report carries the MCERTS logo
- \$ Denotes tests completed by an approved subcontractor
- I/S Denotes insufficient sample to carry out test
- U/S Denotes that the sample is not suitable for testing

Disposal

From the issue date of this test certificate, samples will be held for the following times prior to disposal :-

Soils - 1 month

Liquids - 2 weeks

Asbestos (test portion) - 6 months

Summary of Chemical Analysis

Matrix Descriptions

Our Ref: 13-83653

Client Ref: 12226B

Contract Title: Crugmore

Sample ID	Depth	Sample No	Completed	Matrix Description
TP1	0.30	526837	01/07/2013	Brown gravelly sandy CLAY
TP2	0.50	526838	01/07/2013	Brown gravelly sandy CLAY
TP3	0.40	526839	01/07/2013	Brown gravelly sandy CLAY
TP4	0.15	526840	01/07/2013	Brown gravelly sandy CLAY with numerous rootlets
TP5	0.30	526841	01/07/2013	Brown gravelly sandy CLAY
TP6	0.40	526842	01/07/2013	Brown gravelly sandy CLAY

Summary of Chemical Analysis

Soil Samples

Our Ref: 13-83653

Client Ref: 12226B

Contract Title: Crugmore

				Lab No.	526837	526838	526839	526840
				Sample ID	TP1	TP2	TP3	TP4
				Depth	0.30	0.50	0.40	0.15
				Sample Ref				
				Sample Type				
				Sampling Date	20/06/2013	20/06/2013	20/06/2013	20/06/2013
				Sampling Time				
Test	Units	DETSxx	LOD					
Mercury	mg/kg	DETSC 2325#	0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Arsenic	mg/kg	DETS 042#	0.2	15	21	21	14	
Cadmium	mg/kg	DETS 042#	0.1	0.6	0.8	0.9	0.7	
Chromium	mg/kg	DETS 042#	0.15	29	34	43	27	
Chromium III	mg/kg	DETS 042*	0.15	29	34	43	27	
Copper	mg/kg	DETS 042#	0.2	12	13	25	10	
Nickel	mg/kg	DETS 042#	1	18	27	35	13	
Lead	mg/kg	DETS 042#	0.3	11	16	20	20	
Selenium	mg/kg	DETS 042#	0.5	< 0.5	< 0.5	< 0.5	< 0.5	
Zinc	mg/kg	DETS 042#	1	51	57	71	45	
Cyanide total	mg/kg	DETSC 2130#	0.1	0.2	< 0.1	< 0.1	0.3	
Organic matter	%	DETSC 2002#	0.1	1.4	1.1	1.2	3.2	
Total Sulphate as SO4	%	DETSC 2321#	0.01	0.03	0.03	0.02	0.05	
pH		DETSC 2008#		7.1	7.4	7.3	6.3	
PAH	mg/kg	DETSC 3301	1.6	< 1.6	< 1.6	< 1.6	< 1.6	
Phenol - Monohydric	mg/kg	DETSC 2130#	0.3	0.4	< 0.3	< 0.3	< 0.3	
Hexavalent Chromium	mg/kg	DETSC 2204*	1	< 1.0	< 1.0	< 1.0	< 1.0	

Summary of Chemical Analysis

Soil Samples

Our Ref: 13-83653

Client Ref: 12226B

Contract Title: Crugmore

				Lab No.	526841	526842
				Sample ID	TP5	TP6
				Depth	0.30	0.40
				Sample Ref		
				Sample Type		
				Sampling Date	20/06/2013	20/06/2013
				Sampling Time		
Test	Units	DETSxx	LOD			
Mercury	mg/kg	DETSC 2325#	0.05	< 0.05	< 0.05	
Arsenic	mg/kg	DETS 042#	0.2	20	17	
Cadmium	mg/kg	DETS 042#	0.1	1.0	0.7	
Chromium	mg/kg	DETS 042#	0.15	46	29	
Chromium III	mg/kg	DETS 042*	0.15	46	28	
Copper	mg/kg	DETS 042#	0.2	21	8.4	
Nickel	mg/kg	DETS 042#	1	29	17	
Lead	mg/kg	DETS 042#	0.3	21	13	
Selenium	mg/kg	DETS 042#	0.5	< 0.5	< 0.5	
Zinc	mg/kg	DETS 042#	1	57	43	
Cyanide total	mg/kg	DETSC 2130#	0.1	< 0.1	0.2	
Organic matter	%	DETSC 2002#	0.1	1.0	1.5	
Total Sulphate as SO4	%	DETSC 2321#	0.01	0.03	0.03	
pH		DETSC 2008#		6.9	6.6	
PAH	mg/kg	DETSC 3301	1.6	< 1.6	< 1.6	
Phenol - Monohydric	mg/kg	DETSC 2130#	0.3	< 0.3	< 0.3	
Hexavalent Chromium	mg/kg	DETSC 2204*	1	< 1.0	< 1.0	

Sample Comments

DETS cannot be held responsible for the integrity of sample(s) received whereby the laboratory did not undertake the sampling. In this instance samples received may be deviating.

Deviating Sample criteria are based on British and International standards and laboratory trials in conjunction with the UKAS note "Guidance on Deviating Samples".

All samples received are listed below. However, those samples that have additional comments in relation to hold time and/or inappropriate containers are deviating due to the reasons stated. This means that the analysis is accredited where applicable, but results may be compromised due to sample deviations.

If no sampled date (soils) or date/time (waters) has been supplied then samples are deviating. However, if you are able to supply a sampled date (and time for waters), this will prevent samples being reported as deviating where specific hold times are not exceeded and where the container supplied is suitable.

Lab No.	Sample ID	Date Sampled	Containers Received	Deviating due to holding time being exceeded for test(s)	Deviating due to inappropriate container for test(s)	Deviating due to headspace presence in container for test(s)
526837	TP1 0.30 SOIL	20/06/2013	Glass Jar 250ml (250ml), Plastic Tub 1 litre (1kg)			
526838	TP2 0.50 SOIL	20/06/2013	Glass Jar 250ml (250ml), Plastic Tub 1 litre (1kg)			
526839	TP3 0.40 SOIL	20/06/2013	Glass Jar 250ml (250ml), Plastic Tub 1 litre (1kg)			
526840	TP4 0.15 SOIL	20/06/2013	Glass Jar 250ml (250ml), Plastic Tub 1 litre (1kg)			
526841	TP5 0.30 SOIL	20/06/2013	Glass Jar 250ml (250ml), Plastic Tub 1 litre (1kg)			
526842	TP6 0.40 SOIL	20/06/2013	Glass Jar 250ml (250ml), Plastic Tub 1 litre (1kg)			

Appendix A - Details of Analysis

Method details are shown only for those determinands listed in Annex A of the MCERTS standard. Anything not included on this list falls outside the scope of MCERTS. No Recovery Factors are used in the determination of results. Results reported assume 100% recovery. Full method statements are available on request.

<u>Method</u>	<u>Name of Parameter</u>	<u>Units</u>	<u>Limit of Detection</u>	<u>Sample Preparation</u>	<u>Sub-Contracted</u>	<u>UKAS</u>	<u>MCERTS</u>
DETSC 2002	Organic Matter	%	0.01	Air Dried	No	Yes	Yes
DETSC 2003	Loss on Ignition	%	0.01	Air Dried	No	Yes	Yes
DETSC 2004	Total Sulphate	%	0.01	Air Dried	No	Yes	Yes
DETSC 2321	Total Sulphate	%	0.01	Air Dried	No	Yes	Yes
DETSC 2004	Water Soluble Sulphate	mg/l	10.00	Air Dried	No	Yes	Yes
DETSC 2076	Water Soluble Sulphate	mg/l	10.00	Air Dried	No	Yes	Yes
DETSC 2006	Chloride	mg/kg	0.01	Air Dried	No	Yes	Yes
DETSC 2008	pH	pH Units	0.10	Air Dried	No	Yes	Yes
DETS 042	Selenium	mg/kg	0.50	Air Dried	No	Yes	Yes
DETSC 2119	Ammonia	mg/kg	0.02	Air Dried	No	Yes	Yes
DETS 020	Boron (Water Soluble)	mg/kg	0.20	Air Dried	No	Yes	Yes
DETSC 2024	Sulphide	mg/kg	10.00	Air Dried	No	Yes	Yes
DETS 042	Antimony	mg/kg	1.00	Air Dried	No	No	No
DETS 042	Arsenic	mg/kg	0.20	Air Dried	No	Yes	Yes
DETS 042	Barium	mg/kg	1.50	Air Dried	No	Yes	Yes
DETS 042	Beryllium	mg/kg	0.20	Air Dried	No	Yes	Yes
DETS 042	Cadmium	mg/kg	0.10	Air Dried	No	Yes	Yes
DETS 042	Cobalt	mg/kg	0.70	Air Dried	No	Yes	Yes
DETS 042	Copper	mg/kg	0.20	Air Dried	No	Yes	Yes
DETS 042	Chromium	mg/kg	0.15	Air Dried	No	Yes	Yes
DETS 042	Iron	mg/kg	1.00	Air Dried	No	Yes	No

Appendix A - Details of Analysis

Method details are shown only for those determinands listed in Annex A of the MCERTS standard. Anything not included on this list falls outside the scope of MCERTS. No Recovery Factors are used in the determination of results. Results reported assume 100% recovery. Full method statements are available on request.

<u>Method</u>	<u>Name of Parameter</u>	<u>Units</u>	<u>Limit of Detection</u>	<u>Sample Preparation</u>	<u>Sub-Contracted</u>	<u>UKAS</u>	<u>MCERTS</u>
DETS 042	Lead	mg/kg	0.30	Air Dried	No	Yes	Yes
DETS 042	Manganese	mg/kg	20.00	Air Dried	No	Yes	Yes
DETSC 2325	Mercury	mg/kg	0.05	Air Dried	No	Yes	Yes
DETS 042	Molybdenum	mg/kg	0.40	Air Dried	No	Yes	Yes
DETS 042	Nickel	mg/kg	0.20	Air Dried	No	Yes	Yes
DETS 042	Thallium	mg/kg	1.00	Air Dried	No	No	No
DETS 042	Vanadium	mg/kg	0.80	Air Dried	No	Yes	Yes
DETS 042	Zinc	mg/kg	1.00	Air Dried	No	Yes	Yes
DETSC 3049	Sulphur (Free)	mg/kg	0.50	As Received	No	Yes	Yes
DETSC 3301	PAH by GC-FID	mg/kg	0.10	As Received	No	Yes	No
DETSC 3311	TPH (C10 - C40)	mg/kg	20.00	As Received	No	Yes	Yes
DETSC 3401	PCB	mg/kg	0.01	As Received	No	Yes	Yes
DETSC 3321	Benzene	mg/kg	0.01	As Received	No	Yes	Yes
DETSC 3321	Toluene	mg/kg	0.01	As Received	No	Yes	Yes
DETSC 3321	Ethylbenzene	mg/kg	0.01	As Received	No	Yes	Yes
DETSC 3321	Xylene	mg/kg	0.01	As Received	No	Yes	Yes
DETSC 2130	Phenol - Monohydric	mg/kg	0.3	Air Dried	No	Yes	Yes
DETSC 2130	Easily Liberatable Cyanide	mg/kg	0.1	Air Dried	No	Yes	Yes
DETSC 2130	Complex Cyanide	mg/kg	0.30	Air Dried	No	Yes	No
DETSC 2130	Total Cyanide	mg/kg	0.40	Air Dried	No	Yes	Yes
DETSC 2130	Thiocyanate	mg/kg	0.6	Air Dried	No	Yes	Yes

Appendix A - Details of Analysis

Method details are shown only for those determinands listed in Annex A of the MCERTS standard. Anything not included on this list falls outside the scope of MCERTS. No Recovery Factors are used in the determination of results. Results reported assume 100% recovery. Full method statements are available on request.

<u>Method</u>	<u>Name of Parameter</u>	<u>Units</u>	<u>Limit of Detection</u>	<u>Sample Preparation</u>	<u>Sub-Contracted</u>	<u>UKAS</u>	<u>MCERTS</u>
DETSC 3431	VOC	mg/kg	0.01	As Received	No	No	No
DETSC 3303	PAH by GCMS (see list below)						
DETSC 3303	Acenaphthene	mg/kg	0.03	As Received	No	Yes	Yes
DETSC 3303	Acenaphthylene	mg/kg	0.03	As Received	No	Yes	Yes
DETSC 3303	Benzo(a)anthracene	mg/kg	0.03	As Received	No	Yes	Yes
DETSC 3303	Benzo(a)pyrene	mg/kg	0.03	As Received	No	Yes	Yes
DETSC 3303	Benzo(b)fluoranthene	mg/kg	0.03	As Received	No	Yes	Yes
DETSC 3303	Benzo(k)fluoranthene	mg/kg	0.03	As Received	No	Yes	Yes
DETSC 3303	Benzo(g,h,i)perylene	mg/kg	0.03	As Received	No	Yes	Yes
DETSC 3303	Dibenzo(a,h)anthracene	mg/kg	0.03	As Received	No	Yes	Yes
DETSC 3303	Fluoranthene	mg/kg	0.03	As Received	No	Yes	Yes
DETSC 3303	Indeno(1,2,3-c,d)pyrene	mg/kg	0.03	As Received	No	Yes	Yes
DETSC 3303	Naphthalene	mg/kg	0.03	As Received	No	Yes	Yes
DETSC 3303	Phenanthrene	mg/kg	0.03	As Received	No	Yes	Yes
DETSC 3303	Pyrene	mg/kg	0.03	As Received	No	Yes	Yes
DETSC 3303	Anthracene	mg/kg	0.03	As Received	No	Yes	No
DETSC 3303	Chrysene	mg/kg	0.03	As Received	No	Yes	No
DETSC 3303	Fluorene	mg/kg	0.03	As Received	No	Yes	No

ANNEX F
Plasticity Test Results



Laboratory Report



Contract Number: 19929

Client's Reference: 12226b

Report Date: 05-07-2013

Client Name: Terrafirma Wales Ltd
5 Deryn Court,
Wharfedale Road,
Pentwyn,
Cardiff,
CF23 7HB

Contract Title: Chigmore
For the attention of: Ruth Liley

Date Received: 24-06-2013
Date Commenced: 24-06-2013
Date Completed: 05-07-2013

Test Description	Quantity	Checked	Approved
Moisture Content 1377 : 1990 Part 2 : 3.2 *	3		
4 Point Liquid & Plastic Limit (LL/PL) Part 2 : 4.3 & 5.3 *	3		

Notes: **Observations and Interpretations are outside the UKAS Accreditation**
* - Denotes test included in laboratory scope of accreditation
- Denotes test carried out by approved contractor

This certificate is issued in accordance with the accreditation requirements of the United Kingdom Accreditation Service. The results reported herein relate only to the material supplied to the laboratory. This certificate shall not be reproduced in full, without the prior written approval of the laboratory.

Approved Signatories:

Paul Evans (Quality Manager), Emma Williams (Office Manager),
Benjamin Sharp (Laboratory Coordinator), Alex Wynn (Business Development Manager).

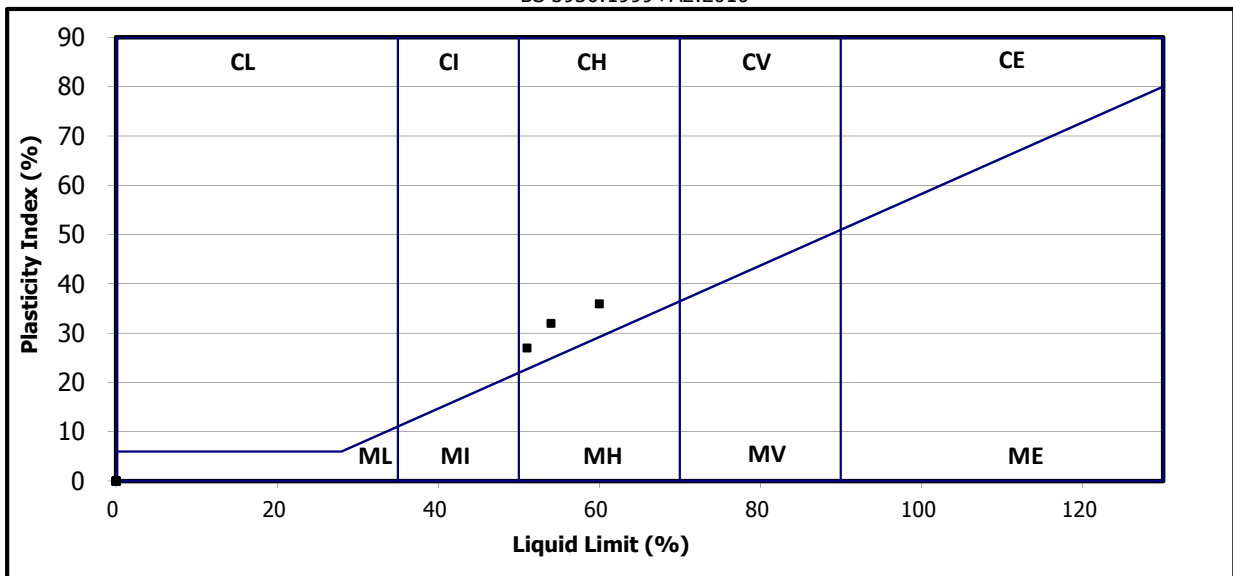
**Test Report: Method of the Determination of the plastic limit and plasticity index
BS 1377 : Part 2 : 1990 Method 5**

Client ref: 12226b
Location: Chigmore
Contract Number: 19929-240613

Hole/ Sample Number	Sample Type	Depth m	Moisture Content % Cl. 3.2	Liquid Limit % Cl. 4.3/4.4	Plastic Limit % Cl. 5.	Plasticity Index % Cl. 6.	% Passing .425mm	Remarks
TP1	D	1.80	25	60	24	36	96	CH High Plasticity
TP2	D	1.00	22	51	24	27	93	CH High Plasticity
TP5	D	1.70	27	54	22	32	93	CH High Plasticity

Symbols: NP : Non Plastic # : Liquid Limit and Plastic Limit Wet Sieved
PLASTICITY CHART FOR CASAGRANDE CLASSIFICATION.

BS 5930:1999+A2:2010



[Signature]
Checked By

[Signature]
Approved By:

Date Approved: 11.7.13





Drawing Number
01

Drawing Title
SITE LAYOUT

Job Number
12226B

Job Title
**CRUGMORE FARM
PENPARC
CARDIGAN**

NOT TO SCALE

