



Renewable Energy Systems Limited

Mynydd Maen Wind Farm

Phase 2 Site Investigation - Coal Mining Risk Assessment

315198-R02 (03)

RSK GENERAL NOTES

Project No.: 315198

Title: Phase 2 Site Investigation - Coal Mining Risk Assessment: Mynydd Maen Wind Farm, Cwmbran NP11 5AY

Client: Renewable Energy Systems Limited

Date: September 2023

Office: RSK Environment Limited, The Old School House, Stillhouse Lane, Bedminster, Bristol, BS3 4EB. Tel 0117 947 1006

Status: Report R02 Rev 03

Author Rachael Lockyer

Signature 

Technical reviewer Gary McGuicken

Signature 

Project manager James Bloore

Signature 

Quality reviewer Ang Wallis

Signature 

Revision control sheet				
Revision ref.	Date	Reason for revision	Amended by:	Approved by:
Rev 00	22/05/23	First issue	n/a	see above
Rev 01	18/08/23	Updated drawings	RL	See above
Rev 02	11/09/23	Updated drawing	RL	See above
Rev 03	04/06/24	Updated drawing	RL	See above

RSK Environment Limited (RSK) has prepared this report for the sole use of the client, showing reasonable skill and care, for the intended purposes as stated in the agreement under which this work was completed. The report may not be relied upon by any other party without the express agreement of the client and RSK. No other warranty, expressed or implied, is made as to the professional advice included in this report.

Where any data supplied by the client or from other sources have been used, it has been assumed that the information is correct. No responsibility can be accepted by RSK for inaccuracies in the data supplied by any other party. The conclusions and recommendations in this report are based on the assumption that all relevant information has been supplied by those bodies from whom it was requested.

This work has been undertaken in accordance with the quality management system of RSK Environment Ltd. No part of this report may be copied or duplicated without the express permission of RSK and the party for whom it was prepared.

Where field investigations have been carried out, these have been restricted to a level of detail required to achieve the stated objectives of the work.

CONTENTS

EXECUTIVE SUMMARY	1
1 INTRODUCTION	3
1.1 Commissioning	3
1.2 Objectives	3
1.3 Scope of works	3
1.4 Existing reports	3
1.5 Limitations	4
2 SITE DETAILS	5
2.1 Site location.....	5
2.2 Site description	5
2.3 Surrounding land uses	5
2.4 Development plans	5
2.5 Summary of previous investigations	6
3 SITE INVESTIGATION STRATEGY & METHODOLOGY	7
3.1 Introduction	7
3.2 Objectives	7
3.3 Selection of investigation methods	7
3.4 Investigation strategy	7
4 SITE INVESTIGATION FACTUAL FINDINGS	9
4.1 Ground conditions encountered.....	9
4.2 Groundwater and surface water	10
4.3 Coal Mining Hazards.....	10
5 CONCLUSIONS AND RECOMMENDATIONS	11
5.1 Coal Mining Risk Assessment	11
5.2 Recommendations	11
REFERENCES	12

FIGURES

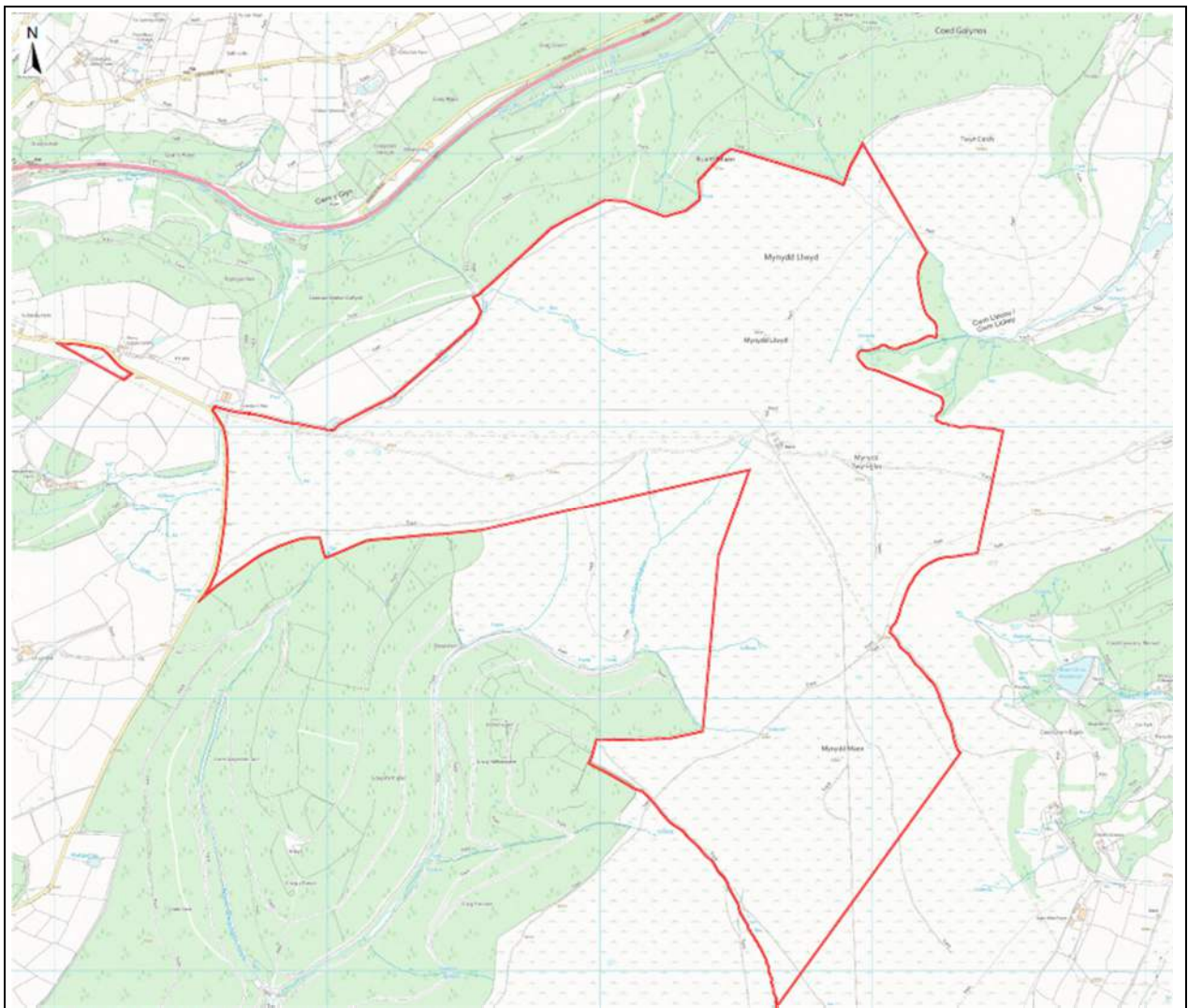
Figure 1	Site location plan
Figure 2	Site layout plan
Figure 3	Exploratory hole location plan

APPENDICES

Appendix A	Service constraints
Appendix B	Development drawings
Appendix C	Utility service plans
Appendix D	Photographs
Appendix E	Technical background
Appendix F	Exploratory hole records

EXECUTIVE SUMMARY

Commissioning and purpose of assessment	RSK Environment Limited (RSK) was commissioned by Renewable Energy Systems Limited to carry out a Phase 2 Site Investigation - Coal Mining Risk Assessment of the land at Mynydd Maen Wind Farm, Cwmbran, NP11 5AY, grid reference ST 25754, 97735. The overall aim of this work was to assess potential coal mining risks identified in an earlier phase of work.
DESK-BASED ASSESSMENT	
Site description and proposed development	The site currently comprises of rough moorland and covers approximately 2000 hectares. The proposed development is a wind farm.
Previous site investigation (SI) reports	In March 2023, RSK undertook a desk based CMRA for Mynydd Maen based on the available data at that time. The site specific coal mining risk which required further assessment (by subsequent intrusive investigation the findings of which are presented in this report) included the possible presence of shallow underground workings in the Mynyddislwyn coal seam.
Geology and environmental setting	The site is underlain by peat, over the Hughes member sandstone according to published geological data. Records from the Coal Authority indicate the potential presence of 4 shallow coal seams across the site including the Tillery Rider No.2, Mynyddislwyn Lower Leaf, Cefn Glas and Brithdir coal seam.
INTRUSIVE INVESTIGATION & ASSESSMENT	
SI scope	Four rotary open hole boreholes and four trial pits at each of four proposed turbine locations (T3, T7, T8 and T11).
SI factual findings	The site is underlain by a layer of peat (between 0.20m to 0.6m thick) over varying amounts of clay, sands and gravels with sandstone bedrock encountered at 1.0m to 2.1m bgl. Generally groundwater was not encountered except for a small seepage found in trial pit T3(RO) at 0.6mbgl. No evidence of coal seams or workings were recorded in any of the exploratory holes.
Coal Mining Risk Assessment	Based on the exploratory findings, it is considered that there is a low or negligible risk from coal mining related hazards at the assessment site, which will have little or no effect on the proposed development.
Recommendations including issues for further assessment	No further investigation or remediation with regards to coal mining hazards is required at the assessment site.
<i>The information given in this summary is necessarily incomplete and is provided for initial briefing purposes only. The summary must not be used as a substitute for the full text of the report.</i>	



Site Name	Mynydd Maen Wind Farm	NGR	ST 25754, 97735
Site Address	Cwmbran NP11 5AY	Site area (ha.)	366

1 INTRODUCTION

1.1 Commissioning

RSK Environment Limited (RSK) was commissioned by Renewable Energy Systems Limited to carry out a Phase 2 Site Investigation - Coal Mining Risk Assessment of the land at Mynydd Maen Wind Farm, Cwmbran NP11 5AY. The project was carried out to an agreed brief as set out in RSK's proposal (reference T315198, dated 20 January 2023). This commission follows an earlier, desk-based assessment completed by RSK and presented in RSK report, Mynydd Maen Wind Farm Coal Mining Risk Assessment, document reference 315198 R01 (02), dated March 2023.

The work is subject to RSK's Service Constraints, which are included in **Appendix A**.

The site in question is being considered for development for commercial use as a wind farm.

1.2 Objectives

The objective of the work is to assess the risk of the presence of potential shallow historical coal workings, identified in the desk based study undertaken by RSK in early March 2023 (Coal Mining Risk Assessment Report ref 315198 R01), at proposed wind turbine locations T3, T7, T8 and T11.

1.3 Scope of works

The scope of this assessment has been developed in accordance with relevant British Standards and authoritative technical guidance as referenced through the report. It is also compliant with relevant planning policy and guidance.

The scope of the intrusive investigation has been designed in line with the recommendations of BS5930:2015+A1:2020 Code of practice for ground investigations (BSI, 2020), which maintains compliance with BS EN 1997-1 and 1997-2 and their related standards. It has also been developed in general accordance with BS 10175: 2011 + A2 2017.

The scope of works for the assessment has included the following:

Intrusive investigation

- design and implementation of an intrusive investigation
- interpretation of ground conditions to develop an updated risk level from coal mining
- preparation of this interpretative report.

1.4 Existing reports

The following reports detailing previous works at the site were made available for review:

- RSK report, Mynydd Maen Wind Farm Coal Mining Risk Assessment 315198 R01 (02), March 2023 (NB this included review of an earlier report carried out by Geoinvestigate Limited "Coal Mining Risk Assessment (CMRA), Mynydd Maen Wind

Farm, Torfaen, between Newbridge and Cwmbran NP4 6US. 13 November 2020.
Project ID4412, Ref. G20374")

Pertinent information from these reports has been summarised in Section 2.

1.5 Limitations

This report is subject to the RSK Service Constraints given in **Appendix A** and limitations that may be described through this document.

2 SITE DETAILS

2.1 Site location

Site location details are presented in Table 1 and a site location plan is provided on Figure 1.

Table 1 Site location details

Site name	Mynydd Maen Wind Farm
Full site address and post code	Mynydd Maen, Cwmbran NP11 5AY
National Grid reference (approximate centre of site)	ST 25754, 97735

2.2 Site description

The site is located between Newbridge and Cwmbran, south of the A472 highway. The site covers an area of approximately 366 hectares comprising rough open moorland and trackways, surrounded by a variety of woodlands and valleys. There are a number of significant watercourses running through the open moorland.

An existing telecoms mast is located roughly in the centre of site at 325660, 197923, and a number of underground services cross through the development area.

The site boundary and current layout are presented in **Figure 2**.

2.3 Surrounding land uses

The site is located on the moorland above Cwmbran. Immediate surrounding land uses are described in Table 2.

Table 2 Surrounding land uses

North	A472 road and the Tirpentwys nature reserve beyond
East	Pontypool and Cwmbran
South	Moorland, agricultural land, Cwmcarn forest
West	Fields, agricultural land, Cwmcarn forest, Newbridge and Abercarn

2.4 Development plans

The proposed layout of the site, at the time of preparing this report, is shown in **Appendix B**.

The proposed development is understood to be a wind farm comprised of up to 13 turbines, a substation and associated trackways.

2.5 Summary of previous investigations

A summary of pertinent information from previous investigations is included in Table 3.

Table 3 Summary of previous investigation reports

Report Details	RSK, 315198 R01 (02), Coal Mining Risk Assessment: Mynydd Maen Wind Farm, March 2023.
Site coverage	Entire site.
Summary scope of works	Desk based assessment of available coal mining records (including Geoinvestigate CMRA report from November 2020).
Key findings	<p>There are underground workings in a number of coal and one ironstone seams beneath the site between 171m and 627m depth.</p> <p>There are 4 coal seams at potentially shallow depth beneath parts of the site including the Tillery Rider No.2, Mynyddislwyn Lower Leaf, Cefn Glas and Brithdir coal seam. Four proposed turbines (T3, T7, T8 and T11) are located in the vicinity of the Mynyddislwyn coal seam. Although records indicate that unrecorded shallow workings (<30m) are not probable directly beneath site, the Coal Authority have indicated on their interactive viewer that parts of site are considered development high risk based on coal seam outcrops and have the potential to have been worked.</p> <p>A number of shafts are recorded around the perimeter of site, the nearest being over 300m to the north east of proposed turbine 1. Given that no entries are present in the vicinity of development, no further consideration of these features is required.</p> <p>There are a number of geological faults recorded beneath or close to the site. They are generally of limited extent and not thought to have resulted in significant structural movement.</p> <p>Given the significant depth of workings, the lack of any known potential direct migration pathway and the proposed form of development, the risk posed by mine gases is considered negligible.</p> <p>The potential presence of shallow workings in the Mynyddislwyn coal seam at the four proposed turbine locations is the only identified risk that requires further assessment.</p>

3 SITE INVESTIGATION STRATEGY & METHODOLOGY

3.1 Introduction

RSK carried out intrusive investigation works between 6 and 14 March 2023.

3.2 Objectives

The specific objective of the investigation was to establish the ground conditions and assess the identified risk from coal shallow coal workings at the four proposed turbine locations (T3, T7, T8 and T11).

3.3 Selection of investigation methods

The techniques adopted for the investigation were chosen with consideration of the objectives and site constraints, which are described below.

Mechanically excavated trial pits were chosen to allow for rapid assessment of shallow ground conditions where coal was suspected to occur near surface in the vicinity of certain turbine locations. Rotary open hole drilling was conducted following the initial trial pitting exercise in search for evidence of historical shallow mine workings in coal seams beneath the site (such as coal arisings, broken ground or voids), drilling was completed to a maximum depth of 20m bgl.

Prior to conducting intrusive works, utility service plans were obtained and buried service clearance undertaken in line with RSK's health and safety procedures. Copies of statutory service records obtained by RSK as part of the agreed scope of works are contained in **Appendix C**.

3.4 Investigation strategy

The ground investigation was carried out using intrusive ground investigation techniques in general accordance with the recommendations of BS5930:2015+A1:2020, which maintains compliance with BS EN 1997-1 and 1997-2 and their related standards. Whilst every attempt was made to record full details of the strata encountered in the boreholes, techniques of hole formation will inevitably lead to disturbance, mixing or loss of material in some soils and rocks.

The investigation strategy involved targeted boreholes and trial pits following the results of a desk based report undertaken by RSK in March 2023. The report identified that four proposed turbines (T3, T7, T8 and T11) are located in the vicinity of the Mynyddislwyn coal seam and could potentially be at risk from coal mining related hazards.

The constraints to the investigation were as follows:

- overhead and underground services
- boggy terrain
- large distances between exploratory locations

- access issues during extreme weather conditions (snow and strong winds)

Details of the investigation locations and rationale are presented in Table 4. Machine excavated trial pits were dug at each of the four proposed turbine locations (T3, T7, T8 and T11) to a maximum depth of 2.50m bgl before being backfilled with arisings. Four rotary open holes were drilled at each of the four turbine locations to a maximum depth of 20m bgl before being backfilled with bentonite. An exploratory hole location plan is shown on **Figure 3**.

Table 4 Exploratory hole and monitoring well location rationale

Investigation type	Number	Location – investigation method	Rationale
Trial-pits excavated by mechanical excavator	4	T3 - TP T7 - TP T8 - TP T11 - TP	To investigate shallow ground conditions beneath proposed turbine locations T3, T7, T8 and T11.
Boreholes by rotary open hole	4	T3 - RO T7 - RO T8 - RO T11 - RO	To prove or disprove the presence of shallow mine workings beneath proposed turbine locations T3, T7, T8 and T11.
T3 etc denotes turbine location and reference number, TP denotes mechanically excavated trial pit, RO denotes rotary open hole borehole			

3.4.1 Implementation of investigation works

The site investigation works were carried out in general accordance with the UK Specification for Ground Investigation (UKSGI), third edition (AGS, 2022).

The exploratory holes were logged by an engineer in general accordance with the recommendations of BS5930:2015+A1:2020 (which incorporates the requirements of BS EN ISO 14688-1, 14688-2 and 14689-1).

4 SITE INVESTIGATION FACTUAL FINDINGS

The results of the intrusive investigation undertaken are detailed below.

4.1 Ground conditions encountered

The descriptions of the strata encountered, notes regarding visual or olfactory evidence of contamination and field observations of soil and groundwater are included on the exploratory hole records presented in **Appendix F**.

At all trial pit and borehole locations the same sequence of lithologies were recorded which varied slightly in thickness. The exploratory holes revealed that the site is underlain by a layer of peat over varying amounts of clay, sands and gravels with sandstone bedrock encountered at relatively shallow depths.

For the purpose of discussion, the ground conditions encountered during the fieldworks are summarised in Table 5 with the strata discussed in subsequent subsections.

Table 5 General succession of strata encountered

Stratum	Exploratory holes encountered	Depth to top of stratum m bgl	Proven thickness (m)
Peat	All four trial pits All four boreholes	0.0	0.20 - 0.60
Clay/ sand/ gravel	All four trial pits All four boreholes	0.20 – 0.60	0.65 - 1.80
Sandstone bedrock (believed to be the Hughes member of the Pennant Sandstone Formation)	All four trial pits All four boreholes	1.00 - 2.10	18.60 - 19.00

4.1.1 Peat

Peat was encountered at all locations directly beneath the grass or moss at surface up to a depth of between 0.20m and 0.60m bgl. The peat was generally black in colour, amorphous, sandy or clayey, plastic or spongy and often contained rootlets.

4.1.2 Variable cohesive and granular unit

This stratum was encountered at all locations at a depth of between 0.20m and 0.6m below ground level and varied between 0.65m and 1.8m in thickness. Cohesive layers were generally orange brown slightly sandy gravelly clay. Granular layers were comprised of primarily sand or gravel with varying amounts of secondary components including clay, silt, sand or gravel. All gravel observed was comprised of sandstone.

4.1.3 Hughes Member of the Pennant Sandstone Formation

Bedrock (believed to represent the Hughes member of the Pennant Sandstone Formation) was encountered at all locations at a depth of between 1.00m and 2.10m below ground level and comprised of grey fine to coarse sandstone. The layer of sandstone had a minimum thickness of 18.6m.

4.2 Groundwater and surface water

4.2.1 Groundwater encountered during intrusive works

Groundwater was not encountered during the investigation works. A seepage of perched groundwater was encountered at the base of the peat in borehole T3 (RO) at 0.60 mbgl.

4.3 Coal Mining Hazards

Ground conditions which may be evidence of possible shallow underground coal mining, such as; intact coal seams; voids; broken or highly fractured ground; soft or backfilled materials within bedrock; or rapid drilling progress or unexpected loss of drilling flush, were **not** encountered in any of the exploratory boreholes.

In summary the boreholes recorded intact sandstone bedrock throughout and there was no evidence of any underground coal mining to the full depths of drilling.

5 CONCLUSIONS AND RECOMMENDATIONS

5.1 Coal Mining Risk Assessment

The investigation has **not** encountered **any** evidence of shallow coal seams or unrecorded shallow workings beneath site up to a maximum depth of 20m bgl in all exploratory locations.

Adequate minimum rock cover (18m to 19m) has been proved in turbine locations T3, T7, T8 and T11; should as a worst case, the seam be present immediately below the base of the borehole.

Based on the above findings, there is a **low or negligible risk** from coal mining related hazards at the assessment site and will have little/no effect on the proposed development.

5.2 Recommendations

No further investigation or remediation with regards to coal mining hazards is required at the assessment site.

REFERENCES

Previous SI reports and other site related information

RSK, 315198 R01 (02), Coal Mining Risk Assessment: Mynydd Maen Wind Farm, March 2023.

OR

Standards and guidance

AGS (2021a), 'Assessment and Control of Asbestos Risk in Soil- Part 1: Protection of personnel working on Ground Investigations'.

AGS (May 2021b), 'Assessment and Control of Asbestos Risk in Soil- Part 2: Protection of Personnel working in Geotechnical and Geoenvironmental Laboratories.

AGS (2022), UK Specification for Ground Investigation (UKSGI), third edition, 2022.

Baker, K., Hayward, H., Potter, L., Bradley, D. and McLeod, C. (2009), CIRIA Report C682. The VOCs Handbook. Investigating, assessing and managing risks from inhalation of VOCs at land affected by contamination.

Boyle, R. A. and Witherington, P. J. (2007), 'Guidance on Evaluation of Development Proposals on Sites where Methane and Carbon Dioxide are Present', National House-Building Council and RSK Group.

BRE (2015). Radon – Guidance on protective measures for new buildings, Chris Scivyer, BRE Report BRE 211. BRE Group, 2015.

British Standards Institution (BSI) (1990), 'BS 1377:1990. Methods of test for soils for civil engineering purposes'.

British Standards Institution (BSI) (2020), 'BS 5930:2015+A1:2020. Code of practice for ground investigations'.

British Standard Institution (BSI) (2019), 'BS 8485:2015+A1:2019. Code of practice for the design of protective measures for methane and carbon dioxide ground gases for new buildings'.

British Standards Institution (BSI) (2017), 'BS 10175:2011 + A2:2017. Investigation of potentially contaminated sites: Code of practice'.

British Standards Institution (BSI) (2013), BS8576:2013. Guidance on investigations for ground gas – permanent gases and volatile organic compounds (VOCs).

Building Research Establishment (2005), BRE Special Digest 1: Concrete in aggressive ground.

Card G, Wilson S, Mortimer S, (2012). A Pragmatic Approach to Ground Gas Risk Assessment. CL:AIRE Research Bulletin RB17. CL:AIRE, London, UK. ISSN 2047- 6450 (Online).

Chartered Institute of Environmental Health (CIEH), (2008), The Local Authority Guide to Ground Gas. Wilson, Card and Haines, September 2008.

CIRIA (2014). Good practice on the testing and verification of protection systems for buildings against hazardous ground gases.

CL:AIRE (2021), Good practice for risk assessment for coal mine gas emissions. CL:AIRE, November 2021.

The Contaminated Land Regulations (England) 2006, <https://www.legislation.gov.uk/> .

The Contaminated Land (England) (Amendment) Regulations 2012,
<https://www.legislation.gov.uk/>

Defra (2012), Part IIA of the Environmental Protection Act 1990, Contaminated Land Statutory Guidance, April 2012.

Environment Agency (2021a), Land contamination risk management,
<https://www.gov.uk/government/publications/land-contamination-risk-management-lcrm>,
April 2021.

Environment Agency (2021b), 'Technical Guidance WM3. Guidance on the classification of and assessment of waste, 1st Edition, v.1.2, October 2021.

National House Building Council (NHBC) (2016), Technical Extra, April 2016.

Norbury, D. (2010), Soil and Rock Description in Engineering Practice.

Part IIA of the Environmental Protection Act (Contaminated Land Regulations (England)) 2002.

Rudland, D. J., Lancefield, R. M. and Mayell, P. N. (2001), CIRIA C552. Contaminated Land Risk Assessment: A Guide to Good Practice.

SoBRA (2022), Guidance on Assessing Risk to Controlled Waters from UK Land Contamination Under Conditions of Future Climate Change, Version 1.0, August 2022.

Stone, K., Murray, A., Cooke, S., Foran, J., Gooderham, L., (2009) CIRIA C681, Unexploded Ordnance (UXO). A guide for the construction industry.

Transport and Road Research Laboratory, (1970), 'TRRL Road Note 29 (Appendix 1). Road pavement design'.

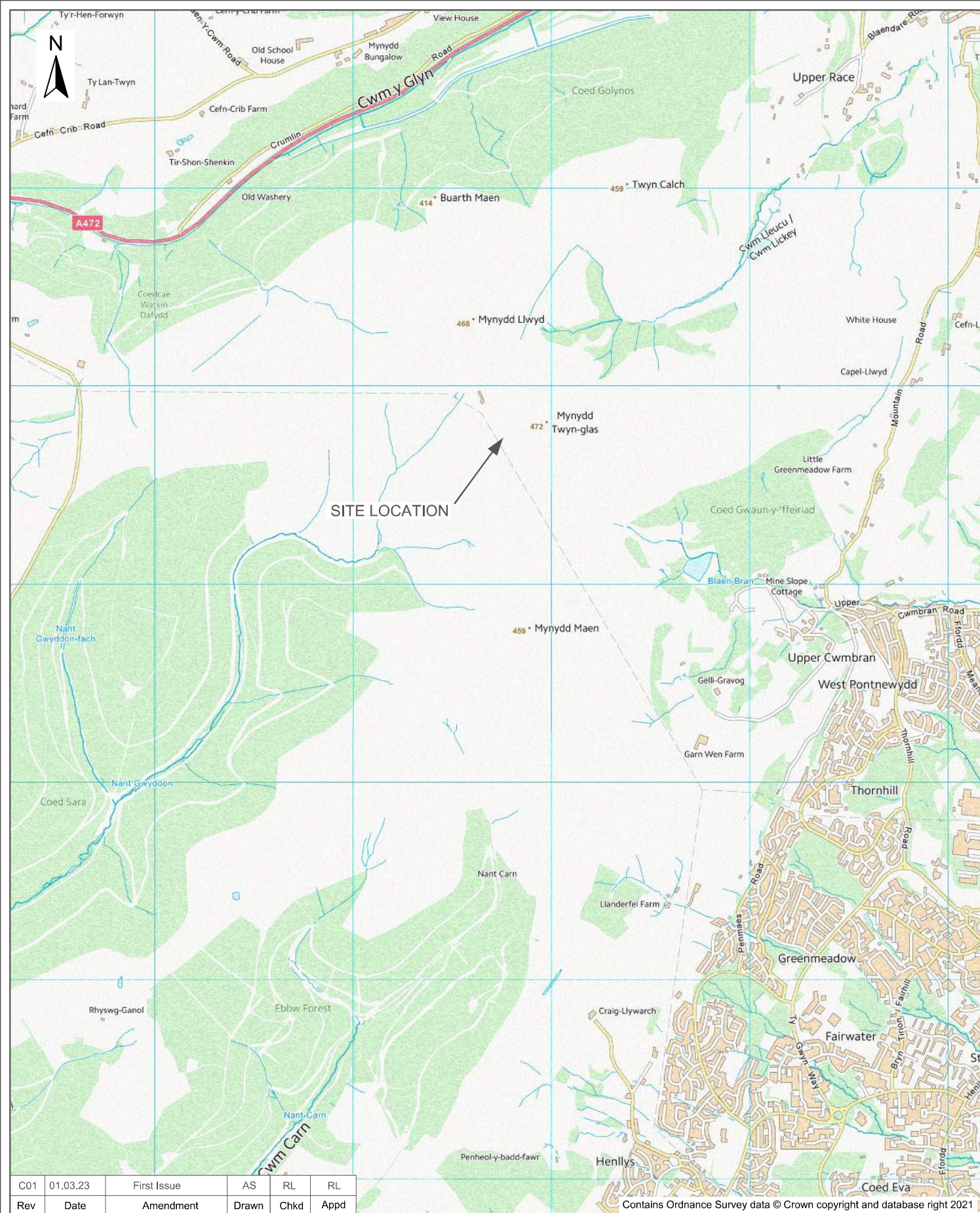
Transport and Road Research Laboratory (1984), 'TRRL Report LR1132 (Table C1)'.

UK Health Security Agency & British Geological Survey (2022), UK Radon Affected Area Map. Accessed from: www.ukradon.org/information/maps.

UK Water Industry Research, (2010), UKWIR Report 10/WM/03/21. Guidance for the Selection of Water Supply Pipes to be used in Brownfield Sites.

FIGURES

FIGURE 1 SITE LOCATION PLAN



C01	01.03.23	First Issue	AS	RL	RL
Rev	Date	Amendment	Drawn	Chkd	Appd

Contains Ordnance Survey data © Crown copyright and database right 2021



RSK
GEOSCIENCES

The Old School
Stillhouse Lane
Bristol
BS3 4EB

Tel: +44(0)1414 180471
Email: info@rsk.co.uk
Web: www.rsk.co.uk

Client

Renewable Energy Systems Limited

Project Name

Mynydd Maen Wind Farm

Description

Site Location Plan

Dimension m	Size A4	Scale 1:25,000	Geolocation 325754,197735	Project ID 315198	Drawing no. 11101	Rev C01	File name 315198-BL-111-SS-D-C-11101-C01
----------------	------------	-------------------	------------------------------	----------------------	----------------------	------------	---

FIGURE 2 SITE LAYOUT PLAN

T1

TR

WA

TU

HA

SU

TE

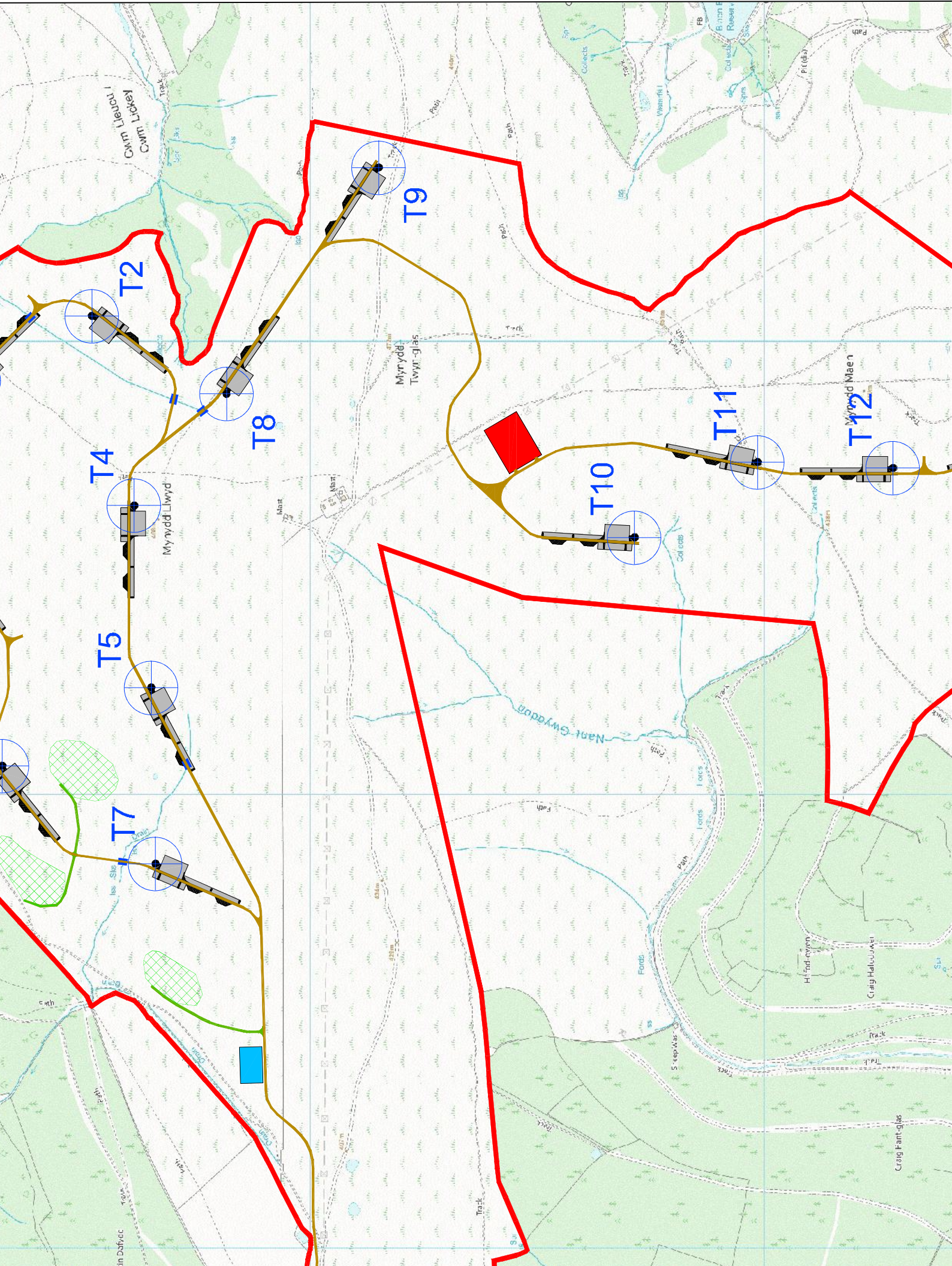
CO

BO

NOTES:

1. PLANNI
FROM C

ISSUE	DATE	BY	FOR	REMARKS
4	JM	M		
3	JM	M		
2	JM	M		
1	JL	M		
PURPOSE		PLAN	SCALE	LAYOUT DRAW
			1:1	
PROJECT TITLE		DRAWING TITLE		



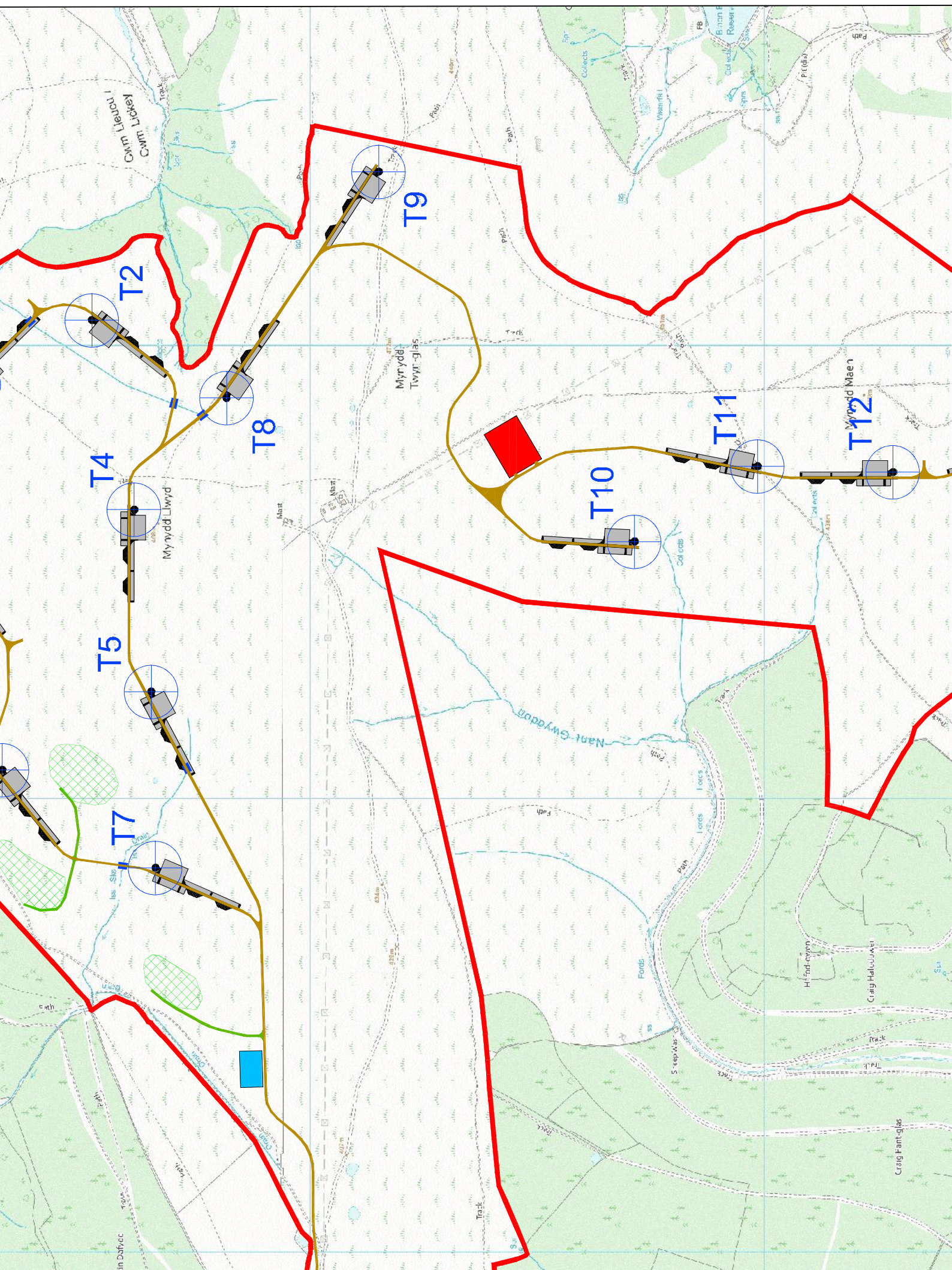


FIGURE 3 EXPLORATORY HOLE LOCATION PLAN



Notes:

Contains google

C01	18.08.2	Date
Rev		



The Oil
Stillhouse
Bristol
BS3 4E

Client

Renew

Project Name

Mynydd

Description

Explor