# **Appendix C**

Cornwall Consultants Ltd., Regulated Mining Search: Metalliferous Minerals, 28 October 2019

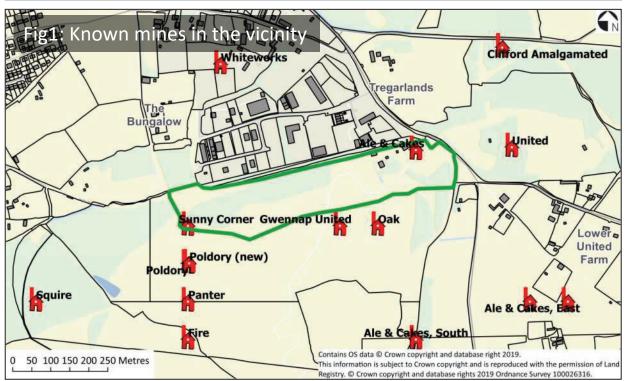


# Regulated Mining Search: METALLIFEROUS MINERALS





Duonoutu Adduoss	A-Ddharn Mining Study	
Property Address		TR16 5HY
National Grid Reference	174433	41294
Client & Client Ref	Ove Arup & Partners International Ltd	FAO: Lee Taylor
Report Reference & Date	JW/CMS/129120	28 October 2019



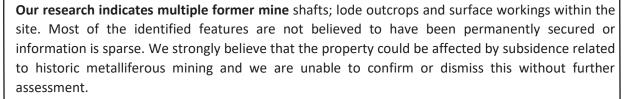
Risk Rating:

**HIGH** - Further Action

**Next Steps:** 

# MINING INVESTIGATION

### PROFESSIONAL OPINION



Several stages or additional appraisal are recommended below. Please contact Cornwall Consultants Limited for further information.





Cornwall TR15 2TT. Registered in England & Wales. Registered Number: 4578850 Coach Lane, Redruth, egistered Office: Parc Ven House,





This Mining Search provides an assessment of the subsidence risk presented to the property from historic metalliferous mining. The report findings are based on factual information from maps, plans and records in Cornwall Consultants Ltd private archive, the results of relevant on-site investigations, as well as commercially available datasets. This information has been interpreted by experts to reasonably predict the existence; location and likelihood of unrecorded mine workings.

### The Findings

The property is situated within an area of extensive historic metalliferous mining activity. It occupies the northern section of the former United Mines lease area. United Mines was an amalgamation of multiple earlier mines the centres of which are approximately indicated by Figure 1. However, the United Mines operational area incorporated all of these, utilising underground workings and obliterating many surface features. As a result, many early surface maps of the older mines are difficult to locate, and many indicated shafts are represented more than once. Where possible we have identified the less likely shaft positions by a grey square (termed 'doubtful').

Extensive underground workings exist beneath the entire site, most at sufficient depth not to present a direct risk of subsidence to surface. The surface of the site is entirely covered by a deposit of raw/partly processed mine waste (mixed rock debris) of variable thickness. Both the underground workings and surface mine waste have been omitted from our attached plans for clarity.

Figure 2 presents the layout of the major lode structures at surface outcrop (subcrop beneath the mine waste); surface workings on these lodes; shafts; adit (drainage) tunnels and other geological structures.

Our records indicate that approximately 60 shafts associated with the former United Mines lie within or on the boundary of the property (Figure 3). It appears that a very small number of these (less than 5) were assessed and treated as part of Operation Minecap in the early 1980's, although others may have been subjected to some form of independent treatment since then. We assume that any shafts for which we do not hold records of remediation remain untreated. Most mine shafts in the South West remain unsecured and cannot be considered to be in a stable state.

While our research has indicated early surface workings on many of the mineral lode outcrops, many further such workings are likely to exist. Unrecorded mine workings may exist on lode outcrops and these can cause subsidence problems, particularly if they connect to underground voids.

The eastern half of the property lies within the Mount Wellington, United Downs and Wheal Maid Mines Mineral Safeguarding Area containing designated metalliferous minerals and/or strategic mine entries. It also lies within the Francis Engine Shaft Mineral Safeguarding Area containing a designated strategic mine entry. Further information can be obtained from the relevant Mineral Planning Authority, if required.

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### The Risk

Based on a detailed search and expert interpretation of our mining records archive we believe the risk to the property from subsidence relating to past extractive metalliferous mining is:

### **HIGH** - Further Action

Our research indicates multiple former mine shafts; lode outcrops and surface workings within the site. Most of the identified features are not believed to have been permanently secured or information is sparse. We strongly believe that the property could be affected by subsidence related to historic metalliferous mining and we are unable to confirm or dismiss this without further assessment.

### The Next Steps

To further assess the risks to this property we recommend the following course of action:

## MINING INVESTIGATION

In the first instance enquiries should be made with the site owner to find out if any identified mining features have been professionally investigated and secured.

Following this, a site meeting should be arranged to discuss the prosed site use and the potential impact of the residual mining risks. A walkover survey should be undertaken by a mining consultant at this time in order to provide additional information on exposed mining features and to aid the design of on-site investigations.

An intrusive on-site Mining Investigation will be required to fully assess the risks presented by the indicated shafts; mineral lodes and surface workings. It is recommended borehole drilling or slot trenching be constantly supervised by an experienced mining consultant. Geophysical survey may also be applied to appraise these areas between the indicated features and any hotspots should be further investigated.

Finally, engineering solutions should be considered for each of the confirmed mining threats within the site in the context of the proposed development and a risk management plan adopted to safeguard the future use of the site.

Cornwall Consultants Limited can assist with each of the above recommended actions.

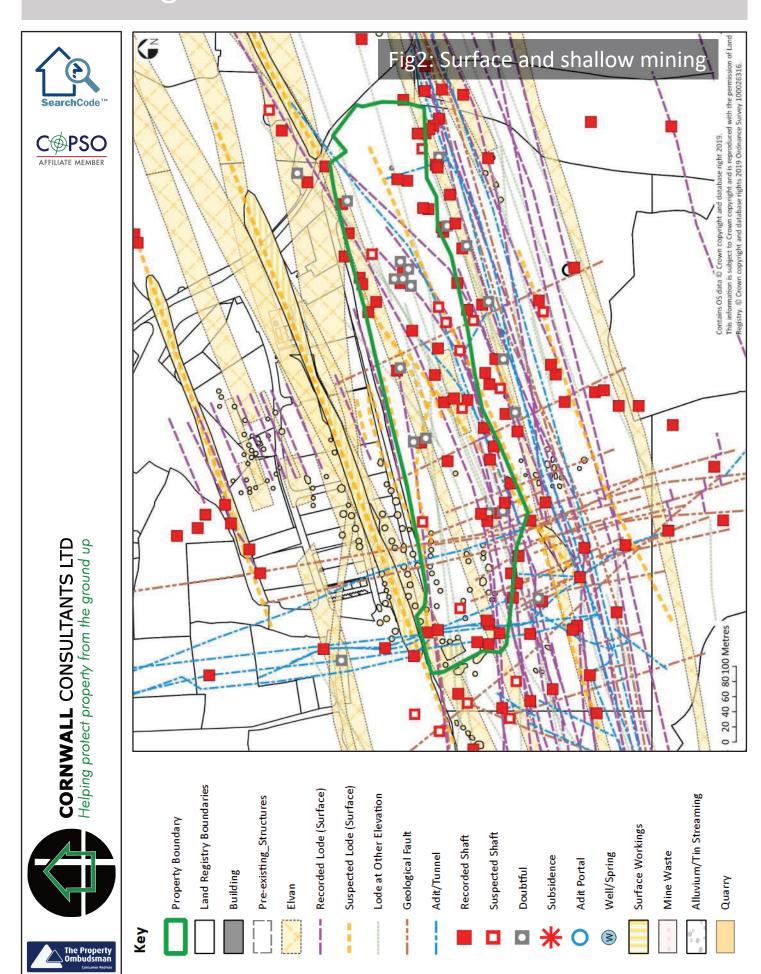






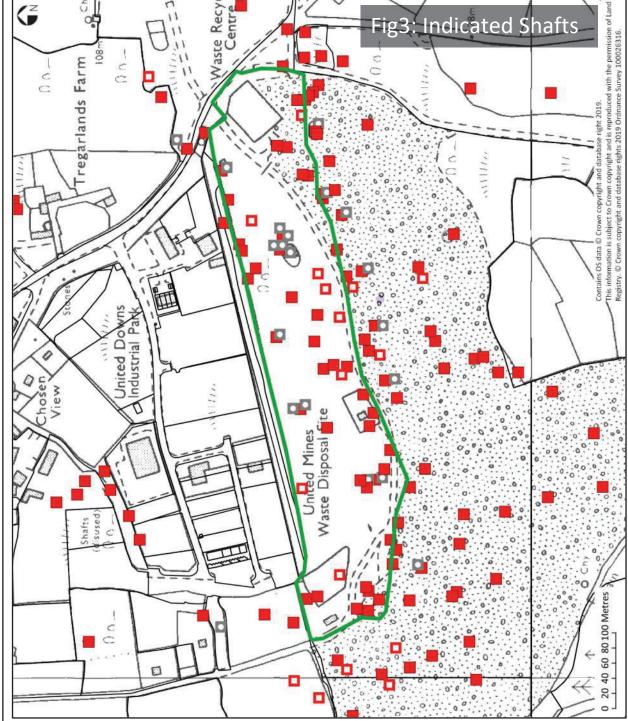
If further information is required regarding the potential for future mineral extraction, we recommend enquiries be pursued with the local Mineral Planning Authority and /or the operator as applicable.

If further assessment has been recommended or you would just like to discuss the findings of this report, we would be happy to assist by phone on 01209 313511 or by email to <a href="mining@cornwallconsultants.co.uk">mining@cornwallconsultants.co.uk</a> or at a site meeting as required. Further explanation of the mining search process can be found on the attached information sheet and our website <a href="www.cornwallconsultants.co.uk">www.cornwallconsultants.co.uk</a>.













Key

Property Boundary

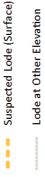




Pre-existing\_Structures











Geological Fault



Adit/Tunnel



Recorded Shaft



Suspected Shaft



Doubtful



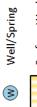
Subsidence



Adit Portal









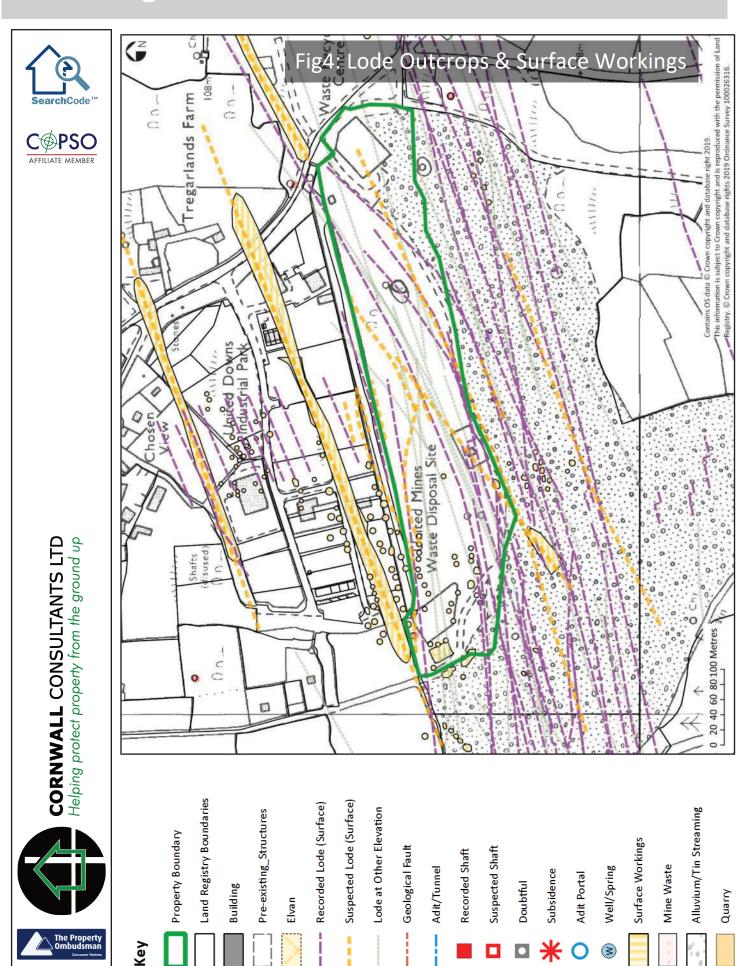




Alluvium/Tin Streaming



Quarry







### Geology

Metallic mineralisation in the South West mainly occurs in lodes (veins), which are sheet-like structures occupying former fissures in the bedrock. Lodes are typically about 1 metre (m) wide but some reach 5m or more and are either vertical or inclined at steep angles. Mineral lodes containing tin, copper and other metalliferous minerals typically course in an east-northeast to west-southwest direction, while those containing lead and silver often course approximately north to south. Localised variations can occur, and lodes are also affected by other geological structures, such as crosscourses (geological faults) and elvan dykes (wide, planar igneous intrusions that are occasionally mineralised).

### Mining Methods & History

The extraction of metalliferous minerals in the South West has taken place for thousands of years, throughout which shallow prospecting was widespread. This involved excavating costean (trial) pits in order to discover mineral lodes, often in areas where earlier tin-streaming had taken place. Once discovered, lodes were often mined by openworks (linear excavations) along the lode outcrop and later by means of shafts, adits (drainage tunnels) and levels (tunnels) driven away from the shafts. The ore was extracted from between the levels to leave stopes (narrow chasms). By the 19th century steam pumping engines enabled the workings to be deepened. During the tin and copper mining heyday, in the 18th and 19th centuries, the South West was one of the most productive mining regions in the world with over 2000 active mines. Thousands of shafts were sunk, and hundreds of miles of underground workings were driven along the lodes. However, by the end of the 19th century, the discovery of larger mineral deposits elsewhere led to the industrial decline in the South West and the closure of most mines. A lack of funds and regulations meant that mine workings were often left abandoned without being secured.

### Mining Archive & Unrecorded Workings

The surviving officially deposited abandoned mine plans of most mines in the South West do not show the full extent of the underground workings, especially at shallow depth. It did not become a legal requirement for metal mines to keep comprehensive plans of the underground workings, and to deposit these upon abandonment until 1872. This law did not apply to mines that employed fewer than 12 people underground and neither did it require mines to survey any unused older workings. As a result, most of the old and shallow workings and smaller mines remain poorly recorded. We use a vast archive of other mining and geological records; maps; plans; books and datasets, along with our knowledge of the geology and mining methods to predict where workings could exist and might present a risk.

### Subsidence Risks

Any near-surface mine working that has not been properly secured poses a potential subsidence risk at surface. Mine shafts present a high risk of localised subsidence; often these features were capped with timber when mining ceased and all evidence of them became obliterated. Shallow adits can collapse or cause flooding and mine waste tips/dumps can cause differential settlement. However, one of the main causes of mining related subsidence is the collapse of near-surface mine workings on lode outcrops. These workings, in the form of small pits, openworks or shallow stopes, were often backfilled with unconsolidated waste rock and are not evident at surface until they collapse, thereby presenting a high risk of subsidence. There is no legal imperative to report subsidence to a central body and so no comprehensive database of historic subsidence events exists. Therefore, it is not possible to conclude comprehensively whether a property has previously been affected; but we include comment on subsidence at a property if we are aware of it.

### Limitations of Mining Search

This Mining Search evaluates the subsidence risk from the extraction of metalliferous minerals only. It cannot be relied upon to indicate risk from clay; stone; coal; oil or other non-metalliferous extraction. It has been produced following a search and review of the extensive collection of abandoned mine plans, maps, records and archives in our possession and from this material we have endeavoured to provide as accurate a report as possible. However, considering that such records may not be wholly complete or accurate, we cannot accept liability for any inaccuracies or omissions with respect to those records. This Mining Search does not include an assessment of soil contamination risks. This report and any mining features described are applicable to the subject property only, the location or boundaries of which have been approved by the client in instructing and receiving this report. We cannot be liable for any erroneous or omitted information as portrayed on any plan supplied to us for this Mining Search. The report must not be relied upon for neighbouring properties, as any adjacent mining features may have been omitted for clarity. This report is confidential to the client, client's solicitor and/or mortgage lender or those acting through a conveyance service provider (as per the quoted reference number) and may not be reproduced or further distributed, re-sold or reassigned without our permission. We shall be under no liability whatsoever to any person who has not been party to the commissioning and fee paid for this report or any undisclosed third party. We have not visited the property.

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### **Consumer Information**

This search has been produced by Cornwall Consultants Ltd, Parc Vean House, Coach Lane, Redruth, TR15 2TT. Tel: (01209) 313511. Fax: (01209) 313512. Email: <a href="mailto:enquiries@cornwallconsultants.co.uk">enquiries@cornwallconsultants.co.uk</a>, which is registered with the Property Codes Compliance Board (PCCB) as a subscriber to the Search Code. This search has been completed in accordance with our Terms and Conditions of business that can be viewed <a href="mailto:here">here</a>.

#### The Search Code:

- Provides protection for homebuyers, sellers, estate agents, conveyancers and mortgage lenders who rely on the information included in property search reports undertaken by subscribers on residential and commercial property within the United Kingdom
- Sets out minimum standards which firms compiling and selling search reports have to meet
- Promotes the best practice and quality standards within the industry for the benefit of consumers and property professionals
- Enables consumers and property professionals to have confidence in firms which subscribe to the code, their products and services.

By giving you this information, the search firm is confirming that they keep to the principles of the Code. This provides important protection for you.

Firms which subscribe to the Search Code will:

- display the Search Code logo prominently on their search reports
- act with integrity and carry out work with due skill, care and diligence
- at all times maintain adequate and appropriate insurance to protect consumers
- conduct business in an honest, fair and professional
- handle complaints speedily and fairly
- ensure that products and services comply with industry registration rules and standards and relevant laws
- monitor their compliance with the Code

#### **Complaints**

If you have a query or complaint about your search, you should raise it directly with the search firm, and if appropriate ask for any complaint to be considered under their formal internal complaints procedure. If you remain dissatisfied with the firm's final response, after your complaint has been formally considered, or if the firm has exceeded the response timescales, you may refer your complaint for consideration under The Property Ombudsman scheme (TPOs). The Ombudsman can award up to £5,000 to you if the Ombudsman finds that you have suffered actual financial loss and/or aggravation, distress or inconvenience as a result of your search provider failing to keep to the Code.

Please note that all queries or complaints regarding your search should be directed to your search provider in the first instance, not to TPOs or to the PCCB.

Contact Cornwall Consultants Ltd if you would like a copy of the Search Code or our Complaints Procedure. We trust this report provides the information you require, however should you have any queries, please contact Cornwall Consultants Ltd at: <a href="mailto:enquiries@cornwallconsultants.co.uk">enquiries@cornwallconsultants.co.uk</a>

#### **TPOs** contact details

The Property Ombudsman scheme Milford House, 43-55 Milford Street, Salisbury, Wiltshire SP1 2BP

Tel: 01722 333306 Fax: 01722 332296

Email: <a href="mailto:admin@tpos.co.uk">admin@tpos.co.uk</a> | Website: <a href="www.tpos.co.uk">www.tpos.co.uk</a> | You can get more information about the PCCB from <a href="www.propertycodes.org.uk">www.propertycodes.org.uk</a> or from our website at <a href="https://cornwallconsultants.com/">https://cornwallconsultants.com/</a>

#### **Complaints Procedure**

Cornwall Consultants Ltd is registered with the Property Codes Compliance Board as a subscriber to the Search Code. A key commitment under the Code is that firms will handle any complaints both speedily and fairly.

If you want to make a complaint directly to Cornwall Consultants Ltd, we will:

- Acknowledge it within 5 working days of receipt.
- Normally deal with it fully and provide a final response, in writing, within 20 working days of receipt.
- Keep you informed by letter, telephone or e-mail, as you prefer, if we need more time.
- Provide a final response, in writing, at the latest within 40 working days of receipt.
- Liaise, at your request, with anyone acting formally on your behalf.

If you are not satisfied with our final response, or if we exceed the response timescales, you may refer the complaint to:

The Property Ombudsman scheme (TPOs):

Tel: 01722 333306 E-mail: admin@tpos.co.uk

| Website: www.tpos.co.uk

We will co-operate fully with the Ombudsman during an investigation and comply with his final decision.

#### Complaints should be sent to:

Dan Berriman Cornwall Consultants Ltd Parc Vean House Coach Lane Redruth

Cornwall TR15 2TT

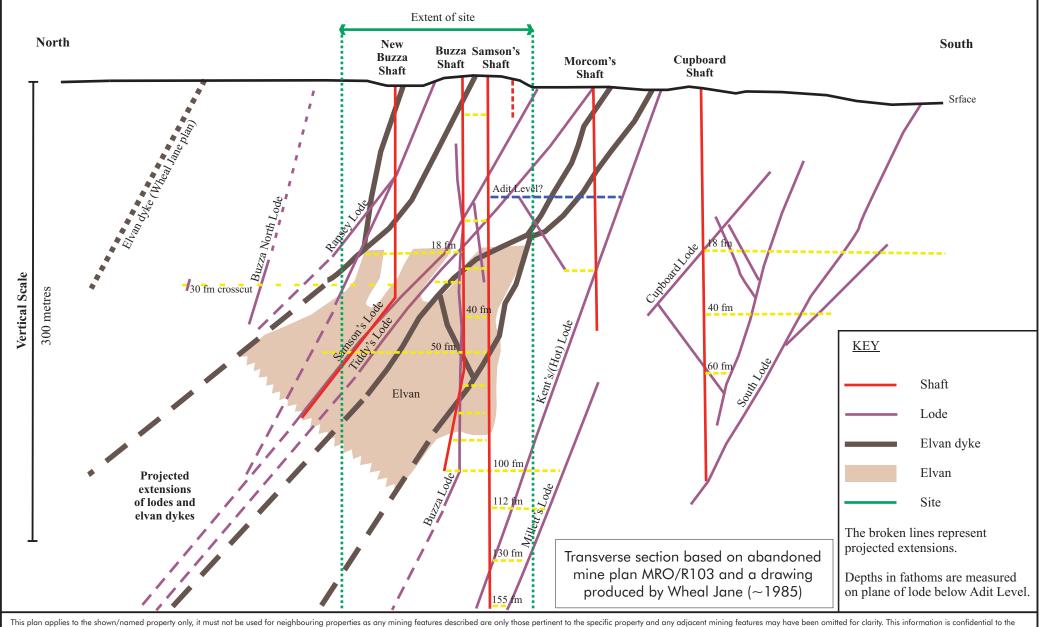
E: help@cornwallconsultants.co.uk

T: 01209 313511

You can also view our complaints procedure here.

RESULT CLASSIFICATIONS FOR MORTGAGE								
PASSED	Typically, acceptable to							
PASSED	mortgage lenders.							
	Value/enjoyment may be							
FURTHER ACTION	affected, and action should be							
FURTHER ACTION	satisfied before mortgage							
	proceeds.							

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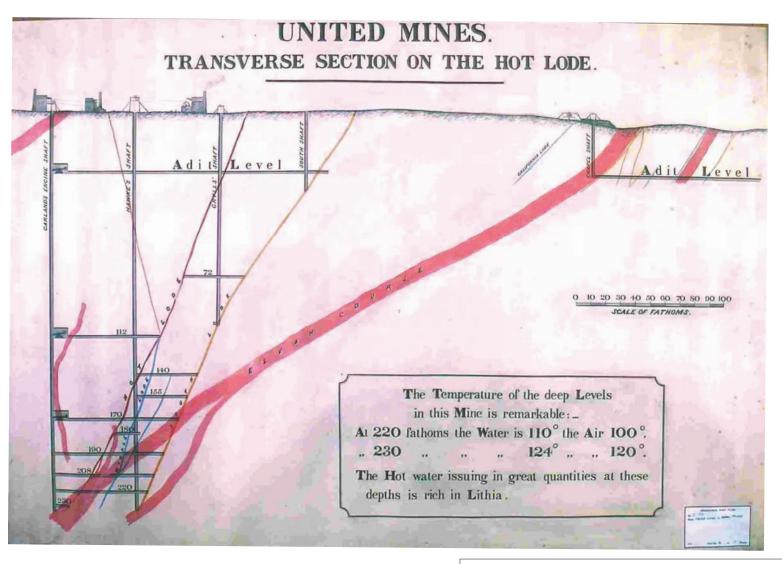


Client: Ove Arup & Partners International Ltd
A-ddharn Site, United Downs
Redruth, Cornwall

Reference:	CMS/129120
Date:	10/24/2019
Scale:	1.2 500

Figure 5:

Transverse section at Samson's Shaft



Transverse section of North/Hot Lode and (Great) South Lode from abandoned mine plan MRO/R103

This plan applies to the shown/named property only, it must not be used for neighbouring properties as any mining features described are only those pertinent to the specific property and any adjacent mining features may have been omitted for clarity. This information is confidential to the client designated in the attached report and must not be further distributed without our permission.



Client: Ove Arup & Partners International Ltd A-ddharn Site, United Downs Redruth, Cornwall

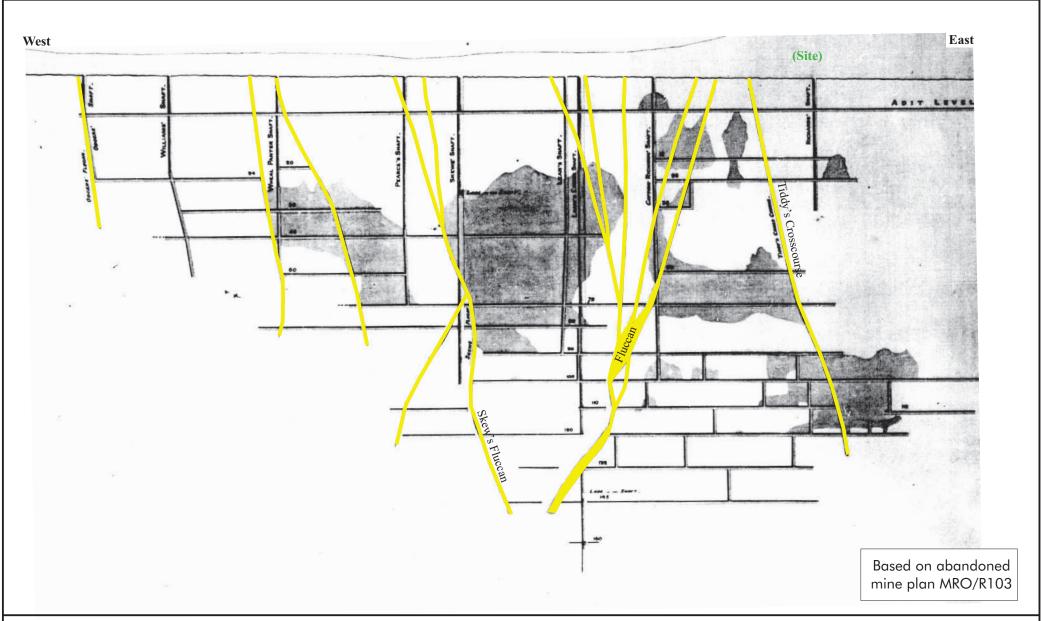
Reference:	CMS/129120
Date:	10/24/2019

10/24/2019

Not re-scaled Scale: from mine plan

### Figure 6:

Copy of MRO plan R103 Sheet 14





Client: Ove Arup & Partners International Ltd A-ddharn Site, United Downs Redruth, Cornwall

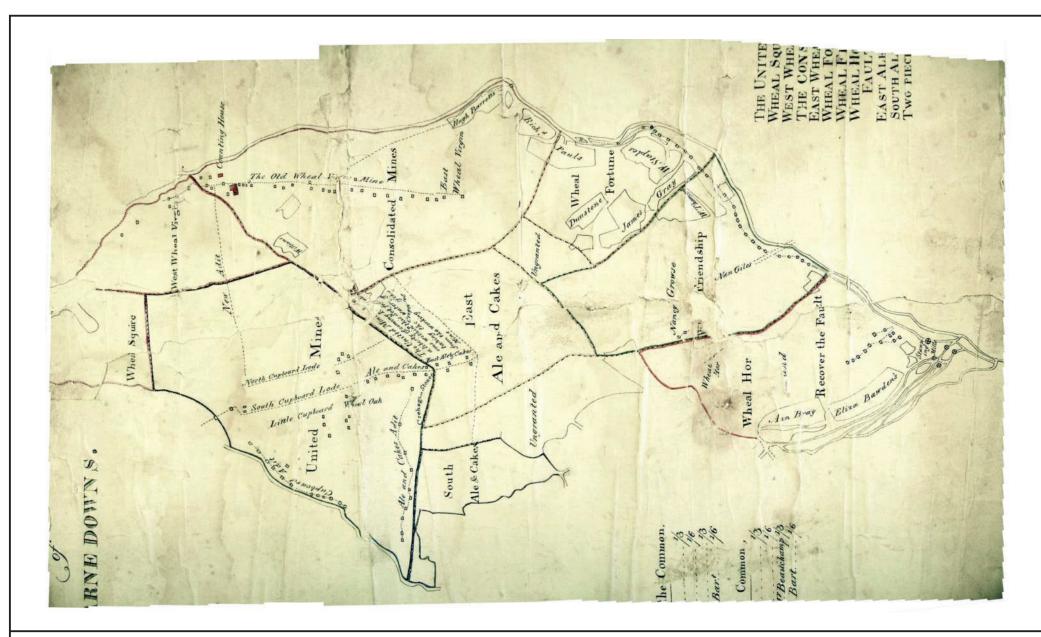
Reference:	CMS/129120

Date: 10/24/2019

Scale: Not re-scaled from mine plan

### Figure 7:

Longitudinal Section of Old/North Lode





Client: Ove Arup & Partners International Ltd A-ddharn Site, United Downs Redruth, Cornwall

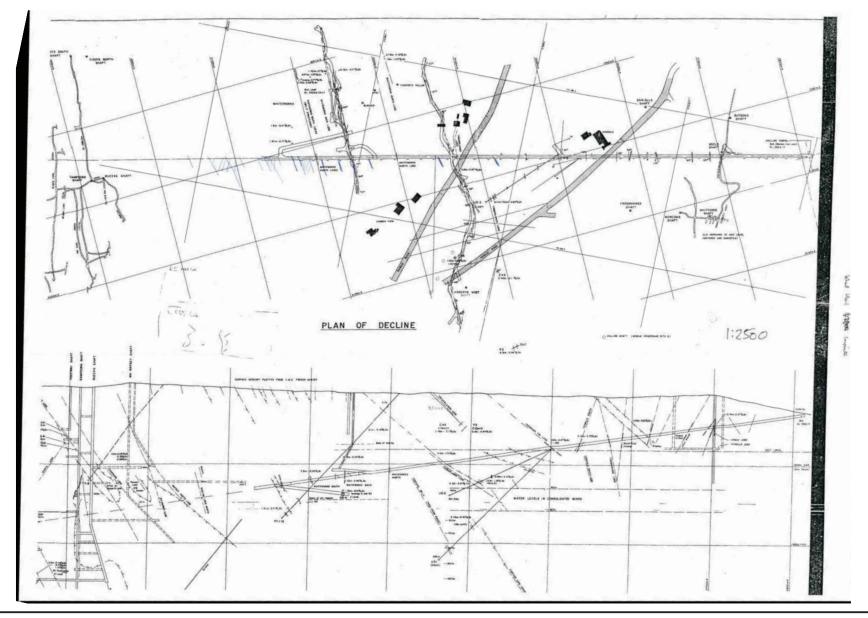
Reference:	CMS/129120
	10/04/0010

Date: 10/24/2019

Scale: Not re-scaled from mine plan

Figure 8:

MRO/A20: Cusgarne Downs





Client: Ove Arup & Partners International Ltd A-ddharn Site, United Downs Redruth, Cornwall

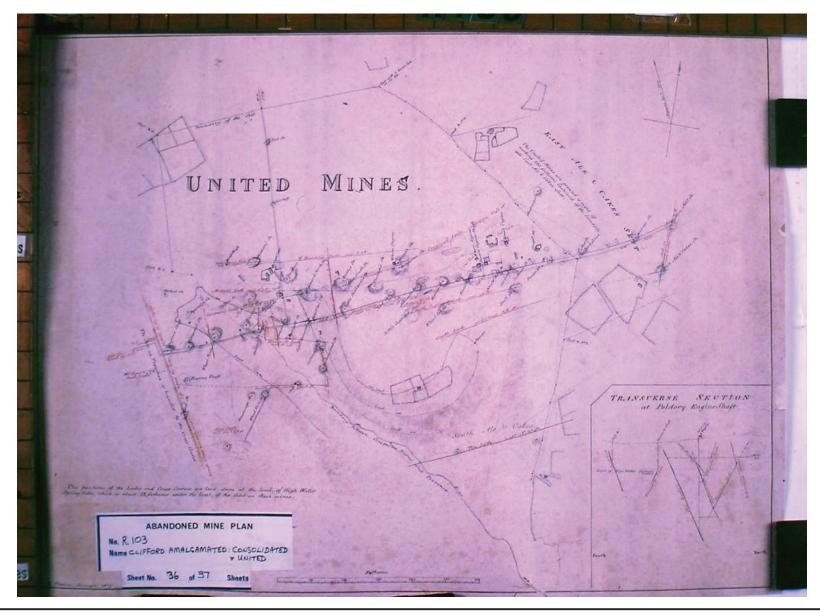
Reference:	CMS/129120
	10/04/0010

Date: 10/24/2019

Scale: Not re-scaled from mine plan

Figure 9:

Plan of Wheal Maid decline





Client: Ove Arup & Partners International Ltd A-ddharn Site, United Downs Redruth, Cornwall

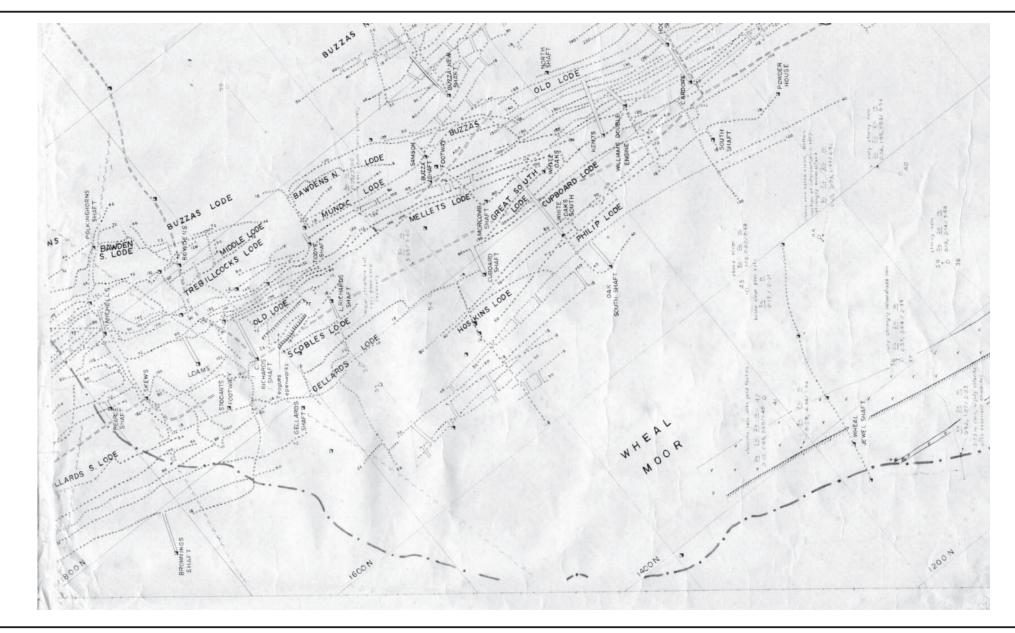
Reference:	CMS/129120
_	10/01/0010

Date: 10/24/2019

Scale: Not re-scaled from mine plan

Figure 10:

R103/36





Client: Ove Arup & Partners International Ltd A-ddharn Site, United Downs Redruth, Cornwall

Reference:	CMS/129120

Date: 10/24/2019

Scale: Not re-scaled from mine plan

### Figure 11:

United Downs Plan Extract

# **Appendix D**

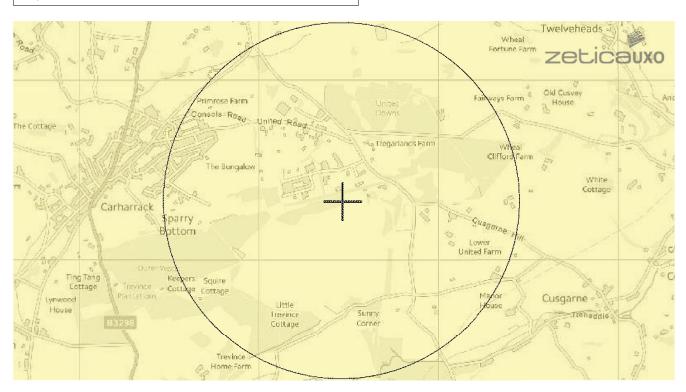
Unexploded Bomb Risk Map

#### **UNEXPLODED BOMB RISK MAP**

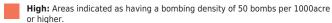


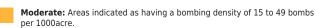
#### SITE LOCATION

Map Centre: 174471,41332



#### LEGEND





Low: Areas indicated as having 15 bombs per 1000acre or less.



transport









Luftwaffe targets





#### How to use your Unexploded Bomb (UXB) risk man?

The map indicates the potential for Unexploded Bombs (UXB) to be present as a result of World War Two (WWII) bombing.

You can incorporate the map into your preliminary risk assessment\* for potential Unexploded Ordnance (UXO) for a site. Using this map, you can make an informed decision as to whether more in-depth detailed risk assessment\* is necessary.

#### What do I do if my site is in a moderate or high risk area?

Generally, we recommend that a detailed UXO desk study and risk assessment is undertaken for sites in a moderate or high UXB risk area.

More often than not, this further detailed research will conclude that the potential for a significant UXO hazard to be present on your site is actually low.

Never plan site work or undertake a risk assessment using these maps alone. More detail is required, particularly where there may be a source of UXO from other military operations which are not reflected on these maps.

#### If my site is in a low risk area, do I need to do anything?

If both the map and other research confirms that there is a low potential for UXO to be present on your site then, subject to your own comfort and risk tolerance, works can proceed with no special precautions.

A low risk really means that there is no greater probability of encountering UXO than anywhere else in the UK.

If you are unsure whether other sources of UXO may be present, you can ask for one of our pre-desk study assessments (PDSA)

If I have any questions, who do I contact?

tel: +44 (0) 1993 886682 email: uxo@zetica.com

web: www.zeticauxo.com

The information in this UXB risk map is derived from a number of sources and should be used in conjunction with the accompanying notes on our website: (https://zeticauxo.com/downloads-and-resources/risk-maps/)

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It is important to note that this map is not a UXO risk assessment and should not be reported as such when reproduced.

\*Preliminary and detailed UXO risk assessments are advocated as good practice by industry guidance such as CIRIA C681 'Unexploded Ordnance (UXO), a guide for the construction industry'.

# **Appendix E**

Settlement Monitoring Data

Table 1 - The levels for the comparison points used in the settlement review

Point number	Point Label	Eastings (m)	Northings (m)	Basal level (m)	Post settlement level (m)	Pre settlement level (m)	2005 Surveyed height (m)	2006 Surveyed height (m)	2007 Surveyed height (m)	2008 Surveyed height (m)	2009 Surveyed height (m)	2010 Surveyed height (m)	2011 Surveyed height (m)	2012 Surveyed height (m)	2013 Surveyed height (m)	2014 Surveyed height (m)	2015 Surveyed height (m)
20001	Phase 1 Point A	174288.007	41169.158		101.625		106.033	105.65	105.715	105.461	105.577	105.287	105.287	106.065	106.096	105.845	106.057
20002	Phase 1 Point B	174309.737	41032.266		98.257		104.105	103.944	103.82	103.82	103.74	103.573	103.573	104.936	104.632	103.981	104.388
20003	Phase 1 Point C	174335.886	40880.544		81.527		84.044	84.045	83.968	83.968	84.098	83.428	82.796	83.749	83.752	83.462	83.608
20004	Phase 1 Point D	174148.799	41185.362		92.944		97.305	97.305	97.308	97.308	96.905	96.804	96.971	96.958	96.906	96.716	96.885
20005	Phase 1 Point E	174049.316	41180.724		83.51		85.398	85.398	85.322	85.322	85.326	85.326	85.326	85.367	85.358	84.999	85.001
20006	Phase 1 Point F	173908.98	41174.142		75.939		77.522	77.522	77.511	77.511	77.249	76.943	76.973	76.778	76.807	76.796	76.807
20007	Phase 2 Point A	174299.656	41245.884		102		106.698	106.664	106.599	106.599	106.365	106.688	106.776	106.52	106.548	106.334	106.172
20008	Phase 2 Point B	174350.52	41304.906		101.813		106.553	106.553	106.273	106.273	106.145	105.908	105.795	105.661	106.509	106.135	106.104
20009	Phase 2 Point C	174146.732	41240.373		90.517		93.887	93.887	93.884	93.884	93.774	93.515	93.505	93.491	93.717	93.717	93.717
20010	Phase 3 Point A	174401.638	41268.67		102		108.37	108.37	108.235	108.213	108.304	108.058	108.059	108.041	107.863	107.604	107.533
20011	Phase 3 Point B	174399.768	41317.218		102		106.688	106.688	106.727	106.727	106.607	106.353	106.209	106.139	106.786	106.602	106.563
20012	Phase 3 Point C	174523.858	41321.181		98.697		102.958	103.008	103.211	103.211	102.922	102.63	102.411	102.284	102.726	102.298	102.222
20013	Phase 4a Point A	174385.333	41193.247		102		108.252	108.252	108	108	107.928	107.606	107.585	107.377	107.975	107.564	107.611
20014	Phase 4a Point B	174374.634	41084.542		100.166		105.157	105.157	104.971	104.971	104.973	104.723	104.762	105.056	104.971	104.966	104.823
20015	Phase 4a Point C	174507.354	41144.078		92.961		97.174	97.174	96.79	96.79	96.421	96.219	96.254	96.282	96.406	96.165	96.102
20016	Phase 4b Point A	174533.079	41243.345		100.06		104.549	104.652	104.96	104.96	104.791	104.657	104.645	104.63	104.578	104.345	104.255
20017	Phase 4b Point B	174615.019	41121.921		84.746		87.996	87.996	87.159	87.159	87.242	87.096	87.158	87.253	86.91	86.753	86.701
20018	Phase 4b Point C	174682.099	41256.082		88.129		91.461	91.461	91.514	91.514	90.756	90.746	90.842	90.905	90.808	90.633	90.242
20019	Extension Phase 1 Point A	174091.115	40879.074	62.838	90.064	96.347	61.437	68.527	68.208	75.405	87.542	91.388	91.353	91.313	89.599	89.387	89.109
20020	Extension Phase 1 Point B	173981.369	40878.227	62.529	79.091	83.097	62.357	82.073	82.073	81.331	81.6	81.534	81.907	81.915	81.316	80.976	80.86
20021	Extension Phase 2 Point A	174087.294	40803.503	62.242	79.865	83.544	63.782	62.581	82.361	81.752	81.471	81.469	81.69	81.69	80.373	80.068	80.313
20022	Extension Phase 2 Point B	174180.272	40777.605	66.3	79.775	83.116	80.831	65.58	78.758	78.62	80.018	81.95	81.696	81.639	80.604	80.592	80.694
20023	Extension Phase 3a Point A	174174.328	41012.386	87.195	93.235	97.481	87.116	87.134	87.193	87.078	94.132	95.613	95.975	95.998	95.845	95.787	95.542
20024	Extension Phase 3b Point A	174067.773	40975.923	70.372	86.525	89.58	70.775	70.656	70.736	82.354	87.903	87.973	88.46	88.484	86.948	86.98	86.602
20025	Extension Phase 4a Point A	174220.808	40840.734	65.119	78.812	81.719	67.047	64.695	64.754	64.348	72.846	80.582	81.443	80.979	79.156	78.904	78.894
20026	Extension Phase 4b Point A	174186.64	40932.993		86.668	89.153	75.448	78.293	78.763	78.576	75.307	86.338	86.322	86.386	85.65	85.434	85.388

The locations of the comparison points are shown on Figure 1

No adjustments to levels are made, the levels are those surveyed and include cap and restoration where and when present Elevations in metres above site datum

The increase in the surveyed heights for Phase 1 at the time of the 2012 survey is understood to be due to the placement of restoration soils

