Phase II Ground Investigation

Land Adjacent to Coppice Inn, Lanner

10 October 2018

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EXECUTIVE SUMMARY

Objectives	
Wheal Jane Consultancy was commissioned by SPS Architectural Services to undertake an intrusive investigation on the site of a proposed residential development.	
Site Investigation	
Previous Investigations	A phase I environmental risk assessment was undertaken by Wheal Jane Consultancy on 9th October 2017.
Site Works	Samples were taken during an intrusive investigation from seven machine excavated trial pits and 5 windowless sample boreholes.
Ground Conditions	Full ground profiles were obtained, showing a distinct presence of made ground, including waste materials. Alluvium was also present in the north east area of the site.
Groundwater	Groundwater was encountered during the site investigation between 2.00m and 3.00m.
Conceptual Site Model	
The potential pollutant linkages for the site have been refined from the Phase 1 report as follows: Risk of ingress of radon gas has been identified as High. Risk from naturally occurring Arsenic is considered to be Moderate. Risk from Heavy metals within the Made Ground is considered to be High. Risk to Groundwater from elevated levels of Copper is deemed Low. Risk from PAH contamination is considered to be Moderate. Risk from TPH contamination is considered to be Low. Risk from ground gas is considered to be Low.	
Geotechnical Considerations	
Foundation Options	It is considered that a piled foundation solution is appropriate, with end-bearing piles driven through the fill material and socketed in the underlying Mylor Slate Formation.
Floor Slabs	Floor slabs should be suspended over the fill material and supported on pile caps.
Excavations	Significant excavations are not expected; however, excavations should stand unsupported up to 1.20m.
Buried Concrete	Based on the sulphate results the site may be classified as falling into the Design Sulphate Class DS-1. The Aggressive Chemical Environment for Concrete (ACEC) class is based upon the pH and mobility of groundwater. The results indicate that the soils on site fall into class AC-1s.

Recommendations

A Phase 3 Remediation Strategy Report should be compiled which outlines the scope of remedial works required to reduce the level of contamination to such condition that the site can be deemed suitable for its proposed residential use.

Once the remediation strategy has been fully implemented and the work concluded to the required specifications, a Phase 4 Verification Report and Certificate must be produced.

As the site is situated in an area where greater than 30% of the properties are above the action level, it is recommended that full radon protective measures are installed on any proposed building.

Suitable safety measures should be taken by those working on site to mitigate the risks associated with contaminated media including undertaking the appropriate risk assessments and ensuring all workers are wearing the correct PPE.

Waste removed from site shall be disposed of at a suitable facility with the appropriate Waste Transfer Notices obtained for future records. Asbestos waste should be handled by a suitable waste contractor.

1 INTRODUCTION

1.1 Instruction

1.1.1 Wheal Jane Consultancy (WJC) was commissioned by Mr C Wells on behalf of SPS Architectural Services, to undertake a Phase II Ground Investigation at a site adjacent to the Coppice Inn, Lanner.

1.1.2 This report has been prepared by Wheal Jane Consultancy solely for the benefit of SPS Architectural Services. It shall not be relied upon or transferred to any third party without the prior written authorisation of WJC.

1.2 Scope and Objectives

1.2.1 The objective of this investigation is to quantify any land contamination based on in-situ data collected from the actual site which will then be interpreted and evaluated. The investigation will also be aimed at evaluating the geotechnical parameters of the sub-surface material in order to aid foundation design.

1.2.2 This investigation was developed to target the possible contamination related to the sites historic use.

1.2.3 This assessment has been undertaken with guidance from BS10175:2011[(1)] and Environment Agency report CLR11[(2)], and as such represents a Phase II Ground Investigation.

1.3 Limitations

1.3.1 Field work consisted of discrete sampling across the site, to assess the character and degree of contamination. Conditions of the ground at locations not included within the investigation may be different from the tested locations.

1.3.2 This report considers site conditions at the time of the ground investigation, but ground conditions may change with time. If future work discovers ground conditions that vary significantly from the findings available in this report, the conclusions should be reviewed in the context of the new information.

1.3.3 Findings were assessed in the context of standards and methodology current at the time of reporting.

1 BS 10175:2011 'Investigation of Potentially Contaminated Sites –Code of Practice'.

2 Environment Agency, 2004. Contaminated Land Report 11 - Model Procedures for the Management of Land Contamination.

1.3.4 The findings and conclusions in this report are based upon information derived from a variety of sources. WJC cannot accept liability for the accuracy or completeness of any information derived from third party sources.

2 THE SITE

2.1 Site Location and Layout

2.1.1 The site is located at land adjacent to the Coppice Inn, Lanner approximately 3.0km to the south east of the town centre of Redruth. The site is approximately centred on National Grid Reference SW 72482 39844.

2.1.2 The site is irregular in shape and covers an area of 0.47ha.

2.1.3 A site location plan is attached as Figure 2.1.

2.1.4 The current site layout can be seen in Figure 2.2, below:

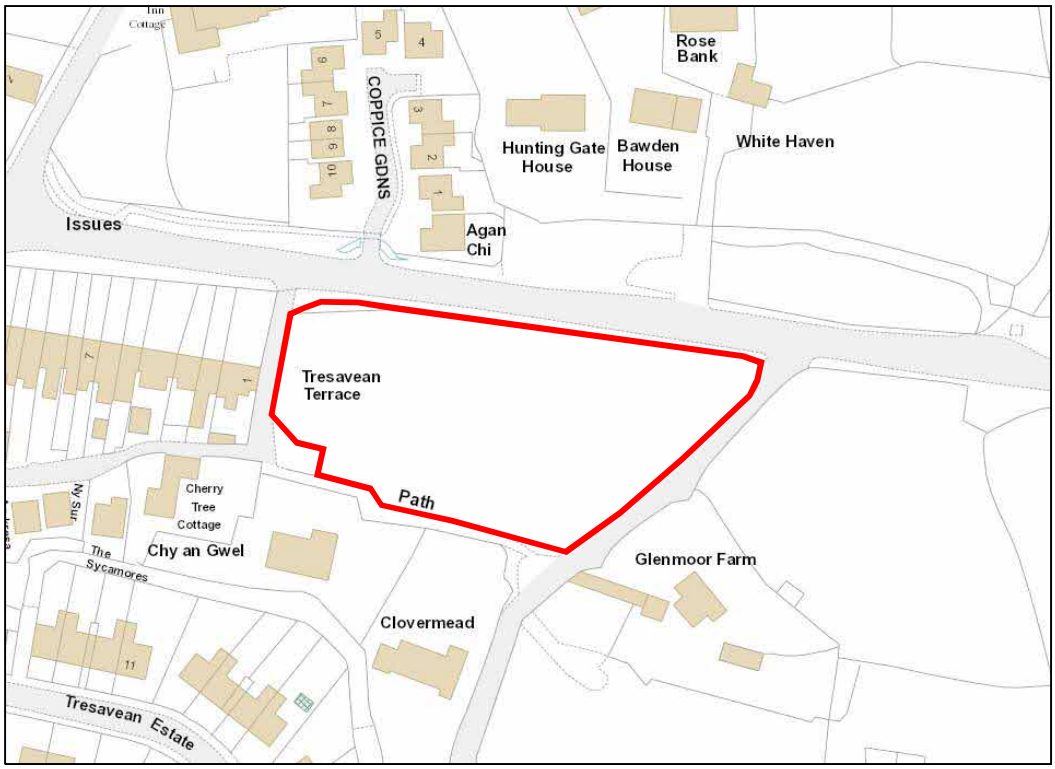

Figure 2.2: The current site layout.

2.2 Surrounding area

2.2.1 The site is bound to the north by the A393 with residential property and the coppice inn beyond. To the west, east and south the site is bound by residential property.

2.2.2 The surrounding area is occupied by residential, commercial and agricultural property.

2.3 Proposed Development

2.3.1 It is proposed to construct five dwellings and associated works to include formation of new access. Further information can be found under planning application number PA18/00405.

2.3.2 An outline plan for the proposed development can be seen in Figure 2.3.

Figure 2.3. The proposed development. (Supplied by SPS Architectural, Drawing number: 0248 SP A.)

3 SITE INVESTIGATION

3.1 Phase I Findings

3.1.1 A Phase I Desk Study was undertaken by Wheal Jane Consultancy in October 2017 (Ref: 19244/PH1; dated 9th October 2017).

3.1.2 The desk study concluded the site was historically used as a historic mining area and as a refuse heap. Features in the vicinity: Refuse heap, disused shaft, copper mine and engine house. The risks identified in the desk study were summarised within the Conceptual Site Model (CSM). It was concluded that an investigation would be required involving soil sampling and testing; focussing specifically on heavy metals, sulphates, pH, asbestos, total petroleum hydrocarbons and polycyclic aromatic hydrocarbons.

3.2 Site Works

3.2.1 An intrusive site investigation was conducted on Thursday 6th September and Wednesday 12th September 2018. The investigation was overseen by a geoenvironmental engineer from Wheal Jane Consultancy.

3.2.2 The following table summarises the intrusive investigation techniques employed during the site investigation;

Table 3.1: Site Works

Exploratory Hole Type	Exploratory Hole ID	Hole Depths (mBGL)	Comments
Trial Pit	TP01 –TP07	3.10 –3.50	Undertaken for site coverage.
Windowless Sample Borehole	WS01 –WS05	4.45 –5.45	To determine thickness of Made Ground & Depth to Bedrock
Dynamic Probe	DP01 –DP02	1.00 –5.40	To determine depth to bedrock

3.2.3 Exploratory hole logs are included as Appendix A.

3.2.4 A plan showing the location of the exploratory holes is provided as Figure 3.1.

3.3 Trial Pitting

3.3.1 7nr Trial Pits, designated TP01 –TP07 inclusive, were advanced to depths of 3.10m to 3.50m using a JCB 4CX excavator on the 6th September 2018. Representative soil samples were taken at regular intervals for geotechnical and environmental analysis and logged on site by a suitably qualified Geoenvironmental Engineer.

3.3.2 The locations of all exploratory hole can be seen on the exploratory hole location plan, contained as Figure 3.1.

3.3.3 All trial pits were backfilled with arisings upon completion.

3.3.4 Trial Pit photographs are included as Appendix B.

3.4 Windowless Sample Boring

3.4.1 5nr Windowless Sample Boreholes, designated WS01 –WS05 inclusive, were advanced to depths of between 4.45m to 5.45m using a tracked Terrier rig on the 12th September 2018. Standard Penetration Tests (SPTs) and representative soil samples were taken at regular intervals for geotechnical and environmental analysis and logged on site by a suitably qualified Geotechnical/Geoenvironmental Engineer.

3.4.2 The locations of all exploratory hole can be seen on the exploratory hole location plan, contained as Figure 3.1.

3.1 Dynamic Probe

3.1.1 2nr Dynamic probe tests, designated DP01 –DP02 inclusive, were advanced to depths of between 4.80m to 5.40m using a tracked Terrier rig on the 12th September 2018.

3.1.2 The locations of all exploratory holes can be seen on the exploratory hole location plan, contained as Figure 3.1.

3.2 Installations and Monitoring

3.2.1 Gas and groundwater monitoring standpipes were installed in the following exploratory holes in order to allow long term monitoring, should it be required;

Table 3.2: Borehole Installations

Exploratory Hole	Seal (mBGL)	Filter Zone (mBGL)
WS02	0.00 –1.00	1.00 –2.70

WS04	0.00 –1.00	1.00 –4.00

3.3 Chemical Sampling and Testing

3.3.1 The proposed end use of the site is for residential housing and the subsequent data analysis will be conducted using this setting to test for levels of contaminants against generic assessment criteria.

3.3.2 The Phase I report highlighted heavy metals, sulphates, pH, total petroleum hydrocarbons and polycyclic aromatic hydrocarbons as the primary contaminants of concern, the sampling was designed to target the proposed areas of soft landscaping or private gardens. Such areas provide the most exposure to potentially contaminated soils. The land contamination investigation works also encountered a significant presence of Made Ground therefore further testing for asbestos were undertaken.

3.3.3 All retrieved samples were logged in accordance with BS5930;2015 and BS EN ISO 14689. Collection of media for environmental testing was obtained, stored in plastic tubs and glass jars and kept within a temperature controlled cool box before being dispatched for testing.

3.3.4 Samples were taken at varying depths and tested for potential contaminants including the following;

Heavy Metals (As, B, Cd, Cr, Cu, Hg, Pb, Ni, Se, Zn)
Sulphates
Polyaromatic Hydrocarbons
pH
Total Petroleum Hydrocarbons
Asbestos
Leachate testing

3.3.1 All samples were tested by a UKAS and MCERT accredited laboratory.

3.3.2 The results are included as Appendix C.

3.4 Geotechnical Sampling and Testing

3.4.1 Samples were dispatched to an accredited geotechnical laboratory in order to classify the geotechnical properties of the soils. The following tests were scheduled:

Moisture Content
Atterberg Limits (4pt)
Particle Size Distribution
pH & Water-Soluble Sulphate

3.4.2 All testing was carried out in accordance with the procedures set out in BS EN ISO/IEC 17025:2005.

3.4.3 All samples were tested by a UKAS accredited laboratory.

3.4.4 The results are included as Appendix D.

4 GROUND CONDITIONS

4.1 General

4.1.1 The BGS 1:50,000-scale bedrock geological map Sheet 352, Falmouth of the area shows the site to be underlain by the Mylor Slate Formation. Superficial deposits of Alluvium are present in the north eastern area of the site. An unnamed felsite dyke is present in the south western area of the site which was formed in the Permian Era.

4.1.2 The following table represents a summary of the strata encountered beneath the site;

Table 4.1: Ground Conditions

Strata	Depth Encountered (mBGL)		Typical Thickness (m)	Brief Description & Comments
	From	To		
Made Ground	0.00	1.20 –3.60	3.00	Generally granular, becoming cohesive with depth
Alluvium	1.30 - 1.70	2.30 - 4.10	1.50	CLAY with elements of sand and gravel
Mylor Slate Formation	1.20 –3.60	4.45 –5.45	Unproven	Grey GRAVEL of Mudstone.

4.2 Strata Encountered

Made Ground

4.2.1 Material described as Made Ground was encountered across the site to depths of up to 3.60m. The unit varies in thickness, from 1.20m in the north east of the site to 3.60m in the south.

4.2.2 The material is generally granular with anthropogenic components of glass, plastic, brick, timber, ceramic, charcoal, metal and concrete. The unit becomes more cohesive with depth and was noted as a clay from depths of around 1.50m to 2.00m across much of the site.

4.2.3 Standard Penetration Tests (SPTs) were completed at regular intervals within the Made Ground and can be summarised in Table 4.2 below;

Table 4.2: Standard Penetration Tests within the Made Ground

Depth (mBGL)	SPT 'N' Value		
	Min	Max	Average
1.00	4	13	*6*
2.00	4	17	*9*
3.00	1	7	*4*

4.2.4 An SPT 'N' Value vs Depth plot is provided as Figure 4.1.

4.2.5 The more granular element of the material was subject to particle size distribution testing and was shown to contain 24% to 41% gravel, 30% to 49% sand and 26% to 27% fines (silt/clay).

4.2.6 The fines content of the material was subject to plasticity testing as shown to be a SILT of low plasticity.

4.2.7 The Modified Plasticity Index (I'p) is defined by the NHBC Chapter 4.1, as the "Plasticity Index (Ip) of the soil multiplied by the percentage of Particles less than 425µm." In this instance the soil has been shown to be subject to negligible volume change potential. This is graphically represented in Appendix D, to the rear of the report.

Alluvium

4.2.8 Material described as Alluvium was encountered in the north east of the site at depths of between 1.20m and 5.00m in exploratory holes WS02, WS03, TP06 and TP07.

4.2.9 The unit may be generally described as soft to firm grey locally black sandy and/or gravelly CLAY. Granular superficial deposits were encountered in WS03 between 2.90m and 4.90m. They have been classified as very loose to medium dense, of subrounded mudstone and granite.

4.2.10 Standard Penetration Tests (SPTs) were completed at regular intervals within the Alluvium and can be summarised below;

Table 4.3: Standard Penetration Tests within the Alluvium

Depth (mBGL)	SPT 'N' Value		
	Min	Max	Average
2.00	15	15	*15*
3.00	2	6	*4*
4.00	11	19	*15*

4.2.11 An SPT 'N' Value vs Depth plot is provided as Figure 4.1.

4.2.12 The material was subject to plasticity testing as shown to consist of both CLAY and SILT, with intermediate to very high plasticity.

4.2.13 The Modified Plasticity Index (I'p) is defined by the NHBC Chapter 4.1, as the "Plasticity Index (Ip) of the soil multiplied by the percentage of Particles less than 425µm." In this instance the soil has been shown to be subject to low volume change potential. This is graphically represented in Appendix D, to the rear of the report.

Weathered Mylor Slate Formation

4.2.14 Material described as Weathered Mylor Slate Formation was encountered across the site to depths of up to 5.45m where the windowless sampler refused.

4.2.15 The material was subject to particle size distribution testing and was shown to contain 12% cobbles, 35% gravel, 10% sand and 13% fines (silt/clay).

4.2.16 In general, the unit may be described as 'Grey GRAVEL of Mudstone.'

4.3 Groundwater

4.3.1 Groundwater was encountered the following exploratory holes:

Table 4.4: Groundwater Encountered

Exploratory Hole	Groundwater Level (mBGL)	Stratum
TP03	3.30	Made Ground
TP04	3.10	Made Ground
TP05	3.10	Made Ground
TP07	2.10	Alluvium
WS01	2.90	Made Ground
WS02	2.30	Alluvium
WS03	2.50	Made Ground / Alluvium Boundary
WS04	3.00	Made Ground
WS05	2.00	Made Ground / Alluvium Boundary

4.4 Contamination Indications

4.4.1 Evidence of potential contamination includes the anthropogenic components mentioned in section 4.2.2, as well as a fragment of charcoal noted in TP03 at 0.50m.

5 GEOTECHNICAL ASSESSMENT

5.1 Introduction

5.1.1 It is proposed to develop the site with five detached residential houses with parking and associated infrastructure.

5.1.2 At the time of writing this report, no definitive structural loads have been provided by the client.

5.2 Foundation Options

5.2.1 Based on the ground conditions encountered it is considered that conventional strip foundations would not be suitable to support the proposed new structures.

5.2.2 Raft foundations are a solution often applied to soils with a low bearing capacity, with the aim of spreading the foundation pressure over as large an area as possible.

5.2.3 Based on the results of Standard Penetration Tests in the Made Ground, as well as geotechnical laboratory testing (namely plasticity indices), it is considered that for a raft foundation of 10m x 10m, with a proposed load of 120kPa, settlement in the centre of the raft will be >100mm, with differential settlement across the raft of 35mm.

5.2.4 On this basis, it is considered that a piled foundation solution is appropriate, with end-bearing piles driven through the Made Ground and Alluvium and socketed in the underlying Mylor Slate Formation at depths of 4.50m to 5.50m.

5.2.5 Due to the variability in subsurface soil conditions in the region, it is recommended that a local specialist piling contractor be contacted to determine the most suitable and cost-effective method of piling at this site. Carnon Contracting, a sister company of Wheal Jane Consultancy, would be more than happy to assist.

5.3 Floor Slabs

5.3.1 Floor slabs should be suspended over the Made Ground and supported on pile caps.

5.3.2 Full radon protection should be incorporated into the floor slab in accordance with BRE guidelines.

5.4 Excavations and Earthworks

5.4.1 It is considered that the anthropogenic components encountered within the Made Ground and the high silt fraction render the material unsuitable for use as structural fill.

5.4.2 Significant excavations are not expected on site, however should excavations be taken into the Made Ground, they are likely to be unstable and should therefore be supported or battered back, particularly where personnel are required to enter.

5.4.3 Due to the fines content of the fill material, excavations should be covered during periods of inclement weather to prevent wetting and subsequent degradation.

5.4.4 It is considered that groundwater will not be encountered in shallow excavations.

5.5 Drainage

5.5.1 Due to the thickness of Made Ground across the site, conventional soakaway drainage is not considered feasible.

5.6 Roads and Hardstanding

5.6.1 In-situ CBR testing was not commissioned as part of this report, however CBR values can be ascertained from the Department of Transport Design Manual for Roads and Bridges, Volume 7, Section 2, Table 2.2, based on the plasticity of the subgrade.

5.6.2 In this instance roads and pavements are likely to be founded in the Made Ground, which contains (in its upper horizon) GRAVEL, with an estimated subsequent CBR value of 7%. During construction, any Made Ground consisting of CLAY and/or SILT encountered at surface level will have an assumed CBR value of 1-2%.

5.6.3 This conservative determination will require confirmation during construction with proof rolling to check for the presence of soft pockets within the formation. Any soft material encountered should be excavated and replaced with suitably compacted granular fill.

5.6.4 All material within 450mm of the surface should be non-frost-susceptible, in accordance with from the Department of Transport Design Manual for Roads and Bridges.

5.7 Chemical Attack on Buried Concrete

5.7.1 Chemical testing indicates water soluble sulphate contents of between <0.010mg/l and 0.48mg/l, with pH values in the range of 5.8 to 6.5.

5.7.2 Based on the above results the site may be classified as falling into the Design Sulphate Class DS-1. The Aggressive Chemical Environment for Concrete (ACEC) class is based upon the pH and mobility of groundwater. The results indicate that the soils on site fall into class AC-1s.

6 CONTAMINATION ASSESSMENT

6.1 Comparison with Generic Assessment Criteria (GACs)

6.1.1 The laboratory results are contained as Appendix C.

6.1.2 Results from the environmental testing can be compared against Generic Assessment Criteria (GAC) to form the basis of a GQRA. The GAC's used are taken from the LQM/CIEH 'Suitable 4 Use Levels' publication. In the absence of a suitable S4UL value (such as Lead), reference has been made to DEFRA's Category 4 Screening Levels (C4SL) where deemed justifiable. Given the proposed land use for this site, the residential with homegrown produce has been chosen for the appropriate set of criteria. A comparison table can be found below in Table 6.1.

Table 6.1: Comparison of soil results against GAC's (Res_{wHP} 6% organic matter; based on the most conservative value recorded – all values in mg/kg unless stated)

Contaminant	GAC's: S4UL's - $Resi_w$HGP (unless stated)	Minimum	Maximum	Exceedances
Metals				
Arsenic	37	74	8200	8
Cadmium	11	0.34	22	1
Chromium (III)	910	5.2	91	0
Chromium (VI)	6	<0.50	<0.50	0
Copper	2400	330	16000	2
Mercury (inorganic)	40	0.18	2.3	0
Nickel	180	18	80	0
Lead	200 (C4SL)	30	2600	6
Selenium	250	0.66	7.3	0
Zinc	3700	290	8900	1
General				
Asbestos	N/A	None Detected		0
pH	N/A	5.8	6.6	-
Organic Matter %	N/A	<0.40	12	-
Sulphates (water soluble, g/l)	N/A	<0.010	0.48	-
Cyanide (total)	23 (USEPA)	<0.50	<0.50	-

Phenols	280	<0.30	<0.30	0
Organics				
Polycyclic Aromatic Hydrocarbons (PAH, 16)				
Acenaphthene	1100	<0.10	0.39	0
Acenaphthylene	920	<0.10	2.2	0
Anthracene	11000	<0.10	2.5	0
Benzo(a)anthracene	13	<0.10	12	0
Benzo(a)pyrene	3.0	<0.10	15	1
Benzo(b)fluoranthene	3.7	<0.10	17	1
Benzo(ghi)perylene	350	<0.10	12	0
Benzo(k)fluoranthene	100	<0.10	11	0
Chrysene	27	<0.10	3.7	0
Dibenzo(ah)anthracene	0.3	<0.10	3.9	4
Fluoranthene	890	<0.10	16	0
Fluorene	860	<0.10	1.1	0
Indeno (123-cd) pyrene	41	<0.10	13	0
Naphthalene	13 f	<0.10	2.5	0
Phenanthrene	440	<0.10	3.8	0
Pyrene	2000	<0.10	15	0
PAH (Total 16)	N/A	<2.0	140	-
Total Petroleum Hydrocarbons (TPH)				
>C6-C8	530	<1.0	<1.0	0
>C8-C10	150	<1.0	<1.0	0
>C10-C12	760	<1.0	<1.0	0
>C12-C16	4300	<1.0	<1.0	0
>C16-C21	110000	<1.0	44	0
>C21-C35	110000	<1.0	77	0
Total TPH	N/A	<10	180	0

6.1.3 Soil pH values ranged from 5.80 to 6.60 with an average of 6.20.

6.1.4 Soil Organic Matter (SOM) testing was undertaken on 8 samples. An average value of 5.3% was calculated, resulting in a value of 6% SOM being adopted.

6.1.5 No asbestos was recorded during testing.

6.1.6 Elevated levels of heavy metals were noted across the site, in particular Arsenic, Cadmium, Copper, Lead and Zinc. Almost all of the exceedances were within the Made Ground, an Arsenic level of 74mg/kg was recorded in WS03 at 2.60m, within the Alluvium.

6.1.7 The average soil concentrations for Arsenic, Cadmium, Copper, Lead and Zinc were entered into the CLEA software. This enabled the ratio of Average Daily Exposure to each contaminant with the relevant Health Criteria Value to be determined. This corresponded with the exceedances reported above when the soil guideline values were used. Site specific data was also entered into the software to model the conditions in a representative manner. Several land use categories are available within CLEA, the most appropriate in this case is the residential with homegrown produce scenario. Values for average soil pH and soil organic matter were also included (6.20 and 6% respectively).

6.1.8 The contaminant pathways for each of the substances were also determined using the CLEA software, and these were expressed as percentages. The distribution pathways varied, as shown in the table below;

Table 6.2: Distribution pathways for metals

	Direct Soil Ingestion	Consumption of Homegrown Produce	Dermal Contact	Inhalation of Vapour	Background (oral)
Arsenic	79.89%	7.54%	12.31%	-	-
Copper	12.34%	37.63%	-	-	49.97%
Cadmium	11.21%	38.70%	-	-	49.96%
Zinc	-	45.36%	-	-	49.99%

6.1.9 The above information is also contained as Appendix E.

6.1.10 Levels of Arsenic, Lead and Copper are considerably higher than their respective GACs and therefore bioavailability testing is unlikely to bring them to within acceptable levels.

6.1.11 The following Polyaromatic hydrocarbons were found to be in exceedance of the relevant guideline values;

Table 6.3 – PAH Exceedances

Determinant Exceeded	Exploratory Hole & Depth			
	TP01 @ 0.30m	TP03 @ 0.20m	TP07 @ 0.20m	TP07 @ 1.30m
Benzo[b]fluoranthene			X	
Benzo[a]pyrene			X	
Dibenz[a,h]anthracene	X	X	X	X

6.1.12 Most of the PAH exceedances were noted within the Made Ground, with the exception of TP07 at 1.30m. As can be seen in the exploratory hole logs in Appendix A, the Made Ground in TP07 is underlain by a black sandy CLAY, which has been designated as Alluvium. The chemical testing confirms that the elevated levels of PAHs within the Made Ground (0.20m) at this location, have percolated into the underlying natural strata. It is worth noting, however, that all PAH exceedances are considered minor.

6.1.13 The average soil concentrations for the three PAHs that were in exceedance were entered into the CLEA software. This enabled the ratio of Average Daily Exposure to each contaminant with the relevant Health Criteria Value to be determined. This corresponded with the exceedances reported above when the soil guideline values were used. Site specific data was also entered into the software to model the conditions in a representative manner. Several land use categories are available within CLEA, the most appropriate in this case was the residential with homegrown produce scenario. Values for average soil pH and soil organic matter were also included (6.20 and 6% respectively).

6.1.14 The contaminant pathways for each of the substances were also determined using the CLEA software, and these were expressed as percentages. The distribution pathways for all three PAHs were broadly similar, with direct soil ingestion being the most significant route. For instance, the pathways for benzo[a]pyrene were 56.32% (direct soil ingestion), 36.25% (outdoor dermal contact with soil and dust), and 5.88% (consumption of homegrown produce and soil). The contribution of inhalation to the overall exposure was minimal.

6.1.15 No elevated levels of TPH were recorded.

6.2 Leachate Analysis

6.2.1 Groundwater was encountered across the site as detailed in Section 4.3 and in Table 4.3. A selection of samples were tested for the leachability of heavy metals and PAHs, in order to assess their risk to groundwater. The full results are contained within Appendix C. The results are also tabulated below;

Table 6.4: Comparison of Leachate results against Freshwater EQS (all values in ug/l unless stated)

Contaminant	Freshwater EQS	Minimum	Maximum	Exceedances
Metals				
Arsenic	50	<0.10	20	0
Cadmium	0.08	<0.08	<0.08	0
Chromium (III)	4.7	<0.10	<0.10	0
Chromium (VI)	3.4	<20	<20	0
Copper	3	5.90	10	2
Mercury	-	<0.50	<0.50	0
Nickel	34	<1.0	<1.0	0
Lead	14	<1.0	1.10	0
Selenium	-	<1.0	<1.0	0
Zinc	10.90	<1.0	10	-
General				
Sulphates (mg/l)	400,000	1.1	2.5	0
Cyanide (total) (mg/l)	1.0	<0.050	<0.050	0
Phenols (mg/l)	7.7	<0.030	<0.030	0
Organics				
Polycyclic Aromatic Hydrocarbons (PAH, 16)				
Acenaphthene	-	<0.10	<0.10	0
Acenaphthylene	-	<0.10	<0.10	0
Anthracene	0.60	<0.10	<0.10	0
Benzo(a)anthracene	-	<0.10	<0.10	0
Benzo(a)pyrene	0.27	<0.10	<0.10	0
Benzo(b)fluoranthene	0.017	<0.10	<0.10	0
Benzo(ghi)perylene	0.0082	<0.10	<0.10	0
Benzo(k)fluoranthene	0.017	<0.10	<0.10	0
Chrysene	-	<0.10	<0.10	0
Dibenzo(ah)anthracene	-	<0.10	<0.10	0
Fluoranthene	-	<0.10	<0.10	0

Fluorene	-	<0.10	<0.10	0
Indeno (123-cd) pyrene	0.10	<0.10	<0.10	0
Naphthalene	2	<0.10	<0.10	0
Phenanthrene	-	<0.10	<0.10	0
Pyrene	-	<0.10	<0.10	0
PAH (Total 16)	-	<2.0	<2.0	0

6.2.2 Leachate analysis was undertaken due to the levels of groundwater encountered during the site investigation, as well as the presence of Hicks Mill Stream, 38m North of the site.

6.2.3 Levels of copper exceeded the freshwater EQS, with levels of 5.90ug/l and 10ug/l, compared to the guideline value of 3ug/l. High levels of naturally occurring copper are widely acknowledged in the local area. The online 'TELLUS South West Map Viewer' indicate local stream sediment concentrations to be in the range of 400-700mg/kg, suggesting elevated levels of copper within surface water. The minor exceedances noted above are therefore not considered to be significant.

6.2.4 All other Leachability testing was below the relevant assessment criteria.

6.3 Refined Conceptual Site Model

Table 6.5: Refined Conceptual Model

Preliminary Conceptual Model						
Source(s)	Contaminant(s)	Pathway(s)	Receptor(s)	Probability	Consequence	Risk Assessment
Natural Geology	Radon gas	Ingress into proposed buildings	Future site users	High	Severe	High Risk –Development is within an area where greater than 30% of properties are affected.
	Arsenic	Dermal contact Soil and dust ingestion and inhalation Ground & surface waters	Future site users Site workers Site flora and fauna	Likely	Medium	Moderate Risk – Levels of arsenic within the Alluvium were recorded at 74mg/kg. Published literature (R.S. Middleton *et al*, 2017) suggest an average bioavailability of 19% for Arsenic in Cornwall, therefore the naturally occurring Arsenic levels of 74mg/kg encountered on site are highly likely to be within guideline values.
Refuse Heap (related to historical mining)	Heavy Metals (Arsenic, cadmium, copper, lead, zinc)	Dermal contact Soil and dust ingestion and inhalation	Future site users Site workers Site flora and fauna	High Likelihood	Medium	High Risk – High levels of heavy metals were encountered throughout the Made Ground. Given the exceptionally high levels of Arsenic, Lead and Copper, it is highly likely that without further mitigation the contaminant will reach the receptor.
	Heavy Metals (Copper)	Percolation	Groundwater	Likely	Minor	Low Risk – Leachability testing has revealed that levels of copper are in exceedance of the relevant assessment criteria, however as discussed in section 6.2.3 this is not considered to be significant.
	Polycyclic Aromatic Hydrocarbons	Dermal contact Soil and dust ingestion	Future site users Site workers Site flora and fauna	Likely	Medium	Moderate Risk – Three PAHs were found to exceed the relevant GAC, Benzo [b] fluoranthene, Benzo [a] pyrene and Dibenz [a,h] anthracene.

	Total Petroleum Hydrocarbons	Dermal contact Soil and dust ingestion and inhalation Ground & surface waters	Future site users Site workers Site flora and fauna	Unlikely	Medium	Low Risk – TPH was tested across the site both in the Made Ground, and in the underlying natural strata. No exceedances were noted therefore the risk is deemed to be low.
	Ground Gas	Ingress into proposed buildings	Future site users	Unlikely	Medium	Low Risk – As mentioned in the Phase 1 Report [ref: 19244], the age of the material on site means it has likely passed its gassing peak. Furthermore there were no indications on site that a gas risk is present.

7 CONCLUSIONS

7.1.0 The site was subject to a Phase II Ground Investigation to determine the level and risk of potential contamination, as well as the stability and geotechnical parameters of the underling material. It can be concluded that heavy metals and PAHs within the soil present and unacceptable level of risk. The site is likely to be suitable for its intended use, as long as the recommendations set out in this report are adhered to.

7.1.1 It is considered that conventional strip foundations will not be appropriate at the site, due to the extent and geotechnical properties of the Made Ground across the site.

7.1.2 Based on the In-situ and laboratory testing, it is considered that a piled foundation solution is appropriate, with end-bearing piles driven through the Made Ground and Alluvium and socketed in the underlying Mylor Slate Formation at depths of 4.50m to 5.50m.

8 RECOMMENDATIONS

8.1.1 A Phase 3 Remediation Strategy Report should be compiled which outlines the scope of remedial works required to reduce the level of contamination to such condition that the site can be deemed suitable for its proposed residential use.

8.1.2 Once the remediation strategy has been fully implemented and the work concluded to the required specifications, a Phase 4 Verification Report and Certificate must be produced.

8.1.3 A flow chart detailing the phased approach to land contamination, as set out in CLR11, is contained to the rear of the report.

8.1.4 It is strongly recommended that a mine search is commissioned for the site. If mining features are located on or close to the site, this may necessitate a regime of ground gas monitoring.

8.1.5 As the site is situated in an area where greater than 30% of the properties are above the action level, it is recommended that full radon protective measures are installed on any proposed building.

8.1.6 Suitable safety measures should be taken by those working on site to mitigate the risks associated with contaminated media including undertaking the appropriate risk assessments and ensuring all workers are wearing the correct PPE.

8.1.7 Waste removed from site shall be disposed of at a suitable facility with the appropriate Waste Transfer Notices obtained for future records. Asbestos waste should be handled by a suitable waste contractor.

9 NOTES

This report is concerned solely with the property, as defined by this report, or parts thereof examined.

The report should not be used in connection with adjacent properties.

In respect of site works, Wheal Jane Consultancy cannot accept any liabilities for any additional mine workings found outside the limits of any areas examined.

The information supplied by third parties which has been used in compiling this Phase 2 ground investigation report, is derived from a number of statutory and non-statutory sources. While every effort is made by the supplier to ensure accuracy, the supplier cannot guarantee the accuracy or completeness of such information or data, nor to identify all the factors that may be relevant.

The conclusions and recommendations relate to the type and extent of development outlined in this report for this specific property only and should not be taken as suitable for any other form or extent of development on this property without further consultation with Wheal Jane Consultancy.

This report is confidential to the client, the client's legal and professional advisors, and may not be reproduced or distributed without our permission other than to directly facilitate the sale or development of the property concerned.

We have no liability toward any person not party to commissioning this report.

Unless otherwise expressly stated, nothing in this report shall create or confer any rights or other benefits pursuant to the Contracts (Rights of Third Parties) Act 1999 in favour of any person other than the person commissioning this report.

This report is not an asbestos inspection that may fall within the control of Control of Asbestos Regulations 2006

Appendix A

Exploratory Hole Logs

Wheal Jane Consultancy — Geotechnical, environmental & mining services

Wheal Jane Group

Site	Number
Lanner	WS01

Excavation Method	Dimensions	Ground Level (mOD)	Client	Job Number
Drive in Windowless Sampler		84.00	Mr C Wells	19490
	Location	**Dates**	**Engineer**	**Sheet**
	Lanner	11/09/2018-12/09/2018	Wheal Jane Consultancy	1/1

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend
					(0.30)	MADE GROUND: Grass over brown sandy angular to subangular, fine to coarse GRAVEL of mudstone, glass, brick and plastic. Sand is fine to coarse.	
				83.70	0.30		
					(0.40)	MADE GROUND: Dark brown sandy angular to subangular, fine to coarse GRAVEL of mudstone, glass, brick, timber and ceramic. Sand is fine to coarse.	
0.80	ES1			83.30	0.70		
1.00-1.45	SPT N=13		2,2/3,5,3,2		(0.60)	MADE GROUND: Firm orangish brown sandy, gravelly CLAY. Gravel is angular to subangular, fine to coarse of mudstone, glass, brick, plastic and metal. Sand is fine to coarse.	
1.50-2.50	B2			82.70	1.30		
2.00-2.45	SPT N=4		1,1/1,1,1,1			MADE GROUND: Loose dark brown sandy angular to subangular, fine to coarse GRAVEL of mudstone, glass, brick, timber and ceramic. Sand is fine to coarse.	
					(2.30)		
3.00-3.45	SPT N=7		Water strike(1) at 2.90m. 1,1/1,2,2,2				▽1
				80.40	3.60		
3.70	D3				(0.40)	Very stiff grey gravelly CLAY. Gravel is angular to subangular, fine to coarse of mudstone.	
4.00-4.45	SPT N=72		7,10/14,17,19,22	80.00	4.00		
					(0.45)	Very dense grey angular to subangular, fine to coarse GRAVEL of mudstone.	
				79.55	4.45		
						Complete at 4.45m	

Remarks
Samples retrieved wet from 2.9m.

Scale (approx)	Logged By
1:50	BH

Figure No.
19490.WS01

Wheal Jane Consultancy — Geotechnical, environmental & mining services

Wheal Jane Group

Site	Number
Lanner	WS02

Excavation Method	Dimensions	Ground Level (mOD)	Client	Job Number
Drive in Windowless Sampler		81.00	Mr C Wells	19490
	Location	**Dates**	**Engineer**	**Sheet**
	Lanner	12/09/2018	Wheal Jane Consultancy	1/1

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Instr
					(0.40)	MADE GROUND: Grass over brown sandy angular to subangular, fine to coarse GRAVEL of mudstone, glass, brick and plastic. Sand is fine to coarse.		
0.20	ES1			80.60	0.40			
					(0.90)	MADE GROUND: Very loose dark brown sandy angular to subangular, fine to coarse GRAVEL of mudstone, glass, brick, timber and ceramic. Sand is fine to coarse.		
1.00-1.45	SPT N=3		0,0/1,0,1,1					
				79.70	1.30	Very soft black sandy CLAY. Sand is fine to coarse.		
1.50	D2				(0.50)			
				79.20	1.80	Firm grey sandy CLAY. Sand is fine to coarse.		
2.00-2.45	SPT N=15		4,15/5,4,3,3		(0.50)			
			Water strike(1) at 2.30m.	78.70	2.30			▽1
					(0.30)	Firm grey gravelly CLAY. Gravel is angular to subangular, fine to coarse of mudstone.		
				78.40	2.60	Stiff grey sandy CLAY. Sand is fine to coarse.		
2.70	D3							
3.00-3.45	SPT N=6		2,2/2,2,1,1					
3.00-4.00	B4				(1.40)			
				77.00	4.00	Very dense brown angular to subangular, fine to coarse GRAVEL of mudstone.		
4.00-4.45	SPT N=19		6,6/4,4,5,6					
4.00-5.00	B5				(1.10)			
5.00-5.45	SPT N=79		10,14/16,18,21,24	75.90	5.10	Very dense grey angular to subangular, fine to coarse GRAVEL of mudstone.		
					(0.35)			
				75.55	5.45	Complete at 5.45m		

Remarks
Samples retreived wet from 2.3m.

Scale (approx)	Logged By
1:50	BH

Figure No.
19490.WS02

Wheal Jane Consultancy — Geotechnical, environmental & mining services

Wheal Jane Group

Site	Number
Lanner	WS03

Excavation Method	Dimensions	Ground Level (mOD)	Client	Job Number
Drive in Windowless Sampler		83.00	Mr C Wells	19490
	Location	**Dates**	**Engineer**	**Sheet**
	Lanner	12/09/2018	Wheal Jane Consultancy	1/1

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend
0.00-0.50	B1				(0.58)	MADE GROUND: Grass over brown sandy angular to subangular, fine to coarse GRAVEL of mudstone, glass, brick and plastic. Sand is fine to coarse.	
				82.42	0.58	MADE GROUND: Loose dark brown sandy angular to subangular, fine to coarse GRAVEL of mudstone, glass, brick, timber and ceramic. Sand is fine to coarse.	
1.00-1.45	SPT N=4		1,1/1,1,1,1		(1.22)		
				81.20	1.80	MADE GROUND: Stiff orangish brown sandy, gravelly CLAY. Gravel is angular to subangular, fine to coarse of mudstone, glass, brick, plastic and metal. Sand is fine to coarse.	
1.90	D2						
2.00-2.45	SPT N=17		3,4/3,5,3,6		(0.70)		
			Water strike(1) at 2.50m.	80.50	2.50	Stiff grey sandy, gravelly CLAY. Gravel is angular to subangular, fine to coarse of mudstone. Sand is fine to coarse.	▽1
2.60	ES3				(0.40)		
				80.10	2.90	Very loose orangish brown clayey subrounded to subangular, fine to coarse GRAVEL of mudstone and granite.	
3.00-3.45	SPT N=2		1,0/1,0,1,0				
3.00	ES4				(0.90)		
				79.20	3.80	Firm brownish grey CLAY.	
					(0.30)		
4.00-4.45	SPT N=11		2,2/3,2,3,3	78.90	4.10	Medium dense orangish brown clayey subrounded to subangular, fine to coarse GRAVEL of mudstone and granite.	
4.00	D5				(0.80)		
4.90	D6			78.10	4.90	Very stiff brownish grey CLAY.	
5.00-5.45	SPT N=51		5,8/11,12,14,14	78.00	5.00	Very dense grey angular to subangular, fine to coarse GRAVEL of mudstone.	
					(0.45)		
				77.55	5.45	Complete at 5.45m	

Remarks
Samples retrevied wet from 2.5m.

Scale (approx)	Logged By
1:50	BH

Figure No. 19490.WS03

Wheal Jane Consultancy — Geotechnical, environmental & mining services

Wheal Jane Group

Site	Number
Lanner	WS04

Excavation Method	Dimensions	Ground Level (mOD)	Client	Job Number
Drive in Windowless Sampler.		84.00	Mr C Wells	19490
	Location	**Dates**	**Engineer**	**Sheet**
	Lanner	12/09/2018	Wheal Jane Consultancy	1/1

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Instr
					(0.56)	MADE GROUND: Grass over brown sandy angular to subangular, fine to coarse GRAVEL of mudstone, glass, brick and plastic. Sand is fine to coarse.		
0.30	ES1			83.44	0.56			
					(0.54)	MADE GROUND: Loose dark brown sandy angular to subangular, fine to coarse GRAVEL of mudstone, glass, brick, timber and ceramic. Sand is fine to coarse.		
1.00-1.45	SPT N=4		1,1/1,1,1,1	82.90	1.10			
					(0.70)	MADE GROUND: Soft orangish brown sandy, gravelly CLAY. Gravel is angular to subangular, fine to coarse of mudstone, glass, brick, plastic and metal. Sand is fine to coarse.		
1.50	D2			82.20	1.80			
2.00-2.45	SPT N=6		1,1/1,1,2,2			MADE GROUND: Looseorangish brown clayey subrounded to subangular, fine to coarse GRAVEL of mudstone, glass and granite.		
2.00-2.50	B3				(0.70)			
				81.50	2.50	MADE GROUND: Very soft orangish brown sandy, gravelly CLAY. Gravel is angular to subangular, fine to coarse of mudstone, glass, brick, plastic and metal. Sand is fine to coarse.		
					(0.50)			
			Water strike(1) at 3.00m.	81.00	3.00			▽1
3.00-3.45	SPT N=1		0,0/0,1,0,0			MADE GROUND: Very loose orangish brown clayey subrounded to subangular, fine to coarse GRAVEL of mudstone, glass and granite.		
					(0.50)			
				80.50	3.50	Stiff orange gravelly CLAY. Gravel is angular to subangular, fine to coarse of mudstone.		
3.70	D4				(0.50)			
4.00-4.45	SPT N=20		3,3/4,5,5,6	80.00	4.00	Medium dense orangish brown clayey subrounded to subangular, fine to coarse GRAVEL of mudstone and granite.		
					(0.50)			
				79.50	4.50	Very stiff orangish grey gravelly CLAY. Gravel is angular to subangular, fine to coarse of mudstone.		
4.60	D5				(0.50)			
5.00-5.45	SPT N=84		8,13/17,18,20,29	79.00	5.00	Very dense grey angular to subangular, fine to coarse GRAVEL of mudstone.		
					(0.45)			
				78.55	5.45	Complete at 5.45m		

Remarks
Sampes retrevied wet from 3.0m.

Scale (approx)	Logged By
1:50	

Figure No.
19490.W

Wheal Jane Consultancy
Geotechnical, environmental & mining services

Wheal Jane Group

Site	Number
Lanner	WS05

Excavation Method	Dimensions	Ground Level (mOD)	Client	Job Number
Drive in Windowless Sampler.		84.00	Mr C Wells	19490
	Location	**Dates**	**Engineer**	**Sheet**
	Lanner	12/09/2018	Wheal Jane Consultancy	1/1

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend
					(0.40)	MADE GROUND: Grass over brown sandy angular to subangular, fine to coarse GRAVEL of mudstone, glass, brick and plastic. Sand is fine to coarse.	
				83.60	0.40		
0.50	ES1					MADE GROUND: Loose dark brown sandy angular to subangular, fine to coarse GRAVEL of mudstone, glass, brick, timber and ceramic. Sand is fine to coarse.	
1.00-1.45	SPT N=8		2,2/2,2,2,2		(1.20)		
				82.40	1.60		
					(0.40)	MADE GROUND: Loose dark brown sandy angular to subangular, fine to coarse GRAVEL of mudstone, glass, brick, timber and ceramic. Sand is fine to coarse. Rare cobbles of granite (Up to 70mm).	
2.00-3.00	B2		Water strike(1) at 2.00m.	82.00	2.00		▽1
2.00-2.45	SPT N=8		1,1/2,2,2,2			Medium dense orangish brown clayey subrounded to subangular, fine to coarse GRAVEL of mudstone and granite.	
					(1.60)		
3.00-3.45	SPT N=14		2,2/2,3,4,5				
				80.40	3.60		
3.60-4.00	B3					Very dense grey angular to subangular, fine to coarse GRAVEL of mudstone.	
4.00-4.45	SPT N=106		10,16/19,25,28,34		(0.85)		
				79.55	4.45		
						Complete at 4.45m	

Remarks
Samples retrieved wet from 2.0m.

Scale (approx)	Logged By
1:50	BH

Figure No.
19490.WS05

Wheal Jane Consultancy
Geotechnical, environmental & mining services

Wheal Jane Group

Site	Trial Pit Number
Lanner	TP01

Excavation Method	Dimensions	Ground Level (mOD)	Client	Job Number
Machine excavated trial pit.	Width: 0.55m Length: 2.40m	84.00	Mr C Wells	19490
	Location Lanner	**Dates** 06/09/2018	**Engineer** Wheal Jane Consultancy	**Sheet** 1/7

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend
					(0.42)	MADE GROUND: Grass over brown sandy angular to subangular, fine to coarse GRAVEL of mudstone, glass, brick and plastic. Sand is fine to coarse.	
0.30	ES1			83.58	0.42		
					(0.88)	MADE GROUND: Dark brown sandy angular to subangular, fine to coarse GRAVEL of mudstone, glass, brick, timber and ceramic. Sand is fine to coarse.	
1.30-1.70	B2			82.70	1.30		
1.50	ES3				(0.40)	MADE GROUND: Brown sandy, gravelly CLAY. Gravel is angular to subangular, fine to coarse of mudstone, ceramic, brick and plastic. Sand is fine to coarse.	
1.80	ES4			82.30	1.70		
					(0.20)	MADE GROUND: Grey sandy CLAY. Sand is fine to coarse.	
2.00-3.00	B5			82.10	1.90		
					(1.30)	MADE GROUND: Brown gravelly CLAY. Gravel is angular to subangular, fine to coarse of ceramic, mudstone, brick and glass.	
2.50	D6			80.80	3.20		
						Complete at 3.20m	

Remarks

No groundwater encountered.
Sides unstable.

Scale (approx)	Logged By	Figure No.
1:50	BH	19490.TP01

Wheal Jane Consultancy			Site: Lanner	Trial Pit Number: TP02
Excavation Method: Machine excavted trial pit.	**Dimensions**: Width: 0.60m, Length: 2.40m	**Ground Level (mOD)**: 84.00	**Client**: Mr C Wells	**Job Number**: 19490
	Location: Lanner	**Dates**: 06/09/2018	**Engineer**: Wheal Jane Consultancy	**Sheet**: 2/7

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend
0.00-0.40	B1				(0.45)	MADE GROUND: Grass over brown sandy angular to subangular, fine to coarse GRAVEL of mudstone, glass, brick and plastic. Sand is fine to coarse. Rare boulders of granite (Up to 550mm).	
0.50	ES2			83.55	0.45	MADE GROUND: Dark brown sandy angular to subangular, fine to coarse GRAVEL of mudstone, glass, brick, timber and ceramic. Sand is fine to coarse.	
					(0.75)		
				82.80	1.20	MADE GROUND: Brown clayey, gravelly fine to coarse SAND. Gravel is angular to subangular, fine to coarse of brick, glass, plastic and mudstone.	
1.60	ES3						
2.00-3.00	B4				(1.90)		
2.70	ES5						
				80.90	3.10	Complete at 3.10m	

Remarks

No groundwater encountered.
Sides unstable.

Scale (approx)	Logged By	Figure No.
1:50	BH	19490.TP02

Wheal Jane Consultancy		Site: Lanner	Trial Pit Number: TP03
Excavation Method: Machine excavted trial pit.	**Dimensions**: Width: 0.50m, Length: 2.45m	**Ground Level (mOD)**: 84.00	**Client**: Mr C Wells	**Job Number**: 19490
	Location: Lanner	**Dates**: 06/09/2018	**Engineer**: Wheal Jane Consultancy	**Sheet**: 3/7

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend
0.00-0.50	B1				(0.50)	MADE GROUND: Orangish brown clayey angular to subangular, fine to coarse GRAVEL of mudstone, charcoal, ceramic, metal and brick.	
0.20	ES2			83.50	0.50		
					(1.10)	MADE GROUND: Dark brown sandy angular to subangular, fine to coarse GRAVEL of mudstone, glass, brick, timber and ceramic. Sand is fine to coarse.	
1.50	ES3			82.40	1.60		
2.10	ES4				(1.70)	MADE GROUND: Greyish brown gravelly CLAY. Gravel is angular to subangular, fine to coarse of mudstone, glass, plastic and ceramic.	
2.50-3.00	B5						
3.00	D6		Water strike(1) at 3.30m.	80.70	3.30	Complete at 3.30m	▽1

Remarks

Sides unstable.
Groundwater encountered at 3.30m.

Scale (approx)	Logged By	Figure No.
1:50	BH	19490.TP03

Site	Trial Pit Number
Lanner	TP04

Excavation Method	Dimensions	Ground Level (mOD)	Client	Job Number
Machine excavted trial pit.	Width: 0.52m Length: 2.40m	85.00	Mr C Wells	19490
	Location	**Dates**	**Engineer**	**Sheet**
	Lanner	06/09/2018	Wheal Jane Consultancy	4/7

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend
0.10	ES1				(0.42)	MADE GROUND: Grass over brown sandy angular to subangular, fine to coarse GRAVEL of mudstone, glass, brick and plastic. Sand is fine to coarse.	
0.50-1.00 0.60	B2 ES3			84.58	0.42	MADE GROUND: Dark brown clayey, sandy angular to subangular, fine to coarse GRAVEL of granite, mudstone, metal, plastic, ceramic and brick. Organic odour.	
					(1.38)		
2.00 2.00 2.00-2.50	D6 ES4 B5			83.20	1.80	MADE GROUND: Brown sandy, gravelly CLAY. Gravel is angular to subangular, fine to coarse of mudstone, ceramic, brick and plastic. Sand is fine to coarse.	
					(1.30)		
			Water strike(1) at 3.10m.	81.90	3.10	Complete at 3.10m	▽1

Remarks

Groundwater encountered at 3.10m.
Sides unstable.

Scale (approx)	Logged By	Figure No.
1:50	BH	19490.TP04

Wheal Jane Consultancy				Site: Lanner	Trial Pit Number: TP05
Excavation Method: Machine excavated trial pit.	**Dimensions**: Width: 0.55m, Length: 2.45m	**Ground Level (mOD)**: 84.00	**Client**: Mr C Wells	**Job Number**: 19490
	Location: Lanner	**Dates**: 06/09/2018	**Engineer**: Wheal Jane Consultancy	**Sheet**: 5/7

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend
					(0.45)	MADE GROUND: Grass over brown sandy angular to subangular, fine to coarse GRAVEL of mudstone, glass, brick and plastic. Sand is fine to coarse.	
0.40	ES1			83.55	0.45		
					(0.95)	MADE GROUND: Dark brown clayey, gravelly, fine to coarse SAND. Gravel is angular to subanular, fine to coarse of mudstone, brick, concrete, ceramic and plastic. Sand is fine to coarse.	
1.20	ES3			82.60	1.40		
1.50-2.00	B2					MADE GROUND: Orangish brown sandy angular to subangular, fine to coarse GRAVEL of mudstone, brick, ceramic, metal and plastic. Sand is fine to coarse.	
					(2.10)		
			Water strike(1) at 3.10m.				▽1
				80.50	3.50		
						Complete at 3.50m	

Remarks

Sides unstable.
Groundwater encountered at 3.10m.

Scale (approx)	Logged By	Figure No.
1:50	BH	19490.TP05

Site	Trial Pit Number
Lanner	TP06

Excavation Method	Dimensions	Ground Level (mOD)	Client	Job Number
Machine excavted trial pit.	Width: 0.50m Length: 2.50m	83.00	Mr C Wells	19490
	Location Lanner	**Dates** 06/09/2018	**Engineer** Wheal Jane Consultancy	**Sheet** 6/7

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend
					(0.35)	MADE GROUND: Grass over brown sandy angular to subangular, fine to coarse GRAVEL of mudstone, glass, brick and plastic. Sand is fine to coarse.	
0.30	ES1			82.65	0.35		
					(1.35)	MADE GROUND: Orangish brown clayey gravelly fine to coarse SAND. Gravel is angular to subangular, fine to coarse of mudstone, brick, metal and plastic.	
1.30	ES2						
1.70-2.00	B3			81.30	1.70	Grey sandy CLAY. Sand is fine to coarse.	
1.80	ES4						
2.00	D5				(1.80)		
				79.50	3.50	Complete at 3.50m	

Remarks

No groundwater encountered.
Sides unstable.

Scale (approx)	Logged By	Figure No.
1:50	BH	19490.TP06

Site	Trial Pit Number
Lanner	TP07

Excavation Method	Dimensions	Ground Level (mOD)	Client	Job Number
Machine excavated trial pit.	Width: 0.55m Length: 2.44m	81.00	Mr C Wells	19490
	Location Lanner	**Dates** 06/09/2018	**Engineer** Wheal Jane Consultancy	**Sheet** 7/7

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend
					(0.30)	MADE GROUND: Grass over brown sandy angular to subangular, fine to coarse GRAVEL of mudstone, glass, brick and plastic. Sand is fine to coarse.	
0.20	ES1			80.70	0.30		
					(0.90)	MADE GROUND: Dark brown sandy angular to subangular, fine to coarse GRAVEL of mudstone, glass, brick, timber and ceramic. Sand is fine to coarse.	
				79.80	1.20		
1.30	ES2				(0.20)	Black sandy CLAY. Sand is fine to coarse. Organic odour.	
1.50	D4			79.60	1.40		
1.50-2.50	B3					Grey sandy CLAY. Sand is fine to coarse.	
			Water strike(1) at 2.10m.		(1.30)		▽1
				78.30	2.70		
2.80	ES5					Greyish brown clayey angular to subangular, fine to coarse GRAVEL of mudstone.	
2.80-3.50	B6				(0.80)		
				77.50	3.50		
						Complete at 3.50m	

Remarks

Groundwater encountered at 2.10m.
Sides unstable.

Scale (approx)	Logged By	Figure No.
1:50	BH	19490.TP07

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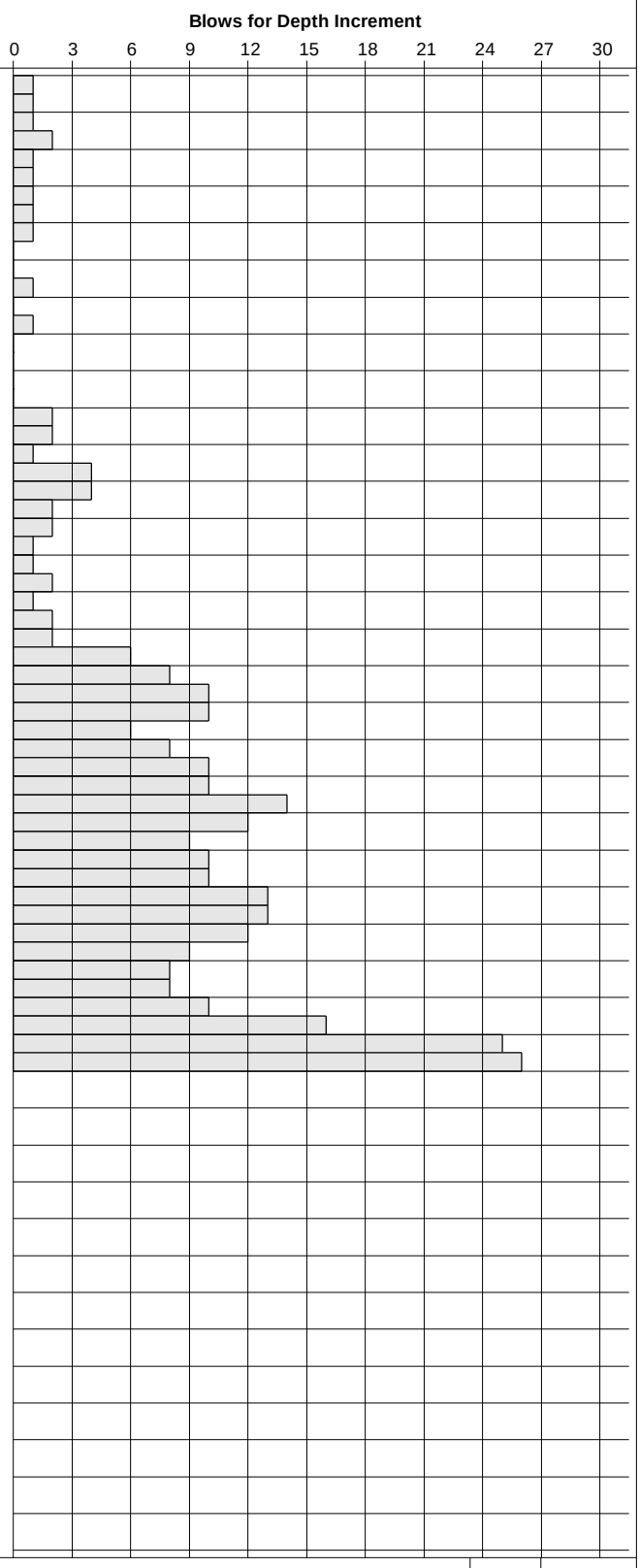
Site	Probe Number
Lanner	DP01

Method	Cone Dimensions	Ground Level (mOD)	Client	Job Number
Bedrock encountered at 5.3m	Diameter 50mm, Angle 90°	82.00	Mr C Wells	19490

Location	Dates	Engineer	Sheet
Lanner	12/09/2018	Wheal Jane Consultancy	1/1

Depth (m)	Blows for Depth Increment	Field Records	Level (mOD)	Depth (m)
0.00-0.10	1		82.00	0.00
0.10-0.20	1			
0.20-0.30	1			
0.30-0.40	2			
0.40-0.50	1			
0.50-0.60	1		81.50	0.50
0.60-0.70	1			
0.70-0.80	1			
0.80-0.90	1			
0.90-1.00	0			
1.00-1.10	0		81.00	1.00
1.10-1.20	1			
1.20-1.30	0			
1.30-1.40	1			
1.40-1.50	0			
1.50-1.60	0		80.50	1.50
1.60-1.70	0			
1.70-1.80	0			
1.80-1.90	2			
1.90-2.00	2			
2.00-2.10	1		80.00	2.00
2.10-2.20	4			
2.20-2.30	4			
2.30-2.40	2			
2.40-2.50	2			
2.50-2.60	1		79.50	2.50
2.60-2.70	1			
2.70-2.80	2			
2.80-2.90	1			
2.90-3.00	2			
3.00-3.10	2		79.00	3.00
3.10-3.20	6			
3.20-3.30	8			
3.30-3.40	10			
3.40-3.50	10			
3.50-3.60	6		78.50	3.50
3.60-3.70	8			
3.70-3.80	10			
3.80-3.90	10			
3.90-4.00	14			
4.00-4.10	12		78.00	4.00
4.10-4.20	9			
4.20-4.30	10			
4.30-4.40	10			
4.40-4.50	13			
4.50-4.60	13		77.50	4.50
4.60-4.70	12			
4.70-4.80	9			
4.80-4.90	8			
4.90-5.00	8			
5.00-5.10	10		77.00	5.00
5.10-5.20	16			
5.20-5.30	25			
5.30-5.40	26			
			76.50	5.50
			76.00	6.00
			75.50	6.50
			75.00	7.00
			74.50	7.50
			74.00	8.00



Remarks

Scale (approx)	Logged By
1:40	BH

Figure No. 19490.DP01

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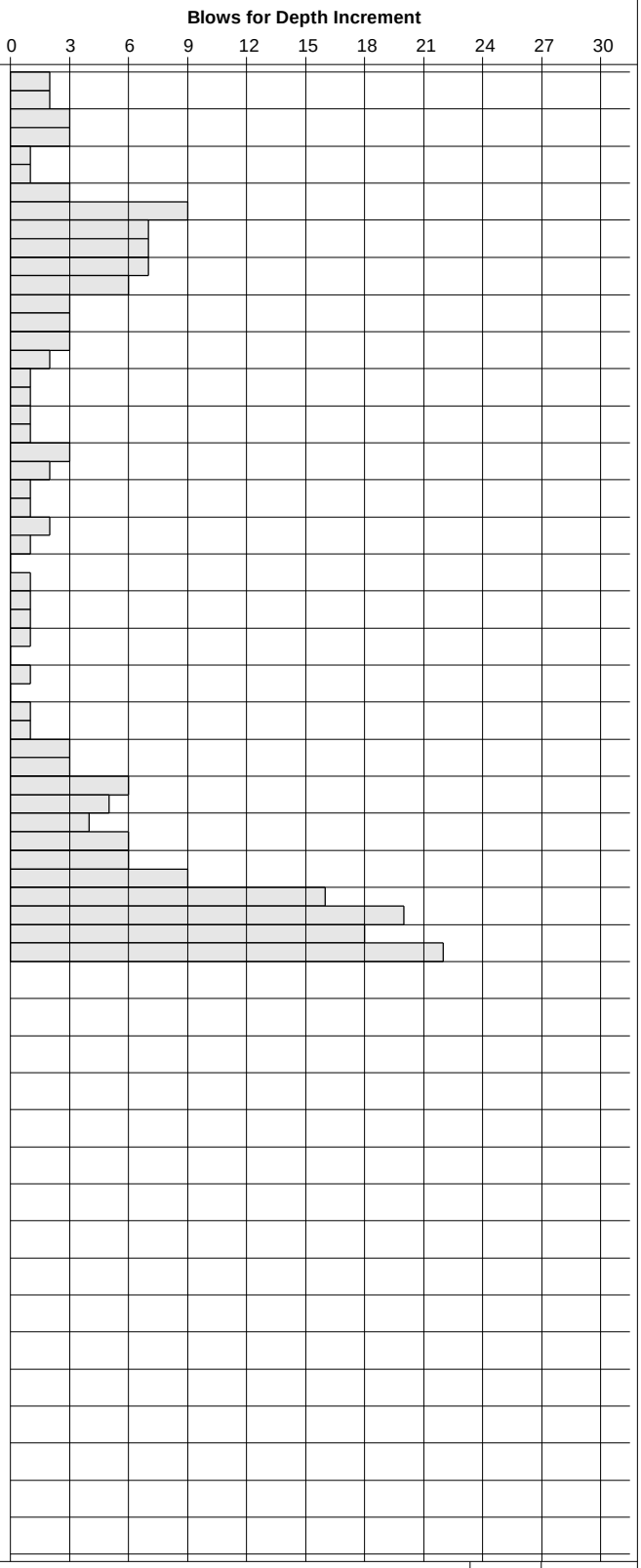
Site	Probe Number
Lanner	DP0 2

Method	Cone Dimensions	Ground Level (mOD)	Client	Job Number
Bedrock encountered at 4.4m.	Diameter 50mm, Angle 90°	85.00	Mr C Wells	19490

Location	Dates	Engineer	Sheet
Lanner	12/09/2018	Wheal Jane Consultancy	1/1

Depth (m)	Blows for Depth Increment	Field Records	Level (mOD)	Depth (m)
0.00-0.10	2		85.00	0.00
0.10-0.20	2			
0.20-0.30	3			
0.30-0.40	3			
0.40-0.50	1			
0.50-0.60	1		84.50	0.50
0.60-0.70	3			
0.70-0.80	9			
0.80-0.90	7			
0.90-1.00	7			
1.00-1.10	7		84.00	1.00
1.10-1.20	6			
1.20-1.30	3			
1.30-1.40	3			
1.40-1.50	3			
1.50-1.60	2		83.50	1.50
1.60-1.70	1			
1.70-1.80	1			
1.80-1.90	1			
1.90-2.00	1			
2.00-2.10	3		83.00	2.00
2.10-2.20	2			
2.20-2.30	1			
2.30-2.40	1			
2.40-2.50	2			
2.50-2.60	1		82.50	2.50
2.60-2.70	0			
2.70-2.80	1			
2.80-2.90	1			
2.90-3.00	1			
3.00-3.10	1		82.00	3.00
3.10-3.20	0			
3.20-3.30	1			
3.30-3.40	0			
3.40-3.50	1			
3.50-3.60	1		81.50	3.50
3.60-3.70	3			
3.70-3.80	3			
3.80-3.90	6			
3.90-4.00	5			
4.00-4.10	4		81.00	4.00
4.10-4.20	6			
4.20-4.30	6			
4.30-4.40	9			
4.40-4.50	16			
4.50-4.60	20		80.50	4.50
4.60-4.70	18			
4.70-4.80	22			
			80.00	5.00
			79.50	5.50
			79.00	6.00
			78.50	6.50
			78.00	7.00
			77.50	7.50
			77.00	8.00



Remarks

Scale (approx)	Logged By
1:40	BH

Figure No. 19490.DP03

Appendix B

Trial Pit Photographs

Wheal Jane Group

Wheal Jane Consultancy
Environment & mining services

Land Adjacent to Coppice Inn, Lanner	19490
Phase 1 Preliminary Investigation	TP01
SPS Architectural Services	September 2018

Wheal Jane Group

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Environment & mining services

Land Adjacent to Coppice Inn, Lanner	19490
Phase 1 Preliminary Investigation	TP01
SPS Architectural Services	September 2018

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Land Adjacent to Coppice Inn, Lanner	19490
Phase 1 Preliminary Investigation	TP02
SPS Architectural Services	September 2018

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Land Adjacent to Coppice Inn, Lanner	19490
Phase 1 Preliminary Investigation	TP02
SPS Architectural Services	September 2018

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Land Adjacent to Coppice Inn, Lanner	19490
Phase 1 Preliminary Investigation	TP03
SPS Architectural Services	September 2018

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Land Adjacent to Coppice Inn, Lanner	19490
Phase 1 Preliminary Investigation	TP03
SPS Architectural Services	September 2018

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Land Adjacent to Coppice Inn, Lanner	19490
Phase 1 Preliminary Investigation	TP04
SPS Architectural Services	September 2018

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Land Adjacent to Coppice Inn, Lanner	19490
Phase 1 Preliminary Investigation	TP04
SPS Architectural Services	September 2018

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Land Adjacent to Coppice Inn, Lanner	19490
Phase 1 Preliminary Investigation	TP05
SPS Architectural Services	September 2018

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Environment & mining services

Land Adjacent to Coppice Inn, Lanner	19490
Phase 1 Preliminary Investigation	TP05
SPS Architectural Services	September 2018

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Environment & mining services

Land Adjacent to Coppice Inn, Lanner	19490
Phase 1 Preliminary Investigation	TP06
SPS Architectural Services	September 2018

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Land Adjacent to Coppice Inn, Lanner	19490
Phase 1 Preliminary Investigation	TP06
SPS Architectural Services	September 2018

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Land Adjacent to Coppice Inn, Lanner	19490
Phase 1 Preliminary Investigation	TP07
SPS Architectural Services	September 2018

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Environment & mining services

Land Adjacent to Coppice Inn, Lanner	19490
Phase 1 Preliminary Investigation	TP07
SPS Architectural Services	September 2018

Appendix C

Chemical Laboratory Results

Chemtest
The right chemistry to deliver results
Chemtest Ltd.
Depot Road
Newmarket
CB8 0AL
Tel: 01638 606070
Email: info@chemtest.com

UKAS TESTING
2183

Final Report

Report No.:	18-28339-1
Initial Date of Issue:	25-Sep-2018
Client	Wheal Jane
Client Address:	Old Mine Offices Wheal Jane Baldhu Truro Cornwall TR3 6EE
Contact(s):	B Halliday
Project	19490 Lanner

Quotation No.:		**Date Received:**	18-Sep-2018
Order No.:	19490	**Date Instructed:**	18-Sep-2018
No. of Samples:	9		
Turnaround (Wkdays):	5	**Results Due:**	24-Sep-2018
Date Approved:	25-Sep-2018		

Approved By:

[redacted]

Details: Glynn Harvey, Laboratory Manager

Results - Leachate

Project: 19490 Lanner

Client: Wheal Jane			**Chemtest Job No.:**		18-28339	18-28339
Quotation No.:			**Chemtest Sample ID.:**		690320	690325
			Sample Location:		TP02	TP07
			Sample Type:		SOIL	SOIL
			Top Depth (m):		2.70	0.20
			Date Sampled:		12-Sep-2018	12-Sep-2018
Determinand	**Accred.**	**SOP**	**Units**	**LOD**		
pH	U	1010		N/A	7.5	7.2
Sulphate	U	1220	mg/l	1.0	2.5	1.1
Cyanide (Total)	U	1300	mg/l	0.050	< 0.050	< 0.050
Cyanide (Free)	U	1300	mg/l	0.050	< 0.050	< 0.050
Thiocyanate	U	1300	mg/l	0.50	< 0.50	< 0.50
Sulphide	U	1325	mg/l	0.050	< 0.050	< 0.050
Arsenic (Dissolved)	U	1450	µg/l	1.0	< 1.0	20
Boron (Dissolved)	U	1450	µg/l	20	< 20	< 20
Cadmium (Dissolved)	U	1450	µg/l	0.080	< 0.080	< 0.080
Chromium (Dissolved)	U	1450	µg/l	1.0	< 1.0	< 1.0
Copper (Dissolved)	U	1450	µg/l	1.0	5.9	10
Mercury (Dissolved)	U	1450	µg/l	0.50	< 0.50	< 0.50
Nickel (Dissolved)	U	1450	µg/l	1.0	< 1.0	< 1.0
Lead (Dissolved)	U	1450	µg/l	1.0	< 1.0	1.1
Selenium (Dissolved)	U	1450	µg/l	1.0	< 1.0	< 1.0
Zinc (Dissolved)	U	1450	µg/l	1.0	< 1.0	10
Chromium (Hexavalent)	U	1490	µg/l	20	< 20	< 20
Naphthalene	U	1700	µg/l	0.10	< 0.10	< 0.10
Acenaphthylene	U	1700	µg/l	0.10	< 0.10	< 0.10
Acenaphthene	U	1700	µg/l	0.10	< 0.10	< 0.10
Fluorene	U	1700	µg/l	0.10	< 0.10	< 0.10
Phenanthrene	U	1700	µg/l	0.10	< 0.10	< 0.10
Anthracene	U	1700	µg/l	0.10	< 0.10	< 0.10
Fluoranthene	U	1700	µg/l	0.10	< 0.10	< 0.10
Pyrene	U	1700	µg/l	0.10	< 0.10	< 0.10
Benzo[a]anthracene	U	1700	µg/l	0.10	< 0.10	< 0.10
Chrysene	U	1700	µg/l	0.10	< 0.10	< 0.10
Benzo[b]fluoranthene	U	1700	µg/l	0.10	< 0.10	< 0.10
Benzo[k]fluoranthene	U	1700	µg/l	0.10	< 0.10	< 0.10
Benzo[a]pyrene	U	1700	µg/l	0.10	< 0.10	< 0.10
Indeno(1,2,3-c,d)Pyrene	U	1700	µg/l	0.10	< 0.10	< 0.10
Dibenz(a,h)Anthracene	U	1700	µg/l	0.10	< 0.10	< 0.10
Benzo[g,h,i]perylene	U	1700	µg/l	0.10	< 0.10	< 0.10
Total Of 16 PAH's	U	1700	µg/l	2.0	< 2.0	< 2.0
Total Phenols	U	1920	mg/l	0.030	< 0.030	< 0.030

Chemtest
The right chemistry to deliver results

Results - Soil

Project: 19490 Lanner

Client: Wheal Jane		**Chemtest Job No.:**			18-28339	18-28339	18-28339	18-28339	18-28339	18-28339	18-28339	18-28339
Quotation No.:		**Chemtest Sample ID.:**			690318	690319	690321	690322	690323	690324	690325	690326
		Sample Location:			TP01	TP02	TP03	TP04	TP06	TP07	TP07	WS03
		Sample Type:			SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL
		Top Depth (m):			0.30	1.60	0.20	2.00	1.80	1.30	0.20	2.60
		Date Sampled:			12-Sep-2018	12-Sep-2018	12-Sep-2018	12-Sep-2018	12-Sep-2018	12-Sep-2018	12-Sep-2018	12-Sep-2018
		Asbestos Lab:			DURHAM	DURHAM	DURHAM	DURHAM	DURHAM	DURHAM	DURHAM	DURHAM
Determinand	**Accred.**	**SOP**	**Units**	**LOD**								
ACM Type	U	2192		N/A	-		-					
Asbestos Identification	U	2192	%	0.001	No Asbestos Detected		No Asbestos Detected					
Moisture	N	2030	%	0.020	16	18	15	22	23	35	13	30
Stones and Removed Materials	N	2030	%	0.020	< 0.020	< 0.020	< 0.020	< 0.020	< 0.020	< 0.020	< 0.020	< 0.020
pH	U	2010		N/A	6.5	6.3	6.0	6.2	6.6	5.8	6.1	6.2
Boron (Hot Water Soluble)	U	2120	mg/kg	0.40	0.96	0.51	0.71	0.45	< 0.40	0.77	0.49	< 0.40
Sulphate (2:1 Water Soluble) as SO4	U	2120	g/l	0.010	< 0.010	< 0.010	< 0.010	< 0.010	0.12	0.48	0.013	< 0.010
Cyanide (Free)	U	2300	mg/kg	0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50
Cyanide (Total)	U	2300	mg/kg	0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50
Thiocyanate	U	2300	mg/kg	5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0
Sulphide (Easily Liberatable)	N	2325	mg/kg	0.50	3.7	2.2	1.1	0.61	2.8	2.7	1.7	1.8
Sulphate (Total)	U	2430	%	0.010	0.085	0.12	0.73	0.061	13	0.98	0.13	0.075
Arsenic	U	2450	mg/kg	1.0	410	2200	8200	360	3000	2700	580	74
Cadmium	U	2450	mg/kg	0.10	0.34	1.7	1.7	1.1	22	7.7	1.4	0.39
Chromium	U	2450	mg/kg	1.0	29	27	91	30	5.2	33	24	21
Copper	U	2450	mg/kg	0.50	330	1300	1600	980	16000	7300	810	2000
Mercury	U	2450	mg/kg	0.10	0.71	0.79	0.79	0.18	2.3	1.7	0.44	0.19
Nickel	U	2450	mg/kg	0.50	28	25	80	26	24	35	20	18
Lead	U	2450	mg/kg	0.50	1100	400	570	64	340	2600	230	30
Selenium	U	2450	mg/kg	0.20	1.3	2.2	2.8	0.66	7.3	7.0	1.2	0.86
Zinc	U	2450	mg/kg	0.50	290	580	1000	500	8900	3300	590	320
Chromium (Hexavalent)	N	2490	mg/kg	0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50
Organic Matter	U	2625	%	0.40	11	3.3	6.0	2.6	< 0.40	12	4.8	2.6
TPH >C6-C8	N	2670	mg/kg	1.0	< 1.0		< 1.0		< 1.0	< 1.0	< 1.0	< 1.0
TPH >C8-C10	N	2670	mg/kg	1.0	< 1.0		< 1.0		< 1.0	< 1.0	< 1.0	< 1.0
TPH >C10-C12	N	2670	mg/kg	1.0	< 1.0		< 1.0		< 1.0	< 1.0	< 1.0	< 1.0
TPH >C12-C16	N	2670	mg/kg	1.0	< 1.0		< 1.0		< 1.0	< 1.0	< 1.0	< 1.0
TPH >C16-C21	N	2670	mg/kg	1.0	< 1.0		< 1.0		< 1.0	< 1.0	44	< 1.0
TPH >C21-C25	N	2670	mg/kg	1.0	< 1.0		< 1.0		< 1.0	< 1.0	77	< 1.0
TPH >C25-C35	N	2670	mg/kg	1.0	< 1.0		< 1.0		< 1.0	< 1.0	58	< 1.0
TPH >C35-C40	N	2670	mg/kg	1.0	< 1.0		< 1.0		< 1.0	< 1.0	< 1.0	< 1.0
Total TPH >C6-C40	U	2670	mg/kg	10	< 10	< 10	< 10	< 10	< 10	< 10	180	< 10
Naphthalene	U	2700	mg/kg	0.10	0.64	< 0.10	1.1	< 0.10	< 0.10	2.5	< 0.10	< 0.10
Acenaphthylene	U	2700	mg/kg	0.10	0.47	< 0.10	0.34	< 0.10	< 0.10	2.2	< 0.10	< 0.10
Acenaphthene	U	2700	mg/kg	0.10	0.12	< 0.10	0.14	< 0.10	< 0.10	0.39	< 0.10	< 0.10
Fluorene	U	2700	mg/kg	0.10	0.18	< 0.10	0.28	< 0.10	< 0.10	1.1	< 0.10	< 0.10
Phenanthrene	U	2700	mg/kg	0.10	3.2	0.89	2.4	< 0.10	< 0.10	3.8	1.5	< 0.10
Anthracene	U	2700	mg/kg	0.10	0.77	0.34	0.61	< 0.10	< 0.10	2.5	0.48	< 0.10

Chemtest
The right chemistry to deliver results

Results - Soil

Project: 19490 Lanner

Client: Wheal Jane		**Chemtest Job No.:**			18-28339	18-28339	18-28339	18-28339	18-28339	18-28339	18-28339	18-28339
Quotation No.:		**Chemtest Sample ID.:**			690318	690319	690321	690322	690323	690324	690325	690326
		Sample Location:			TP01	TP02	TP03	TP04	TP06	TP07	TP07	WS03
		Sample Type:			SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL
		Top Depth (m):			0.30	1.60	0.20	2.00	1.80	1.30	0.20	2.60
		Date Sampled:			12-Sep-2018	12-Sep-2018	12-Sep-2018	12-Sep-2018	12-Sep-2018	12-Sep-2018	12-Sep-2018	12-Sep-2018
		Asbestos Lab:			DURHAM	DURHAM	DURHAM	DURHAM	DURHAM	DURHAM	DURHAM	DURHAM
Determinand	**Accred.**	**SOP**	**Units**	**LOD**								
Fluoranthene	U	2700	mg/kg	0.10	5.7	2.7	4.4	< 0.10	< 0.10	16	4.0	< 0.10
Pyrene	U	2700	mg/kg	0.10	4.7	2.6	4.2	< 0.10	< 0.10	15	3.9	< 0.10
Benzo[a]anthracene	U	2700	mg/kg	0.10	2.1	0.85	1.9	< 0.10	< 0.10	12	2.0	< 0.10
Chrysene	U	2700	mg/kg	0.10	3.7	0.47	3.6	< 0.10	< 0.10	12	3.5	< 0.10
Benzo[b]fluoranthene	U	2700	mg/kg	0.10	3.2	1.9	2.7	< 0.10	< 0.10	17	2.9	< 0.10
Benzo[k]fluoranthene	U	2700	mg/kg	0.10	1.9	1.2	1.8	< 0.10	< 0.10	11	1.6	< 0.10
Benzo[a]pyrene	U	2700	mg/kg	0.10	2.3	1.2	1.9	< 0.10	< 0.10	15	2.2	< 0.10
Indeno(1,2,3-c,d)Pyrene	U	2700	mg/kg	0.10	1.4	0.94	1.4	< 0.10	< 0.10	13	1.8	< 0.10
Dibenz(a,h)Anthracene	U	2700	mg/kg	0.10	0.49	0.11	0.82	< 0.10	< 0.10	3.9	0.83	< 0.10
Benzo[g,h,i]perylene	U	2700	mg/kg	0.10	2.3	0.81	2.4	< 0.10	< 0.10	12	1.9	< 0.10
Total Of 16 PAH's	U	2700	mg/kg	2.0	33	14	30	< 2.0	< 2.0	140	27	< 2.0
Total Phenols	U	2920	mg/kg	0.30	< 0.30	< 0.30	< 0.30	< 0.30	< 0.30	< 0.30	< 0.30	< 0.30

Test Methods

SOP	Title	Parameters included	Method summary
1010	pH Value of Waters	pH	pH Meter
1220	Anions, Alkalinity & Ammonium in Waters	Fluoride; Chloride; Nitrite; Nitrate; Total; Oxidisable Nitrogen (TON); Sulfate; Phosphate; Alkalinity; Ammonium	Automated colorimetric analysis using 'Aquakem 600' Discrete Analyser.
1300	Cyanides & Thiocyanate in Waters	Free (or easy liberatable) Cyanide; total Cyanide; complex Cyanide; Thiocyanate	Continuous Flow Analysis.
1325	Sulphide in Waters	Sulphides	Automated colorimetric analysis by 'Aquakem 600' Discrete Analyser using N,N–dimethyl-pphenylenediamine.
1450	Metals in Waters by ICP-MS	Metals, including: Antimony; Arsenic; Barium; Beryllium; Boron; Cadmium; Chromium; Cobalt; Copper; Lead; Manganese; Mercury; Molybdenum; Nickel; Selenium; Tin; Vanadium; Zinc	Filtration of samples followed by direct determination by inductively coupled plasma mass spectrometry (ICP-MS).
1490	Hexavalent Chromium in Waters	Chromium [VI]	Automated colorimetric analysis by 'Aquakem 600' Discrete Analyser using 1,5-diphenylcarbazide.
1700	Speciated Polynuclear Aromatic Hydrocarbons (PAH) in Waters by GC-FID	Acenaphthene; Acenaphthylene; Anthracene; Benzo[a]Anthracene; Benzo[a]Pyrene; Benzo[b]Fluoranthene; Benzo[ghi]Perylene; Benzo[k]Fluoranthene; Chrysene; Dibenz[ah]Anthracene; Fluoranthene; Fluorene; Indeno[123cd]Pyrene; Naphthalene; Phenanthrene; Pyrene	Pentane extraction / GC FID detection
1920	Phenols in Waters by HPLC	Phenolic compounds including: Phenol, Cresols, Xylenols, Trimethylphenols Note: Chlorophenols are excluded.	Determination by High Performance Liquid Chromatography (HPLC) using electrochemical detection.
2010	pH Value of Soils	pH	pH Meter
2030	Moisture and Stone Content of Soils(Requirement of MCERTS)	Moisture content	Determination of moisture content of soil as a percentage of its as received mass obtained at <37°C.
2120	Water Soluble Boron, Sulphate, Magnesium & Chromium	Boron; Sulphate; Magnesium; Chromium	Aqueous extraction / ICP-OES
2192	Asbestos	Asbestos	Polarised light microscopy / Gravimetry
2300	Cyanides & Thiocyanate in Soils	Free (or easy liberatable) Cyanide; total Cyanide; complex Cyanide; Thiocyanate	Allkaline extraction followed by colorimetric determination using Automated Flow Injection Analyser.
2325	Sulphide in Soils	Sulphide	Steam distillation with sulphuric acid / analysis by 'Aquakem 600' Discrete Analyser, using N,N–dimethyl-p-phenylenediamine.
2430	Total Sulphate in soils	Total Sulphate	Acid digestion followed by determination of sulphate in extract by ICP-OES.
2450	Acid Soluble Metals in Soils	Metals, including: Arsenic; Barium; Beryllium; Cadmium; Chromium; Cobalt; Copper; Lead; Manganese; Mercury; Molybdenum; Nickel; Selenium; Vanadium; Zinc	Acid digestion followed by determination of metals in extract by ICP-MS.
2490	Hexavalent Chromium in Soils	Chromium [VI]	Soil extracts are prepared by extracting dried and ground soil samples into boiling water. Chromium [VI] is determined by 'Aquakem 600' Discrete Analyser using 1,5-diphenylcarbazide.
2625	Total Organic Carbon in Soils	Total organic Carbon (TOC)	Determined by high temperature combustion under oxygen, using an Eltra elemental analyser.
2670	Total Petroleum Hydrocarbons (TPH) in Soils by GC-FID	TPH (C6–C40); optional carbon banding, e.g. 3-band – GRO, DRO & LRO*TPH C8–C40	Dichloromethane extraction / GC-FID

Test Methods

SOP	Title	Parameters included	Method summary
2700	Speciated Polynuclear Aromatic Hydrocarbons (PAH) in Soil by GC-FID	Acenaphthene; Acenaphthylene; Anthracene; Benzo[a]Anthracene; Benzo[a]Pyrene; Benzo[b]Fluoranthene; Benzo[ghi]Perylene; Benzo[k]Fluoranthene; Chrysene; Dibenz[ah]Anthracene; Fluoranthene; Fluorene; Indeno[123cd]Pyrene; Naphthalene; Phenanthrene; Pyrene	Dichloromethane extraction / GC-FID
2920	Phenols in Soils by HPLC	Phenolic compounds including Resorcinol, Phenol, Methylphenols, Dimethylphenols, 1-Naphthol and TrimethylphenolsNote: chlorophenols are excluded.	60:40 methanol/water mixture extraction, followed by HPLC determination using electrochemical detection.
640	Characterisation of Waste (Leaching)	Waste material including soil, sludges and granular waste	ComplianceTest for Leaching of Granular Waste Material and Sludge

Report Information

Key

U	UKAS accredited
M	MCERTS and UKAS accredited
N	Unaccredited
S	This analysis has been subcontracted to a UKAS accredited laboratory that is accredited for this analysis
SN	This analysis has been subcontracted to a UKAS accredited laboratory that is not accredited for this analysis
T	This analysis has been subcontracted to an unaccredited laboratory
I/S	Insufficient Sample
U/S	Unsuitable Sample
N/E	not evaluated
<	"less than"
>	"greater than"

Comments or interpretations are beyond the scope of UKAS accreditation
The results relate only to the items tested
Uncertainty of measurement for the determinands tested are available upon request
None of the results in this report have been recovery corrected
All results are expressed on a dry weight basis
The following tests were analysed on samples as received and the results subsequently corrected to a dry weight basis TPH, BTEX, VOCs, SVOCs, PCBs, Phenols
For all other tests the samples were dried at < 37°C prior to analysis
All Asbestos testing is performed at the indicated laboratory
Issue numbers are sequential starting with 1 all subsequent reports are incremented by 1

Sample Deviation Codes

A - Date of sampling not supplied
B - Sample age exceeds stability time (sampling to extraction)
C - Sample not received in appropriate containers
D - Broken Container
E - Insufficient Sample (Applies to LOI in Trommel Fines Only)

Sample Retention and Disposal

All soil samples will be retained for a period of 45 days from the date of receipt
All water samples will be retained for 14 days from the date of receipt
Charges may apply to extended sample storage

If you require extended retention of samples, please email your requirements to:
customerservices@chemtest.com

Appendix D

Geotechnical Laboratory results

Transmittal Note

South West Geotechnical Ltd
Unit 3 Brooklands,
Howden Road,
Tiverton,
Devon
EX16 5HW

Job No:	10636	Date Received:	20/09/18
Job Name:	Lanner	Date Sent:	05/10/18
Client Name:	Wheal Jane Ltd	Transmittal Number:	t3851
Client Job No:	19490	Senders Initials:	DT
Client Address	Old Mine Offices, Wheal Jane, Baldhu, Truro, Cornwall, TR3 6EE		

Ref.	Test Detail	No. of Tests / Report No.
A1	BS1377: Part 2: 1990: Clause 3 - Moisture Content - UKAS Accredited	3
A5	BS1377: Part 2: 1990: Clause 4 & 5 - Atterberg Limits - UKAS Accredited	3
A9	BS1377: Part 2: 1990: Clause 9.2 / 9.3 - Particle Size Distribution - UKAS Accredited	3

Approved Signatories:

Nick Worthington-Williams (Laboratory Technical Manager), Dan Ayre (Deputy Quality Manager)

David Trowbridge (Senior Technician)

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Accredited to
ISO/IEC
17025:2005

Summary of Classification Test Results

Unit 3 Brooklands,
Howden Road,
Tiverton,
Devon
EX16 5HW

Project No.	Project Name
10636	Lanner
Client Job No.	**Client**
19490	Wheal Jane Consultancy

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Hole No.	Sample				Soil Description	*mc* Cl.3.2	Passing 425µm	LL	PL Cl5.3	PI Cl5.4	Particle density	Remarks
	Type	Top	Base	Ref		%	%	%	%	%	Mg/m3	
TP06	D	2.00		-	Grey silty CLAY	34	100 - Natural	38	25	13	-	
WS02	D	1.50		-	Dark brown slightly gravelly slightly sandy clayey SILT	61	60 - Sieved	71	50	21	-	
WS03	D	1.90		-	Green brown very clayey very gravelly SAND	21	44 - Sieved	34	26	8	-	
						-	-	-	-	-	-	
						-	-	-	-	-	-	
						-	-	-	-	-	-	
						-	-	-	-	-	-	
						-	-	-	-	-	-	
						-	-	-	-	-	-	
						-	-	-	-	-	-	

Preparation Clauses: Particle Density (BS1377:Part 1: 1990: CL7.4.4) Atterberg Limits (BS1377:Part 1: 1990: CL7.4.3) Moisture Content (BS1377: Part 1: 1990: CL7.3.3 & 7.4.2)

Key

Atterberg Limits BS1377-2:1990
4pt cone (CL.4.3) unless :
1pt - single point test (CL.4.4)
4.2.3 - Natural
4.2.4 - Sieved
Moisture Content (mc) %

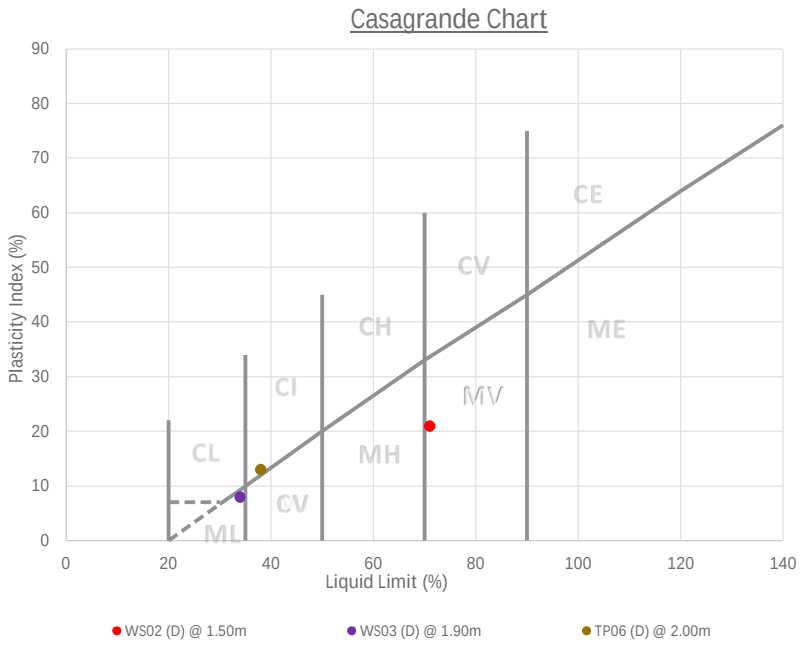
Particle density BS1377-2:1990
sp - small pyknometer CL.8.3
gj - gas jar CL.8.2

Date	Approved By	Page No.	1
05/10/2018	David Trowbridge - Senior Tech	KL001R Index Summary	

Graphical Summary of Atterberg Test Results

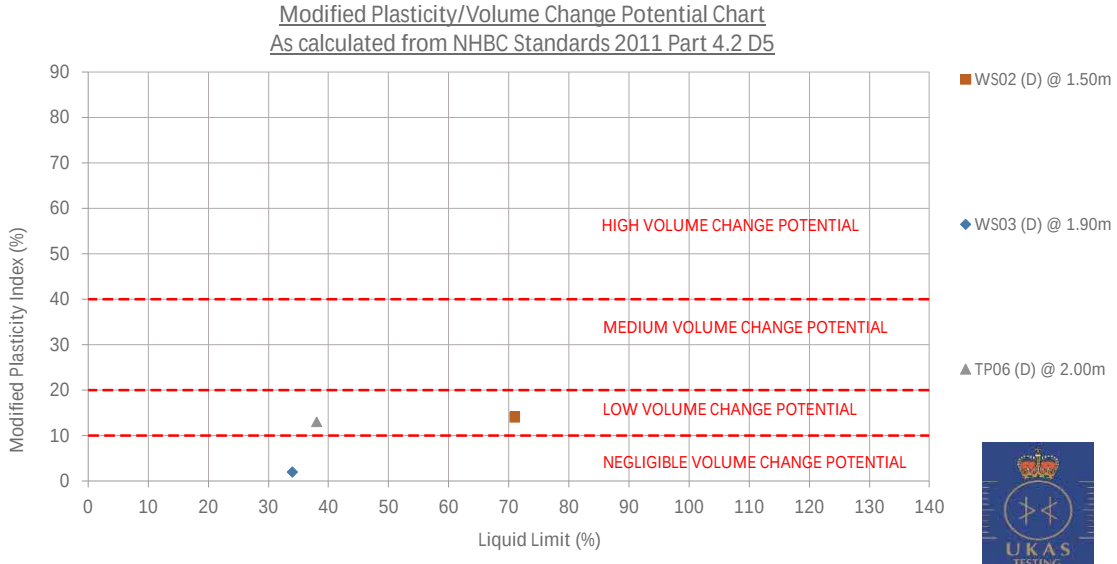
Unit 3 Brooklands,
Howden Road,
Tiverton,
Devon
EX16 5HW

Project No.	Project Name
10636	Lanner
Client Job No.	**Client**
19490	Wheal Jane Ltd



Sample ID	Plasticity Index (%)	Modified Plasticity Index (%)
WS02 (D) @ 1.50m	21	14
WS03 (D) @ 1.90m	8	2
TP06 (D) @ 2.00m	13	13
-	-	-
-	-	-
-	-	-
-	-	-
-	-	-
-	-	-
-	-	-

The Modified Plasticity Index (I'p) is defined as the Plasticity Index (Ip) of the soil multiplied by the percentage of particles less than 425µm.
ie. I'p x % less than 425um/100%



KL001a Index Graphical Summary	Approved By	Date	Page No.
	David Trowbridge - Senior Technician	05/10/2018 16:50	1

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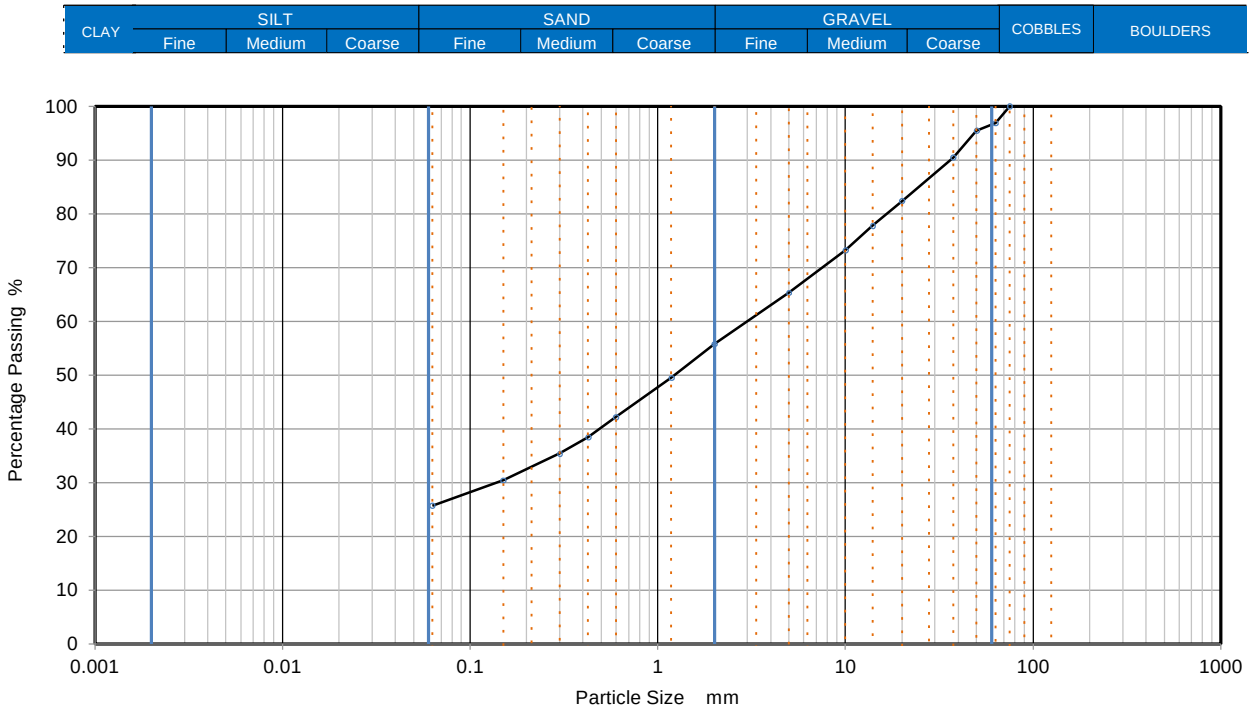
Unit 3 Brooklands, Howden Road, Tiverton, Devon, EX16 5HW

Particle Size Distribution

BS1377:Part 2:1990, clause 9.2

Project No.	10636					
Borehole/Pit No.	TP01					
Project Name	Lanner			Sample No.	-	
Soil Description	Brown very silty very sandy GRAVEL with occasional cobbles			Depth, m	1.30	- 1.70
Client Job No.	19490	Specimen Depth	1.30 m	Sample Type	B	
Client	Wheal Jane Consultancy					



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
125	-	-	-
75	100	-	-
63	97	-	-
50	96		
37.5	91		
20	82		
14	78		
10	73		
5	65		
2	56		
1.18	50		
0.6	42		
0.425	38		
0.3	35		
0.15	30		
0.063	26		

Dry Mass of sample, g	13308

Sample Proportions	% dry mass
Very coarse	3
Gravel	41
Sand	30
Fines <0.063mm	26

Grading Analysis		
D100	mm	75
D60	mm	3
D30	mm	0.139
D10	mm	
Uniformity Coefficient		
Curvature Coefficient		

Sedimentation pre-teatment
N/A

Remarks

Preparation and testing in accordance with BS1377 - Deviation to standard as insufficient material provided in order to meet the minimum mass requirement

Page No.	1	Date	Approved
Sheet ID: KL002R PSD		05/10/2018 17:11	David Trowbridge - Senior Tech

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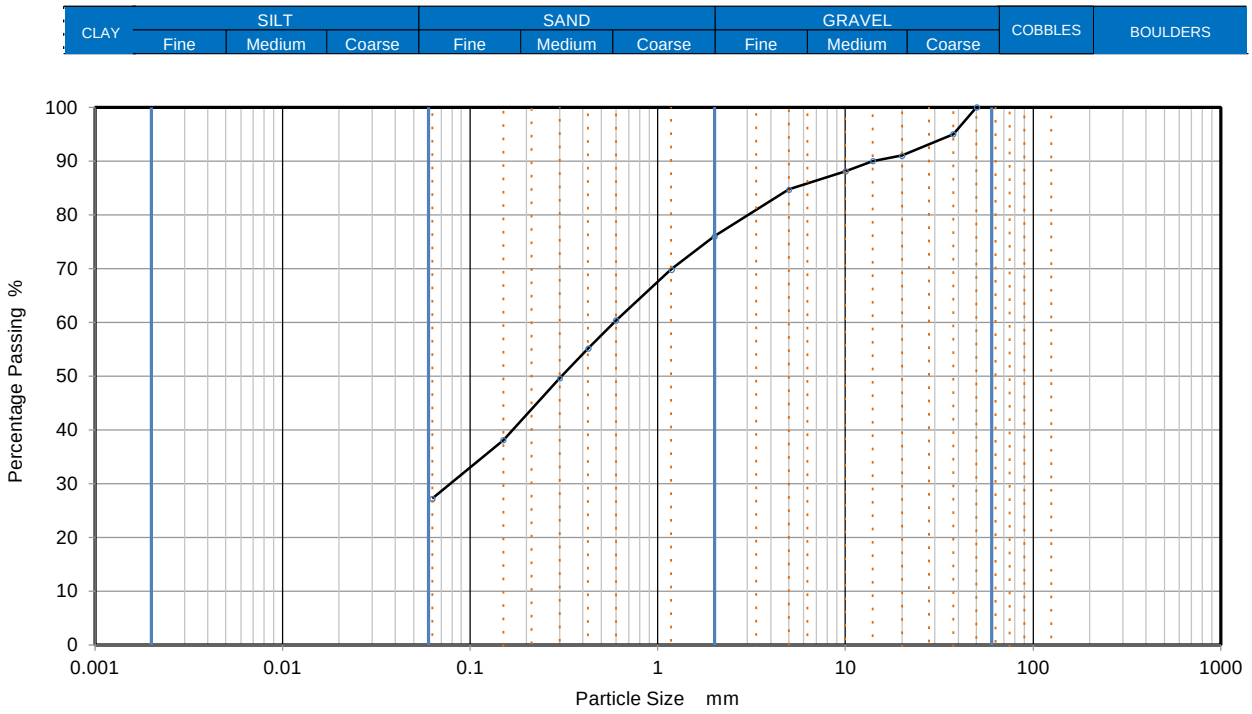
Unit 3 Brooklands, Howden Road, Tiverton, Devon, EX16 5HW

Particle Size Distribution

BS1377:Part 2:1990, clause 9.2

Project No.	10636					
Borehole/Pit No.	TP05					
Project Name	Lanner			Sample No.	-	
Soil Description	Brown very silty very gravelly SAND			Depth, m	1.50	- 2.00
Client Job No.	19490	Specimen Depth	1.50 m	Sample Type	B	
Client	Wheal Jane Consultancy					



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
125	-	-	-
75	-	-	-
63	-	-	-
50	100		
37.5	95		
20	91		
14	90		
10	88		
5	85		
2	76		
1.18	70		
0.6	60		
0.425	55		
0.3	50		
0.15	38		
0.063	27		

Dry Mass of sample, g	4006

Sample Proportions	% dry mass
Very coarse	0
Gravel	24
Sand	49
Fines <0.063mm	27

Grading Analysis		
D100	mm	50
D60	mm	0.584
D30	mm	0.0787
D10	mm	
Uniformity Coefficient		
Curvature Coefficient		

Sedimentation pre-teatment
N/A

Remarks

Preparation and testing in accordance with BS1377 - Deviation to standard as insufficient material provided in order to meet the minimum mass requirement

Page No.	2	Date	Approved
Sheet ID: KL002R PSD		05/10/2018 17:11	David Trowbridge - Senior Tech

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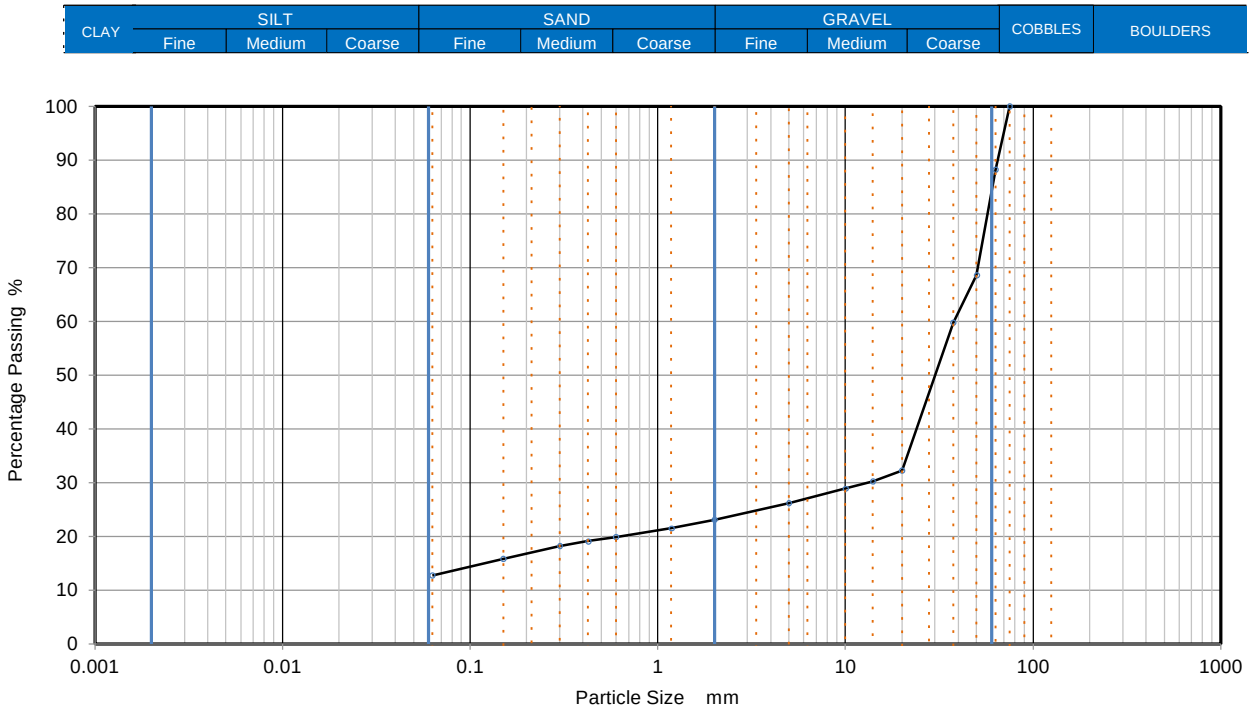
Unit 3 Brooklands, Howden Road, Tiverton, Devon, EX16 5HW

Particle Size Distribution

BS1377:Part 2:1990, clause 9.2

Project No.	**10636**						
Borehole/Pit No.	TP07						
Project Name	Lanner			**Sample No.**	-		
Soil Description	Greenish brown silty sandy GRAVEL with cobbles			**Depth, m**	2.80	-	3.50
Client Job No.	19490	**Specimen Depth**	2.80 m	**Sample Type**	B		
Client	Wheal Jane Consultancy						



Sieving		Sedimentation	
Particle Size mm	**% Passing**	**Particle Size mm**	**% Passing**
125	-	-	-
75	100	-	-
63	88	-	-
50	69		
37.5	60		
20	32		
14	30		
10	29		
5	26		
2	23		
1.18	22		
0.6	20		
0.425	19		
0.3	18		
0.15	16		
0.063	13		

Dry Mass of sample, g	4256

Sample Proportions	**% dry mass**
Very coarse	12
Gravel	65
Sand	10
Fines <0.063mm	13

Grading Analysis		
D100	**mm**	75
D60	**mm**	37.7
D30	**mm**	13.2
D10	**mm**	
Uniformity Coefficient		
Curvature Coefficient		

Sedimentation pre-teatment
N/A

Remarks
Preparation and testing in accordance with BS1377 - Deviation to standard as insufficient material provided in order to meet the minimum mass requirement

Page No.	3	**Date**	**Approved**
Sheet ID: KL002R PSD		05/10/2018 17:11	David Trowbridge - Senior Tech

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Appendix E

CLEA Analysis

CLEA Software Version 1.06

Report generated	10-Oct-18
Report title	Land Adjacent to Coppice Inn, Lanner
Created by	D Jobson at Wheal Jane Consultancy

RESULTS

		Assessment Criterion (mg kg^{-1})			Ratio of ADE to HCV			Saturation Limit (mg kg^{-1})	50% rule?	
		oral	inhalation	combined	oral	inhalation	combined		Oral	Inhal
1	Benzo[b]fluoranthene	1.07E+01	2.05E+01	7.02E+00	0.66	0.34	1.00	7.29E+00 (sol)	No	No
2	Benzo[a]pyrene	1.52E+00	2.90E+00	9.98E-01	0.66	0.34	1.00	5.46E+00 (vap)	No	No
3	Dibenz[ah]anthracene	1.39E+00	2.56E+00	9.03E-01	0.65	0.35	1.00	2.36E-02 (vap)	No	No
4	Arsenic	3.24E+01	8.50E+01	NR	1.00	0.38	NR	NR	No	No
5	Copper	2.66E+03	1.04E+04	2.33E+03	0.78	0.22	1.00	NR	Yes	No
6	Cadmium	5.45E+00	2.97E+01	5.17E+00	0.91	0.10	1.00	NR	Yes	Yes
7	Zinc	3.75E+03	2.55E+07	3.75E+03	1.00	0.00	1.00	NR	Yes	No
8										
9										
10										
11										
12										
13										
14										
15										
16										
17										
18										
19										
20										

	Assessment Criterion (mg kg^{-1})			Ratio of ADE to HCV			Saturation Limit (mg kg^{-1})	50% rule?	
	oral	inhalation	combined	oral	inhalation	combined		Oral	Inhal
21									
22									
23									
24									
25									
26									
27									
28									
29									
30									

		Soil Distribution				Media Concentrations													
		%	%	%	%	mg kg^{-1}	mg m^{-3}	mg kg^{-1}	mg m^{-3}	mg m^{-3}	mg m^{-3}	mg m^{-3}	mg m^{-3}	mg kg^{-1} FW	mg kg^{-1} FW	mg kg^{-1} FW	mg kg^{-1} FW	mg kg^{-1} FW	mg kg^{-1} FW
1	Benzo[b]fluoranthene	100.0	0.0	0.0	100.0	7.02E+00	3.95E-06	3.51E+00	2.99E-09	0.00E+00	5.16E-09	2.48E-08	0.00E+00	4.13E-03	1.91E-02	1.32E-02	0.00E+00	0.00E+00	3.02E-05
2	Benzo[a]pyrene	100.0	0.0	0.0	100.0	9.98E-01	3.92E-07	4.99E-01	4.25E-10	0.00E+00	5.17E-10	3.20E-09	0.00E+00	4.16E-04	2.21E-03	1.57E-03	0.00E+00	0.00E+00	2.60E-06
3	Dibenz[ah]anthracene	100.0	0.0	0.0	100.0	9.03E-01	7.52E-07	4.51E-01	3.84E-10	0.00E+00	9.34E-10	2.33E-09	0.00E+00	1.93E-04	1.39E-03	9.43E-04	0.00E+00	0.00E+00	8.83E-07
4	Arsenic	99.9	0.1	0.0	100.0	3.24E+01	NR	1.62E+01	1.38E-08	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.39E-02	1.30E-02	7.45E-03	1.07E-02	6.48E-03	3.56E-02
5	Copper	99.7	0.3	0.0	100.0	2.33E+03	NR	1.16E+03	9.90E-07	0.00E+00	0.00E+00	0.00E+00	0.00E+00	4.79E+01	4.79E+01	4.79E+01	5.42E+01	4.79E+01	4.79E+01
6	Cadmium	99.7	0.3	0.0	100.0	5.17E+00	NR	2.59E+00	2.20E-09	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.69E-01	1.50E-01	1.60E-01	8.28E-02	1.60E-02	7.24E-03
7	Zinc	99.3	0.7	0.0	100.0	3.75E+03	NR	1.87E+03	1.59E-06	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.02E+02	2.02E+02	2.02E+02	5.36E+02	2.02E+02	2.02E+02
8																			
9																			
10																			
11																			
12																			
13																			
14																			
15																			
16																			
17																			
18																			
19																			
20																			

	Soil Distribution				Media Concentrations													
	%	%	%	%	mg kg^{-1}	mg m^{-3}	mg kg^{-1}	mg m^{-3}	mg m^{-3}	mg m^{-3}	mg m^{-3}	mg m^{-3}	mg kg^{-1} FW	mg kg^{-1} FW	mg kg^{-1} FW	mg kg^{-1} FW	mg kg^{-1} FW	mg kg^{-1} FW
21																		
22																		
23																		
24																		
25																		
26																		
27																		
28																		
29																		
30																		

		Average Daily Exposure (mg kg^{-1} bw day^{-1})							Distribution by Pathway (%)							
1	Benzo[b]fluoranthene	5.20E-05	6.64E-06	3.48E-05	1.65E-07	5.81E-09	6.19E-06	7.88E-07	55.60	7.09	37.13	0.18	0.01	0.00	0.00	0.00
2	Benzo[a]pyrene	7.40E-06	7.72E-07	4.94E-06	2.35E-08	6.12E-10	6.19E-06	3.64E-07	56.32	5.88	37.62	0.18	0.00	0.00	0.00	0.00
3	Dibenz[ah]anthracene	6.70E-06	4.85E-07	4.47E-06	2.12E-08	9.61E-10	2.25E-06	2.00E-06	57.35	4.16	38.30	0.18	0.01	0.00	0.00	0.00
4	Arsenic	2.40E-04	2.27E-05	3.70E-05	7.62E-07	0.00E+00	0.00E+00	0.00E+00	79.89	7.54	12.31	0.25	0.00	0.00	0.00	0.00
5	Copper	1.73E-02	5.26E-02	0.00E+00	5.48E-05	0.00E+00	3.94E-01	4.12E-05	12.34	37.63	0.00	0.04	0.00	0.00	49.97	0.03
6	Cadmium	3.84E-05	1.32E-04	1.97E-07	1.22E-07	0.00E+00	7.54E-04	1.21E-06	11.21	38.70	0.06	0.04	0.00	0.00	49.96	0.04
7	Zinc	2.78E-02	2.72E-01	0.00E+00	8.81E-05	0.00E+00	1.52E+00	1.45E-04	4.63	45.36	0.00	0.01	0.00	0.00	49.99	0.01
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	Average Daily Exposure (mg kg^{-1} bw day^{-1})							Distribution by Pathway (%)							
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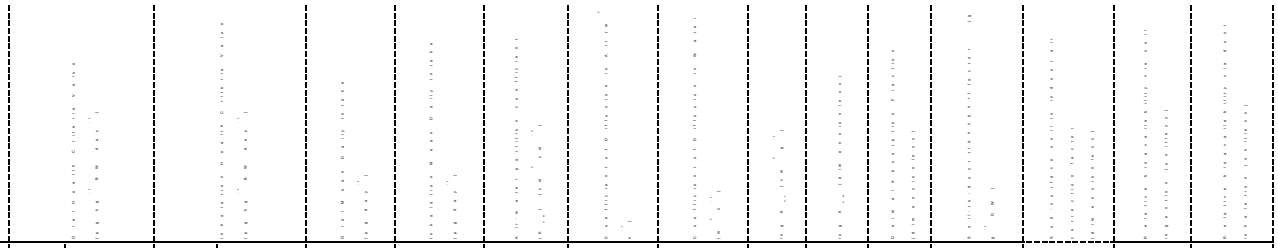

1	Benzo[b]fluoranthene	ID	0.142	ID	0.0005	0.11	0.013	2.05E-06	4.36E-06	3.62E-10	5.02	6.08	0.13	0.5	1	1	1
2	Benzo[a]pyrene	ID	0.02	ID	0.00007	0.11	0.006	1.76E-06	4.38E-06	3.67E-10	5.11	6.18	0.13	0.5	1	1	1
3	Dibenz[ah]anthracene	ID	0.018	ID	0.000063	0.04	0.033	5.40E-06	4.08E-06	3.40E-10	5.27	6.38	0.13	0.5	1	1	1
4	Arsenic	ID	0.3	ID	0.002	NR	NR	NR	NR	NR	NR	NR	0.03	0.5	1	1	1
5	Copper	TDI	160	TDI	0.286	7000	0.68	NR	NR	NR	NR	NR	0	0.5	0	1	1
6	Cadmium	TDI	0.36	TDI	0.0014	13.4	0.02	NR	NR	NR	NR	NR	0.001	0.5	1	1	1
7	Zinc	TDI	600	TDI	600	27000	2.4	NR	NR	NR	NR	NR	0	0.5	0	1	1
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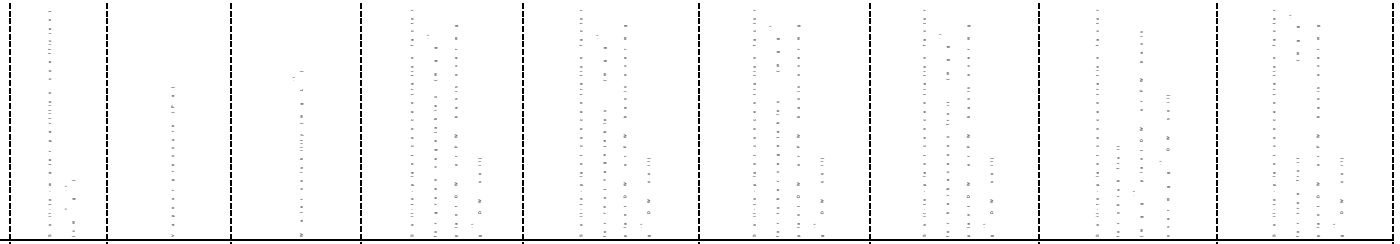

1	Benzo[b]fluoranthene	3.64E+03	6.34E-08	2.00E-03	model	model	model	model	model	model
2	Benzo[a]pyrene	4.48E+03	2.00E-08	3.80E-03	model	model	model	model	model	model
3	Dibenz[ah]anthracene	6.48E+03	1.66E-10	6.00E-04	model	model	model	model	model	model
4	Arsenic	5.00E+02	NR	1.25E+06	0.00043 fw	0.0004 fw	0.00023 fw	0.00033 fw	0.0002 fw	0.0011 fw
5	Copper	1.00E+02	NR	1.38E+06	0.0206 fw	0.0206 fw	0.0206 fw	0.0233 fw	0.0206 fw	0.0206 fw
6	Cadmium	1.00E+02	NR	1.62E+06	0.052 fw	0.029 fw	0.031 fw	0.016 fw	0.0031 fw	0.0014 fw
7	Zinc	3.80E+01	NR	4.32E+06	0.054 fw	0.054 fw	0.054 fw	0.143 fw	0.054 fw	0.054 fw
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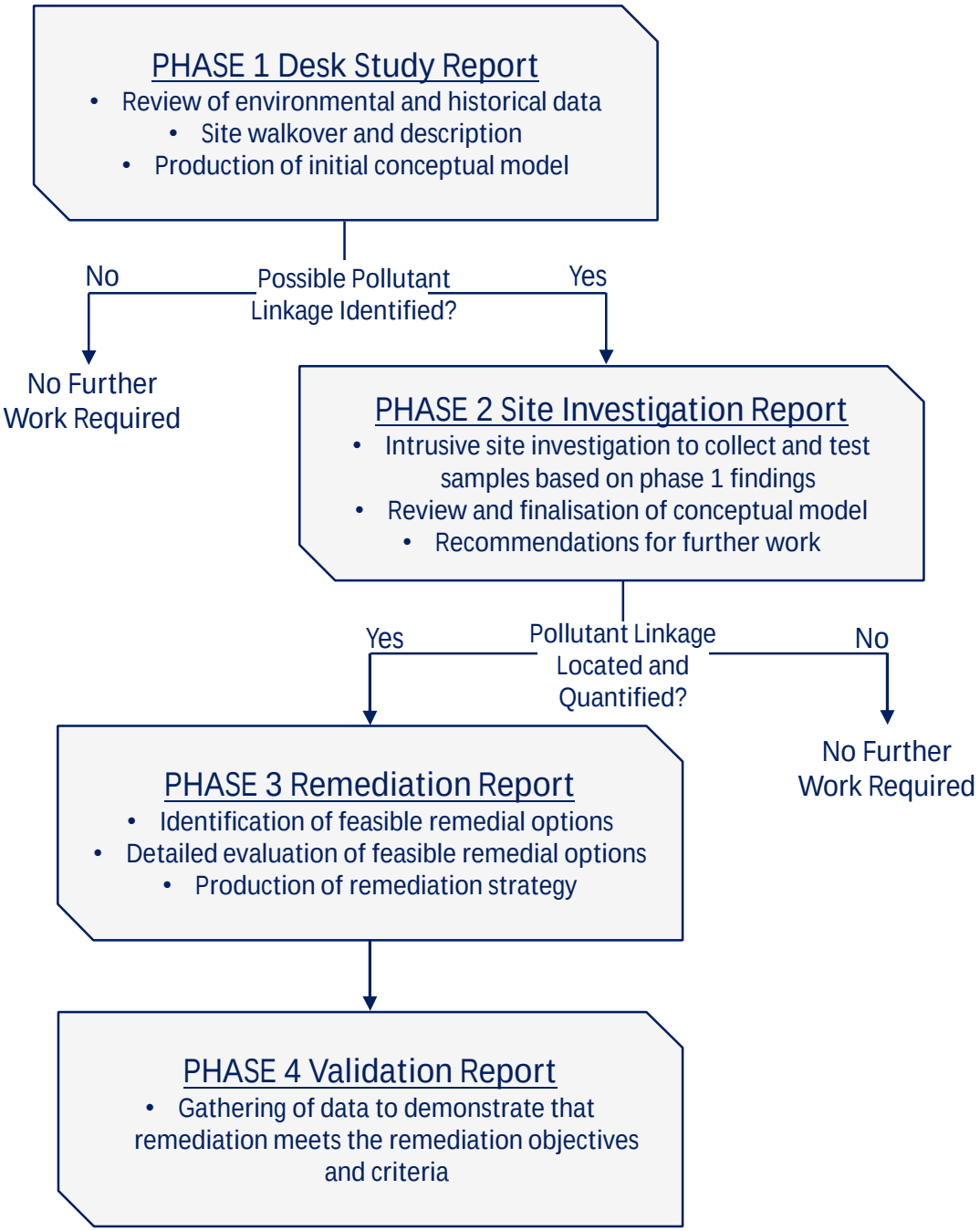
Wheal Jane Consultancy
Geotechnical, environmental & mining services

Wheal Jane Group

The Phased Approach to Land Contamination

As set out in Contaminated Land Report 11 - Model Procedures for the Management of Land Contamination. Environment Agency Guidelines



Please contact Wheal Jane Consultancy for further information including costs and anticipated duration

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