

Caulmert Limited

Engineering, Environmental & Planning
Consultancy Services

Phase 1 and 2 Contaminated Land Assessment

Clywedog Road North, Wrexham

Proposed Industrial/Warehouse Unit

JCP Investments Limited

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TABLE OF CONTENTS

1.0	INTRODUCTION	1
1.1	Details of Commission	1
1.2	Objectives of the Report.....	1
1.3	Limitations of this Study	1
1.4	Sources of Information	2
2.0	SITE LOCATION AND DESCRIPTION	3
2.1	Site Setting	3
2.2	Proposed Development	4
2.3	Site History	4
2.4	Site Walkover Survey	6
3.0	ENVIRONMENTAL INFORMATION.....	8
3.1	Environmental Setting	8
3.2	Unexploded Ordnance	12
4.0	PRELIMINARY RISK ASSESSMENT	14
4.1	Introduction	14
4.2	Conceptual Site Model.....	14
5.0	PHASE 1 CONCLUSIONS	16
5.1	Summary	16
5.2	Recommendations for Further Investigation- Phase 2.....	16
6.0	PHASE 2 INVESTIGATION	17
6.2	Ground Investigation – Sampling Strategy	17
6.3	Chemical Analysis Strategy	18
7.0	GROUND INVESTIGATION.....	19
7.1	Preliminaries	19
7.2	Limitations	19
7.3	Field Observations	19
7.4	Chemical Analytical Data	21
8.0	REVISED CONCEPTUAL MODEL AND QUALITATIVE RISK ASSESSMENT.....	23
8.1	Conceptual Model.....	23
8.2	Risks to Human Health.....	24
8.3	Risks to Controlled Waters	24
8.4	Risks to Construction Workers.....	24
9.0	CONCLUSIONS AND RECOMMENDATIONS	25

DRAWINGS

1149 - P - 001 - Site Location Plan

1149 - P - 003 - Proposed Site Plan

APPENDICES

- Appendix 1** Groundsure Reports
- Appendix 2** Site Investigation Photographic Log
- Appendix 3** Trial Pit Logs
- Appendix 4** Lab Report Certificate

1.0 INTRODUCTION

1.1 Details of Commission

- 1.1.1 Caulmert Limited (Caulmert) have been appointed by JCP Investments Limited (the Client) to undertake a Phase 1 Geo-Environmental Site Assessment and Phase 2 Assessment in relation to the proposed development of an industrial/warehouse unit at Clywedog Road North, Wrexham, as shown on Drawing 1149 - P – 003.
- 1.1.2 The Client proposes the development of a freestanding industrial / warehouse unit (Classes B1c, B2, B8) on land at Clywedog Road North, Wrexham Industrial Estate, Wrexham.

1.2 Objectives of the Report

- 1.2.1 The objective of this report is to provide a preliminary assessment of the potential risks posed by the ground conditions at the site to the proposed development. The report represents a combined Phase 1 (desk Study) and Phase 2 (site investigation) in line with current planning requirements.
- 1.2.2 The report follows the scope and principles presented in Model procedures for the management of contaminated land CLR11, which has been adopted by NRW for the assessment of contaminated land. The following guidance and legislation apply to this document
- Part IIA of the Environment Protection Act, 1990;
 - Contaminated Land (Wales) (Amendment) Regulations 2012 and
 - Contaminated Land Statutory Guidance (Welsh Government, April 2012);
 - DEFRA/Environment Agency (2004) Report CLR11 “Model Procedures for the Management of Land Contamination”
 - Environment Agency - Groundwater protection formerly Groundwater Protection: Principles and practise -GP3,
 - BS 5930: 2015: “Code of practice for site investigations”;
 - BS 10175: 2011 +A1:2013 “Investigation of Potentially Contaminated Sites- Code of Practice”;

1.3 Limitations of this Study

- 1.3.1 The report is solely for the use of the Client and should not be relied upon by third parties without prior written consent from Caulmert. Information used within this report has been gathered from data sets compiled by third party organisations and purchased on behalf of the client. The validity and accuracy of this third-party information is outside the control of Caulmert.
- 1.3.2 Interpretation and recommendations contained within this report should not be assumed valid for adjacent areas of land or for alternative land uses and are based upon the proposed requirements of the development provided to Caulmert at the time of compiling this report.

1.4 Sources of Information

1.4.1 A number of sources of information where used to support this report, these include:

- A site-specific environmental and geological report provided by Groundsure (Appendix 1);
- The British Geological Survey (BGS) online borehole database; and
- Publicly available information hosted by GOV.UK on DEFRA and Environment Agency pages.

2.0 SITE LOCATION AND DESCRIPTION

2.1 Site Setting

- 2.1.1 The site is set within the Wrexham Industrial Estate and is bounded by industrial/warehouse units occupied by Etiquette Labels Ltd, AST Plastics Ltd and Décor-Lam Ltd to the north, west and south, respectively, and by Clywedog Road North to the east.
- 2.1.2 The surrounding area comprises of buildings, offices of similar use with some residential properties to the south-western part of the Wrexham Industrial Estate. Wrexham Town Centre is located approximately 5.7km to the west of Wrexham Industrial Estate and is served by two main railway stations; Wrexham Central and Wrexham General. There are direct routes to a number of surrounding cities/towns including Chester and Liverpool to the north, Crewe and Stoke-on-Trent to the east and Shrewsbury to the south. Wrexham Industrial Estate benefits from direct access to the A543 (Wrexham Road).
- 2.1.3 The site sits within an area of previously developed land on the former Cordite works munitions factory. The location of the site is shown in Figure 1 below.

Figure 1: Site Location of Clywedog Road North proposed development



2.2 Proposed Development

- 2.2.1 The proposed development involves the erection of an industrial/warehouse unit (Use Classes B1c, B2, B8) including the construction of car parking and servicing areas, the formation of a new vehicular access onto Clywedog Road North and associated landscaping.
- 2.2.2 The wider Wrexham industrial Estate has been developed on the former Cordite works (munitions factory). Consequently, there is a generic requirement to undertake a contaminated land assessment for any new development, including the proposed development at Clywedog Road North.

2.3 Site History

- 2.3.1 In compiling the risk assessment, the most recent environmental data provided by Groundsure was reviewed. A summary of the historical uses on and off-site, including potentially contaminative past uses is presented in Table 2.1 and Table 2.2 below.

Table 2.1: On-site History

Potentially Contaminative Past Uses		
Current Land Use Vacant. The site comprises a grassed area with a number of trees.		
Surrounding Area Area situated within Wrexham Industrial Park, 2.5miles from the centre of Wrexham. Current estate covers 550 hectares of land with over 300 businesses.		
North: Industrial units including Etiquete Labels (directly adjacent), Skanda Roofing Centre (c.120m) and Meridian Foods (c.150m).		
East: Clywedog Road North (c.20m), grassed and woodland area (c.30m) which is understood to be the subject of a current planning application for employment uses. Drain located within wooded area.		
South: Décor-Lam Ltd (directly adjacent), Clywedog Road East (c.125m), habitat land (c.150m) and Pentre Maelor housing estate (c.265m)		
West: AST Plastics Containers UK(<50m), Trittech Engineering Solutions (C.140m) and Clywedog Road East (c.110m)		
Site History Description	Map Date	
	From	To
Site is shown within an open area situated between Coed-Aben Woods	1899	1912
Wrexham Royal Ordnance Factory construction started in 1939, with operations ceasing in 1945. Not shown on contemporary OS maps.	-	-
Munitions buildings and factory works present surrounding the site area. A road runs through the	1960	1961

centre of the site area which leads to several of the munition factory buildings. Coed-Abden Woods still remaining to the north and south of the site area. Residential properties to the south.		
Wrexham Industrial Estate established, buildings that were previously associated with the munitions works and factory are now gone. Only larger remaining buildings to the east of the site area. Road which intersects the site area still remains. Remnants of Coed-Abden Woods remain, however shrinking in size.	1976	1978
Development of road network (now Clywedog Road North) built around the site area. Coed-Abden Woods to the north now cleared, very little remains of the woodland to the south. Small building to the south-south-west of the site	1982	1983
The Bridgeway Centre established east of the site area. Larger building works now shown south-south-east from the site located off Clywedog Road. More industrial development to the north. No development currently on site area.	1985	1986
Expansion of industrial development to the north. None within site area and very little change to industrial development to the south east and east.	1989	1991
Directly adjacent to the south and north, industrial units/properties have been developed and surround the site area. Intersection of carpark area into the site area.	1991	2003
Little change from the 2003 mapping, the establishment of industrial units, no building development within site area.	2003	2020

Table 2.2: Off-site history

Potentially Contaminative Past Uses	
Originally the site of a World War II munitions factory. Site covered approximately 550 hectares and the largest industrial estate in Wales. The ROF Wrexham factory produced cordite, as explosive propellant for shells. The complex was spread over a large area to minimise damage from aerial attack. After the war, the need for Cordite ceased and in 1945 the production facilities at Wrexham closed. Many of the building were left in place, abandoned and agriculture took over fields surrounding the area.	
1951- Ministry of Works built large water abstraction and treatment plant at Sesswick on the River Dee which was amalgamated into the Wrexham Water Company. All cordite produced on site was transported along Military Usage Railway. Locomotives with diesel engines were used instead of steam trains as they were less likely to ignite any stray cordite.	
UXO Ordnance Risk Assessment	
Potential unexploded ordnance (UXO) risk has been identified at the site	
Indicative British/Allied UXO Risk	MEDIUM
Indicative German UXO Risk	NEGLIGIBLE
Manufacture of Explosives and Explosive Ordnance. Wrexham facility ROF, WWII 0.7km from site boundary	

2.4 Site Walkover Survey

- 2.4.1 A site walkover survey was undertaken and completed by Caulmert on 29th July 2020. A summary of observations made during the visit is presented in Table 2.3 below and photographs are included in Appendix 2.

Table 2.3: Summary of Observations from the Site Walkover Survey.

Observations	Comments
Buildings and Structures	Single story Decor-Lam warehouse. Large warehouse with hard standing courtyard to the rear.
Topography	- The site is level, with a small bund running along part of the boundary to the Clywedog Road North.
Site Access	- There is no access point from the Clywedog Road North to the grass field to the rear of the warehouse, however the curb is low and there is no fence preventing entrance from this side. Access to the warehouse is gained from Clywedog Road East.
Site Surface	- The site comprises a combination of gravel hard standing & asphalt to the rear of the warehouse, however, beyond this is grassland. The grassland makes up the majority of the site area.
Services	- No gas meters were identified on site or in its immediate vicinity. - No overhead services were visible at the site. - Buried services were visible within the site boundary and included drainage with manhole covers and drain grates. - No electrical buried services were identified on site, however, the CT Scan detected fibre optic cable to the rear of the gravel hardstanding, in the grassland.
Vegetation	- The majority of the site comprises maintained grass. The north east boundary (to Clywedog Road North) contains a row of trees. There is another small area of trees in the north western portion of the site, bordering the asphalt hard standing portion of the site. - There was no evidence of any vegetation distress.
Surface Water Features	- Runoff from the gravel hard standing is collected in a subsurface pipe drain that travels in a south easterly direction. The specific point of discharge was not confirmed. However, drainage plans show that the Clywedog Road North contains drainage along the footpath that borders the site. This is a likely point of discharge. - Drainage grates were also noted on the asphalt hard standing portion of the site (North West boundary) running in a south westerly direction.
Potential Contaminative Sources (on site)	- No oil or fuel storage tanks were identified on the proposed development. - No ventilation pipes were identified.
Potential Contaminative Sources (off site)	- None identified.

3.0 ENVIRONMENTAL INFORMATION

3.1 Environmental Setting

- 3.1.1 The data in Table 3.1 below was compiled from the Groundsure Report (Appendix 1), together with observations made during the site walkover survey.

Table 3.1: Summary of Environmental Information

Reference	Description
Geology	
Artificial Geology	- There is a record of artificial disturbed and landscaped ground shown on the site according to the Groundsure data
Superficial Deposits	On site; 1- Till, Devensian – Diamicton 345m NE; - Alluvium – Clay (unlithified Deposits) 500m NW; - Glaciolacustrine Deposits, Devensian - Clay The potential for landslide ground stability is recorded as <i>low</i> , with none recorded within 500m of the site. Superficial permeability flow type is mixed ranging from high to low.
Solid Geology & Faults	On site; - Salop Formation – sedimentary rock cycle, coal measure type. Cisuralian Epoch – Westphalian D Sub-age. 440m NW; - Kinnerton Sandstone Formation – early Triassic Epoch. - There is a record of 1 geological fault trending NE/SW located 440m NW of the site. Normal fault, inferred.
Radon Data	- The site is within a radon affected area of between 15 % and 3 % - No radon protective measures are required according to the Groundsure data.
Ground Workings	
Historical Surface Ground / Underground workings	-There is one record of an onsite surface ground working identified by Groundsure as an 'unspecified heap' from the 1964 mapping. A further 16 surface ground workings are recorded between 50 to 250m of the site - There are no records of historical underground workings on the site or within 1000 m of the site.
Current Ground Workings	- There are no records of current, onsite surface or underground ground workings.
Mining, Extraction & Natural Cavities	
Historical and Coal mining	- The Site is located within a historical coal mining area, as defined by the Coal Authority. It is however not within an area of coal mine abandonment and there are no recorded mine entries within 1000m of the site. The Coal mining risk is considered to be low.
Non-Coal Mining	- There are no non-coal mining areas located within 1,000m of the site.
Railways & Tunnels	
Historical Railway & Tunnel Features	- There are no Railway infrastructure and projects identified within the site boundary. - There are no underground railways, tunnels, historical, railways, cross-rails or HS2 lines onsite or within 1000m of the site.

Reference	Description
Active Railways	- There are no active railway sites within the site boundary - There are no active railway sites within 1000m of the site boundary.
Estimated Background Soil Chemistry	
Soil Chemistry	- There are 3 records of estimated soil chemistry within 250m of the site as follows: On Site Sample Type: Sediment Arsenic (As) : <15 mg/kg Cadmium (Cd) : <1.8 mg/kg Chromium (Cr): 60 – 90 mg/kg Nickel (Ni) : 15 – 30 mg/kg Lead (Pb): 100 mg/kg Bioaccessible Lead (Pb): 60 mg/kg 6m NW Sample Type: Sediment Arsenic (As) : <15 mg/kg Cadmium (Cd) : <1.8 mg/kg Chromium (Cr): 60 – 90 mg/kg Nickel (Ni) : 15 – 30 mg/kg Lead (Pb): 100 mg/kg Bioaccessible Lead (Pb): 60 mg/kg 37m SE Sample Type: Sediment Arsenic (As) : <15 mg/kg Cadmium (Cd) : <1.8 mg/kg Chromium (Cr): 60 – 90 mg/kg Nickel (Ni) : 15 – 30 mg/kg Lead (Pb): 100 mg/kg Bioaccessible Lead (Pb): 60 mg/kg
Environmental Permits, Incidents and Registers	
Industrial Sites Holding Licences and/or Authorisations	- There are 4 records of historic IPC authorisations within 500 m of the site. - There are 15 recorded Part A(1) and IPPC Authorised Activities within 500 m of the site. - There are no red list discharge consents (potentially harmful discharges to the public sewer) within 500 m of site; - There are no records of list 1 dangerous substances inventory sites within 500 m of site; - There are no records of list 2 dangerous substances inventory sites within 500 m of site. - There are no records of Category 3 or 4 radioactive substances authorisations. - There are 8 records of licensed discharge consents to controlled within 500m of the site, the closest located: 103m NE Effluent Type: Unspecified Receiving Water: Stream near Redwither Brook -There are 0 records of planning hazards within 500m of the site.

Reference	Description
Dangerous or Hazardous Sites	- There are no records of COMAH & NIHS sites within 500m of the site.
Environment Agency Recorded Pollution Incidents	- There are 17 records of national incidents recorded within 500m of the site boundary. None are on site. A full list of NRW incidents are in Table 4.18 of the Groundsure report, the 3 nearest incidents are as follows: 90m NE Incident Date: 04/05/2001 Incident Identification: 4393 Pollutant: Specific Waste Materials Pollutant description: Other specific waste materials Water Impact: Category 3 (Minor) 159m NE Incident Date: 18/03/2002 Incident Identification: 64721 Pollutant: General Biodegradable Materials and Wastes Pollutant description: Food and Drink Water Impact: Category 3 (Minor) Land Impact: Category 3 (Minor) 182m NE Incident Date: 29/10/2015 Incident Identification: 1384243 Pollutant: General Biodegradable Materials and Wastes Pollutant description: Food and Drink Air Impact: Category 3 (Minor) - There are no records of national incidents recording system Category 1 within 500 m of site.
Sites Determined as Contaminated Land under Part 2A EPA 1990	- None identified within 500 m of the site.
Landfill and Other Waste Sites	
Landfill sites	- There are no records of: active, recent, historical landfill sites within 2000m of the site boundary.
Other Waste Sites	-There are no records of: any historical or licensed waste sites within 2000m of the site boundary. -There is 1 record of a waste exemption site within 2000m of the site boundary: 258m NE Lockwell Electrical Ltd NRW WME049814 Storing waste exemption Storing of waste in a secure place
Current Land Uses	
Current Industrial Data	- There are 27 recorded potentially contaminated industrial sites within 250 m of the site.

Reference	Description
	None of these are on site, and are located from 50m beyond the site boundary including: Industrial products Packaging Electrical features, infrastructure and facilities General construction supplies Industrial repairs & servicing Food Stuffs Recycling Services Vehicle repair, testing and servicing. - There are no recorded open, closed, under development or obsolete petrol stations within 500m of the site boundary. - There are no recorded open, high voltage underground electricity transmission cables within 500m of the site boundary. - There are no recorded high pressure underground gas transmission pipelines within 500m of the site boundary.
Hydrogeology and Hydrology	
Aquifer Within Superficial Deposits	- The site is within a Secondary Undifferentiated aquifer designation. "Assigned where it is not possible to attribute either category A or B to a rock type. In general, these layers have previously been designated as both minor and non-aquifer due to the variable characteristics of the rock type."
Aquifer Within Bedrock Deposits	- There is 1 record for aquifers within the bedrock deposits located on site: Designated Secondary A "permeable layers capable of supporting water supplies at a local rather than strategic scale, and in some cases forming an important source of base flow to rivers. These are generally aquifers formerly classified as minor aquifers."
Groundwater / Surface Water & Potable Abstractions Licences	- There are 11 records of groundwater abstraction licences within 2000 m of the site. - There is 1 record of a surface water abstraction licences within 2000 m of the site. - There are 0 records for potable water abstraction licences located within 1000 m of the site.
Source Protection Zones	- The site is not located within a source protection zone. - The site is not located within a source protection zone within a confined aquifer. - There are no records for Environment Agency information on river quality located within 1000m of the site.
Detailed River Networks and Surface Water Features	- There are records of 14 detailed river networks and drainage located within 250 m of the site. - There are records of 13 surface water features within 250 m of the site.
Flooding	
Flood Risk	- There are no records of Risk of Flooding from Rivers and Sea within 50m of the site. - There are no records of Historical Flood Events within 250m within the site boundary. - There are no areas benefiting from flood defences within 250m of the site. - There are no areas benefiting from flood storage within 250m of site. The site is not within a Flood Zone 2 of Flood Zone 3 area.

Reference	Description
	- Regional mapping data indicates that the site lies within a British Geological Survey (BGS) a low groundwater flooding susceptibility area.
Designated Environmentally Sensitive Sites	
Environmental Designations	- There are no records of the following designations within 2000m of the site boundary: Sites of Special Scientific Interest (SSSI) Ramsar Sites Special Areas of Conservation (SAC) Special Protection Areas (SPA) National Nature Reserves (NNR) Local Nature Reserves (LNR) - There are 32 Designated Ancient Woodland records located within 2000m of the site boundary, of which the nearest is 61m SE and is an 'Ancient Semi Natural Woodland'. - There are no records of Nitrate Sensitive Areas or Nitrate Vulnerable Zones within 2000m of the site boundary.

Table 3.2: Summary of Natural Ground Hazards

Natural Hazard	Maximum Hazard Rating
Shrink / Swell (Clay)	Very low
Landslides	Very low
Ground Dissolution of Soluble Rocks	Negligible
Compressible Deposits	Negligible
Collapsible Deposits	Very Low
Running Sand	Negligible

3.2 Unexploded Ordnance

3.2.1 The site sits within previously developed land on the former Cordite works (munitions factory). Therefore, a Groundsure Preliminary Unexploded Ordnance Risk Assessment report was acquired for the site (Appendix 1).

3.2.2 The Groundsure Preliminary Unexploded Ordnance Risk Assessment report identified 'medium' risk levels for Indicative British/Allied UXO Risk.

'there are potential sources of British/Allied UXO recorded in Dynasafe BACTEC's historical database in proximity to the site. It is recommended that further research is undertaken to determine more about these potential sources and how they may have affected the site. Given the proximity of these sources, the risk on site from UXO is considered to be Medium.'

3.2.3 The Groundsure Preliminary Unexploded Ordnance Risk Assessment report identified 'negligible' from German unexploded bombs at this site.

'Historical records indicate a negligible level of bombing density from WWII.'

- 3.2.4 Search results indicated the following potential sources of explosive ordnance recorded in Table 3.3 below. It is identified in Table 3.4 that the proposed development lies within the vicinity of a facility used to produce explosives and/or fill ordnance with explosive and chemical constituents.

Table 3.3: Potential Sources of explosive ordnance recorded within 10km

Source	Number within 10km
Military Airfield Sites	1
Bombing Decoy Sites	2
Press Articles regarding UXO Finds	1
WWII Defence Related Positions & Pillboxes	18
Historic Army Camps	5
Army Explosive Ordnance Clearance Tasks/Recces	2
Sites Related to the Manufacture of Explosives and Explosive Ordnance	2
Abandoned Bombs	None Recorded
Military Training Areas and Firing Ranges	None Recorded
Heavy Anti-Aircraft Batteries	None Recorded
Pipe Mined WWII Airfields	None Recorded
WWII Pipe Mined Locations	None Recorded

Table 3.4: Sites related to the Manufacture of Explosives and Explosive Ordnance

Facility Name	Approximate Distance (km) from site
Wrexham, ROF, WWII	0.7

4.0 PRELIMINARY RISK ASSESSMENT

4.1 Introduction

4.1.1 This section assesses the potential risks posed by contamination within the proposed development area with respect to human health, the natural environment and the built environment. The risk assessment is a preliminary qualitative source-pathway-receptor of the type recommended in current guidelines.

4.1.2 It is a preliminary risk assessment based on the desk study, site walkover and proposed development. The objective of the risk assessment is to demonstrate whether or not there is a potential pollutant linkage existing at the site which may present an unacceptable risk to human health and controlled water.

4.1.3 For there to be a potential risk from contamination, a complete source-pathway-receptor pollutant linkage must exist, or potentially exist, during and after development of the site. Each aspect of the pollutant linkage is described below:

Source (contaminant): A substance that is in or under the land that has the potential to cause harm to the receptor.

Pathway: The route(s) or means via which a receptor can be exposed to, or affected by, contaminant.

Receptor: The factor (person, built environment or ecosystems) that might adversely be affected by the source.

4.1.4 Risk can be defined as the combination of the consequence or a harmful effect and the probability of its occurrence. The existence of a pollutant linkage is heavily dependent on-site use, as well as environmental conditions.

4.2 Conceptual Site Model

4.2.1 The conceptual site model (CSM) constitutes a preliminary or interim risk assessment which determines only the likelihood of a linkage being present. The CSM is described below and displayed in Figure 2, Section 7.5.

Sources

- 4.2.3 Based on the desk study presented above, it is considered that the presence of the large working site of historical cordite munitions factory (which ceased in 1945) may have resulted in potential sources of contamination. It is therefore considered that ground investigation is recommended, including for the trial pitting and laboratory analysis comprising of a basic suite of metals and a further testing for residual explosives analytical suite to address the past historic land use.

Receptors

- 4.2.4 Surrounding site includes Wrexham Industrial estate road networks. The groundwater receptors include a Secondary Undifferentiated aquifer within the superficial deposit and a Secondary A aquifer within the bedrock. These are classified as low vulnerability.
- 4.2.5 There are no surface water receptors on site and the nearest surface water abstraction point was identified as a historical abstraction 1087 m to the north, at a tributary of Redwither Brook.

Pathways

- 4.2.6 Potential pollutant linkage that could exist at the site includes migration through permeable landscaped ground.
- 4.2.7 The assessment assumes that the site will be used for commercial/industrial use only. The potential pollution linkages on the site are summarised in Table 4.1 below.

Table 4.1: Summary of Potential Pollutant Linkages

Potential Source	Pathway	Potential Receptor	Comments
Gravel hard standing	Through permeable hardstanding	Underlying ground	Possible contaminant pathway from activities on gravel hardstanding into underlying ground
landscaped ground	Ground gas	Site users	Ground gas regime unknown. Due to the presence of landscaped ground there is potential for gas to be present.
Historical site use – WWII Munitions Development	Ground	Site users, building & infrastructure	

5.0 PHASE 1 CONCLUSIONS

5.1 Summary

- 5.1.1 This Phase 1 desk study report has indicated that the overall site has a varied industrial legacy with historical uses as a munitions factory which was then developed into Wrexham Industrial Estate. It is assumed that unless proven otherwise, the pathways and source of contamination from previous site use and activities may still exist.
- 5.1.2 The contaminants of concern include those linked to munitions factory including heavy metals, potentially asbestos and explosive contaminants.
- 5.1.3 The desk study indicated that the site is located in a negligible to medium risk area of potential explosive ordnance, with several facilities within 10km screening distance and Wrexham ROF within 0.7km of the site boundary.
- 5.1.4 In conclusion, the preliminary risk assessment has demonstrated that there are potential pollution linkages present at the site which may pose a risk to future site uses. Recommendations for a Phase 2 investigation will reduce the uncertainty by characterising the source term(s) present within the site area.

5.2 Recommendations for Further Investigation- Phase 2

- 5.2.1 A Phase 2 intrusive ground investigation was required to determine soil geochemistry on site and confirm whether the pollutant linkages identified in the desk study are valid on site.

6.0 PHASE 2 INVESTIGATION

6.1.1 This Phase 2 site investigation was designed to target the areas of potential sources of contamination identified in the Phase I Report and Site Walkover. The site investigation focussed upon the current area of proposed development only.

6.2 Ground Investigation – Sampling Strategy

Objectives

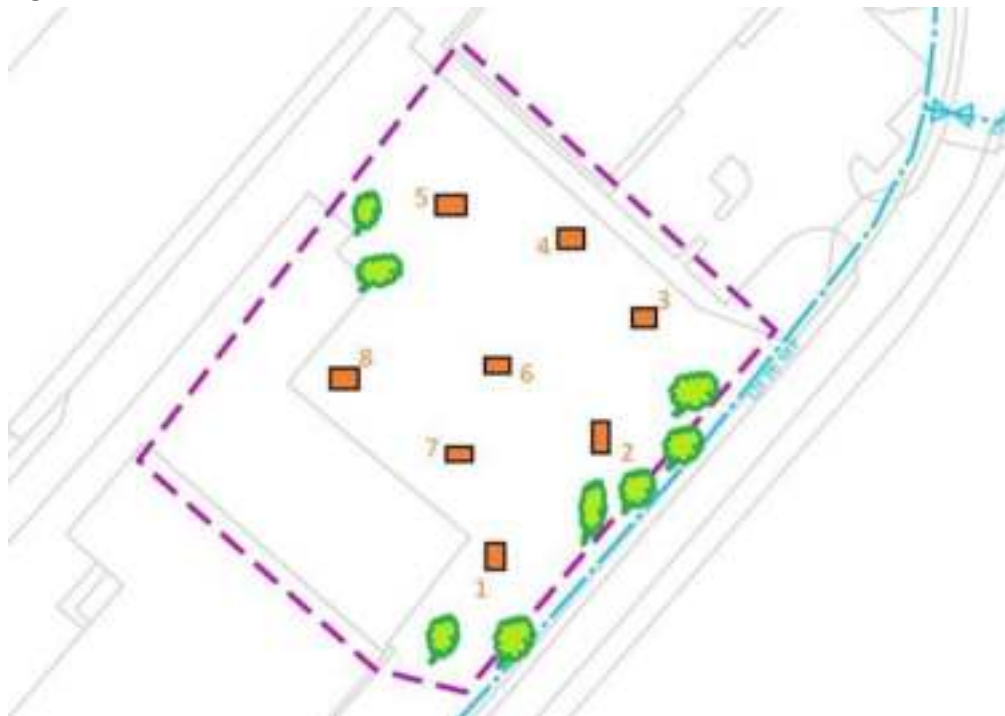
6.2.1 The Phase 2 site investigation was designed to target areas of potential sources of contamination identified in the Phase 1 report and site walkover:

- Pollutant: the presence of the large working site of historical cordite munitions factory.
- Pathway: Infiltration of rainwater through contaminated landscaped ground, migration through permeable landscaped ground and permeable superficial drift deposits.

Sampling Strategy

6.2.2 The ground conditions were investigated by means of trial pitting which allowed for the detailed examination of the arisings for lithological description and any visual and olfactory evidence of contamination. The exploratory pits also permitted the collection of soil samples for laboratory analysis. The exploratory locations are shown on Figure 3 below.

Figure 3: Trail Pit Locations



6.2.3 Eight Trial Pits (TP 1 – 8) were distributed across the entire site, allowing for even spatial coverage of the site. Samples were collected at a shallow depth where there was evidence of made ground, or a variation in the natural ground. Trial pits were terminated on encountering

stiff natural clay deposits considered to represent a barrier to any vertical migration of contamination.

6.3 Chemical Analysis Strategy

- 6.3.1 The analytical suite for the soils (Table 7.2 below) were selected based upon the past land uses and the findings of the Phase I report and focused upon the different made ground encountered. One sample of natural ground was also analysed for comparison. No groundwater was encountered during the ground works.
- 6.3.2 Samples of the soil were collected in appropriate containers supplied by the UKAS accredited laboratory. All samples were placed within a cool box and dispatched within 24 hours of collection.
- 6.3.3 The samples were analysed in accordance with the procedures set out in the Environment Agency's Monitoring Certification Scheme (MCERTS), where MCERTS methods are applicable. The testing laboratory used to complete the soils and water analyses was SOCOTEC, who also supplied the cool boxes and the appropriate sampling containers.

7.0 GROUND INVESTIGATION

7.1 Preliminaries

- 7.1.1 The site investigation was undertaken on the 29th July 2020. Weather was sunny, with no rain for the duration of the works. The average temperature was 15°C, and there was a wind from the NW at a speed of approximately 12 mph.
- 7.1.2 Thomas Plant Hire provided a JCB excavator, driver and banksman who performed scans for electrical services.
- 7.1.3 All works were undertaken under the supervision of a Caulmert Engineer who was also responsible for exploratory locations, logging of the trial pits and collection of samples for laboratory testing.

7.2 Limitations

- 7.2.1 It should be noted that the trial pits represent discrete locations of investigation, and whilst every effort has been made to characterise the area fully, the exploratory pits and the laboratory testing results reflect the soil quality only in those specific locations.
- 7.2.2 The trial pits were excavated to intercept the top of the natural geology (clay) where possible, and the depths to the base of the excavations is summarised in Table 2. Depths are shown in metres below ground level. The trial pits were not excavated deeper than the level of the superficial deposits as this would have the potential to form a new pathway to underlying strata. The maximum depth of excavation was 1m. Detailed trial pit logs are included in Appendix 3.

7.3 Field Observations

- 7.3.1 A photographic record of the investigation is presented in Appendix 2. The field observations are summarised below.

Table 7.1: Summary of Trial Pit Excavations

Trial Pit Number	Depth Excavated (mBGL)	Comments
TP1	0.5	No odour, Made ground (brick rubble) above underlying clay Terminated in stiff natural clay deposits.
TP2	0.5	No odour, Made ground (brick rubble) above underlying clay. Terminated in stiff natural clay deposits.
TP3	1.0	No odour, Made ground (brick rubble) with a thin band of black gravel above underlying clay. Terminated in stiff natural clay deposits.
TP4	0.4	Natural ground. Terminated in stiff natural clay deposits.
TP5	0.4	Natural ground. Terminated in stiff natural clay deposits.
TP6	2.5	No odour, Made ground (small rounded stone) above underlying clay. Terminated in stiff natural clay deposits.
TP7	3.0	No odour, Made ground (brick rubble) with a thin band of black gravel above underlying clay. Terminated in stiff natural clay deposits.
TP8	1.0	No odour, Made ground (small rounded stone) above underlying clay. Terminated in stiff natural clay deposits.

Made Ground

- 7.3.2 Made ground was encountered in the majority of the exploratory pits and typically comprised a thin (10 cm) superficial layer of light brown gravel of crushed brick, concrete and fragments of red clay brick with no odour or visible contamination. A slightly silty black gravel, with no odour, was found in two locations in a thin, 2cm layer above the underlying clay.
- 7.3.3 A wooden board was encountered in TP6 at 0.6 m, however this did not appear to have any structural function and was lifted to reveal stiff clay underneath.
- 7.3.4 The made ground in TP3 was the deepest area of these deposits identified in all the trial pits at a thickness of 80 cm. There was no evidence of any organic matter which would have the potential to generate gas. The maximum depth of the made ground was 1 mBGL and underlain by clay deposits.
- 7.3.5 Full ground conditions are detailed in the trial pit logs presented in Appendix 3.

Natural Superficial Deposits

- 7.3.6 The superficial deposits comprised predominantly soft to firm clay deposits. This was identified in all locations. The deposits appeared to become stiffer with depth. The clay was described as dry, orange, stiff clay with no odour.

Bedrock

- 7.3.7 Excavations were terminated in the superficial deposits due to the presence of the stiff underlying clay layer. The Phase 1 investigation identifies the underlying bedrock as Salop Formation. The British Geological Society¹ description for this formation states:

Red and red-brown mudstone, and red-brown (mostly sublitharenite) sandstone containing beds of pebbly sandstone and conglomerate itself containing Carboniferous limestone and chert clasts, and thin 'Spirobis' limestone beds and caliche in the lower part of the unit.

- 7.3.8 The thickness can range between 200m to 360m in Shropshire¹.

Groundwater

- 7.3.9 No groundwater was encountered in any of the trial pits during the investigation. Due to impermeable nature of the deposits encountered groundwater is not anticipated near surface.

¹ The BGS Lexicon of Named Rock Units: <https://webapps.bgs.ac.uk/lexicon/lexicon.cfm?pub=SAL>

7.4 Chemical Analytical Data

7.4.1 The soil samples were collected from the made ground encountered and the natural ground. Chemical analysis was carried out on one of the natural ground samples (TP5) and four of the made ground samples (TP1, TP3, TP6 and TP8).

7.4.2 The laboratory testing results and test certificates are presented in Appendix 4. A summary of the results is presented below in Table 7.2.

Table 7.2: Soil Chemical Analysis Results

Analyte	Units	TP1	TP3	TP5	TP6	TP8	S4UL
Ammoniacal Nitrogen (Exchangeable) as N	mg/kg	4.1	<2.32	3	3.7	4.4	
Benzene	µg/kg	<12	<12	<12	<13	<12	27
Ethylbenzene	µg/kg	<12	<12	<12	<13	<12	5700
m/p-Xylene	µg/kg	<24	<23	<25	<25	<25	5900
o-Xylene	µg/kg	<12	<12	<12	<13	<12	6600
Toluene	µg/kg	<12	<12	<12	<13	<12	56000
Colour of Material	-	Brown	Brown	Brown	Brown	Brown	
Major Constituents	-	SILT	SILT	CLAY	SILT	SILT	
Minor Constituents	-	Gravel	Gravel	Silt	Clay	Clay	
Miscellaneous Constituents	-	Brick	Brick	Rootlets	Gravel	Gravel	
Total Moisture at 35°C	%	11.9	11.8	20.5	17.6	18.6	
>C6-C7 Aliphatic	mg/kg	<0.235	<0.232	<0.249	<0.254	<0.247	7800
>C7-C8 Aliphatic	mg/kg	<0.235	<0.232	<0.249	<0.254	<0.247	
>C7-C8 Aromatic	mg/kg	<0.012	<0.012	<0.012	<0.013	<0.012	56000
>C8-C10 Aliphatic	mg/kg	<0.235	<0.232	<0.249	<0.254	<0.247	2000
>C8-C10 Aromatic	mg/kg	<0.048	<0.047	<0.05	<0.051	<0.049	3500
C5-C6 Aliphatic	mg/kg	<0.235	<0.232	<0.249	<0.254	<0.247	3200
C5-C7 Aromatic	mg/kg	<0.012	<0.012	<0.012	<0.013	<0.012	26000
Total GRO	mg/kg	<0.235	<0.232	<0.249	<0.254	<0.247	
Acid Soluble Sulphate as SO ₄	mg/kg	717	2410	370	574	560	
Arsenic as As	mg/kg	9.6	21.9	9.6	7.8	7	640
Cadmium as Cd	mg/kg	2	5.4	0.3	0.4	0.6	190
Copper as Cu	mg/kg	29.4	150.1	24	22.4	20.7	68000
Lead as Pb	mg/kg	106.8	3310	67.3	81.7	69	2200
Mercury as Hg	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5	1100
Nickel as Ni	mg/kg	29.4	27.6	35	23.1	24.5	980
Selenium as Se	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5	12000
Total Chromium as Cr	mg/kg	44.6	30.1	45.3	60	39.1	8600
Vanadium as V	mg/kg	36.9	30.6	39.2	38	30.9	9000
Zinc as Zn	mg/kg	523.7	7218	140.1	155.2	146	730000
Chromium (VI) as Cr	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1	33
Acenaphthene	mg/kg	<0.09	<0.09	<0.10	<0.10	<0.10	84000
Acenaphthylene	mg/kg	<0.09	<0.09	<0.10	<0.10	<0.10	83000
Anthracene	mg/kg	0.1	<0.09	<0.10	<0.10	<0.10	520000
Benzo[a]anthracene	mg/kg	0.64	0.18	<0.10	<0.10	<0.10	170
Benzo[a]pyrene	mg/kg	1.7	0.17	<0.10	<0.10	<0.10	35
Benzo[b]fluoranthene	mg/kg	1.79	0.23	<0.10	<0.10	0.1	44
Benzo[g,h,i]perylene	mg/kg	1.57	0.11	<0.10	<0.10	<0.10	3900
Benzo[k]fluoranthene	mg/kg	0.62	0.1	<0.10	<0.10	<0.10	1200
Chrysene	mg/kg	0.61	0.18	<0.10	<0.10	<0.10	350
Dibenzo[a,h]anthracene	mg/kg	0.29	<0.09	<0.10	<0.10	<0.10	3.5
Fluoranthene	mg/kg	0.89	0.39	<0.10	<0.10	0.15	23000
Fluorene	mg/kg	<0.09	<0.09	<0.10	<0.10	<0.10	63000
Indeno[1,2,3-cd]pyrene	mg/kg	1.53	0.12	<0.10	<0.10	<0.10	500
Naphthalene	mg/kg	<0.09	<0.09	<0.10	<0.10	<0.10	190

Analyte	Units	TP1	TP3	TP5	TP6	TP8	S4UL
Phenanthrene	mg/kg	0.2	0.58	<0.10	<0.10	<0.10	22000
Pyrene	mg/kg	1	0.32	<0.10	<0.10	0.14	54000
Total PAH 16	mg/kg	<11.3	<2.95	<1.59	<1.62	<1.67	
pH (2.5:1 extraction)	pH units	8	8.2	7.9	8.3	8.3	
Asbestos Identification	-	NAIIS	NAIIS	NAIIS	NAIIS	NAIIS	
Total Moisture at 105°C	%	14.8	13.9	19.6	21.2	18.9	
>C10-C12 (Aliphatic)	mg/kg	<4.69	<4.65	<4.98	<5.08	<4.93	9700
>C12-C16 (Aliphatic)	mg/kg	<4.69	<4.65	<4.98	<5.08	<4.93	59000
>C16-C21 (Aliphatic)	mg/kg	<4.69	<4.65	<4.98	<5.08	<4.93	1600000
>C21-C35 (Aliphatic)	mg/kg	19.9	<11.6	<12.4	<12.7	<12.3	
Total TPH (Aliphatic)	mg/kg	26.2	<23.2	<24.9	<25.4	<24.7	
>C10-C12 (Aromatic)	mg/kg	<4.69	<4.65	<4.98	<5.08	<4.93	16000
>C12-C16 (Aromatic)	mg/kg	<4.69	<4.65	<4.98	<5.08	<4.93	36000
>C16-C21 (Aromatic)	mg/kg	<4.69	6.48	<4.98	<5.08	<4.93	280000
>C21-C35 (Aromatic)	mg/kg	32.7	12.8	<12.4	<12.7	<12.3	28000
Total TPH (Aromatic)	mg/kg	38.9	23.6	<24.9	<25.4	<24.7	
Soil Organic Matter	% m/m	4.24	8.49	2.47	2.56	2.81	

- 7.4.3 With the exception of lead, all metals detected are below the LQM/CIEH Suitable for Use Levels (S4ULs) for commercial land use. It is noted that the zinc concentrations are also elevated, however, remain below the commercial screening criteria. Similarly, the sulphate concentrations are also elevated within this black silty gravel in comparison to other locations.
- 7.4.4 These results were verified with repeat testing of TP3 samples which returned repeatable concentrations.
- 7.4.5 The source of the lead and zinc is unknown, however, may be related to lead paint or accumulation of ash from lead paint associated with the historic activities on site. The thickness of the layer, the limited lateral extent and description would suggest that this material has most likely settled out of water as sediment. Due to the thickness the layer, this lead concentrations are not considered to represent the risks posed by the bulk soil chemistry.
- 7.4.6 The screening criteria for organic contaminants above are based on an organic matter percentage (SOM 1 %), representing the most stringent scenario for comparison.
- 7.4.7 Low, trace concentrations of petroleum hydrocarbons were detected in TP1 alone. Aliphatic Petroleum Hydrocarbons were detected at in the range of >C21-C35 at 19.9 mg/kg and Aromatic Petroleum Hydrocarbons in the range >C21-C35 at 32.7 mg/kg. These concentrations are significantly below the threshold values presented above. The TPHs detected were also below their respective LQM threshold limits.
- 7.4.8 Asbestos was not identified in the screening of the soil samples.

8.0 REVISED CONCEPTUAL MODEL AND QUALITATIVE RISK ASSESSMENT

8.1 Conceptual Model

- 8.1.1 The conceptual site model (CSM) presented below is based on the site data and the development proposal.

Source:

- 8.1.2 There is no significant (>1m) thickness of made ground present at the site which could potential generation a source of ground gas and therefore the risks to the development from ground gas area considered to be negligible.
- 8.1.3 A thin (2cm) black layer was identified containing elevated concentrations of lead above the generic screening value.

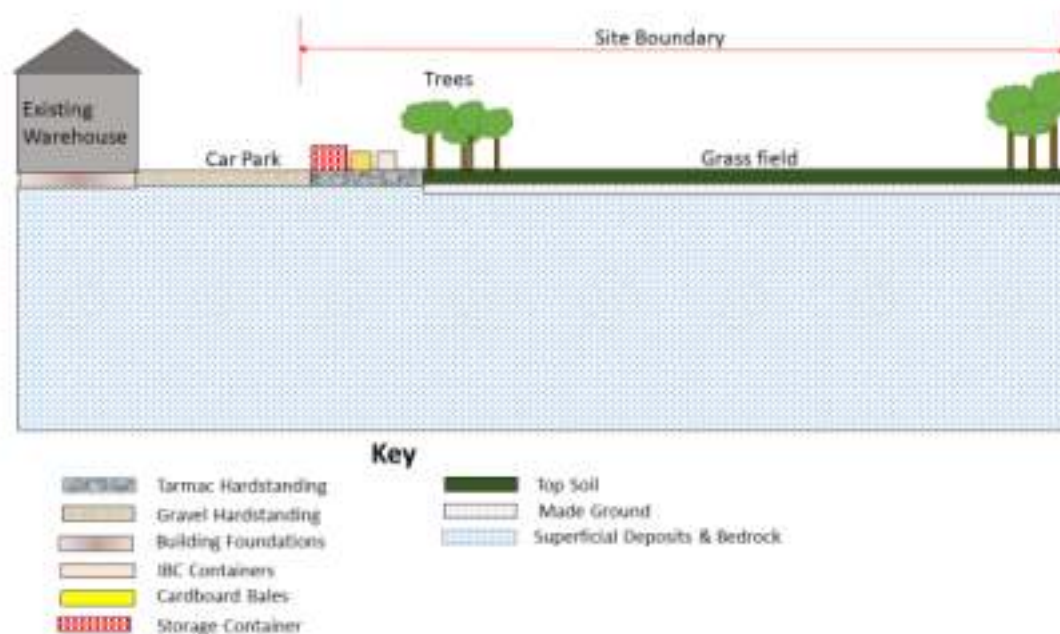
Pathways

- 8.1.4 The presence of a stiff natural clay beneath the shallow made ground (typically /<0.3m) would indicate that there is no potential for the vertical migration of contamination at the site. Pathways are limited to the inhalation and ingestion of potentially contaminated dust. The proposed development includes the construction of a building and hardstanding which would minimise the potential generation of dust from the soil layers.

Receptors

- 8.1.5 Receptors considered are future site operatives, construction workers and controlled waters comprising groundwater and streams within the area.

Figure 2: Conceptual Site Model



8.2 Risks to Human Health

- 8.2.1 Based on the assessment of these concentrations against generic screening values for commercial land use, the measured concentrations are all below this value and would indicate that the risks posed to human health are acceptable with the exception of lead within the isolated thin black layer. As indicated above, this layer is not considered to represent the bulk soil properties with respect to the risks to the proposed development. The lead concentrations are above the screening values and therefore it is recommended it is removed where encountered.
- 8.2.2 Future risks posed to site users are mitigated by the construction of the building and areas of hardstanding which conceptually would form a barrier between the site users and the underlying soils.

8.3 Risks to Controlled Waters

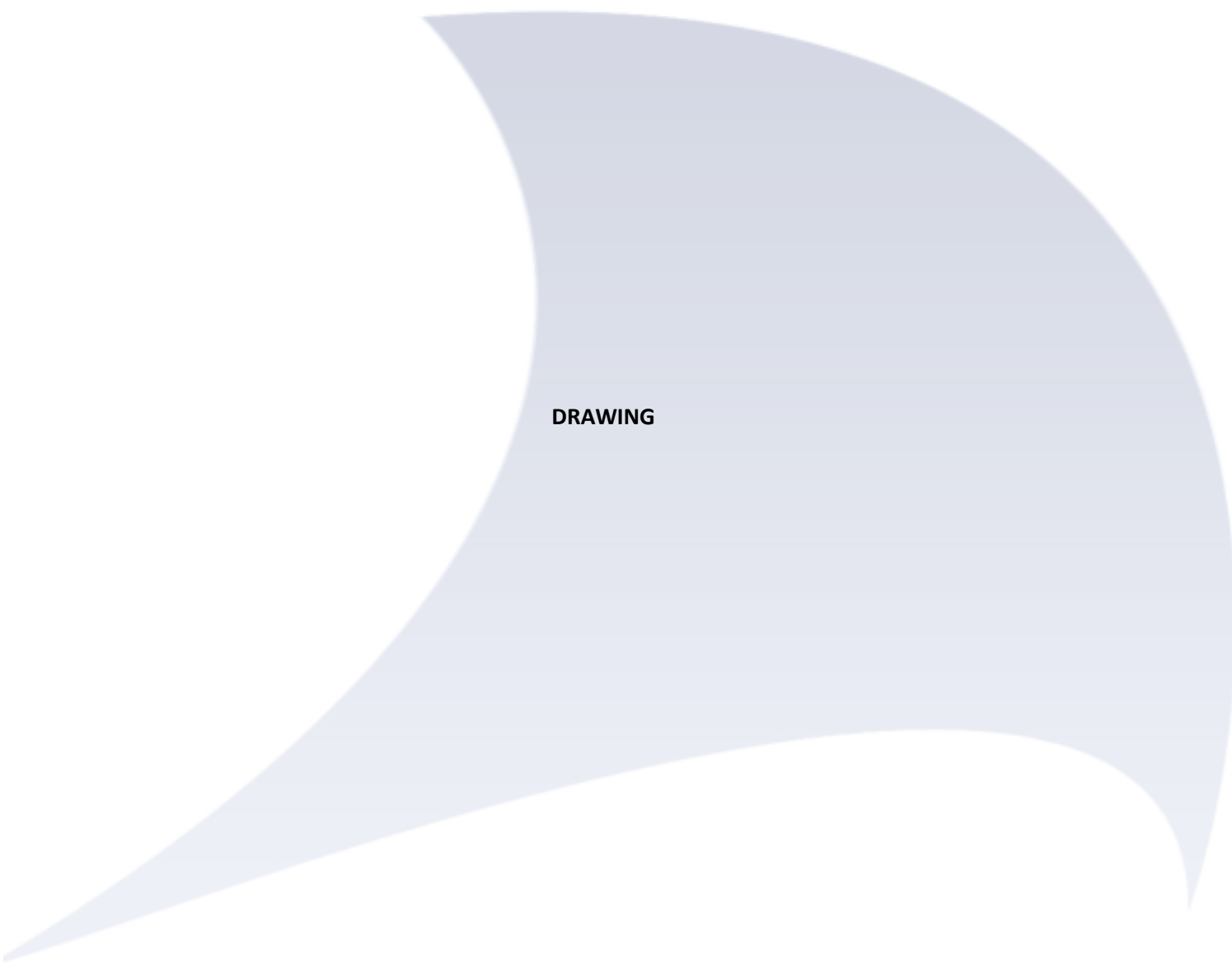
- 8.3.1 The presence of clay deposits immediately below the thin made ground is considered to represent a barrier to vertical migration of any contamination present at the site. Therefore there is no pathway present at the site and in adopting the risk assessment methodology, this would indicate negligible risk to groundwater.
- 8.3.2 The potential risk to surface water from the thin, black contaminated layer is considered to be low due to its limited spatial extent and vertical thickness. The potential to generate a significant volume of contaminated water is considered to be very low also due to the absence of permeably strata at the site. Contamination would only reach surface water receptors via overland flow. This will be mitigated via the proposed developments drainage strategy.
- 8.3.3 Where it lies beneath the footprint of future buildings, the risks posed by this material are further reduced as infiltration will be negligible and therefore the potential for mobilisation via surface water will be negligible.

8.4 Risks to Construction Workers

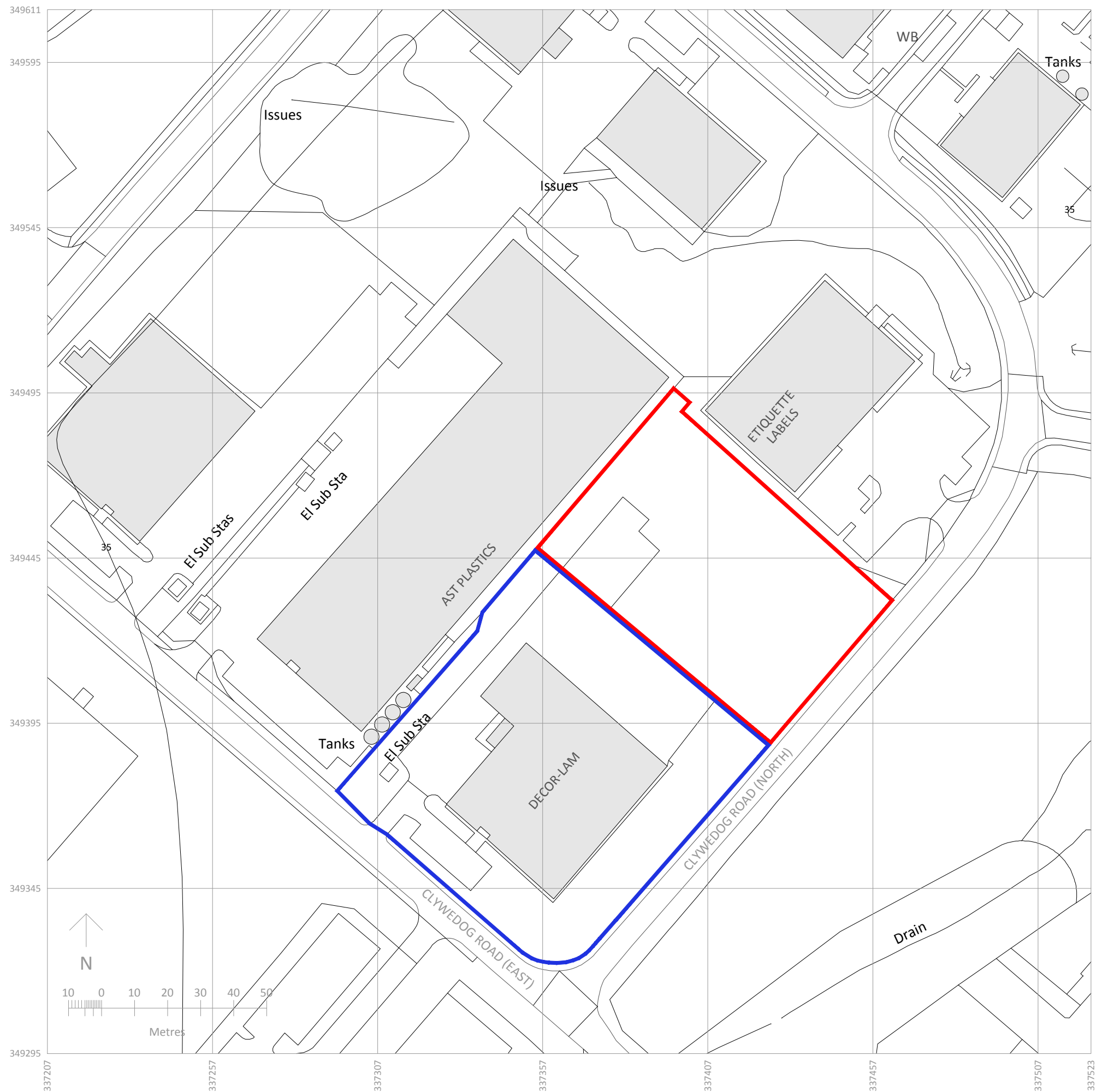
- 8.4.1 The highest risk posed by the lead concentrations is considered to be to ground workers during the development of the site. Good hygiene rules and minimisation of dust during construction works would minimise this risk. As indicated above, where identified (assume to be localised settling of sediment in hollows) the material will be removed as part of the development process.

9.0 CONCLUSIONS AND RECOMMENDATIONS

- 9.1.1 This report summarises the finding of the Phase I and Phase II investigation at Clywedog Road North, Wrexham, with respect to the risks posed to the proposed development.
- 9.1.2 The Phase 1 identified that the site was part of the large Cordite works and whilst no specific buildings were present within the footprint, there was the potential for contamination to be present associated with historic land use and any made ground associated with its redevelopment.
- 9.1.3 The Phase II site investigation adopted a non targeted approach. It confirmed the absence of any significant deposits of made ground and did not identify any contamination which would present a risk to future site users or controlled waters.
- 9.1.4 The ground investigation encountered an isolated occurrence of lead contamination in the form of a very thin layer (<2 cm) of black aggregate. The presence of this material was limited in both vertical and spatial extent. It was not considered that this thin band presented the bulk geochemical properties of the underlying soils. The proposed development is considered to mitigate against the risks by forming a barrier between the underlying soil and future site users. This material is considered to pose the greatest risk to construction workers via inhalation and ingestion of contaminated dust due to the concentrations present. Therefore, it is recommended that this material is removed where encounter to minimise the risks during the construction process.
- 9.1.5 A qualitative assessment considered that this thin isolated band did not represent a risk to controlled waters due to the absence of permeable deposits at the site.



DRAWING

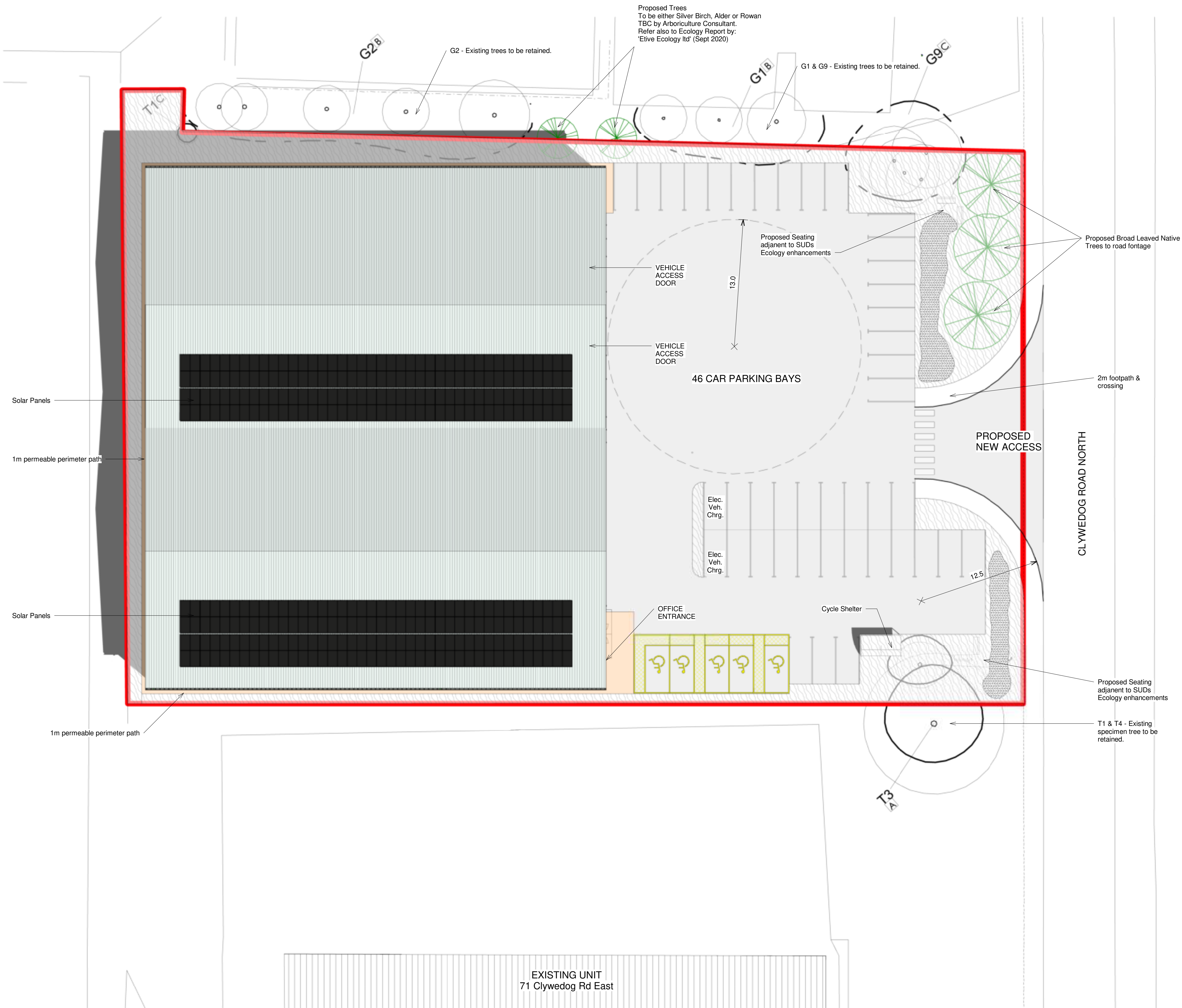


KEY	
—	Planning application site boundary
—	Adjoining land under the control of the applicant

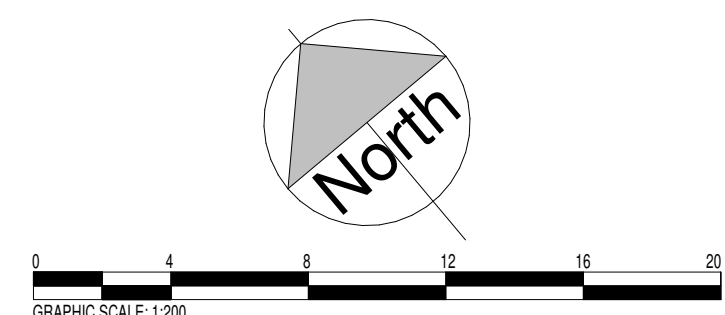
PACE | ARCHITECTURE

T| 07964 736 546 E|info@pace-architecture.co.uk
W| www.pace-architecture.co.uk

CLIENT	JCP Investments Ltd	
PROJECT	Proposed Industrial/Warehouse Unit at Clwedog Road North, LL13 9XN	
DRAWING TITLE	SITE LOCATION PLAN	
DRAWING NO.	1149 . P . 001	SHEET A3
DATE	09.10.20	SCALE 1:1250

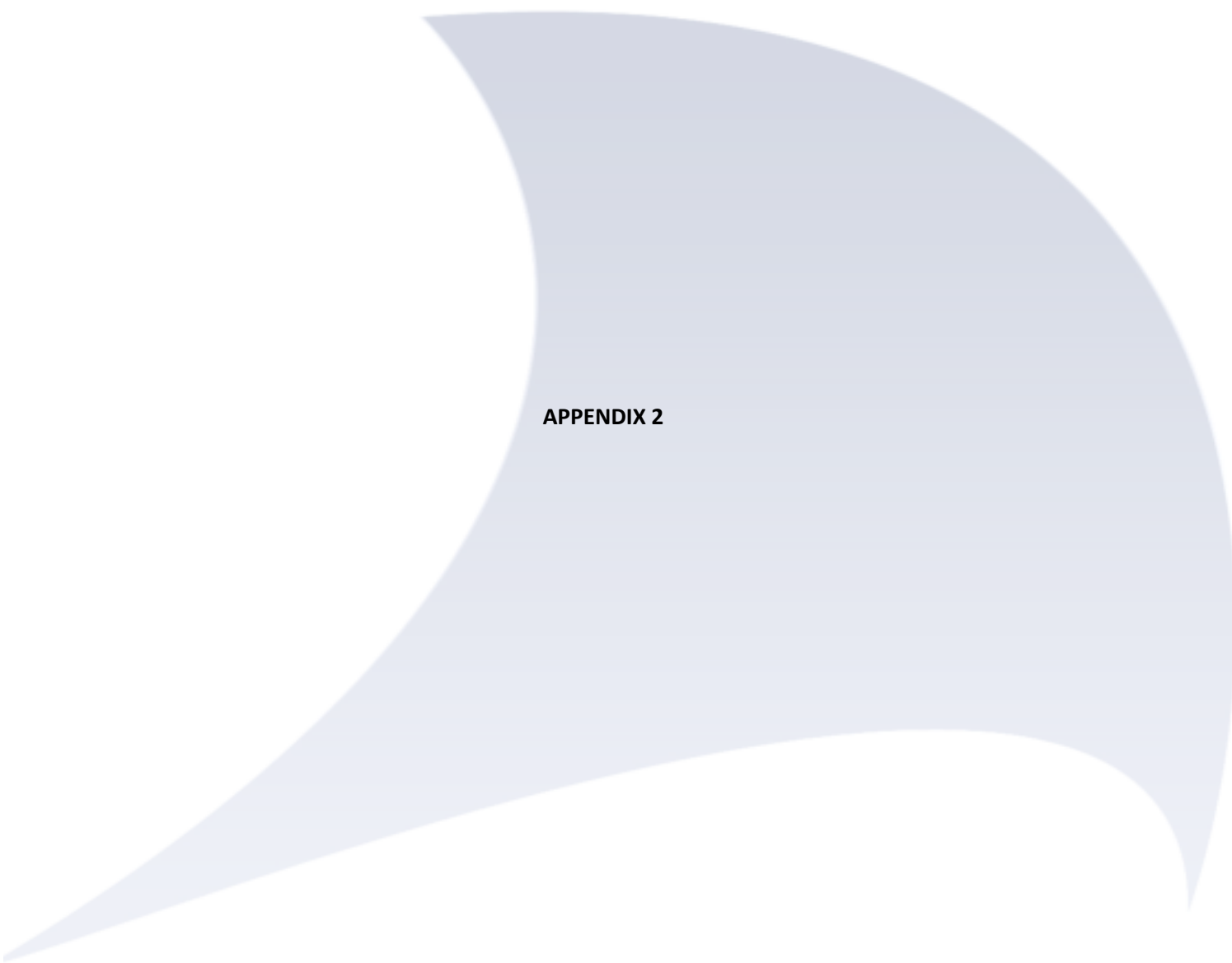


- PROPOSED TREE
- PROPOSED COMPOUND SURFACE
Refer to proposed SUDs Drainage Design by 'Caulmert'.
- PROPOSED BUILDING PERIMETER PAVING
Refer to SUDs Drainage Design by 'Caulmert'.
- PROPOSED WILDFLOWER GRASSLAND
Refer to Ecology Report by: 'Elive Ecology Ltd' (Sept 2020)
- PROPOSED SUDs DRAINAGE SWALE
Refer to Drainage Scheme by 'Caulmert'



PURPOSE OF ISSUE		
PLANNING		
PACE ARCHITECTURE		
www.pace-architecture.co.uk		
PROJECT		
PROPOSED INDUSTRIAL/WAREHOUSE UNIT		
ADDRESS		
Clywedog Road North, LL13 9XN		
TITLE		
PROPOSED SITE PLAN		
CLIENT		
JCP Investments Ltd		
DRAWN BY	CHECKED BY	DATE
nc	client	09.10.20
SCALE (@ A1)	PROJECT NUMBER	
1 : 200	1149	
DRAWING NUMBER		REV
1149 . P . 003		

1 Proposed Site Plan
1 : 200



APPENDIX 2

PHOTOGRAPHIC LOG

Photo No.	Comments
1	Site setting, looking NE
2	Site setting, looking N
3	Site setting, looking NW
4	Storage on paved hardstanding area
5	Gravel hardstanding to rear of warehouse
6	TP1
7	TP2
8	TP3
9	TP3 – Thin black layer
10	TP4
11	TP5
12	TP6
13	TP7
14	TP8

Photo 1



Photo 2



Photo 3



Photo 4



Photo 5



Photo 6



Photo 7



Photo 8



Photo 9



Photo 10



Photo 11



Photo 12

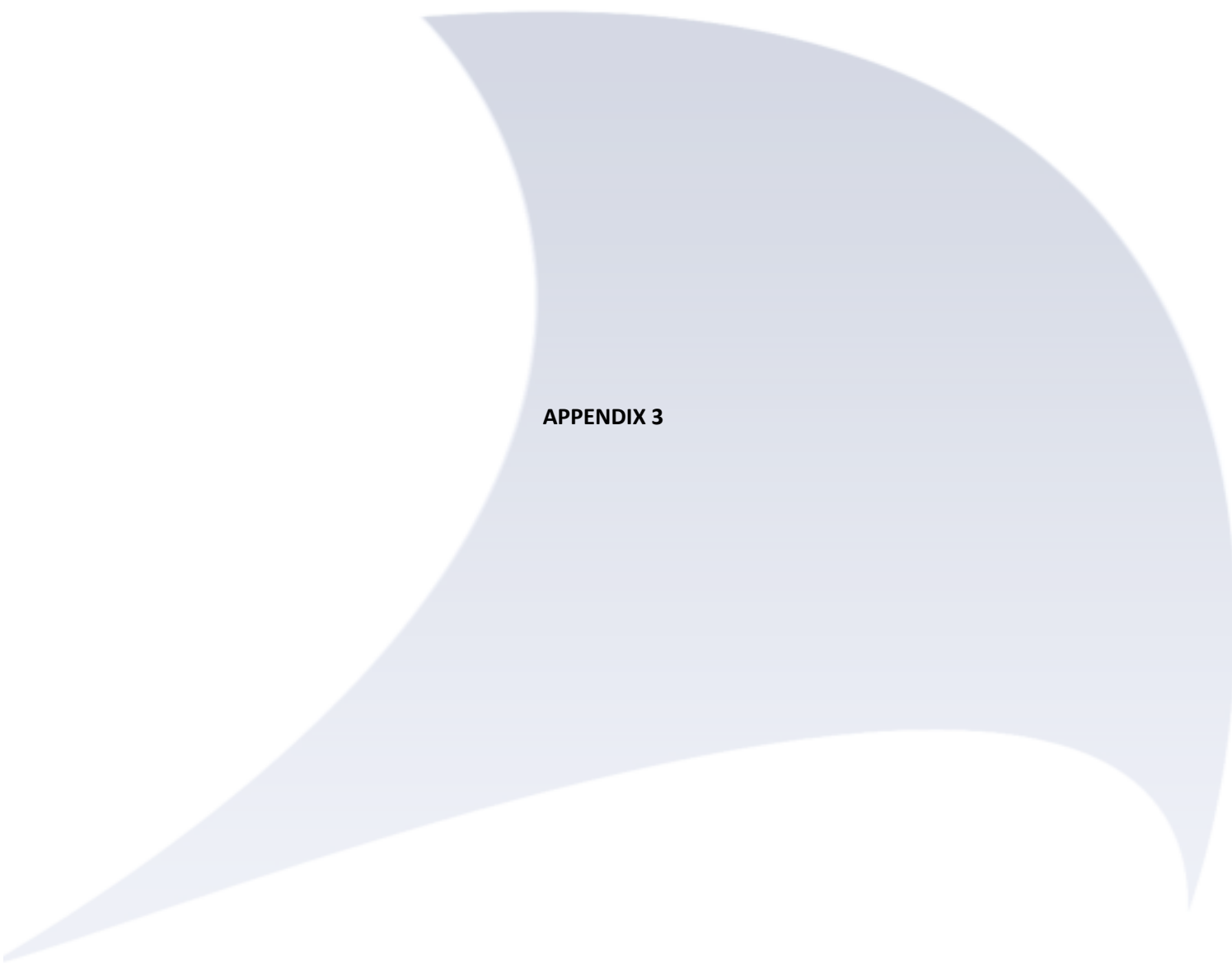


Photo 13



Photo 14





APPENDIX 3

		Project: Land At Clywedog Road North, Wrexham.		Trial Pit: TP1	
Excavation date: 29.07.20		Logged by: SOB		Client: JCP	
Project ID: 4371					
Strata:					Sheet 1 of 1
Depth (m)		Description			Samples
From	To				
0	0.3	TOPSOIL. Medium dense, dark brown, slightly clayey sand.			TP1
0.3	0.4	MADE GROUND. Loose, brown, slightly silty, gravelly, sand. Gravels fine to medium, sub-angular fragments of slate and limestone.			
0.4	0.5	CLAY. Firm, orange sandy clay			
		<u>End of trial pit 0.5 m</u> <i>Terminated in natural ground</i>			
Excavated by - 9 ton tracked excavator. Plan Dimensions of Pit (length x width x depth) – 1.0 x 1.0 x 0.5 m Groundwater – none Stability – Stable, sides remained vertical when excavated. Contamination –none					

		Project: Land At Clywedog Road North, Wrexham.		Trial Pit: TP2	
Excavation date: 29.07.20		Logged by: SOB		Client: JCP	
Project ID: 4371					
Strata:					Sheet 1 of 1
Depth (m)		Description			Samples
From	To				
0	0.3	TOPSOIL. Medium dense, dark brown, slightly clayey sand.			TP2
0.3	0.4	MADE GROUND. Loose, brown, slightly silty, gravelly, sand. Gravels fine to medium, angular to sub-angular fragments of clay brick and concrete			
0.4	0.5	CLAY. Firm, orange sandy clay			
		<u>End of trial pit 0.5 m</u> <i>Terminated in natural ground</i>			
Excavated by - 9 ton tracked excavator. Plan Dimensions of Pit (length x width x depth)– 1.0 x 1.0 x 0.5 m Groundwater – none Stability – Stable, sides remained vertical when excavated. Contamination –none					

		Project: Land At Clywedog Road North, Wrexham.	Trial Pit: TP3
Excavation date: 29.07.20	Logged by: SOB	Client: JCP	Project ID: 4371
Strata:			Sheet 1 of 1
Depth (m)		Description	Samples
From	To		
0	0.2	TOPSOIL. Medium dense, dark brown, slightly clayey sand.	TP3
0.2	1.0	MADE GROUND. Loose, grey brown, slightly silty, gravelly, sand. Gravels medium, angular fragments of red clay bricks and concrete *1cm thick band of black, fine gravel at 0.4 m. No odour*	
1.0	1.2	CLAY. Firm, orange sandy clay <u>End of trial pit 1.2 m</u> <i>Terminated in natural ground</i>	
Excavated by - 9 ton tracked excavator. Plan Dimensions of Pit (length x width x depth) – 1.0 x 1.0 m x 1.2 m Groundwater – none Stability – Stable, sides remained vertical when excavated. Contamination –none			

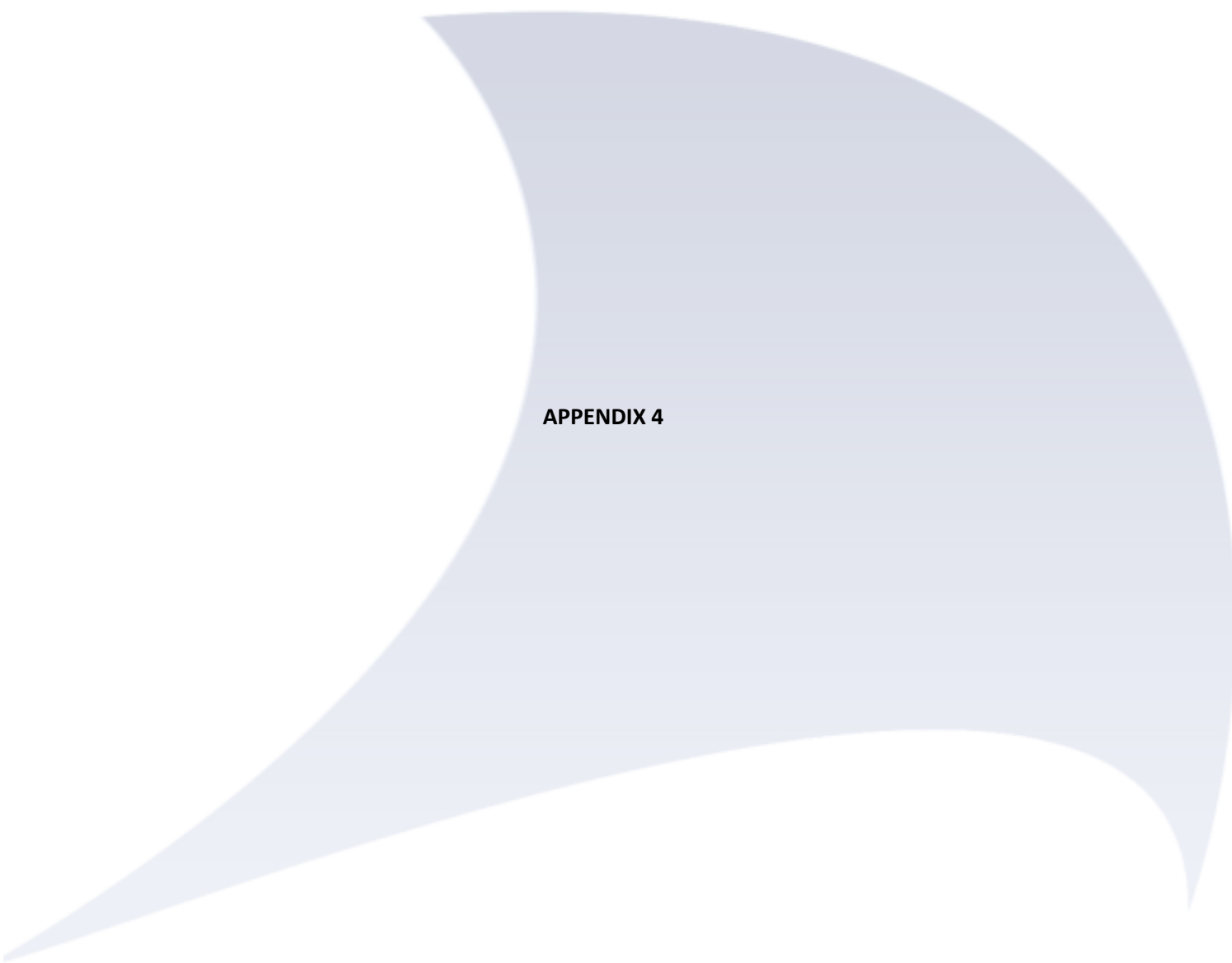
		Project: Land At Clywedog Road North, Wrexham.	Trial Pit: TP4
Excavation date: 29.07.20	Logged by: SOB	Client: JCP	Project ID: 4371
Strata:			Sheet 1 of 1
Depth (m)		Description	Samples
From	To		
0	0.2	TOPSOIL. Medium dense, dark brown, slightly clayey sand.	TP4
0.2	0.3	TOPSOIL. Medium dense, light brown, slightly clayey sand and CLAY	
0.3	0.4	CLAY. Firm, orange sandy clay	
		<u>End of trial pit 0.4 m</u> <i>Terminated in natural ground</i>	
Excavated by - 9 ton tracked excavator. Plan Dimensions of Pit (length x width x depth) – 1.0 x 1.0 x 0.4 Groundwater – none Stability – Stable, sides remained vertical when excavated. Contamination –none			

		Project: Land At Clywedog Road North, Wrexham.	Trial Pit: TP5
Excavation date: 29.07.20	Logged by: SOB	Client: JCP	Project ID: 4371
Strata:			Sheet 1 of 1
Depth (m)		Description	Samples
From	To		
0	0.2	TOPSOIL. Medium dense, dark brown, slightly clayey sand.	TP5
0.2	0.3	TOPSOIL. Medium dense, light brown, slightly clayey sand and CLAY	
0.3	0.4	CLAY. Firm, orange sandy clay	
		<u>End of trial pit 0.4 m</u> <i>Terminated in natural ground</i>	
Excavated by - 9 ton tracked excavator. Plan Dimensions of Pit (length x width x depth) – 1.0 x 1.0 x 0.4 Groundwater – none Stability – Stable, sides remained vertical when excavated. Contamination –none			

		Project: Land At Clywedog Road North, Wrexham.	Trial Pit: TP6
Excavation date: 29.07.20	Logged by: SOB	Client: JCP	Project ID: 4371
Strata:			Sheet 1 of 1
Depth (m)		Description	Samples
From	To		
0	0.2	TOPSOIL. Medium dense, dark brown, slightly clayey sand.	TP6
0.2	0.3	MADE GROUND. Loose, light brown, sandy CLAY with small to medium, well rounded gravel. *plank of hardwood at 0.3m*	
0.3	0.4	CLAY. Firm, orange sandy clay	
		<u>End of trial pit 0.4 m</u> <i>Terminated in natural ground</i>	
Excavated by - 9 ton tracked excavator. Plan Dimensions of Pit (length x width x depth) – 1.0 x 1.0 x 0.4 Groundwater – none Stability – Stable, sides remained vertical when excavated. Contamination –none			

		Project: Land At Clywedog Road North, Wrexham.		Trial Pit: TP7			
Excavation date: 29.07.20		Logged by: SOB		Client: JCP		Project ID: 4371	
Strata:						Sheet 1 of 1	
Depth (m)		Description				Samples	
From	To						
0	0.2	TOPSOIL. Medium dense, dark brown, slightly clayey sand.				TP7	
0.2	0.3	TOPSOIL. Loose, light brown, clayey sand.					
0.3	0.4	MADE GROUND. Loose, grey brown, slightly silty, gravelly, sand. Gravels medium, angular fragments of red clay bricks and concrete *2 cm thick band of black, fine gravel at 0.35 m. No odour*					
0.4	0.5	CLAY. Firm, orange sandy clay <u>End of trial pit 0.5 m</u> <i>Terminated in natural ground</i>					
Excavated by - 9 ton tracked excavator. Plan Dimensions of Pit (length x width x depth) – 1.0 x 1.0 x 0.5 Groundwater – none Stability – Stable, sides remained vertical when excavated. Contamination –1-2cm black gravel no odour or olfactory evidence of contamination							

		Project: Land At Clywedog Road North, Wrexham.	Trial Pit: TP8
Excavation date: 29.07.20	Logged by: SOB	Client: JCP	Project ID: 4371
Strata:			Sheet 1 of 1
Depth (m)		Description	Samples
From	To		
0	0.1	TOPSOIL. Medium dense, dark brown, slightly clayey sand.	TP7
0.1	0.2	TOPSOIL. Loose, light brown, clayey sand.	
0.2	0.3	MADE GROUND. Loose, light brown, sandy CLAY with small to medium, well rounded gravel.	
0.3	0.4	CLAY. Firm, orange sandy clay	
<u>End of trial pit 0.4 m</u> <i>Terminated in natural ground</i>			
Excavated by - 9 ton tracked excavator. Plan Dimensions of Pit (length x width x depth) – 1.0 x 1.0 x 0.4 Groundwater – none Stability – Stable, sides remained vertical when excavated. Contamination –none			



APPENDIX 4



Environmental Chemistry
SOCOTEC UK
Ashby Rd, Bretby,
Burton-on-Trent, UK
DE15 0YZ

Certificate of Analysis

Project No: 20080158

Client: Caulmert Limited

Quote Number: BEC20026282

Project Reference: Wrexham

Site Name: 4371

Contact: Sarah Venning

Address: 14 Farrington Way
Eastwood Link Business Park
Eastwood
Nottinghamshire

Post Code: NG16 3BF

E-Mail: SarahVenning@caulmert.com

Phone No: Unknown

Number of Samples Received: 5

Date Received: 05/08/2020

Analysis Date: 04/09/2020

Date Issued: 07/09/2020

Job Status: Complete

Report Type: Final Version 01

This report supersedes any versions previously issued by the laboratory

A handwritten signature in black ink, appearing to read 'M. Elliott-Palmer'.

Account Manager
Martin Elliott-Palmer

A handwritten signature in black ink, appearing to read 'R. Batham'.

Authorised by the Operations Manager
Becky Batham



Client: Caulmert Limited

Project Name: 4371

Project No: 20080158

Date Issued: 07/09/2020

Samples Analysed

<u>Sample Reference</u>	<u>Text ID</u>	<u>Sample Date</u>	<u>Sample Type</u>
TP1	20080158-001	29/07/2020 00:00:00	SOLID
TP3	20080158-002	29/07/2020 00:00:00	SOLID
TP5	20080158-003	29/07/2020 00:00:00	SOLID
TP6	20080158-004	29/07/2020 00:00:00	SOLID
TP8	20080158-005	29/07/2020 00:00:00	SOLID



Client: Caulmert Limited

Project Name: 4371

Project No: 20080158

Date Issued: 07/09/2020

Analysis Results

					Project ID	20080158				
					Sample ID	001	002	003	004	005
					Customer ID	TP1	TP3	TP5	TP6	TP8
					Sample Type	SOLID	SOLID	SOLID	SOLID	SOLID
					Sampling Date	29/07/2020	29/07/2020	29/07/2020	29/07/2020	29/07/2020
Analysis	Method Code	MDL	Units	Accred						
Ammoniacal Nitrogen (Exchangeable) as N	AMMAR	0.5	mg/kg^	UM	4.10	<2.32	3.00	3.70	4.40	
>C6-C7 Aliphatic	GROHSA/BTEXHSA	0.2	mg/kg^	UM	<0.235	<0.232	<0.249	<0.254	<0.247	
>C7-C8 Aliphatic	GROHSA/BTEXHSA	0.2	mg/kg^	UM	<0.235	<0.232	<0.249	<0.254	<0.247	
>C7-C8 Aromatic	GROHSA/BTEXHSA	0.01	mg/kg^	UM	<0.012	<0.012	<0.012	<0.013	<0.012	
>C8-C10 Aliphatic	GROHSA/BTEXHSA	0.2	mg/kg^	UM	<0.235	<0.232	<0.249	<0.254	<0.247	
>C8-C10 Aromatic	GROHSA/BTEXHSA	0.04	mg/kg^	UM	<0.048	<0.047	<0.05	<0.051	<0.049	
C5-C6 Aliphatic	GROHSA/BTEXHSA	0.2	mg/kg^	UM	<0.235	<0.232	<0.249	<0.254	<0.247	
C5-C7 Aromatic	GROHSA/BTEXHSA	0.01	mg/kg^	UM	<0.012	<0.012	<0.012	<0.013	<0.012	
Total GRO	GROHSA/BTEXHSA	0.2	mg/kg^	UM	<0.235	<0.232	<0.249	<0.254	<0.247	
pH (2.5:1 extraction)	PHSOIL	1	pH units	UM	8.0	8.2	7.9	8.3	8.3	
Chromium (VI) as Cr	KONENS	0.1	mg/kg	N	<0.1	<0.1	<0.1	<0.1	<0.1	
Soil Organic Matter	WSLM59	0.04	% m/m^	U	4.24	8.49	2.47	2.56	2.81	
Arsenic as As	ICPMSS	0.3	mg/kg^	UM	9.6		9.6	7.8	7.0	
				UM		21.9				
Cadmium as Cd	ICPMSS	0.2	mg/kg^	UM	2.0		0.3	0.4	0.6	
				UM		5.4				
Copper as Cu	ICPMSS	1.6	mg/kg^	UM	29.4		24.0	22.4	20.7	
				UM		150.1				
Lead as Pb	ICPMSS	0.7	mg/kg^	UM	106.8		67.3	81.7	69.0	
				UM		3310				
Mercury as Hg	ICPMSS	0.5	mg/kg^	UM	<0.5		<0.5	<0.5	<0.5	
				UM		<0.5				
Nickel as Ni	ICPMSS	2	mg/kg^	UM	29.4		35.0	23.1	24.5	
				UM		27.6				
Selenium as Se	ICPMSS	0.5	mg/kg^	UM	<0.5		<0.5	<0.5	<0.5	





Client: Caulmert Limited

Project Name: 4371

Project No: 20080158

Date Issued: 07/09/2020

Analysis Results

Project ID					20080158				
Sample ID					001	002	003	004	005
Customer ID					TP1	TP3	TP5	TP6	TP8
Sample Type					SOLID	SOLID	SOLID	SOLID	SOLID
Sampling Date					29/07/2020	29/07/2020	29/07/2020	29/07/2020	29/07/2020
Analysis	Method Code	MDL	Units	Accred					
Selenium as Se	ICPMSS	0.5	mg/kg [^]	UM		<0.5			
Total Chromium as Cr	ICPMSS	1.2	mg/kg [^]	UM	44.6		45.3	60.0	39.1
				UM		30.1			
Vanadium as V	ICPMSS	0.6	mg/kg [^]	N	36.9		39.2	38.0	30.9
				N		30.6			
Zinc as Zn	ICPMSS	16	mg/kg [^]	UM	523.7		140.1	155.2	146.0
				UM		7218			
Acid Soluble Sulphate as SO ₄	ICPACIDS	20	mg/kg [^]	UM	717	2410	370	574	560
Benzene	BTEXHSA	10	µg/kg [^]	UM	<12	<12	<12	<13	<12
Ethylbenzene	BTEXHSA	10	µg/kg [^]	UM	<12	<12	<12	<13	<12
m/p-Xylene	BTEXHSA	20	µg/kg [^]	UM	<24	<23	<25	<25	<25
o-Xylene	BTEXHSA	10	µg/kg [^]	UM	<12	<12	<12	<13	<12
Toluene	BTEXHSA	10	µg/kg [^]	UM	<12	<12	<12	<13	<12
Acenaphthene	PAHMSUS	0.08	mg/kg [^]	UM	<0.09	<0.09	<0.10	<0.10	<0.10
Acenaphthylene	PAHMSUS	0.08	mg/kg [^]	U	<0.09	<0.09	<0.10	<0.10	<0.10
Anthracene	PAHMSUS	0.08	mg/kg [^]	U	0.10	<0.09	<0.10	<0.10	<0.10
Benzo[a]anthracene	PAHMSUS	0.08	mg/kg [^]	UM	0.64	0.18	<0.10	<0.10	<0.10
Benzo[a]pyrene	PAHMSUS	0.08	mg/kg [^]	UM	1.70	0.17	<0.10	<0.10	<0.10
Benzo[b]fluoranthene	PAHMSUS	0.08	mg/kg [^]	UM	1.79	0.23	<0.10	<0.10	0.10
Benzo[g,h,i]perylene	PAHMSUS	0.08	mg/kg [^]	UM	1.57	0.11	<0.10	<0.10	<0.10
Benzo[k]fluoranthene	PAHMSUS	0.08	mg/kg [^]	UM	0.62	0.10	<0.10	<0.10	<0.10
Chrysene	PAHMSUS	0.08	mg/kg [^]	UM	0.61	0.18	<0.10	<0.10	<0.10
Dibenzo[a,h]anthracene	PAHMSUS	0.08	mg/kg [^]	UM	0.29	<0.09	<0.10	<0.10	<0.10
Fluoranthene	PAHMSUS	0.08	mg/kg [^]	UM	0.89	0.39	<0.10	<0.10	0.15
Fluorene	PAHMSUS	0.08	mg/kg [^]	UM	<0.09	<0.09	<0.10	<0.10	<0.10





Client: Caulmert Limited

Project Name: 4371

Project No: 20080158

Date Issued: 07/09/2020

Analysis Results

					Project ID 20080158				
					Sample ID				
					Customer ID				
					Sample Type				
					Sampling Date				
					001	002	003	004	005
					TP1	TP3	TP5	TP6	TP8
					SOLID	SOLID	SOLID	SOLID	SOLID
					29/07/2020	29/07/2020	29/07/2020	29/07/2020	29/07/2020
Analysis	Method Code	MDL	Units	Accred					
Indeno[1,2,3-cd]pyrene	PAHMSUS	0.08	mg/kg [^]	UM	1.53*	0.12*	<0.10*	<0.10*	<0.10*
Naphthalene	PAHMSUS	0.08	mg/kg [^]	UM	<0.09	<0.09	<0.10	<0.10	<0.10
Phenanthrene	PAHMSUS	0.08	mg/kg [^]	UM	0.20	0.58	<0.10	<0.10	<0.10
Pyrene	PAHMSUS	0.08	mg/kg [^]	UM	1.00	0.32	<0.10	<0.10	0.14
Total PAH 16	PAHMSUS	1.28	mg/kg [^]	U	<11.3	<2.95	<1.59	<1.62	<1.67
>C10-C12 (Aliphatic)	TPHFIDUS (Aliphatic)	4	mg/kg [^]	U	<4.69	<4.65	<4.98	<5.08	<4.93
>C12-C16 (Aliphatic)	TPHFIDUS (Aliphatic)	4	mg/kg [^]	U	<4.69	<4.65	<4.98	<5.08	<4.93
>C16-C21 (Aliphatic)	TPHFIDUS (Aliphatic)	4	mg/kg [^]	U	<4.69	<4.65	<4.98	<5.08	<4.93
>C21-C35 (Aliphatic)	TPHFIDUS (Aliphatic)	10	mg/kg [^]	U	19.9	<11.6	<12.4	<12.7	<12.3
Total TPH (Aliphatic)	TPHFIDUS (Aliphatic)	20	mg/kg [^]	U	26.2	<23.2	<24.9	<25.4	<24.7
>C10-C12 (Aromatic)	TPHFIDUS (Aromatic)	4	mg/kg [^]	U	<4.69	<4.65	<4.98	<5.08	<4.93
>C12-C16 (Aromatic)	TPHFIDUS (Aromatic)	4	mg/kg [^]	U	<4.69	<4.65	<4.98	<5.08	<4.93
>C16-C21 (Aromatic)	TPHFIDUS (Aromatic)	4	mg/kg [^]	U	<4.69	6.48	<4.98	<5.08	<4.93
>C21-C35 (Aromatic)	TPHFIDUS (Aromatic)	10	mg/kg [^]	U	32.7	12.8	<12.4	<12.7	<12.3
Total TPH (Aromatic)	TPHFIDUS (Aromatic)	20	mg/kg [^]	U	38.9	23.6	<24.9	<25.4	<24.7
Total Moisture at 105°C	TMSS	0.1	%	U	14.8	13.9	19.6	21.2	18.9
Total Moisture at 35°C	CLANDPREP	0.1	%	N	11.9	11.8	20.5	17.6	18.6
Colour of Material	CLANDPREP		-	N	Brown	Brown	Brown	Brown	Brown
Major Constituents	CLANDPREP		-	N	SILT	SILT	CLAY	SILT	SILT
Minor Constituents	CLANDPREP		-	N	Gravel	Gravel	Silt	Clay	Clay
Miscellaneous Constituents	CLANDPREP		-	N	Brick	Brick	Rootlets	Gravel	Gravel
Asbestos Identification	SUB020		-	N	NAIIS	NAIIS	NAIIS	NAIIS	NAIIS



CERTIFICATE OF ANALYSIS

ANALYSIS REQUESTED BY: SOCOTEC UK Ltd
Environmental Chemistry
PO Box 100
Burton upon Trent
Staffordshire
DE15 0XD

CONTRACT NO: S13925-1

DATE OF ISSUE: 25.08.20

DATE SAMPLES RECEIVED: 18.08.20

DATE ANALYSIS COMPLETED: 25.08.20

DESCRIPTION: Five soil/loose aggregate samples.

ANALYSIS REQUESTED: Qualitative analysis of samples for determination of presence/type of asbestos.

METHODS:

Our method involves initial examination of the samples followed by detailed analysis of representative sub-samples. The sub-samples are analysed qualitatively for asbestos by polarised light and dispersion staining as described by the Health and Safety Executive in HSG 248.

RESULTS:

Initial Screening

No asbestos was detected in any of the soil samples by stereo-binocular and polarised light microscopy.

A summary of the results is given in Table 1.





CONTRACT NO: S13925-1
DATE OF ISSUE: 25.08.20

RESULTS: (cont.)

Table 1: Qualitative Results

SOCOTEC Job ID: 20080158

IOM sample number	Client sample number	ACM type detected	PLM result
S75085	20080158-001-12	-	No Asbestos Detected
S75086	20080158-002-12	-	No Asbestos Detected
S75087	20080158-003-12	-	No Asbestos Detected
S75088	20080158-004-12	-	No Asbestos Detected
S75089	20080158-005-12	-	No Asbestos Detected

Our detection limit for this method is 0.001%.

COMMENTS:

IOM Consulting cannot accept responsibility for samples that have been incorrectly collected or despatched by external clients.

Any opinions and interpretations expressed herein are out with the scope of our UKAS accreditation.

K. Parsons-Hewes
AUTHORISED BY:
K Parsons-Hewes
Senior Scientific Technician

Additional Report Notes

Method Code	Sample ID	The following information should be taken into consideration when using the data contained within this report
PAHMUS	20080158-001 TO 20080158-005	The Primary process control data associated with this Test has not wholly met the requirements of the Laboratory Quality Management System QMS with one or more target analytes falling outside acceptable limits. However the remaining data gives the Laboratory confidence that the test has performed satisfactorily and that the validity of the data may not have been significantly affected. However in line with our QMS policy we have removed accreditation, where applicable, from the affected analytes (Indeno[1,2,3-cd]pyrene) . These circumstances should be taken into consideration when utilising the data.

LIMS-F002 - Report Notes



Client: Caulmert Limited

Project Name: 4371

Project No: 20080158

Date Issued: 07/09/2020

<u>Deviating Sample Report</u>			Incorrect Container	Incorrect Label	Headspace	Incorrect/No Preservative	No Sampling Date	Holding Time	Handling Time
Sample Reference	Text ID	Reported Name							

Analysis Method

<u>Analysis</u>	<u>Analysis Type</u>	<u>Analysis Method</u>
AMMAR	INORGANIC	
BTEXHSA	ORGANIC	As Received
CLANDPREP	PHYS	As Received
GROHSA	ORGANIC	As Received
GROHSA/BTEXHSA	ORGANIC	
ICPACIDS	METALS	Air Dried & Ground
ICPEXT	METALS	Air Dried & Ground
ICPMSS	METALS	Air Dried & Ground
KONENS	INORGANIC	Air Dried & Ground
PAHMSUS	ORGANIC	As Received
PHSOIL	INORGANIC	As Received
SUB020	SUBCON	
TMSS	PHYS	As Received
TPHFIDUS (Aliphatic)	ORGANIC	As Received
TPHFIDUS (Aromatic)	ORGANIC	As Received
WSLM59	INORGANIC	Air Dried & Ground



Client: Caulmert Limited

Project Name: 4371

Project No: 20080158

Date Issued: 07/09/2020

Additional Information

This report refers to samples as received, and SOCOTEC Uk Ltd takes no responsibility for accuracy or competence of sampling by others.

Results within this report relate only to the samples tested.

In the accreditation column of analysis report the codes are as follows:

- U = UKAS accredited analysis
- M = MCERT accredited analysis
- N = Unaccredited analysis

Any units marked with ^ signify results are reported on a dry weight basis of 105° c

All Air Dried and Ground Samples (ADG) are oven dried at less than 35° c.

This report shall not be reproduced except in full and with approval from the laboratory.

Opinions and interpretations given are outside the scope of our UKAS accreditation.

Any samples marked with * are not covered by our scope of UKAS accreditation, if applicable further report notes have been added.

Any solid samples where the Major Constituents are not one of the following (Sand, Silt, Clay, Made Ground) are not one of our accredited matrix types.

Any samples marked with ‡ have had MCERTS accreditation removed for this result

Any samples marked with a tick in the deviant table is deviant for the specific reason.

Any samples reported as IS, NA, ND mean the following:

- IS = Insufficient Sample to complete analysis
- NA = Sample is not amenable for the required analysis
- ND = Results cannot be determined

Our deviating sample report does not include deviancy information for Subcontracted analysis. Please see the report from the Subcontracted lab for information regarding any deviancies for this analysis.

End of Certificate of Analysis



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