

APPENDIX 5

GROUND GAS RESISTANT MEMBRANE INSPECTION RECORD SHEET



Construction Site Validation Services

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Project:	A SITE
Project No:	111
Plot No. Inspected:	NO 1
Date of inspection:	01/01/2024
Inspected by:	PSP

INSPECTED ITEM	YES/NO	COMMENTS	PHOTOGRAPHED YES / NO
Identification Identify that the correct membrane has been used, including sealing / jointing tape and pre-formed components e.g. tophats, corners.	Y		Y
General Condition Inspect the general condition of the membrane for rips, tears and punctures.	Y		Y
Jointing Check that all jointing has been carried out to the manufacturer's specification.	Y		Y
Installation Check that the membrane has been installed correctly across cavities, including correct jointing in these areas.	Y		Y
Top Hat Installation Check that top hats have been correctly installed around service entries, including jubilee clip around pipe and correct lapping and jointing to membrane at base.	Y		Y
Vent Installation Check that vents have been installed around the perimeter of the building in sufficient number and in the correct locations, including inspecting the condition i.e. not blocked or otherwise restricted.	Y		N
Pressure Relief / Passive Venting Check the presence of a vented void / pressure relief pathway, including measuring that this is of a sufficient depth and not been filled or otherwise compromised. Check that internal sleeper walls are also vented to provide adequate flow-through within the void so that none of the walls are blocking off unvented sections within the void.	N		N

This Plot has **PASSED / FAILED** inspection.

Additional inspection visit **IS / IS NOT** required for this plot.

Engineer:Paul Speakman.....

Signed: .



Figure 1 -- General View Across Plot 51/52 during subfloor construction note Perimeter and through vents



Figure 2 – Through vent and depth of trench block is depth of void, once beams are placed.



Figure 3 – Plot 51/52 with membrane in place



Figure 4 – Perimeter Sub floor vents in place

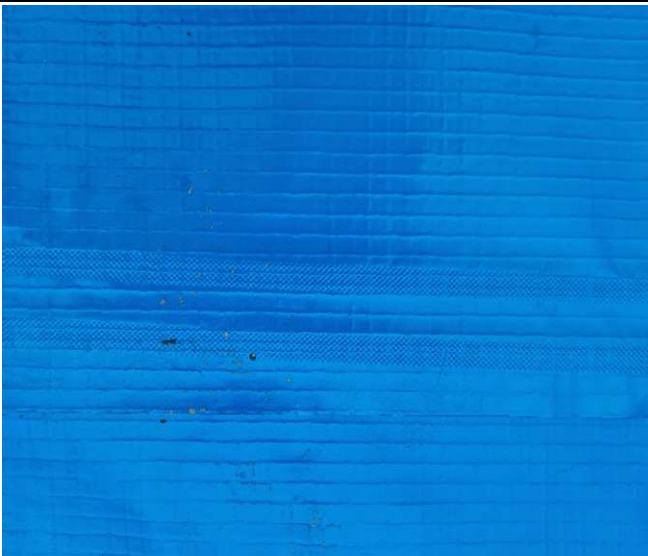


Figure 5 – Sheet sealed by Twin Seam mechanical welding



Figure 6 – Sheet sealed by hand held heat welding

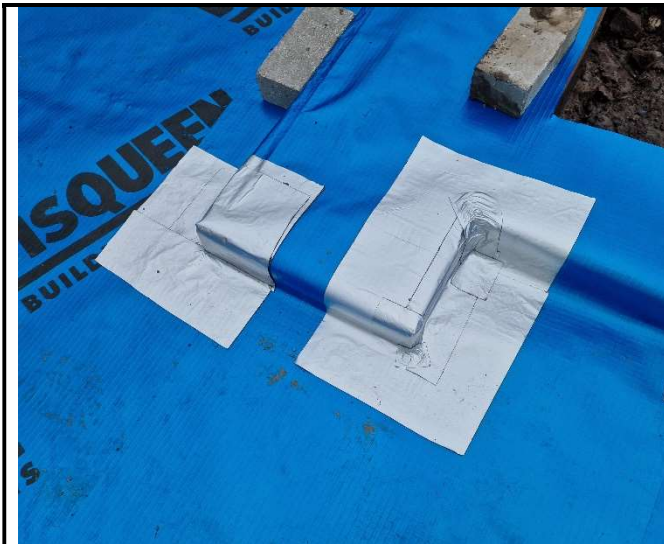


Figure 7 -- Corners detailed with Visqueen PRO Detail Tape



Figure 8 -- Corners detailed with Visqueen PRO Detail Tape



Figure 9 -- Service penetrations detailed well

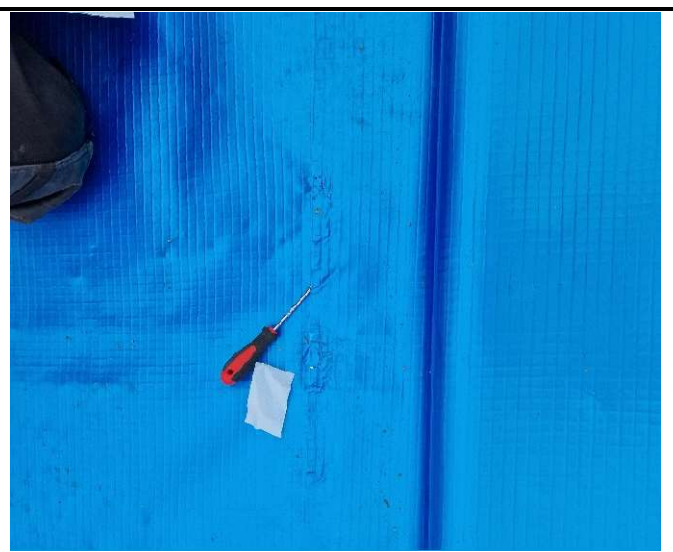


Figure 10 -- Area of weak bonding proven with pick



Figure 11 -- Area in Fig 10 over patched with Visqueen Pro Detail tape



Figure 12 -- Cavities well covered

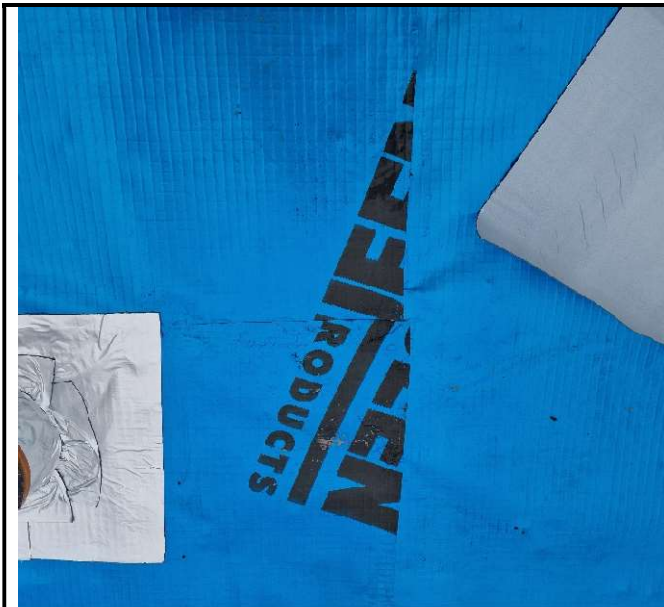


Figure 13 – Loose seam proven by pick

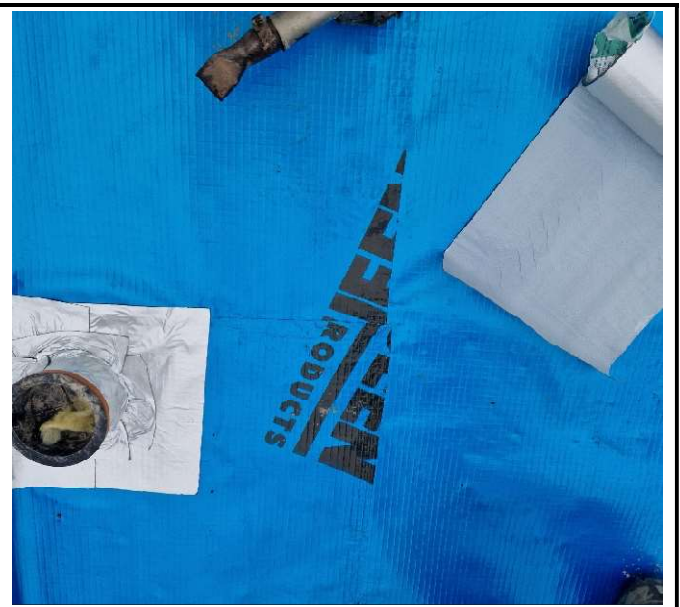


Figure 14 - Seam in Fig 13 re-bonded by heat gun



Figure 15 - Minor damage to membrane



Figure 16 – Damage in Fig 15 patched with Visqueen Pro detail tape



Figure 17 - Weak seam at interface VTcal to Horizontal



Figure 18 weak seam strengthened with visqueen pro detail tape

Product Installation

How to lap and joint a membrane above a floor slab



Remove loose debris from the surface of the floor slab and unroll the first sheet of membrane. The surface of the slab should be smooth and free from projections or indentations – if very rough, apply a sand blinding.



Remove the protective paper from one side of the appropriate jointing tape and apply it to the first sheet, starting about 50mm from the edge. Ensure that all surfaces are dry for maximum adhesion.



Unroll the second sheet along the joint, overlapping the first by at least 150mm. Press firmly onto the double sided tape, gradually removing the protective paper.



Seal the edge of the overlap with appropriate sealing tape.

How to joint the cavity tray to the membrane at the floor perimeter



Install the DPC starting from the outside of the external wall, over the inner masonry leaf and finishing at least 200mm from the wall.



Just before the floor topping is applied (or floor slab is cast), clean any mortar droppings, or other debris from the DPC. Remove the protective paper from the appropriate jointing tape and apply the tape to the DPC, starting about 50mm from the edge.



Lay the membrane over the floor slab (or subfloor blinding), overlapping the DPC by at least 150mm. Press firmly onto the appropriate jointing tape, gradually removing the protective paper.

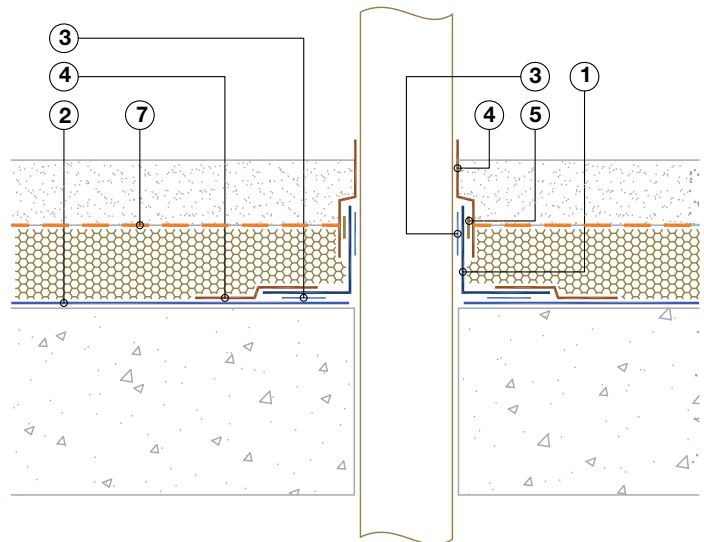


Seal the edge of the overlap with appropriate sealing tape.

Service Pipe Penetrations

Damp proof and airtight seals should be formed around all service entry points. Visqueen Top Hat Units are available for sealing around pipe units. The full system consists of:

- Rigid preformed pipe sleeve (top hat) unit – available for either 110mm, 135mm or 160mm
- External diameter pipes.
- Flexible preformed pipe sleeve (Top Hat) unit – supplied to suit pipe.
- External diameter as required.
- Double sided jointing tape.
- Girth lap tape.
- Foil lap tape – for gas applications.

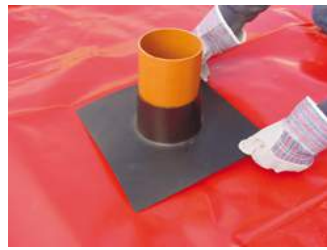


Key			
1	Preformed Pipe Sleeve	5	Jubilee Clip
2	Visqueen Gas Barrier	6	Visqueen TreadGUARD 1500
3	Visqueen Double Sided Tape	7	Visqueen Vapour Barrier
4	Visqueen GR Lap Tape	8	Smooth Sand Blinding Layer

How to install a top hat



Cut a circular hole in the membrane as close as possible to the pipe, or pipe socket. Ensure that pipe penetrations do not occur at joints in the membrane.



With the pipe in position, slide the Visqueen Preformed Top Hat Unit over the pipe (various diameters are available – 110mm being the most common).



Mark the extent of the square horizontal skirt over the membrane and also mark the line of the top of the top hat unit around the pipe.



Raise the top hat unit and cut four lengths of Visqueen Double Sided Jointing Tape, one for each side of the horizontal skirt. Allowing for an overlap at each corner. Cut one length to go round the pipe.



Start to remove the protective paper from the double sided tape around the pipe and raise it up at an angle so that it will project above the top hat unit when it is stuck to the membrane.



Release the protective paper from each of the four lengths of double sided tape. Lower the top hat unit, ensuring that the free end of the protective paper around the pipe is reachable, and seal the horizontal skirt to the membrane.



Gradually remove the remainder of the protective paper from the double sided tape around the pipe.



Seal the junction of the horizontal skirt and the membrane with the appropriate sealing tape and secure the top hat unit to the pipe with a jubilee clip.

APPENDIX 6



Phase I & II Geo-Environmental Assessment

Deardens Street

Bury
Greater Manchester
BL8 2BT

Prepared for:

Thomas Stoner Developments Limited

Carlinghow Mills
501 Bradford Road
Batley
WF17 8LL

EPS Reference Number: UK21.5294

Date Issued: 14th April 2021

Report Status: Issue 1

DEARDENS STREET, BURY

NON-TECHNICAL CLIENT SUMMARY

This report presents the findings of a combined Phase I Desk Study and Phase II Intrusive Investigation undertaken to determine ground conditions, establish if there are any environmental risks associated with the site and its development and provide a geotechnical appraisal. Pertinent findings and conclusions may be summarised as follows:

- The site comprises an open area of land accessible from the southern end of Deardens Street. At the time of this investigation, asphalt made up the majority of the northern surface area, while the southern area was overgrown and made ground was present from the surface. It should be noted that possible Japanese Knotweed was recorded in the southern area, although this should be confirmed by a specialist in invasive species.
- The investigation involved drilling four boreholes to a maximum depth of 5.0m and found made ground to extend between 1.80-3.0m and varied from sandy clayey gravel with frequent brick, concrete, plastic and dark grey sandy gravelly clay with similar constituents. A dark grey to black ashy slightly sandy gravel with evidence of coal and slag/clinker was also noted. Natural soils were recorded as light brown gravelly clay, clayey gravel or clayey gravelly sand. This variability is considered typical of Glaciofluvial Deposits.
- Laboratory analysis of soil samples has established that the made ground materials do not meet the necessary environmental quality standards for use within gardens at a residential setting, therefore control measures will be required to make the site safe and suitable for its proposed use.
- A coal mining report was obtained from the Coal Authority. It is concluded that despite evidence of coal mining features in the surrounding area, it is unlikely that they will impact on the stability of the enquiry boundary and therefore no further investigation works are recommended, subject to confirmation with the Coal Authority.
- This report should be submitted to Bury Council to support any future application and for inclusion in their land quality records.

ENGINEERING SUMMARY

- The shallow ground conditions are not considered suitable for conventional spread foundations and therefore consideration should be given to a deep foundation solution such as piles.
- A suspended ground floor construction is recommended for the proposed structure and a design CBR value of 2% is considered appropriate for any new areas of pavement bearing upon the made ground.
- A design sulphate class of DS-1 is considered suitable for concrete in direct contact with made ground or natural soils, with an aggressive chemical environment for concrete (ACEC) of AC-1s.
- Falling head infiltration tests were undertaken and suggest the natural geology can be classified as low to moderate permeability.

The above points represent a simplified summary of the findings of this assessment and should not form the basis for key decisions for the proposed development. A thorough review of the details is contained within the following report, or alternatively get in touch and we'll talk you through it.



Project Reference:	UK21.5294	
Title:	Phase I & II Geo-Environmental Assessment – Deardens Street, Bury	
Client:	Thomas Stoner Developments Limited	
Date:	14 th April 2021	
EPS (Leeds) Ltd Contact Details:	7B Caxton House Broad Street Cambourne Cambridge CB23 6JN	T: 01954 710666 F: 01954 710677 E: info@epstrategies.co.uk W: www.epstrategies.co.uk
Status:	Issue 1	

Author:	Reviewed:	Authorised:
		
Jack Johnson	Lee Anderson	Steve Bullock
Consultant	Senior Consultant	Director

This report has been prepared for the client(s) listed on the report title page. EPS accepts no liability or responsibility for use of, or reliance upon, this report and / or the information contained within it by third parties.

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No part of this report, or references to it, may be included in published documents of any kind without approval from EPS.

This report and its contents, together with any supporting correspondence or other documentation, remain the property of Environmental Protection Strategies Ltd until paid for in full.

Where ground investigations have been conducted, these have been limited to the level of detail required for the site in order to achieve the objectives of the investigation.

The report has been written, reviewed and authorised by the persons listed above. It has also undergone EPS' quality management inspection. Should you require any further assistance regarding the information provided within the report, please do not hesitate to contact us.

The National Planning Policy Framework 2019 requires a competent person to prepare site investigation information, which is defined as a person with a recognised relevant qualification, sufficient experience in dealing with the type(s) of pollution or land instability, and membership of a relevant professional organisation. EPS considers that it fulfils these criteria and would welcome any request for staff CVs or case studies to demonstrate it.

As stated within DEFRA's Contaminated Land Statutory Guidance (2012), with any complex risk assessment it is possible that different suitably qualified people may reach slightly different conclusions when interpreting the same information. EPS recognises this and considers the conclusions presented within this report to be robust and appropriate but input from the Local Authority and their judgement in line with this guidance would still be welcomed.

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Appendix B	Proposed Development Plan
Appendix C	Surrounding Land Use
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Appendix E	Groundwater Vulnerability and Flood Risk Maps
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1 INTRODUCTION

In March 2021, EPS was commissioned by Thomas Stoner Developments Ltd to complete a Phase I and II Geo-Environmental Assessment Report at Dearden's Street, Bury, Greater Manchester, BL8 2BT ('the site'); see Figure 1.

The work was commissioned in order to fulfil pre-planning requirements to construct terraced housing including car parking space and soft landscaping areas.

This report presents the findings, conclusions, and recommendations of the Phase I Desk Study and subsequent Phase II Intrusive Investigation undertaken as instructed.

1.1 Objectives

The objectives of this investigation were as follows:

- a) Compile a Phase I Desk Study and Conceptual Site Model through a Preliminary Risk Assessment to evaluate the potential risks the site may pose to human and environmental receptors, both currently and in future.
- b) Investigate potential contaminant linkages identified in the CSM by means of investigating shallow soils and groundwater.
- c) Determine the potential risks posed by the site and make recommendations for further work that may be required, to ensure safe development in accordance the Environment Agency's *Land Contamination: Risk Management* guidance (LC:RM, 2020) and the *National Planning Policy Framework*.
- d) To collect information on ground conditions and strength in order to make appropriate recommendations for geotechnical design.

1.2 Scope of Work

To perform an exploratory assessment of the site in accordance with the principles and requirements of DEFRA's '*Contaminated Land Statutory Guidance*' (2012), BS10175 – '*Investigation of Potentially Contaminated Sites*', BS5930:2015 '*Code of practice for ground investigations* and BS EN 1997 '*Geotechnical Design*', the following tasks were undertaken:

Desk Study:

- Collection of site records.
- Study of existing geological, hydrogeological and historic maps of the area.
- Consultation of environmental databases, including records held by the local authority (where available).
- Review of proposed development plans.
- Development of a Conceptual Site Model (CSM) through a Preliminary Risk Assessment.

Intrusive Investigation:

- Site walkover, inspection of any visual evidence of contamination at the site, obtaining photographic records.
- Health and safety briefing / site supervision.

- Drilling of four window sample boreholes to a depth of 5.0m below ground level (bgl) using a track-mounted percussive rig.
- Continual logging of ground conditions including inspection of samples for visual and olfactory contamination, and laboratory analysis of selected representative samples.
- Installation of gas and groundwater monitoring standpipes at selected locations on a precautionary basis to allow future monitoring if required.
- Three falling head borehole infiltration tests in one borehole (WS01) to assess the feasibility of infiltration drainage at the site.

Reporting:

- Data collection
- Interpretation of data including completion of Generic Quantitative Risk Assessment

The findings and conclusions of these investigations are presented in the following sections.

1.3 Limitations and Constraints

The purpose of this report is to present the findings of a soil sampling investigation conducted at the location(s) specified. When examining the data collected from the investigations made during the assessment, Environmental Protection Strategies Ltd (EPS) makes the following statements:

No investigation method is capable of completely identifying all ground conditions that might be present in the soil or groundwater under a site. Where outlined in our report, we have examined the ground beneath a site by constructing a number of boreholes and / or trial pits to recover soil and / or groundwater samples. The locations of these excavations and sampling points are considered to be representative of the condition of the whole site subsurface however, ground conditions are naturally variable and it may be possible that the conditions encountered may differ to those found during the investigation.

Possible evidence of Japanese Knotweed was identified during the site walkover. However, this plant can be difficult to identify in the early stages of growth and therefore it is not always possible to identify its' presence at certain times of the year. For this reason, EPS cannot confirm that Japanese Knotweed rhizomes do not exist and it is recommended that if it is suspected that this species, or other similarly invasive plants are present at the site, a specialist contractor should be commissioned to make a detailed assessment.

The investigation was carried out to assess the significance of contamination resulting from the use of the site as identified in this report. Unless EPS has otherwise indicated, no assessment of potential impact of any other previous uses has been made.

2 SITE CHARACTERISATION

The following section provides a summary of the information collected in relation to the site location and history.

2.1 Site & Location Description

Detail	Description
Location	The site is situated at the south eastern end of Deardens Street, Bury.
National Grid Reference	379117, 410322
Topographic Elevation	Approximately 95m above Ordnance Datum. The site is generally flat but the surrounding land slopes sharply to the south.
Description of Site	The site is roughly square shaped although a narrow section extends to the southwest. The total area is approximately 25m ² . The land is currently disused and is predominantly covered by asphalt hardstanding. An area of dense vegetation lies to the south which is soft underfoot, suspected Japanese Knotweed was also recorded in this area of the site, although it is difficult to identify during winter months as the key visual indicators including leaves and flowers are not present.
Surrounding Land Use	The surrounding land is currently used for residential housing to the west, north and east. Land immediately south was noted to slope southwards and was heavily vegetated with mature trees. Dearden's Lodge Reservoir is present within 100m southeast and beyond this, land is predominantly industrial.

A plan showing the site location is provided as Figure 1, the current site layout is detailed on Figure 2 and an aerial photograph is included as Figure 3. Selected site photographs are included as Appendix A, a proposed development plan is included as Appendix B and relevant extracts of a Landmark Envirocheck report are included as Appendix C.

2.2 Geo-Environmental Setting

Detail	Description
Geology	Records suggest the site is underlain by superficial Glaciofluvial Deposits of Quaternary Age, which are indicated to comprise sands and gravels. The underlying bedrock belongs to the Lower Pennine Coal Measures Formation of Carboniferous Age – these deposits comprise interbedded siltstone, mudstone and coal. No historic boreholes are located within 100m of the proposed development. Geological maps are included as Appendix D.
Coal Mining	The site lies within an area that may have been affected by historical coal mining activity according to the Coal Authority. While the site is not listed within a High Risk Development Area, further searches have been undertaken to gather information of potential risks at the site and this is further detailed in Section 3.
Geological Hazards	Hazard
	Mining Activities
	Collapsible Ground
	Compressible Ground
	Ground Dissolution
	Running Sand
	Landslide
	Shrinking / Swelling Clay
	On Site Risk
	Very Low
	Very Low
	No Hazard
	No Hazard
	Very Low
	Very Low
	No Hazard
Radon	The Envirocheck indicates the site to lie in a location where the percentage of homes above the radon action level is less than 1%. It further reports that the site will not require radon protection measures in the construction of new buildings.
Hydrogeology	Groundwater vulnerability maps for the area show that the underlying bedrock geology is classified as a Secondary A Aquifer, and the site does not lie within a Source Protection Zone (SPZ) for local groundwater abstraction. Groundwater vulnerability maps are included as Appendix E. The Envirocheck report lists one groundwater abstraction licence –within 100m to the east, which was operated by the former JR Compton manufacturing premises and no end date for the permit is provided.
Hydrology	The nearest surface water feature is Dearden's Lodge Reservoir situated approximately 80m to the southeast. Manchester, Bolton & Bury Reservoir is situated approximately 180m due south west. One surface water abstraction is recorded within 200m to the east. Review of the EA Flood Zone Map for the area indicates that the site lies within Flood Zone 1, which is defined as the area with a low potential risk of flooding from fluvial or tidal sources. It should be noted that the EA maps do not take into account the presence of flood defences or flooding from poor drainage, or groundwater.

Detail	Description
Hydrology Cont	Review of the BGS groundwater flooding susceptibility map for the area indicates that there is potential for flooding of a property below ground level – and potential for flooding of groundwater at the surface within 100m of the site. A copy of the flood map for the site and surrounding area is also included within Appendix E.
Known Site Drainage & Utilities	A enquiry regarding location of underground apparatus on the site, dated 23/02/2021, shows; • A low pressure gas main belonging to ESP Utilities. • A 6Kv to 6.6Kv Electric cable belonging to Electricity North West. • A medium pressure gas main belonging to National Grid Gas.
Landfill & Waste	The Envirocheck report shows that an infilled body of water within 8m of the site – the date of mapping is 1956. This infilled body of water is most likely a canal feeder shown on historic maps between 1850-1956. The canal feeder is not shown on the site between 1963-1989, indicating it was likely infilled at some point during this period of time. There are no other listed areas of infilled land or registered landfills on the site. There are three historic landfills listed within 500m – the closest of which is approximately 250m to the north east (Victoria Street) and was held by British Gas between 1984-1985. The second is/was held by an unnamed licence holder approximately 330m to the east (Wellington Street). The last is located around 500m to the north east and was held by P.R. Smith. The location is listed as the gasworks off Ainsworth Road, and deposited waste including inert waste. There are several other areas of potentially infilled land listed within 500m of the site.

2.3 Industrial Land Use & Pollution

There are 35 sites licensed for industrial and commercial activity within the surrounding 500m, the details of the most pertinent are detailed below.

Land Use	Approximate Distance (Direction)	Status
Wellington Garage Services Ltd	33 (NE)	Inactive
Horological Solvents Ltd	70 (NE)	Inactive
Dearden Service Station	66 (W)	Inactive
Esso (Service Station)	72 (W)	Active

Land Use	Approximate Distance (Direction)	Status
Tesco Petrol Station	72 (W)	Active
L T R Renault Specialist (Garage Services)	154 (W)	Inactive
Alpha Hospitals	170 (S)	Inactive
Athol Paints Ltd	285 (E)	Active
Rota Ltd (Hydraulic Engineers)	285 (E)	Inactive
Rakem Ltd (Chemicals & Allied Products)	290 (SE)	Inactive
The Rakem Group (Chemical Manufacturers)	290 (SE)	Active
Milliken (Textile manufacturers)	310 (E)	Active

One pollution incident to controlled waters is reported within the local area at a distance of roughly 71m south east; whereby crude sewage was released into the River Irwell in January 1996. The incident was recorded as a 'Category 3' (minor) incident and was caused by a blocked sewer.

2.4 Sensitive Land Use

The site lies approximately 180m north east of an area of adopted greenbelt; which is most likely the area surrounding Manchester, Bolton & Bury Reservoir. No other sensitive land use is listed within 500m of the site.

2.5 Site History

A summary of historical map data from 1850 to 2021 is provided below and copies of relevant historic maps and any others examined during the investigation are included in this report as Appendix F. A map detailing historic features in the area surrounding the site is displayed below.



The map shows the most pertinent land use and changes in land use that occurred from 1850 to the present day. In chronological order these are;

- A canal feeder is shown to run through the site from the south west to north east from 1850 - until the north eastern section is infilled around 1956 to 1959. The canal feeder was infilled on site circa 1980s.
- Deardens Farm is pictured on maps from 1889 along with residential housing within 50m of the site – the farm is not shown past 1939.
- A tar distillery is pictured within 50m north east of the site from 1910 until 1939
- An unmarked building is shown on the site from 1929 to 1957.
- A garage is pictured from 1957 on to the present day.
- Unnamed works pictured from 1957 to the present day; assumed to be light industrial use.

2.6 Preliminary Coal Mining Risk Assessment

The following sections summarise the information available at the site regarding presence of coal and historical working and is taken from the Coal Authority report included as Appendix G.

Past, Present & Future Coal Mining

The property is not within a surface area that may be affected by past recorded or present underground coal mining or an area where the Coal Authority has received an application for, and is currently considering whether to grant a license to remove or work coal by underground methods or where a license has been granted to do so. The property is also not in an area likely to be affected from future underground coal mining but reserves of coal do still exist in the area, which could be worked at some point in the future.

No known coal mine entries are recorded within 20m of the boundary.

The property is not within the boundary of an opencast site where coal is known to have been removed, neither does it lie within 200m of the boundary of a present opencast mine. There are no license requests outstanding for opencast mining within 800m or within 800m of where a license to remove coal by opencast methods has been granted.

Summary of Coal Mining Report

The Coal Authority is not aware of any damage due to geological faults of other lines of weakness that have been affected by coal mining.

The Coal Authority Report does not list any subsidence claims within the surrounding area.

No recorded entries of mine gas are recorded that require action and the property has not been subject to remedial works in behalf of, or by the Coal Authority, under its Emergency Surface Hazard Call Out Procedures.

Previous Investigations

The Coal Authority has not recorded any previous coal mining investigations and a review of planning records at the site has also not highlighted any past investigation or remedial works relating to coal.

Summary of Findings and Recommendations

Review of information supplied by the Coal Authority has not indicated that the site lies within an area of historical underground or surface coal mining reporting and that it has no record of any coal seams or outcrops at or beneath the site or any mine entries, shafts or adits in the surrounding area. The Coal Authority report also concludes that it is unlikely that any coal mining features will impact on the stability of the enquiry boundary. Therefore, no investigative works specific to coal mining legacy are required. The Coal Authority do highlight that coal reserves exist in the area that may be worked in the future.

The Coal Mining Report for the site is included as Appendix G.

3 PRELIMINARY RISK ASSESSMENT & CONCEPTUAL SITE MODEL

In accordance with the Environment Agency's Land Contamination: Risk Management, there are three stages to managing contaminated land (Risk Assessment/Remedial Options Appraisal/Remediation and Verification). This section outlines the first tier of Stage 1, the Preliminary Risk Assessment.

The following section provides a review of the contaminant linkages that may be active at the site, whereby EPS have examined the potential sources that may be present as a result of historic and / or current site activities and where potential interaction between these sources and the identified human / environmental receptors may occur.

3.1 Background

A Desk Study comprises the first stage of any geo-environmental assessment, the purpose of which is to determine what potentially contaminative activities may have occurred at the property or the surrounding area which may pose an environmental or geological risk to site users, the surrounding environment or proposed development, either at present or in the future.

The method used in this investigation to assess the environmental risk posed is based on the concept of 'contaminant linkage', which considers the following three factors:

Source	The location from which an environmentally hazardous / contaminative substance is, (or was,) derived.
Pathway	A route or mechanism via which a source could come into contact with a receptor to cause significant harm.
Receptor	An environmentally sensitive object or condition e.g. person, property, controlled water, or ecological system, which may be present now or in future.

If all three factors are identified, there is the potential for a 'contaminant linkage' to be active, which could result in significant harm being caused to the environment or human health.

3.2 Source Characterisation

The following potential contaminant sources have been identified at the site and in the surrounding area:

Potential Source	Source Description	Principal Contaminants of Concern
Current & Historic Site Use	In-fill material of unknown origin (Made Ground) used to level areas beneath historic buildings and hardstanding	PAH, Metals, ACM
	Historically infilled canal feeder (waterway) located within site boundary	PAH, Metals, ACM, CO ₂ , CH ₄

Potential Source	Source Description	Principal Contaminants of Concern
Current and Historic Surrounding Land Use	Current/historic industrial land-use of the area including Deardens Farm from 1889 to 1939, a tar distillery shown from 1910 to 1939 and a currently operational petrol station	Metals, Pesticides, PAH, TPH, BTEX, MTBE

Notes:

PAH	Polycyclic Aromatic Hydrocarbons	ACM	Asbestos Containing Material
TPH	Total Petroleum Hydrocarbons	BTEX	Benzene, Toluene, Ethylbenzene and Xylenes
MTBE	Methyl Tert Butyl Ether	CO ₂	Carbon Dioxide
CH ₄	Methane		

3.3 Potential Receptors

A framework for the assessment of risks arising from the presence of contamination in soils has been produced by the Environment Agency and the Department for the Environment, Food and Rural Affairs (DEFRA) and is presented with the report: '*Using Science to Create A Better Place: Updated Technical Background to the CLEA Model – Science Report SC050021/SR3*'. This guidance document defines a series of standard land-uses which have been further developed into six generic land uses in the Category 4 Screening Levels project for Land Affected by Contamination (DEFRA/Contaminated Land: Applications in Real Environments (CL:AIRE) Project Report SP1010, 2014) which form a basis for the development of the Conceptual Site Model.

Risks posed to controlled waters have been considered in line with the Environment Agency's *approach to groundwater protection* (v1.2, 2018) and associated position statements.

The proposed development plan includes the construction of a row of five terraced houses, along with car parking space and rear gardens with soft landscaping. Therefore, the proposed land use has been considered as:

- Residential (with plant uptake).

The above land use has been adopted as it is considered the most representative at this stage.

In view of the environmental setting, current and potential future land use of the site and surrounding sites, the potential receptors for any contaminant impact are discussed in the table below:

Receptor	Site Specific Description
Human	Future site users, site workers involved in the site redevelopment, and those working and living in the surrounding area have the potential to be at risk from exposure to potential contaminants of concern (CoCs).
Groundwater	The underlying geology comprises bedrock of the Lower Pennine Coal Measures and superficial Glaciofluvial Deposits, which are both classified by the EA as Secondary A Aquifers. Whilst the site does not lie within a SPZ for nearby groundwater abstraction, the underlying geology is a potential groundwater resource, and with records of an historic groundwater abstraction licence 70m east, groundwater should be considered as a potential receptor to site derived contaminants.
Surface Water	The nearest surface watercourse is an unnamed reservoir which comes within 80m of the boundary and is located down gradient from the site. It is possible that site derived contaminants of concern may enter these watercourses by overland flow, migration through unsaturated soils or entering shallow surface drainage / historical land drainage which discharges to these drains, therefore surface waters must also be considered as a sensitive receptor within the conceptual site model.
Flora and Fauna	The proposed development includes the provision of soft landscaping and planting of trees to the south of the site. Some of the identified contaminants of concern are known to be phytotoxic and as such, the potential for this impact should be considered.
Buildings & Infrastructure	Subsurface structures are likely to be present at the site which may be adversely affected by the potential presence of the identified contaminants of concern. These include concrete used in building foundations, buried potable water supply pipes and other service lines and pipes.
Adjacent Land	Adjacent properties including private residential dwellings could also be at risk from potential contaminants found at the site.

3.4 Potential Pathways

Where contaminants may be present in soil, there are a number of potential pathways that enable human receptors to come into contact with or be exposed to them. The most direct pathways, considered under current UK legislation, can be summarised as follows:

- Direct ingestion of contaminated soil
- Ingestion of household dust
- Ingestion of contaminated vegetables
- Ingestion of soil attached to vegetables
- Dermal contact with contaminated soil
- Dermal contact with household dust
- Inhalation of fugitive soil dust
- Inhalation of fugitive household dust
- Inhalation of vapours outside
- Inhalation of vapours inside

Clearly, not all of these potential pathways apply for every standard land-use. For example, ingestion of contaminated vegetables will not apply to land uses other than residential with plant uptake and allotments.

However, in addition to direct exposure pathways, a number of physical transport mechanisms / pathways may also exist at a site that allow remote or less accessible contaminants in soil or groundwater to reach human or environmental receptors both at a site and beyond the site boundary. These include the transport mechanisms listed below.

- Downward and lateral movement of contaminants in soil either by gravity or through being 'leached' by percolating rainwater
- Lateral migration of contaminants dissolved in groundwater.
- Direct seepage or leaching of contaminants from soil into subsurface drains or supply pipework.
- Volatilisation of contaminants from groundwater or unsaturated soils into buildings or outdoor air.

Through examination of the standard land use and environmental setting at each site, the presence of pathways and transport mechanisms described above must be considered when assessing whether a contaminant linkage may plausibly be active, and therefore be included in the conceptual site model.

3.5 Summary of Contaminant Linkages

Considering the site use and environmental setting, and proposed land use, the following plausible contaminant linkages have been identified through this phase I assessment and require further investigation.

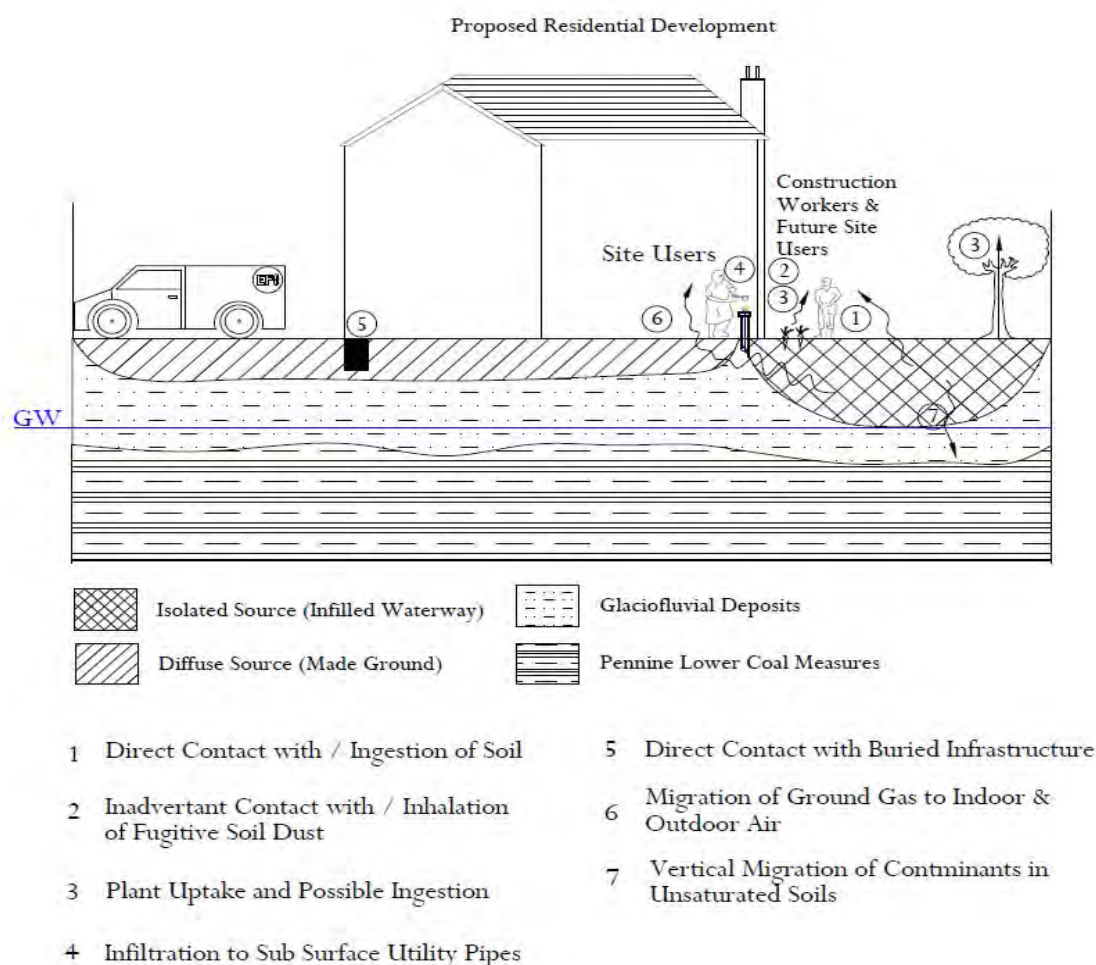
Source	Pathway	Receptor
Contaminated soil	Direct contact and inadvertent ingestion by eating or smoking with dirty hands	Construction workers during redevelopment & site users
	Inadvertent contact and inhalation of fugitive dusts	
	Direct uptake of contaminants via root systems and possible ingestion	Plants/site users
	Migration of ground gases into indoor and outdoor air	Site users
Contaminated soil / groundwater	Ingress / diffusion through permeable potable water supply pipes	Site users
	Direct contact	Buried infrastructure
	Migration of contaminants through unsaturated soils	Controlled waters & Groundwater.

The following comments are made with respect to contaminant linkages which have been considered through development of the conceptual model, but have not been concluded as 'plausible' – i.e. through which a significant possibility of significant harm could occur to an identified receptor:

- PAHs and metals have been identified as contaminants of concern associated with the historic on-site and surrounding use, however these contaminants are considered to be relatively immobile in the environment by virtue of their very low solubility and volatility. On this basis, plausible pathways by which these potential contaminants could pose a significant risk to the underlying groundwater (or nearby surface watercourses) are not considered to be active.
- Whilst several potential sources of volatile contaminants are recorded in the surrounding area, including a PFS to the north, there is considered to be sufficient development and distance between the site and these sources to mitigate any unacceptable risk from on-site migration to the site.
- Whilst a watercourse (reservoir) is located within 100m of the property boundary, there is no evidence to suggest that large quantities of mobile contaminants were recently stored at the site such as petroleum fuels or liquid chemicals. For this reason, the local waterways have not been included in the CSM a receptor from site derived contaminants.

The following diagram provides an illustration of the plausible contaminant linkages that may be active at the site and which may need further investigation or control to ensure safe development:

Illustrative Conceptual Site Model – Deardens Street, Bury



3.6 Key Potential Areas of Concern and Uncertainties

The main area of focus within the property boundary is the potential for the interaction between ground workers/site users and potentially contaminated shallow soils during the development works – specifically in the area of an infilled canal feeder channel, which may represent deeper deposits of made ground. Depending on the nature of the fill material this may also present a ground gas risk to the inhabitants of the proposed developments.

4 SUMMARY OF INTRUSIVE INVESTIGATIONS

Intrusive ground investigations were undertaken on 3rd March 2021 in accordance with EPS standard operating procedures, copies of which will be made available on request. A summary of all site activities is presented in the following sections:

4.1 Exploratory Hole Locations

Exploratory hole locations were selected through consideration of the potential contaminant linkages identified through the Phase I Desk Study, the proposed development layout, the location of below ground utilities as well as operational and health & safety considerations.

Four window sample boreholes (WS01 – WS04) were formed at the site to a maximum 5.00m using a track-mounted percussive drilling rig. In addition to this, three falling head borehole infiltration tests were undertaken in WS01.

The overall objective in terms of exploratory hole locations was to provide an appropriate lateral and vertical coverage of the soils underlying the site in order to offer information relating to their quality and nature as well as provide information for geotechnical design.

Standpipes were installed in within positions WS02 and WS03 in order to facilitate future gas and groundwater monitoring if deemed necessary. Groundwater sampling pipes were installed using 50mm diameter uPVC well casing and fitted with a gas tap. Slotted casing (1mm slot) was installed at each location from the base of the borehole to approximately 1.0m below the surface. The installations were completed to ground surface using plain casing. A filter pack of 2-3mm of washed gravel extended from the base of the boreholes to approximately 0.1m above the slotted section with a bentonite seal to surface. All installations were finished with flush-mounted, bolt-down headworks.

A borehole location plan is presented as Figure 4.

4.2 In-Situ Testing & Soil Sampling

Each borehole was logged for ground conditions encountered and inspected for any physical evidence of contamination, such as soil staining, odour and the presence of separate phase liquids on a precautionary basis. Borehole logs are presented in Appendix H.

Standard or cone penetration tests (SPT / CPT) were carried out in all materials using an automatic trip hammer. The number of blows required to advance a standard split spoon, (or solid 60° nose cone for the CPT test) over the final 300mm of a 450mm total drive was recorded, and is shown on the borehole records at the penetration resistance (“N” value).

Where potentially volatile organic compounds are suspected, EPS carries a Photo-ionisation Detector (PID), which can be used to measure the relative concentrations of vapour associated with soil samples collected from different depths and locations at the site. In these circumstances, soil samples will be placed into plastic bags, sealed, shaken and then allowed to rest for a few minutes to allow time for volatile vapour to accumulate in the air trapped within the bag. The PID probe will then be used to pierce the bag and sample the air above the soil to measure the concentration of volatile compounds that have accumulated. PID readings are only used to provide EPS with a basic means to quantify areas of volatile organic compound in the field to help guide the

investigation. As potentially volatile organic compounds, specifically including petroleum hydrocarbons, were identified in the conceptual site model, PID readings were collected during this intrusive investigation. These readings are included within borehole logs presented as Appendix H and the results are discussed further in later sections.

A laboratory testing schedule is included as Table 1.

4.3 Laboratory Testing

Samples obtained for analysis of identified contaminants of concern were submitted to Element Materials Testing Limited of Deeside, who hold appropriate UKAS / MCERT accreditation for the required testing. Samples were transported in laboratory supplied containers and delivered to the laboratory by approved courier.

Geotechnical testing was undertaken by Professional Soils Laboratory Limited, Doncaster, a UKAS accredited laboratory. Copies of chain of custody documentation are held by EPS and will be made available on request.

4.4 Infiltration Testing

Infiltration testing, in the form of falling head tests, were undertaken in WS01. This method of testing was in accordance with *BS EN 22282-2:2012 Geotechnical Investigation and Testing. Geohydraulic testing. Water permeability tests in boreholes using open systems*. This method is recommended in *CIRIA C753 SuDS Manual* where site constraints do not allow the excavation of trial pits. In this instance, boreholes were considered the most suitable means of intrusive investigation and infiltration testing. The method involved the addition of water to boreholes with the water level being monitored at 10 second intervals for the first minute, then 30 second intervals up to ten minutes and then at appropriate times based on the rate of infiltration observed.

5 FINDINGS OF THE INVESTIGATION

This section of the report provides a summary of the findings of the various aspects of the ground investigation.

5.1 Ground Conditions

A total of four window sample boreholes were formed at the site and the ground conditions encountered, from surface level, were found to comprise:

- Made Ground
- Glaciofluvial Deposits

Site specific borehole logs are included as Appendix H and give descriptions and depths of strata encountered. A summary of the general strata encountered across the site is provided in the table below, with more detailed description given in the following sub sections.

Geological Strata	Maximum Depth to Base of Strata (m bgl)	Strata Thickness (m)
Made Ground	3.00	1.80 - 3.00
Glaciofluvial Deposits	5.00	Not proven

5.1.1 Made Ground

Made ground was variable from the south to the north of the site. A slightly sandy clayey gravel consisting of sandstone with fragments of brick, ceramic, glass and bitumen – along with brick was encountered at ground level in WS01. Asphalt was present at ground level in the other three boreholes.

Made ground below this consisted of slightly sandy clayey gravel or gravelly to a maximum depth of 2.10m in WS02. The gravel generally consisted of sandstone, with brick, concrete, ceramic, metal and plastic fragments. Timber fragments were noted in WS01, and coal fragments in WS03 and WS04.

A black gravelly ash containing sandstone, slag and brick fragments was also noted in WS03 and WS04. Between 0.80m to 1.80m, and 0.80m to 3.00m respectively.

5.1.2 Glaciofluvial Deposits

Superficial Glaciofluvial deposits were encountered below the made ground at all locations. These deposits consisted of firm to stiff slightly gravelly sandy clay to around 2.70m in WS01, from 2.00m to 5.00m in WS03, and between 3.00m to 5.00m in WS04.

In WS01, a sandy gravel was encountered below the clay to 4.65m. A gravelly sand was encountered in WS02 to 4.95m.

5.2 Groundwater

Slight groundwater seepage was encountered at the base of WS01(4.60m) - no rise was recorded. A water strike was also recorded in WS04 at the base of the hole (5.00m) - the water level rose to 4.40m after 20 minutes.

5.3 Physical Evidence of Contamination

Significant thicknesses of made ground were encountered which deepened towards the north of the site and included a black ashy material and appears more likely to be waste relating to industrial processes due to the presence of ash.

A hydrocarbon odour was noted in WS02, between 1.10m to 1.80m. This was the only olfactory evidence of contamination found on the site. However, headspace testing returned inconsequential results.

5.4 Laboratory Analysis – Soil

A laboratory analysis testing schedule is presented as Table 1 and all environmental sample results obtained from the laboratory are included as Appendix I. The key results of laboratory testing on environmental soil samples are summarised below.

Contaminant	No. of Samples	No of Detections	Range of Detections (mg/kg)		Highest Location & Depth (m bgl)
			Min	Max	
Arsenic	4	4	4.3	17	WS02 (1.70–1.80)
Cadmium	4	4	0.1	0.6	WS04 (0.30–0.50)
Chromium	4	4	22.1	60.3	WS01 (0.10-0.20)
Copper	4	4	13	84	WS04 (0.30-0.40)
Lead	4	4	8	215	WS02 (1.70–1.80)
Mercury	4	2	0.2	0.4	WS02 (1.70–1.80)
Nickel	4	4	21.2	26.8	WS01 (0.10–0.20)
Zinc	4	2	52	193	WS04 (0.30–0.50)
Selenium	4	0	-		-
Naphthalene	4	3	0.24	0.83	WS02 (1.70–1.80)
Benzo[a]pyrene	4	3	1.57	16.2	WS02 (1.70-1.80)
Dibenzo(ah)anthracene	4	3	0.16	1.76	WS01 (0.10-0.20)
PAH 16 Total	4	3	18.8	226.1	WS02 (1.70-1.80)
Phenols	4	0	-		-
Benzene	4	0	-		-
Toluene	4	2	0.007	0.010	WS01 (0.10- 0.20)
Ethylbenzene	4	0	-		-
Xylene (meta/para)	4	1	0.022		WS01 (0.10-0.20)
Xylene (ortho)	4	1	0.037		WS01 (0.10-0.20)
MTBE	4	0	-		-
Total Cyanide	4	1	1.2		WS02 (1.70-1.80)
TPH CWG Total Aliphatics & Aromatics	4	3	1079	2633	WS01 (0.10-0.20)
TPH Aliphatic (C5-C6)	4	1	0.5		WS01 (0.10-0.20)
TPH Aliphatic (C8-C10)	4	2	0.2	6.5	WS01 (0.10-0.20)
TPH Aliphatic (C12-C16))	4	1	16		WS04 (0.30-0.50)
TPH Aliphatic (C16-C21)	4	3	16	36	WS04 (0.30-0.50)
TPH Aliphatic (C21-C35)	4	3	93	351	WS04 (0.30-0.50)
TPH Aliphatic (C35-C40)	4	3	10	51	WS01 (0.10-0.20)
TPH Aromatic (EC10-EC12)	4	2	1.6	21.2	WS01 (0.10-0.20)
TPH Aromatic (EC12-EC16)	4	3	27	51	WS01 (0.10-0.20)
TPH Aromatic (EC16-EC21)	4	3	63	488	WS01 (0.10-0.20)
TPH Aromatic (EC21-EC35)	4	3	435	1714	WS01 (0.10-0.20)
TPH Aromatic (EC35-EC40)	4	3	100	170	WS01 (0.10-0.20)
Asbestos (%)	4	2	<0.001%		WS02(1.70-1.80) & WS04(0.30-0.50)

Notes: - Contaminant not found above laboratory detection limits PAH Polycyclic Aromatic Hydrocarbons
BTEX Benzene, Toluene, Ethylbenzene, Xylenes
TPH CWG Total Petroleum Hydrocarbons (Criteria Working Group)

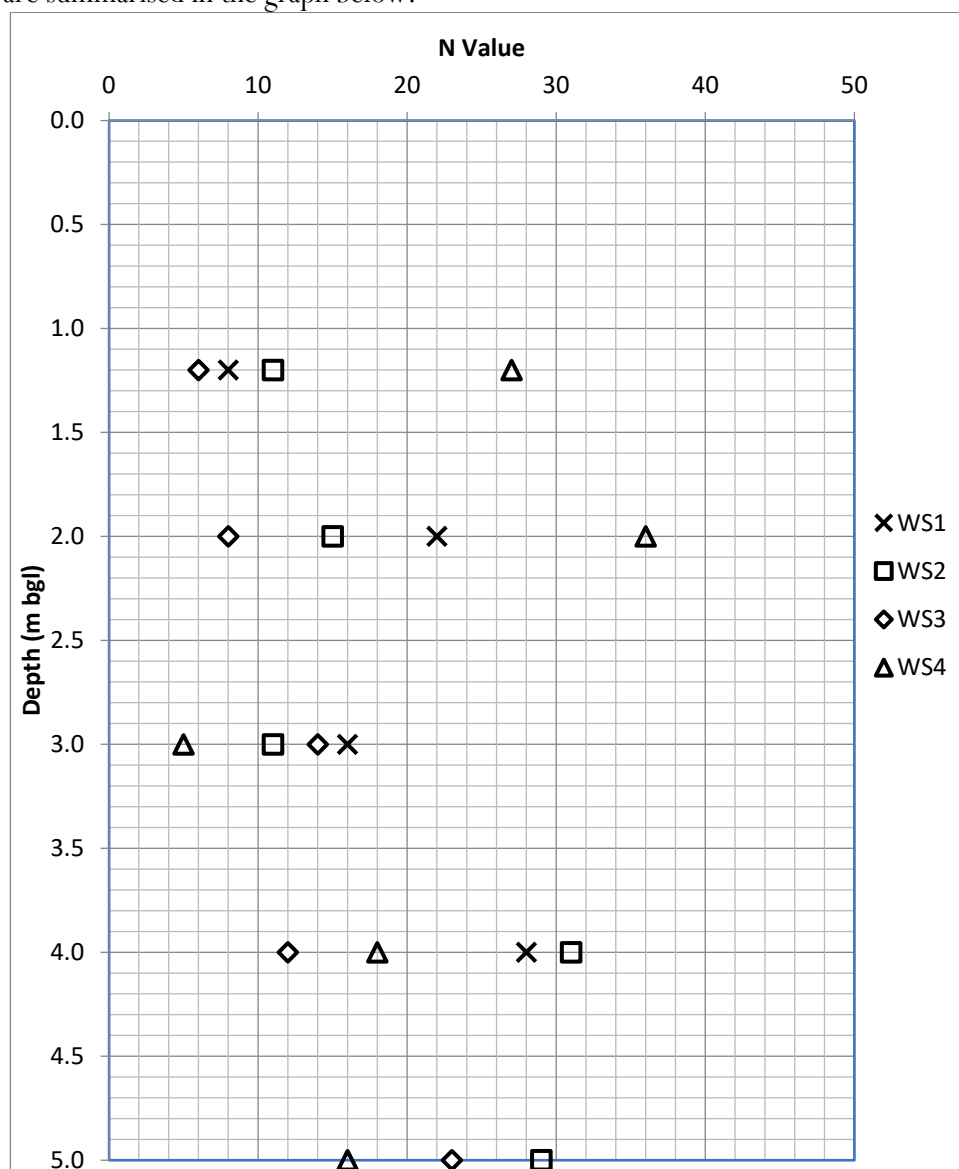
- Detectable concentrations of ACM, in the form of chrysotile and amosite fibre bundles were identified in shallow soils recovered from WS02 (1.70m to 1.80m). However, upon quantification analysis, the percentage of ACM by sample mass was identified at below minimum detection limits (MDL) of 0.001%.

- Fractions of TPH where detections have been recorded are included in the above table, otherwise they have been omitted.

5.5 Geotechnical Testing

5.5.1 In-Situ Geotechnical Testing

The results of in-situ geotechnical testing, as applicable to the made ground and glaciofluvial deposits are summarised in the graph below.



The above data indicates that the strength profile of the made ground across the site is variable with 'N-Values' ranging from 6 to 27 at 1.20m and from 8 to 36 at 2.0m, which is representative of made ground in all three locations except WS01, where natural soils were present from 1.80m. Soil strength is seen to decrease in all locations between 2.0m to 3.0m before increasing to 4.0m in all locations except WS03 where a slight decrease in 'N-Value' was recorded. Between 4.0m to 5.0m, slight decreases in 'N-Value' were noted in WS02 and WS04, while an increase was noted in WS03.

5.5.2 Laboratory Geotechnical Testing

The results of geotechnical laboratory testing are summarised in the table below and all geotechnical sample results obtained from the laboratory are included as Appendix J. The key results of laboratory testing on geotechnical soil samples are summarised below.

Strata	Range of Parameters			
	Moisture Content (%)		Plasticity Index (%)	
	Min	Max	Min	Max
Glaciofluvial Deposits	20	29	26 (24.18)	29 (26.97)

Moisture contents and Atterberg Limit was established for two samples of cohesive soils in accordance with BS1377: Part 2: 1990. Clauses 3.2, 4.3/4, 5.3, 5.3.

Particle size distribution (PSD) analysis was undertaken on two samples of predominantly granular soils in accordance with BS1377: Part 2: 1990. Wet Sieve – Clause 9.2.

Sulphate contents and pH values determinations were carried out by the analytical laboratory, the results of which are included in Appendix I and summarised in section 6.5.

A geotechnical laboratory analysis testing schedule is presented as Table 2.

6 GEOTECHNICAL APPRAISAL

The ground conditions have been found to comprise a notable thickness of made ground (up to 3m) underlain by superficial Glaciofluvial Deposits that were typically recorded as a sandy gravel in WS01 and a dense gravelly sand in WS02. In WS03 and WS04, the natural geology was recorded as a slightly sandy gravelly clay.

6.1 Geotechnical Category

Geotechnical Category (BS EN 1997-1:2004)	Definition
GC1	Geotechnical Category 1 (GC1) should only include small and relatively simple structures for which it is possible to ensure that the fundamental requirements will be satisfied on the basis of experience and qualitative geotechnical investigations with negligible risk in terms of overall stability or ground movements and in ground conditions which are known.
GC2	Geotechnical Category 2 (GC2) should include conventional types of structure and foundation with no exceptional risk or difficult or loading conditions. Designs for structures in Geotechnical Category 2 should normally include quantitative geotechnical data and analysis.
GC3	Geotechnical Category 3 (GC3) should include structures or parts of structures, which fall outside the limits of Geotechnical Categories 1 and 2. This may include very large or unusual structures, structures involving abnormal risks, or unusual or exceptionally difficult ground or loading conditions, or structures in areas of probable site instability or persistent ground movements that require separate investigation or special measures.

The proposed development comprises a number of residential properties, and therefore the below assessment has been undertaken in accordance with Geotechnical Category 2 (GC2), including conventional types of structure and foundation with no exceptional risk or difficult ground or loading conditions, as defined by BS EN 1997-1:2004.

6.2 Structural Foundations

This investigation has recorded depths of made ground from 1.80m to 3.0m, which isn't considered to be a suitable bearing strata for conventional spread foundations and where foundation depths exceed roughly 2.0m to 2.5m it is typically considered that a deep foundation solution, such as piles, offers the most appropriate alternative.

Piles are considered likely to terminate in the underlying Glaciofluvial Deposits and carry their loads through a combination of sleeve friction and base resistance. It would be unwise to assume any positive contribution to skin friction within the overlying made ground and should levels be raised the effects of negative skin friction will need to be considered.

In view of the wide variety of piles sizes available, and the range of installation plant and techniques, the design of the piles should be carried out by and should remain the responsibility of the specialist piling contractor or structural engineer, who will reflect their own methods, experience, and design procedures within their proposals.

6.3 Ground Floor Construction

Given that made ground is consistently present across the site to depths of greater than 1.80m and the natural cohesive soils being recorded as high plasticity, suspended ground floor slabs are recommended for the site, incorporating a suitable sub-floor void.

6.4 Groundworks

The stability of any excavations within the made/reworked ground must not be relied upon in unsupported excavations and the presence of potential obstructions should also be accounted for.

Heavy plant and stockpiles of materials should not be permitted close to the edges of unsupported excavations. Further reference may be made to CIRIA Report No. 97 '*Trenching Practice*' 1992.

On the basis of the findings of the ground investigation, significant quantities of groundwater are unlikely to be encountered within shallow excavations.

6.5 Concrete Grade

Sulphate contents and pH values determinations were carried out for the natural material by the analytical laboratory, the results of which are also included within Appendix I. Results for concrete grade are summarised within the following table:

Strata	Water Soluble Sulphate (mg/l SO ₄)		pH	
	Min	Max	Min	Max
Made Ground	<1.5	5.2	8.03	8.21
Glaciofluvial Deposits	9.2	98.7	7.99	10.52

In accordance with Part 1 of the BRE Special Digest 1 '*Concrete in Aggressive Ground*' 2005, the mean of the highest two water soluble sulphate values has been used. This gives a Design Sulphate Class (DS) of DS-1 with an aggressive chemical environment for concrete (ACEC) of AC-1s.

6.6 Drainage

Falling head infiltration testing was undertaken in one borehole to give an indication of the infiltration potential of the underlying soils, as applicable to the adoption of soakaways or other shallow drainage features as part of the proposed scheme. The results of the testing are detailed in the table below:

Borehole Location	Test Depth (m bgl)	Indicative Infiltration Rate (m/s)	
		Test 1	Test 2
WS01	4.415	4.26x10 ⁻⁶	2.45x10 ⁻⁶
		Test 2	4.24x10 ⁻⁶
		Test 3	4.24x10 ⁻⁶

The infiltration testing in WS01 was targeted to assess the permeability on natural geology rather than the overlying made ground and is generally indicative of low to medium permeability conditions. It should also be noted that EPS do not recommend the installation of soakaways in made ground due to the inherent variability in its nature and as any concentrated infiltration will most likely result in consolidation of the made ground and settlement that could affect structures.

If a soakaway system is being considered further for the proposed scheme, full testing in accordance with *BRE Digest 365* would be recommended to inform the design. The results of this method are often more favourable when compared against falling head tests, which should only be treated as a guide.

7 ENVIRONMENTAL APPRAISAL

The following section outlines the approach applied to assessing the risks posed to human health and controlled waters, then identifies any sample results found by this investigation which warrant further consideration. In accordance with the Environment Agency's Land Contamination: Risk Management, this section represents the second tier of Stage 1, the Generic Quantitative Risk Assessment.

7.1 Human Health

7.1.1 Land Use Setting

It is understood that development proposals for the site includes the construction of number of residential properties with associated gardens and soft landscaping. In order to screen laboratory data for concentrations of contaminants in soil with potential to cause harm to human health in these soft landscaped areas, relevant generic screening values most applicable to this land use have been utilised. A land use setting of Residential (with home-grown produce) has been adopted as it is considered the most representative.

The technical framework used to derive DEFRA's Category 4 Screening Levels (Policy Companion Document '*SP1010: Development of Category 4 Screening Levels for Assessment of Land Affected by Contamination*') outlines the relevant factors for determining land use selection in the application of the screening levels and the following key considerations have been taken into account.

7.1.2 Generic Screening – Soils

The technical framework used to derive the assessment criteria and the documents in which they are published are summarised as follows:

- *EA Science Reports* (SC050021/SR2, SC050021/SR3, and SC050021/SR7)
- *EA Soil Guideline Value Science Reports*
- *Suitable For Use Levels (S4ULs) for Human Health Risk Assessment* – LQM and CIEH (2015)
- *Soil Generic Assessment Criteria for Human Health Risk Assessment* - EIC/AGS/CL:AIRE (2010)

Category 4 Screening Levels (C4SLs) provide generic suitable for use screening values for common contaminants in a variety of land uses and are also utilised as appropriate generic screening criteria.

Where assessment of the risk to human health from asbestos in soil is concerned there is no nationally recognised suitable for use /generic screening value commonly referred to through the planning system. Due to this, it is necessary to take a more qualitative approach to the risks posed to future site users from asbestos on a site-specific basis.

A summary of the screening criteria and the methodology used to derive them is included in Appendix K.

7.1.3 Assessment of Results- Human Health

The results of the screening process for on-site human receptors showed that generic screening criteria representative of risks to future site users were exceeded for a number of contaminants of concern as presented in the below table.

On the basis of the recorded exceedances, a remedial measure will be required to protect future site users, this is discussed below.

Contaminant	Adopted Screening Criteria (mg/kg)	No. of Exceedances	Highest Concentration (mg/kg) & Location (m bgl)
Lead	200	1	215 (WS02 1.70-1.80)
Benzo(a)pyrene	5	2	16.2 (WS02 1.70-1.80)
Benzo(b)fluoranthene	2.6	2	22.64 (WS02 1.70-1.80)
Dibenzo(ah)anthracene	0.24	2	1.76 (WS01 0.10-0.20)
TPH Aromatic EC16-EC21	260	1	488 (WS01 0.10-0.20)
TPH Aromatic EC21-EC35	1100	1	1714 (WS01 0.10-0.20)

Exceedances of contaminants of concern in the above table are recorded in two separate made ground populations. One of which was recorded as a dark grey slightly sandy clayey gravel with frequent sandstone, brick, ceramic, glass and plastic and extended to a depth of 0.70m in WS01 but a similar material was recorded in WS02, WS03 and WS04, with the maximum recorded depth being 1.00m in WS02. The other distinct made ground material found to contain elevated concentrations of contaminants of concern was recorded as a dark grey to black slightly sandy gravelly clay including sandstone, brick, concrete, ceramic and plastic where a hydrocarbon odour was noted in WS02 at 1.00-1.80m, although a visibly similar material was also recorded across the site.

It is acknowledged that some of the soil sample results returned concentrations of petroleum hydrocarbons in excess of saturation limits, although that does not necessarily mean a potentially significant risk to future users exists. As stated within LQM's S4UL document, where a S4UL exceeds a lower saturation limit (i.e. the lower of either the aqueous or vapour-based saturation limit) and is highlighted by the CLEA model (if the vapour pathway is an important contributor to exposure) the lower saturation limit is also shown and in some cases it can be much lower than the modelled screening value. The soil saturation concentration is the theoretical concentration at which soil vapour and/or pore water have become fully saturated. This can indicate that Non-Aqueous Phase Liquid (NAPL -free phase product) is likely to be present, but for contaminants that are strongly sorbed to soils (i.e. have high K_{oc}, which C16-C21 and C21-C35 is high) and that have a low aqueous solubility and vapour pressure, exceedance of the soil saturation concentration does not necessarily imply that NAPL is present.

Due to the concentrations of contaminants recorded, a remedial measure will be required to protect future site users. During consideration and design of the remedial requirements, reference has been made to *Guidance on Comparing Soil Contamination Data with a Critical Concentration (CIEH/CL:AIRE, 2008)*, however, it is acknowledged that this guidance has now been superseded and therefore reference has also been made to the recently published document by CL:AIRE: *Professional Guidance: Comparing Soil Contamination Data with a Critical Concentration*. Assessment of the dataset from this project has found the distribution of data to be unsuitable in-line with the current guidance and therefore the cover system calculation has been based on the highest recorded concentration of Benzo(a)pyrene, which is deemed to be the key risk driver in this investigation and representative of a genotoxic marker for PAHs.

In this instance, a soil-based cover system is considered suitable to act as a 'breaks-layer' between the contaminant source (made ground) and future receptors. It should be noted that all made ground does not necessarily need to be excavated but a sufficient quantity may require excavation and disposal in order to facilitate the suggested remedial measures below.

The depth of cover system has been developed with reference to the BRE publication: *Cover Systems for Land Regeneration: Thickness Design of Cover Systems for Contaminated Land (BRE, Mar 2004)*. The results of cover system calculation indicate an overall cover thickness of approximately 560mm could be considered suitable based on maximum concentrations of PAHs at the site, however, it would be considered prudent to round this up to **600mm** given the variability in chemical composition of the made ground and the lack of robust statistical analysis due to the aforementioned variability in the dataset. Any cover system installed should have a geotextile at the base to prevent mixing of soil. It should also be noted that a proportion of made ground may need to be excavated and disposed of to achieve the required depths. It may be appropriate to install 300mm of clean imported 'subsoil' at the base of the cover system, with appropriate topsoil making up the final 300mm.

Extracts from the cover system calculator are included as Appendix L.

Alternatively, hardstanding would present a suitable 'break-layer' to prevent future site users from coming into contact with contaminated underlying soils. Any hardstanding used for this purpose should be a minimum of 100mm in thickness to ensure competency as a 'break-layer'.

All imported topsoil / subsoil for use within soft landscaping should be accompanied by appropriate laboratory analysis to demonstrate its chemical and physical suitability for use. The analysis should include Total Petroleum Hydrocarbons, Asbestos, Speciated Polycyclic Aromatic Hydrocarbons and Metals and should also comply with the relevant physical parameters outlined within the British Standard BS 3882:2015 'Specification for topsoil and requirements for use'. Verification of cover systems will be required to ensure they are installed to a suitable standard in line with the above recommendations.

A Cover Soils Checklist is included as Appendix M as a guide to ensuring cover system installation is undertaken appropriately.

No ground gas risk assessment was undertaken as part of this investigation, however, deep made ground has been recorded along with an infilled former waterway in part of the site. It has not been

possible to dismiss the potential risks of ground gas generation and therefore additional works involving a period of ground gas monitoring are recommended. Otherwise, gas protection measures will be required in accordance with BS8485:2015 'Code of practice for the design of protective measures for methane and carbon dioxide ground gases for new buildings'.

7.2 Controlled Waters

7.2.1 Generic Screening

In addition to screening the recorded concentrations of contaminants to pose risks to human health, EPS has also screened the results of soil analysis for potential to cause harm to water resources.

The criteria used for this process were derived by EPS using the following technical guidance

- *Environment Agency Remedial Targets Methodology: Hydrogeological Risk Assessment for Land Contamination.*

Resource Sensitivity of Area	Basis of Tier 1 Criteria
High Groundwater Resource Potential (HGwRP) - Principal Aquifers	UK Drinking Water Standards (UKDWS)
Low Groundwater Resource Potential (LGwRP) - Secondary Aquifers not being abstracted and Unproductive groundwater strata	UK Environmental Quality Standards (EQS)

Screening criteria for Low Groundwater Resource Potential (LGwRP) have been adopted for this site due to the underlying geology being classified as a Secondary Aquifer and not being within an SPZ for groundwater abstraction.

7.2.2 Assessment of Results- Controlled Waters

The results of the screening process for risks to controlled waters have highlighted a number of exceedances of screening criteria for controlled waters from soil analysis. The below table highlights these exceedances:

Contaminant	Adopted Screening Criteria (mg/kg)	No. of Exceedances	Highest Concentration & Location (m bgl)
Benzo(a)Pyrene	10	2	16.2 (WS02 1.70-1.80)
TPH (Aromatic EC10-EC12)	13.8	1	21.2 (WS02 1.70-1.80)
TPH (Aromatic EC12-EC16)	27.5	2	51 (WS02 1.70-1.80)
TPH (Aromatic EC16-EC21)	86.9	2	488 (WS02 1.70-1.80)
TPH (Aromatic EC21-EC35)	690	2	1,714 (WS02 1.70-1.80)

The exceedances of soil contaminants are all from made ground materials, with the highest concentrations being recorded at 1.70-1.80m in WS02 where a hydrocarbon odour was noted.

However, no detections of PAH, TPH or BTEX have been recorded in materials representative of natural Glaciofluvial Deposits that was sampled from the well with the highest TPH concentrations at a depth of 4.60-4.70m. It is therefore concluded that downward migration of these contaminants is not occurring at a level that represents an unacceptable risk to groundwater.

It is acknowledged that detections of a number of PAH and TPH compounds exceed screening criteria quite significantly in made ground, however, the investigation has highlighted that soils present immediately below the made ground are recorded as cohesive in all boreholes, with the exception of WS03, where clayey gravelly sands are recorded below made ground. Although in WS03, the content of clay within the material increased between 2.80m to 3.0m. As a result, the likelihood of vertical migration of contaminants into the underlying secondary aquifer is reduced. Groundwater was only recorded during drilling in WS01 and WS04 and no visual/olfactory evidence of contamination in natural geology below the strike depth or groundwater was recorded, this was corroborated by PID values of 0ppm v/v during on-site headspace analysis.

Dearden's Lodge Reservoir is located within approximately 100m of the site boundary and whilst risks to this feature were dismissed at desk study stage, the potential impact to this receptor has also been considered further as part of the controlled waters risk assessment. Given the low mobility and weathering of TPH and cohesive nature of shallow geology recorded during drilling, there is not considered to be an unacceptable risk relating to the lateral migration of contamination, including hydrocarbons, into this reservoir from the site.

It is therefore considered that the made ground at this site does not pose an unacceptable risk to the underlying secondary aquifer based on the presence of cohesive soils below made ground where the contamination was recorded at the highest concentration. Made ground is currently present above recorded groundwater and the proposed development should not place potentially contaminated soils at depths where groundwater may be present.

Despite the above points, it may be considered prudent to undertake groundwater monitoring in order to assess the groundwater quality beneath the site to fully understand if contaminants within shallow soils are contaminating the underlying groundwater.

7.3 Summary of Findings

Laboratory analysis of shallow soils sampled from the proposed soft landscaped areas across the site has identified that the adopted screening criteria protective of future site users (including residents) have been exceeded by contaminants of concern. Therefore, a remedial control measure is warranted to ensure future garden areas are safe and suitable for use. This can take the form of either a 600mm clean cover system or competent hardstanding to break potential contaminant linkages for future site users.

Based on the nature of contaminants recorded and the physical properties of the ground conditions encountered during the investigation it is not considered plausible that the site or proposed development poses any appreciable risk to controlled waters.

In the context of potentially unacceptable or acceptable risks as outlined within the Environment Agency's *Land Contamination: Risk Management* guidance (LC:RM, 2020), the risks identified by this work can be addressed through implementation of the following recommendations.

7.4 Recommendations

The risks identified by this work can be addressed as follows, which represents the Remedial Strategy for the site.

The most appropriate form of remedial action / control measure that will mitigate risks associated with the identified contamination in shallow soils to acceptable levels is considered to be the implementation of a clean topsoil cover system in all areas of proposed domestic gardens and soft landscaping within the redline planning boundary, in broad accordance the *BRE publication: Cover Systems for Land Regeneration: Thickness Design of Cover Systems for Contaminated Land (BRE, Mar 2004)*. The minimum recommended thickness is **600mm** based on the worst-case laboratory data and is designed to ensure a practical thickness can be implemented. Cover system calculations are included in Appendix L.

It should be noted that this recommendation is made only for areas of gardens and soft landscaping, and there is no such requirement for areas beneath any hard standing or building footprints. It is recognised that some shallow soils will need to be removed to achieve this cover thickness. Following the sufficient removal of shallow soils (to allow for the recommended cover system thickness), the excavations should then be made up with clean imported soils accompanied by appropriate laboratory analysis to demonstrate its chemical suitability for use. A Cover Soils Checklist which details these requirements further is presented as Appendix M.

Ground gas was identified as a potential risk to the development as a result of locally infilled former waterways being recorded on-site. These sources warrant further investigation by means of a ground gas monitoring programme and subsequent risk assessment. Monitoring wells were installed during this investigation. However, no gas monitoring has been undertaken and it has not been possible to wholly dismiss risks associated with ground gas generation based on soil quality data obtained.

Precautionary installation and third-party verification of ground gas protection measures will be required in lieu of site-specific data. Gas protection measures will require design in accordance with BS8485:2015 '*Code of practice for the design of protective measures for methane and carbon dioxide ground gases for new buildings*'. Where gas protection is installed, the council will require an independent third-party verification report to prove the gas protection measures installed meet the measures set out in CIRIA C735 '*Good practice on the testing and verification of protection systems for buildings against hazardous ground gases*'.

In order to reduce potential risks associated with ingress of contaminants to underground water supply pipework, for any new pipework installed as part of the proposed redevelopment, aluminium barrier pipework meeting Water Industry Standard 4-32-19 and associated fittings may be required subject to agreement with the local water company. Where water supply pipework is being installed within a clean imported material overlying natural clay, the use of barrier pipe is not deemed necessary.

These remedial works must be verified and EPS can assist in this process. All waste transfer documentation must be retained, with photographs of the excavations including any exposed clean natural soils and compiling the information outlined in the Cover Soils Checklist. If an established

supplier such as British Sugar was used, then the soil is tested at source and no further analysis would typically be needed.

Precautionary measures are also recommended to ensure safe development, as follows:

- a) All construction workers operating at the site should be advised of the potential for contact with made ground material within shallow soils, particularly beneath the existing buildings and hardstanding. Appropriate health and safety precautions should be adopted during any excavation works to avoid exposure to infilled soils. Reference should be made to relevant health & safety guidance including the following CIRIA document: *R132 Guide to Safe Working on Contaminated Sites*.
- b) Although the findings of the investigation would suggest that significant quantities of asbestos are unlikely to be encountered, the possibility of discrete pockets of this material existing within the made ground remains. If any evidence of visually identifiable ACM is suspected and is to be disturbed during the site development it is recommended that all works are postponed until suitable assessment and control measures (including a Working Method Statement (WMS)) are created. This WMS should be in accordance with guidance from CIRIA as well as the CL:AIRE /Joint Industry Working Group industry guidance on Interpretation for Managing and Working with Asbestos in Soil and Construction and Demolition Materials (2016).
- c) Should any palpable evidence of unexpected contamination be encountered during the redevelopment work, it should be reported to EPS so that an inspection can be made and appropriate sampling and assessment work carried out, a method statement for this is provided as Appendix N.

It is recommended that a copy of this report be provided to the Environmental Health Department of Bury Council so that the information may be incorporated into their land quality records and used to support the current planning application. This report should satisfy the pre-commencement requirements of the planning process relating to contamination. A Verification Report will be required documenting the implementation of the remediation prior to completion.

7.5 Additional Considerations

7.5.1 Land Reclamation Relief (Tax)

It is likely the client would be eligible for land reclamation relief on all activities associated with the remediation of the site at the rate of x1.5 the original expenditure. Areas where this relief could be applied would include but not necessarily be limited to the following, although a detailed review of the issue should be undertaken by a suitably qualified accountant.

Relief is likely to apply to:

- EPS' fees in developing the remedial strategy and the verification works.
- The disposal costs of waste soils/liquids.
- The costs of importing any clean soils for use in the cover system.
- Soil gas protection measures and barrier pipework.

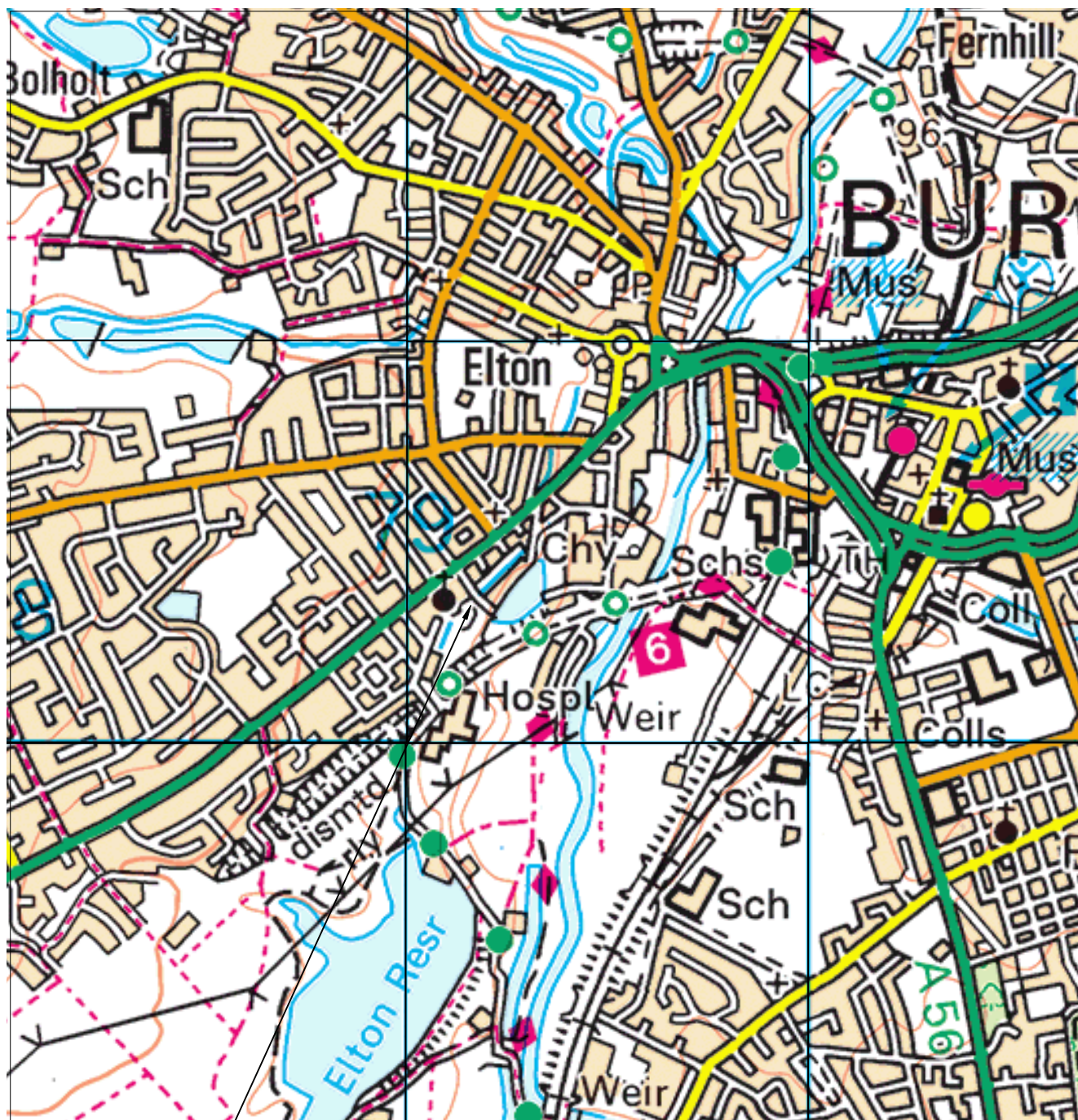
7.5.2 *Waste Management*

Depending on the requirements of the final scheme and any associated earthworks balance, it is possible that the site will be subject to a materials management exercise to ensure all potential waste soils are handled and re-used in a legally correct sustainable fashion.

In those circumstances, through a risk assessment process and in accordance with CL:AIRE's *Definition of Waste: Development Industry Code of Practice*, re-use criteria can be defined for site-won soils which are suitable for use being both protective of relevant receptors and geotechnically appropriate (with input from the structural engineers as necessary). If requested, EPS can prepare a Materials Management Plan and have it formally declared by a Qualified Person prior to commencement of groundworks. EPS can also assist with similar mechanisms for re-using waste materials exempt of an environmental permit, such as a U1.

Where viable, EPS would always encourage the employment of an MMP to sustainably manage the re-use of site won soils.

FIGURES



Approximate Site Location

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Title: Site Location Plan

Project: Deardens Street, Bury

Fig No: 1

Scale: NTS

Drawn By: JJ **Approved By:** LA

Job No: UK21.5294

Dwg No: Deardens/0421/01

Date: April 2021



Key:

 Approximate Site Boundary

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Title: Current Site Layout

Project: Deardens Street, Bury

Fig No: 2

Scale: NTS

Drawn By: JJ

Approved By: LA

Job No: UK21.5294

Dwg No: Deardens/0321/02

Date: March 2021



Key:

 Approximate Site Boundary

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Title: Aerial Photograph

Project: Deardens Street, Bury

Fig No: 3

Scale: NTS

Drawn By: J. Johnson Approved By:

Job No: UK21.5294

Dwg No: Deardens/0321/03

Date: March 2021



Key:

-  Approximate Site Boundary
-  Approximate Borehole Location

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Title: Borehole Location Plan

Project: Deardens Street, Bury

Fig No: Figure 4

Scale: NTS

Drawn By: JJ **Approved By:** LA

Job No: UK21.5294

Dwg No: Deardens/0421/04

Date: April 2021

TABLES

Table 1 – Laboratory Testing Schedule (Environmental)

Sample ID	Sample Depth (m bgl)	EPS Mini Suite	EPS TPH Suite	pH and Water Soluble Sulphate
WS01 ES1	0.10 - 0.20	X	X	-
WS01 ES2	0.70 - 0.80	-	-	-
WS01 ES3	2.00 - 2.10	-	-	X
WS02 ES1	0.50 - 0.60	-	-	-
WS02 ES2	1.10 - 1.20	-	-	-
WS02 ES3	1.70 - 1.80	X	X	-
WS02 ES4	4.60 - 4.70	X	X	-
WS03 ES1	0.80 - 1.00	-	-	-
WS03 ES2	1.80 - 2.00	-	-	-
WS04 ES1	0.30 - 0.50	X	X	-

Notes:

mbgl

meters below ground level

1

Sample Taken

-

Sample Not Analysed

EPS Mini Suite

Organic Matter, Cyanide, Metals, PAH's, Phenols, Asbestos

EPS TPH Suite

TPH CWG Aromatic and Aliphatic C5-C40, BTEX, MTBE

Table 2 – Laboratory Testing Schedule (Geotechnical)

Sample ID	Sample Depth (m bgl)	Moisture Content	Liquid / Plastic Limits	Particle Size Distribution (PSD) – Wet Sieve
WS01 D1	1.20-1.40	-	-	-
WS01 D2	2.20-2.60	X	X	-
WS01 D3	4.20-4.40	-	-	-
WS01 B1	2.70-3.10	-	-	X
WS02 D1	2-2.10	-	-	-
WS02 D2	2.80-3.20	-	-	-
WS02 B1	3.0-4.0	-	-	X
WS03 D1	3.60-3.70	-	-	-
WS03 D2	4.0-4.30	-	-	-
WS03 D3	2.0-.3.0	X	X	-
WS03 B1	1.0-1.80	-	-	-

Notes:

mbgl

1

-

meters below ground level

Sample Taken

Sample Not Analysed

APPENDICES

APPENDIX A

Selected Site Photographs



Key:

-  Approximate Site Boundary
-  Approximate Photo Location

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Licence Number: 100054115



Title: Photo Location Plan

Project: Deardens Street, Bury

Fig No: App. A

Scale: NTS

Drawn By: JJ Approved By: LA

Job No: UK21.5294

Dwg No: Deardens/0421App.A

Date: April 2021

Photo 1: Overgrown area to the south of the site.	Photo 2: View across northern area.
	
Photo 3: View from south to north across site.	Photo 4: Made ground soils from WS01 during hand-pitting
	
Photo 5: Arisings from WS02.	Photo 6: Close up of natural cohesive soils in WS04.
	

APPENDIX B

Proposed Development Plan

Do not scale drawings. All dimensions to be verified on site before proceeding with the work. All dimensions given in millimetres unless stated otherwise. All drawings to be read in conjunction with other consultants' drawings and specifications.

revision	drawn	date
A	AEP	21.12.20
Council land hatched, with services & notes added		



DRAFT

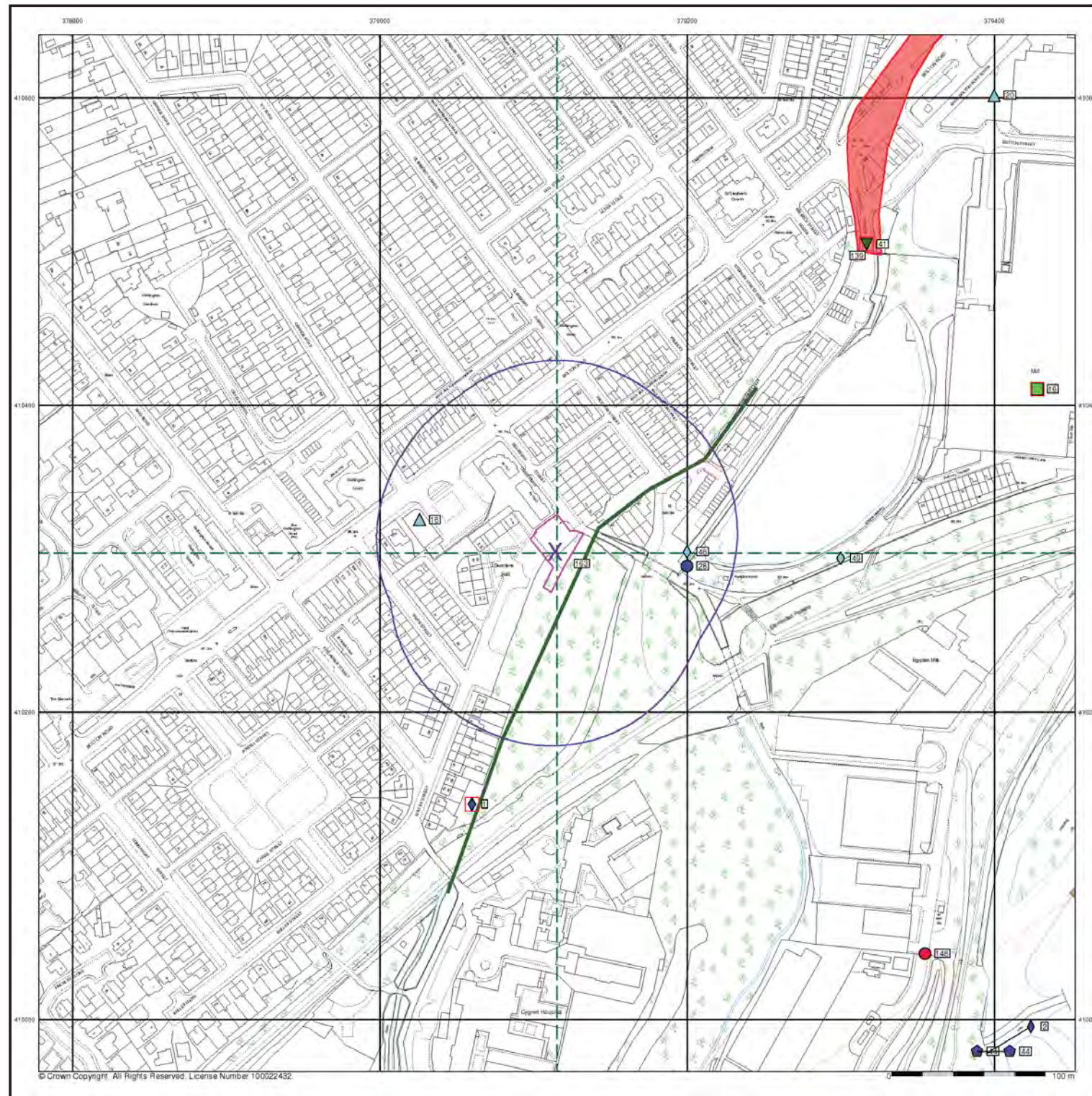
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DRAWING TITLE: PROPOSED SITE PLAN	REVISION: A
SCALE: 1:200@A3	DATE: 10.08.20
DRAWN BY:	

pettifer architecture

tel: 07973629158
email: ashley@pettiferarchitecture.com
www.pettiferarchitecture.com

APPENDIX C

Surrounding Land Use



General

- Specified Site
- Specified Buffer(s)
- Bearing Reference Point
- Map ID
- Several of Type at Location
- Pylon
- Overhead Transmission Line

Agency and Hydrological

- Contaminated Land Register Entry or Notice (Location)
- Contaminated Land Register Entry or Notice
- Discharge Consent
- Enforcement or Prohibition Notice
- Integrated Pollution Control
- Integrated Pollution Prevention Control
- Local Authority Integrated Pollution Prevention and Control
- Local Authority Pollution Prevention and Control Enforcement
- Pollution Incident to Controlled Waters
- Prosecution Relating to Authorised Processes
- Prosecution Relating to Controlled Waters
- Registered Radioactive Substance
- River Network or Water Feature
- River Quality Sampling Point
- Substantiated Pollution Incident Register
- Water Abstraction
- Water Industry Act Referral

Hazardous Substances

- COMAH Site
- Explosive Site
- NHHS Site
- Planning Hazardous Substance Consent
- Planning Hazardous Substance Enforcement
- BGS Recorded Mineral Site

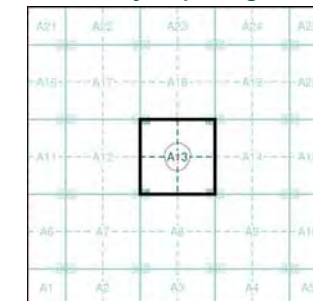
Geological

- BGS Recorded Mineral Site

Waste

- BOS Recorded Landfill Site (Location)
- BOS Recorded Landfill Site
- EA Historic Landfill (Buffered Point)
- EA Historic Landfill (Polygon)
- Integrated Pollution Control Registered Waste Site
- Licensed Waste Management Facility (Landfill Boundary)
- Licensed Waste Management Facility (Location)
- Local Authority Recorded Landfill Site (Location)
- Local Authority Recorded Landfill Site
- Potentially Infilled Land (Non-water)
- Potentially Infilled Land (Non-water)
- Potentially Infilled Land (Non-water)
- Potentially Infilled Land (Water)
- Potentially Infilled Land (Water)
- Potentially Infilled Land (Water)
- Registered Landfill Site
- Registered Landfill Site (Location)
- Registered Landfill Site (Point Buffered to 100m)
- Registered Landfill Site (Point Buffered to 250m)
- Registered Waste Transfer Site (Location)
- Registered Waste Treatment or Disposal Site (Location)
- Registered Waste Treatment or Disposal Site

Site Sensitivity Map - Segment A13



Order Details

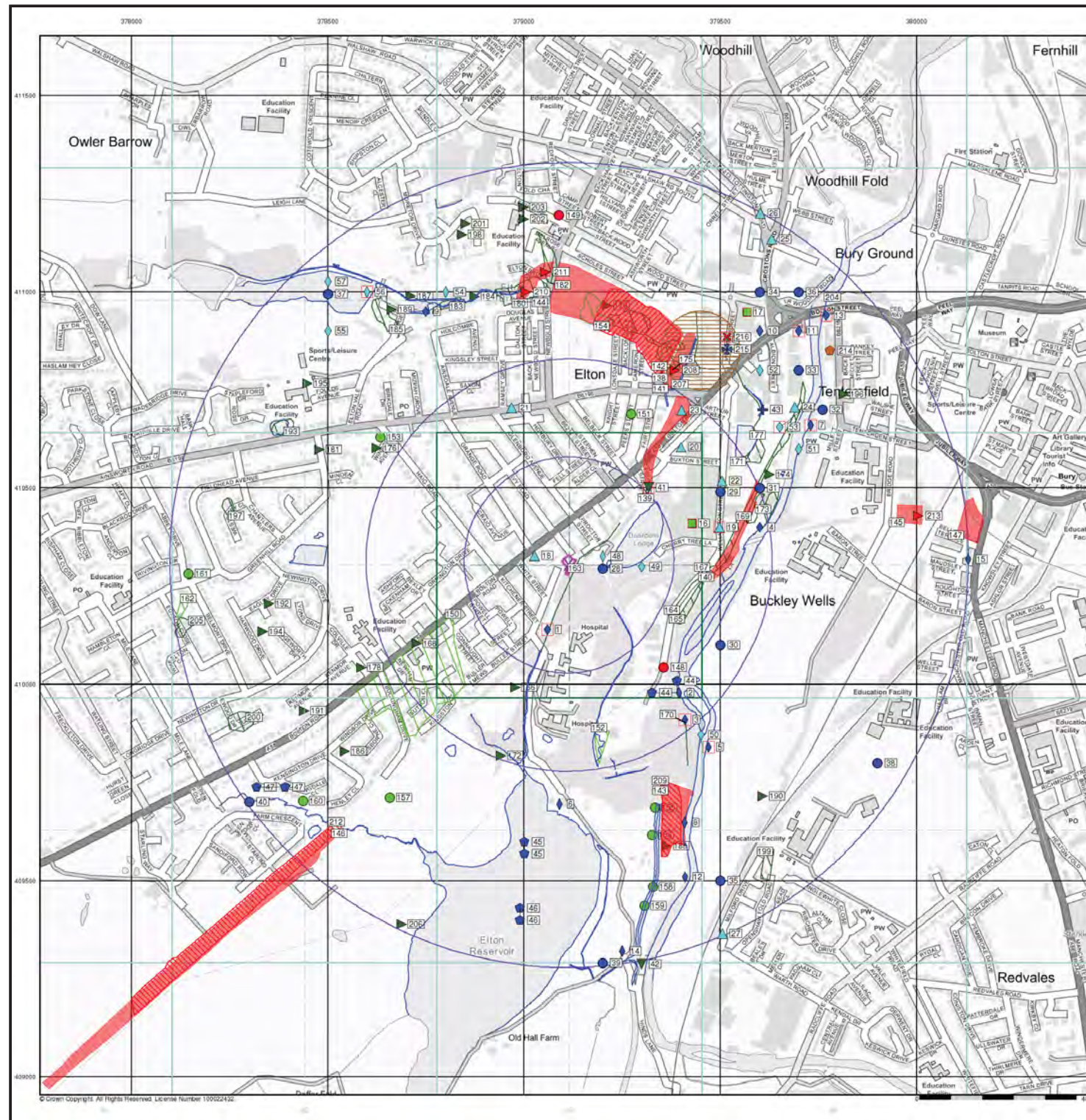
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 Customer Ref: UK21.5294
 National Grid Reference: 379110, 410300
 Slice: A
 Site Area (Ha): 0.08
 Plot Buffer (m): 100

Site Details

Deardens Street, Bury, BL8 2PB

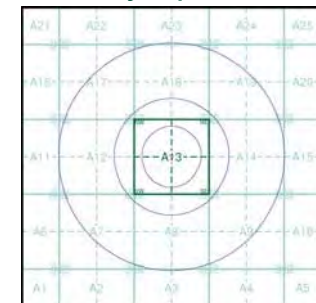


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 Fax: 0844 844 9951
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- General**
- Specified Site
 - Specified Buffer(s)
 - Bearing Reference Point
 - Map ID
- Agency and Hydrological**
- Contaminated Land Register Entry or Notice (Location)
 - Contaminated Land Register Entry or Notice
 - Discharge Consent
 - Enforcement or Prohibition Notice
 - Integrated Pollution Control
 - Integrated Pollution Prevention and Control
 - Local Authority Integrated Pollution Prevention and Control
 - Local Authority Pollution Prevention and Control
 - Local Authority Pollution Prevention and Control Enforcement
 - Pollution Incident to Controlled Waters
 - Prosecution Relating to Authorised Processes
 - Prosecution Relating to Controlled Waters
 - Registered Radioactive Substance
 - River Network or Water Feature
 - River Quality Sampling Point
 - Substantiated Pollution Incident Register
 - Water Abstraction
 - Water Industry Act Referral
- Hazardous Substances**
- COMAH Site
 - Explosive Site
 - NIHHS Site
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 - Planning Hazardous Substance Enforcement
- Geological**
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- Waste**
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 - BGS Recorded Landfill Site
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 - EA Historic Landfill (Polygon)
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 - Licensed Waste Management Facility (Location)
 - Local Authority Recorded Landfill Site (Location)
 - Local Authority Recorded Landfill Site
 - Potentially Infilled Land (Non-water)
 - Potentially Infilled Land (Non-water)
 - Potentially Infilled Land (Water)
 - Potentially Infilled Land (Water)
 - Registered Landfill Site
 - Registered Landfill Site (Location)
 - Registered Landfill Site (Point Buffered to 100m)
 - Registered Landfill Site (Point Buffered to 250m)
 - Registered Waste Transfer Site (Location)
 - Registered Waste Transfer Site
 - Registered Waste Treatment or Disposal Site (Location)
 - Registered Waste Treatment or Disposal Site

Site Sensitivity Map - Slice A



Order Details

Order Number: 273600133_1_1
 Customer Ref: UK21.5294
 National Grid Reference: 379110, 410300
 Slice: A
 Site Area (Ha): 0.08
 Search Buffer (m): 1000

Site Details

Deardens Street, Bury, BL8 2PB



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

APPENDIX D

Geological Context

Geology 1:50,000 Maps Legends

Artificial Ground and Landslip

Map Colour	Lex Code	Rock Name	Rock Type	Min and Max Age
	WGR	Worked Ground (Undivided)	Void	Not Supplied - Holocene
	MGR	Made Ground (Undivided)	Artificial Deposit	Not Supplied - Holocene

Superficial Geology

Map Colour	Lex Code	Rock Name	Rock Type	Min and Max Age
	ALV	Alluvium	Clay, Silt, Sand and Gravel	Not Supplied - Holocene
	GFDUD	Glaciofluvial Deposits, Devensian	Sand and Gravel	Not Supplied - Devensian
	TILLD	Till, Devensian	Diamicton	Not Supplied - Devensian
	GFSDD	Glaciofluvial Sheet Deposits, Devensian	Sand and Gravel	Not Supplied - Devensian
	GLLDD	Glaciolacustrine Deposits, Devensian	Clay and Silt	Not Supplied - Devensian
	HMGDD	Hummocky (Moundy) Glacial Deposits, Devensian	Diamicton	Not Supplied - Devensian
	RTD1	River Terrace Deposits, 1	Sand and Gravel	Not Supplied - Quaternary
	RTD2	River Terrace Deposits, 2	Sand and Gravel	Not Supplied - Quaternary
	HEAD	Head	Clay, Silt, Sand and Gravel	Not Supplied - Quaternary

Bedrock and Faults

Map Colour	Lex Code	Rock Name	Rock Type	Min and Max Age
	PMCM	Pennine Middle Coal Measures Formation	Mudstone, Siltstone and Sandstone	Not Supplied - Westphalian
	PR	Peel Hall Rock	Sandstone	Not Supplied - Westphalian
	PMCM	Pennine Middle Coal Measures Formation	Sandstone	Not Supplied - Westphalian
	PLCM	Pennine Lower Coal Measures Formation	Mudstone, Siltstone and Sandstone	Not Supplied - Westphalian
	PLCM	Pennine Lower Coal Measures Formation	Sandstone	Not Supplied - Westphalian
	TRBR	Trencherbone Rock	Sandstone	Not Supplied - Westphalian

Map Colour	Lex Code	Rock Name	Rock Type	Min and Max Age
	CAR	Cannel Rock (South Lancashire)	Sandstone	Not Supplied - Westphalian
	OL	Old Lawrence Rock	Sandstone	Not Supplied - Westphalian
	MLRS	Milnrow Sandstone	Sandstone	Not Supplied - Westphalian
	HER	Helpet Edge Rock	Sandstone	Not Supplied - Westphalian
		Rock Segments		
		Faults		



Geology 1:50,000 Maps

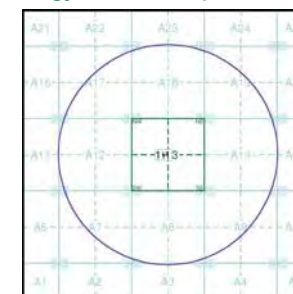
This report contains geological map extracts taken from the BGS Digital Geological map of Great Britain at 1:50,000 scale and is designed for users carrying out preliminary site assessments who require geological maps for the area around the site. This mapping may be more up to date than previously published paper maps.

The various geological layers - artificial and landslip deposits, superficial geology and solid (bedrock) geology are displayed in separate maps, but superimposed on the final 'Combined Surface Geology' map. All map legends feature on this page. Not all layers have complete nationwide coverage, so availability of data for relevant map sheets is indicated below.

Geology 1:50,000 Maps Coverage

Map ID: 1
Map Sheet No: 085
Map Name: Manchester
Map Date: 2010
Bedrock Geology: Available
Superficial Geology: Not Available
Artificial Geology: Not Available
Faults: Not Supplied
Landslip: Not Available
Rock Segments: Not Supplied

Geology 1:50,000 Maps - Slice A



Order Details:

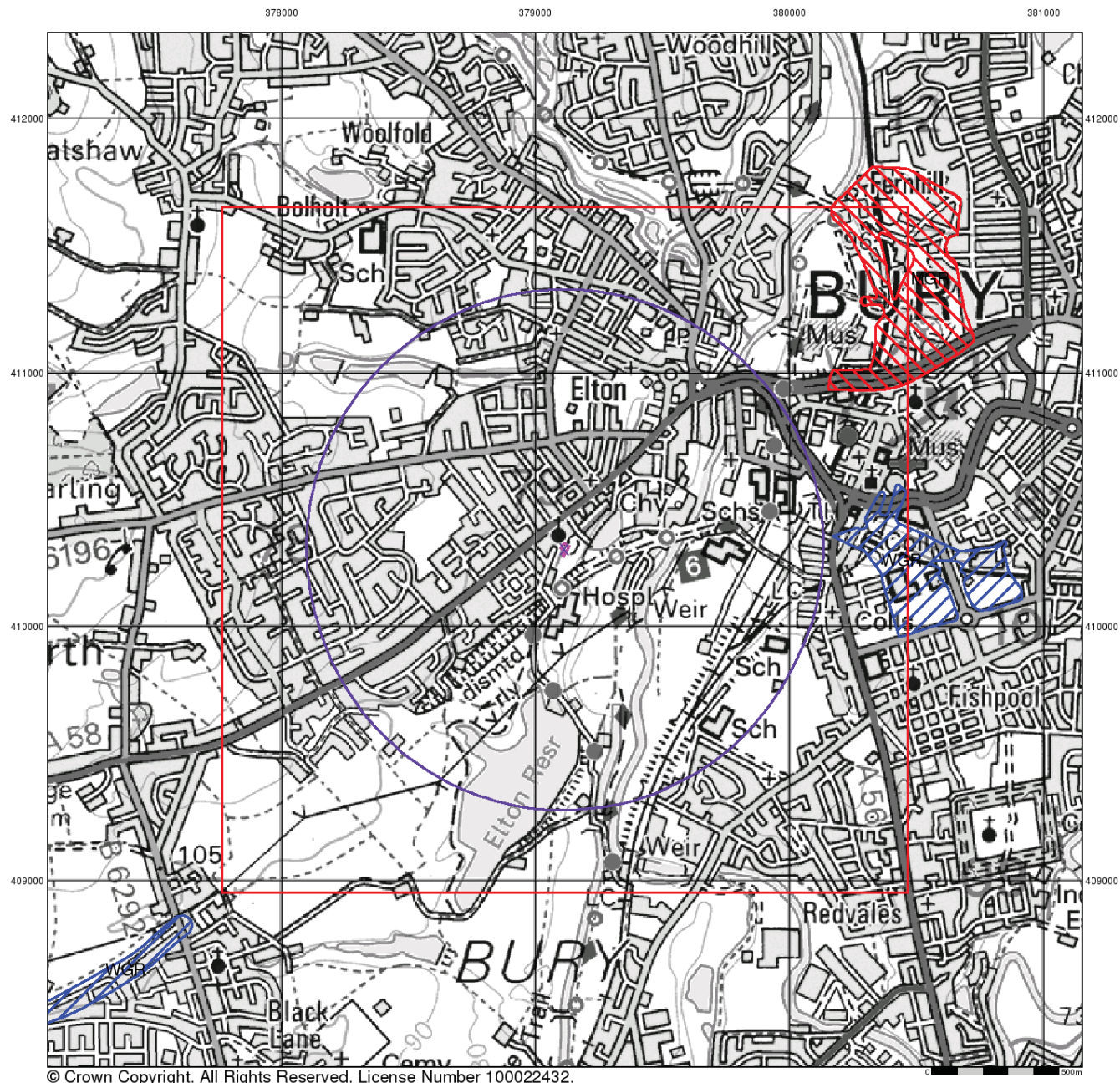
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National Grid Reference: 379110, 410300
Slice: A
Site Area (Ha): 0.08
Search Buffer (m): 1000

Site Details:

Deardens Street, Bury, BL8 2PB



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Artificial Ground and Landslip

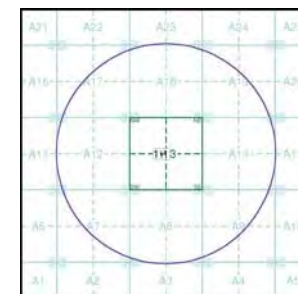
Artificial ground is a term used by BGS for those areas where the ground surface has been significantly modified by human activity. Information about previously developed ground is especially important, as it is often associated with potentially contaminated material, unpredictable engineering conditions and unstable ground.

Artificial ground includes:

- Made ground - man-made deposits such as embankments and spoil heaps on the natural ground surface.
- Worked ground - areas where the ground has been cut away such as quarries and road cuttings.
- Infilled ground - areas where the ground has been cut away then wholly or partially backfilled.
- Landscaped ground - areas where the surface has been reshaped.
- Disturbed ground - areas of ill-defined shallow or near surface mineral workings where it is impracticable to map made and worked ground separately.

Mass movement (landslip) deposits on BGS geological maps are primarily superficial deposits that have moved down slope under gravity to form landslips. These affect bedrock, other superficial deposits and artificial ground. The dataset also includes foundered strata, where the ground has collapsed due to subsidence.

Artificial Ground and Landslip Map - Slice A



Order Details:

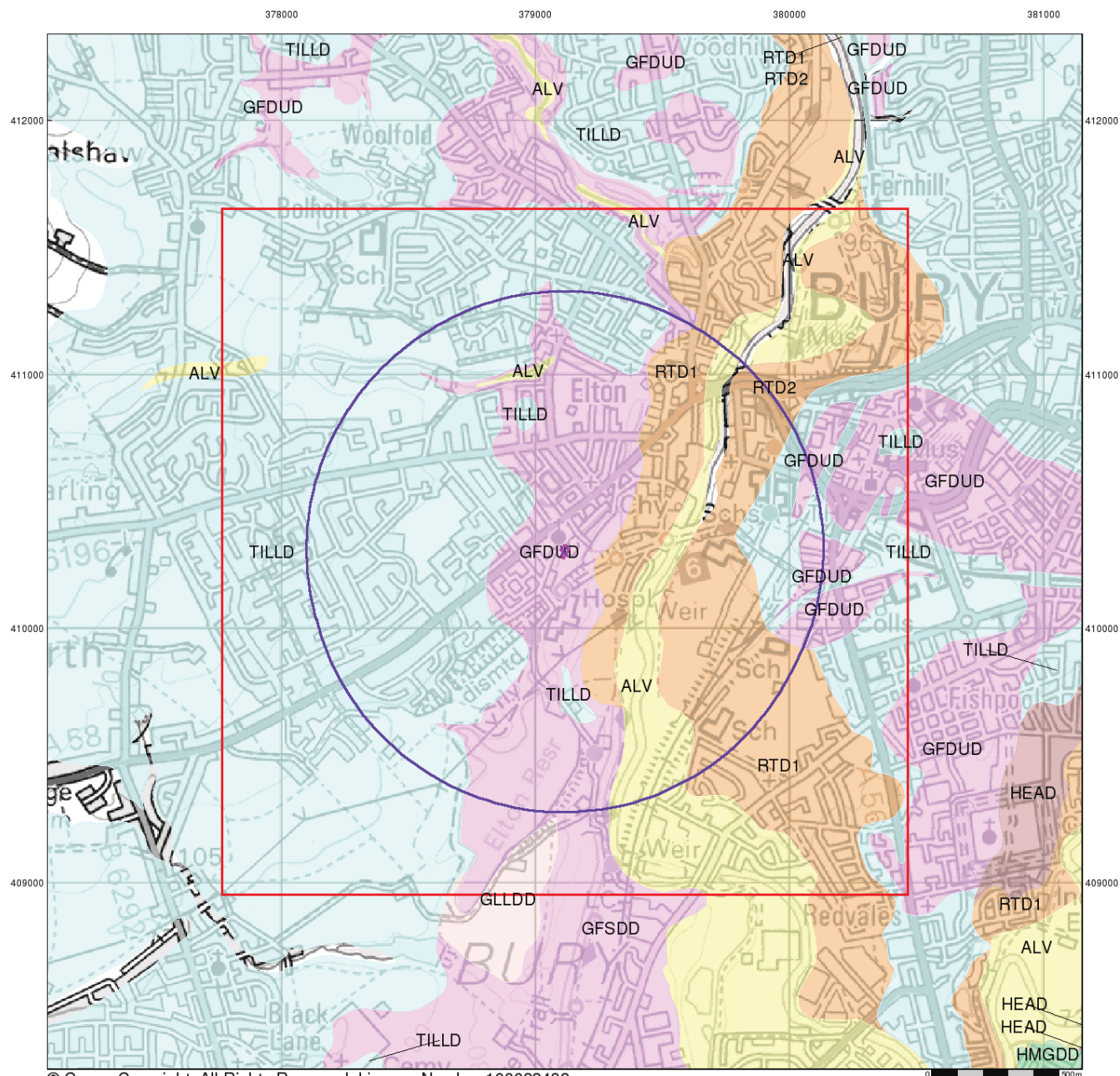
Order Number: 273600133_1_1
 Customer Reference: UK21.5294
 National Grid Reference: 379110, 410300
 Slice: A
 Site Area (Ha): 0.08
 Search Buffer (m): 1000

Site Details:

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Landmark
 INFORMATION GROUP

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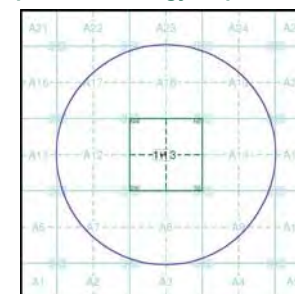
Superficial Geology

Superficial Deposits are the youngest geological deposits formed during the most recent period of geological time, the Quaternary, which extends back about 1.8 million years from the present.

They rest on older deposits or rocks referred to as Bedrock. This dataset contains Superficial deposits that are of natural origin and 'in place'. Other superficial strata may be held in the Mass Movement dataset where they have been moved, or in the Artificial Ground dataset where they are of man-made origin.

Most of these Superficial deposits are unconsolidated sediments such as gravel, sand, silt and clay, and onshore they form relatively thin, often discontinuous patches or larger spreads.

Superficial Geology Map - Slice A



Order Details:

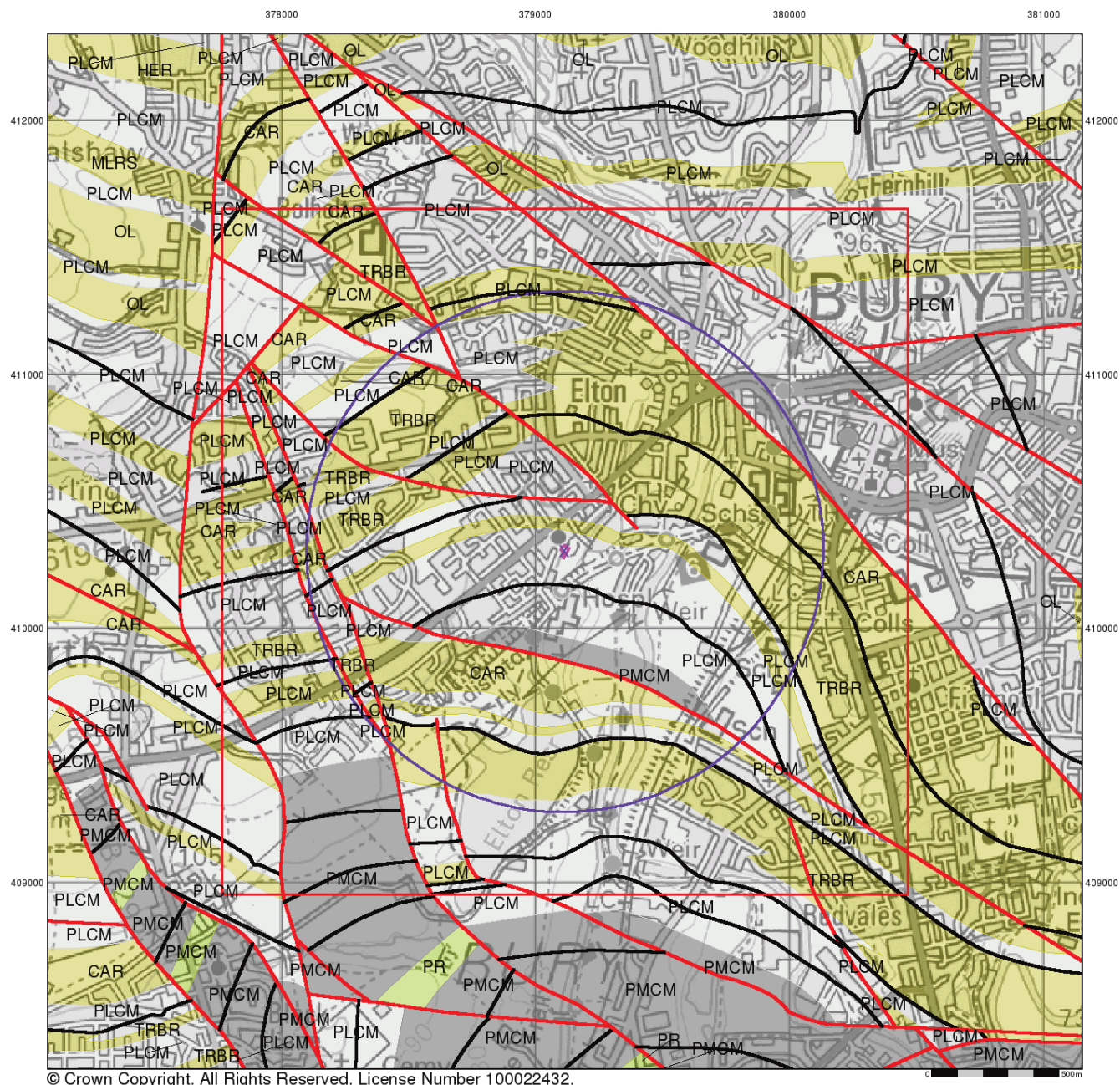
Order Number: 273600133_1_1
 Customer Reference: UK21.5294
 National Grid Reference: 379110, 410300
 Slice: A
 Site Area (Ha): 0.08
 Search Buffer (m): 1000

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Bedrock and Faults

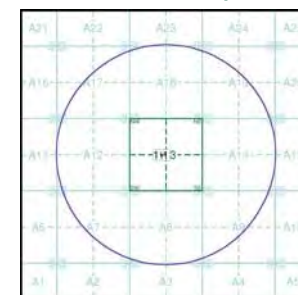
Bedrock geology is a term used for the main mass of rocks forming the Earth and are present everywhere, whether exposed at the surface in outcrops or concealed beneath superficial deposits or water.

The bedrock has formed over vast lengths of geological time ranging from ancient and highly altered rocks of the Proterozoic, some 2500 million years ago, or older, up to the relatively young Pliocene, 1.8 million years ago.

The bedrock geology includes many lithologies, often classified into three types based on origin: igneous, metamorphic and sedimentary.

The BGS Faults and Rock Segments dataset includes geological faults (e.g. normal, thrust), and thin beds mapped as lines (e.g. coal seam, gypsum bed). Some of these are linked to other particular 1:50,000 Geology datasets, for example, coal seams are part of the bedrock sequence, most faults and mineral veins primarily affect the bedrock but cut across the strata and post date its deposition.

Bedrock and Faults Map - Slice A



Order Details:

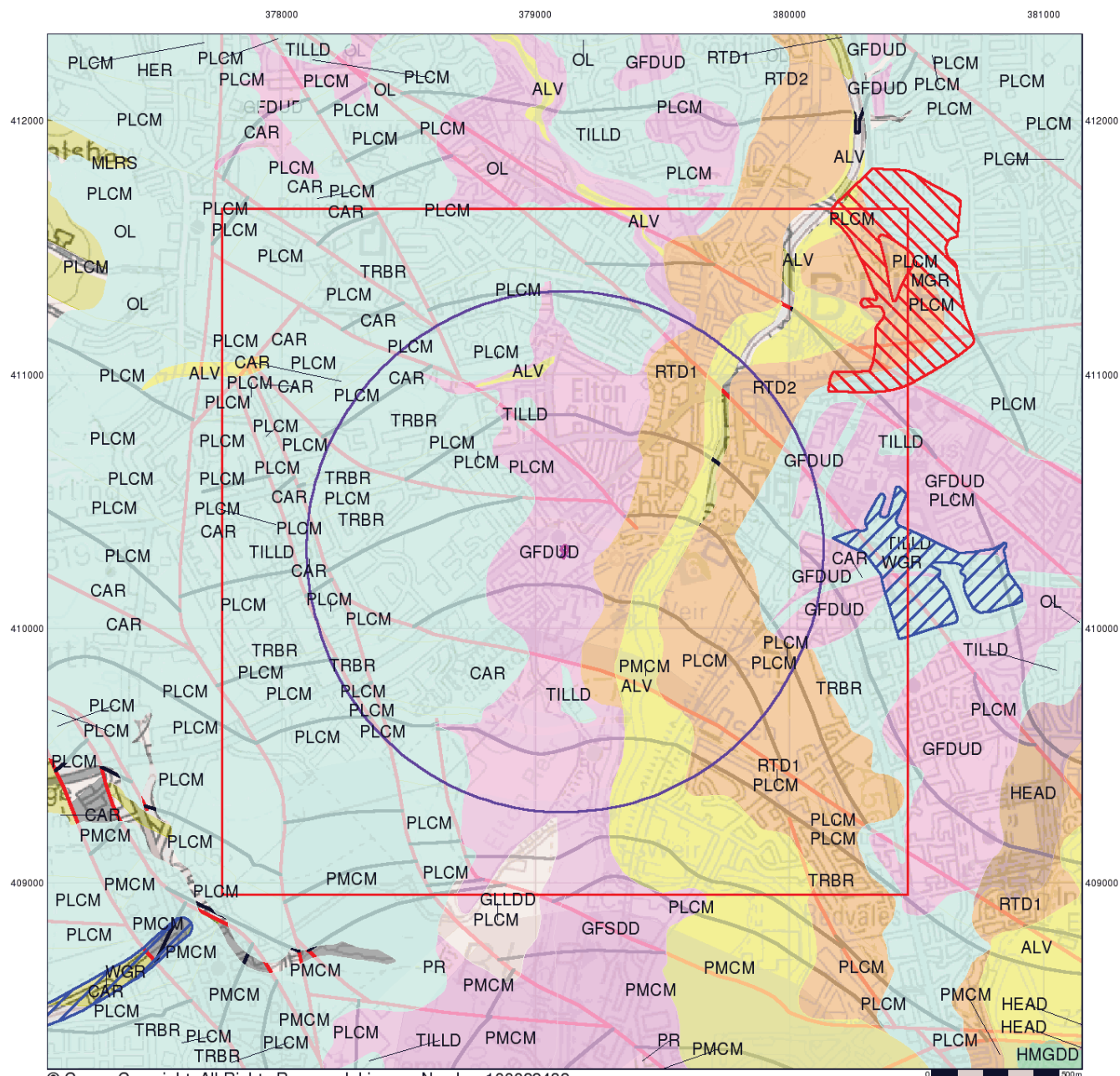
Order Number: 273600133_1_1
 Customer Reference: UK21.5294
 National Grid Reference: 379110, 410300
 Slice: A
 Site Area (Ha): 0.08
 Search Buffer (m): 1000

Site Details:

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Combined Surface Geology

The Combined Surface Geology map combines all the previous maps into one combined geological overview of your site.

Please consult the legends to the previous maps to interpret the Combined "Surface Geology" map.

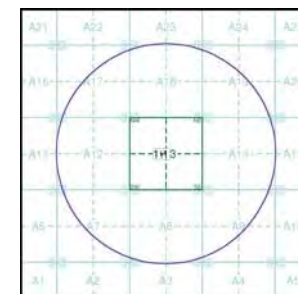
Additional Information

More information on 1:50,000 Geological mapping and explanations of rock classifications can be found on the BGS website. Using the LEX Codes in this report, further descriptions of rock types can be obtained by interrogating the 'BGS Lexicon of Named Rock Units'. This database can be accessed by following the 'Information and Data' link on the BGS website.

Contact

British Geological Survey
Kingsley Dunham Centre
Keyworth
Nottingham
NG12 5GG
Telephone: 0115 936 3143
Fax: 0115 936 3276
email: enquiries@bgs.ac.uk
website: www.bgs.ac.uk

Combined Geology Map - Slice A



Order Details:

Order Number: 273600133_1_1
Customer Reference: UK21.5294
National Grid Reference: 379110, 410300
Slice: A
Site Area (Ha): 0.08
Search Buffer (m): 1000

Site Details:

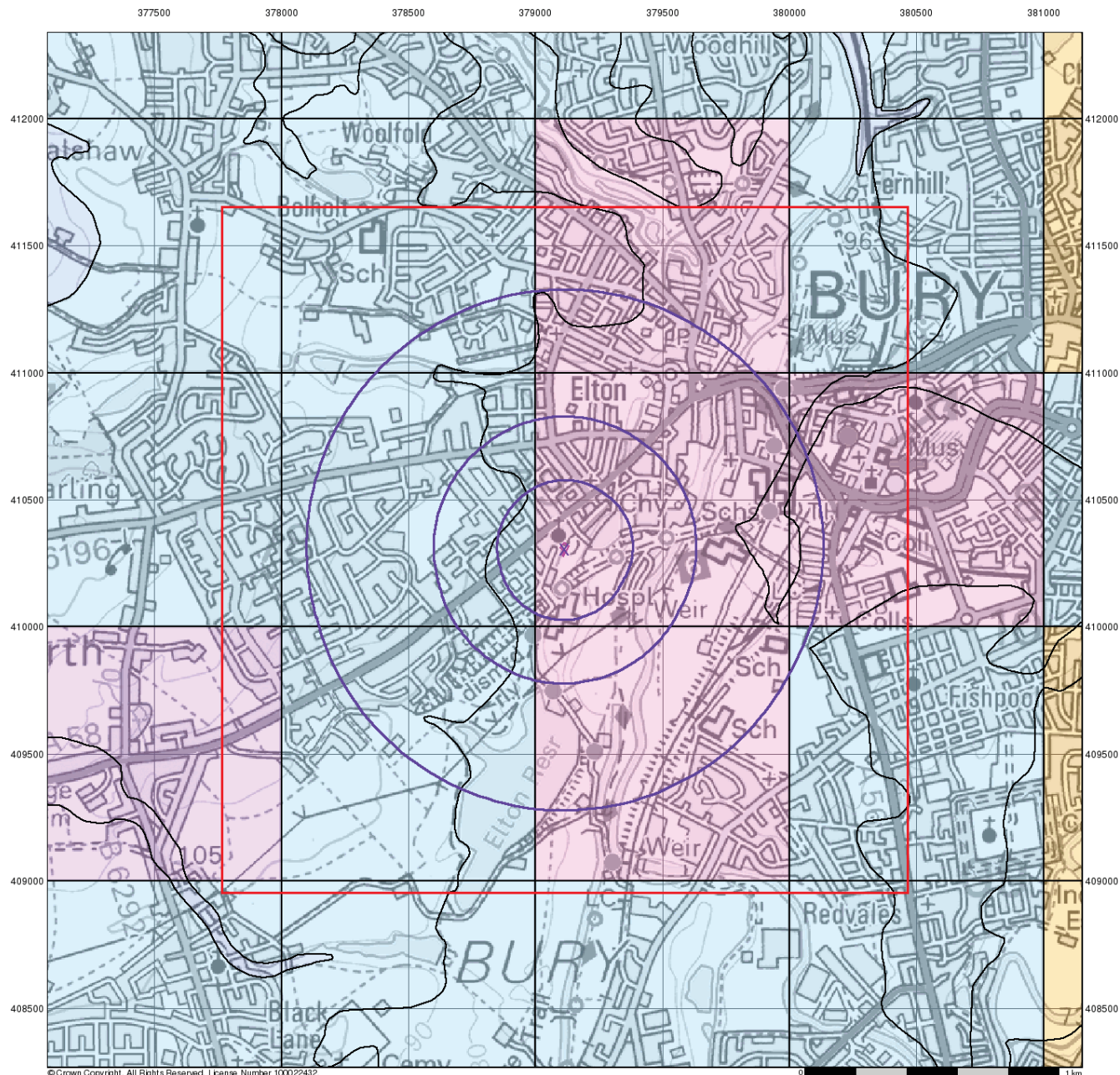
Deardens Street, Bury, BL8 2PB



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APPENDIX E

Groundwater Vulnerability and Flood Maps



Groundwater Vulnerability

General

- Specified Site
- Specified Buffer(s)
- Bearing Reference Point
- Slice
- Map ID

Agency and Hydrological

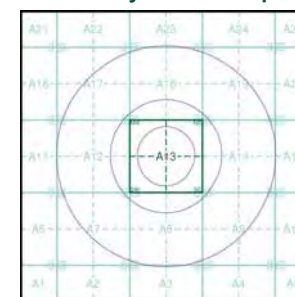
Bedrock Aquifers

- High Vulnerability, Principal Aquifer
- High Vulnerability, Secondary Aquifer
- Medium Vulnerability, Principal Aquifer
- Medium Vulnerability, Secondary Aquifer
- Low Vulnerability, Principal Aquifer
- Low Vulnerability, Secondary Aquifer
- Unproductive Aquifer
- Soluble Rock

Superficial Aquifers

- High Vulnerability, Principal Aquifer
- High Vulnerability, Secondary Aquifer
- Medium Vulnerability, Principal Aquifer
- Medium Vulnerability, Secondary Aquifer
- Low Vulnerability, Principal Aquifer
- Low Vulnerability, Secondary Aquifer

Site Sensitivity Context Map - Slice A



Order Details

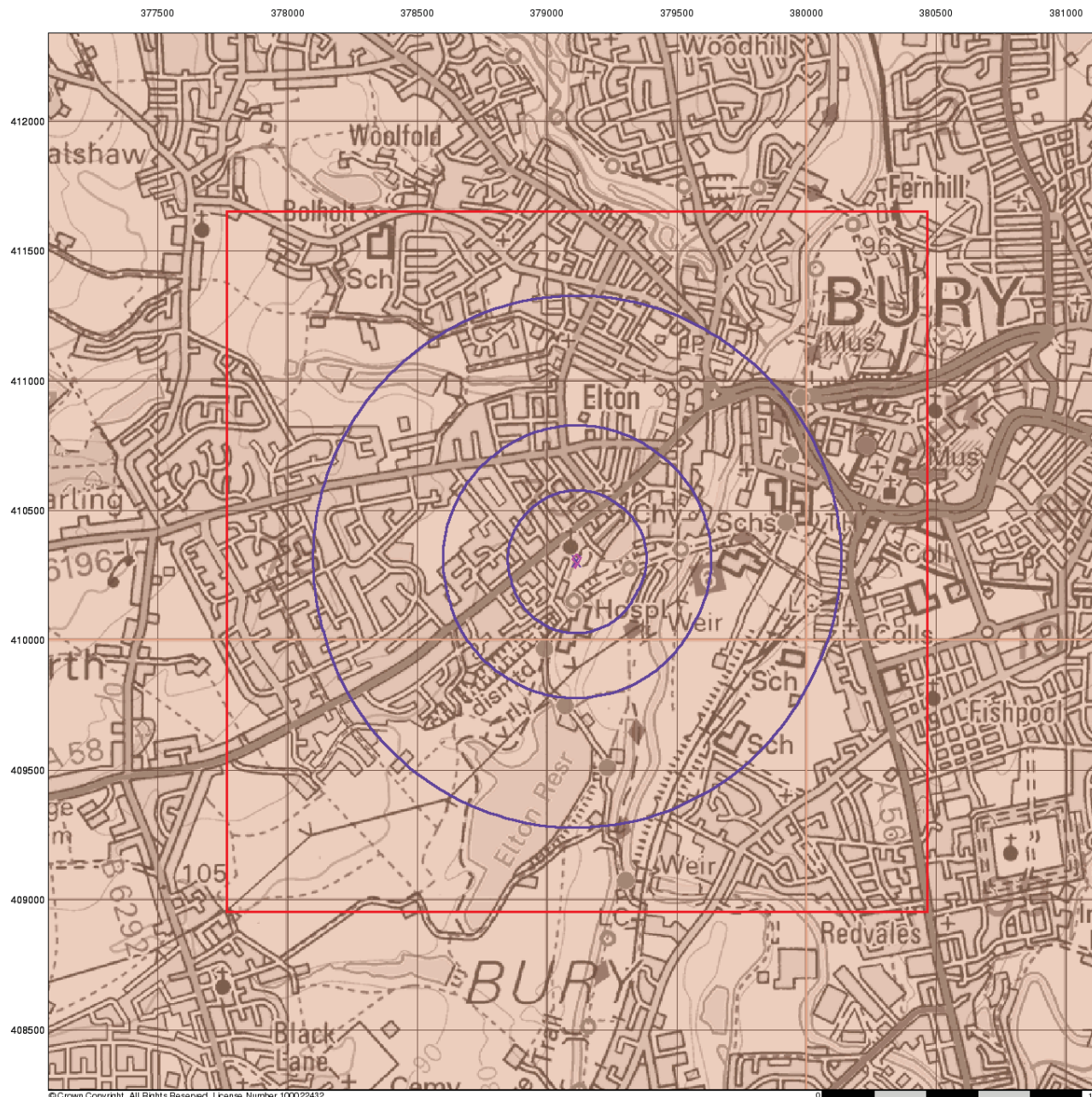
Order Number: 273600133_1_1
 Customer Ref: UK21.5294
 National Grid Reference: 379110, 410300
 Slice: A
 Site Area (Ha): 0.08
 Search Buffer (m): 1000

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0 1 km



Bedrock Aquifer Designation

General

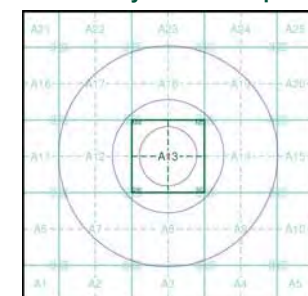
- Specified Site
- Specified Buffer(s)
- Bearing Reference Point
- Slice
- Map ID

Agency and Hydrological

Geological Classes

- Principal Aquifer
- Secondary A Aquifer
- Secondary B Aquifer
- Secondary Undifferentiated
- Unproductive Strata
- Unknown
- Unknown (Lakes and Landslip)

Site Sensitivity Context Map - Slice A



Order Details

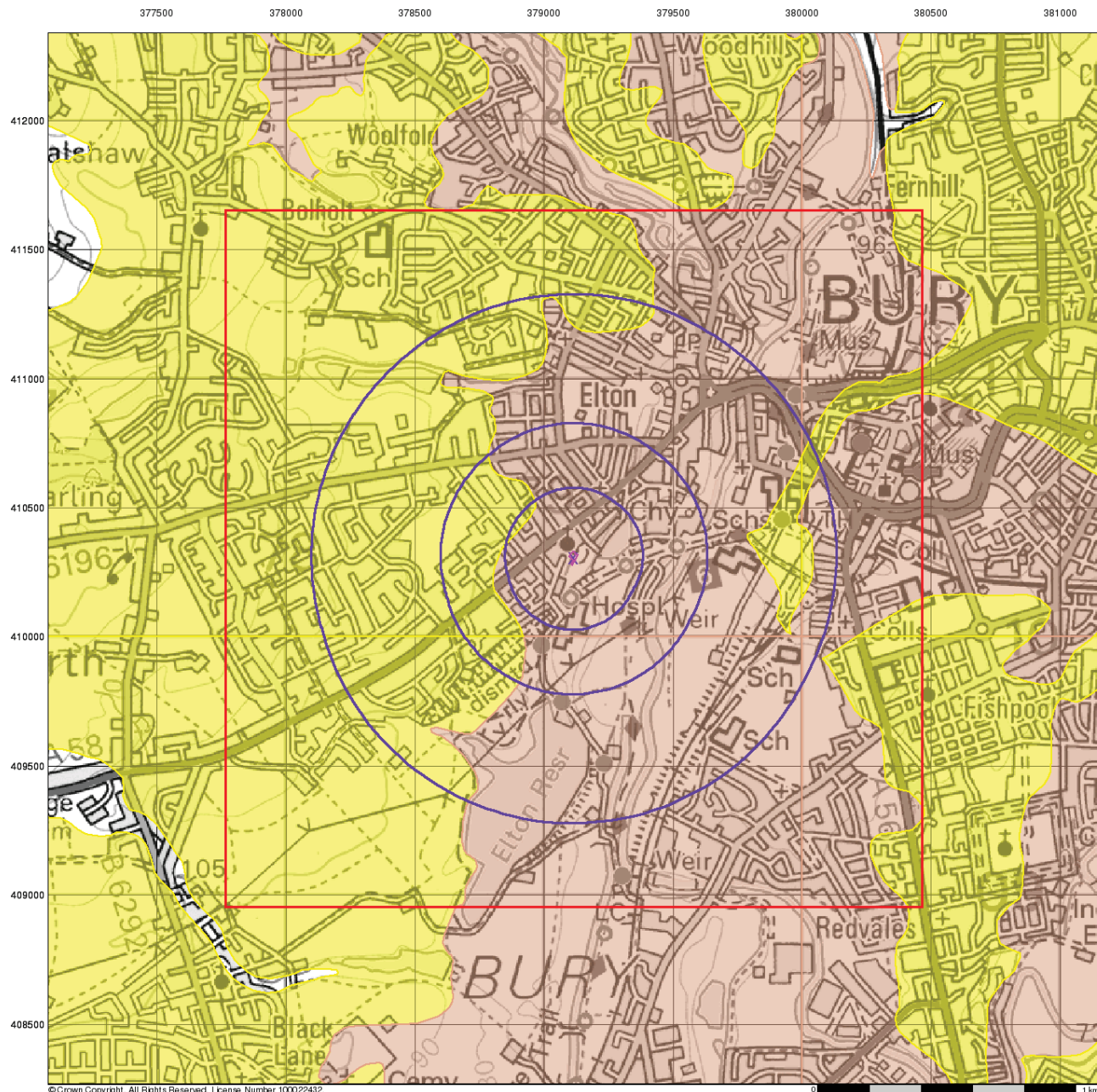
Order Number: 273600133_1_1
 Customer Ref: UK21.5294
 National Grid Reference: 379110, 410300
 Slice: A
 Site Area (Ha): 0.08
 Search Buffer (m): 1000

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Superficial Aquifer Designation

General

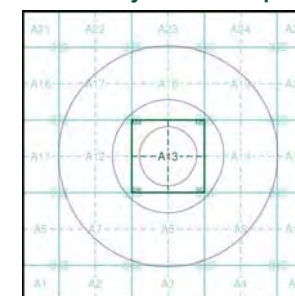
- Specified Site
- Specified Buffer(s)
- Bearing Reference Point
- Slice
- Map ID

Agency and Hydrological

Geological Classes

- Principal Aquifer
- Secondary A Aquifer
- Secondary B Aquifer
- Secondary Undifferentiated
- Unproductive Strata
- Unknown
- Unknown (Lakes and Landslip)

Site Sensitivity Context Map - Slice A



Order Details

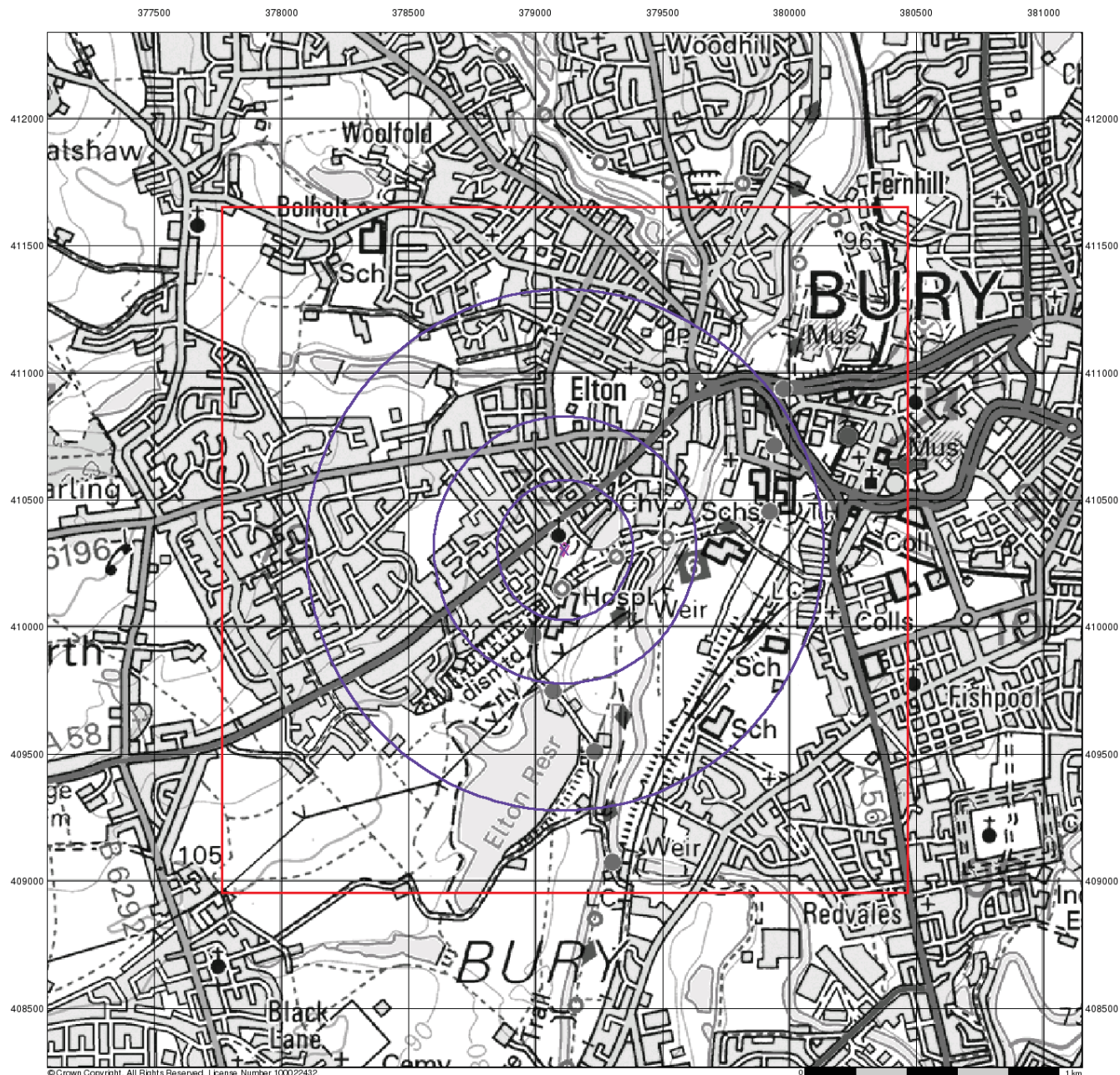
Order Number: 273600133_1_1
 Customer Ref: UK21.5294
 National Grid Reference: 379110, 410300
 Slice: A
 Site Area (Ha): 0.08
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Source Protection Zones

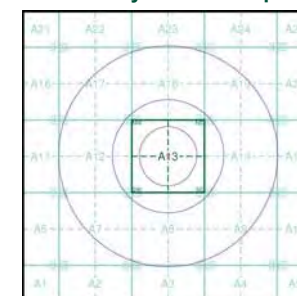
General

- Specified Site
- Specified Buffer(s)
- Bearing Reference Point
- Slice
- Map ID

Agency and Hydrological

- Inner zone (Zone 1)
- Inner zone - subsurface activity only (Zone 1c)
- Outer zone (Zone 2)
- Outer zone - subsurface activity only (Zone 2c)
- Total catchment (Zone 3)
- Total catchment - subsurface activity only (Zone 3c)
- Special interest (Zone 4)

Site Sensitivity Context Map - Slice A



Order Details

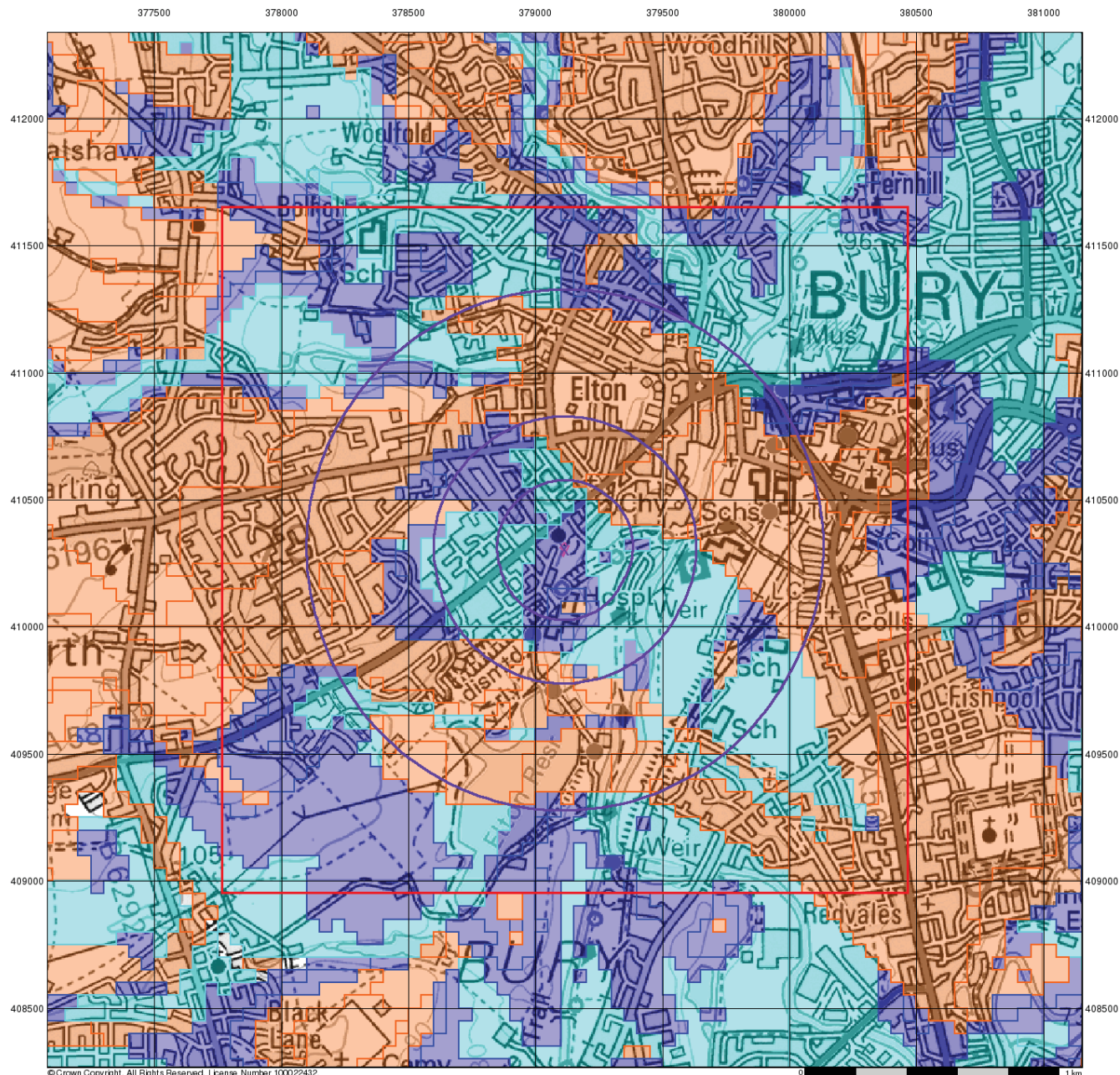
Order Number: 273600133_1_1
 Customer Ref: UK21.5294
 National Grid Reference: 379110, 410300
 Slice: A
 Site Area (Ha): 0.08
 Search Buffer (m): 1000

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BGS Flood GFS Data

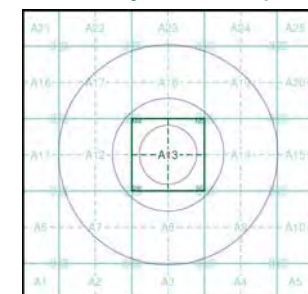
General

- Specified Site
- Specified Buffer(s)
- Bearing Reference Point
- Slice

Agency and Hydrological (Flood)

- Limited Potential for Groundwater Flooding to Occur
- Potential for Groundwater Flooding of Property Situated Below Ground Level
- Potential for Groundwater Flooding to Occur at Surface

Site Sensitivity Context Map - Slice A



Order Details

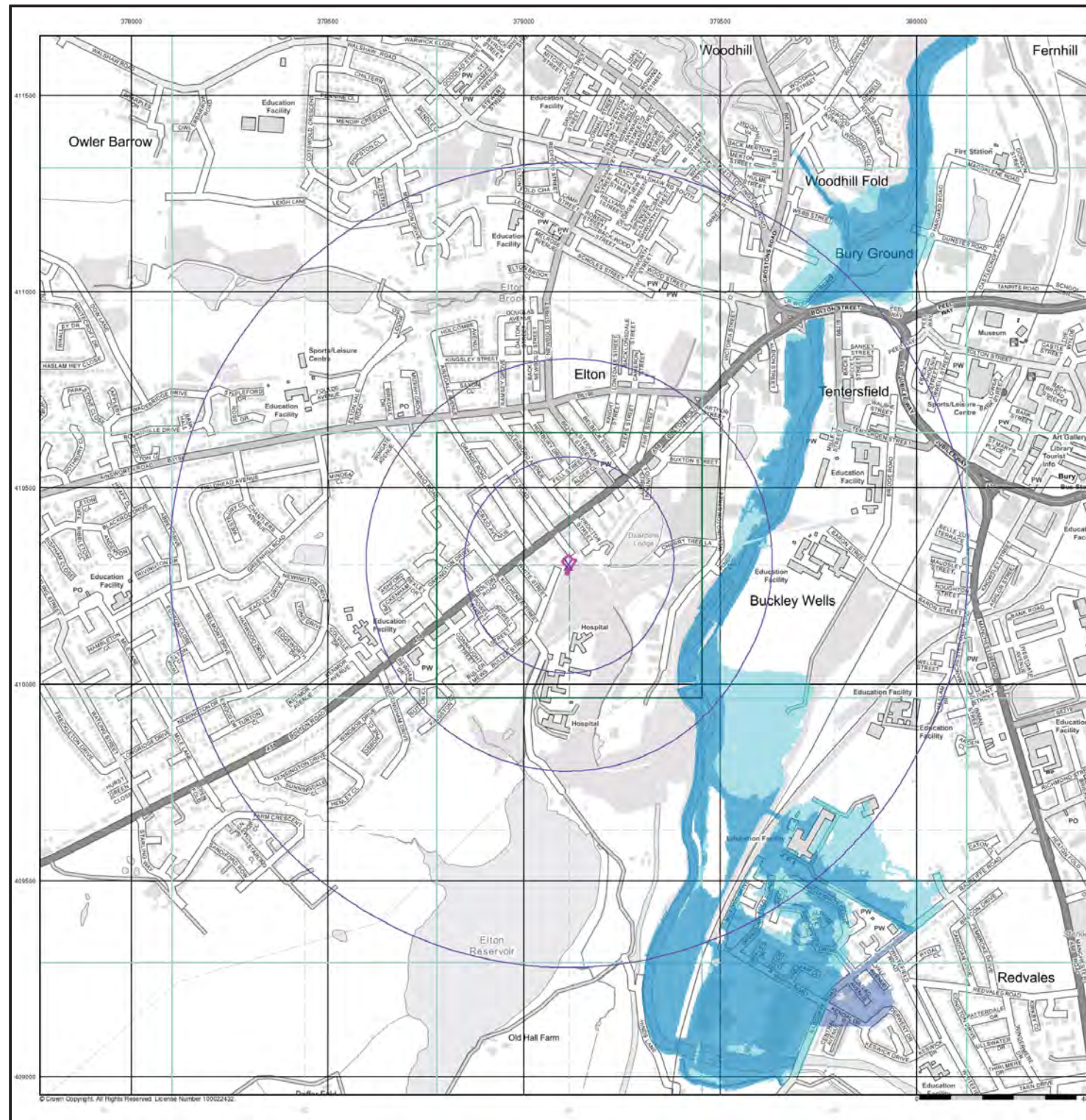
Order Number: 273600133_1_1
 Customer Ref: UK21.5294
 National Grid Reference: 379110, 410300
 Slice: A
 Site Area (Ha): 0.08
 Search Buffer (m): 1000

Site Details

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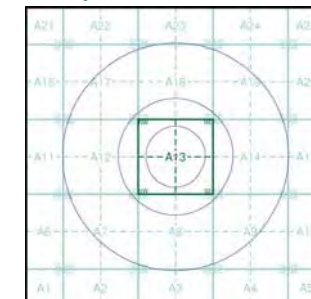
General

- Specified Site
- Specified Buffer(s)
- Bearing Reference Point

Agency and Hydrological (Flood)

- Extreme Flooding from Rivers or Sea without Defences (Zone 2)
- Flooding from Rivers or Sea without Defences (Zone 3)
- Area Benefiting from Flood Defence
- Flood Water Storage Areas
- Flood Defence

Flood Map - Slice A



Order Details

Order Number: 273600133_1_1
 Customer Ref: UK21.5294
 National Grid Reference: 379110, 410300
 Slice: A
 Site Area (Ha): 0.08
 Search Buffer (m): 1000

Site Details

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APPENDIX F

A Selection of Historic Maps



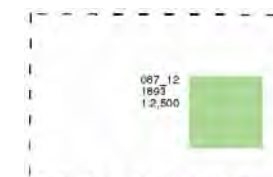
Lancashire And Furness

Published 1893

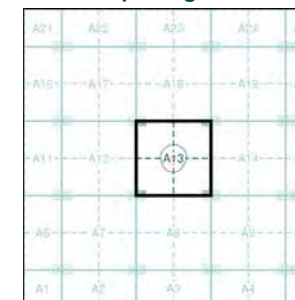
Source map scale - 1:2,500

The historical maps shown were reproduced from maps predominantly held at the scale adopted for England, Wales and Scotland in the 1840's. In 1854 the 1:2,500 scale was adopted for mapping urban areas and by 1896 it covered the whole of what were considered to be the cultivated parts of Great Britain. The published date given below is often some years later than the surveyed date. Before 1938, all OS maps were based on the Cassini Projection, with independent surveys of a single county or group of counties, giving rise to significant inaccuracies in outlying areas.

Map Name(s) and Date(s)



Historical Map - Segment A13



Order Details

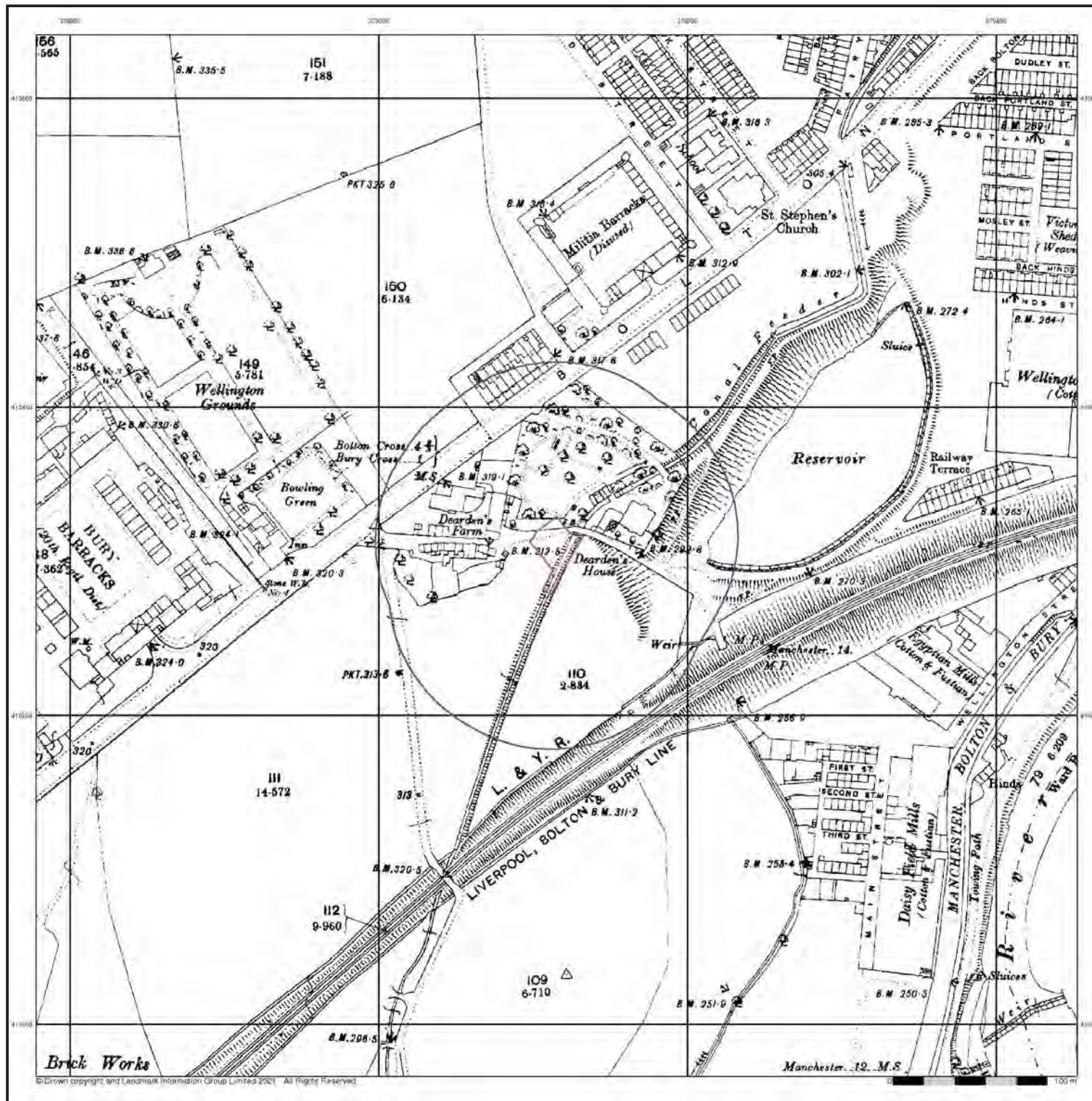
Order Number: 273600133_1_1
Customer Ref: UK21.5294
National Grid Reference: 379110, 410300
Slice: A
Site Area (Ha): 0.08
Search Buffer (m): 100

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INFORMATION GROUP

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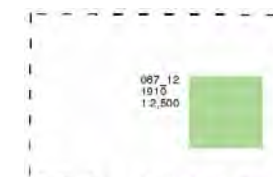
Lancashire And Furness

Published 1910

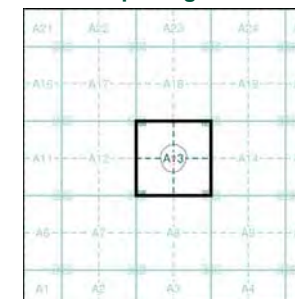
Source map scale - 1:2,500

The historical maps shown were reproduced from maps predominantly held at the scale adopted for England, Wales and Scotland in the 1840's. In 1854 the 1:2,500 scale was adopted for mapping urban areas and by 1896 it covered the whole of what were considered to be the cultivated parts of Great Britain. The published date given below is often some years later than the surveyed date. Before 1938, all OS maps were based on the Cassini Projection, with independent surveys of a single county or group of counties, giving rise to significant inaccuracies in outlying areas.

Map Name(s) and Date(s)



Historical Map - Segment A13



Order Details

Order Number: 273600133_1_1
Customer Ref: UK21.5294
National Grid Reference: 379110, 410300
Slice: A
Site Area (Ha): 0.08
Search Buffer (m): 100

Site Details

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Landmark
INFORMATION GROUP

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Lancashire And Furness

Published 1929

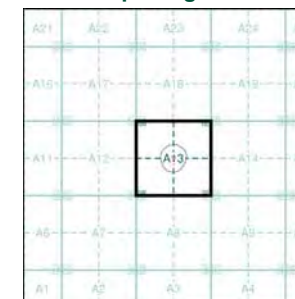
Source map scale - 1:2,500

The historical maps shown were reproduced from maps predominantly held at the scale adopted for England, Wales and Scotland in the 1840's. In 1854 the 1:2,500 scale was adopted for mapping urban areas and by 1896 it covered the whole of what were considered to be the cultivated parts of Great Britain. The published date given below is often some years later than the surveyed date. Before 1938, all OS maps were based on the Cassini Projection, with independent surveys of a single county or group of counties, giving rise to significant inaccuracies in outlying areas.

Map Name(s) and Date(s)



Historical Map - Segment A13



Order Details

Order Number: 273600133_1_1
Customer Ref: UK21.5294
National Grid Reference: 379110, 410300
Slice: A
Site Area (Ha): 0.08
Search Buffer (m): 100

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Ordnance Survey Plan

Published 1970

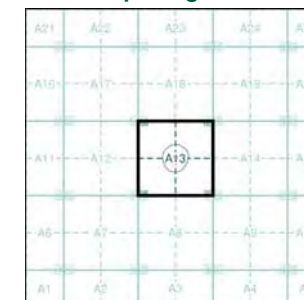
Source map scale - 1:2,500

The historical maps shown were reproduced from maps predominantly held at the scale adopted for England, Wales and Scotland in the 1840's. In 1854 the 1:2,500 scale was adopted for mapping urban areas and by 1896 it covered the whole of what were considered to be the cultivated parts of Great Britain. The published date given below is often some years later than the surveyed date. Before 1938, all OS maps were based on the Cassini Projection, with independent surveys of a single county or group of counties, giving rise to significant inaccuracies in outlying areas.

Map Name(s) and Date(s)

SD7810 1970 1:2,500	SD7910 1970 1:2,500
SD7808 1970 1:2,500	SD7809 1970 1:2,500

Historical Map - Segment A13



Order Details

Order Number: 273600133_1_1
Customer Ref: UK21.5294
National Grid Reference: 379110, 410300
Slice: A
Site Area (Ha): 0.08
Search Buffer (m): 100

Site Details

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Large-Scale National Grid Data

Published 1992

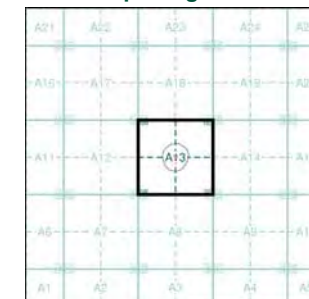
Source map scale - 1:1,250

'Large Scale National Grid Data' superseded SIM cards (Ordnance Survey's 'Survey of Information on Microfilm') in 1992, and continued to be produced until 1999. These maps were the fore-runners of digital mapping and so provide detailed information on houses and roads, but tend to show less topographic features such as vegetation. These maps were produced at both 1:2,500 and 1:1,250 scales.

Map Name(s) and Date(s)

SD7810NE SD7910NW
1992 1992
1:1,250 1:1,250
SD7810SE SD7910SW
1992 1992
1:1,250 1:1,250
SD7809NE SD7909NW
1992 1992
1:1,250 1:1,250

Historical Map - Segment A13



Order Details

Order Number: 273600133_1_1
Customer Ref: UK21.5294
National Grid Reference: 379110, 410300
Slice: A
Site Area (Ha): 0.08
Search Buffer (m): 100

Site Details

Deardens Street, Bury, BL8 2PB

Landmark
INFORMATION GROUP

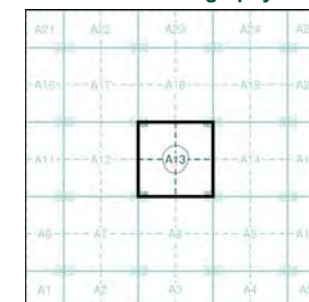
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Historical Aerial Photography Published 2001

This aerial photography was produced by Getmapping, these vertical aerial photographs provide a seamless, full colour survey of the whole of Great Britain

Historical Aerial Photography - Segment A13



Order Details

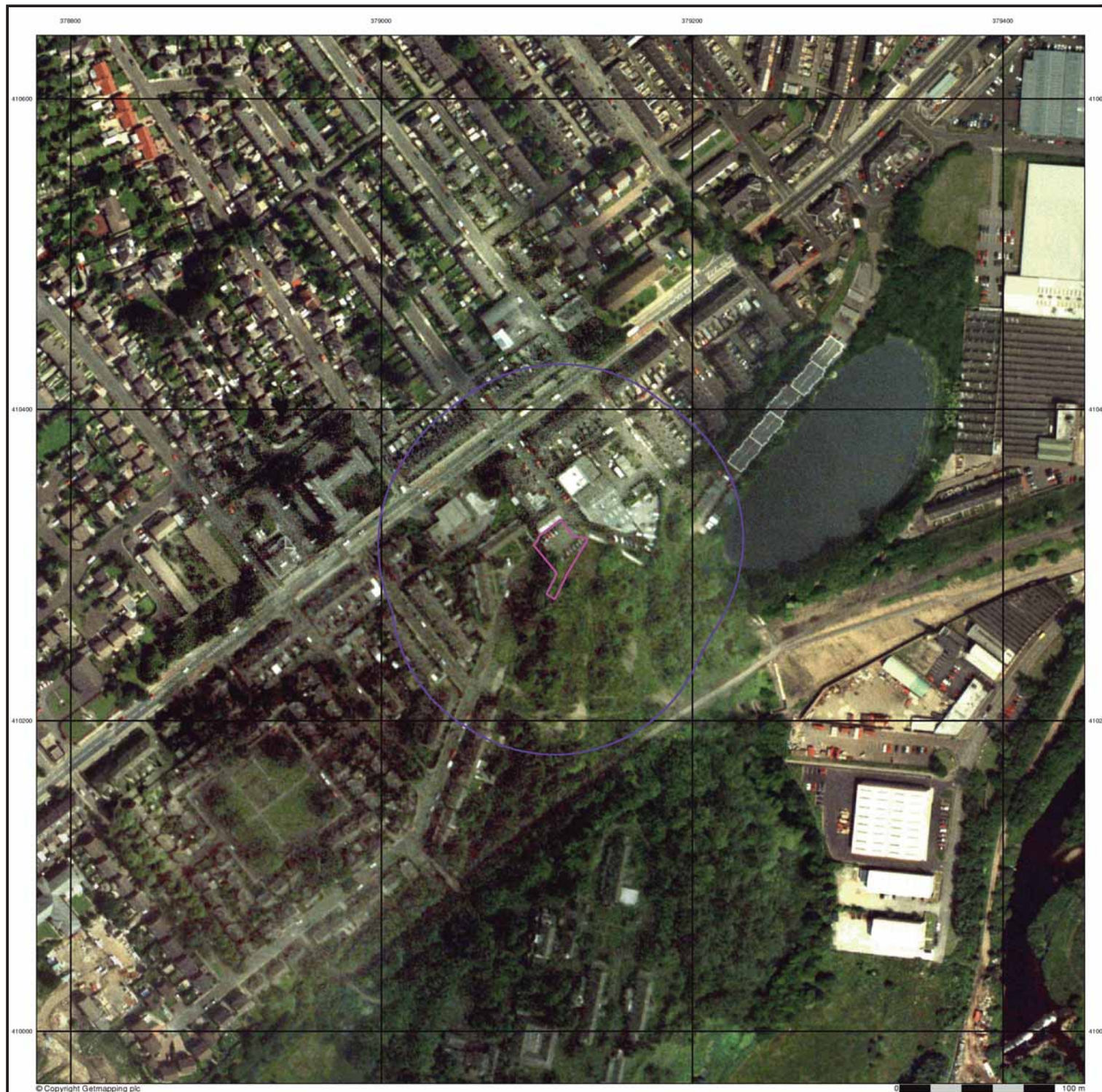
Order Number: 273600133_1_1
Customer Ref: UK21.5294
National Grid Reference: 379110, 410300
Slice: A
Site Area (Ha): 0.08
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VectorMap Local

Published 2020

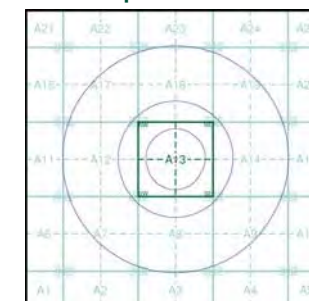
Source map scale - 1:10,000

VectorMap Local (Raster) is Ordnance Survey's highest detailed 'backdrop' mapping product. These maps are produced from OS's VectorMap Local, a simple vector dataset at a nominal scale of 1:10,000, covering the whole of Great Britain, that has been designed for creating graphical mapping. OS VectorMap Local is derived from large-scale information surveyed at 1:1250 scale (covering major towns and cities), 1:2500 scale (smaller towns, villages and developed rural areas), and 1:10 000 scale (mountain, moorland and river estuary areas).

Map Name(s) and Date(s)

SD71SE 2020 Variable	SD81SW 2020 Variable
SD70NE 2020 Variable	SD80NW 2020 Variable

Historical Map - Slice A



Order Details

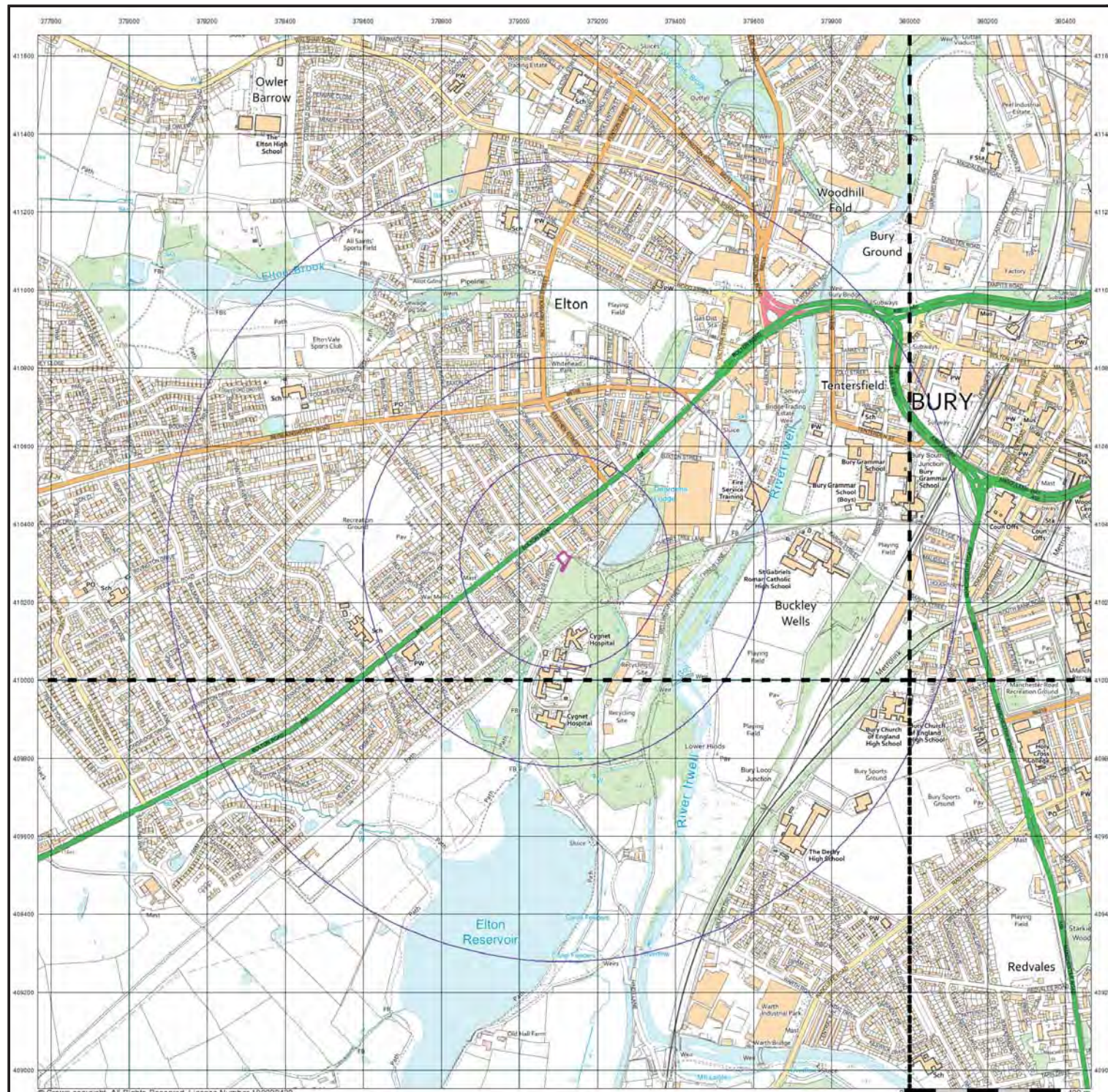
Order Number: 273600133_1_1
Customer Ref: UK21.5294
National Grid Reference: 379110, 410300
Slice: A
Site Area (Ha): 0.08
Search Buffer (m): 1000

Site Details

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INFORMATION GROUP

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Web: www.envirocheck.co.uk



APPENDIX G

Coal Authority Report



The Coal
Authority

CON29M

coal mining report

DEARDENS STREET, BURY, LANCASHIRE, BL8 2PB



Known or potential coal mining risks

Future underground coal mining

Page 3



Further action

No further reports from the Coal Authority are required. Further information on any next steps can be found in our Professional opinion.

For more information on our reports please visit
www.groundstability.com



Professional opinion

According to the official mining information records held by the Coal Authority at the time of this search, evidence of, or the potential for, coal mining related features have been identified. It is unlikely that these features will impact on the stability of the enquiry boundary.

Your reference: **273600133_2**
Our reference: **51002393455001**
Date: **18 February 2021**

Client name:
NLIS Hub

If you require any further assistance please
contact our experts on:
0345 762 6848
groundstability@coal.gov.uk

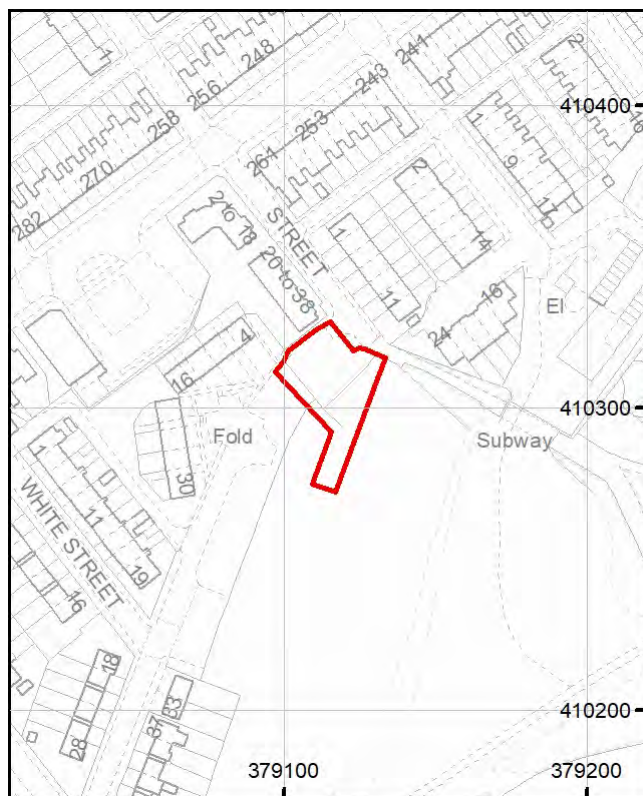


The Law
Society

Enquiry boundary

Key

Approximate position of enquiry boundary shown



We can confirm that the location is
on the coalfield



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This report is prepared in accordance with the latest Law Society's Guidance Notes 2018, the User Guide 2018 and the Coal Authority's Terms and Conditions applicable at the time the report was produced.



Accessibility

If you would like this information in an alternative format, please contact our communications team on 0345 762 6848 or email communications@coal.gov.uk.

Detailed findings

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1 Past underground coal mining

The property is not within a surface area that could be affected by any past recorded underground coal mining.

2 Present underground coal mining

The property is not within a surface area that could be affected by present underground mining.

3 Future underground coal mining

The property is not in an area where the Coal Authority has received an application for, and is currently considering whether to grant a licence to remove or work coal by underground methods.

The property is not in an area where a licence has been granted to remove or otherwise work coal using underground methods.

The property is not in an area likely to be affected from any planned future underground coal mining.

However, reserves of coal exist in the local area which could be worked at some time in the future.

No notices have been given, under section 46 of the Coal Mining Subsidence Act 1991, stating that the land is at risk of subsidence.

4 Mine entries

There are no recorded coal mine entries known to the Coal Authority within, or within 20 metres, of the boundary of the property.

5 Coal mining geology

The Coal Authority is not aware of any damage due to geological faults or other lines of weakness that have been affected by coal mining.

6 Past opencast coal mining

The property is not within the boundary of an opencast site from which coal has been removed by opencast methods.

7 Present opencast coal mining

The property does not lie within 200 metres of the boundary of an opencast site from which coal is being removed by opencast methods.

8 Future opencast coal mining

There are no licence requests outstanding to remove coal by opencast methods within 800 metres of the boundary.

The property is not within 800 metres of the boundary of an opencast site for which a licence to remove coal by opencast methods has been granted.

9 Coal mining subsidence

The Coal Authority has not received a damage notice or claim for the subject property, or any property within 50 metres of the enquiry boundary, since 31 October 1994.

There is no current Stop Notice delaying the start of remedial works or repairs to the property.

The Coal Authority is not aware of any request having been made to carry out preventive works before coal is worked under section 33 of the Coal Mining Subsidence Act 1991.

10 Mine gas

The Coal Authority has no record of a mine gas emission requiring action.

11 Hazards related to coal mining

The property has not been subject to remedial works, by or on behalf of the Coal Authority, under its Emergency Surface Hazard Call Out procedures.

12 Withdrawal of support

The property is not in an area where a notice to withdraw support has been given.

The property is not in an area where a notice has been given under section 41 of the Coal Industry Act 1994, cancelling the entitlement to withdraw support.

13 Working facilities order

The property is not in an area where an order has been made, under the provisions of the Mines (Working Facilities and Support) Acts 1923 and 1966 or any statutory modification or amendment thereof.

14 Payments to owners of former copyhold land

The property is not in an area where a relevant notice has been published under the Coal Industry Act 1975/Coal Industry Act 1994.

Statutory cover



Coal mining subsidence

In the unlikely event of any coal mining related subsidence damage, the Coal Authority or the mine operator has a duty to take remedial action in respect of subsidence caused by the withdrawal of support from land or property in connection with lawful coal mining operations.

When the works are the responsibility of the Coal Authority, our dedicated public safety and subsidence team will manage the claim. The house or land owner ("the owner") is covered for these works under the terms of the Coal Mining Subsidence Act 1991 (as amended by the Coal Industry Act 1994). Please note, this Act does not apply where coal was worked or gotten by virtue of the grant of a gale in the Forest of Dean, or any other part of the Hundred of St. Briavels in the county of Gloucester.

If you believe your land or property is suffering from coal mining subsidence damage and you need more information on what to do next, please use the following link to our website which sets out what your rights are and what you need to consider before making a claim.

www.gov.uk/government/publications/coal-mining-subsidence-damage-notice-form



Coal mining hazards

Our public safety and subsidence team provide a 24 hour a day, 7 days a week hazard reporting service, to help protect the public from hazards caused by past coal workings, such as a mine shaft or shallow working collapse. To report any hazards please call **01623 646 333**. Further information can be found on our website: www.gov.uk/coalauthority.

Glossary



Key terms

adit - horizontal or sloped entrance to a mine

coal mining subsidence - ground movement caused by the removal of coal by underground mining

Coal Mining Subsidence Act 1991 - the Act setting out the duties of the Coal Authority to repair damage caused by coal mining subsidence

coal mining subsidence damage - damage to land, buildings or structures caused by the removal of coal by underground mining

coal seams - bed of coal of varying thickness

future opencast coal mining - a licence granted, or licence application received, by the Coal Authority to excavate coal from the surface

future underground coal mining - a licence granted, or licence application received, by the Coal Authority to excavate coal underground. Although it is unlikely, remaining coal reserves could create a possibility for future mining, which would be licensed by the Coal Authority

mine entries - collective name for shafts and adits

payments to owners of former copyhold land - historically, copyhold land gave rights to coal to the copyholder. Legislation was set up to allow others to work this coal, but they had to issue a notice and pay compensation if a copyholder came forward

shaft - vertical entry into a mine

site investigation - investigations of coal mining risks carried out with the Coal Authority's permission

stop notice - a delay to repairs because further coal mining subsidence damage may occur and it would be unwise to carry out permanent repairs

subsidence claim - a formal notice of subsidence damage to the Coal Authority since it was established on 31 October 1994

withdrawal of support - a historic notice informing landowners that the coal beneath their property was going to be worked

working facilities orders - a court order which gave permission, restricted or prevented coal mine workings

APPENDIX H

Site Specific Borehole Logs



Borehole Log

Borehole No.

WS01

Sheet 1 of 1

Project Name: Deardens Street, Bury

Project No.
UK21.5294

Co-ords: -

Hole Type
WLS

Location: Bury, Greater Manchester

Level:

Scale
1:27

Client: Thomas Stoner Developments Limited

Dates: 03/03/2021 - 03/03/2021

Logged By
JJ

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
		Depth (m)	Type	Results					
		0.10 - 0.20	ES					MADE GROUND: Dark grey slightly sandy clayey angular to subangular fine to coarse GRAVEL of sandstone, brick, ceramic, glass and plastic fragments.	
		0.70 - 0.80	ES		0.70			<i>Between 0.60m to 0.70m, angular fragment of brick.</i>	
		1.20		N=8 (1,2/2,1,2,3) PID=0	1.20			MADE GROUND: Dark grey slightly sandy clayey ashy angular to subangular fine to coarse GRAVEL of sandstone, brick, ceramic, concrete, metal and plastic fragments. <i>At 1.00m, timber fragments (up to 100mm in diameter). Below 1.00m, organic odour.</i>	1
		1.20 - 1.40	D					MADE GROUND: Dark grey sandy gravelly CLAY. Gravel is angular to subangular of sandstone, brick, ceramic, concrete, metal and plastic fragments.	
		2.00		N=22 (2,3/4,5,7,6) PID=0	1.80			Firm to stiff grey slightly gravelly sandy CLAY with occasional rootlets. Gravel is angular to subrounded fine to coarse of sandstone, coal and mudstone. <i>Below 2.00m, brown mottled orangish brown and blueish grey.</i>	2
		2.00 - 2.10	ES						
		2.20 - 2.60	D					<i>Between 2.50m to 2.70m, band of very sandy clay.</i>	
		2.70 - 3.10	B		2.70			Medium dense brown mottled orangish brown sandy subangular to subrounded fine to coarse GRAVEL of sandstone and quartzite.	3
		3.00		N=16 (6,4/4,4,4,4)				<i>Between 3.40m to 4.00m, band of gravelly fine to coarse sand.</i>	
		3.80 - 4.00	ES						4
		4.00		N=28 (5,10/6,7,6,9) PID=0					
		4.20 - 4.60	D		4.60				5

Remarks





Borehole Log

Borehole No.

WS02

Sheet 1 of 1

Project Name: Deardens Street, Bury

Project No.
UK21.5294

Co-ords: -

Hole Type
WLS

Location: Bury, Greater Manchester

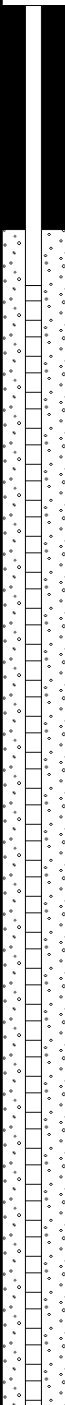
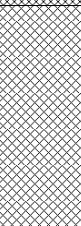
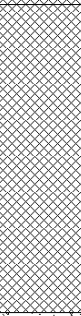
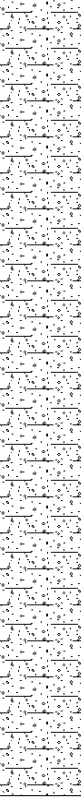
Level:

Scale
1:27

Client: Thomas Stoner Developments Limited

Dates: 03/03/2021 - 03/03/2021

Logged By
JJ

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
		Depth (m)	Type	Results					
					0.20			MADE GROUND: Dark grey asphalt.	
		0.50 - 0.60	ES					MADE GROUND: Dark grey slightly sandy clayey angular to subangular fine to coarse gravel of sandstone, brick, concrete, ceramic and plastic fragments. <i>Below 0.30m, medium angular to subangular cobble and boulder content of brick and concrete.</i>	
		1.10 - 1.20 1.20	ES	PID=0 N=11 (6,4/3,2,3,3)	1.00			MADE GROUND: Dark grey mottled grey slightly sandy gravelly clay. Gravel is angular to subangular fine to coarse of sandstone, brick, concrete, ceramic and plastic fragments. <i>Between 1.10m to 1.80, Hydrocarbon odour.</i>	1
		1.70 - 1.80	ES						
		2.00		N=15 (3,2/3,4,4,4) PID=0	2.10				2
		2.00 - 2.10	D					Medium dense brown mottled orangish brown clayey gravelly fine to coarse SAND. Gravel is angular to subrounded fine to coarse of sandstone, quartzite and possible coal fragments. <i>Between 2.80m to 3.00m, very clayey.</i>	
		2.80 - 3.20 3.00 3.00 - 4.00	D B	PID=0 N=11 (3,2/2,3,3,3)					3
		4.00		N=31 (7,6/8,10,6,7)					4
		4.60 - 4.70	ES						
		5.00		N=29 (5,9/8,7,6,8)	4.95				5

Remarks





Borehole Log

Borehole No.

WS03

Sheet 1 of 1

Project Name: Deardens Street, Bury

Project No.
UK21.5294

Co-ords: -

Hole Type
WLS

Location: Bury, Greater Manchester

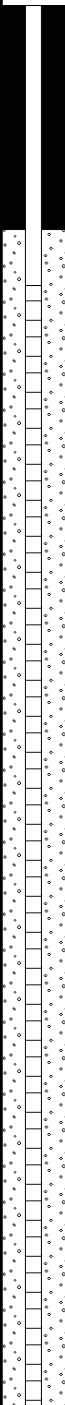
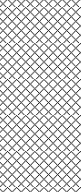
Level:

Scale
1:27

Client: Thomas Stoner Developments Limited

Dates: 03/03/2021 - 03/03/2021

Logged By
JJ

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
		Depth (m)	Type	Results					
					0.10			MADE GROUND: Dark grey asphalt.	
								MADE GROUND: Dark grey slightly sandy clayey angular to subangular fine to coarse GRAVEL of sandstone, brick, concrete, ceramic and plastic fragments.	
		0.80 - 1.00	ES		0.80				
		1.00 - 1.80	B						
		1.20		N=6 (1,1/1,1,2,2)					1
				PID=0					
		1.80 - 2.00	ES		1.80				
		2.00		N=8 (1,2/2,2,2,2)					2
		2.00 - 3.00	ES						
				PID=0					
		3.00		N=14 (2,2/3,3,4,4)	3.00				3
		3.60 - 3.70	D						
		4.00		N=12 (3,3/4,3,2,3)					4
		4.00 - 4.40	D						
		5.00		N=23 (12,12/5,6,5,7)	5.00				5

Remarks





Borehole Log

Borehole No.

WS04

Sheet 1 of 1

Project Name: Deardens Street, Bury

Project No.
UK21.5294

Co-ords: -

Hole Type
WLS

Location: Bury, Greater Manchester

Level:

Scale
1:27

Client: Thomas Stoner Developments Limited

Dates: 03/03/2021 - 03/03/2021

Logged By

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
		Depth (m)	Type	Results					
		0.30 - 0.50	ES	PID=0	0.10			MADE GROUND: Dark grey asphalt.	
								MADE GROUND: Dark grey slightly sandy clayey angular to subangular fine to coarse GRAVEL of sandstone, brick, concrete, ceramic and plastic fragments.	
		1.20		N=27 (4,6/6,4,5,12)	0.80			MADE GROUND: Dark grey sandy ashy angular to subangular fine to medium GRAVEL of sandstone, slag, brick and coal fragments.	1
		2.00		N=36 (7,10/12,10,6,8)					2
		3.00		N=5 (3,2/2,1,1,1)	3.00			Soft to firm brown mottled dark grey slightly sandy gravelly CLAY. Gravel is angular to subangular fine to coarse of sandstone, quartzite and possible coal fragments.	3
		4.00		N=18 (4,7/3,5,5,5)					4
		5.00		N=16 (4,4/3,3,4,6)	5.00				5

Remarks



APPENDIX I

Laboratory Results – Environmental

EPS Ltd
7B Caxton House
Broad Street
Cambourne
Cambridgeshire
CB23 6JN



Attention :	Lee Anderson
Date :	19th March, 2021
Your reference :	UK21.5294
Our reference :	Test Report 21/3262 Batch 1
Location :	Deardens Street, Bury
Date samples received :	6th March, 2021
Status :	Final report
Issue :	1

Twelve samples were received for analysis on 6th March, 2021 of which five were scheduled for analysis. Please find attached our Test Report which should be read with notes at the end of the report and should include all sections if reproduced. Interpretations and opinions are outside the scope of any accreditation, and all results relate only to samples supplied.
All analysis is carried out on as received samples and reported on a dry weight basis unless stated otherwise. Results are not surrogate corrected.

Authorised By:



Hayley Prowse
Project Manager

Please include all sections of this report if it is reproduced

Element Materials Technology

Client Name: EPS Ltd
Reference: UK21.5294
Location: Deardens Street, Bury
Contact: Lee Anderson
EMT Job No: 21/3262

Report : Solid

Solids: V=60g VOC jar, J=250g glass jar, T=plastic tub

EMT Sample No.	1-2	5-6	12-13	14-15	20-21						Please see attached notes for all abbreviations and acronyms		
Sample ID	WS01	WS01	WS02	WS02	WS04								
Depth	0.10-0.20	2.00-2.10	1.70-1.80	4.60-4.70	0.30-0.50								
COC No / misc													
Containers	V J	V J	V J	V J	V J								
Sample Date	03/03/2021	03/03/2021	03/03/2021	03/03/2021	03/03/2021								
Sample Type	Clayey Sand	Clay	Clay	Clayey Sand	Clay								
Batch Number	1	1	1	1	1								
Date of Receipt	06/03/2021	06/03/2021	06/03/2021	06/03/2021	06/03/2021						LOD/LOR	Units	Method No.
Arsenic ^{#M}	9.3	-	-	4.3	-						<0.5	mg/kg	TM30/PM15
Cadmium ^{#M}	0.2	-	-	0.1	-						<0.1	mg/kg	TM30/PM15
Chromium ^{#M}	60.3	-	-	40.5	-						<0.5	mg/kg	TM30/PM15
Copper ^{#M}	44	-	-	13	-						<1	mg/kg	TM30/PM15
Lead ^{#M}	52	-	-	8	-						<5	mg/kg	TM30/PM15
Mercury ^{#M}	0.2	-	-	<0.1	-						<0.1	mg/kg	TM30/PM15
Nickel ^{#M}	26.6	-	-	21.2	-						<0.7	mg/kg	TM30/PM15
Selenium ^{#M}	<1	-	-	<1	-						<1	mg/kg	TM30/PM15
Total Sulphate as SO4 ^{#M}	256	-	-	<50	-						<50	mg/kg	TM50/PM29
Zinc ^{#M}	86	-	-	52	-						<5	mg/kg	TM30/PM15
Arsenic	-	-	17.0	-	16.1						<0.5	mg/kg	TM30/PM62
Cadmium	-	-	0.2	-	0.6						<0.1	mg/kg	TM30/PM62
Chromium	-	-	22.1	-	32.0						<0.5	mg/kg	TM30/PM62
Copper	-	-	49	-	84						<1	mg/kg	TM30/PM62
Lead	-	-	215	-	151						<5	mg/kg	TM30/PM62
Mercury	-	-	0.4	-	<0.1						<0.1	mg/kg	TM30/PM62
Nickel	-	-	24.1	-	26.8						<0.7	mg/kg	TM30/PM62
Selenium	-	-	<1	-	<1						<1	mg/kg	TM30/PM62
Total Sulphate as SO4	-	-	403	-	1305						<50	mg/kg	TM50/PM129
Zinc	-	-	94	-	193						<5	mg/kg	TM30/PM62
PAH MS													
Naphthalene ^{#M}	0.77 ^{AA}	-	0.83 ^{AA}	<0.04	0.24						<0.04	mg/kg	TM4/PM8
Acenaphthylene	0.93 ^{AA}	-	1.23 ^{AA}	<0.03	0.11						<0.03	mg/kg	TM4/PM8
Acenaphthene ^{#M}	2.04 ^{AA}	-	1.93 ^{AA}	<0.05	0.24						<0.05	mg/kg	TM4/PM8
Fluorene ^{#M}	1.75 ^{AA}	-	1.44 ^{AA}	<0.04	0.24						<0.04	mg/kg	TM4/PM8
Phenanthrene ^{#M}	22.08 ^{AA}	-	15.80 ^{AA}	0.08	1.85						<0.03	mg/kg	TM4/PM8
Anthracene [#]	5.99 ^{AA}	-	5.62 ^{AA}	<0.04	0.49						<0.04	mg/kg	TM4/PM8
Fluoranthene ^{#M}	39.15 ^{AA}	-	52.66 ^{AA}	0.11	3.21						<0.03	mg/kg	TM4/PM8
Pyrene [#]	30.54 ^{AA}	-	41.27 ^{AA}	0.10	2.87						<0.03	mg/kg	TM4/PM8
Benzo(a)anthracene [#]	14.85 ^{AA}	-	16.75 ^{AA}	<0.06	1.29						<0.06	mg/kg	TM4/PM8
Chrysene ^{#M}	15.56 ^{AA}	-	17.23 ^{AA}	0.06	1.48						<0.02	mg/kg	TM4/PM8
Benzo(bk)fluoranthene ^{#M}	29.75 ^{AA}	-	31.45 ^{AA}	0.08	2.85						<0.07	mg/kg	TM4/PM8
Benzo(a)pyrene [#]	15.60 ^{AA}	-	16.20 ^{AA}	<0.04	1.57						<0.04	mg/kg	TM4/PM8
Indeno(123cd)pyrene ^{#M}	10.73 ^{AA}	-	10.94 ^{AA}	<0.04	1.06						<0.04	mg/kg	TM4/PM8
Dibenzo(ah)anthracene [#]	1.76 ^{AA}	-	1.55 ^{AA}	<0.04	0.16						<0.04	mg/kg	TM4/PM8
Benzo(ghi)perylene [#]	10.64 ^{AA}	-	11.18 ^{AA}	<0.04	1.14						<0.04	mg/kg	TM4/PM8
PAH 16 Total	202.1 ^{AA}	-	226.1 ^{AA}	<0.6	18.8						<0.6	mg/kg	TM4/PM8
Benzo(b)fluoranthene	21.42 ^{AA}	-	22.64 ^{AA}	0.06	2.05						<0.05	mg/kg	TM4/PM8
Benzo(k)fluoranthene	8.33 ^{AA}	-	8.81 ^{AA}	0.02	0.80						<0.02	mg/kg	TM4/PM8
PAH Surrogate % Recovery	96 ^{AA}	-	93 ^{AA}	95	94						<0	%	TM4/PM8

Element Materials Technology

Client Name: EPS Ltd
Reference: UK21.5294
Location: Deardens Street, Bury
Contact: Lee Anderson
EMT Job No: 21/3262

Report : Solid

Solids: V=60g VOC jar, J=250g glass jar, T=plastic tub

EMT Sample No.	1-2	5-6	12-13	14-15	20-21						Please see attached notes for all abbreviations and acronyms		
Sample ID	WS01	WS01	WS02	WS02	WS04								
Depth	0.10-0.20	2.00-2.10	1.70-1.80	4.60-4.70	0.30-0.50								
COC No / misc													
Containers	V J	V J	V J	V J	V J								
Sample Date	03/03/2021	03/03/2021	03/03/2021	03/03/2021	03/03/2021								
Sample Type	Clayey Sand	Clay	Clay	Clayey Sand	Clay								
Batch Number	1	1	1	1	1								
Date of Receipt	06/03/2021	06/03/2021	06/03/2021	06/03/2021	06/03/2021						LOD/LOR	Units	Method No.
TPH CWG													
Aliphatics													
>C5-C6 (HS_1D_AL) ^{#M}	0.5 ^{SV}	-	<0.1 ^{SV}	<0.1	<0.1						<0.1	mg/kg	TM36/PM12
>C6-C8 (HS_1D_AL) ^{#M}	<0.1 ^{SV}	-	<0.1 ^{SV}	<0.1	<0.1						<0.1	mg/kg	TM36/PM12
>C8-C10 (HS_1D_AL)	6.5 ^{SV}	-	<0.1 ^{SV}	<0.1	0.2						<0.1	mg/kg	TM36/PM12
>C10-C12 (EH_CU_1D_AL) ^{#M}	<0.2	-	<0.2	<0.2	<0.2						<0.2	mg/kg	TM5/PM8/PM16
>C12-C16 (EH_CU_1D_AL) ^{#M}	<4	-	<4	<4	16						<4	mg/kg	TM5/PM8/PM16
>C16-C21 (EH_CU_1D_AL) ^{#M}	16	-	17	<7	36						<7	mg/kg	TM5/PM8/PM16
>C21-C35 (EH_CU_1D_AL) ^{#M}	151	-	93	<7	351						<7	mg/kg	TM5/PM8/PM16
>C35-C40 (EH_1D_AL)	15	-	10	<7	51						<7	mg/kg	TM5/PM8/PM16
Total aliphatics C5-40 (EH+HS_1D_AL)	189	-	120	<26	454						<26	mg/kg	TM5/PM8/PM16/PM12/PM11
Aromatics													
>C5-EC7 (HS_1D_AR) [#]	<0.1 ^{SV}	-	<0.1 ^{SV}	<0.1	<0.1						<0.1	mg/kg	TM36/PM12
>EC7-EC8 (HS_1D_AR) [#]	<0.1 ^{SV}	-	<0.1 ^{SV}	<0.1	<0.1						<0.1	mg/kg	TM36/PM12
>EC8-EC10 (HS_1D_AR) ^{#M}	<0.1 ^{SV}	-	<0.1 ^{SV}	<0.1	<0.1						<0.1	mg/kg	TM36/PM12
>EC10-EC12 (EH_CU_1D_AR) [#]	21.2	-	1.6	<0.2	<0.2						<0.2	mg/kg	TM5/PM8/PM16
>EC12-EC16 (EH_CU_1D_AR) [#]	51	-	33	<4	27						<4	mg/kg	TM5/PM8/PM16
>EC16-EC21 (EH_CU_1D_AR) [#]	488	-	232	<7	63						<7	mg/kg	TM5/PM8/PM16
>EC21-EC35 (EH_CU_1D_AR) [#]	1714	-	791	<7	435						<7	mg/kg	TM5/PM8/PM16
>EC35-EC40 (EH_1D_AR)	170	-	100	<7	100						<7	mg/kg	TM5/PM8/PM16
Total aromatics C5-40 (EH+HS_1D_AR)	2444	-	1158	<26	625						<26	mg/kg	TM5/PM8/PM16/PM12/PM11
Total aliphatics and aromatics (C5-40) (EH+HS_CU_1D_Total)	2633	-	1278	<52	1079						<52	mg/kg	TM5/PM8/PM16/PM12/PM11
MTBE [#]	<5 ^{SV}	-	<5 ^{SV}	<5	<5						<5	ug/kg	TM36/PM12
Benzene [#]	<5 ^{SV}	-	<5 ^{SV}	<5	<5						<5	ug/kg	TM36/PM12
Toluene [#]	10 ^{SV}	-	<5 ^{SV}	<5	7						<5	ug/kg	TM36/PM12
Ethylbenzene [#]	<5 ^{SV}	-	<5 ^{SV}	<5	<5						<5	ug/kg	TM36/PM12
m/p-Xylene [#]	22 ^{SV}	-	<5 ^{SV}	<5	<5						<5	ug/kg	TM36/PM12
o-Xylene [#]	37 ^{SV}	-	<5 ^{SV}	<5	<5						<5	ug/kg	TM36/PM12
Total Phenols HPLC	<0.15	-	<0.15	<0.15	<0.15						<0.15	mg/kg	TM26/PM21B
Natural Moisture Content	24.1	-	22.1	20.6	21.6						<0.1	%	PM4/PM0
Hexavalent Chromium [#]	<0.3	-	<0.3	<0.3	<0.3						<0.3	mg/kg	TM38/PM20
Sulphate as SO4 (2:1 Ext) ^{#M}	0.0092	<0.0015	-	0.0052	-						<0.0015	g/l	TM38/PM20
Sulphate as SO4 (2:1 Ext)	-	-	0.0183	-	0.0987						<0.0015	g/l	TM38/PM60
Chromium III	60.3	-	-	40.5	-						<0.5	mg/kg	NONE/NONE
Chromium III	-	-	22.1	-	32.0						<0.5	mg/kg	NONE/NONE
Total Cyanide ^{#M}	<0.5	-	1.2	<0.5	<0.5						<0.5	mg/kg	TM89/PM45
Organic Matter	6.1	-	NDP	0.4	NDP						<0.2	%	TM21/PM24
Organic Matter	-	-	NDP	-	6.4						<0.2	%	TM21/PM89

Element Materials Technology

Client Name: EPS Ltd
Reference: UK21.5294
Location: Deardens Street, Bury
Contact: Lee Anderson
EMT Job No: 21/3262

Report : Solid

Solids: V=60g VOC jar, J=250g glass jar, T=plastic tub

[illegible]

Matrix : Solid

[illegible]

Client Name: EPS Ltd
Reference: UK21.5294
Location: Deardens Street, Bury
Contact: Lee Anderson

Note:

Asbestos Screen analysis is carried out in accordance with our documented in-house methods PM042 and TM065 and HSG 248 by Stereo and Polarised Light Microscopy using Dispersion Staining Techniques and is covered by our UKAS accreditation. Detailed Gravimetric Quantification and PCOM Fibre Analysis is carried out in accordance with our documented in-house methods PM042 and TM131 and HSG 248 using Stereo and Polarised Light Microscopy and Phase Contrast Optical Microscopy (PCOM). Samples are retained for not less than 6 months from the date of analysis unless specifically requested.

Opinions, including ACM type and Asbestos level less than 0.1%, lie outside the scope of our UKAS accreditation.

Where the sample is not taken by a Element Materials Technology consultant, Element Materials Technology cannot be responsible for inaccurate or unrepresentative sampling.

EMT Job No.	Batch	Sample ID	Depth	EMT Sample No.	Date Of Analysis	Analysis	Result
21/3262	1	WS01	0.10-0.20	2	11/03/2021	General Description (Bulk Analysis)	Soil/Stones
					11/03/2021	Asbestos Fibres	NAD
					11/03/2021	Asbestos ACM	NAD
					11/03/2021	Asbestos Type	NAD
					11/03/2021	Asbestos Level Screen	NAD
21/3262	1	WS02	1.70-1.80	13	11/03/2021	General Description (Bulk Analysis)	Soil/Stones
					11/03/2021	Asbestos Fibres	Fibre Bundles
					11/03/2021	Asbestos Fibres (2)	Fibre Bundles
					11/03/2021	Asbestos ACM	NAD
					11/03/2021	Asbestos ACM (2)	NAD
					11/03/2021	Asbestos Type	Chrysotile
					11/03/2021	Asbestos Type (2)	Amosite
					11/03/2021	Asbestos Level Screen	less than 0.1%
					18/03/2021	Total ACM Gravimetric Quantification (% Asb)	<0.001 (mass %)
					18/03/2021	Total Detailed Gravimetric Quantification (% Asb)	<0.001 (mass %)
					18/03/2021	Total Gravimetric Quantification (ACM + Detailed) (% Asb)	<0.001 (mass %)
					19/03/2021	Asbestos PCOM Quantification (Fibres)	<0.001 (mass %)
					19/03/2021	Asbestos Gravimetric & PCOM Total	<0.001 (mass %)
21/3262	1	WS02	4.60-4.70	15	11/03/2021	General Description (Bulk Analysis)	Soil/Stones
					11/03/2021	Asbestos Fibres	NAD
					11/03/2021	Asbestos ACM	NAD
					11/03/2021	Asbestos Type	NAD
					11/03/2021	Asbestos Level Screen	NAD
21/3262	1	WS04	0.30-0.50	21	10/03/2021	General Description (Bulk Analysis)	soil.stones
					10/03/2021	Asbestos Fibres	NAD
					10/03/2021	Asbestos ACM	ACM Debris
					10/03/2021	Asbestos Type	Chrysotile
					10/03/2021	Asbestos Level Screen	less than 0.1%
					18/03/2021	Total ACM Gravimetric Quantification (% Asb)	<0.001 (mass %)
					18/03/2021	Total Detailed Gravimetric Quantification (% Asb)	<0.001 (mass %)
					18/03/2021	Total Gravimetric Quantification (ACM + Detailed) (% Asb)	<0.001 (mass %)
					19/03/2021	Asbestos PCOM Quantification (Fibres)	<0.001 (mass %)
					19/03/2021	Asbestos Gravimetric & PCOM Total	<0.001 (mass %)

Matrix : Solid

7 of 15

Client Name: EPS Ltd
Reference: UK21.5294
Location: Deardens Street, Bury
Contact: Lee Anderson

[illegible]

Please note that only samples that are deviating are mentioned in this report. If no samples are listed it is because none were deviating. Only analyses which are accredited are recorded as deviating if set criteria are not met.

NOTES TO ACCOMPANY ALL SCHEDULES AND REPORTS

EMT Job No.: 21/3262

SOILS

Please note we are only MCERTS accredited (UK soils only) for sand, loam and clay and any other matrix is outside our scope of accreditation.

Where an MCERTS report has been requested, you will be notified within 48 hours of any samples that have been identified as being outside our MCERTS scope. As validation has been performed on clay, sand and loam, only samples that are predominantly these matrices, or combinations of them will be within our MCERTS scope. If samples are not one of a combination of the above matrices they will not be marked as MCERTS accredited.

It is assumed that you have taken representative samples on site and require analysis on a representative subsample. Stones will generally be included unless we are requested to remove them.

All samples will be discarded one month after the date of reporting, unless we are instructed to the contrary.

If you have not already done so, please send us a purchase order if this is required by your company.

Where appropriate please make sure that our detection limits are suitable for your needs, if they are not, please notify us immediately.

All analysis is reported on a dry weight basis unless stated otherwise. Limits of detection for analyses carried out on as received samples are not moisture content corrected. Results are not surrogate corrected. Samples are dried at 35°C ±5°C unless otherwise stated. Moisture content for CEN Leachate tests are dried at 105°C ±5°C.

Where Mineral Oil or Fats, Oils and Grease is quoted, this refers to Total Aliphatics C10-C40.

Where a CEN 10:1 ZERO Headspace VOC test has been carried out, a 10:1 ratio of water to wet (as received) soil has been used.

% Asbestos in Asbestos Containing Materials (ACMs) is determined by reference to HSG 264 The Survey Guide - Appendix 2 : ACMs in buildings listed in order of ease of fibre release.

Sufficient amount of sample must be received to carry out the testing specified. Where an insufficient amount of sample has been received the testing may not meet the requirements of our accredited methods, as such accreditation may be removed.

Negative Neutralization Potential (NP) values are obtained when the volume of NaOH (0.1N) titrated (pH 8.3) is greater than the volume of HCl (1N) to reduce the pH of the sample to 2.0 - 2.5. Any negative NP values are corrected to 0.

The calculation of Pyrite content assumes that all oxidisable sulphides present in the sample are pyrite. This may not be the case. The calculation may be an overestimate when other sulphides such as Barite (Barium Sulphate) are present.

WATERS

Please note we are not a UK Drinking Water Inspectorate (DWI) Approved Laboratory .

ISO17025 accreditation applies to surface water and groundwater and usually one other matrix which is analysis specific, any other liquids are outside our scope of accreditation.

As surface waters require different sample preparation to groundwaters the laboratory must be informed of the water type when submitting samples.

Where Mineral Oil or Fats, Oils and Grease is quoted, this refers to Total Aliphatics C10-C40.

DEVIATING SAMPLES

All samples should be submitted to the laboratory in suitable containers with sufficient ice packs to sustain an appropriate temperature for the requested analysis. The temperature of sample receipt is recorded on the confirmation schedules in order that the client can make an informed decision as to whether testing should still be undertaken.

SURROGATES

Surrogate compounds are added during the preparation process to monitor recovery of analytes. However low recovery in soils is often due to peat, clay or other organic rich matrices. For waters this can be due to oxidants, surfactants, organic rich sediments or remediation fluids. Acceptable limits for most organic methods are 70 - 130% and for VOCs are 50 - 150%. When surrogate recoveries are outside the performance criteria but the associated AQC passes this is assumed to be due to matrix effect. Results are not surrogate corrected.

DILUTIONS

A dilution suffix indicates a dilution has been performed and the reported result takes this into account. No further calculation is required.

BLANKS

Where analytes have been found in the blank, the sample will be treated in accordance with our laboratory procedure for dealing with contaminated blanks.

NOTE

Data is only reported if the laboratory is confident that the data is a true reflection of the samples analysed. Data is only reported as accredited when all the requirements of our Quality System have been met. In certain circumstances where all the requirements of the Quality System have not been met, for instance if the associated AQC has failed, the reason is fully investigated and documented. The sample data is then evaluated alongside the other quality control checks performed during analysis to determine its suitability. Following this evaluation, provided the sample results have not been effected, the data is reported but accreditation is removed. It is a UKAS requirement for data not reported as accredited to be considered indicative only, but this does not mean the data is not valid.

Where possible, and if requested, samples will be re-extracted and a revised report issued with accredited results. Please do not hesitate to contact the laboratory if further details are required of the circumstances which have led to the removal of accreditation.

REPORTS FROM THE SOUTH AFRICA LABORATORY

Any method number not prefixed with SA has been undertaken in our UK laboratory unless reported as subcontracted.

Measurement Uncertainty

Measurement uncertainty defines the range of values that could reasonably be attributed to the measured quantity. This range of values has not been included within the reported results. Uncertainty expressed as a percentage can be provided upon request.

ABBREVIATIONS and ACRONYMS USED

#	ISO17025 (UKAS Ref No. 4225) accredited - UK.
SA	ISO17025 (SANAS Ref No.T0729) accredited - South Africa
B	Indicates analyte found in associated method blank.
DR	Dilution required.
M	MCERTS accredited.
NA	Not applicable
NAD	No Asbestos Detected.
ND	None Detected (usually refers to VOC and/SVOC TICs).
NDP	No Determination Possible
SS	Calibrated against a single substance
SV	Surrogate recovery outside performance criteria. This may be due to a matrix effect.
W	Results expressed on as received basis.
+	AQC failure, accreditation has been removed from this result, if appropriate, see 'Note' on previous page.
>>	Results above calibration range, the result should be considered the minimum value. The actual result could be significantly higher, this result is not accredited.
*	Analysis subcontracted to an Element Materials Technology approved laboratory.
AD	Samples are dried at 35°C ±5°C
CO	Suspected carry over
LOD/LOR	Limit of Detection (Limit of Reporting) in line with ISO 17025 and MCERTS
ME	Matrix Effect
NFD	No Fibres Detected
BS	AQC Sample
LB	Blank Sample
N	Client Sample
TB	Trip Blank Sample
OC	Outside Calibration Range

AA	x5 Dilution
----	-------------

HWOL ACRONYMS AND OPERATORS USED

HS	Headspace Analysis.
EH	Extractable Hydrocarbons - i.e. everything extracted by the solvent.
CU	Clean-up - e.g. by florisil, silica gel.
1D	GC - Single coil gas chromatography.
Total	Aliphatics & Aromatics.
AL	Aliphatics only.
AR	Aromatics only.
2D	GC-GC - Double coil gas chromatography.
#1	EH_Total but with humics extracted.
#2	EU_Total but with fatty acids extracted.
_	Operator - underscore to separate acronyms (exception for +).
+	Operator to indicate cumulative e.g. EH+HS_Total or EH_CU+HS_Total
MS	Mass Spectrometry.

EMT Job No: 21/3262

Test Method No.	Description	Prep Method No. (if appropriate)	Description	ISO 17025 (UKAS/ANAS)	MCERTS (UK soils only)	Analysis done on As Received (AR) or Dried (AD)	Reported on dry weight basis
PM4	Gravimetric measurement of Natural Moisture Content and % Moisture Content at either 35°C or 105°C. Calculation based on ISO 11465:1993(E) and BS1377-2:1990.	PM0	No preparation is required.			AR	
TM4	Modified USEPA 8270D v5:2014 method for the solvent extraction and determination of PAHs by GC-MS.	PM8	End over end extraction of solid samples for organic analysis. The solvent mix varies depending on analysis required.			AR	Yes
TM4	Modified USEPA 8270D v5:2014 method for the solvent extraction and determination of PAHs by GC-MS.	PM8	End over end extraction of solid samples for organic analysis. The solvent mix varies depending on analysis required.	Yes		AR	Yes
TM4	Modified USEPA 8270D v5:2014 method for the solvent extraction and determination of PAHs by GC-MS.	PM8	End over end extraction of solid samples for organic analysis. The solvent mix varies depending on analysis required.	Yes	Yes	AR	Yes
TM5	Modified 8015B v2:1996 method for the determination of solvent Extractable Petroleum Hydrocarbons (EPH) within the range C8-C40 by GCFID. For waters the solvent extracts dissolved phase plus a sheen if present.	PM16	Fractionation into aliphatic and aromatic fractions using a Rapid Trace SPE.			AR	
TM5	Modified 8015B v2:1996 method for the determination of solvent Extractable Petroleum Hydrocarbons (EPH) within the range C8-C40 by GCFID. For waters the solvent extracts dissolved phase plus a sheen if present.	PM8/PM16	End over end extraction of solid samples for organic analysis. The solvent mix varies depending on analysis required/Fractionation into aliphatic and aromatic fractions using a Rapid Trace SPE.			AR	Yes
TM5	Modified 8015B v2:1996 method for the determination of solvent Extractable Petroleum Hydrocarbons (EPH) within the range C8-C40 by GCFID. For waters the solvent extracts dissolved phase plus a sheen if present.	PM8/PM16	End over end extraction of solid samples for organic analysis. The solvent mix varies depending on analysis required/Fractionation into aliphatic and aromatic fractions using a Rapid Trace SPE.	Yes		AR	Yes
TM5	Modified 8015B v2:1996 method for the determination of solvent Extractable Petroleum Hydrocarbons (EPH) within the range C8-C40 by GCFID. For waters the solvent extracts dissolved phase plus a sheen if present.	PM8/PM16	End over end extraction of solid samples for organic analysis. The solvent mix varies depending on analysis required/Fractionation into aliphatic and aromatic fractions using a Rapid Trace SPE.	Yes	Yes	AR	Yes
TM5/TM36	please refer to TM5 and TM36 for method details	PM8/PM12/PM16	please refer to PM8/PM16 and PM12 for method details			AR	Yes
PM13	A visual examination of the solid sample is carried out to ascertain sample make up, colour and any other inclusions. This is not a geotechnical description.	PM0	No preparation is required.			AR	No

EMT Job No: 21/3262

Test Method No.	Description	Prep Method No. (if appropriate)	Description	ISO 17025 (UKAS/ANAS)	MCERTS (UK soils only)	Analysis done on As Received (AR) or Dried (AD)	Reported on dry weight basis
TM21	Modified BS 7755-3:1995, ISO10694:1995 Determination of Total Organic Carbon or Total Carbon by combustion in an Eltra TOC furnace/analyser in the presence of oxygen. The CO ₂ generated is quantified using infra-red detection. Organic Matter (SOM) calculated as per EA MCERTS Chemical Testing of Soil, March 2012 v4.	PM24	Dried and ground solid samples are washed with hydrochloric acid, then rinsed with deionised water to remove the mineral carbon before TOC analysis.			AD	Yes
TM21	Modified BS 7755-3:1995, ISO10694:1995 Determination of Total Organic Carbon or Total Carbon by combustion in an Eltra TOC furnace/analyser in the presence of oxygen. The CO ₂ generated is quantified using infra-red detection. Organic Matter (SOM) calculated as per EA MCERTS Chemical Testing of Soil, March 2012 v4.	PM89	Preparation of positive asbestos samples for Eltra analysis			AD	Yes
TM26	Determination of phenols by Reversed Phased High Performance Liquid Chromatography and Electro-Chemical Detection.	PM21B	As Received samples are extracted in Methanol: Water (60:40) by reciprocal shaker.			AR	Yes
TM30	Determination of Trace Metals by ICP-OES (Inductively Coupled Plasma – Optical Emission Spectrometry); WATERS by Modified USEPA Method 200.7, Rev. 4.4, 1994; Modified EPA Method 6010B, Rev.2, Dec 1996; Modified BS EN ISO 11885:2009: SOILS by Modified USEP	PM15	Acid digestion of dried and ground solid samples using Aqua Regia refluxed at 112.5 °C. Samples containing asbestos are not dried and ground.	Yes	Yes	AD	Yes
TM30	Determination of Trace Metals by ICP-OES (Inductively Coupled Plasma – Optical Emission Spectrometry); WATERS by Modified USEPA Method 200.7, Rev. 4.4, 1994; Modified EPA Method 6010B, Rev.2, Dec 1996; Modified BS EN ISO 11885:2009: SOILS by Modified USEP	PM62	Acid digestion of as received solid samples using Aqua Regia refluxed at 112.5 °C.			AR	Yes
TM36	Modified US EPA method 8015B v2:1996. Determination of Gasoline Range Organics (GRO) in the carbon chain range of C4-12 by headspace GC-FID. MTBE by GC/FID co-elutes with 3-methylpentane if present and therefore can give a false positive. Positive MTBE results will be re-run using GC-MS to double check, when requested.	PM12	Modified US EPA method 5021A v2:2014. Preparation of solid and liquid samples for GC headspace analysis.			AR	Yes
TM36	Modified US EPA method 8015B v2:1996. Determination of Gasoline Range Organics (GRO) in the carbon chain range of C4-12 by headspace GC-FID. MTBE by GC/FID co-elutes with 3-methylpentane if present and therefore can give a false positive. Positive MTBE results will be re-run using GC-MS to double check, when requested.	PM12	Modified US EPA method 5021A v2:2014. Preparation of solid and liquid samples for GC headspace analysis.	Yes		AR	Yes
TM36	Modified US EPA method 8015B v2:1996. Determination of Gasoline Range Organics (GRO) in the carbon chain range of C4-12 by headspace GC-FID. MTBE by GC/FID co-elutes with 3-methylpentane if present and therefore can give a false positive. Positive MTBE results will be re-run using GC-MS to double check, when requested.	PM12	Modified US EPA method 5021A v2:2014. Preparation of solid and liquid samples for GC headspace analysis.	Yes	Yes	AR	Yes
TM38	Soluble Ion analysis using Discrete Analyser. Modified US EPA methods: Chloride 325.2 (1978), Sulphate 375.4 (Rev.2 1993), o-Phosphate 365.2 (Rev.2 1993), TON 353.1 (Rev.2 1993), Nitrite 354.1 (1971), Hex Cr 7196A (1992), NH ₄ + 350.1 (Rev.2 1993) – All anions comparable to BS ISO 15923-1: 2013I	PM20	Extraction of dried and ground or as received samples with deionised water in a 2:1 water to solid ratio using a reciprocal shaker for all analytes except hexavalent chromium. Extraction of as received sample using 10:1 ratio of 0.2M sodium hydroxide to soil for hexavalent chromium using a reciprocal shaker.	Yes	Yes	AD	Yes
TM38	Soluble Ion analysis using Discrete Analyser. Modified US EPA methods: Chloride 325.2 (1978), Sulphate 375.4 (Rev.2 1993), o-Phosphate 365.2 (Rev.2 1993), TON 353.1 (Rev.2 1993), Nitrite 354.1 (1971), Hex Cr 7196A (1992), NH ₄ + 350.1 (Rev.2 1993) – All anions comparable to BS ISO 15923-1: 2013I	PM20	Extraction of dried and ground or as received samples with deionised water in a 2:1 water to solid ratio using a reciprocal shaker for all analytes except hexavalent chromium. Extraction of as received sample using 10:1 ratio of 0.2M sodium hydroxide to soil for hexavalent chromium using a reciprocal shaker.	Yes		AR	Yes

EMT Job No: 21/3262

Test Method No.	Description	Prep Method No. (if appropriate)	Description	ISO 17025 (UKAS/ANAS)	MCERTS (UK soils only)	Analysis done on As Received (AR) or Dried (AD)	Reported on dry weight basis
TM38	Soluble Ion analysis using Discrete Analyser. Modified US EPA methods: Chloride 325.2 (1978), Sulphate 375.4 (Rev.2 1993), o-Phosphate 365.2 (Rev.2 1993), TON 353.1 (Rev.2 1993), Nitrite 354.1 (1971), Hex Cr 7196A (1992), NH4+ 350.1 (Rev.2 1993) – All anions comparable to BS ISO 15923-1: 2013I	PM60	As received solid samples are extracted with deionised water in a 2:1 ratio of water to solid.			AR	Yes
TM50	Acid soluble sulphate (Total Sulphate) analysed by ICP-OES	PM129	A hot hydrochloric acid digest is performed on an as received sample, and the resulting liquor is analysed.			AR	Yes
TM50	Acid soluble sulphate (Total Sulphate) analysed by ICP-OES	PM29	A hot hydrochloric acid digest is performed on a dried and ground sample, and the resulting liquor is analysed.	Yes	Yes	AD	Yes
TM65	Asbestos Bulk Identification method based on HSG 248 First edition (2006)	PM42	Modified SCA Blue Book V.12 draft 2017 and WM3 1st Edition v1.1:2018. Solid samples undergo a thorough visual inspection for asbestos fibres prior to asbestos identification using TM065.	Yes		AR	
TM73	Modified US EPA methods 150.1 (1982) and 9045D Rev. 4 - 2004) and BS1377-3:1990. Determination of pH by Metrohm automated probe analyser.	PM11	Extraction of as received solid samples using one part solid to 2.5 parts deionised water.	Yes	Yes	AR	No
TM89	Modified USEPA method OIA-1667 (1999). Determination of cyanide by Flow Injection Analyser. Where WAD cyanides are required a Ligand displacement step is carried out before analysis.	PM45	As received solid samples are extracted with 1M NaOH by orbital shaker for Cyanide, Sulphide and Thiocyanate analysis.	Yes	Yes	AR	Yes
TM131	Quantification of Asbestos Fibres and ACM based on HSG248 First edition:2006, HSG 264 Second edition:2012, HSE Contract Research Report No.83/1996, MDHS 87:1998, WM3 1st Edition v1.1:2018	PM42	Modified SCA Blue Book V.12 draft 2017 and WM3 1st Edition v1.1:2018. Solid samples undergo a thorough visual inspection for asbestos fibres prior to asbestos identification using TM065.	Yes		AR	Yes
NONE	No Method Code	NONE	No Method Code			AD	Yes
NONE	No Method Code	NONE	No Method Code			AR	Yes

APPENDIX J

Laboratory Results – Geotechnical



LABORATORY REPORT



4043

Contract Number: PSL21/2005

Report Date: 01 April 2021
Client's Reference: UK21.5294
Client Name: EP Strategies
7B Caxton House
Broad Street
Cambourne
Cambridgeshire
CB23 6JN

For the attention of: Lee Anderson

Contract Title: Drearden's Street, Bury
Date Received: 10/3/2021
Date Commenced: 10/3/2021
Date Completed: 1/4/2021

Notes: Opinions and Interpretations are outside the UKAS Accreditation

A copy of the Laboratory Schedule of accredited tests as issued by UKAS is attached to this report. This certificate is issued in accordance with the accreditation requirements of the United Kingdom Accreditation Service. The results reported herein relate only to the material supplied to the laboratory. This certificate shall not be reproduced other than in full, without the prior written approval of the laboratory.

Checked and Approved Signatories:

A Watkins
(Director)

R Berriman
(Quality Manager)

S Royle
(Laboratory Manager)

L Knight
(Senior Technician)

S Eyre
(Senior Technician)


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Page 1 of

SUMMARY OF LABORATORY SOIL DESCRIPTIONS

[illegible]

4043

PSL
Professional Soils Laboratory

Drearden's Street, Bury

Contract No:**PSL21/2005**

Client Ref:

UK21.5294

SUMMARY OF SOIL CLASSIFICATION TESTS

(BS1377 : PART 2 : 1990)

[illegible]

SYMBOLS : NP : Non Plastic

*** : Liquid Limit and Plastic Limit Wet Sieved.**



4043

PSL
Professional Soils Laboratory

Drearden's Street, Bury

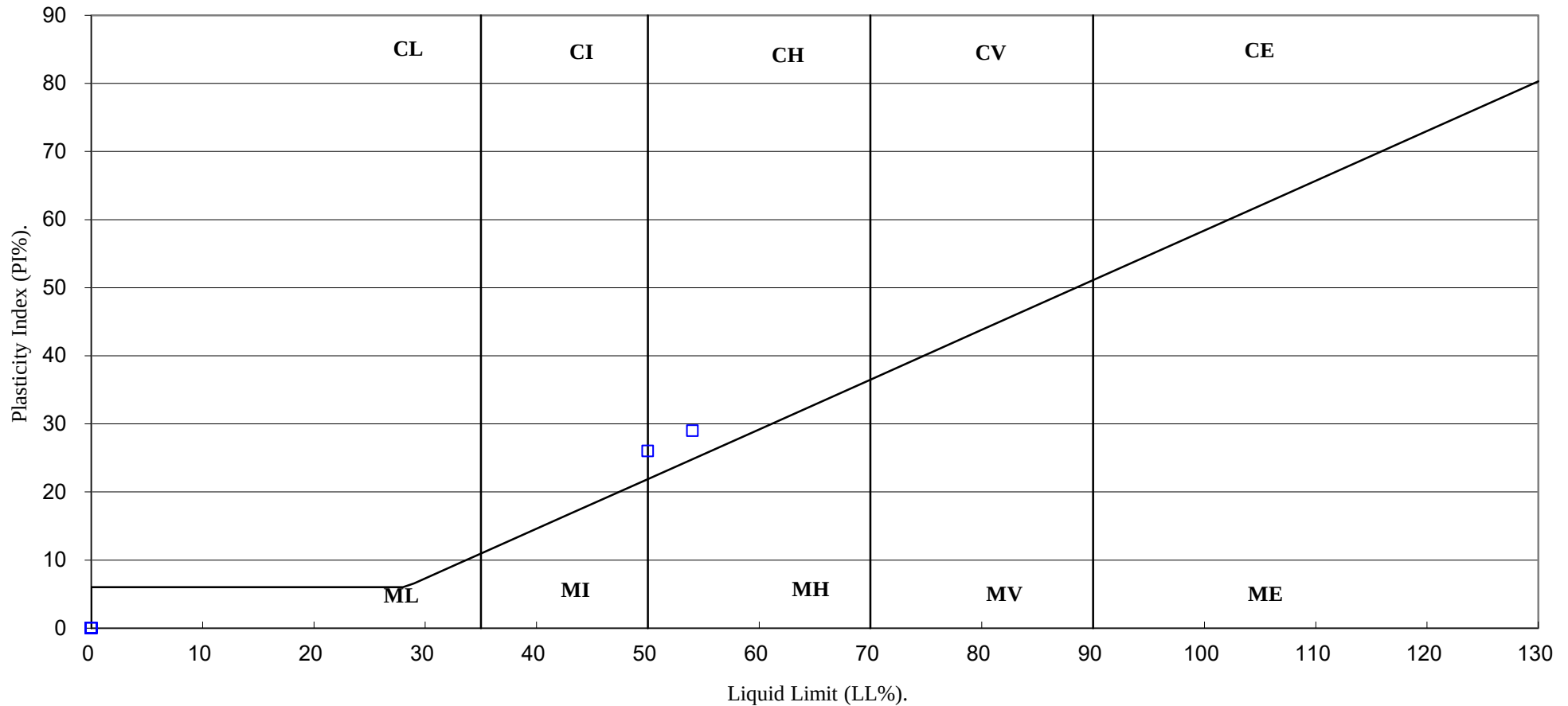
Contract No:

PSL21/2005

Client Ref:

UK21.5294

PLASTICITY CHART FOR CASAGRANDE CLASSIFICATION.



4043

PSL
Professional Soils Laboratory

Drearden's Street, Bury

Contract No:

PSL21/2005

Client Ref:

UK21.5294

PARTICLE SIZE DISTRIBUTION TEST

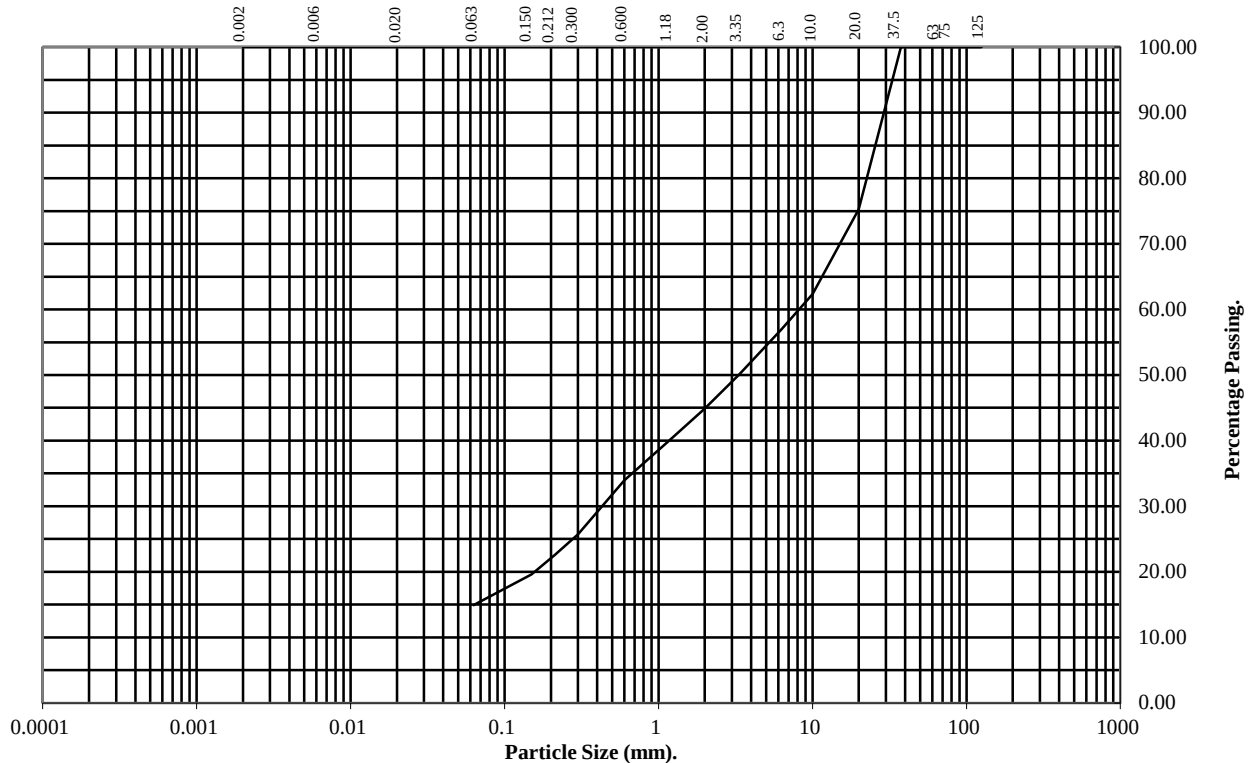
BS1377 : Part 2 : 1990

Wet Sieve, Clause 9.2

Hole Number: WS01 Top Depth (m): 2.70

Sample Number: 1 Base Depth(m): 3.10

Sample Type: B



BS Test Sieve (mm)	Percentage Passing
125	100
75	100
63	100
37.5	100
20	75
10	62
6.3	57
3.35	50
2	45
1.18	40
0.6	34
0.3	26
0.212	23
0.15	20
0.063	15

Soil Fraction	Total Percentage
Cobbles	0
Gravel	55
Sand	30
Silt/Clay	15

Remarks:

See Summary of Soil Descriptions



PSL
Professional Soils Laboratory

Drearden's Street, Bury

Contract No:
PSL21/2005
Client Ref:
UK21.5294

PARTICLE SIZE DISTRIBUTION TEST

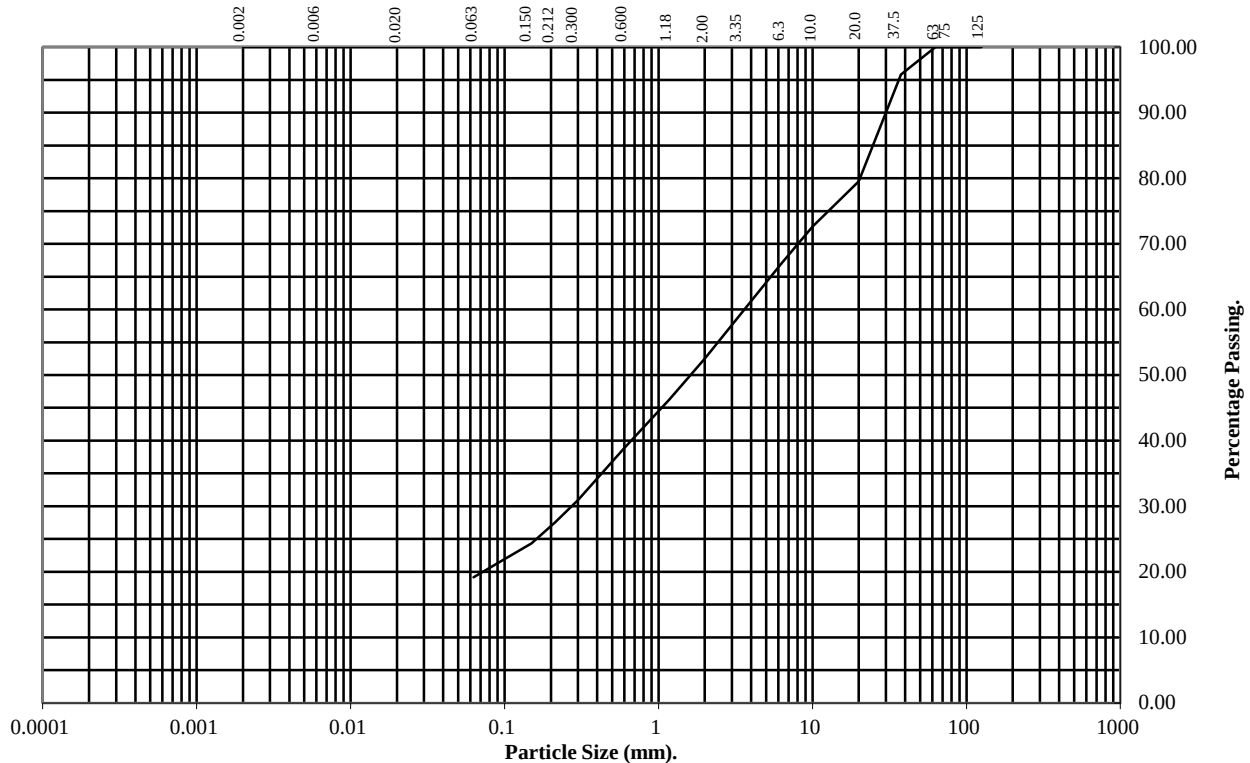
BS1377 : Part 2 : 1990

Wet Sieve, Clause 9.2

Hole Number: WS02 Top Depth (m): 3.00

Sample Number: 1 Base Depth(m): 4.00

Sample Type: B



BS Test Sieve (mm)	Percentage Passing
125	100
75	100
63	100
37.5	96
20	80
10	73
6.3	67
3.35	59
2	52
1.18	46
0.6	39
0.3	31
0.212	27
0.15	24
0.063	19

Soil Fraction	Total Percentage
Cobbles	0
Gravel	48
Sand	33
Silt/Clay	19

Remarks:

See Summary of Soil Descriptions



PSL
Professional Soils Laboratory

Drearden's Street, Bury

Contract No:
PSL21/2005
Client Ref:
UK21.5294

APPENDIX K

Generic Screening Criteria



EPS Generic Quantitative Risk Assessment

Generic Screening Criteria (C4SLs) - All Land Uses

	Soil Targets					
Contaminant	Residential		Allotments	Commercial	Public Open Spaces	
	With Home Grown Produce	Without Home Grown Produce			Residential	Parks
Unit	mg/kg					
Arsenic	37	40	49	640	79	168
Benzene	0.87	3.3	0.18	98	140	230
Benzo(a)pyrene	5	5.3	5.7	76	10	21
Cadmium	26	149	4.9	410	220	880
Chromium (VI)	21	21	170	49	23	250
Lead	200	310	80	2330	630	1300

Notes:

Targets for Human Health have been taken from the publicly available Category 4 Screening Levels (C4SLs) for assessment of land affected by contamination issued by DEFRA in December 2013.

Within the modelling for C4SLs, a Soil Organic Matter content of 6% has been used. Reference to site-specific data should be made where possible. EPS have carried out a sensitivity analysis in-house and the contaminant benzene is the current C4SL most susceptible to changes in SOM and therefore any risk assessment for this compound must account for this aspect.

EPS Generic Quantitative Risk Assessment - Residential Land Use

Contaminant	Soil Targets			Groundwater Targets	
	Human Health	Controlled Waters		Controlled Waters	
		LGWRP	HGWRP	LGWRP	HGWRP
Unit		mg/kg		ug/l	
Arsenic	See C4SL	n/c	n/c	50	10
Cadmium	See C4SL	n/c	n/c	5	5
Chromium III	910	n/c	n/c	250	50
Chromium VI	See C4SL	n/c	n/c	n/c	n/c
Copper	2400	n/c	n/c	28	28
Mercury (elemental)	1.2	n/c	n/c	1	1
Nickel	180	n/c	n/c	200	50
Lead	See C4SL	n/c	n/c	250	10
Selenium	250	n/c	n/c	10	10
Zinc	3700	n/c	n/c	500	500
Benzene	See C4SL	0.252	0.008	30	1
Toluene	130	1.17	1.17	50	50
Ethylbenzene	47	15.0	10.0	300	200
Xylene (para)	56	0.885	0.885	30	30
MTBE#	49	0.138	0.0276	75	15
Benzo(a)Pyrene	See C4SL	10	1.44	0.7	0.1
Naphthalene	2.3	0.934	0.02	10	0.1
Dibenz(ah)anthracene	0.24	n/c	n/c	n/c	n/c
Aliphatic C5-C6	42	5.27	1.05	50	10
Aliphatic C6-C8	100	23.2	4.64	50	10
Aliphatic C8-C10	27	175	35.1	50	10
Aliphatic C10-C12	130(48)*	1380	276	50	10
Aliphatic C12-C16	1100(8.48)**	27500	5490	50	10
Aliphatic C16-C35	65000 (8.48)**	3.46E+06	6.91E+05	50	10
Aromatic C8-C10	34	8.74	1.75	50	10
Aromatic C10-C12	74	13.8	2.76	50	10
Aromatic C12-C16	140	27.5	5.5	50	10
Aromatic C16-C21	260	86.9	17.4	50	10
Aromatic C21-C35	1100	690	138	50	10

Notes:

LGWRP - Low Groundwater Resource Potential

HGWRP - High Groundwater Resource Potential

f = Oral, dermal and inhalation exposure compared with oral HCV N/C = Not Calculated

* = S4UL exceeds vapour saturation limit (in brackets)

** = S4UL exceeds solubility saturation limit (in brackets)

Soil Targets

Targets for Human Health have been taken from S4ULs 'Suitable For Use Levels for Human Health Risk Assessment' – LQM and CIEH (2014) derived using standard sandy loam soil with 1% SOM, except (#) = EIC/AGS/CL:AIRE GAC 'Soil Generic Assessment Criteria' (2010). For sites where ground conditions differ significantly from sandy loam or site-specific SOM and pH are available, the generic human health targets may be revised.

Targets for Controlled waters have been derived using EA Remedial Targets Worksheet (v3.1) - using standard Sandy Loam ground conditions as described in Science Report SC050021/SR3, assuming no degradation for a 10m compliance distance with criteria of EQS or UKDWS for LGWRP and HGWRP respectively (see notes for GW targets).

Groundwater Targets

For LGWRP, targets have been taken as Freshwater EQS where available. For Ethylbenzene and BaP the WHO Health limit has been used and for MTBE and individual TPH fractions a 5 times multiplier of taste threshold and UKDWS has been taken respectively.

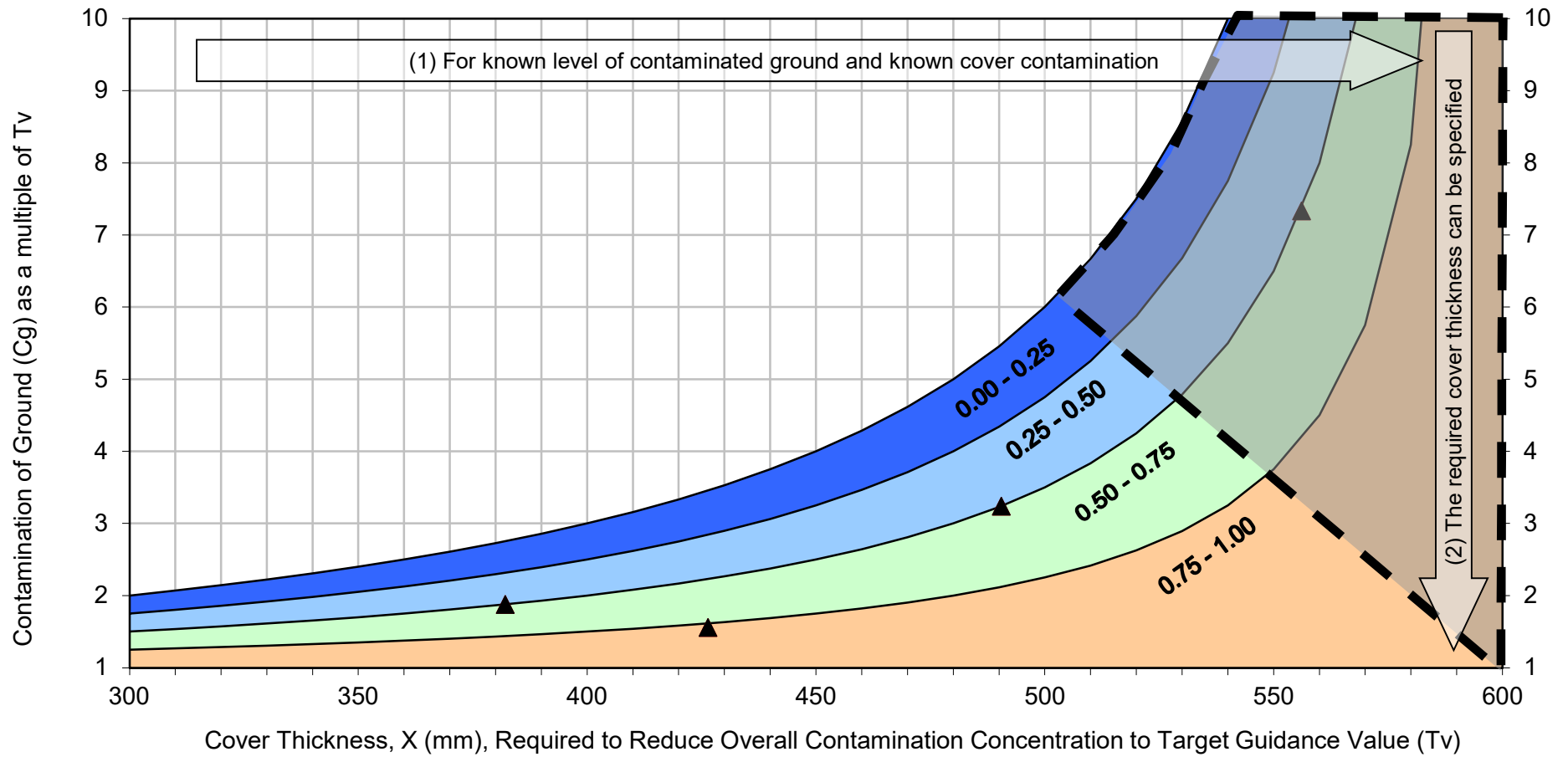
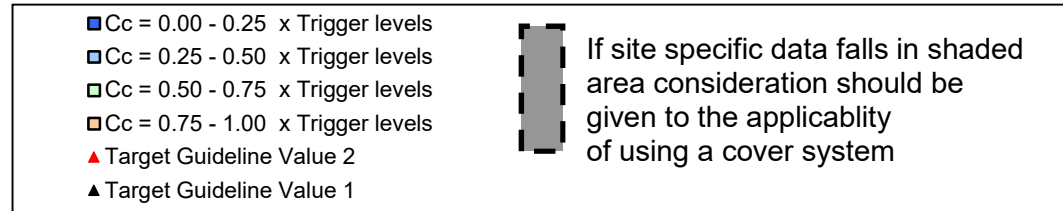
For HGWRP, targets have been taken as UKDWS where available, with the exception of Copper and Zinc where the EQS is lower than the DWS and therefore the EQS has been used as the groundwater target. For Ethylbenzene the upper WHO ATO limit has been used. For Toluene and Xylene, the WHO ATO limit is higher than the EQS and so the lower value has been taken. For MTBE the taste threshold has been taken.

Work carried out to calculate generic screening criteria for concentrations of contaminant in groundwater with respect of risks to Human Health has generally found that criteria far exceed (by at least 2 orders of magnitude) those listed for the protection of either LGWRP and HGWRP receptors. On this basis, the above Groundwater criteria are also considered protective of human health and further evaluation of these risks should be considered alongside any detailed quantitative risk assessments carried out for groundwater on a site specific basis.

APPENDIX L

Cover System Calculator

Design Chart



APPENDIX M

Cover Soils Checklist



ADVISORY NOTE

SOILS FOR USE IN COVER SYSTEMS

This assessment has recommended a control measure in the form of a defined thickness of clean soil to be used in gardens and soft landscaped areas in order to reduce risks from underlying contamination (a 'cover system'). The thickness presented is what EPS consider sufficient provided the soil forming the cover system is good quality, as it is assumed that over time this soil will become intermixed with the underlying soils and therefore needs to have the necessary 'diluting' effect. The aim being that an acceptable reduction in exposure to contamination is achieved, rather than absolute prevention.

These simple cover systems are designed in general accordance with the BRE 2004 guidance '*Cover Systems for Land Regeneration, Thickness of Cover Systems for Contaminated Land*'. In many cases guidance from the relevant Local Planning Authority or NHBC/Approved Inspector may also apply and need to be taken into account. In most cases, to design the cover system EPS have to assume a certain quality of cover soils in advance. In these circumstances, we utilise what we consider to represent 'good quality soil' in that the soil could never be considered 'contaminated' but is also pragmatic and does not represent an unrealistic or unsustainable objective for much of the soils in the UK. In numerical terms, this standard typically equates to around 25% of the adopted screening value in the risk assessment.

For the cover system itself, EPS would usually carry out a verification process of your site to demonstrate the control measure has been implemented as intended to satisfy all interested parties such as planning authorities, the NHBC and the future property owner. To document this process, EPS will prepare a Verification Report. If you wish for EPS to do this, we will need the following points confirmed relating to the soils preferably before they are installed in gardens.

If there are any queries, please contact EPS before purchasing any soil.

EPS Contact Details:

Tel: 01954 710666

Email: info@epstrategies.co.uk



Pre-Verification Cover System Checklist		Yes?
Soil Source	The soil must not be a waste. Please confirm that the soil is not a waste and has never been deemed as such in the past.	
	Has the source of the soil been provided?	
	Have all the delivery notes confirming the source, volume and type of soil been provided for all that is to be used?	
Soil Quality	The soils are free of invasive plant species such as Japanese Knotweed, and have not been sourced from an affected area?	
	Do the soils look clean and of a high quality? I.e. the soil must not have an odour or contain any visual evidence of contamination, including oils, asbestos, glass, plastic, rubble, metal, ash, tarmac/bitumen?	
	Testing to 'BS 3882:2015 <i>Specification for topsoil and requirements for use</i> ' is preferable but generally not essential for public health regulation, provided you can confirm the soils comply with the above points, are suitable for their intended purpose and will provide an adequate growing medium?	
	Has the soil been chemically tested prior to it arriving at site? Any soil test results presented to EPS by a third party must be current and clearly relate to the soil used, i.e. the testing must generally be dated within 6 weeks of delivery. The quantity of testing will be dependent on how much confidence is generated in the quality of the material, as well any specific local regulatory requirements. If the soil is clean soil from an established source such as British Sugar, the testing they provide at source may be sufficient alone. For other soils, EPS can advise on the likely testing frequencies but as a rule of thumb, anticipate at least one sample per plot. The testing would usually comprise the following: Heavy Metals, Poly Aromatic Hydrocarbons, Asbestos and Total Petroleum Hydrocarbons at an accredited lab. If adequate testing has not been completed, then EPS will need to test it from stockpiles prior to installation.	
Cover Thickness	Are all excavations ready which will allow the necessary thickness of cover soils to be installed?	
	If yes, can you provide waste transfer documentation for any excavated soils?	

APPENDIX N

Method Statement for Encountering Unexpected Contamination



METHOD STATEMENT

ACTIONS TO BE TAKEN IN THE EVENT OF DISCOVERING UNEXPECTED CONTAMINATION DURING INTRUSIVE GROUNDWORKS

If at any point during intrusive groundworks at a site, evidence of unforeseen contamination is encountered in the form of significant noxious odours, discolouration, or instability within soils or sheen/ discolouration in groundwater, the following actions will be taken:

- Intrusive works in the immediate area of the impacted ground will be suspended and the continuation of work in other areas of the site will be considered within the context of the site specific health & safety plan.
- Environmental Protection Strategies Ltd (EPS) will be contacted and appraised of the situation so that arrangements can be made to characterise the impact and determine what action may be necessary in addition to the scheduled site works. Where possible / health & safety plan permits, digital photographs of the impacted ground will be taken and emailed to EPS at the address below to assist in the initial assessment
- It may well be necessary for EPS to attend site to undertake visual inspection and obtain samples for field and/or laboratory analysis, although the actions taken will be dependent on the nature of what is encountered
- In cases where EPS consider the unforeseen contamination likely to pose a significant risk of significant harm to adjacent site users or local environmental receptors, the local authority and the Environment Agency will be informed of the situation and the actions being taken
- Once appropriate action has been agreed and undertaken, a written summary will be produced by EPS for submission to the Local Authority, (and where relevant, the Environment Agency) in accordance with planning requirements. The submission will include details of work undertaken, analytical results of investigative and validation samples obtained and conclusions and recommendations for any further actions considered necessary
- Where regulatory bodies have been involved, site works should only recommence following their agreement and in all cases should only recommence when the site manager considers it safe to do so within the context of the site specific health & safety plan.

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Will Evans	Director	Tel: 0781 253 9655
Steve Bullock	Director	Tel: 0786 694 9221

Email: info@epstrategies.co.uk (Automatically forwarded to the above and office-based personnel)



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