

GEO-ENVIRONMENTAL AUDIT

PHASE 1 Preliminary Risk Assessment

PHASE 2 Site Investigations

PHASE 3 Remediation Statement

Former Dexine Mill

Spotland Road

Rochdale

OL12 0AU

Author: Daniel Slattery
Client: Hallmark Developments.
Reference: rep-tjba-hallmark-dexine-Phs 1+2+3
Env-080415.docx

Revision	Date	Reason
0	April 2015	Original.
1	April 2018	Update for new planning application.
2	May 2019	Update for new planning application.
3	May 2019	Minor amendments to report.
4	July 2019	Amendment to planning layout.
5	Oct 2020	Updated for new planning application & latest SI info.
6	Nov 2020	Updated with 26.11.20 SI.
7	Nov 2021	Update re RMBC & EA env comments, water samples & residential plots.
8	Jul 2022	Incorporate office block proposals fronting Spotland Road.

T J Booth Associates.
20A Eastgate St,
Rochdale,
Lancs,
OL16 1DH.
Tel: 01706 868288.
Email: office@tjba.co.uk

GEO-ENVIRONMENTAL AUDIT

Former Dexine Mill

Spotland Road

Rochdale

OL12 0AU

CONTENTS:

1.	Phase 1 – Preliminary Risk Assessment	4
1.1.	Introduction	4
1.2.	Proposed Development.....	4
1.3.	Historic Maps.....	4
1.4.	Present Day Maps	5
1.5.	Geology	5
1.6.	Boreholes Records.....	5
1.7.	Landmark Environmental Data.....	6
1.8.	BGS/HPA.....	7
1.9.	Environment Agency Data.....	7
1.10.	Coal Authority Data	7
1.11.	Local knowledge & Planning Search/LPA Records	7
1.12.	Industry Profiles.....	8
1.13.	Site Reconnaissance - Pre-development - April 2015.....	9
1.14.	Post demolition Reconnaissance - October 2020	10
1.15.	New Office Block Reconnaissance – August 2022	11
1.16.	Identification of Source-Pathway-Receptor.	11
1.17.	Preliminary Conceptual Model.....	13
2.	Phase 2 - Site Investigations	14
2.1.	Summary.	14
2.2.	Site Investigation (Soil Sampling) 15.11.2018.	14
2.3.	Site Investigation (Trial Holes) 22.05.2020.	14
2.4.	Site Investigation (Trial Hole) 03.07.2020.....	15
2.5.	Site Investigations (Geotechnical Boreholes) 11.08.2020.	15
2.6.	Site Investigation (Trial Holes) 26.11.2020.	15
2.7.	Site Investigation (Water Samples) 09.09.2021.....	16
2.8.	Environmental Site Risk Summary.....	17
2.9.	Final Conceptual Model.	18
3.	Phase 3 - Remediation Strategy.	19
3.1.	Contamination Risk:	19
3.2.	Gas Risk:.....	19
3.3.	Verification (Phase 4 requirements)	20
3.4.	Additional Notes:.....	20
4.	References.	22
5.	Appendix A: Photos & Figures.	23
5.1.	Location Plan.	23
5.2.	Proposed Plans (Overall Site Planning Permission 2021).	24
5.3.	Proposed Plans (New Office Block 2022).	25
5.4.	Pre-development Site Photos 2015.	27
5.5.	Site Photos October 2020.	29
5.6.	Site Photos August 2021.....	32

5.7.	Site Photos August 2022.....	33
5.8.	Site Reconnaissance (Pre-development) Sketch April 2015.....	34
5.9.	Site Reconnaissance (Post-demolition) Sketch October 2020.....	35
5.10.	Proposed Development.....	36
5.11.	Site Investigation Plan.....	37
5.12.	Borehole Logs.....	38
5.13.	Soil Sampling Analysis – 15.11.18.....	40
5.14.	Soil Sampling Analysis – 26.11.20.....	41
5.15.	Soil Sampling Analysis – 09.09.21.....	42
6.	Appendix B: Maps.....	43
6.1.	Ordnance Survey c1844.....	43
6.2.	Ordnance Survey c1890.....	43
6.3.	Ordnance Survey c1910.....	44
6.4.	Ordnance Survey c1930.....	44
6.5.	Ordnance Survey c1960.....	45
6.6.	Ordnance Survey c1990.....	45
6.7.	BGS Geological Map (Solid).....	46
6.8.	BGS Geological Map (Superficial).....	46
6.9.	Environment Agency Landfill Map.....	47
6.10.	Environment Agency Flood Map.....	47
6.11.	BGS/HPA Radon Map.....	48
6.12.	Coal Authority Arley Mine Abandonment Plan.....	48
7.	Appendix C: Site Reports & Certificates.....	49
7.1.	CLS Soil Certificates. 15.11.2018 Soil Sampling.....	49
7.2.	CLS Soil Certificates. 26.11.2020 Soil Sampling.....	54
7.3.	CLS Soil Certificates. 09.09.2021 Water Sampling.....	59
8.	Appendix D: Publications.....	65
8.1.	CIRIA (Report c665) Wilson and Card Classification.....	65
8.2.	CIRIA (Report c665) Wilson and Card Protective Measures.....	66
8.3.	BGS/HPA report IR/11/044 – Radon Potential Class.....	67
8.4.	BGS/HPA report IR/11/044 – Radon Potential Class/Protection Measures.....	67
8.5.	BRE 211 – Typical Ground Bearing Slab, Membrane/Cavity Tray Detail.....	68
8.6.	BRE 211 – Typical Service Penetration Detail.....	68
8.7.	CIRIA C552, 2001 – Tables 6.3-6.6, Risk Matrices.....	69

1. PHASE 1 – PRELIMINARY RISK ASSESSMENT

1.1. Introduction

T. J. Booth Associates have been appointed by Hallmark Developments Ltd to undertake a Phase I & 2 Environmental Audit to the former Dexine Mill Site to support a Town & Country Planning permission for a mixed commercial & residential end use.

Dexine Rubber Company Ltd moved from the Development Site in 2007 which has remained in a disused and dilapidated state until acquired by Hallmark Developments.

The pre-development Site comprised masonry buildings and steel-clad warehouses & storage buildings. The Site was completely covered in hardstanding. The commercial nature of the Site dates to 1850s-1900s.

Since operations moved in 2007, the Site was earmarked for development. A Phase I Preliminary Risk Assessment & data search was undertaken by Millard Consulting Engineers (circa September 2007 ref: 8037/SO/09-07/1843) for a previous planning application.

Planning permission was obtained for mixed commercial/residential use by Hallmark Developments in December 2015 (reference: 15/00463/HYBR), supported the original version of this Phase I Preliminary Risk Assessment (revision 0) completed in April 2015. Subsequent planning amendments & applications have been undertaken including updates to this report.

Due to a new planning application being submitted, T J Booth Associates have been employed to revise the TJBA Phase 1 Report in line with the updated proposals and latest environmental legislation.

This report provides a desk-based study & intrusive ground investigation based on current UK guidance for environmental investigation within the construction industry. Principal to the assessment is the potential for contamination pollutant linkages via the CLR-11 source-pathway-receptor methodology. Assessment of potential pollution linkages is primarily undertaken in strict accordance with BS5930:2015, BS 10175:2011+A2:2017, CIRIA C665, and BS 8485:2015+A1:2019 et al.

1.2. Proposed Development

The proposal is primarily for a commercial development comprising the following:

- renovation of existing commercial units: units 5-8, 19 & 20;
- for the construction of new units 9-18;
- as of summer 2022, construction of new offices fronting Spotland Road to the northeast corner of the Site (herein referred to as the "New Office Block") – REFER TO PROPOSED PLANS IN APPENDIX.

The proposal is also for the construction of 2No. residential dwellings to the southeast corner of the Site adjacent existing residential terraces on Primrose Street.

The development will include associated parking/yards/access roads.

Refer to Proposed Site Plan in the Appendix.

1.3. Historic Maps

DATE	ON-SITE	OFF-SITE/SURROUNDING AREA
c1844	Majority of the Site comprises open fields. Spotland Bridge Brewery to the W side. Potential reservoirs to the W perimeter.	Spotland Bridge Dye Works immediately to the W off-site. River Spodden immediately to the SW side flowing S. Spotland Workhouse to the SE. Sand pit nominally 50m NW, tenters fields to the SE, other cotton/woollen mills in the local area within 500m radius.
c1890	Reservoirs noted to the W perimeter. Site now dominated by Spotland New Mill to the E side and Spotland Bridge Mill to the centre. Chimney noted between the two mills.	Workhouse by now demolished. Much of the local surrounding area to the E & N is residential, industrial to the S & W. Chimney noted to the W perimeter. Primrose mill nominally 100m SE.

c1910	On-site mills indicated as cotton mills.	Residential terraces to the S off Spodden Street. Spotland Finishing Works & associated chimneys noted to the S. Smithy noted to the W on adjacent Site. Chimney noted off-site to the E side of Primrose St. Tramway depot noted to the SW across the River Spodden. Further urban infill to the wider area.
c1930	Reservoirs no longer noted to W perimeter.	Tanks noted off Site to the E side of Primrose St.
c1960	No overall change.	Allotment gardens noted nominally 200m E/SE. No overall change.
c1990	Residential terraces to the S & N side of the Site demolished. Additional buildings and yard areas note to the NE of the Site.	No overall change.

1.4. Present Day Maps

Site Boundaries, Outlines of Structures and Buildings:	As of 2020 the present-day maps show only the warehouse to the west side, and former office blocks to the east side remaining. The former mill and other ancillary buildings and chimney etc have all been demolished and the ground reprofiled for preparation of ground improvement. The Site is generally enclosed to the S side along the perimeter wall to the Spodden River. The site is adjacent to the River Spodden to the SW, commercial developments to the W and SE, residential properties to the N & E.
Ground Contours, Natural Drainage Features:	There is a fall in elevation to the S towards the River Spodden, however, the site is elevated and retained from the river in the order of approximately 8m. Surface runoff in the local area overall is to the south towards the River Spodden. Pre-development surface water collection locally was to man-made piped sewerage services within the site, discharging to the River Spodden via piped outlets in the retaining wall. Much of these have now been removed in the vicinity of demolished buildings. Although, some do still exist, serving the remaining site buildings.
Water Courses:	The River Spodden is located immediately S of the site, which is a tributary of the Roch, the confluence of which is nominally 500m SE.
Below Ground Obstructions:	None noted.

1.5. Geology

Bedrock Geology:	The data indicated that the bedrock geology beneath the Site comprises undifferentiated sandstone/mudstone of the Carboniferous Lower Coal Measures.
Superficial Geology:	Drift geology beneath the Site is noted as SAND & GRAVEL. There are alluvial deposits to the S nominally 50-100m distant and boulder clays nominally 100m to the N/NW.
Coal Seams/Faults.	The Arley Mine coal seam sub-crops beneath the S side of the Site. The local stratigraphic dip is in the order of 5deg S.

1.6. Boreholes Records

The British Geological Survey has records of boreholes for England & Wales. A previous borehole search by Millard Consulting Engineers noted two boreholes 95m SE and 265m NE. The borehole to the SE noted that sands and gravels (generally 2.8m

thick) directly overlies Lower Coal Measures comprising mudstone, shale and coal and proven to a depth of 45m.

1.7. Landmark Environmental Data

The following data search was obtained from Landmark Environmental Group in 2007 by Millard Consulting Engineers.

Discharge Consents:	One on-site discharge consent related to the discharge of public sewage from an unknown outlet. The consent which is now revoked (dated 1995) was operated by United Utilities Water Plc. A further 35 off-site consents are recorded within 1km. The closest was located approximately 120m NW & relates to public storm sewage but is now revoked. The second closest also relates to storm sewage into the River Roch approximately 530m S.
Integrated Pollution Controls:	Six off-site integrated pollution controls are recorded within 1km, the closest of which is located approximately 755m NW and relates to processes involving asbestos within the mineral industry.
Integrated Pollution Prevention and Control:	Two off-site pollution and prevention control records are recorded within 250m: both located approximately 130m W and SW and relate to coating, printing and textiles.
Local Authority Pollution Prevention and Control:	One on-site LA PPC relates to rubber processes. The closest off-site LA PPC record is located approximately 130m NW, also operated by Dexine Rubber Company. The record relates to general waste incineration. A further 9 off-site controls are recorded within 1km and generally relate to textiles, re-spraying, dry cleaning, a petrol filling station, and metal adhesive coating.
Pollution Incidents:	One on-site pollution incident is recorded as occurring on 2 September 1996. The incident was a category 3 minor incident related to oils but the polluter and receiving water is not known. 50 off-site pollution incidents are recorded within 1km, six of which are categorised as category 2 significant incidents. The closest pollution incident recorded is approximately 105m NW: a category 3 minor incident dated 1996.
Substantiated Pollution Incidents:	3 off-site substantiated pollution incidents are recorded within 1km, the closest being 100m SW. All 3 incidents were category 2 significant incidents to water and land.
Prosecutions Relating to Controlled Waters:	3 prosecutions are recorded within 250m, the closest being 150m W and relating to a breach of an obstruction licence. One prosecution relates to the release of trade effluent into controlled waters approximately 170m W.
Historical Landfill Sites:	Three historic landfill sites are recorded within 1km. The closest known as Central Tip is recorded approximately 160m SE. The second closest is recorded approximately 340m S known as Sandy Brow. No further details were available.
Licensed Waste Management Facilities:	Four off-site waste management facilities are recorded within 1km. The closest, located approximately 580m S relates to a metal recycling site. The remainder relate to a second metal recycling site and transfer sites (industrial, commercial, and household).
Registered Waste Treatment or Disposal Sites:	Three registered waste treatment sites are located 629m S, 845m S, and 981m S. The closest two are scrap yards, the third is a transfer station.
Control of Major Accident Hazards Sites (COMAH):	One COMAH is recorded approximately 710m S relating to Transco Plc.
Notification of Installations Handling Hazardous Substances (NIHHS):	One NIHHS is recorded approximately 700m S relating to Transco.
Planning Hazardous Substance Consents:	Two consents are located within 1km. The closest is located approximately 675m SE and relates to British Gas and flammable substances.
Contemporary Trade Directory Entries:	Two consents relate to the Site, one for furniture manufacturers and one for rubber and plastic products. A further 150 consents are recorded within 1km, relating to but not including paint spraying,

garage services, clothing and fabrics distribution services and industrial engineers.

1.8. BGS/HPA

The Application Site is within a low (class 1) radon area with <1% of homes above the action level. No protective measures required.

1.9. Environment Agency Data

The following data search was obtained from Landmark Environmental Group in 2007 by Millard Consulting Engineers.

Flood zone:	Site is within Flood Zone 1.
EA Recorded Landfill:	In a search on the EA landfill map, one historic landfill site was noted to within 250m of the site boundaries named as Central Tip. No other information was recorded.
Groundwater source protection zone:	The Site is not within a Source Protection Zone.
Superficial aquifer:	Secondary A - aquifers that comprise permeable layers that can support local water supplies, and may form an important source of base flow to rivers.
Bedrock aquifer:	Secondary A - aquifers that comprise permeable layers that can support local water supplies, and may form an important source of base flow to rivers.

1.10. Coal Authority Data

Coal Authority interactive digital online mapping service, and Abandonment Plans from the Coal Authority database. Data tabulated below, Abandonment Plan in appendix.

Mine Shafts, Pits, Adits/Entries:	2 adits were noted off-site within approximately 30-40m SE of the southern tip of the Site boundary. An additional adit is noted on-site nominally from the west side heading towards Primrose Street beneath the alleyway located between the terraced houses numbered 54-56. An on-site bell pit is also noted on the Abandonment Plan to the E on-site beneath a warehouse slab.
Past/Present Recorded Underground Mining.	The CA interactive map indicated the on-site adit to be part of past recorded workings. However, the Arley Mine Abandonment Plan indicates this is an adit access to the workings offsite to the E. The main underground coal workings that the adit lead to was to the E of Primrose Street from c1870s, targeting the Arley Coal Seam. Due to the presence of the above mentioned bell pit, there is expected to be some shallow workings local to the pit location.
Probable/Potential Shallow Underground Workings & Outcrops:	The interactive map indicates the S part of the Site around Spodden Street could be subject to potential unrecorded historic mining.
Outcrops:	Arley Mine subcrops to the centre S side of the site.
Development High Risk Area:	The S side of the site is noted to be within a Development High Risk Area.

1.11. Local knowledge & Planning Search/LPA Records

The following table was obtained from the Millard Consulting Engineers Phase I PRA for the Site in 2007. The table relates to landfill records.

Consultee	Comment(s)
Rochdale Metropolitan Borough Council	Rochdale Metropolitan BC were contacted by post. The LA has confirmed the presence of the off-site landfill site located within 250m. The landfill site was operational prior to licensing. The L.A holds one historic record summarising gas results from a soil spike survey. The results show that all lower explosive limits were low and below 1%. The L.A also highlights the fact that the data set is limited and now outdated. Rochdale Metropolitan BC state that the site has not been considered for designation as 'contaminated land' as Part IIA. The L.A has identified five site investigations that have been undertaken within 250m of the site however, no further details are provided. Rochdale Metropolitan BC highlights several areas of the site authorised as 'Part B' processes (permits under the Environmental Protection Act 1990) and 'A2' processes (regulated by the EA) all for rubber manufacture. A copy of the response is shown in Appendix D.
Environment Agency (EA)	The EA were contacted by post and an Environmental Property Search has been completed within 500 m of the search coordinates. The EA response is still awaited.

Recent correspondence with the Senior Contaminated Land Officer for Rochdale MBC (April 2015) corroborated the above information and further indicated that no additional testing had been undertaken to the Central Tip historic landfill site.

The Contaminated Land Officer indicated that paper mulch had been disposed of at Central Tip, and although the site is likely to be relatively low risk and spike testing had proved negligible amounts of ground gas; it remains a potential gassing source.

1.12. Industry Profiles

The Department of the Environment industry profiles can be located on the UK government website. A search revealed a document for Chemical Works – Rubber Processing Works. The following contaminants are generally associated with such Sites, indicated below:

General contaminants

Solvents	toluene xylene benzene petroleum naphtha chlorinated solvents (eg 1,1,1-trichloroethane)
Polycyclic aromatic hydrocarbons	anthracene phenanthrene benzo(a)pyrene
Phenols	
Amines	
Oils	fuel oil
Acids and alkalis	sodium hydroxide
Metals and metal compounds	zinc and iron compounds aluminium bronze
Combustible materials	rubber crumb elemental sulphur or sulphur compounds
Plating chemicals	see the profile on electroplating and other metal finishing works, Section 4
Polychlorinated biphenyls	
Asbestos	

1.13. Site Reconnaissance - Pre-development - April 2015

A pre-development reconnaissance sketch can be found in the appendix relating pertinent site features and buildings which have been numbered for ease of identification.

Details of Existing Structures/Site:	The Site was generally enclosed by masonry walls and steel paling fencing and is accessed by access roads to the N & W sides. It was derelict, with minor tipping & stripped/empty buildings. Building 1 was a modern clad steel shed/warehouse. There was a storage pen and concrete bunded pool to the west side, the pool was formerly the location of an above ground tank (most likely used for the storage of petroleum spirit) that had been removed prior to client ownership. No visual or olfactory evidence of contamination was noted. There were some empty IBCs, and some asbestos roof sheet panels noted to NW side, as well as 2No. 205 litre drums, overflowing from rainwater on to the macadam/concrete surface found around the building external area. A concrete slab to the east side of Building 1 remained which was previously the location of a above ground tank. No visual or olfactory evidence of contamination was noted to the surface. Building 2 had been demolished and was an area with building rubble covering the surface. Building 3 (most likely comprising general storage and service rooms) had been demolished and the only discernible feature was a service pit with partially stained timber sleepers covering the pit. The pit comprised some general tipping but was partially filled with water indicating that it was generally watertight. Building 4 was an asbestos clad shed/warehouse (walls & roof) with asbestos guttering & downpipes. The sheet material was in poor condition. There were formerly above ground tanks to the N side of the building which had been removed. The surface below the tanks comprised a concrete slab. No visual or olfactory evidence of contamination was noted to the surface. c2019, all asbestos sheet had been removed leaving the steel frame only. Building 5 (old gatehouse) had previously been demolished. Building 6 (former warehouse) had previously been demolished. Building 7 (the original mill building) had a substation annexe building to the N side. Within the substation annexe, the electrical contents/transformers etc had been removed leaving a sandy subfloor exposed. Minor staining was noted to some parts of the sand but the absence of any odour and dilapidated state of the roof suggest this could be due to rainwater. Within the main mill building there was a pit noted to the SE side with a gas canister lying inside. There was a slight oily film to the water surface. The extension to the S side of the mill building had been demolished and was reduced to brick rubble. Building 8 adjacent the chimney had been demolished leaving only the rear wall and concrete slab remaining. The chimney interior could not be accessed for inspection. The chimney was first noted on historic maps from the 1890s. Since the TJBA site walkover in 2015, the chimney has been reduced to c 10m. Building 9 (former shed/warehouse) comprised an asbestos sheet roof, and was in poor condition in places. An empty IBC was noted inside. Building 10 (former haulage depot and upstairs offices) had a minor fuel odour in the downstairs haulage garage area. Building 11 and extension to the S side of the main mill had been demolished leaving only the concrete slabs. There was some black staining to part of the floor slabs to the E side of the building as well as a filled pit which had a slight fuel & putrid odour. There was also a filled pit to the S extension which also had a slight fuel & putrid odour. Building 12 (empty shed) to the S side of the site comprise an asbestos sheet clad wall and roof, in generally poor condition. Car Parks to the N side of the site were generally empty except for the storage of some masonry building materials, and timber beams. To the S side of the Site was an area of infilled/made-ground behind the retaining wall adjacent the river. The retaining wall (nominally 10-15m long) had visible evidence of overloading & cracking.
--------------------------------------	---

	The Site contained numerous manholes and pits associated with drainage and former processes. The precise purpose or connectivity to the environment was not evident from this inspection.
Adjacent Properties:	North: Spotland Road and residential areas. East: Mix of residential, commercial, and parkland. South: Generally commercial properties. West: Generally commercial properties.
Water Levels, Directions of Flow and Rates in Rivers:	The River Spodden was noted to the S/SW side of the site. The flow was to the S/SE towards the town centre. There were some outfall pipes into the river the source of which is unknown.
Old Mine or Quarry Workings:	None noted on site.
Obvious/Immediate Hazards to Health/Safety:	Open manholes, trapdoor inside Building 1.
Areas of Discoloured Soil, Polluted Water, Vegetation, and Significant Odours:	The site in general is covered with concrete slabs. There are some areas of potential interest noted above.
Relevant Ground Levels, Ground Water Levels, Positions of Wells and Springs:	There is a fall in the order of approximately 10m from the northeast corner at Spotland Road (136.50maod) to the S side of the Site where it meet Spodden Street at 126.50maOD. There is a retaining wall to the south side of the Site approximately 8m high to the adjacent River Spodden.
Past Walkover:	A previous Site walkover in 2007 while the Dexine rubber manufacturing plant was operational revealed that some of the IBCs & 205 litre drums contained within the S of the site were stored on timber pallets. The contents of the drums primarily consisted of flame retardant and hydrocarbons including hydraulic and paraffin oils. Oily staining beneath and within the vicinity of the drums and IBC's was observed during the Site walkover.

1.14. Post demolition Reconnaissance - October 2020

Details of Existing Structures/Site:	Building 1 (PROPOSED UNITS 5-8) to the west corner of the Site had been refurbished. The hardstanding areas surrounding comprising new macadam with no soft landscaping. The old storage pen/concrete bunded pool had been cleaned of all materials, infilled with engineering fill & was now part of the yard area. NOTE: AS INDICATED IN SECTION 13 (SITE RECONNAISSANCE - PRE-DEVELOPMENT – APRIL 2015) – ALL TANKS HAD BEEN REMOVED PRIOR TO CLIENT OWNERSHIP, AND THE ORIGINAL TJBA INSPECTION/WALKOVER. Buildings 9 & 10 (PROPOSED UNITS 19 & 20) are also currently being refurbished & reclad. All other site buildings have been demolished, and carefully stripped of asbestos cladding removed from site in accordance with HSE guidance. Much of the brick/block, and concrete from former buildings has been crushed on site to engineering specification for reuse in cut and fill operations. Apart from the immediate surrounds to Building 1 (PROPOSED UNITS 5-8), and the west entrance & yard; the east part of the Site was reprofiled to formation levels ready for vibro ground improvement. In the position of predevelopment Building 11 where the fuel odour was noted in the original site reconnaissance, a disused and remediated petrol tank was noted beneath the former floor slab. The remediation was undertaken by the previous owners and there are no records of this. The tank (steel construction, approximately 1200 x 3000mm) was left in situ and existing soil around the tank had been previously removed and replaced with clean sand. When this was removed by the present Site contractor, there was no evidence of present contamination of the Site soil, indicating fuel odour was associated with the tank. There is no photographic evidence of the removal undertaken by the contractor, however the ground level in the location of the tank was further reduced by approximately 2.7m (ie approximately 1500mm below the base of the tank) for vibro reprofiling & no contamination was noted. The area has since been developed over with the proposed Site buildings.
--------------------------------------	---

1.15. New Office Block Reconnaissance – August 2022

Details of Existing Structures/Site:	A reconnaissance was undertaken in August 2022, to support a new planning application to turn the approved car park to the northeast corner of the Site into a commercial office block. The New Office Block fronts Spotland Road & is adjacent the main entrance. The proposal area was cleared earlier in May/June 2022, and partially excavated and infilled to prep this part of the Site for construction of the road and proposed offices. The area was filled with made ground, generally comprising demolition rubble associated with the former dwellings being used to infill the former cellars, as well as storage of material from the main site. The made ground was excavated and cellars partially exposed to ensure loose/soft spots were removed prior to construction, which included the removal of slabs, and large debris such as concrete, brick and stone. Fill materials from other parts of the overall development have been used to bring up levels. It should be noted that some areas of made ground on the overall development site that were stockpiled, initially recorded contaminants of concern above commercial thresholds when sampled & tested. Refer to site reconnaissance photos in the Appendix.
--------------------------------------	---

1.16. Identification of Source-Pathway-Receptor.

1.16.1. Potential Contaminants.

CURRENT SOURCE/S	ORIGINAL ASSOCIATED SOURCE	CONTAMINANT/S
General made ground/upper soil across the Site.	Aerial contamination from past industry (mills, foundries, engineering factories, other works with chimneys); which settles in surrounding soil prior to the Site being hard surfaced.	Metals/PAH.
	Sheet roofing & cladding was noted across the Site and was in poor condition in some places.	Asbestos.
Made ground/upper soil to E SE part of the Site.	Container storage, IBCs, 205l drums, former petrol tanks, and former garage areas noted. Overground tanks to the E of the Site were known to contain fuel oil amongst other chemicals.	Fuels/hydrocarbons.
Made ground/upper soil/sand to area beneath former substation.	Substation to the centre of the Site.	BTEX.
Made ground/upper soil.	Potential on site storage.	Acids/alkalis, sulphur/sulphur compounds, phenols, SVOCs.
Ground gas migration associated with shallow mining.	Potential worked coal seam beneath the site.	CO ₂ , CH ₄ .

1.16.2. Potential Pathways.

The potential pathways to/from the Development Site include (not an exhaustive list but a summary of the main points):

PATHWAY	MEDIA
Soil and dust ingestion	Soil and indoor dust

Consumption of home grown fruit and vegetables	Produce
Skin contact (indoors)	Indoor dust
Skin contact (outdoors)	Soil
Inhalation of dust (indoors)	Air
Inhalation of dust (outdoors)	Air
Vapours (indoors)	Air
Vapours (outdoors)	Air

1.16.3. Potential Receptors.

Receptors mainly comprise workers in the construction phase, and workforce for the proposed end use.

1.17. Preliminary Conceptual Model.

CURRENT SOURCE/S	ORIGINAL ASSOCIATED USAGE	CONTAMINANT TYPE	PATHWAY	RECEPTOR	POLLUTION LINKAGE	CONSEQUENCE	PROBABILITY	RISK
Site surface /sub soil.	Various – see potential contaminants section.	Chemical contamination.	Direct ingestion, aerial ingestion, dermal contact, drinking water. Contact with potential hazards.	Site construction operatives & future occupants. Site buildings.	PRESENT – Made ground and other potential areas containing tanks etc have been noted across the Site. Demolition rubble fill could also comprise minor contamination.	Medium.	Likely.	Moderate risk.
Geological ground gas.	Coal seams & radon sources, peat.	CH ₄ , CO ₂ , Rn, other trace gases.	Diffusion through soil, substructures, aerial inhalation.	Future occupants. Explosion, suffocation.	PRESENT – potential shallow workings beneath the Site and although there is a pollutant linkage, it is unlikely that .	Medium.	Low likelihood.	Moderate to low risk.
Anthropogenic ground gas.	Decomposing organic material in the ground.	CH ₄ , CO ₂ , other trace gases.	Diffusion through soil, substructures, aerial inhalation.	Future occupants. Explosion, suffocation.	NOT PRESENT – Ground gas sources such as waste, landfill & other unidentified infilled sites have been identified as a source, although it is classed as a minor source. However, development buildings within 250m are at lower elevation to the source suggesting lack of pathway. Those parts of the development that are at higher elevation suggesting a credible pathway are over 250m distant.	Medium.	Unlikely.	Low risk.
Contaminated ground /surface water. Controlled Waters.	Made ground.	Chemical contamination.	Permeation through soil into ground water, local watercourses or aquatic habitats.	Watercourses, canal, aquatic habitats & associated wildlife.	PRESENT – The Site is adjacent to the River Spodden which falls under the Controlled Waters designation by the Water Resources Act. There are also Secondary A Aquifers beneath the Site which are considered as Controlled Waters and provide base flow to the adjacent watercourse. Made ground beneath the Site could potentially be a source of contamination and should be subject to testing. The River Spodden should also be tested to assess the potential impact of the Site from upstream to downstream. The Site is not within a source control area.	Mild.	Likely.	Moderate risk.

2. PHASE 2 - SITE INVESTIGATIONS

2.1. Summary.

All TJBA Soil analysis will use the LQM/CIEH S4ULs, and the DEFRA C4ULs. The LQM/CIEH S4UL data is the most current and comprehensive list of contaminant exposure level based on proposed end use, however, contaminant levels within S4ULs are considered 'low risk' and exceedance of S4ULs may warrant further analysis to ensure suitability for the specified end use.

The C4SL data relates to updated DEFRA Statutory Guidance under Part 2A of the Environmental Protection Act 1990 (Part 2A). The guidance introduces a 4 category system in which Category 4 is of the least concern and levels falling within this risk category are considered as 'acceptably low'.

As the S4ULs are considered more conservative than C4SLs, any contaminant levels exceeding a S4UL although not considered 'low risk' can still be considered 'acceptably low' for use within the planning regime as long as it is still within the C4SL risk category. Thus, soil sampling results are firstly held to C4SLs where available and then to S4ULs thereafter to define suitability with respect to specified proposed end uses within the planning regime.

2.2. Site Investigation (Soil Sampling) 15.11.2018.

A limited soil sampling site investigation was undertaken to upper made ground (nominally 750mm depth) between the existing N entrance and the rear of the renovated warehouse (PROPOSED UNITS 5-8), to assess suitability for water pipes to these units from the water main in Spotland Road. The investigation comprised 3 hand excavated trial pits (TPs1-3) from which the respective soil samples S1-3 were taken, refer to SI Plan in Appendix for sample locations. TP1 was undertaken in existing made ground to the front of the Site. TPs 2 & 3 were undertaken in demolition fill placed to the rear of the recently constructed retaining wall to the north side of PROPOSED UNITS 5-8. The trial pits/samples comprised the following:

- TP1
- 0-750 Orange/brown, occasional black silty sand & gravel MADE GROUND. Gravel size fragments of sandstone, brick, etc (S1).
- TP2
- 0-500 Red/brown sand & gravel sized demolition crush MADE GROUND (S2).
- TP3
- 0-500 Red/brown sand & gravel sized demolition crush MADE GROUND (S3).

Soil samples were sealed in 1kg white plastic snap top containers, amber jars & vials where appropriate and sent to Concept Life Sciences Ltd (CLS), to be tested for a range of common contaminants. The samples were tested for metals, speciated PAH, inorganics & sulphates, SOM, asbestos screening, and TPHCWG/BTEX analysis.

On return the samples were assessed by TJ Booth Associates to common threshold comparison data, specifically the Defra Category 4 Screening Levels (C4SLs), then to LQM/CIEH (S4ULs).

RESULTS

The assessment was for the commercial part of the Site and thus was compared to commercial threshold trigger values.

Limited testing of made ground has revealed contaminant levels above threshold values of benzo[b]fluoranthene & dibenz[ah]anthracene (sample S1). Asbestos and elevated sulphate was also identified in Samples 2 & 3. No hydrocarbons were noted above commercial threshold values. Refer to Appendix for TJBA soil analysis table and CLS sampling certification.

2.3. Site Investigation (Trial Holes) 22.05.2020.

A limited trial hole investigation was undertaken on the 22.05.2020 to assess the ground for geotechnical purposes for foundation/vibro design. NOTE: THIS IS ONLY INCLUDED FOR REFERENCE AS IT WAS NOT PART OF THE GEOENVIRONMENTAL SITE ASSESSMENT BUT HAS BEEN INCLUDED TO ADD TO THE KNOWLEDGE BASE.

The investigation comprised 5No. trial holes (THs1-5), around PROPOSED UNITS 9-10 & 11-12, and revealed clayey/silty MADE GROUND over silty SAND & GRAVEL. The investigation was undertaken once all buildings had been demolished, slabs taken up, but prior to ground reprofiling.

- TH1** GL 129.60 m aOD
- 0-1450 Orange-brown clayey/gravelly MADE GROUND. Gravel is brick, stone & concrete, occasional slate & glass.

1450-2000	Orange-brown silty SAND & GRAVEL.
TH2	GL 130.50 m aOD
0-600	Orange-brown clayey/gravelly MADE GROUND. Gravel is brick, stone & concrete, occasional slate & glass.
600-2000	Orange-brown silty SAND & GRAVEL. (standing water at 2200).
TH3	GL 132.00 m aOD
0-2800	Orange-brown clayey/gravelly MADE GROUND. Gravel is brick, stone & concrete, occasional slate & glass.
2800-3000	Orange-brown silty SAND & GRAVEL.
TH4	GL 132.00 m aOD
0-2100	Orange-brown silty SAND & GRAVEL.
TH5	GL 132.10 m aOD
0-2300	Orange-brown silty SAND & GRAVEL.

2.4. Site Investigation (Trial Hole) 03.07.2020.

A trial hole investigation was undertaken on the 03.07.2020 to assess the presence of an historic coal mining adit to the southeast boundary of the Site. The investigation comprised the following:

TH6	GL 131.00 m aOD
0-5000	Orange/brown sand & gravel MADE GROUND with abundant cobbles & boulders of mudstone (mining backfill).

2.5. Site Investigations (Geotechnical Boreholes) 11.08.2020.

Due to the potential for coal mining legacy to the southeast part of the Site, particularly beneath proposed Units 9 & 10, a borehole investigation was undertaken to assess the risk from the Arley coal seam. The investigations comprised 15No. BHs, (BHs1-15), undertaken by Pennine Geotechnical Services Ltd. Refer to Appendix for trial hole logs.

The boreholes revealed bedrock at nominally 3.5-6m deep, and the seam/voids/broken ground beneath the Site at nominally 6-7m deep. Mine gas monitoring was undertaken whilst drilling but no gas was encountered.

The data has been used to provide mitigation measures for foundation design.

2.6. Site Investigation (Trial Holes) 26.11.2020.

A trial hole investigation was undertaken on the 26.11.2020 to assess the ground for geo-environmental & geotechnical purposes, around the commercial part of the Site where the new units are to be constructed (refer to SI Plan in appendix).

The investigations were undertaken to provide a final contamination risk across the Site, and were taken in the upper MADE GROUND profile.

The investigation comprised 7No. trial holes (THs7-13), and 5No. soil samples (S4-8) were taken. The trial hole logs are noted below:

TH7	GL 122.30 m aOD
0-1900	Brown silty building rubble MADE GROUND. (S4)
1900-2600	Orange-brown silty SAND & GRAVEL. (standing water at 2200).
TH8	GL 135.40 m aOD
0-700	Brown clayey MADE GROUND rare brick & coal fragments (Hardcore fill to upper 200). (S5)
700-1000	Firm orange-brown very gravelly CLAY.
1000-2900	Light brown SAND & GRAVEL occasional cobbles.
TH9	GL 136.00 m aOD
0-1900	Mixed occasionally clayey occasionally gravelly MADE GROUND with much brick/stone/slate.

	Foundation wall to south east side of trench. (S6)
1900-3400	Light brown SAND & GRAVEL occasional cobbles.
TH10	GL 130.10 m aOD
0-1000	Orange-brown sand & gravel MADE GROUND. (S7)
1000-2100	Orange-brown SAND & GRAVEL. (Standing water 1675mm).
TH11	GL 127.20 m aOD
0-2300	Dark brown clayey MADE GROUND, much building rubble. (S8)
2300-3000	Stiff dark brown CLAY.
3000-3200	Stiff orange-brown grey mottled CLAY.
TH12	GL 122.30 m aOD
0-700	Red brick building rubble fill MADE GROUND. Slab to bottom of hole (abandoned).
TH13	GL 122.30 m aOD
0-1000	Red brick building rubble fill MADE GROUND. Slab to bottom of hole (abandoned).

Soil samples were sealed in 1kg white plastic snap top containers & amber jars and sent to Eurofins Chemtest Ltd to be tested for a range of common contaminants. The samples were tested for metals, speciated PAH, inorganics & sulphates, SOM, asbestos screening. No evidence of hydrocarbons was noted on Site investigations, and thus no testing was undertaken.

On return the samples were assessed by TJ Booth Associates to common threshold comparison data, specifically the Defra Category 4 Screening Levels (C4SLs), then to LQM/CIEH (S4ULs).

Testing of made ground revealed contaminant levels were all below commercial threshold values, and elevated levels of lead (S8), and of benzo[b]fluoranthene/dibenz[ah]anthracene (S4) were recorded above residential values.

NOTE: the above general Site material, suitable for commercial, but not for residential – has since been stored on the residential part of the Site.

2.7. Site Investigation (Water Samples) 09.09.2021.

The investigation comprised 3 No water samples (WS1-3), to assess for potential changes in water chemistry upstream and downstream of the River Spodden which bounds the west perimeter of the Site.

WS1 was taken approximately 10-15m upstream of the Site boundary to ascertain general contaminants within the river prior to encountering the Site boundary. WS2 was taken nominally halfway down the Site boundary, and WS3 at the downstream boundary, refer to SI Plan for locations.

The results have been tabulated and compared against common contaminants from various water regulation guidelines such as the EA Freshwater Environmental Quality Standards (EQS), the DWI Water Supply Regulations 2016, and the WHO Drinking Water Quality Standards 2017.

The results of the watercourse sampling indicate it is mildly contaminated with elevated readings above both background annual mean & max allowable concentrations in the EQS guidelines, as well as those for drinking water standards.

While this gives an indication of contaminant levels within watercourse overall, the comparison of the upstream sample to those adjacent to the Site give a more pertinent indication of potential impacts from the Site, and thus impacts from groundwater. It is also prudent to note that the only contaminants noted above current soil guideline thresholds within the previous soil investigations on-site were benzo[b]fluoranthene & dibenz[ah]anthracene: in the original limited sampling investigation 15.11.2018 (analysed against commercial) prior to Site demolition; and elevated levels of lead (S8), and of benzo[b]fluoranthene/dibenz[ah]anthracene (only triggered against residential) in the 26.11.2020 site investigation. No other hydrocarbons were noted above commercial threshold values.

When each of the water samples (WS1-3) were compared together the following trends were identified.

- BOD fell from upstream to downstream.
- Metals were generally lower than EQS thresholds, however in the two contaminants which were above (chromium VI & copper; chromium VI threshold was below the LOD but showed no discernible change from upstream to downstream, and copper showed no discernible change from upstream to downstream.
- Cyanide showed no discernible change from upstream to downstream.

- PAHs were recorded at the LOD & showed no discernible change from upstream to downstream.
- All hydrocarbons were noted below the LOD except aromatic bandings C12-16, and C16-21. Of these, banding C12-16 showed no discernible change from upstream to downstream. Banding C16-21 showed a slight increase in level at the midpoint of the boundary, although for perspective the value was only a ~5% increase on the trigger for WHO Drinking Water Regulations. There is the potential for sediment to have been mobilised as the order of sampling was WS3/downstream-WS1/upstream-WS2/midpoint. However, the value returned to the LOD at the downstream sampling point.
- The CL:AIRE guidance: 'Petroleum Hydrocarbons In Groundwater' indicates that banding ranges C16-21 have a low to very low mobility in groundwater; so the lack of identified on-site hydrocarbons and low mobility suggests the source is not from the Site/groundwater.

2.8. Environmental Site Risk Summary.

Since Site reprofiling has occurred, the makeup of the ground on-site is approximately 1-1.5m of clayey/silty gravelly MADE GROUND over virgin SAND & GRAVEL. The MADE GROUND thickness lessened to the east boundary revealing the virgin soils at the surface. Sand and gravels are nominally 4-5m deep on to bedrock (mudstone), with the Arley seam subcropping southeast. The Arley seam, identified by rotary boreholes recorded voids up to one metre thick, occasionally backfilled with workings.

Regarding the Site soils, trial hole investigations and soil sampling have tested for common contaminants including metals, hydrocarbons, and PAH across the Site. The Site is considered relatively clean with little contamination noted, and most probably owing to adequate bunds and mostly above ground storage tanks. On contaminant testing, the only triggers above threshold values were noted for benzo[b]fluoranthene & dibenz[ah]anthracene, asbestos and elevated sulphate for a commercial end use; and with the addition of lead when assessed against a residential end use.

The above soils which tested positive for benzo[b]fluoranthene & dibenz[ah]anthracene, asbestos and elevated sulphate above residential thresholds, have since been stored on the residential plots to the far southeast corner of the Application Site, and those plots are now considered to have been cross-contaminated and shall be remediated accordingly

The elevation of benzo[b]fluoranthene & dibenz[ah]anthracene is not considered to affect Controlled Waters. Although an exceedance was noted in these contaminants, leading guidance bodies such as the World Health Organisation recognise that leaching of PAHs from soils into groundwater is generally considered negligible unless there is a particular source, or a site is heavily contaminated. The investigations and sampling taken across the Application Site have revealed that this is not the case.

Likewise, water sampling of the River Spodden has revealed the river is mildly contaminated upstream of the Site, and that no noticeable change was recorded from upstream to downstream adjacent to the Site boundary in all contaminants tested, apart from a slight increase in aromatic banding of hydrocarbons in the range C16-21. As indicated in the previous section, the elevation was only around 5% above drinking water regulations (WHO), and banding ranges in the C16-21 category have a low to very low mobility in groundwater (CL:AIRE); so are unlikely to originate from the Site due to both the lack of identified on-site hydrocarbons and low mobility.

The former fuel tank removed from Site upon building demolition & clearance noted it had been previously decommissioned and remediated. Although there are no records of the original decommissioning, and no photographic evidence of the removal of the tank; the ground level in that location has been reduced by 2.7m overall (nominally 1500mm below the base of the tank for Site reprofiling. No contamination was noted and the area has since been developed over.

There is one noted historic landfill site approximately 220m to the east. Previous discussions with RMBC suggest 'mulch' was disposed of historically and the risk is low. The historic landfill is also at a higher elevation to the parts of the Application Site within 250m. The type of development (Type D industrial to BS8485:2019) is low risk also.

Coal Authority and abandonment records suggested the presence of a coal mining bell pit and mining adit to the E of the Site under the predevelopment Building 11 slab. This was investigated by trial hole and found to be backfilled with mining backfill generally comprising superficial sand and gravels with broken mudstone (coal measures).

The shallow seam was also investigated and found to have been worked. Ground gas risk is considered low but building & foundation design will be included in PROPOSED UNITS 9-12 to mitigate risks in accordance with the separate & approved TJBA Coal Mining Risk Assessment.

2.9. Final Conceptual Model.

CURRENT SOURCE/S		ORIGINAL ASSOCIATED USAGE	CONTAMINANT TYPE	PATHWAY	RECEPTOR	POLLUTION LINKAGE	CONSEQUENCE	PROBABILITY	RISK
COMMERCIAL SITE (NEW OFFICE BLOCK)	Site surface /sub soil.	Various – see potential contaminants section.	Chemical contamination.	Direct ingestion, aerial ingestion, dermal contact, drinking water. Services.	Site construction operatives & future occupants. Site buildings.	POTENTIALLY PRESENT Former overall site made ground that did record contaminants of concern above threshold levels, may have been used in infilling and reprofiling operations for the New Office Block location.	Medium.	Likely.	Moderate risk.
	Geological ground gas.	Coal seams & radon sources, peat.	CH ₄ , CO ₂ , Rn, other trace gases.	Diffusion through soil, substructures, aerial inhalation.	Future occupants. Explosion, suffocation.	NOT PRESENT – No shallow workings beneath the Site, no landfill sites in the local area and not within radon protection area.	Medium.	Unlikely.	Low risk.
MAIN COMMERCIAL SITE (UNITS 9-18)	Site surface /sub soil.	Various – see potential contaminants section.	Chemical contamination.	Direct ingestion, aerial ingestion, dermal contact, drinking water. Services.	Site construction operatives & future occupants. Site buildings.	NOT PRESENT All potential sources of contamination have been removed from the ground on Site and current made ground has been assessed and sampled indicating contaminant values below guidelines for a commercial end use, breaking the pollutant linkage. No requirement to remediate further.	Medium.	Unlikely.	Low risk.
	Geological ground gas.	Coal seams & radon sources, peat.	CH ₄ , CO ₂ , Rn, other trace gases.	Diffusion through soil, substructures, aerial inhalation.	Future occupants. Explosion, suffocation.	PRESENT – shallow workings beneath the site. Mitigation in the form of protective measure/foundation & slab design are to be included to break pollutant linkage.	Medium.	Low likelihood.	Moderate to low risk.
	Contaminated ground /surface water. Controlled Waters.	Made ground.	Chemical/hydrocarbon contamination.	Permeation through soil into ground water, local watercourses or aquatic habitats.	Watercourses, canal, aquatic habitats & associated wildlife.	NOT PRESENT – Sampling to the Site has revealed no contaminants at threshold levels that can be considered significant, and of those values that triggered, contaminants are generally immobile in the ground water profile. Water sampling of the adjacent watercourse has corroborated this with no noticeable elevation of common contaminants recorded from upstream of the Site to downstream.	Mild.	Unlikely.	Very low risk.
RESIDENTIAL SITE	Site surface /sub soil.	Various – see potential contaminants section.	Chemical contamination.	Direct ingestion, aerial ingestion, dermal contact, drinking water. Services.	Site construction operatives & future occupants. Site buildings.	PRESENT – Made ground has been noted in and limited testing has revealed elevated PAHs metals, PAH, and TPH. Rubble fill over the site could comprise minor contamination.	Medium.	Likely.	Moderate risk.
	Geological ground gas.	Coal seams & radon sources, peat.	CH ₄ , CO ₂ , Rn, other trace gases.	Diffusion through soil, substructures, aerial inhalation.	Future occupants. Explosion, suffocation.	PRESENT – shallow workings beneath the site.	Medium.	Low likelihood.	Moderate to low risk.

3. PHASE 3 - REMEDIATION STRATEGY.

3.1. Contamination Risk:

MAIN COMMERCIAL DEVELOPMENT SITE (UNITS 9-18):

No risk and therefore no further remediation required to the main site, ie around proposed units 9-18.

NEW OFFICE BLOCK COMMERCIAL SITE:

The New Office Block fronting Spotland Road is to comprise some soft landscaping within the development. The Site has been infilled with material, some of which may have been historically tested as containing contaminants of concern above commercial threshold values.

While made ground may remain on site beneath permanent hardstandings such as buildings, roads, pavements & pathways etc; to mitigate the risk to receptors, it is advised that a cover layer of clean inert soil is imported for soft landscaping areas ONLY

Dependent on the final finished levels, it is proposed that either:

- The existing made ground is tested analysed to confirm if there is a risk to end use receptors.

OR

- existing made ground within proposed soft landscaping areas, should either be covered with 600mm of imported soil, or excavated to 600mm from finish levels and replaced/covered with clean imported soil to suit finishes.

Imported soil should be clean/inert and free from deleterious materials, and should be suitable for use in a residential end use setting. It should be able to pass testing of metals, speciated PAH, inorganics & sulphates, SOM, and asbestos screening to current Defra Category 4 Screening Levels (C4SLs) where available, and then to the LQM/CIEH (S4ULs), for use in a residential end use setting.

RESIDENTIAL DEVELOPMENT:

The Site was historically developed with residential terraces and is likely to comprise infilled basements below the proposed footprint. Demolition rubble within the plot (external area) footprint is also likely to exist.

As development of the commercial part of the Site has been ongoing, lightly contaminated material with thresholds above metals, PAH & asbestos have been stockpiled on Site. As such, cross contamination from this source cannot be discounted within the residential plot footprint.

The proposed development plans for the residential part of the Site are for permanently hard landscaped rear yard areas. As a permanent feature, the paving is a break to the contamination pathway and therefore the pollutant linkage with regards to Site soils. Permanent paving to rear yard areas should comprise concrete, macadam or paving slabs etc.

No further testing or remediation is required.

3.2. Gas Risk:

Gas risk to the Development Site from the historic landfill to the east is considered to be mitigated due to lack of pathways.

However, there is a partially worked shallow coal seam beneath the east part of the development site as a whole, and although no mine gas was recorded in the borehole investigations; there is a moderate to low risk of potential ground gas generation and migration to the surface, that should be mitigated through protective measures based on the risk category of the development.

Due to the above and location of the seam, there is only a realistic risk to the following parts of the development:

- Main commercial site, Units 9-10, & 11-12 ONLY.
- Residential site (southeast corner).

For the avoidance of doubt, the New Office Block to the northwest corner is not at risk from ground gas, and does not require gas protection measures.

The risk category for development is classified by the type of development (residential/industrial) in accordance with BS 8485:2015+A1:2019, and are as follows:

- | | | |
|---------------|-----------------|------------|
| • Commercial | Type D building | Low risk; |
| • Residential | Type A building | High risk. |

In lieu of gas testing; CS2 protection measures are recommended within the development which should include the following to provide the minimum score indicated from at least two sources in accordance with BS8485:2019:

INDUSTRIAL DEVELOPMENT – TYPE D RISK BUILDING		BS8485:2019 score required: 1.5
CS2 GAS PROTECTIVE MEASURES		
SLAB	Monolithic reinforced cast in situ suspended slab	1.5
MEMBRANE	Standard DPM 2000g	0
VOID/SUBSPACE	N/A.	0.5
VENTILATION	Granular formation pressure relief pathway	

RESIDENTIAL DEVELOPMENT – TYPE A RISK BUILDING		BS8485:2019 score required: 3.5
CS2 GAS PROTECTIVE MEASURES		
SLAB	Reinforced ground bearing raft or reinforced suspended slab.	1.5
MEMBRANE	Reinforced gas membrane Alderprufe GRA comprising <40ml/day/m2 CH4 transmission rate, >0.4mm thick. All joints and penetrations sealed to manufacturers details & specifications.	2
VOID/SUBSPACE	N/A.	0
VENTS	N/A.	

3.3. Verification (Phase 4 requirements)

Verification of the imported soil may be required for Planning or Building Control/Building Regulations submission. Should this be required, it will need to be undertaken by suitably qualified consultants and comprise the following:

- Import source material.
- Characterisation & suitability of material.
- Soil sampling should be undertaken as per YALPAG or other guidelines as appropriate, as per the following ratios:
 - Virgin quarried materials, 1-2 samples to confirm inert nature.
 - Crushed hardcore, stone, brick, min 1 sample per 500cum.
 - Greenfield/manufactured, generally 1 sample per 250cum (min 3 samples).
 - Brownfield, generally 1 sample per 50cum (min 6 samples).

Samples should be tested for the following contamination suites: metals, inorganics, PAH USEPA16 speciated, and asbestos screening. Results will be analysed against Defra Category 4 Screening Levels (C4SLs) where available, and then to the LQM/CIEH (S4ULs), for use in a residential end use setting.
- Verification Depth.

3.4. Additional Notes:

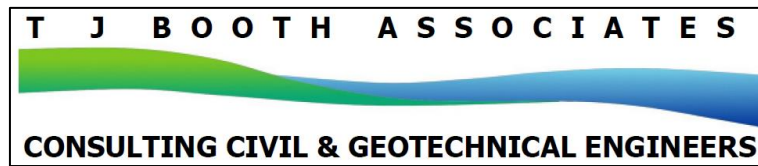
As of November 2021, ground works in the commercial Site have been completed, and all foundations/structures erected in accordance with the T J Booth Associates Coal Mining Risk Assessment, ref: rep-tjba-hallmark-dexine-CMRA-rev0.

The erected buildings are awaiting final finishes such as cladding, and surfacing to external areas.

No further ground works are anticipated and therefore no unexpected contamination will be encountered.

This report should be issued to the RMBC Contaminated Land Officer, for approval and discharge of the geo-environmental planning condition No.6.

We trust the above is clear but should any further clarification be required please do not hesitate to contact T J Booth Associates.



Signed.....

D.Slattery BSc (Hons).

T J Booth Associates.

Authorised.....

T J Booth BSc (Hons), C. Eng. C. Env. MICE.

T J Booth Associates.

4. REFERENCES.

BS 8485:2015+A1:2019. Code of practice for the design of protective measures for methane and carbon dioxide ground gases for new buildings.

BS 10175:2011+A2:2017. Investigation of potentially contaminated sites. Code of practice.

BS5930:2015. Code of practice for site investigations.

CL:AIRE. 2012. Research Bulletin-RB17-A Pragmatic Approach to Ground Gas Risk Assessment.

CIRIA. Report C665.

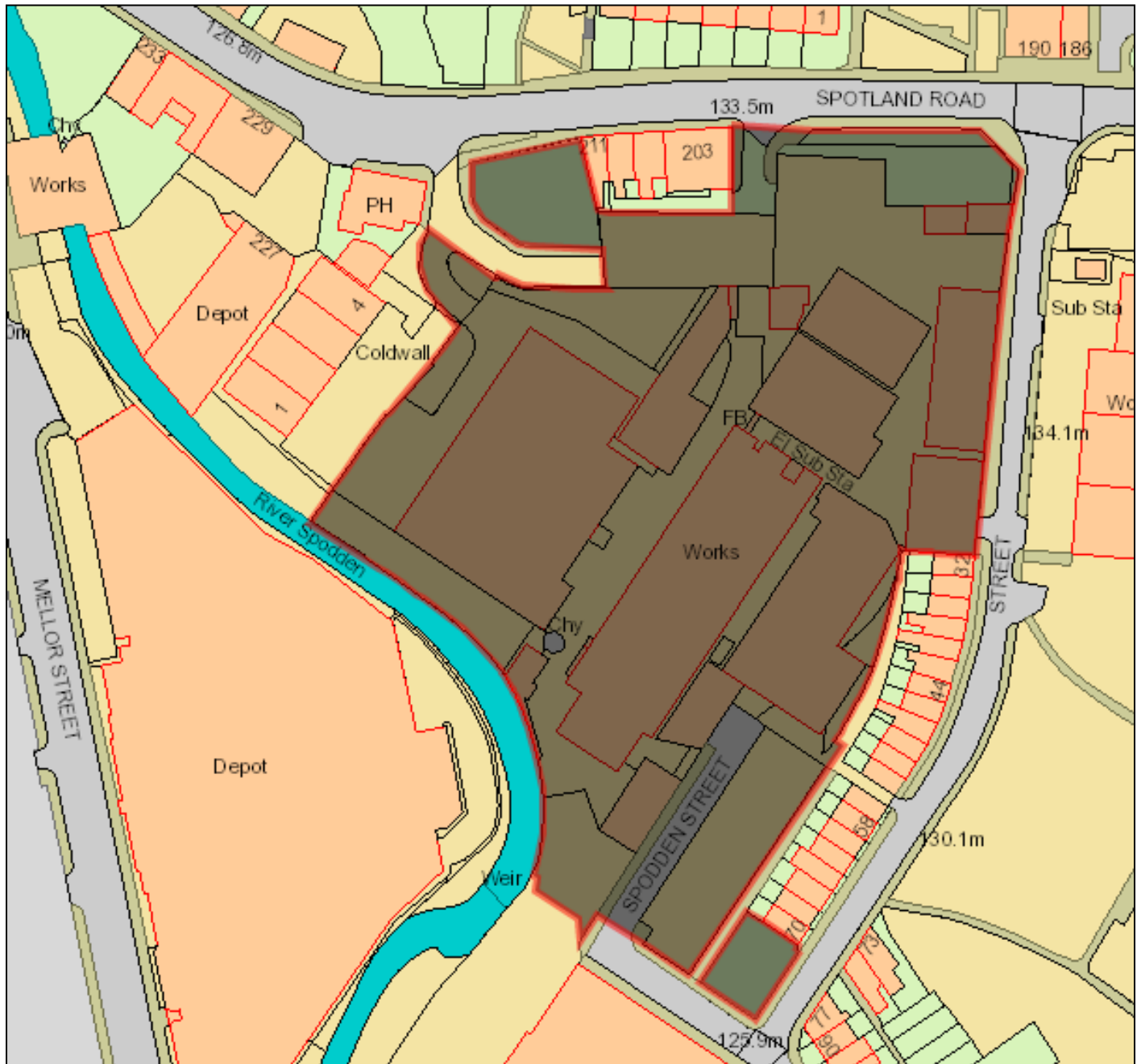
Environment Agency. 2005. Secondary Model Procedure for the Development of Appropriate Soil Sampling Strategies for Land Contamination. R&D Technical Report P5-066/TR.

ICE Manual of Geotechnical Engineering Volume I. 2012.

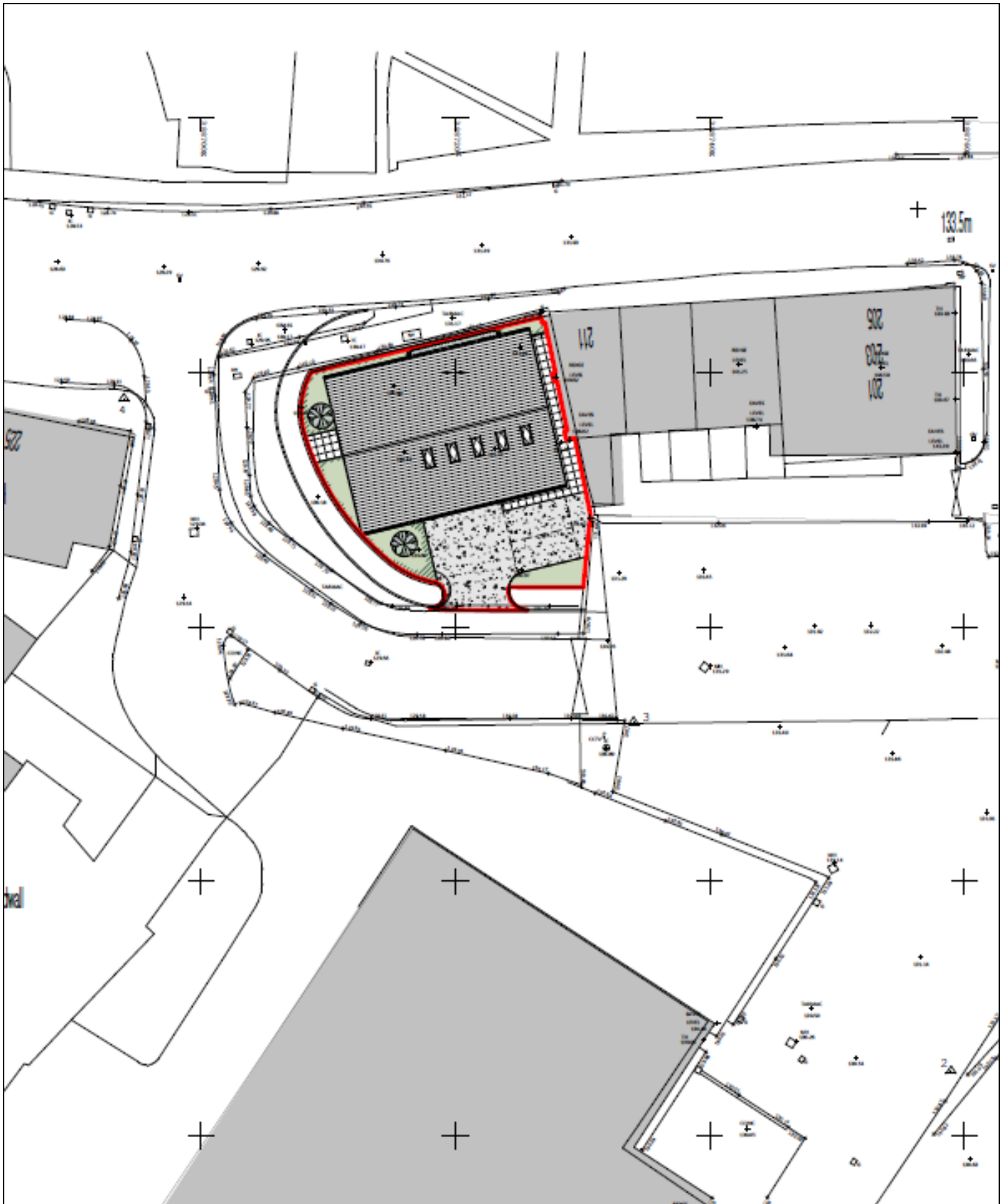
CIRIA. Report SP32.

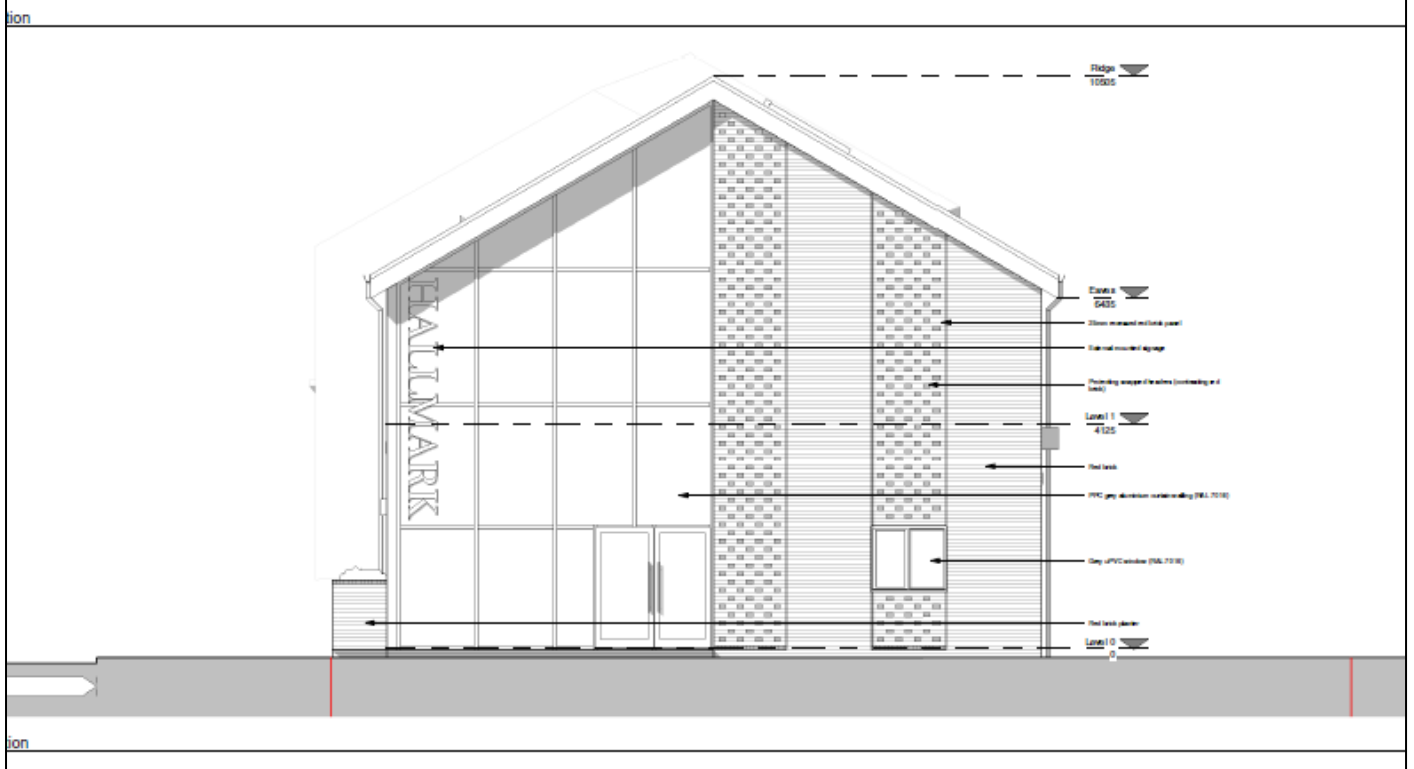
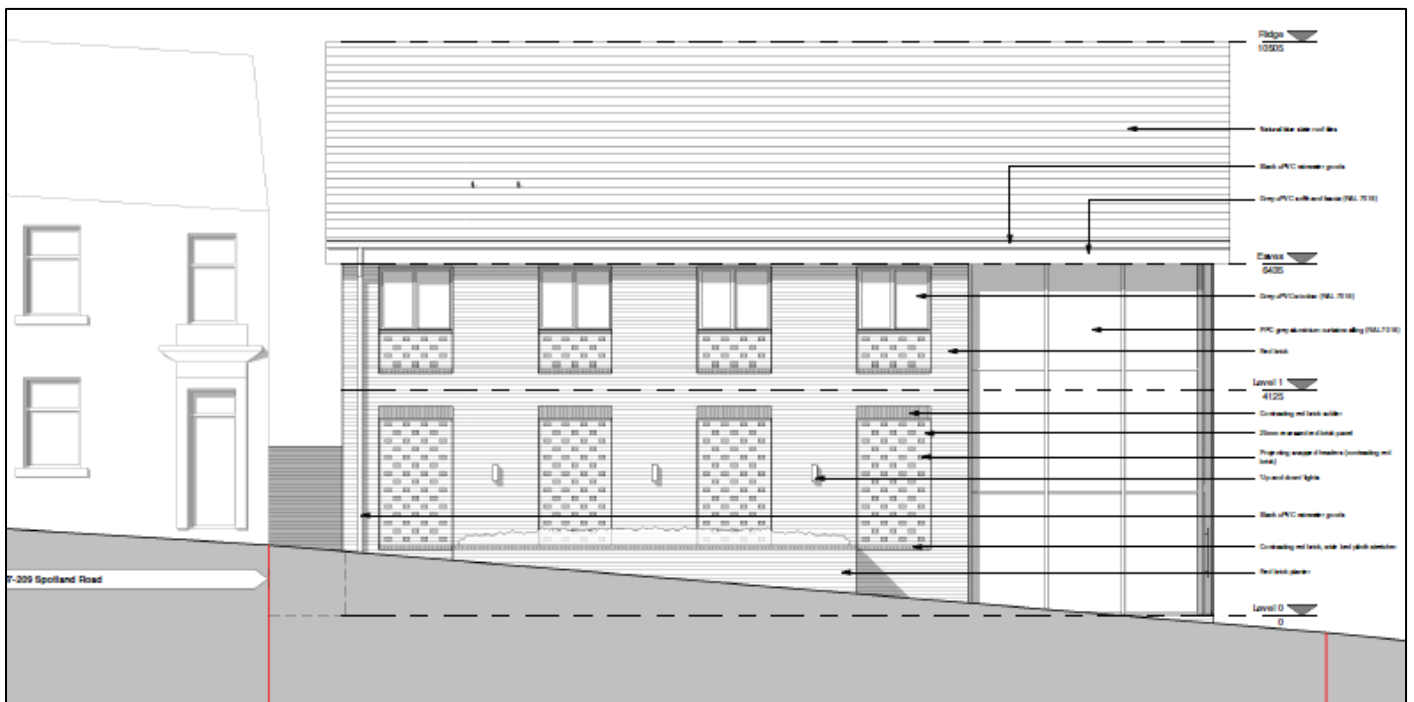
5. APPENDIX A: PHOTOS & FIGURES.

5.1. Location Plan.



5.3. Proposed Plans (New Office Block 2022).





5.4. Pre-development Site Photos 2015.



Bunded area SW of Building 1.



Car park to NE corner of Site.



Storage/Service (Building 3 to N of Site).



Service trench (Building 3 to N of Site).



Asbestos sheeting to numerous buildings across Site (Building 4).



Former location of tanks to N of Building 4.



Pit with minor slick to surface in original mill building (Building 7).



Potential spillages - putrid & minor H/C odours (Building 11)



Potential spillages - putrid & minor H/C odours (Building 11).



Former substation outbuilding.



Concrete plinth to former tank adjacent E side of Building 1.

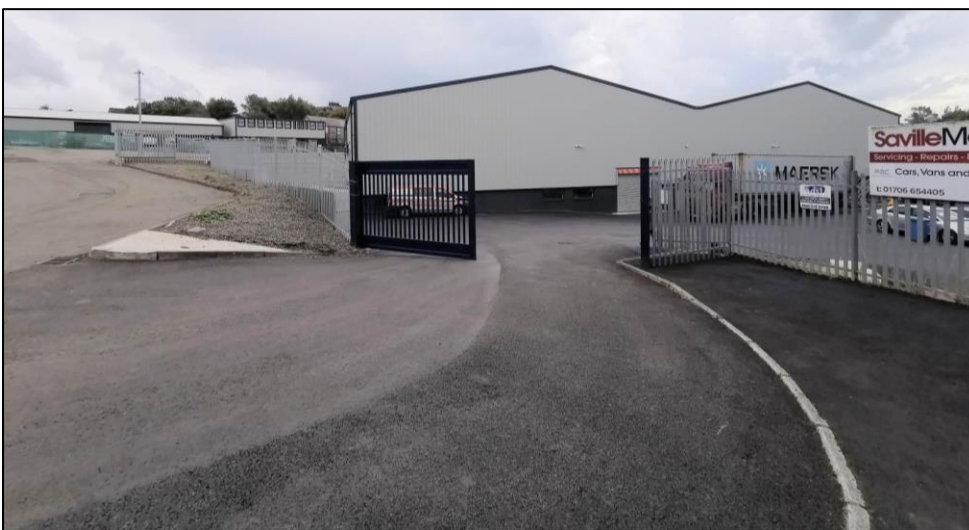


Demolished extension to S side of original mill building & demolished Building 8 in b/g. Area previously noted as being used for drum/IBC storage.



Position of former above ground tank between buildings 11 & 12.

5.5. Site Photos October 2020.



Refurbished commercial units to the south west site.



Refurbished commercial units to the south west site.



South side of the site looking north east.



South side of the site looking west.



South side of the site looking south east over the proposed residential units.



Centre of the site looking south east.



North of the site looking south.

5.6. Site Photos August 2021.



Residential plot – used to store building rubble from main Site.

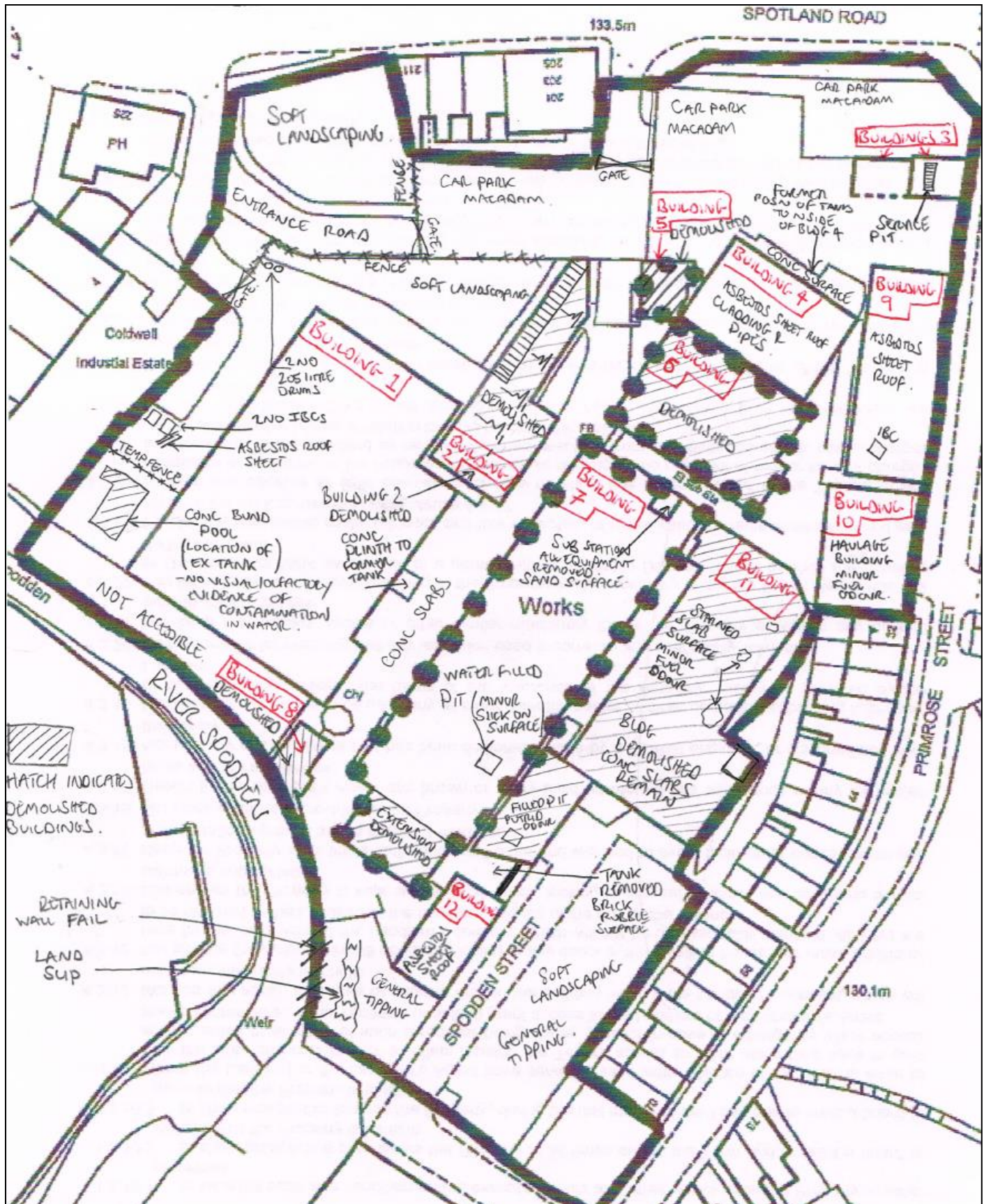


Residential plot – used to store building rubble from main Site.

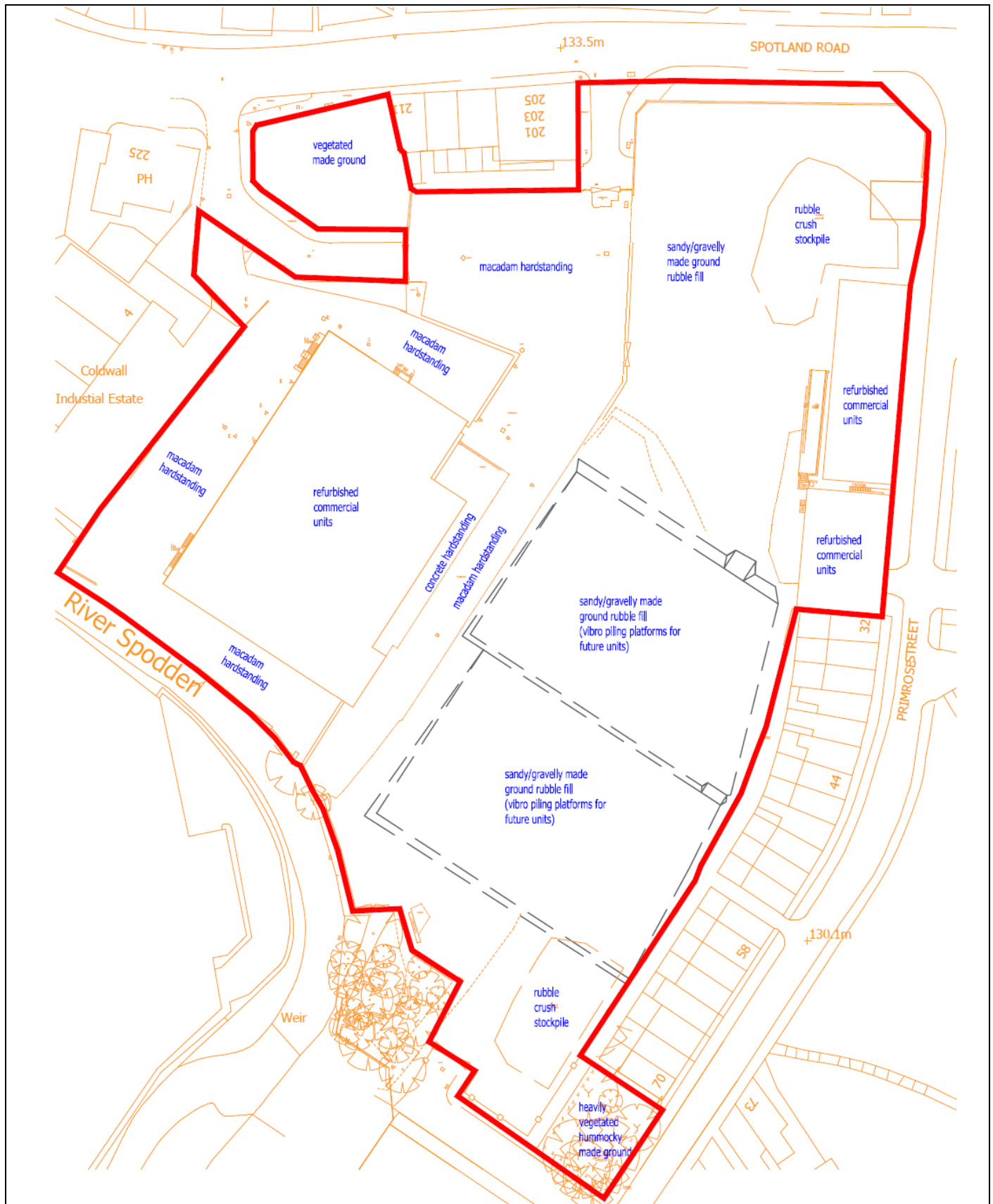
5.7. Site Photos August 2022.

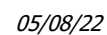


5.8. Site Reconnaissance (Pre-development) Sketch April 2015.



5.9. Site Reconnaissance (Post-demolition) Sketch October 2020.



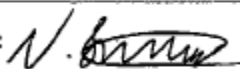


5.12. Borehole Logs.

Client: GUARDIAN DEV.	Site: DEXINE	 PENN NE Pennine Geotechnical Services Ltd, 234 College Rd, Rochdale, Lancashire, OL12 6AF T: 01706 881823 F: 01706 880580
Date: 11-8-20	Method: Rotary - Perc, Water Flush	

Measurements In Metres

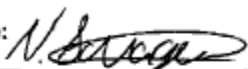
BH no	From	To	Thickness	Description
01	0.00	5.50	5.5 metres	Variable Made Ground / Cased to 6 metres / Full flush returns
	5.50	6.50	1.0 metres	Shaley Mudstone
	6.50	7.50	1.0 metres	Void / Lost all flush returns
	7.50	10	2.5 metres	Hard drilling / No flush returns
02	0.00	4.00	4 metres	VARIABLE MADE GROUND / CASSED TO 3M / FULL FLUSH RETURNS
	4.00	6.20	2.2 metres	SHALEY MUDSTONE
	6.20	8.10	1.9 metres	VOID / LOST FLUSH RETURNS
	8.10	10.00	1.9 metres	HARD STRATA NO RETURNS
03	0.00	3.90	3.9 metres	VARIABLE MADE GROUND / CASSED TO 3M / FULL FLUSH RETURNS
	3.90	6.10	2.2 metres	SHALEY MUDSTONE
	6.10	7.50	1.4 metres	VOID / LOST FLUSH RETURNS
	7.50	10.00	2.5 metres	HARD STRATA NO RETURNS
04	0.00	3.70	3.7 metres	VARIABLE MADE GROUND / CASSED TO 3M / FULL RETURNS
	3.70	6.00	2.3 metres	SHALEY MUDSTONE
	6.00	7.50	1.5 metres	VOID / LOST FLUSH RETURNS
	7.50	10.00	2.5 metres	HARD STRATA NO RETURNS
05	0.00	3.50	3.5 metres	VARIABLE MADE GROUND / CASSED TO 3M / FULL RETURNS
	3.50	5.50	2.0 metres	SHALEY MUDSTONE
	5.50	7.00	1.5 metres	VOID / LOST FLUSH RETURNS
	7.00	10.00	3 metres	HARD STRATA NO RETURNS
06	0.00	3.60	3.6 metres	VARIABLE MADE GROUND / CASSED TO 3M / FULL RETURNS
	3.60	4.50	0.9 metres	SHALEY MUDSTONE
	4.50	7.00	2.5 metres	VOID / LOST FLUSH RETURNS
	7.00	10.00	3.0 metres	HARD STRATA NO RETURNS
07	0.00	3.70	3.7 metres	VARIABLE MADE GROUND / CASSED TO 3M / FULL RETURNS
	3.70	6.00	2.3 metres	SHALEY MUDSTONE
	6.00	7.00	1.0 metres	VOID / LOST FLUSH RETURNS
	7.00	10.00	3.0 metres	HARD STRATA NO RETURNS

Driller: N. SAUAGE	Driller's Assistant:
Driller's Signature: 	Page 1 / 2

Client: GUARDIAN PEU	Site: DEXINE	 PENN NE Pennine Geotechnical Services Ltd, 234 College Rd, Rochdale, Lancashire, OL12 6AF T: 01706 881823 F: 01706 880560
Date: 11.8.20	Method: LOANED PEC WATER FLUSH	

Measurements In Metres

BH no	From	To	Thickness	Description
08	0.00	4.50	4.5 METRES	VARIABLE MADE GROUND / CASED TO 3m / FULL RETURNS
	4.50	5.70	1.2 METRES	SHALEM MUDSTONE
	5.70	6.90	1.2 METRES	VOID / LOST FLUSH RETURNS
	6.90	10.00	3.1 METRES	HARD STRATA NO RETURNS
09	0.00	5.50	5.5 METRES	VARIABLE MADE GROUND / CASED TO 3m / FULL RETURNS
	5.50	6.20	0.7 METRES	SHALEM MUDSTONE
	6.20	7.00	0.8 METRES	VOID / LOST FLUSH RETURNS
	7.00	10.00	3.0 METRES	HARD STRATA NO RETURNS
10	0.00	6.60	6.6 METRES	SOFT PUSH NO FLUSH RETURNS
	6.60	10.00	3.4 METRES	HARD STRATA NO RETURNS
11	0.00	5.00	5.0 METRES	VARIABLE MADE GROUND / CASED TO 3m / FULL RETURNS
	5.00	6.00	1.0 METRES	SOFT COAL
	6.00	10.00	4.0 METRES	MUDSTONE
12	0.00	4.00	4.0 METRES	VARIABLE MADE GROUND / 3m CASING / FULL RETURNS
	4.00	6.50	2.5 METRES	SOFT COLLAPSED WORKINGS / PARTIAL FLUSH RETURNS
	6.50	10.00	3.5 METRES	HARD STRATA NO RETURNS
13	0.00	3.80	3.8 METRES	VARIABLE MADE GROUND / CASED TO 3m / FULL RETURNS
	3.80	5.50	1.7 METRES	SHALEM MUDSTONE
	5.50	6.50	1.0 METRES	BROKEN GROUND NO RETURNS
	6.50	10.00	3.5 METRES	HARD STRATA NO RETURNS
14	0.00	4.00	4.0 METRES	VARIABLE MADE GROUND / CASED TO 3m / FULL FLUSH
	4.00	4.50	0.5 METRES	SHALEM MUDSTONE
	4.50	6.50	2.0 METRES	BROKEN GROUND NO RETURNS
	6.50	10.00	3.5 METRES	HARD STRATA NO RETURNS
15	0.00	4.00	4.0 METRES	VARIABLE MADE GROUND / CASED TO 3m / FULL FLUSH
	4.00	5.50	1.5 METRES	SHALEM MUDSTONE
	5.50	6.50	1.0 METRES	VOID / LOST FLUSH RETURNS
	6.50	10.00	3.5 METRES	HARD STRATA NO RETURNS

Driller: N. SAVAGE	Driller's Assistant:
Driller's Signature: 	Page 2/2

5.13. Soil Sampling Analysis – 15.11.18.

Client / Site:		Hallmark Developments - Dexine, Spotland Rd,							
Sample Type:		Soil Samples							
Sampling Date:		15.11.2018							
CONTAMINANT		No	Max	Mean	t 95	COMMERCIAL			
							Pass/Fail	Comment	
METALS	Arsenic as As, dry weight	3	11	8.333	10.6	640	PASS		
	Boron as B, hot water sol dw	3	23	18.33	22.4	240000	PASS		
	Cadmium as Cd, dry weight	3	1	1	1	410	PASS		
	chromium as Cr(III) dry weight	3	24.00	20.00	23.40	8600	PASS		
	Chromium as Cr(VI), dry weight	3	1	1	1	49	PASS		
	Copper, as Dry Weight	3	43	38	42.6	68000	PASS		
	Lead, as Dry Weight	3	160	115	159	2300	PASS		
	Mercury as Hg, dry weight	3	1	1	1	25.8	PASS		
	Nickel as Ni, dry weight	3	36	21	33.8	980	PASS		
	Selenium as Se, dry weight	3	3	3	3	12000	PASS		
	Zinc as Zn, dry weight	3	240	196.7	240	730000	PASS		
INORGANIC	Cyanide (Total)	3	1	1	1	2.5	PASS		
	Sulphate (Total) as SO4	3	0.41	0.287	0.405	0.24	FAIL	DS2 (S2&S3)	
	Sulphide	3	10	10	10	250	PASS		
	pH	3	11.1	9.7	11.07	5 to 9	ALKALINE		
	Sulphur (Elemental)	3	500	500	500	100	comment		
	Asbestos Identification	3	1	0.667	1	0	FAIL	S2 & S3	
ORGANIC	SOM	3	2.5	2.5	2.5				
	PAH acenaphthene	3	33	11.11	29.73	97000	PASS		
	PAH acenaphthylene	3	1	0.347	0.903	97000	PASS		
	PAH anthracene	3	38	12.86	34.25	540000	PASS		
	PAH benz[a]anthracene	3	72	24.55	64.93	170	PASS		
	PAH benzo[a]pyrene	3	54	18.47	48.71	77	PASS		
	PAH benzo[b]flouranthene	3	60	20.48	54.11	44	FAIL	S1	
	PAH benzo[g,h,i]perylene	3	32	10.95	28.87	4000	PASS		
	PAH benzo[k]flouranthene	3	47	15.99	42.37	1200	PASS		
	PAH chrysene	3	67	22.92	60.44	350	PASS		
	PAH dibenz[ah]anthracene	3	12	4.097	10.82	3.6	FAIL	S1	
	PAH flouranthene	3	170	57.78	153.3	23000	PASS		
	PAH flourene	3	22	7.427	19.82	68000	PASS		
	PAH indeno[123-cd]pyrene	3	33	11.28	29.77	510	PASS		
	PAH napthalene	3	14	4.99	12.69	460	PASS		
	PAH phenanthrene	3	170	57.66	153.3	22000	PASS		
	PAH pyrene	3	140	47.73	126.3	54000	PASS		
	PAH PAH (Total - SUMEPA16)	3	950	323.8	856.7	1	comment		
	FUEL	aliphatic EC 5-6	3	0.01	0.01	0.01	5900	PASS	
		aliphatic EC 6-8	3	0.01	0.01	0.01	17000	PASS	
		aliphatic EC 8-10	3	0.01	0.01	0.01	4800	PASS	
aliphatic EC 10-12		3	10	4	9.1	23000	PASS		
aliphatic EC 12-16		3	10	4	9.1	82000	PASS		
aliphatic EC 16-35		3	104	96	102.9	1700000	PASS		
aromatic EC 5-7,Benzene		3	0.01	0.01	0.01	46000	PASS		
aromatic EC 7-8,Toluene		3	0.01	0.01	0.01	110000	PASS		
aromatic EC 8-10		3	0.063	0.04	0.061	8100	PASS		
aromatic EC 10-12		3	10	4	9.1	28000	PASS		
aromatic EC 12-16		3	98	35.33	88.6	37000	PASS		
aromatic EC 16-21		3	620	215.7	559.6	28000	PASS		
aromatic EC 21-35		3	1400	496.3	1265	28000	PASS		
VOC/BTEX		benzene	3	0.001	0.001	0.001	98	PASS	
		toluene	3	0.001	0.001	0.001	1920	PASS	
	ethylbenzene	3	0.001	0.001	0.001	1220	PASS		
	m-xylene	3	0.002	0.001	0.002	14000	PASS		
	p-xylene	3	0.002	0.001	0.002	14000	PASS		
	o-xylene	3	0.001	0.001	0.001	15000	PASS		
SVOC	phenol	3	1	1	1	690	PASS		

5.14. Soil Sampling Analysis – 26.11.20.

Client / Site:		Guardian - Dexine, Spotland Rd.									
Sample Type:		Soil Samples									
Sampling Date:		26.11.2020									
CONTAMINANT		No	Max	Mean	t 95	RESIDENTIAL			COMMERCIAL		
							Pass/Fail	Comment		Pass/Fail	Comment
METALS	Arsenic as As, dry weight	5	12	10.1	11.8	37	PASS		640	PASS	
	Boron as B, hot water sol dw	5	0.4	0.4	0.4	290	PASS		240000	PASS	
	Cadmium as Cd, dry weight	5	0.45	0.212	0.416	22	PASS		410	PASS	
	chromium as Cr(III) dry weight	5	20.00	17.20	19.80	910	PASS		8600	PASS	
	Chromium as Cr(VI), dry weight	5	0.5	0.5	0.5	21	PASS		49	PASS	
	Copper, as Dry Weight	5	40	27.4	37	2400	PASS		68000	PASS	
	Lead, as Dry Weight	5	350	123.8	302	200	FAIL	S8	2300	PASS	
	Mercury as Hg, dry weight	5	0.32	0.178	0.296	1.2	PASS		25.8	PASS	
	Nickel as Ni, dry weight	5	26	20.4	25.4	130	PASS		980	PASS	
	Selenium as Se, dry weight	5	0.36	0.264	0.356	250	PASS		12000	PASS	
	Zinc as Zn, dry weight	5	140	77.8	128	3700	PASS		730000	PASS	
INORGANIC	Cyanide (Total)	5	0.5	0.5	0.5	2.5	PASS		2.5	PASS	
	Sulphate (Total) as SO4	5	0.14	0.105	0.138	0.24	PASS		0.24	PASS	
	Sulphide	5	12	5.08	10.82	250	PASS		250	PASS	
	pH	5	8.9	8.6	8.86	6 to 8	ALKALINE		5 to 9	NORMAL	
	Sulphur (Elemental)	5	25	10.92	22	100	PASS		100	PASS	
	Asbestos Identification	5	0	0	0	0	PASS		0	PASS	
ORGANIC	SOM	5	4.8	2.74	4.46						
	PAH acenaphthene	5	3.3	0.74	2.66	1100	PASS		100000	PASS	
	PAH acenaphthylene	5	1.4	0.36	1.14	920	PASS		100000	PASS	
	PAH anthracene	5	3.5	0.9	2.88	11000	PASS		540000	PASS	
	PAH benz[a]anthracene	5	5.3	1.14	4.26	13	PASS		180	PASS	
	PAH benzo[a]pyrene	5	4	0.88	3.22	5	PASS		77	PASS	
	PAH benzo[b]fluoranthene	5	5.4	1.16	4.34	3.7	FAIL	S4	45	PASS	
	PAH benzo[g,h,i]perylene	5	2.6	0.6	2.1	350	PASS		4000	PASS	
	PAH benzo[k]fluoranthene	5	2.4	0.56	1.94	100	PASS		1200	PASS	
	PAH chrysene	5	6.3	1.34	5.06	27	PASS		350	PASS	
	PAH dibenz[ah]anthracene	5	1.4	0.36	1.14	0.3	FAIL	S4	3.6	PASS	
	PAH fluoranthene	5	11	3	9.12	890	PASS		23000	PASS	
	PAH flourene	5	3.1	0.7	2.5	860	PASS		71000	PASS	
	PAH indeno[123-cd]pyrene	5	2.3	0.54	1.86	41	PASS		510	PASS	
	PAH napthalene	5	7.6	1.6	6.1	13	PASS		1100	PASS	
	PAH phenanthrene	5	14	3.46	11.54	440	PASS		23000	PASS	
	PAH pyrene	5	13	3.342	10.74	2000	PASS		54000	PASS	
	PAH PAH (Total - SUM EPA16)	5	87	20.1	70.62	1	comment		1	comment	
	SVOC phenol	5	0.3	0.3	0.3	380	PASS		1300	PASS	

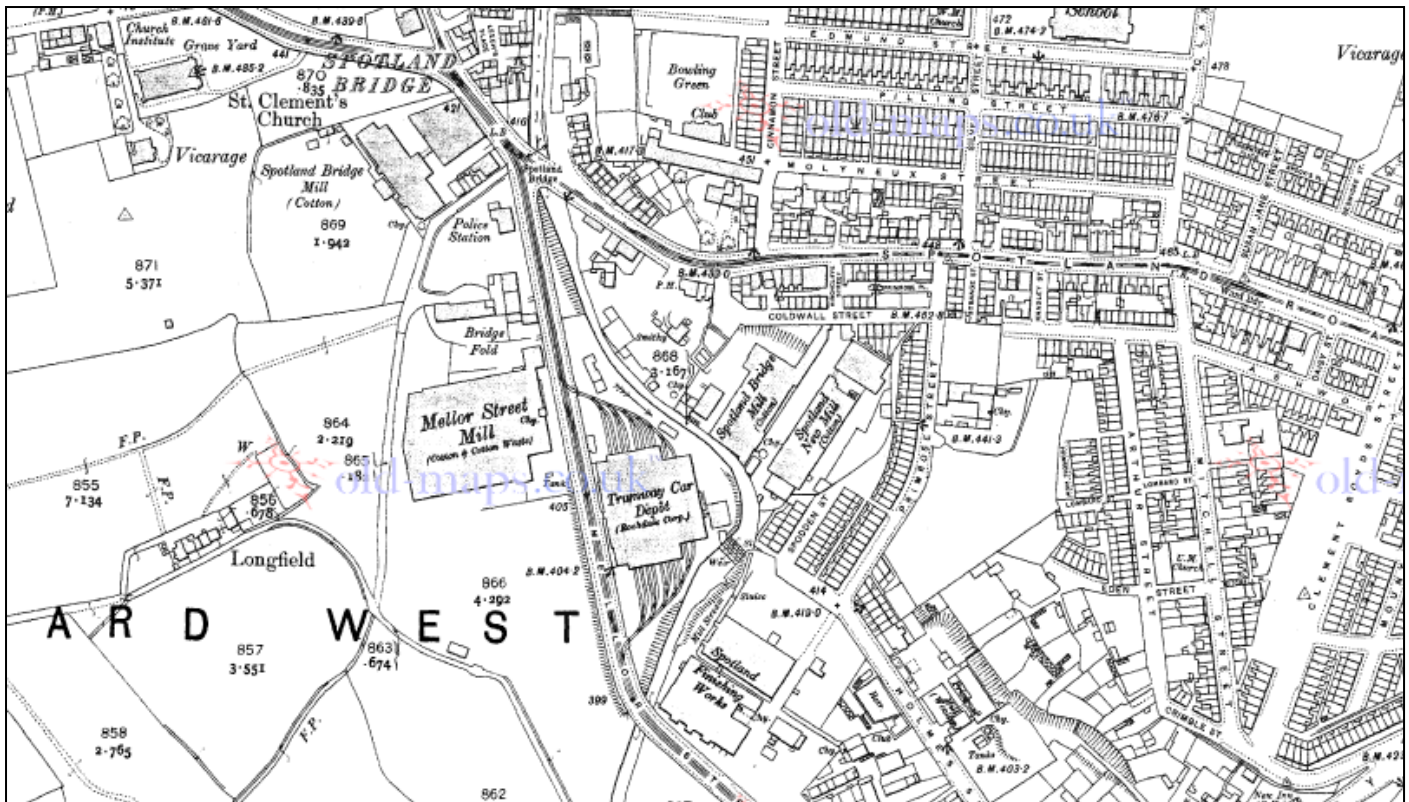
5.15. Soil Sampling Analysis – 09.09.21.

Client / Site:		Hallmark Developments - Dexine, Spotland Road, Rochdale												
Sample Type:		Water Samples												
Sampling Date:		09.09.2021												
CONTAMINANT		No	Max	Mean	t 95	EQS FRESHWATER			UK DWI WATER SUPPLY REGULATIONS 2016			WHO DRINKING WATER QUALITY 2017		
							Pass/Fail	Comment		Pass/Fail	Comment		Pass/Fail	Comment
METALS	Arsenic	3	1.5	0.85	1.424	50	PASS		10	PASS		10	PASS	
	Cadmium	3	0.29	0.17	0.272	0.6	PASS		5	PASS		3	PASS	
	Chromium III	3	23	10.37	21.35	32	PASS		50	PASS		50	PASS	
	Chromium VI	3	20	20	20	3.4	FAIL	below LOD	50	PASS		50	PASS	
	Copper	3	1.5	1.3	1.48	1	FAIL		2000	PASS		2000	PASS	
	Lead	3	0.5	0.5	0.5	14	PASS		10	PASS		10	PASS	
	Mercury	3	0.05	0.05	0.05	0.07	PASS		1	PASS		6	PASS	
	Nickel	3	11	5.5667	10.3	34	PASS		20	PASS		70	PASS	
	Selenium	3	1.9	1.6	1.86	0	NO REGS		10	PASS		40	PASS	
	Zinc	3	2.5	2.5	2.5	10.9	PASS		5000	PASS		3000	PASS	
INORGANIC	Cyanide (Total)	3	0.05	0.05	0.05	0.005	FAIL	below LOD	50	PASS		0	NO REGS	
ORGANIC	TOC	3	12	11	11.9									
	PAH anthracene	3	0.1	0.1	0.1	0.1	PASS		0	NO REGS		0	NO REGS	
	PAH benzo[a]pyrene	3	0.1	0.1	0.1	0.27	PASS		0.01	FAIL		0.7	PASS	
	PAH benzo[b]fluoranthene	3	0.1	0.1	0.1	0.017	FAIL	below LOD	0.1	PASS		0	NO REGS	
	PAH benzo[g,h,i]perylene	3	0.1	0.1	0.1	0.0082	FAIL	below LOD	0.1	PASS		0	NO REGS	
	PAH benzo[k]fluoranthene	3	0.1	0.1	0.1	0.017	FAIL	below LOD	0.1	PASS		0	NO REGS	
	PAH fluoranthene	3	0.1	0.1	0.1	0.12	PASS		0	NO REGS		0	NO REGS	
	PAH indeno[123-cd]pyrene	3	0.1	0.1	0.1	0.00017	FAIL	below LOD	0.1	PASS		0	NO REGS	
	PAH naphthalene	3	0.1	0.1	0.1	130	PASS		0	NO REGS		0	NO REGS	
	FUEL aliphatic EC 5-6	3	0.1	0.1	0.1	0	NO REGS		0	NO REGS		15000	PASS	
	FUEL aliphatic EC 6-8	3	0.1	0.1	0.1	0	NO REGS		0	NO REGS		15000	PASS	
	FUEL aliphatic EC 8-10	3	0.1	0.1	0.1	0	NO REGS		0	NO REGS		300	PASS	
	FUEL aliphatic EC 10-12	3	0.1	0.1	0.1	0	NO REGS		0	NO REGS		300	PASS	
	FUEL aliphatic EC 12-16	3	0.1	0.1	0.1	0	NO REGS		0	NO REGS		300	PASS	
	FUEL aliphatic EC 16-35	3	0.1	0.1	0.1	0	NO REGS		0	NO REGS		600	PASS	
	FUEL aromatic EC 5-7,Benzene	3	0.1	0.1	0.1	50	PASS		1	PASS		10	PASS	
	FUEL aromatic EC 7-8,Toluene	3	0.1	0.1	0.1	380	PASS		0	NO REGS		700	PASS	
	FUEL aromatic EC 8-10	3	0.1	0.1	0.1	0	NO REGS		0	NO REGS		300	PASS	
	FUEL aromatic EC 10-12	3	0.1	0.1	0.1	0	NO REGS		0	NO REGS		90	PASS	
	FUEL aromatic EC 12-16	3	160	146.67	158	0	NO REGS	S1, S2, S3	0	NO REGS		90	FAIL	
	FUEL aromatic EC 16-21	3	95	31.733	85.51	0	NO REGS	S2	0	NO REGS		90	FAIL	
	FUEL aromatic EC 21-35	3	0.1	0.1	0.1	0	NO REGS		0	NO REGS		90	PASS	
	FUEL aromatic EC 35-44	3	0.1	0.1	0.1	0	NO REGS		0	NO REGS		90	PASS	
SVOC	phenol	3	0.03	0.03	0.03	0.046	PASS		0	NO REGS		0	NO REGS	

6.1. Ordnance Survey c1844



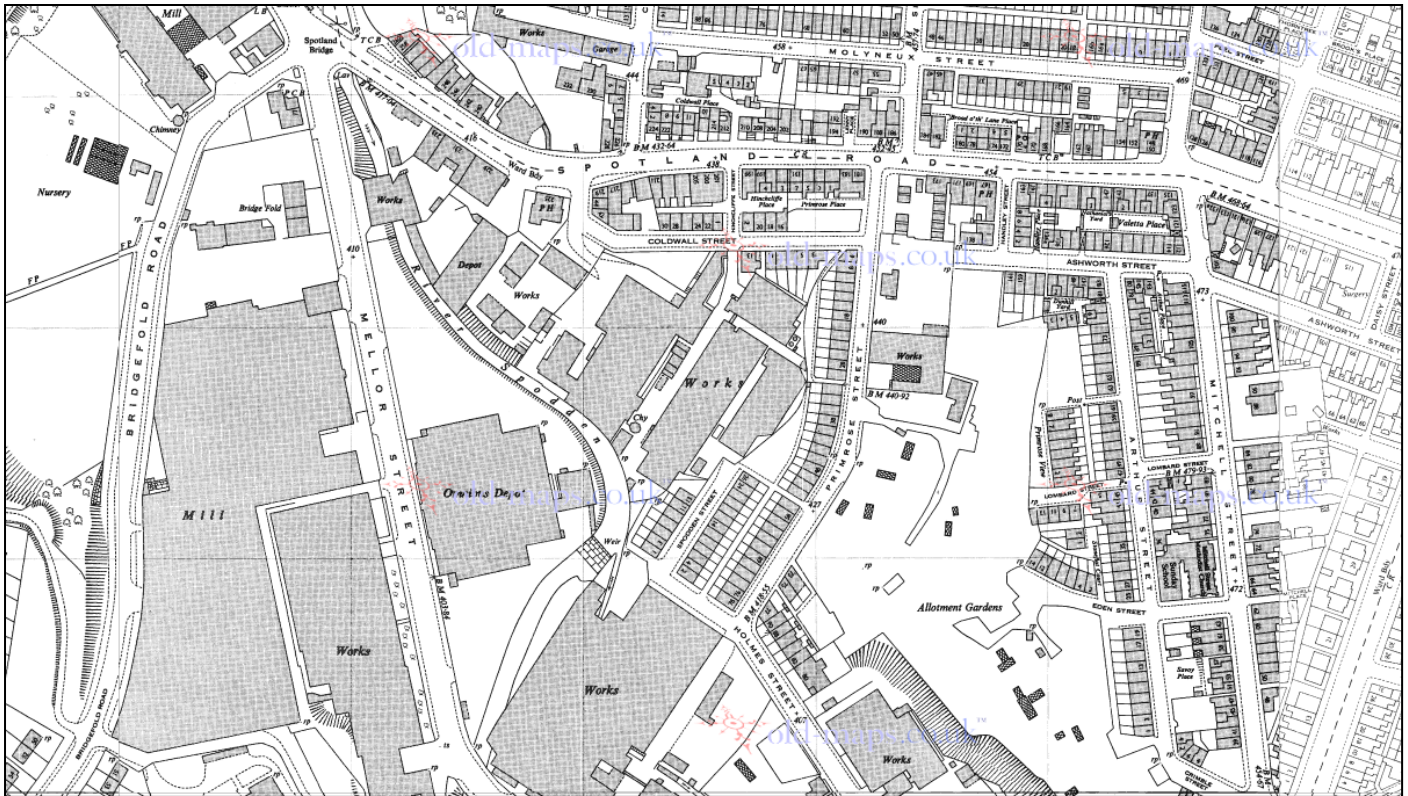
6.3. Ordnance Survey c1910



6.4. Ordnance Survey c1930



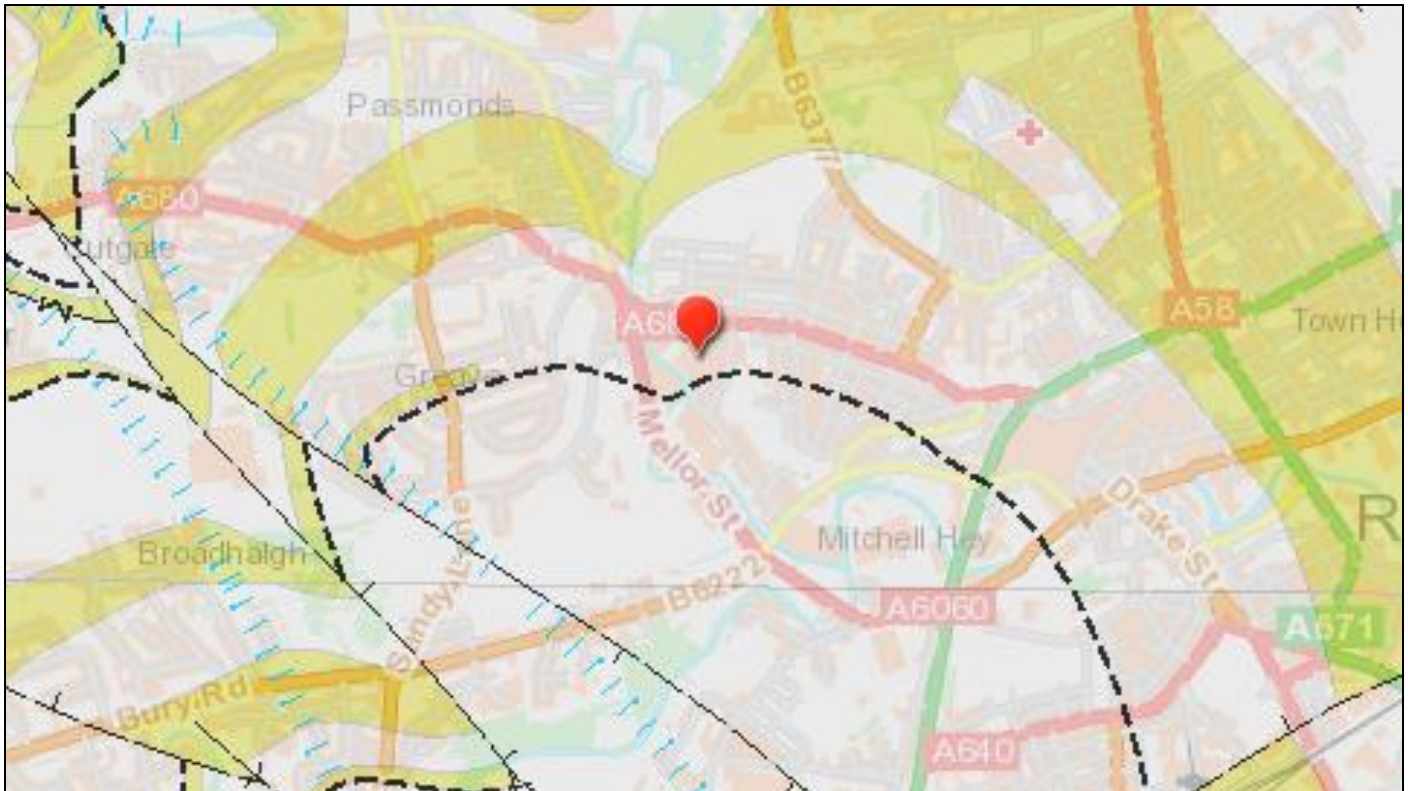
6.5. Ordnance Survey c1960



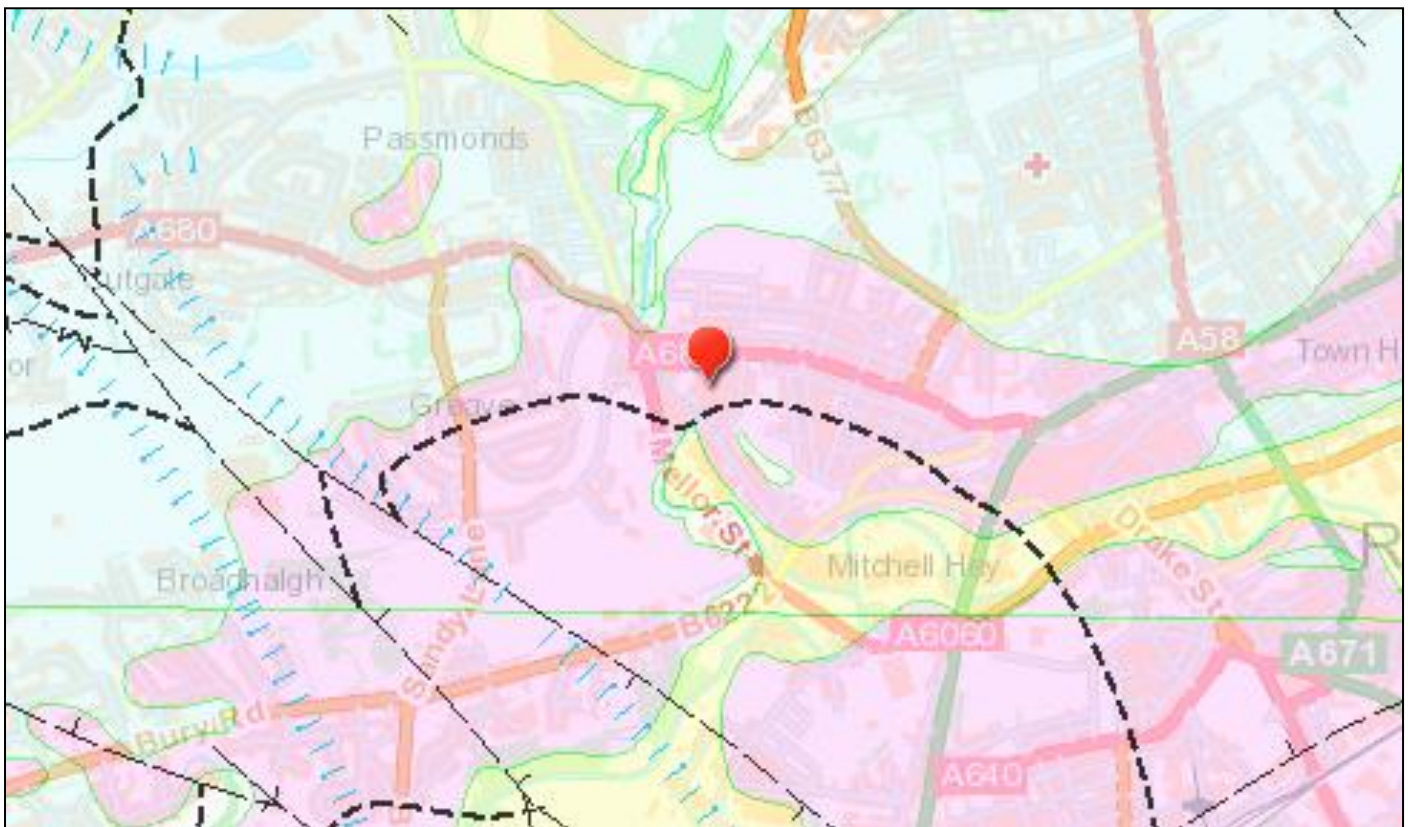
6.6. Ordnance Survey c1990



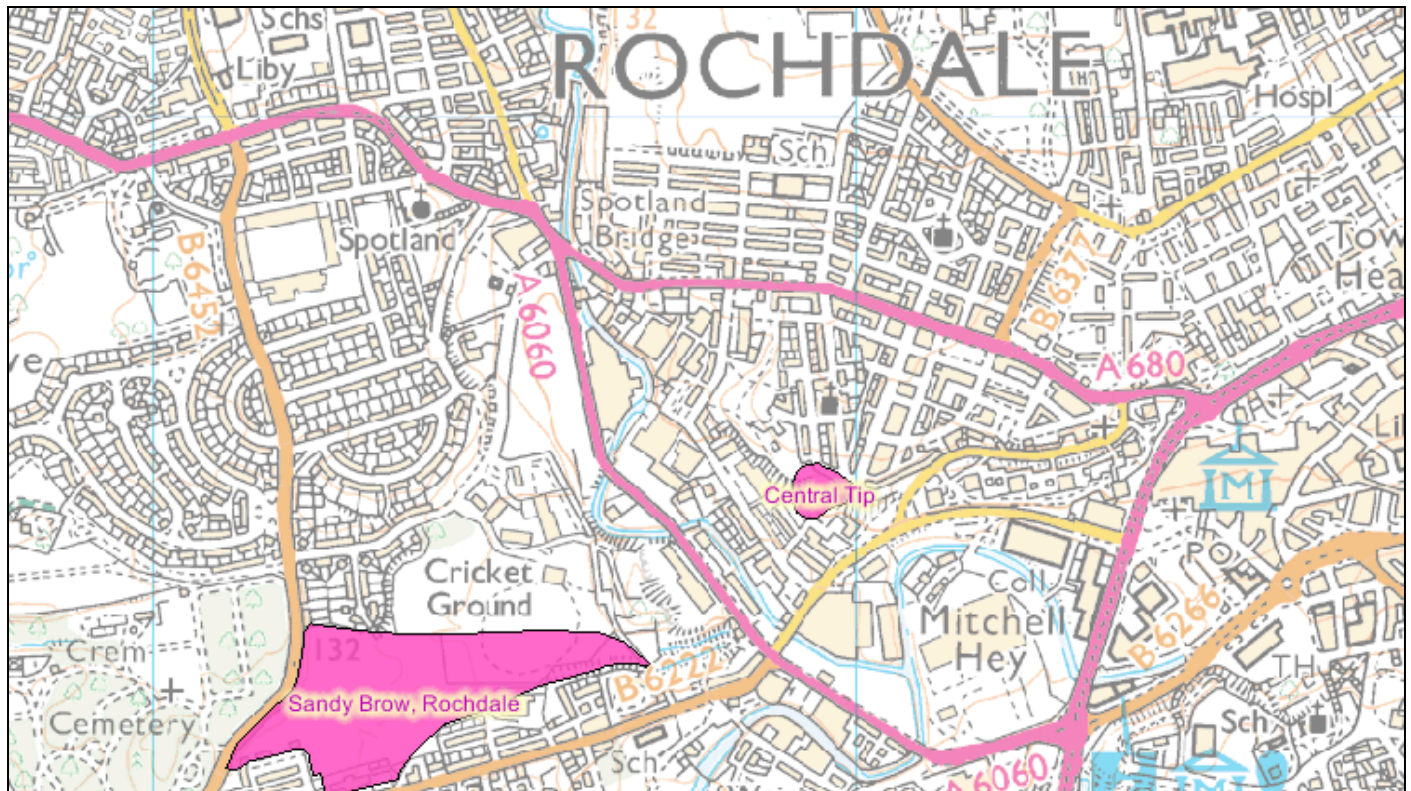
6.7. BGS Geological Map (Solid).



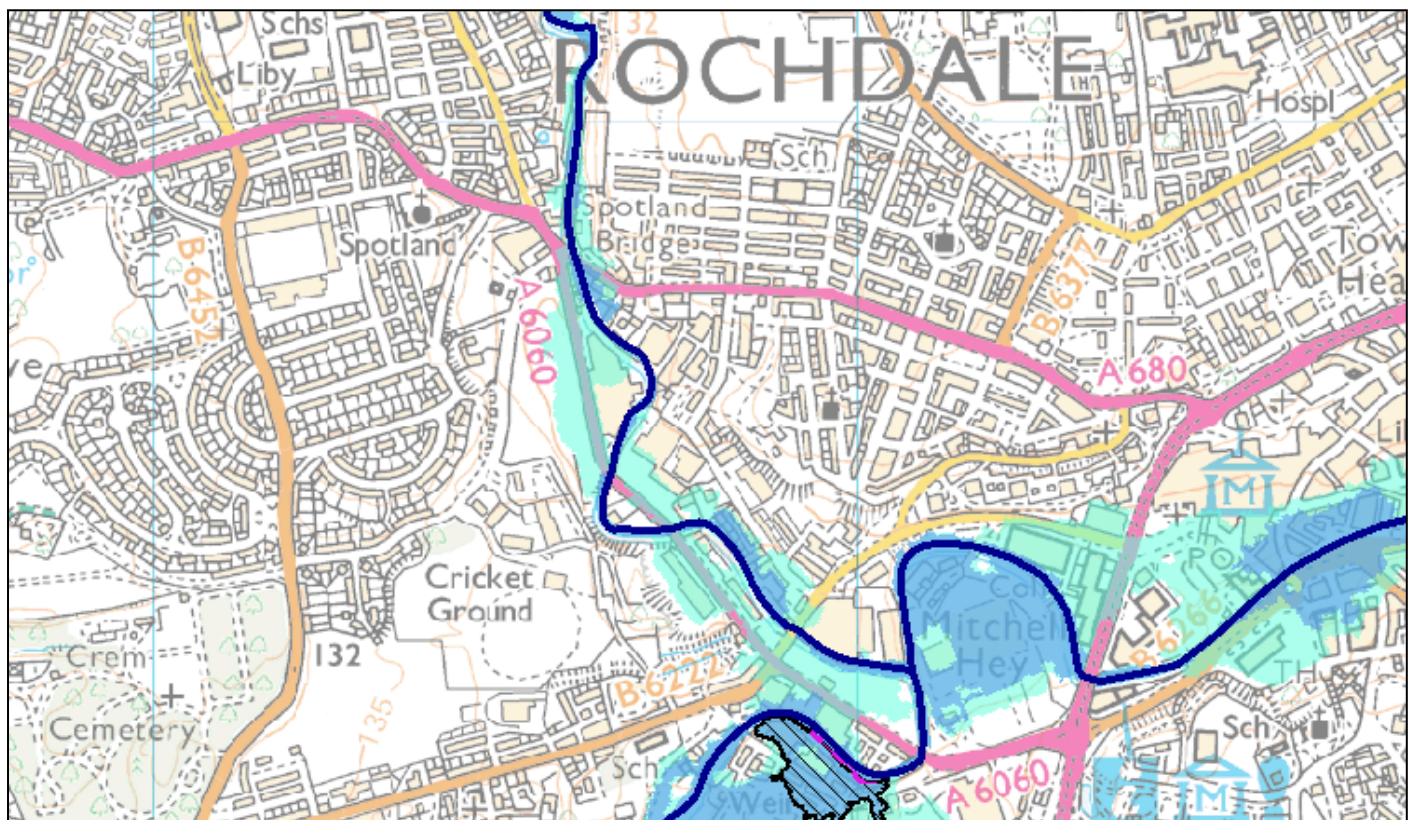
6.8. BGS Geological Map (Superficial).



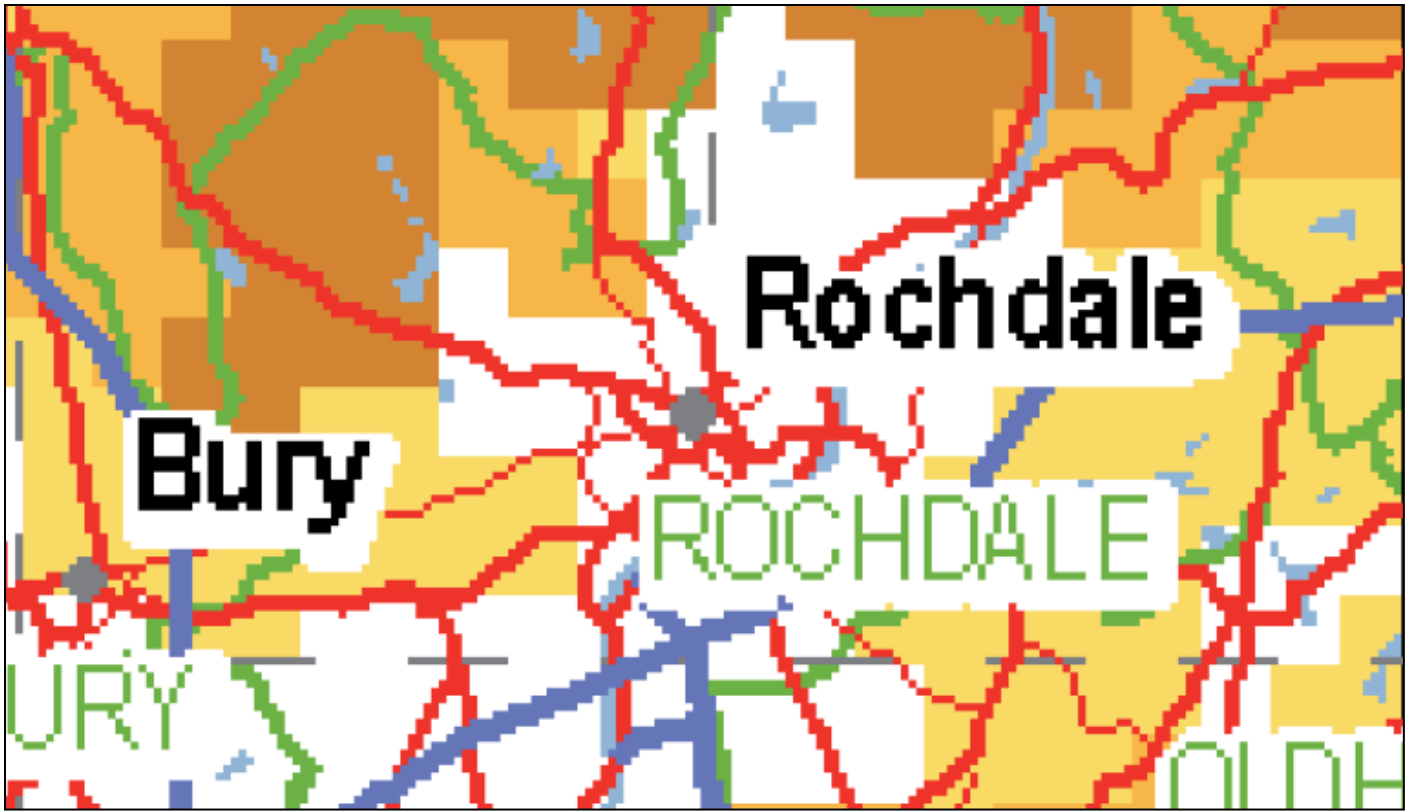
6.9. Environment Agency Landfill Map.



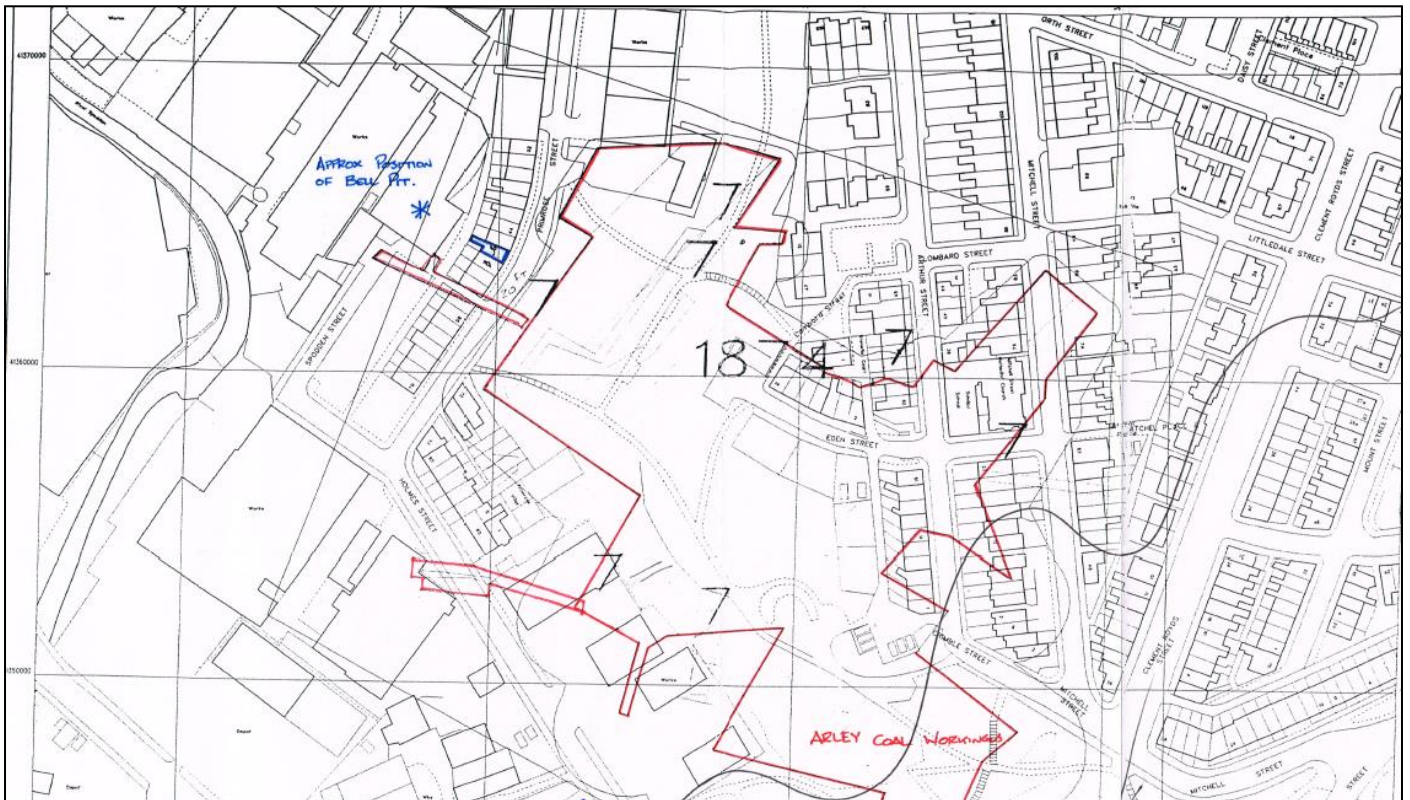
6.10. Environment Agency Flood Map.



6.11. BGS/HPA Radon Map.



6.12. Coal Authority Arley Mine Abandonment Plan.



7. APPENDIX C: SITE REPORTS & CERTIFICATES.

7.1. CLS Soil Certificates. 15.11.2018 Soil Sampling.

 CONCEPT LIFE SCIENCES DELIVERING SCIENCE Concept Life Sciences is a trading name of Concept Life Sciences Analytical & Development Services Limited registered in England and Wales (No 2514788)	Concept Life Sciences Certificate of Analysis	Hadfield House Hadfield Street Combrook Manchester M16 9FE Tel : 0161 874 2400 Fax : 0161 874 2468
Report Number: 783309-1 Date of Report: 28-Nov-2018 Customer: T J Booth Associates 20A Eastgate Rochdale OL16 1DH Customer Contact: Mr Daniel Slattery Customer Job Reference: Customer Purchase Order: tjba-guardian-dexine-151118-CLS Customer Site Reference: Guardian - Dexine, Rochdale Date Job Received at Concept: 16-Nov-2018 Date Analysis Started: 19-Nov-2018 Date Analysis Completed: 28-Nov-2018		
The results reported relate to samples received in the laboratory and may not be representative of a whole batch. Opinions and interpretations expressed herein are outside the scope of UKAS accreditation This report should not be reproduced except in full without the written approval of the laboratory Tests covered by this certificate were conducted in accordance with Concept Life Sciences SOPs All results have been reviewed in accordance with Section 25 of the Concept Life Sciences, Analytical Services Quality Manual		
	Report checked and authorised by : Aleksandra Pacula Senior Customer Service Advisor	Issued by : Aleksandra Pacula Senior Customer Service Advisor 
Page 1 of 5 783309-1		

Customer Reference:

Soil	Analysed as Soil
ICRCL (Maxi)	

Concept Reference					783309 001	783309 002	783309 003
Customer Sample Reference					S1	S2	S3
Date Sampled					15-NOV-2018	15-NOV-2018	15-NOV-2018
Determinand	Method	Test Sample	LOD	Units			
Chromium VI	T6	A40	1	mg/kg	<1	<1	<1
Arsenic	T6	A40	1	mg/kg	11	7	7
Boron (water-soluble)	T6	A40	1	mg/kg	23	17	15
Cadmium	T6	A40	1	mg/kg	<1	<1	<1
Chromium	T6	A40	1	mg/kg	24	18	18
Copper	T6	A40	1	mg/kg	39	43	32
Cyanide(Total)	T4	AR	1	mg/kg	<1	<1	<1
Cyanide(free)	T4	AR	1	mg/kg	<1	<1	<1
Lead	T6	A40	1	mg/kg	35	160	150
Mercury	T6	A40	1	mg/kg	<1	<1	<1
Nickel	T6	A40	1	mg/kg	36	14	13
pH	T7	A40			7.2	11.1	10.8
Phenols(Mono)	T4	AR	1	mg/kg	<1	<1	<1
Selenium	T6	A40	3	mg/kg	3	<3	<3
SO4(Total)	T6	A40	0.01	%	0.09	0.41	0.36
Sulphide	T4	A40	10	mg/kg	<10	<10	<10
Sulphur(Free)	T2	AR	500	mg/kg	<500	<500	<500
Thiocyanate	T4	A40	10	mg/kg	<10	<10	<10
Zinc	T6	A40	1	mg/kg	110	240	240

Customer Reference:

Soil	Analysed as Soil
Total and Speciated USEPA16 PAH	

Concept Reference					783309 001	783309 002	783309 003
Customer Sample Reference					S1	S2	S3
Date Sampled					15-NOV-2018	15-NOV-2018	15-NOV-2018
Determinand	Method	Test Sample	LOD	Units			
Naphthalene	T149	AR	0.01	mg/kg	14	0.08	0.89
Acenaphthylene	T149	AR	0.01	mg/kg	<1.0 ⁽⁹⁾	0.01	0.03
Acenaphthene	T149	AR	0.01	mg/kg	33	0.06	0.28
Fluorene	T149	AR	0.01	mg/kg	22	0.05	0.23
Phenanthrene	T149	AR	0.01	mg/kg	170	0.49	2.5
Anthracene	T149	AR	0.01	mg/kg	38	0.14	0.45
Fluoranthene	T149	AR	0.01	mg/kg	170	0.73	2.6
Pyrene	T149	AR	0.01	mg/kg	140	0.68	2.5
Benzo(a)Anthracene	T149	AR	0.01	mg/kg	72	0.36	1.3
Chrysene	T149	AR	0.01	mg/kg	67	0.35	1.4
Benzo(b/k)Fluoranthene	T149	AR	0.01	mg/kg	110	0.58	1.8
Benzo(a)Pyrene	T149	AR	0.01	mg/kg	54	0.31	1.1
Indeno(123-cd)Pyrene	T149	AR	0.01	mg/kg	33	0.19	0.66
Dibenzo(ah)Anthracene	T149	AR	0.01	mg/kg	12	0.06	0.23
Dibenzo(ghi)Perylene	T149	AR	0.01	mg/kg	32	0.19	0.66
PAH(total)	T149	AR	0.01	mg/kg	950	4.3	17

Concept Reference: 783309 Project Site: Guardian - Dextine, Rochdale Customer Reference:								
Soil TPH (CWG)			Analysed as Soil					
Concept Reference					783309 001	783309 002	783309 003	
Customer Sample Reference					S1	S2	S3	
Date Sampled					15-NOV-2018	15-NOV-2018	15-NOV-2018	
Determinand	Method	Test Sample	LOD	Units				
Benzene	T54	AR	1	µg/kg	<1 ⁽¹³⁾	<1 ⁽¹³⁾	<1 ⁽¹³⁾	
Toluene	T54	AR	1	µg/kg	<1	<1	<1	
EthylBenzene	T54	AR	1	µg/kg	<1	<1	<1	
M/P Xylene	T54	AR	1	µg/kg	<1	<1	2	
O Xylene	T54	AR	1	µg/kg	<1	1	<1	
Methyl tert-Butyl Ether	T54	AR	1	µg/kg	<1	<1	<1	
TPH (C5-C6 aliphatic)	T54	AR	0.010	mg/kg	<0.010	<0.010	<0.010	
TPH (C6-C8 aliphatic)	T54	AR	0.010	mg/kg	<0.010	<0.010	<0.010	
TPH (C8-C10 aliphatic)	T54	AR	0.010	mg/kg	<0.010	<0.010	<0.010	
TPH (C10-C12 aliphatic)	T8	AR	1	mg/kg	<10 ^(9,13)	<1 ⁽¹³⁾	<1 ⁽¹³⁾	
TPH (C12-C16 aliphatic)	T8	AR	1	mg/kg	<10 ^(13,9)	1 ⁽¹³⁾	1 ⁽¹³⁾	
TPH (C16-C21 aliphatic)	T8	AR	1	mg/kg	<10 ^(13,9)	4 ⁽¹³⁾	4 ⁽¹³⁾	
TPH (C21-C35 aliphatic)	T8	AR	1	mg/kg	81 ⁽¹³⁾	891 ⁽¹³⁾	100 ⁽¹³⁾	
TPH (C6-C7 aromatic)	T54	AR	0.010	mg/kg	<0.010	<0.010	<0.010	
TPH (C7-C8 aromatic)	T54	AR	0.010	mg/kg	<0.010	<0.010	<0.010	
TPH (C8-C10 aromatic)	T54	AR	0.010	mg/kg	<0.010	0.063	0.046	
TPH (C10-C12 aromatic)	T8	AR	1	mg/kg	<10 ^(9,13)	<1 ⁽¹³⁾	<1 ⁽¹³⁾	
TPH (C12-C16 aromatic)	T8	AR	1	mg/kg	98 ⁽¹³⁾	4 ⁽¹³⁾	4 ⁽¹³⁾	
TPH (C16-C21 aromatic)	T8	AR	1	mg/kg	620 ⁽¹³⁾	16 ⁽¹³⁾	11 ⁽¹³⁾	
TPH (C21-C35 aromatic)	T8	AR	1	mg/kg	1400 ⁽¹³⁾	491 ⁽¹³⁾	40 ⁽¹³⁾	

Concept Reference: 783309 Project Site: Guardian - Dextine, Rochdale Customer Reference:							
Soil		Analysed as Soil					
Miscellaneous							
Concept Reference				783309 001	783309 002	783309 003	
Customer Sample Reference				S1	S2	S3	
Date Sampled				15-NOV-2018	15-NOV-2018	15-NOV-2018	
Determinand	Method	Test Sample	LOD	Units			
Asbestos ID	T27	A40			N.D.	Chrysotile Fibres Detected	Chrysotile Fibres Detected
Soil Organic Matter	T287	A40	0.1	%	3.8	3.0	3.1
Benzo(b)fluoranthene	T149	AR	0.01	mg/kg	60	0.34	1.1
Benzo(k)fluoranthene	T149	AR	0.01	mg/kg	47	0.29	0.68

Index to symbols used in 783309-1

Value	Description
A40	Assisted dried < 40C
AR	As Received
N.D.	Not Detected
13	Results have been blank corrected.
9	LOD raised due to dilution of sample
S	Analysis was subcontracted
U	Analysis is UKAS accredited
N	Analysis is not UKAS accredited

Notes

Asbestos testing was subcontracted.

Method Index

Value	Description
T4	Colorimetry
T8	GC/FID
T287	Calc TOC/0.58
T2	Grav
T27	PLM
T6	ICP/OES
T149	GC/MS (SIR)
T7	Probe
T54	GC/MS (Headspace)

Accreditation Summary

Determinand	Method	Test Sample	LOD	Units	Symbol	Concept References
Chromium VI	T6	A40	1	mg/kg	N	001-003
Arsenic	T6	A40	1	mg/kg	U	001-003
Boron (water-soluble)	T6	A40	1	mg/kg	N	001-003
Cadmium	T6	A40	1	mg/kg	U	001-003
Chromium	T6	A40	1	mg/kg	U	001-003
Copper	T6	A40	1	mg/kg	U	001-003
Cyanide(Total)	T4	AR	1	mg/kg	U	001-003
Cyanide(free)	T4	AR	1	mg/kg	U	001-003
Lead	T6	A40	1	mg/kg	U	001-003
Mercury	T6	A40	1	mg/kg	U	001-003
Nickel	T6	A40	1	mg/kg	U	001-003
pH	T7	A40			U	001-003
Phenols(Mono)	T4	AR	1	mg/kg	U	001-003
Selenium	T6	A40	3	mg/kg	U	001-003
SO4(Total)	T6	A40	0.01	%	N	001-003
Sulphide	T4	A40	10	mg/kg	N	001-003
Sulphur(Free)	T2	AR	500	mg/kg	N	001-003
Thiocyanate	T4	A40	10	mg/kg	N	001-003
Zinc	T6	A40	1	mg/kg	U	001-003
Naphthalene	T149	AR	0.01	mg/kg	U	001-003
Acenaphthylene	T149	AR	0.01	mg/kg	U	001-003
Acenaphthene	T149	AR	0.01	mg/kg	U	001-003
Fluorene	T149	AR	0.01	mg/kg	U	001-003
Phenanthrene	T149	AR	0.01	mg/kg	U	001-003
Anthracene	T149	AR	0.01	mg/kg	U	001-003
Fluoranthene	T149	AR	0.01	mg/kg	U	001-003
Pyrene	T149	AR	0.01	mg/kg	U	001-003
Benzo(a)Anthracene	T149	AR	0.01	mg/kg	U	001-003
Chrysene	T149	AR	0.01	mg/kg	U	001-003
Benzo(b/k)Fluoranthene	T149	AR	0.01	mg/kg	U	001-003
Benzo(a)Pyrene	T149	AR	0.01	mg/kg	U	001-003
Indeno(123-cd)Pyrene	T149	AR	0.01	mg/kg	U	001-003
Dibenzo(ah)Anthracene	T149	AR	0.01	mg/kg	U	001-003
Benzo(ghi)Perylene	T149	AR	0.01	mg/kg	U	001-003
PAH(total)	T149	AR	0.01	mg/kg	U	001-003
Benzene	T54	AR	1	µg/kg	U	001-003
Toluene	T54	AR	1	µg/kg	U	001-003
EthylBenzene	T54	AR	1	µg/kg	U	001-003
m/P Xylene	T54	AR	1	µg/kg	U	001-003
O Xylene	T54	AR	1	µg/kg	U	001-003
Methyl tert-Butyl Ether	T54	AR	1	µg/kg	U	001-003
TPH (C5-C6 aliphatic)	T54	AR	0.010	mg/kg	N	001-003
TPH (C6-C8 aliphatic)	T54	AR	0.010	mg/kg	N	001-003
TPH (C8-C10 aliphatic)	T54	AR	0.010	mg/kg	N	001-003
TPH (C10-C12 aliphatic)	T8	AR	1	mg/kg	N	001-003
TPH (C12-C16 aliphatic)	T8	AR	1	mg/kg	N	001-003
TPH (C16-C21 aliphatic)	T8	AR	1	mg/kg	N	001-003
TPH (C21-C35 aliphatic)	T8	AR	1	mg/kg	N	001-003
TPH (C6-C7 aromatic)	T54	AR	0.010	mg/kg	N	001-003
TPH (C7-C8 aromatic)	T54	AR	0.010	mg/kg	N	001-003
TPH (C8-C10 aromatic)	T54	AR	0.010	mg/kg	N	001-003
TPH (C10-C12 aromatic)	T8	AR	1	mg/kg	N	001-003
TPH (C12-C16 aromatic)	T8	AR	1	mg/kg	N	001-003

Determinand	Method	Test Sample	LOD	Units	Symbol	Concept References
TPH (C16-C21 aromatic)	T8	AR	1	mg/kg	N	001-003
TPH (C21-C35 aromatic)	T8	AR	1	mg/kg	N	001-003
Asbestos ID	T27	A40			SU	001-003
Soil Organic Matter	T267	A40	0.1	%	N	001-003
Benzo(b)fluoranthene	T149	AR	0.01	mg/kg	U	001-003
Benzo(k)fluoranthene	T149	AR	0.01	mg/kg	U	001-003



7.2. CLS Soil Certificates. 26.11.2020 Soil Sampling.



Chemtest
Eurofins Chemtest Ltd
Depot Road
Newmarket
CB8 0AL
Tel: 01638 606070
Email: info@chemtest.com

Final Report

Report No.:	20-32632-1		
Initial Date of Issue:	10-Dec-2020		
Client	TJ Booth Associates		
Client Address:	20a Eastgate Street Rochdale Lancs OL16 1DH		
Contact(s):	Daniel Slattery		
Project	Hallmar Dexine, Spotland Road, Rochdale		
Quotation No.:	Q19-18321	Date Received:	30-Nov-2020
Order No.:		Date Instructed:	30-Nov-2020
No. of Samples:	5		
Turnaround (Wkdays):	10	Results Due:	11-Dec-2020
Date Approved:	10-Dec-2020		
Approved By:			
Details:	Glynn Harvey, Technical Manager		

Results - Soil

Project: Hallmar Dextine, Spotland Road, Rochdale									
Client: TJ Booth Associates		Chemtest Job No.:		20-32632		20-32632		20-32632	
Quotation No.: 019-18321		Chemtest Sample ID.:		1105381		1105382		1105384	
Order No.:		Client Sample Ref.:		S4		S6		S7	
		Client Sample ID.:		1		2		3	
		Sample Location:		TH7		TH8		TH9	
		Sample Type:		SOIL		SOIL		SOIL	
		Top Depth (m):		0.00		0.00		0.00	
		Bottom Depth (m):		0.60		0.60		0.60	
		Date Sampled:		26-Nov-2020		26-Nov-2020		26-Nov-2020	
		Asbestos Lab:		DURHAM		DURHAM		DURHAM	
		Asbestos LOD		-		-		-	
Determine and		Accred.		SOP		Units		LOD	
ACM Type		U		2192				N/A	
Asbestos Identification		U		2192				N/A	
ACM Detection Stage		U		2192				N/A	
Moisture		N		2030		%		12	
pH		U		2010		mg/kg		8.4	
Boron (Hot Water Soluble)		U		2120		mg/kg		<0.40	
Sulphur (Elemental)		U		2180		mg/kg		1.0	
Cyanide (Total)		U		2300		mg/kg		<0.50	
Thiocyanate		U		2300		mg/kg		5.0	
Sulphide (Easily Liberatable)		N		2325		mg/kg		0.50	
Sulphate (Total)		U		2430		mg/kg		100	
Arsenic		U		2450		mg/kg		1.0	
Cadmium		U		2450		mg/kg		0.10	
Chromium		U		2450		mg/kg		1.0	
Copper		U		2450		mg/kg		0.50	
Mercury		U		2450		mg/kg		0.10	
Nickel		U		2450		mg/kg		0.50	
Lead		U		2450		mg/kg		0.50	
Selenium		U		2450		mg/kg		0.20	
Zinc		U		2450		mg/kg		0.50	
Chromium (Hexavalent)		N		2450		mg/kg		0.50	
Organic Matter		U		2625		%		0.40	
Naphthalene		U		2700		mg/kg		0.10	
Acenaphthylene		U		2700		mg/kg		0.10	
Acenaphthene		U		2700		mg/kg		0.10	
Fluorene		U		2700		mg/kg		0.10	
Phenanthrene		U		2700		mg/kg		0.10	
Anthracene		U		2700		mg/kg		0.10	
Fluoranthene		U		2700		mg/kg		0.10	
Pyrene		U		2700		mg/kg		0.10	
Benzofluoranthene		U		2700		mg/kg		0.10	
Chrysene		U		2700		mg/kg		0.10	
Benzofluoranthene		U		2700		mg/kg		0.10	
Benzofluoranthene		U		2700		mg/kg		0.10	
Benzofluoranthene		U		2700		mg/kg		0.10	
Benzofluoranthene		U		2700		mg/kg		0.10	
Benzofluoranthene		U		2700		mg/kg		0.10	
Benzofluoranthene		U		2700		mg/kg		0.10	
Benzofluoranthene		U		2700		mg/kg		0.10	
Benzofluoranthene		U		2700		mg/kg		0.10	
Benzofluoranthene		U		2700		mg/kg		0.10	
Benzofluoranthene		U		2700		mg/kg		0.10	
Benzofluoranthene		U		2700		mg/kg		0.10	
Benzofluoranthene		U		2700		mg/kg		0.10	
Benzofluoranthene		U		2700		mg/kg		0.10	
Benzofluoranthene		U		2700		mg/kg		0.10	
Benzofluoranthene		U		2700		mg/kg		0.10	
Benzofluoranthene		U		2700		mg/kg		0.10	
Benzofluoranthene		U		2700		mg/kg		0.10	
Benzofluoranthene		U		2700		mg/kg		0.10	
Benzofluoranthene		U		2700		mg/kg		0.10	
Benzofluoranthene		U		2700		mg/kg		0.10	
Benzofluoranthene		U		2700		mg/kg		0.10	
Benzofluoranthene		U		2700		mg/kg		0.10	
Benzofluoranthene		U		2700		mg/kg		0.10	
Benzofluoranthene		U		2700		mg/kg		0.10	
Benzofluoranthene		U		2700		mg/kg		0.10	
Benzofluoranthene		U		2700		mg/kg		0.10	
Benzofluoranthene		U		2700		mg/kg		0.10	
Benzofluoranthene		U		2700		mg/kg		0.10	
Benzofluoranthene		U		2700		mg/kg		0.10	
Benzofluoranthene		U		2700		mg/kg		0.10	
Benzofluoranthene		U		2700		mg/kg		0.10	
Benzofluoranthene		U		2700		mg/kg		0.10	
Benzofluoranthene		U		2700		mg/kg		0.10	
Benzofluoranthene		U		2700		mg/kg		0.10	
Benzofluoranthene		U		2700		mg/kg		0.10	
Benzofluoranthene		U		2700		mg/kg		0.10	
Benzofluoranthene		U		2700		mg/kg		0.10	
Benzofluoranthene		U		2700		mg/kg		0.10	
Benzofluoranthene		U		2700		mg/kg		0.10	
Benzofluoranthene		U		2700		mg/kg		0.10	
Benzofluoranthene		U		2700		mg/kg		0.10	
Benzofluoranthene									

Results - Soil

Project: Hallmar Dextine, Spotland Road, Rochdale									
Client: TJ Booth Associates		Chemtest Job No.:		20-32632		20-32632		20-32632	
Quotation No.: Q19-18321		Chemtest Sample ID.:		1105381		1105382		1105384	
Order No.:		Client Sample Ref.:		S4		S6		S7	
		Client Sample ID.:		1		3		4	
		Sample Location:		TH7		TH8		TH9	
		Sample Type:		SOIL		SOIL		SOIL	
		Top Depth (m):		0.00		0.00		0.00	
		Bottom Depth (m):		0.60		0.60		0.60	
		Date Sampled:		26-Nov-2020		26-Nov-2020		26-Nov-2020	
		Asbestos Lab:		DURHAM		DURHAM		DURHAM	
Determinand		Accred.	SOP	Units	LOD				
Indeno(1,2,3-c,d)Pyrene		U	2700	mg/kg	0.10	< 0.10		< 0.10	
Dibenz(a,h)Anthracene		U	2700	mg/kg	0.10	< 0.10		< 0.10	
Benzo(g,h,i)perylene		U	2700	mg/kg	0.10	< 0.10		< 0.10	
Total Of 16 PAH's		U	2700	mg/kg	2.0	< 2.0		5.1	
Total Phenols		U	2920	mg/kg	0.30	< 0.30		< 0.30	

Test Methods

SOP	Title	Parameters included	Method summary
2010	pH Value of Soils	pH	pH Meter
2030	Moisture and Stone Content of Soils (Requirement of MCERTS)	Moisture content	Determination of moisture content of soil as a percentage of its as received mass obtained at <37°C.
2040	Soil Description (Requirement of MCERTS)	Soil description	As received soil is described based upon BS5930
2120	Water Soluble Boron, Sulphate, Magnesium & Chromium	Boron; Sulphate; Magnesium; Chromium	Aqueous extraction / ICP-OES
2180	Sulphur (Elemental) in Soils by HPLC	Sulphur	Dichloromethane extraction / HPLC with UV detection
2192	Asbestos	Asbestos	Polarised light microscopy / Gravimetry
2300	Cyanides & Thiocyanate in Soils	Free (or easily liberatable) Cyanide; total Cyanide; complex Cyanide; Thiocyanate	Alkaline extraction followed by colorimetric determination using Automated Flow Injection Analyser.
2325	Sulphide in Soils	Sulphide	Steam distillation with sulphuric acid / analysis by 'Aquakem 600' Discrete Analyser, using N,N-dimethyl-p-phenylenediamine.
2430	Total Sulphate in soils	Total Sulphate	Acid digestion followed by determination of sulphate in extract by ICP-OES.
2450	Acid Soluble Metals in Soils	Metals, including: Arsenic; Barium; Beryllium; Cadmium; Chromium; Cobalt; Copper; Lead; Manganese; Mercury; Molybdenum; Nickel; Selenium; Vanadium; Zinc	Acid digestion followed by determination of metals in extract by ICP-MS.
2490	Hexavalent Chromium in Soils	Chromium [VI]	Soil extracts are prepared by extracting dried and ground soil samples into boiling water. Chromium [VI] is determined by 'Aquakem 600' Discrete Analyser using 1,5-diphenylcarbazide.
2625	Total Organic Carbon in Soils	Total organic Carbon (TOC)	Determined by high temperature combustion under oxygen, using an Eltra elemental analyser.
2700	Speciated Polynuclear Aromatic Hydrocarbons (PAH) in Soil by GC-FID	Acenaphthene; Acenaphthylene; Anthracene; Benzo[a]Anthracene; Benzo[a]Pyrene; Benzo[b]Fluoranthene; Benzo[ghi]Perylene; Benzo[k]Fluoranthene; Chrysene; Dibenz[ah]Anthracene; Fluoranthene; Fluorene; Indeno[123cd]Pyrene; Naphthalene; Phenanthrene; Pyrene	Dichloromethane extraction / GC-FID (GC-FID detection is non-selective and can be subject to interference from co-eluting compounds)
2920	Phenols in Soils by HPLC	Phenolic compounds including Resorcinol, Phenol, Methylphenols, Dimethylphenols, 1-Naphthol and Trimethylphenols. Note: chlorophenols are excluded.	60:40 methanol/water mixture extraction, followed by HPLC determination using electrochemical detection.

Report Information

Key

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

Comments or interpretations are beyond the scope of UKAS accreditation

The results relate only to the items tested

Uncertainty of measurement for the determinands tested are available upon request

None of the results in this report have been recovery corrected

All results are expressed on a dry weight basis

The following tests were analysed on samples as received and the results subsequently corrected to a dry weight basis TPH, BTEX, VOCs, SVOCs, PCBs, Phenols

For all other tests the samples were dried at < 37°C prior to analysis

All Asbestos testing is performed at the indicated laboratory

Issue numbers are sequential starting with 1 all subsequent reports are incremented by 1

Sample Deviation Codes

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

Sample Retention and Disposal

All soil samples will be retained for a period of 45 days from the date of receipt

All water samples will be retained for 14 days from the date of receipt

Charges may apply to extended sample storage

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

7.3. CLS Soil Certificates. 09.09.2021 Water Sampling.



Chemtest
Eurofins Chemtest Ltd
Depot Road
Newmarket
CB8 0AL
Tel: 01638 606070
Email: info@chemtest.com

Final Report

Report No.:	21-31492-1		
Initial Date of Issue:	24-Sep-2021		
Client	TJ Booth Associates		
Client Address:	20a Eastgate Street Rochdale Lancs OL16 1DH		
Contact(s):	Daniel Slattery		
Project	Hallmark Developments - Dexine, Rochdale		
Quotation No.:	Date Received:	13-Sep-2021	
Order No.:	Date Instructed:	13-Sep-2021	
No. of Samples:	3		
Turnaround (Wkdays):	10	Results Due:	24-Sep-2021
Date Approved:	24-Sep-2021		
Approved By:			
Details:	Glynn Harvey, Technical Manager		

Results - Water

Project: Hallmark Developments - Dextine, Rochdale									
Client: TJ Booth Associates		Chemtest Job No.:		21-31492		21-31492		21-31492	
Quotation No.:		Chemtest Sample ID.:		1276932		1276933		1276934	
		Client Sample ID.:		WS1		WS2		WS3	
		Sample Location:		Upstream River		Midpoint River		Downstream River	
		Sample Type:		WATER		WATER		WATER	
		Date Sampled:		09-Sep-2021		09-Sep-2021		09-Sep-2021	
Determinand	Accred.	SOP	Units	LOD					
pH	U	1010		N/A	7.4	7.6	7.7		
Biochemical Oxygen Demand	N	1000	mg O ₂ /l	4.0	[B] 6.8	[B] < 4.0	[B] 4.6		
Sulphur	N	1220	mg/l	1.0	11	11	11		
Cyanide (Total)	U	1300	mg/l	0.050	< 0.050	< 0.050	< 0.050		
Total Hardness as CaCO ₃	U	1270	mg/l	15	75	75	75		
Arsenic (Dissolved)	U	1455	µg/l	0.20	1.5	0.74	0.31		
Cadmium (Dissolved)	U	1455	µg/l	0.11	0.29	< 0.11	< 0.11		
Chromium (Dissolved)	U	1455	µg/l	0.50	1.6	6.5	23		
Copper (Dissolved)	U	1455	µg/l	0.50	1.3	1.1	1.5		
Mercury (Dissolved)	U	1455	µg/l	0.05	< 0.05	< 0.05	< 0.05		
Nickel (Dissolved)	U	1455	µg/l	0.50	1.7	4.0	11		
Lead (Dissolved)	U	1455	µg/l	0.50	< 0.50	< 0.50	< 0.50		
Selenium (Dissolved)	U	1455	µg/l	0.50	1.9	1.5	1.4		
Zinc (Dissolved)	U	1455	µg/l	2.5	< 2.5	< 2.5	< 2.5		
Chromium (Hexavalent)	U	1450	µg/l	20	[B] < 20	[B] < 20	[B] < 20		
Total Organic Carbon	U	1610	mg/l	2.0	12	11	10		
Aliphatic TPH > C5-C6	N	1675	µg/l	0.10	[C] < 0.10	[C] < 0.10	[C] < 0.10		
Aliphatic TPH > C6-C8	N	1675	µg/l	0.10	[C] < 0.10	[C] < 0.10	[C] < 0.10		
Aliphatic TPH > C9-C10	N	1675	µg/l	0.10	[C] < 0.10	[C] < 0.10	[C] < 0.10		
Aliphatic TPH > C10-C12	N	1675	µg/l	0.10	[C] < 0.10	[C] < 0.10	[C] < 0.10		
Aliphatic TPH > C12-C16	N	1675	µg/l	0.10	[C] < 0.10	[C] < 0.10	[C] < 0.10		
Aliphatic TPH > C16-C21	N	1675	µg/l	0.10	[C] < 0.10	[C] < 0.10	[C] < 0.10		
Aliphatic TPH > C21-C35	N	1675	µg/l	0.10	[C] < 0.10	[C] < 0.10	[C] < 0.10		
Aliphatic TPH > C35-C44	N	1675	µg/l	0.10	[C] < 0.10	[C] < 0.10	[C] < 0.10		
Total Aliphatic Hydrocarbons	N	1675	µg/l	5.0	[C] < 5.0	[C] < 5.0	[C] < 5.0		
Aromatic TPH > C5-C7	N	1675	µg/l	0.10	[C] < 0.10	[C] < 0.10	[C] < 0.10		
Aromatic TPH > C7-C8	N	1675	µg/l	0.10	[C] < 0.10	[C] < 0.10	[C] < 0.10		
Aromatic TPH > C8-C10	N	1675	µg/l	0.10	[C] < 0.10	[C] < 0.10	[C] < 0.10		
Aromatic TPH > C10-C12	N	1675	µg/l	0.10	[C] < 0.10	[C] < 0.10	[C] < 0.10		
Aromatic TPH > C12-C16	N	1675	µg/l	0.10	[C] < 0.10	[C] < 0.10	[C] < 0.10		
Aromatic TPH > C16-C21	N	1675	µg/l	0.10	[C] < 0.10	[C] < 0.10	[C] < 0.10		
Aromatic TPH > C21-C35	N	1675	µg/l	0.10	[C] < 0.10	[C] < 0.10	[C] < 0.10		
Aromatic TPH > C35-C44	N	1675	µg/l	0.10	[C] < 0.10	[C] < 0.10	[C] < 0.10		
Total Aromatic Hydrocarbons	N	1675	µg/l	5.0	[C] < 5.0	[C] < 5.0	[C] < 5.0		
Total Petroleum Hydrocarbons	N	1675	µg/l	10	[C] < 10	[C] < 10	[C] < 10		
Naphthalene	U	1800	µg/l	0.10	[C] < 0.10	[C] < 0.10	[C] < 0.10		
Acenaphthylene	U	1800	µg/l	0.10	[C] < 0.10	[C] < 0.10	[C] < 0.10		
Acenaphthene	U	1800	µg/l	0.10	[C] < 0.10	[C] < 0.10	[C] < 0.10		
Fluorene	U	1800	µg/l	0.10	[C] < 0.10	[C] < 0.10	[C] < 0.10		

Results - Water

Project Hallmark Developments - Dextine, Rochdale									
Client: TJ Booth Associates Quotation No.:	Chemtest Job No.:	21-31492	21-31492	21-31492	21-31492	21-31492	21-31492	21-31492	21-31492
	Chemtest Sample ID.:	1276932	1276933	1276934	WS1	WS2	WS3	WS4	WS5
	Client Sample ID.:	WS1	WS2	WS3	WS4	WS5	WS6	WS7	WS8
	Sample Location:	Upstream River	Midpoint River	Downstream River	WS1	WS2	WS3	WS4	WS5
	Sample Type:	WATER	WATER	WATER	WATER	WATER	WATER	WATER	WATER
	Date Sampled:	09-Sep-2021	09-Sep-2021	09-Sep-2021	09-Sep-2021	09-Sep-2021	09-Sep-2021	09-Sep-2021	09-Sep-2021
Determinand	Accred.	SOP	Units	LOD					
Phenanthrene	U	1800	µg/l	0.10	[C] < 0.10	[C] < 0.10	[C] < 0.10	[C] < 0.10	[C] < 0.10
Anthracene	U	1800	µg/l	0.10	[C] < 0.10	[C] < 0.10	[C] < 0.10	[C] < 0.10	[C] < 0.10
Fluoranthene	U	1800	µg/l	0.10	[C] < 0.10	[C] < 0.10	[C] < 0.10	[C] < 0.10	[C] < 0.10
Pyrene	U	1800	µg/l	0.10	[C] < 0.10	[C] < 0.10	[C] < 0.10	[C] < 0.10	[C] < 0.10
Benzofluoranthene	U	1800	µg/l	0.10	[C] < 0.10	[C] < 0.10	[C] < 0.10	[C] < 0.10	[C] < 0.10
Chrysene	U	1800	µg/l	0.10	[C] < 0.10	[C] < 0.10	[C] < 0.10	[C] < 0.10	[C] < 0.10
Benzofluoranthene	U	1800	µg/l	0.10	[C] < 0.10	[C] < 0.10	[C] < 0.10	[C] < 0.10	[C] < 0.10
Benzofluoranthene	U	1800	µg/l	0.10	[C] < 0.10	[C] < 0.10	[C] < 0.10	[C] < 0.10	[C] < 0.10
Benzofluoranthene	U	1800	µg/l	0.10	[C] < 0.10	[C] < 0.10	[C] < 0.10	[C] < 0.10	[C] < 0.10
Indeno(1,2,3-c,d)Pyrene	U	1800	µg/l	0.10	[C] < 0.10	[C] < 0.10	[C] < 0.10	[C] < 0.10	[C] < 0.10
Dibenz(a,h)Anthracene	U	1800	µg/l	0.10	[C] < 0.10	[C] < 0.10	[C] < 0.10	[C] < 0.10	[C] < 0.10
Benzofluoranthene	U	1800	µg/l	0.10	[C] < 0.10	[C] < 0.10	[C] < 0.10	[C] < 0.10	[C] < 0.10
Total Of 16 PAH's	U	1800	µg/l	2.0	[C] < 2.0	[C] < 2.0	[C] < 2.0	[C] < 2.0	[C] < 2.0
Total Phenols	U	1920	mg/l	0.030	[C] < 0.030	[C] < 0.030	[C] < 0.030	[C] < 0.030	[C] < 0.030

Deviations

In accordance with UKAS Policy on Deviating Samples TPS 63, Chemtest have a procedure to ensure 'upon receipt of each sample a competent laboratory shall assess whether the sample is suitable with regard to the requested test(s)'. This policy and the respective holding times applied, can be supplied upon request. The reason a sample is declared as deviating is detailed below. Where applicable the analysis remains UKAS/IMCERTs accredited but the results may be compromised.

Sample:	Sample Ref:	Sample ID:	Sample Location:	Sampled Date:	Deviation Code(s):	Containers Received:
1276932		WS1	Upstream River	09-Sep-2021	BC	Plastic Bottle 1000ml
1276933		WS2	Midpoint River	09-Sep-2021	BC	Plastic Bottle 1000ml
1276934		WS3	Downstream River	09-Sep-2021	BC	Plastic Bottle 1000ml

Test Methods

SOP	Title	Parameters included	Method summary
1010	pH Value of Waters	pH	pH Meter
1090	Biochemical Oxygen Demand	Biochemical Oxygen demand (BOD)	Colorimetric determination of dissolved oxygen in seeded sample after 5 days incubation at 20°C.
1220	Anions, Alkalinity & Ammonium in Waters	Fluoride; Chloride; Nitrite; Nitrate; Total; Oxidisable Nitrogen (TON); Sulfate; Phosphate; Alkalinity; Ammonium	Automated colorimetric analysis using 'Aquakem 600' Discrete Analyser.
1270	Total Hardness of Waters	Total hardness	Calculation applied to calcium and magnesium results, expressed as mg l-1 CaCO3 equivalent.
1300	Cyanides & Thiocyanate in Waters	Free (or easily liberatable) Cyanide; total Cyanide; complex Cyanide; Thiocyanate	Continuous Flow Analysis.
1455	Metals in Waters by ICP-MS	Metals, including: Antimony; Arsenic; Barium; Beryllium; Boron; Cadmium; Chromium; Cobalt; Copper; Lead; Manganese; Mercury; Molybdenum; Nickel; Selenium; Tin; Vanadium; Zinc	Filtration of samples followed by direct determination by inductively coupled plasma mass spectrometry (ICP-MS).
1490	Hexavalent Chromium in Waters	Chromium [VI]	Automated colorimetric analysis by 'Aquakem 600' Discrete Analyser using 1,5-diphenylcarbazide.
1610	Total/Dissolved Organic Carbon in Waters	Organic Carbon	TOC Analyser using Catalytic Oxidation
1675	TPH Aliphatic/Aromatic split in Waters by GC-FID(cf. Texas Method 1008 / TPH CWG)	Aliphatics: >C5-C8, >C6-C8, >C8-C10, >C10-C12, >C12-C16, >C16-C21, >C21-C35, >C35-C44 Aromatics: >C5-C7, >C7-C8, >C8-C10, >C10-C12, >C12-C16, >C16-C21, >C21-C35, >C35-C44	Pentane extraction / GCxGC FID detection
1800	Speciated Polynuclear Aromatic Hydrocarbons (PAH) in Waters by GC-MS	Acenaphthene; Acenaphthylene; Anthracene; Benzo[a]Anthracene; Benzo[a]Pyrene; Benzo[b]Fluoranthene; Benzo[ghi]Perylene; Benzo[k]Fluoranthene; Chrysene; Dibenz[ah]Anthracene; Fluoranthene; Fluorene; Indeno[123cd]Pyrene; Naphthalene; Phenanthrene; Pyrene	Pentane extraction / GCMS detection
1920	Phenols in Waters by HPLC	Phenolic compounds including: Phenol, Cresols, Xylenols, Trimethylphenols Note: Chlorophenols are excluded.	Determination by High Performance Liquid Chromatography (HPLC) using electrochemical detection.

Report Information

Key

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

Comments or interpretations are beyond the scope of UKAS accreditation

The results relate only to the items tested

Uncertainty of measurement for the determinands tested are available upon request

None of the results in this report have been recovery corrected

All results are expressed on a dry weight basis

The following tests were analysed on samples as received and the results subsequently corrected to a dry weight basis TPH, BTEX, VOCs, SVOCs, PCBs, Phenols

For all other tests the samples were dried at < 37°C prior to analysis

All Asbestos testing is performed at the indicated laboratory

Issue numbers are sequential starting with 1 all subsequent reports are incremented by 1

Sample Deviation Codes

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

Sample Retention and Disposal

All soil samples will be retained for a period of 30 days from the date of receipt

All water samples will be retained for 14 days from the date of receipt

Charges may apply to extended sample storage

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

8. APPENDIX D: PUBLICATIONS.

8.1. CIRIA (Report c665) Wilson and Card Classification.

Modified Wilson and Card classification

	Characteristic situation (CIRIA R149)	Comparable classification in DETR et al (1999)	Risk classification	Gas screening value (GSV) (CH ₄ or CO ₂) (l/hr) ¹ Threshold	Additional factors	Typical source of generation
	1	A	Very low risk	<0.07	Typically methane <1 % and/or carbon dioxide <5 %. Otherwise consider increase to Situation 2	Natural soils with low organic content "Typical" made ground
	2	B	Low risk	<0.7	Borehole air flow rate not to exceed 70l/hr. Otherwise consider increase to characteristic Situation 3	Natural soil, high peat/organic content. "Typical" made ground
	3	C	Moderate risk	<3.5		Old landfill, inert waste, mineworking flooded
	4	D	Moderate to high risk	<15	Quantitative risk assessment required to evaluate scope of protective measures.	Mineworking – susceptible to flooding, completed landfill (WMP 26B criteria)
	5	E	High risk	<70		Mineworking unflooded inactive with shallow workings near surface
	6	F	Very high risk	>70		Recent landfill site

Notes on the use of Table 8.5

- 1 Gas screening value: (Litres of gas/hour) is calculated by multiplying the maximum gas concentration (%) by the maximum measured borehole flow rate (l/hr) – see Glossary.
- 2 Site characterisation should be based on gas monitoring of concentrations and borehole flow rates for the minimum periods defined in Table 5.5.
- 3 Source of gas and generation potential/performance should be identified.
- 4 Soil gas investigation should be in accordance with guidance provided in Chapters 4 to 6.
- 5 If there is no detectable flow, use the limit of detection of the instrument.
- 6 The boundaries between the Partners in Technology classifications do not fit exactly with the boundaries for the CIRIA classification.

8.2. CIRIA (Report c665) Wilson and Card Protective Measures.

Typical scope of gas protective measures

Characteristic situation	Residential building (not those which belong to Situation B) ¹		Office/commercial/Industrial development	
(From Table 8.5)	Number of levels of protection	Typical scope of protective measures	Number of levels of protection	Typical scope of protective measures
1	None	No special precautions	None	No special precautions
2	2	a. Reinforced concrete cast in situ floor slab (suspended, non-suspended or raft) with at least 1200 g DPM and underfloor venting. b. Beam and block or pre-cast concrete and 2000 g DPM/reinforced gas membrane and underfloor venting. All joints and penetrations sealed.	1 to 2	a) Reinforced concrete cast in situ floor slab (suspended, non-suspended or raft) with at least 1200 g DPM. b) Beam and block or pre-cast concrete slab and minimum 2000 g DPM/reinforced gas membrane. c) Possibly underfloor venting or pressurisation in combination with a) and b) depending on use. All joints and penetrations sealed.
3	2	All types of floor slab as above. All joints and penetrations sealed. Proprietary gas resistant membrane and passively ventilated or positively pressurised underfloor sub-space.	1 to 2	All types of floor slab as above. All joints and penetrations sealed. Minimum 2000 g/reinforced gas proof membrane and passively ventilated underfloor sub-space or positively pressurised underfloor sub-space
	3	All types of floor slab as above. All joints and penetrations sealed. Proprietary gas resistant membrane and passively ventilated underfloor sub-space or positively pressurised underfloor sub-space, oversite capping or blinding and in-ground venting layer.	2 to 3	All types of floor slab as above. All joints and penetrations sealed. Proprietary gas resistant membrane and passively ventilated or positively pressurised underfloor sub-space with monitoring facility.
	4	Reinforced concrete cast in situ floor slab (suspended, non-suspended or raft). All joints and penetrations sealed. Proprietary gas resistant membrane and ventilated or positively pressurised underfloor sub-space, oversite capping and in-ground venting layer and in-ground venting wells or barriers.	3 to 4	Reinforced concrete cast in situ floor slab (suspended, non-suspended or raft). All joints and penetrations sealed. Proprietary gas resistant membrane and passively ventilated or positively pressurised underfloor sub-space with monitoring facility. In ground venting wells or barriers.
	5	Not suitable unless gas regime is reduced first and quantitative risk assessment carried out to assess design of protection measures in conjunction with foundation design.	4 to 5	Reinforced concrete cast in situ floor slab (suspended, non-suspended or raft). All joints and penetrations sealed. Proprietary gas resistant membrane and actively ventilated or positively pressurised underfloor sub-space with monitoring facility, with monitoring. In ground venting wells and reduction of gas regime.

Note:

- 1 For low rise traditional housing with ventilated clear underfloor void (ie Situation B. See Table 8.7, Box 8.4 and Section 8.3.2).

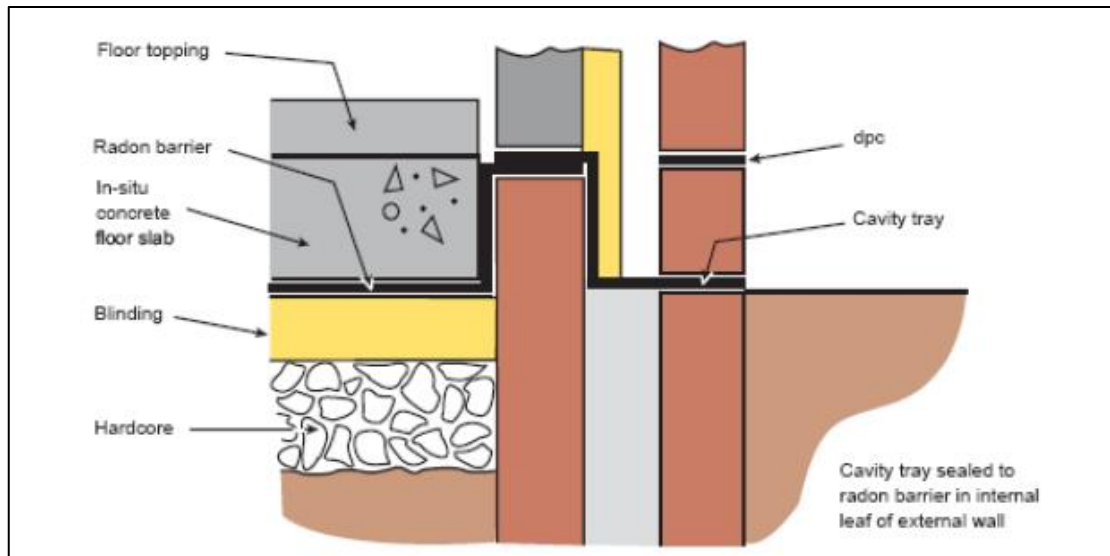
8.3. BGS/HPA report IR/11/044 – Radon Potential Class.

Radon Potential Class*	Is the property in a Radon Affected Area?	Additional information
1	No	The property is in a Lower probability radon area (less than 1% of homes are estimated to be at or above the Action Level). The property is not in a radon affected area.
2	Yes	The property is in an Intermediate probability radon area (1 to 3% of homes are estimated to be at or above the Action Level). The property is in a radon affected area.
3	Yes	The property is an Intermediate probability radon area (3 to 5% of homes are estimated to be at or above the Action Level). The property is in a radon affected area.
4	Yes	The property is in an Intermediate probability radon area (5 to 10% of homes are estimated to be at or above the Action Level). The property is in a radon affected area.
5	Yes	The property is in a Higher probability radon area (10 to 30% of homes are estimated to be at or above the Action Level). The property is in a radon affected area.
6	Yes	The property is in a Higher probability radon area (more than 30% of homes are estimated to be at or above the Action Level). The property is in a radon affected area.

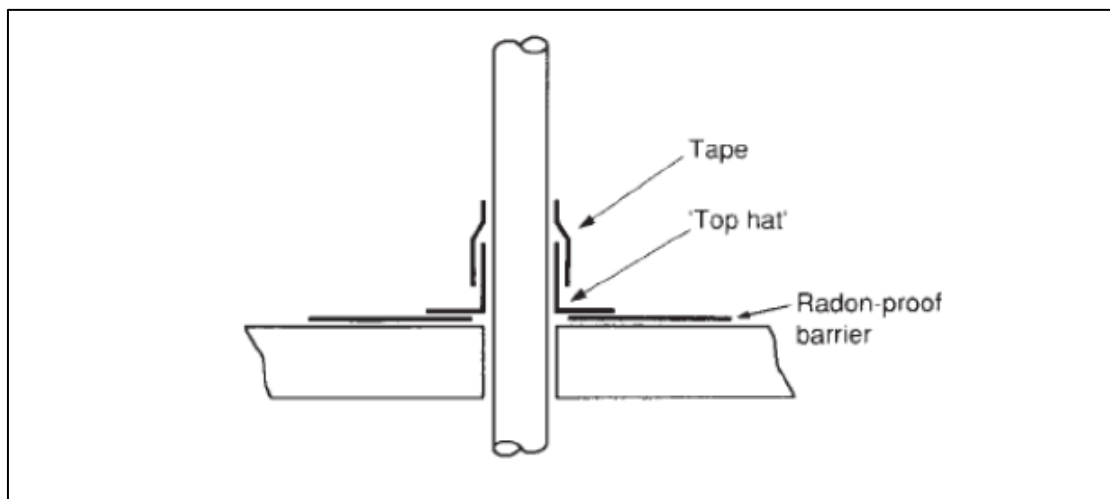
8.4. BGS/HPA report IR/11/044 – Radon Potential Class/Protection Measures.

Radon Potential Class*	What level of radon protective measures are required for new buildings in England and Wales?	What level of radon protective measures are required for new dwellings in Scotland?
1	None**	None**
2	None	Stage 1
3	Basic	Stage 1
4	Basic	Stage 1
5	Full	Stage 2
6	Full	Stage 2

8.5. BRE 211 – Typical Ground Bearing Slab, Membrane/Cavity Tray Detail.



8.6. BRE 211 – Typical Service Penetration Detail.



8.7. CIRIA C552, 2001 – Tables 6.3-6.6, Risk Matrices.

Table 6.3 *Classification of consequence*

Classification	Definition	Examples
Severe	Short-term (acute) risk to human health likely to result in "significant harm" as defined by the Environment Protection Act 1990, Part IIA. Short-term risk of pollution (note: Water Resources Act contains no scope for considering significance of pollution) of sensitive water resource. Catastrophic damage to buildings/property. A short-term risk to a particular ecosystem, or organism forming part of such ecosystem (note: the definitions of ecological systems within the Draft Circular on Contaminated Land, DETR, 2000).	High concentrations of cyanide on the surface of an informal recreation area. Major spillage of contaminants from site into controlled water. Explosion, causing building collapse (can also equate to a short-term human health risk if buildings are occupied).
Medium	Chronic damage to Human Health ("significant harm" as defined in DETR, 2000). Pollution of sensitive water resources (note: Water Resources Act contains no scope for considering significance of pollution). A significant change in a particular ecosystem, or organism forming part of such ecosystem. (note: the definitions of ecological systems within Draft Circular on Contaminated Land, DETR, 2000).	Concentrations of a contaminant from site exceed the generic, or site-specific assessment criteria. Leaching of contaminants from a site to a major or minor aquifer. Death of a species within a designated nature reserve.
Mild	Pollution of non-sensitive water resources. Significant damage to crops, buildings, structures and services ("significant harm" as defined in the <i>Draft Circular on Contaminated Land</i> , DETR, 2000). Damage to sensitive buildings/structures/services or the environment.	Pollution of non-classified groundwater. Damage to building rendering it unsafe to occupy (eg foundation damage resulting in instability).
Minor	Harm, although not necessarily significant harm, which may result in a financial loss, or expenditure to resolve. Non-permanent health effects to human health (easily prevented by means such as personal protective clothing etc). Easily repairable effects of damage to buildings, structures and services.	The presence of contaminants at such concentrations that protective equipment is required during site works. The loss of plants in a landscaping scheme. Discoloration of concrete.

Table 6.4 *Classification of probability*

Classification	Definition
High likelihood	There is a pollution linkage and an event that either appears very likely in the short term and almost inevitable over the long term, or there is evidence at the receptor of harm or pollution.
Likely	There is a pollution linkage and all the elements are present and in the right place, which means that it is probable that an event will occur. Circumstances are such that an event is not inevitable, but possible in the short term and likely over the long term.
Low likelihood	There is a pollution linkage and circumstances are possible under which an event could occur. However, it is by no means certain that even over a longer period such event would take place, and is less likely in the shorter term.
Unlikely	There is a pollution linkage but circumstances are such that it is improbable that an event would occur even in the very long term

Table 6.5 Comparison of consequence against probability

		Consequence			
		Severe	Medium	Mild	Minor
Probability	High likelihood	Very high risk	High risk	Moderate risk	Moderate/low risk
	Likely	High risk	Moderate risk	Moderate/low risk	Low risk
	Low likelihood	Moderate risk	Moderate/low risk	Low risk	Very low risk
	Unlikely	Moderate/low risk	Low risk	Very low risk	Very low risk

Table 6.6 Description of the classified risks and likely action required

Very high risk	There is a high probability that severe harm could arise to a designated receptor from an identified hazard, OR, there is evidence that severe harm to a designated receptor is currently happening. This risk, if realised, is likely to result in a substantial liability. Urgent investigation (if not undertaken already) and remediation are likely to be required.
High risk	Harm is likely to arise to a designated receptor from an identified hazard. Realisation of the risk is likely to present a substantial liability. Urgent investigation (if not undertaken already) is required and remedial works may be necessary in the short term and are likely over the longer term
Moderate risk	It is possible that harm could arise to a designated receptor from an identified hazard. However, if is either relatively unlikely that any such harm would be severe, or if any harm were to occur it is more likely that the harm would be relatively mild Investigation (if not already undertaken) is normally required to clarify the risk and to determine the potential liability. Some remedial works may be required in the longer term
Low risk	It is possible that harm could arise to a designated receptor from an identified hazard, but it is likely that this harm, if realised, would at worst normally be mild.
Very low risk	There is a low possibility that harm could arise to a receptor. In the event of such harm being realised it is not likely to be severe.