CampbellReith
consulting engineers

Whitworth Community High School, Rochdale

Land Quality Statement

For

Turner & Townsend

Project Number:

13516

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1.0 SUMMARY OF ACTIONS

HUMAN HEALTH	An engineered cover system of validated soils will be required in communal open space areas if impacted Made Ground is reused in these areas i.e. not below hardstanding.
CONTROLLED WATERS	No specific remedial actions will be required.
BUILDINGS AND STRUCTURES	With respect to ground gas, the site is considered to be classified as CIRIA Characteristic Situation 2 and gas protection measures are required. Consideration should be given to further monitoring and assessment which may potentially lead to a downgrade of requirements for protection measures. A site specific Radon Assessment Report is recommended to identify whether radon protection measures will be required in the proposed development.
SERVICES	Consideration of potable water pipework with respect to soil contamination is required (i.e. Pipe Selection Risk Assessment).
SITE WORK CONTROLS	A watching brief should be maintained throughout intrusive ground works by the Contractor such that any previously unidentified contamination or asbestos containing materials (ACM) can be identified and referred to an experienced Environmental Consultant for evaluation. Groundworks should be undertaken by a suitably qualified Contractor in accordance with the Control of Asbestos Regulations 2012, associated Approved Code of Practice (ACoP) and guidance prepared by CL:AIRE and the Joint Industry Working Group (JIWG), and CIRIA.
REGULATORY APPROVAL	This document should be submitted to the Regulators (EA/EHO) for comment via the planning process, in order to discharge conditions relating to land quality. Thereafter a Method Statement for Contamination and verification reporting process will require agreement via the planning process.
WASTE	The LQS does not address the classification of waste soils. The soil results can however be utilised as a basis for such assessments, although additional testing may be required. It is noted that such assessments are required to accord with the Environmental Permitting and Planning Legislation and also to control costs during development.
GEOTECHNICAL ACTIONS	A targeted site investigation is recommended once the development proposals are finalised. Recommendations for the scope and layout of this investigation are provided, based on the development scheme at the time of reporting.
DOCUMENTATION	The following are likely to be required to control the works and to accord with planning requirements: Groundworks/ Remediation Specification; Verification Report; and, Health and Safety documentation.

2.0 EXECUTIVE SUMMARY

SITE LOCATION	The site is located off Hall Street in the south west area of Whitworth, post code OL12 8TS. It is approximately 4.5km to the north of Rochdale town centre and is centred at approximate National Grid Reference 388080, 417930. Site redevelopment proposals have not been finalised, however, they are anticipated to comprise the demolition of several existing structures and the construction of new school buildings to the east of the existing main school structure.
ENVIRONMENTAL SETTING	The geological sequence at the site comprises Made Ground over superficial deposits of Glacial Till. Bedrock comprises Rossendale Formation and Lower Haslingden Flags, however these were not encountered in the site investigation. The site is considered to have Moderate hydrogeological Sensitivity associated with the presence of a Secondary A Aquifer, and a Very High hydrological Sensitivity due to presence of the River Spodden adjacent to the north east of the site.
CURRENT USE AND HISTORY	The site comprises an existing school with several ancillary buildings including a science block and sports hall, car parking areas, a hardstanding playing courts and playing fields. The overall site covers an approximate area of 5.5ha and is relatively flat lying. Historical plans indicate that the site remained largely free from development prior to construction of the existing school in the 1970s. An area of ground workings/excavation is noted around 1930. Development of note in the surrounding area includes mills with tanks and reservoirs to the south and southeast, and a complex of mills and a gas works to the north of the site. Reference to the Zetica unexploded bomb risk maps indicates that the site is located within a low risk area.
GEOTECHNICAL HAZARDS	The following potential geotechnical hazards have been identified: • Localised Made Ground to depths up to 2.4m. • Local soft ground to depths in excess of 3.0m. • Shallow groundwater level. • Potential obstructions within the Made Ground and Glacial Till. • Construction on a fill platform. • Ground conditions aggressive to buried concrete.
CONTAMINATION ISSUES	The proposed school development is considered to be a Medium - High sensitivity end use. Several chemical contaminants have been recorded in the Made Ground, primarily associated with hardstanding subbase material, at concentrations above relevant screening criteria, however, risk assessment has demonstrated that this is not indicative of widespread contamination requiring remediation. The following risks have been identified: • End Users: Low • Controlled Waters: Low • Ground gas: Low – Moderate • Buildings: Low • Services: Low – Moderate • Groundworkers: Low • Off-site Receptors: Low
GEOTECHNICAL RECOMMENDATIONS	Traditional pad or strip foundations should be constructed below the Made Ground in the natural Glacial Till. Assuming a minimum foundation depth of 1.80m bgl, an allowable bearing resistance of 100kN/m^2 has been estimated for the Glacial Till. Due to the thickness of Made Ground encountered across the site, ground bearing floor slabs may only be used subject to ground improvement of the Made Ground. A preliminary CBR value of 3% may be adopted.

	For the Made Ground and Glacial Till design concrete classes of DS-1 and DS-2 and ACEC classes of AC-1 and AC-3z, respectively, are recommended. Excavations are unlikely to remain stable unsupported is a significant proportion of granular soil is present, or in the presence of shallow groundwater. Additional site investigation is recommended where the new buildings are proposed, once the development has been finalised.
ENVIRONMENTAL RECOMMENDATIONS	A watching brief should be maintained across the site during the groundworks for any unforeseen contamination. Site works should be controlled by a Remediation Specification or similar. At this stage, gas protection measures are required and will require independent validation. Material imported to use in soft landscaped areas (if incorporated into the scheme) should be validated to comply with agreed Limiting Values for human exposure and suitability as a growing medium. A survey for invasive plant species is recommended. Following confirmation of the proposed development location, a site specific radon assessment report should be obtained to confirm if radon protection measures are required.

3.0 INTRODUCTION

3.1. Appointment and Scope

3.1.1. This report has been produced by Campbell Reith Hill LLP (CampbellReith) on behalf of Turner and Townsend (the Client) to summarise environmental and geotechnical information relating to Whitworth Community High School, Rochdale OL12 8TS (hereafter referred to as the site). The references and limitations associated with this report follow the main text. Figures showing the location of the site and the development proposals are presented in Appendix A.

3.1.2. The report has been produced in general accordance with the procedures for ground investigation, interpretation and reporting set out in DEFRA Contaminated Land Report (CLR) 11, BS 5930:2015 (+A1:2020), BS 10175:2011 (+A2:2017) and BS EN 1997 (Eurocode 7). The objective of the report is to collate and interpret Phase 1 Desk Study information and Phase 2 exploratory data in order to provide:

a) a conceptual model for the site ground conditions (soil, water and gas);

b) a generic quantitative risk assessment (human health, controlled waters and gas);

c) outline recommendations for land contamination issues;

d) a geotechnical evaluation; and,

e) geotechnical design recommendations.

3.1.3. The contamination appraisal is intended to identify remedial requirements necessary to permit the construction of new school buildings at the site.

3.1.4. This assessment considers the objectives of the National Planning Policy Framework which requires information to demonstrate that a site is suitable for its new use (taking account of ground conditions and land instability) and not capable of being determined as contaminated land under Part IIA of the Environmental Protection Act 1990 (after remediation). The NPPF requires adequate site investigation information, prepared by a competent person, with the minimum requirement comprising a desk study and site reconnaissance.

3.1.5. The geotechnical appraisal has been carried out in accordance with Eurocode 7. Sections 3 to 5, 7 and 10, together with Appendix C, comprise the Ground Investigation Report. Preliminary geotechnical recommendations are presented in Section 12 and these should be verified in a Geotechnical Design Report once structural details of the proposed development are confirmed.

3.1.6. It should be recognised that further appraisals, investigations, specification and validation may be required to accord with the recommendations stated herein.

3.1.7. The report is based on a recent site investigation commissioned for this project and a review of readily available information as referenced. The desk study information is presented in Appendix B. The site investigation report produced by Geotechnics Limited in January 2021, is contained in Appendix C.

3.2. Previous Investigations

3.2.1. A Desk Study Report was produced for the site by CampbellReith in September 2020 (ref. 13516-CRH-XX-XX-RP-LQ-0001, rev P01) and has been incorporated into Sections 4 to 6 as necessary.

4.0 SITE DESCRIPTION AND ENVIRONMENTAL SETTING

4.1. Site Location

4.1.1. The site location is presented in Figure 1. The site is located off Hall Street in the southwest area of Whitworth. It is approximately 4.5km to the north of Rochdale town centre and is centred at approximate National Grid Reference 388080, 417930.

4.2. Site Layout

4.2.1. An annotated site layout plan is presented as Figure 2. The site comprises an existing school with several ancillary buildings including a sports hall, science block, car parking areas, a hardstanding playing courts and playing fields. An electricity substation is located within the eastern section of the main school building. A site visit was completed by a geoenvironmental engineer on 27th October 2020.

4.2.2. The overall site covers an approximate area of 5.5 ha and several slopes and retaining walls were noted during the site walkover. The site generally slopes down towards the east.

4.2.3. The dining hall has been constructed from below surrounding ground level and the playing fields are elevated from the school buildings. Several areas of standing water were noted on the playing fields during the site inspection.

4.2.4. The proposed development area is located to the east of the existing main school building and currently comprises the science block, an area of hardstanding used for parking, part of the playing fields and the hardstanding court / play area.

4.2.5. Access to the site is gained via a single vehicular driveway leading north from Hall Street.

4.3. Invasive Plant Species

4.3.1. Although not observed during the site walkover, the potential presence of invasive plant species, such as Japanese Knotweed, has not been assessed. It is recommended that an appropriately qualified specialist undertakes a survey.

4.4. Surrounding Land Use

4.4.1. The site is bound to the northeast, east, southeast and southwest by residential properties. St. Bartholomew's School is present to the south and to the west and northwest are open fields that rise, further to the west, to become steep hills.

4.4.2. Tong End Brook forms the north / north eastern site boundary and discharges into the River Spodden towards the northeast. The River Spodden flows roughly north to south adjacent to the east of the playing fields. A further stream, Miller's Gutter, flows along the southwest site boundary and is culverted under the school entrance driveway.

4.5. Redevelopment Proposal

4.5.1. The proposed site redevelopment is shown in Figure 2. At this stage, site redevelopment proposals have not been finalised, but have become better defined since the design and completion of the site investigation. It is currently proposed to construct a new L-shaped 3-storey

school building to the northeast of the existing main school building, in an area currently occupied by a playing field.

4.5.2. Based on the above, the proposed development is considered to fall into geotechnical category 2 with respect to BS EN 1997 (Eurocode 7).

4.5.3. The end user sensitivity is considered to be Medium to High for the proposed end use as a school.

4.6. Geology

4.6.1. The Groundsure Report [1], the British Geological Society (BGS) 1:50,000 geological sheet for the area [2] and the BGS website [3] indicate that the geology on site is superficial deposits of Diamicton over a bedrock of Rossendale Formation and Lower Haslingden Flags.

4.6.2. A variable thickness of Made Ground is indicated to be present [1] on site, associated with the existing built up area and historic land use. The anticipated ground conditions are summarised in Table 4.1. The associated references are listed at the rear of the report.

TABLE 4.1: Summary of Anticipated Geology

Strata	Thickness (m)	Typical Description
Superficial: Diamicton [Glacial Till]	>24	Heterogeneous mixtures of predominantly clay, with varying proportions of sand, gravel, and boulders.
Bedrock: Rossendale Formation and Lower Haslingden Flags [Millstone Grit Group]	>130	Sandstones, interbedded with grey siltstones and mudstones, with subordinate marine black shale, thin coals and seatearths.

4.6.3. A collection of historic boreholes located c.0.6km north of the site [3] (Reference: SD81NE69 to 81), indicate localised pockets of Alluvium present from ground level, comprising a peat layer with horizons of sand and gravel below. The localised presence of these superficial deposits can be expected along the northern and north eastern parts of the site, associated with River Spodden and Tong End Brook.

4.6.4. A Bedrock fault is indicated [2] along the northern edge of the site in a northwest-southeast orientation. Three other bedrock faults are indicated within 500m of the site, in generally parallel orientations. The Groundsure report shows an inferred fault crossing the site, however this is considered to be incorrect as it is based on the interbedded nature of the bedrock geology.

4.6.5. The site is located within a coal mining area, and is within Coalfield consultation Area, however the BGS Coal Authority website [13], indicates that it is not within a 'Development High Risk Area'. The Groundsure report indicates presence of coal mining and surface ground workings associated with non-coal mining on site and within 250m off site. The Consultants Coal Mining Report [12] indicates no past underground mining records, no unrecorded shallow workings, no mine entries, no open cast mines, and no coal mining subsidence reports on site and within 50m-100m off site. Hence the risk to development due to historic coal mining, is considered to be very low.

4.6.6. The Groundsure report indicates moderate hazard for compressible deposits along the northeast side of the site, where alluvium is anticipated.

4.6.7. The Groundsure report indicates moderate hazard for landslides towards the western site boundary. This is associated with the steep hills that rise to the west of the site.

4.6.8. A very low to low hazard for running sands, collapsible deposits and ground dissolution of soluble rocks is indicated [1].

4.6.9. A very low risk of shrink-swell clays is identified for the site [1]. However, due to the anticipated shallow geology comprising clay-dominated Diamicton, as well as the potential presence of Alluvium in the northeast of the site, this hazard cannot be discounted.

4.7. Seismicity

4.7.1. The national forward to BS EN 1998-1:2004+A1:2013 'Eurocode 8: Design of Structures for Earthquake Resistance – Part1' states there are no requirements in the UK to consider seismic loading, and the whole of the UK may be considered an area of very low seismicity in which the provisions of EN 1998 need not apply

4.8. Hydrogeology

4.8.1. The site hydrogeology is summarised in Table 4.2 and the associated references listed at the rear of the report.

TABLE 4.2: Summary of Hydrogeology

Type	Description	Reference
Superficial Deposits [Glacial Till]	Secondary Undifferentiated Aquifer – assigned where it is not possible to attribute either Category A or B. These layers have previously been designated as both minor and non-aquifer in different locations due to variable characteristics.	[1]
Superficial Deposits [Alluvium]	Secondary A Aquifer – permeable layers capable of supporting water supplies at local rather than strategic scale, in some cases forming an important source of base flow to rivers.	
Bedrock Deposits [Rossendale Formation & Lower Haslingden Flags]	Secondary A Aquifer – permeable layers capable of supporting water supplies at local rather than strategic scale, in some cases forming an important source of base flow to rivers.	
Soil Leaching Potential	Indicated to be low – high.	
Source Protection Zone	The site is not located within a source protection zone.	
Groundwater Abstractions	Several located within 500m, the nearest of which is approximately 270m to the northeast noted for process water. All are noted as "historical".	

4.8.2. The site is considered to have a Medium Sensitivity with respect to hydrogeology. The sensitivities have been based upon the definitions provided in NHBC R&D66 [4], as amended to include the requirements of the Water Framework Directive and the EA's River Basin Catchment Plans.

4.9. Hydrology

4.9.1. The site hydrology is summarised in Table 4.3 and the associated references listed at the rear of the report.

TABLE 4.3: Summary of Hydrology

Type	Distance	Description	Reference
Surface Waters	On site in south	Small stream, Miller's Gutter, indicated to be culverted.	[1], [5]
	North and east boundary	Tong End Brook forms the northern site boundary and discharges into River Spodden, which forms the eastern boundary of the playing fields.	
Surface Water Abstractions	370m south east	Noted as historical, for boiler feed / process.	
Flooding	On site	Majority of site – Flood Zone 1; north and north-eastern site boundary – Flood Zone 2.	

4.9.2. The site is considered to have a Very High Sensitivity with respect to hydrology. The sensitivities have been based upon the guidance detailed for the hydrogeological assessment above.

4.10. Radon

4.10.1. Reference to the Groundsure report [1] and the Radon Atlas of England and Wales [6] indicate that majority of the site is situated within a LOW Radon Risk area with a maximum potential of less than 1% of properties affected. The western edge of the site encroaches into an area where a maximum of between 3% and 5% of properties are affected. The boundary between these two risk areas roughly corresponds with the edge of the superficial Diamicton deposits, and is therefore likely to be associated with shallow bedrock deposits.

4.10.2. With reference to BRE 211 [7], and based on the above, it is considered that the proposed development would not require any radon protection measures, however, this should be confirmed by obtaining a site specific Radon Assessment Report.

4.10.3. Guidance on Protective Measures for New Buildings (2015) notes that all basements are at increased risk of elevated levels of radon regardless of geographic location, because more walls are in contact with the ground as well as the floor, and reduced natural ventilation below ground level increases the risk of elevated radon levels. In addition, the Management of Health and Safety at Work Regulations (1999) require the assessment of health and safety risks and both the Health and Safety Executive (HSE) and Public Health England (PHE) state that this should include the measurement of radon for occupied below ground workplaces (occupied for more than 1 hour per week/52 hours of the year), irrespective of whether a site is situated in a radon affected area. This is the responsibility of the Employer.

4.10.4. As such, if the proposed development includes construction of a basement, consideration should be given to the incorporation of radon protection measures or site specific assessment to determine whether protective measures are actually required. The form of assessment should be agreed in advance with Building Control and/or the Contaminated Land Department of the Local Planning Authority but may include passive radon monitoring during ground investigation together with a more detailed assessment of the site geology to determine the likelihood for radon-emitting strata to be present at the site.

4.11. Sensitive Land Uses

4.11.1. A review has been made of Designated Ecological and Heritage sites and these are summarised below. The Local Authority may also consider non-designated heritage and archaeological sites as significant, and these are not appraised except where noted.

4.11.2. Reference to the MAGIC Map [8] and the Groundsure Report [1] indicates the site lies within Liverpool and Manchester Green Belt. A Grade II Listed Building, Hall Fold, is located approximately 90m to the south-west. Land immediately to the north of the site is noted as deciduous woodland. No other significant sensitive land uses have been identified on or within proximity of the site.

5.0 SITE HISTORY AND INDUSTRIAL SETTING

5.1. Site History

5.1.1. Information relating to the site history has been obtained by reference to the Groundsure Report [1] and is summarised for the site and its surroundings in Tables 5.1 and 5.2.

TABLE 5.1: Site History

Date	Development	Location
1851 – 1909	Site shown as part of a network if undeveloped fields.	-
1928/29	Area of ground workings/excavation	North
	Two small structures	North
1938 – 1967	No significant changes noted.	-
1967	Two small structures no longer shown	North
1975	Whitworth High School present	South
	Playing fields with rectangular courts area	North
	Area of workings/excavation no longer shown	North
2001	School buildings extended	South
2010	Slight changes in layout of school buildings noted	South
	Sports hall to the north of the main school buildings	Central west

TABLE 5.2: Adjacent Land History

Date	Development	Distance and Orientation
1851	Tong End Brook and the River Spodden	North and east
	Buildings (likely residential)	Adjacent to the south
	Mills with two reservoirs	30m south of access road
	Cotton Mills	350m northeast
	Two sandstone quarries	500m west
1891	One of the two reservoirs is no longer shown	30m south of access road
	Cotton Mills	120m north east
	Railway line	30m east
	The junction where Tong End Brook joins the River Spodden has been realigned slightly to accommodate the new railway.	20m east
	Gas Works	400m northeast
	Sandstone quarries are no longer indicated	500m west
1909/10	Thor Mill (Cotton) with tanks and a reservoir	10m southeast
1928/29	Expansion of mill complex	120m to northeast
	Lloyd Street Mill	100m northeast
	Spring	150m west
1956/62	Refuse tips	60m and 120m northeast
	Several buildings added to the Mill	30m southeast

Date	Development	Distance and Orientation
	Gas works no longer shown	400m north
1967	The spring is now indicated to be a well	150m west
1975/79	School	Adjacent south
	Residential development on land beyond Tong End Brook	40m north
	Mill to the east has been extended and the reservoir is no longer shown	10m east
	Mills to south no longer shown, reservoir remains	30m south of access road
1985	Mill has extended towards the site	30m southeast
2020	Mill has been replaced by residential properties	30m southeast

5.1.2. In summary, the site remained largely free from development prior to construction of the existing school in around 1970. An area of ground workings/excavation is noted around 1930 and two small structures, possibly glass houses, were present at this time in the north of the site. The addition of the sports hall to the north of the main school building is shown around 2010.

5.1.3. Development of note in the surrounding area includes mills with tanks and reservoirs to the south and southeast, and a complex of mills and a gas works to the north of the site.

5.2. Regulatory Consultation

5.2.1. Rochdale Council Environmental Health has been contacted to provide information they may hold regarding the current environmental status of the site. At the time of writing, a response has not yet been received.

5.3. Unexploded Ordnance (UXO)

5.3.1. A preliminary review has been made of the UXO risk presented by the site based upon CIRIA C681 ('Unexploded Ordnance (UXO) – A guide for the construction industry') [9] and the assessment matrices presented in Tables 5.1 - 5.3 therein.

5.3.2. Reference to the Zetica unexploded bomb risk maps [10] indicates that the site is located within a low risk area.

5.3.3. Notwithstanding this, any works that disturb the ground such as demolition and groundworks should include UXO tool-box talks and further advice sought from a specialist if suspicious articles are encountered.

5.4. Tunnels and Infrastructure

5.4.1. Based on readily available information, CampbellReith is not aware of any tunnels within the site.

5.4.2. Historic railway feature associated with Tramway sidings are recorded c.100m to c.130m south west and south east of the site. An abandoned railway line is indicated 21m east of the site.

5.4.3. It should be noted that the above review does not constitute a formal review of all buried utilities that may be present at the site.

5.5. Current Industrial Setting

5.5.1. Table 5.3 summarises identified industrial features which may present a potential source of contamination to the site based upon the Groundsure Report. The Groundsure Report should be consulted for further details. Unless otherwise stated, only those features that are within the stated review distances have been included.

TABLE 5.3: Industrial Setting

Type	Distance Reviewed	Distance from Site	Description
Contaminated land register entries and notices	<500m	350m NE	Former Whitworth Vale Gas Works, noted as potentially contaminated land.
Landfills	<250m	63m E	Refuse tip noted on historical plan (1962, 1970)
		102m SE	Refuse tip noted on historical plan (1962)
		119m E	Refuse tip noted on historical plan (1962)
		239m SE	Refuse tip noted on historical plan (1962)
Waste Transfer / Treatment Stations	<100m	-	None recorded
Potentially Infilled Land	<250m	On site NW	Area of worked ground indicated on 1:10,000 geology plan
		On site N	Area of excavated ground shown on historical plan (1928)
Pollution Incidents	<50m	-	None recorded.
Environmental Permits	<150m	123m E	Permit exemption for the storage of waste
		130m E	Metals recycling facility waste oil burner
Discharge Consents	<100m	50m SE	Discharge of sewer storm overflow to River Spodden
Abstractions	<250m	-	None recorded.
Fuel Stations	<200m	-	None recorded.
Contemporary trade directory entries- active	<100m	-	None recorded.
Contemporary trade directory entries- non active	<100m	-	None recorded.
Control of Major Accident Hazards (COMAH) Sites	<500m	-	None recorded.

6.0 PRELIMINARY CONCEPTUAL SITE MODEL & QUALITATIVE RISK ASSESSMENT

6.1. Introduction

6.1.1. Current practice for land contamination evaluation involves classification of risk for each of the identified contaminant source-pathway-receptor pollutant linkages. These are summarised below, considering the desk study information obtained. This information has been utilised to design the site investigation considering the proposed end use.

6.2. Classification of Risk

6.2.1. Risk is defined by the combination of two factors: i) the probability of an occurrence (expressed as a likelihood); and ii) the consequence of it happening (expressed as a severity). The procedure for classifying risk is summarised in Table 6.1. The categories of risk have been based upon those defined in the Guidance for the Safe Development of Housing on Land Affected by Contamination, R&D66: 2008 Volume 1 (Environment Agency, NHBC and CIEH). The categories are defined in the Environmental Risk Assessment Supporting Information section to the rear of this report, together with definitions of the classifications of probability and consequence.

TABLE 6.1: Classification of Risk

Probability (Likelihood)		Consequence			
		Severe	Medium	Mild	Minor
	High likelihood	Very high risk	High risk	Moderate risk	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

6.3. Potential Sources of Contamination

6.3.1. Table 6.2 summarises the potential contamination sources that have been identified on or near the site. The potential contaminant types associated with these is then given based upon a review of CLR 11, industry profiles and anecdotal information:

TABLE 6.2: Potential Sources of Contamination

Feature on or near site	Potential Contaminant
Reworked &/or Made Ground including the potential for buried asbestos from previous development and Made Ground indicated on geological plans.	M, H, PAH, GG, ACM
Historical leaks associated with heating oil / storage heating systems.	M, H, VOC
On site electricity substation	M, H, PAH, PCB
Vehicles on site.	M, H, PAH
Notes: M – Metals. H – Hydrocarbons. PAH – Polycyclic Aromatic Hydrocarbons. VOC – Volatile Organic Compounds. PCB – polychlorinated biphenyls. ACM – Asbestos containing Materials. GG – Ground Gases.	

6.4. Receptors and Exposure Pathways

6.4.1. Potential risks have been identified based on the proposed site use, the receptors and potential pathways by which the receptor/s may be exposed to the contaminant source/s. These are presented in Table 6.3 and have been used to inform the site investigation.

TABLE 6.3: Receptors and Exposure Pathways

Receptor	Pathway	Risk
End Users	Ingestion of soil/dust	Low – Moderate
Neighbours		Very Low
Construction Workers		Low*
End Users	Inhalation of soil/dust	Low – Moderate
Neighbours		Very Low
Construction Workers		Low*
End Users	Dermal contact with soil/dust/water	Low – Moderate
Neighbours		Very Low
Construction Workers		Low*
End Users	Inhalation of vapour from soil/dust	Low – Moderate
Neighbours		Very Low
Construction Workers		Low*
End Users	Consumption of vegetables/plants	Very Low
End Users	Migration of soil gases to confined spaces/structures	Low – Moderate
Construction Workers		Low
Building		Low – Moderate
End Users	Inhalation of vapour from groundwater	Low
Neighbours		Very Low
Construction Workers		Low
Surface Waters	Migration of water borne contaminants from on site	Low
Groundwater Aquifer	Migration of contamination from surface and/or subsurface to groundwater	Low – Moderate
Groundwater Aquifer	Migration of water borne contamination from off-site	Low
End Users	Movement of contaminants to engineered structures (water pipes)	Low – Moderate
Sensitive Land Use (SSSI etc.)	Uptake by flora/fauna associated with sensitive land use	N/A – no sensitive receptors identified

6.4.2. Based on the preliminary conceptual site model, a LOW – MODERATE RISK is considered to be appropriate with respect to ingestion / inhalation and direct contact with the underlying soils, as playing fields are likely to be included as part of the final development.

6.4.3. A LOW - MODERATE RISK is considered to exist with respect to the potential for vapours to be present in soils, associated with Made Ground anticipated to be present and potential for historical leaks associated with possible fuel oil / storage heaters on site.

6.4.4. A LOW RISK is considered to exist with respect to the potential for vapours to be present in groundwater as no significant source of potential vapours in groundwater has been identified.

6.4.5. A LOW – MODERATE RISK is considered to exist with respect to the potential for gas generation due to anticipated Made Ground and areas of worked ground which are likely to have been backfilled.

6.4.6. A LOW – MODERATE RISK is considered to exist with respect surface waters due to the presence of Tong End Brook and the River Spodden.

6.4.7. A LOW – MODERATE RISK is considered to exist with respect to the migration of contamination from surface and/or subsurface to groundwater due to the site's location on a Secondary A Aquifer.

6.4.8. The potential risks associated with radon should be clarified by obtaining a site specific Radon Assessment Report.

6.4.9. The site investigation was targeted at the identified pollutant linkages, as detailed in Table 6.4:

TABLE 6.4: Targeted Pollutant Linkages

Issue	Exploration
Human exposure to shallow Made Ground soils.	General site coverage. Shallow soil samples in all holes within 1.0m.
Potential vertical migration of mobile contaminants from Made Ground to underlying groundwater and adjacent surface watercourses.	Targeted and general site coverage, including leachate testing of soils. Groundwater installations, sampling and monitoring.
Ground gas and vapour generation from anticipated Made Ground.	Targeted ground gas monitoring installations within the proposed building footprints.

6.4.10. The findings of the intrusive investigation of the potential contaminant sources and pathways has informed the Generic Quantitative Risk Assessment presented in Section 8 and the subsequent discussion of risk in Section 13.

7.0 SITE INVESTIGATION

7.1. Scope of Works

7.1.1. The exploratory locations are shown on Drawing No. Geo-PN204160-001 within Geotechnics' factual report presented in Appendix B. The scheduled site work comprised 10 No. dynamic continuous sampling holes (WS101 to WS110) to a maximum depth of 5.0m below ground level (bgl).

7.1.2. During the course of the site investigation a number of changes to the scope of works were made as follows:

- WS07 encountered shallow groundwater within the hand excavated inspection pit and was terminated at 0.8m depth.
- WS09A encountered a clay pipe at approximately 1.0m depth and was relocated to WS09.
- WS02, WS04, WS06, WS08 and WS09 terminated at 4.25m, 3.39m, 4.33m, 4.32m and 3.30m bgl respectively due to cobble obstructions encountered within the boreholes.

7.1.3. The ground conditions encountered with respect to the monitoring installations are summarised in Table 7.1. Visits have been made to site on 3 occasions to monitor gas and water levels within the installations and to obtain samples.

TABLE 7.1: Standpipe Summary

Exploratory Hole	Response Zone (m bgl)	Response Zone Strata	
WS02	1.0 – 4.0	1.0 – 1.2	Made Ground
		1.2 – 4.0	Slightly gravelly sandy clay
WS03	1.0 – 4.0	1.0 – 1.2	Made Ground
		1.2 – 4.0	Sandy gravelly clay
WS05	0.5 – 2.5	0.5 – 2.4	Made Ground
		2.4 – 2.5	Sandy gravelly clay
WS08	1.5 – 4.0	1.5 – 4.0	Sandy gravelly clay
WS10	1.0 – 3.0	1.0 – 1.2	Made Ground
		1.2 – 3.0	Sandy gravelly clay

7.2. Groundwater Observations

7.2.1. Groundwater monitoring was undertaken between 23rd November and 9th December 2020. Water strikes observed during the site works and the results of the monitoring visits are summarised in Table 7.2 below.

TABLE 7.2: Groundwater Observations

Hole	Water Strikes				Standing Water Level During Monitoring			
	Struck		Rose to		Shallowest		Deepest	
	m bgl	m OD	m bgl	m OD	m bgl	m OD	m bgl	m OD
WS01	3.50	221.19	-	-	-	-	-	-
WS02	3.00	221.73	-	-	0.82	223.91	1.43	223.30
WS03	5.45	219.70	-	-	3.20	221.95	3.35	221.80
WS04	2.00	223.69	-	-	-	-	-	-
WS05	0.50	224.07	-	-	0.56	224.01	0.68	223.89
WS07	0.80	226.63	0.60	226.83	-	-	-	-
WS08	-	-	-	-	0.43	226.03	0.97	225.49
WS10	-	-	-	-	1.20	226.33	1.56	225.97

7.2.2. During the site investigation groundwater was encountered at depth within the natural Glacial Till in WS01 to WS04, located in the northeast of the site nearest to the location of the proposed development.

7.2.3. In WS05 and WS07, groundwater was recorded within the Made Ground at shallow depth. These two holes are located within the school development towards the east side of the site. This groundwater is considered to be perched water held within the Made Ground, possibly associated with confining features associated with the development. WS05 was noted to have locally deep Made Ground and WS07 could not be progressed due to the fast inflow of groundwater within the Made Ground.

7.2.4. Although no groundwater was recorded in WS08 or WS10 during the site works, subsequent monitoring recorded generally consistent level of groundwater in both locations, at around 226m OD.

7.3. Geotechnical Testing

7.3.1. In-situ testing was undertaken for geotechnical purposes and samples were obtained for appropriate laboratory analysis. Site based geotechnical testing is summarised in Table 7.3. Any limitations to the testing that require consideration during the evaluation of the data are described in the following paragraphs.

TABLE 7.3: In-situ Tests (Geotechnical)

Test type and Reference	Number
Standard penetration test (BS EN ISO 22476-3:2005+A1:2011)	36

7.3.2. Although a standardised test, uncorrected Standard Penetration Test (SPT) ‘N’ values display a considerable amount of scatter. Calibrated SPT hammers were used by the ground investigation

contractor and in our appraisal (given in Section 10) the results have been normalised to 'N_{60}' in accordance with Eurocode 7.

7.3.3. Some grossly elevated SPT N values, likely to be due to encountering obstructions were recorded between 3.30m and 4.33m bgl. These are not considered representative of the stratum as a whole and have been discounted from subsequent analysis.

7.3.4. The above factors have been considered in the appraisal of geotechnical results given in Section 10.

7.3.5. Geotechnical laboratory testing is summarised in Table 7.4.

TABLE 7.4: Laboratory Tests (Geotechnical)

Test type and reference	Number
Water (Moisture) Content (BS EN ISO 17892-1:2014).	24
Liquid and plastic limits and plasticity index (BS EN ISO 17892-18:2018 cl. 5.3 & 5.5)	7
Particle size distribution - wet sieving (BS EN ISO 17892-4:2016 cl. 5.2)	5
Particle size distribution - sedimentation by pipette method (BS EN ISO 17892-4:2016 cl. 5.4)	5
Organic matter content (BS 1377: 1990 part 3:3)	10
Water soluble sulphate content 2:1 aqueous extract (BRE SD1 2005)	13
Soil pH (BRE SD1 2005)	13

7.3.6. As with in situ testing, it is necessary to consider the limitations associated with any laboratory testing and to review any potentially anomalous results. In all geotechnical tests it should be noted the specimen is selected from a much larger volume of material which may have an inherent degree of variability, particularly in Made Ground.

7.3.7. Water content determinations on disturbed samples may not be wholly representative due to disturbance arising from the sampling process. In addition, moisture content results can be influenced by climatic factors and it cannot be guaranteed that the values determined at the time of investigation will be the same as those that prevail at the time of construction.

7.3.8. The above factors have been considered in the appraisal of geotechnical results given in Section 10.

7.4. Contamination Observations and Testing

7.4.1. Olfactory and visual evidence of potential contamination is summarised in Table 7.5 and includes observations relating to organic materials that may indicate a ground gas risk potential. Table 7.6 summarises the chemical suites that were analysed based upon the preliminary conceptual model and observed site conditions.

TABLE 7.5: Summary of Evidence of Contamination

Exploratory Hole	Depth (m bgl)	Comment	
WS07	0.1 – 0.4	Made Ground	Ash

Exploratory Hole	Depth (m bgl)	Comment	
	0.4 – 0.6		
	0.6 – 0.8		
WS10	0.1 – 0.45	Made Ground	Ash and clinker

7.4.2. Table 7.6 summarises the chemical suites that were analysed based upon the preliminary conceptual model and observed site conditions during the intrusive ground investigation works.

TABLE 7.6: Laboratory Tests (Environmental)

Test type	Number
SOIL	
S1.6 General Suite: pH, moisture content, metals and inorganics, phenol, speciated polycyclic aromatic hydrocarbons (PAHs) and total petroleum hydrocarbons (TPH)	12
Total organic carbon	7
Asbestos screen	8
WATER	
W1.1 General Suite: pH, metals and inorganics, phenol, total polycyclic aromatic hydrocarbons (PAHs) and total petroleum hydrocarbons (TPH).	4
Speciated PAH	4

8.0 GENERIC QUANTITATIVE RISK ASSESSMENT

8.1. Assessment Framework

8.1.1. Subsequent to the identification and quantification of contaminant species in soils, waters and gases, it is necessary to select a method for assessing their significance in view of the current and proposed future use of the land. The initial assessment comprises comparison of identified contaminant levels to generic screening values that have been prepared to assess the risk to human, controlled water and gas risk receptors. The guidance used to provide this initial screening is listed in Table 8.1.

8.1.2. With respect to Human Health Risk Assessment the screening values for a residential (with plant update) end use as defined in Environment Agency Guidance SR3[1] have been selected based upon the proposed development remaining as a school. It should be noted that using screening values for a residential end use is a highly conservative approach. The assessment assumes a Soil Organic Matter (SOM) content of 2.5% based on average site derived SOM data from the Made Ground of 4.6%.

8.1.3. Controlled Water Risk Assessment has been undertaken using as available Environmental Quality Standards (EQS) for the protection of aquatic life due to the site's location adjacent to Tong End Brook and the River Spodden. The specific legislation and/or guidance that dictate the water quality standards adopted are contaminant specific and these are referenced in the Summary of Water Analysis table. The water quality standards have been chosen in accordance with section 4.2 of the EA's Remedial Targets Methodology as informed by the EA's Groundwater Protection Guides (2017), and documents listed in Table 8.1[2].

8.1.4. For further detailed information on the current Regulations and selection of appropriate threshold values, please refer to the rear of this report text.

TABLE 8.1 Generic Quantitative Screening Values

	Key Guidance
Soil	LQM/CIEH S4ULs for Human Health Risk Assessment.*
	Defra Development of Category 4 Screening Levels Main Report and associated documents
	Environment Agency CLEA Version 1.06 software. Environment Agency Science Reports SC050021 SR2/SR3
	Generic Assessment Criteria based upon Environment Agency CLEA UK Beta Version 1.0.
Water	EA Groundwater Protection Guides, March 2017.
	The Water Framework Directive (Standards and Classification) Directions (England and Wales) 2015
	Water Environment (Water Framework Directive) (England and Wales) (Amendment) Regulations 2015
	EC and UK Drinking Water Standards.
	WHO Drinking Water Standards.

[1] Updated Technical Background to the CLEA Model, Science Report SC050021/SR3
[2] https://www.gov.uk/government/collections/groundwater-protection

	Key Guidance
	Background Water Quality.
Gas	CIRIA C748, 'Guidance on the use of plastic membranes as VOC vapour barriers'.
	CIRIA C735, 'Good practice on the testing and verification of protection systems for buildings against hazardous ground gases'.
	BS 8576:2013, 'Guidance on investigations for ground gas – permanent gases and VOCs'
	CIRIA Report C665, 'Assessing Risks Posed by Hazardous Ground Gases to Buildings'
	CIRIA Report C682, 'VOCs Handbook: investigating, assessing and managing risks from inhalation of VOCs at land affected by contamination'
	British Standard BS:8485+A1:2019, 2015, 'Code of practice for the design of protective measures for methane and carbon dioxide ground gases for new buildings'.
	CIRIA Report 150 'Methane Investigation Strategies'.
	BRE 414 'Protective Measures for Housing on Gas Contaminated Land', 2001.
	The Building Regulations 2000, Approved Document C, Section 2. Updated 2004.
	BR211, 'Radon: Guidance on Protective Measures for New Buildings', 2015.
	Health Protection Agency Publication HPA RPD-033, 2007,' Indicative Atlas of Radon in England and Wales.

8.2. Soil

8.2.1. The results have been reviewed for evidence of potential zoning across the site and/or between the various soil strata. As a consequence, the statistical assessment has treated the site as a single averaging area and screened in its entirety. The assessment has included the upper 1.0m depth of the Made Ground. Additional tables are presented where appropriate to reflect distinct ground characteristics relevant to the conceptual model.

8.2.2. The statistics associated with soil analysis are summarised in Table 8.2. The Mean Value (95%ile) and Maximum Value Tests were undertaken on the sample population/s for those parameters exceeding the screening levels. Where the 95%ile exceeds the screening values, these results are highlighted and discussed. The remainder are not considered indicative of significant contamination for the proposed end use.

TABLE 8.2: Summary of Soil Analysis

Contaminant	Units	Exceeding	Max	95% UCL	GAC
Metals & Inorganics					
Arsenic	mg/kg	0 / 12	12	-	37 [B]
Cadmium	mg/kg	0 / 12	0.5	-	22 [B]
Chromium	mg/kg	0 / 12	20	-	910 [A]
Chromium - Hexavalent	mg/kg	0 / 12	<1	-	21 [B]
Copper	mg/kg	0 / 12	42	-	2900 [A]
Lead	mg/kg	0 / 12	52	-	200 [B]
Mercury	mg/kg	0 / 12	0.18	-	42 [A]
Nickel	mg/kg	0 / 12	29	-	140 [A]
Selenium	mg/kg	0 / 12	<0.5	-	270 [A]

Vanadium	mg/kg	0 / 4	38	-	9000 [A]
Zinc	mg/kg	0 / 12	89	-	4800 [A]
Cyanide	mg/kg	0 / 12	0.3	-	24 [C]
Total Petroleum Hydrocarbons					
GRO >C6-8	mg/kg	0 / 12	<0.1	-	n/a
GRO >C8-10	mg/kg	0 / 12	<0.1	-	n/a
EPH >C10-12	mg/kg	0 / 12	<10	-	190 [A]
EPH >C12-16	mg/kg	0 / 12	15	-	360 [A]
EPH >C16-21	mg/kg	0 / 12	110	-	590 [A]
EPH >C21-40	mg/kg	0 / 12	1700	-	n/a
Polycyclic Aromatic Hydrocarbons					
Naphthalene	mg/kg	0 / 12	0.04	-	5.6 [A]
Acenaphthylene	mg/kg	0 / 12	0.32	-	460 [A]
Acenaphthene	mg/kg	0 / 12	1.6	-	550 [A]
Fluorene	mg/kg	0 / 12	1.2	-	440 [A]
Phenanthrene	mg/kg	0 / 12	4.8	-	240 [A]
Anthracene	mg/kg	0 / 12	2.3	-	5800 [A]
Fluoranthene	mg/kg	0 / 12	8.6	-	590 [A]
Pyrene	mg/kg	0 / 12	7.9	-	1300 [A]
Benzo (a) anthracene	mg/kg	0 / 12	3.8	-	11 [A]
Chrysene	mg/kg	0 / 12	3.4	-	23 [A]
Benzo (b) fluoranthene	mg/kg	0 / 11	4.8	-	3.3 [A]
Benzo (k) fluoranthene	mg/kg	0 / 12	2.4	-	93 [A]
Benzo (a) pyrene	mg/kg	0 / 11	5.6	-	5 [B]
Indeno (1,2,3 - cd) pyrene	mg/kg	0 / 12	2	-	37 [A]
Dibenzo (ah) anthracene	mg/kg	0 / 11	0.48	-	0.29 [A]
Benzo (ghi) perylene	mg/kg	0 / 12	3	-	340 [A]
Speciated Phenols					
Phenol (Monohydric)	mg/kg	0 / 12	0.4	-	230 [A]

Residential with Plant Uptake assuming 2.5% SOM; [A] LQM/CIEH Suitable for use Levels (S4UL). Copyright Land Quality Management Limited reproduced with permission; Publication Number S4UL 3036. All rights reserved; [B] Defra Category 4 Screening Levels (C4SLs); [C] Acute Risk GAC (SoBRA derived); [D] GAC from CLEA v1.071; "-" Not calculated (fewer than 4 samples or no exceedances); N/A No Tier 2 screening value available; Results below Laboratory LOD and with no GAC have been removed

Metals and Inorganics

8.2.3. The concentration of metal and inorganic contaminants tested in the Made Ground samples did not exceed the Tier 2 screening values for a conservative residential end use.

8.2.4. Lead has been assessed using the Category 4 Screening levels (C4SLs). The C4SLs were developed as indicative of a Low Risk, rather than Minimal Risk; however, in the absence of any other screening level they are considered to be appropriate for use, particularly as they are significantly lower than the withdrawn SGVs and they represent values below which there will not be an unacceptable risk.

Polycyclic Aromatic Hydrocarbons (PAH)

8.2.5. Concentrations of PAH compounds Benzo(a)pyrene, benzo(b)fluoranthene and dibenzo(ah)anthracene were recorded marginally above the GAC in the Made Ground sample collected from WS10 at 0.35m. This exploratory hole was located on asphalt and the sample at 0.35m was collected from the underlying subbase material which is recorded to have contained ash and clinker. As long as this material remains, or is reused, under hardstanding, it does not pose a significant risk to site end users.

8.2.6. The concentrations of PAH compounds in all other samples were all below the relevant Tier 2 screening values for a conservative residential end use.

Petroleum Hydrocarbons

8.2.7. The concentration of petroleum hydrocarbons tested in the Made Ground samples did not exceed the Tier 2 screening values for a conservative residential end use.

8.3. Asbestos

8.3.1. It is noted that there are no UK generic quantitative assessment criteria for asbestos in soils. A summary of the results for asbestos is presented below. Additional guidance on this topic is presented in CIRIA C733[3].

8.3.2. A total of 8 No. samples of Made Ground soils were screened for the presence of asbestos. None of the samples tested positive for asbestos and suspected asbestos containing material was not visually identified during the invasive investigation works.

8.4. Water

8.4.1. Groundwater samples were obtained from installations screened in Made Ground and superficial deposits on 4th December 2020.

8.4.2. During monitoring, an oil/water interphase probe was used to dip groundwater levels and check for LNAPL/free product on the surface of groundwater. The interphase probe was also lowered to base of monitoring installations to check for the presence of DNAPL. No evidence of either LNAPL or DNAPL was recorded.

8.4.3. The results of the groundwater analyses have been compared to the values contained within the references detailed in Table 8.1 for water quality. The selection of EQSs is considered appropriate given the site's location directly adjacent to Tong End Brook and the River Spodden, and the absence of potable groundwater abstractions in the area. The results associated with groundwater analysis are summarised in Table 8.3, below.

TABLE 8.3: Summary of Water Analysis

Contaminant	Units	Exceeding	Max	Mean	GAC
Metals & Inorganics					
Arsenic	µg/l	0/ 4	1.9	-	50[B*]
Boron	µg/l	0/ 4	46	-	2000[C]
Cadmium	µg/l	0/ 4	0.04	-	0.08[B]
Chromium	µg/l	0/ 4	0.4	-	4.7[B]
Chromium - Hexavalent	µg/l	0/ 4	<2	-	3.4[A*]
Copper	µg/l	2/ 4	3	2.00	1[B#]
Lead	µg/l	0/ 4	<0.4	-	1.2[B*#]
Mercury	µg/l	0/ 4	<0.5	-	0.07[B*]
Nickel	µg/l	0/ 4	1.6	-	4[B#]
Selenium	µg/l	0/ 4	1.7	-	7.5[A]
Zinc	µg/l	0/ 4	1.9	-	10.9[B#]
Cyanide	µg/l	1/ 4	3	1.50	1[B]
Cyanide Free	µg/l	- / 4	<1	-	n/a

[3] CIRIA - Asbestos in soil and made ground: a guide to understanding and managing risks, March 2014

Thiocyanate	µg/l	- / 4	<20	-	n/a
Sulphate as SO4	µg/l	0/ 4	55300	-	400000[C]
Sulphide	µg/l	0/ 4	<10	10.0	0.25[C]
Polycyclic Aromatic Hydrocarbons					
Naphthalene	µg/l	0/ 4	0.8	-	2[B]
Acenaphthylene	µg/l	- / 4	0.04	-	n/a
Fluorene	µg/l	- / 4	0.86	-	n/a
Phenanthrene	µg/l	- / 4	0.83	-	n/a
Anthracene	µg/l	1/ 4	0.27	0.08	0.1[B*]
Fluoranthene	µg/l	1/ 4	0.41	0.11	0.0063[B*]
Pyrene	µg/l	- / 4	0.31	-	n/a
Benzo(a)anthracene	µg/l	- / 4	0.07	-	n/a
Chrysene	µg/l	- / 4	0.07	-	n/a
Benzo(b)fluoranthene	µg/l	- / 4	0.06	-	n/a
Benzo(k)fluoranthene	µg/l	- / 4	0.02	-	n/a
Benzo(a)pyrene	µg/l	4/ 4	0.05	0.02	0.00017[B*]
Indeno(1,2,3-cd)pyrene	µg/l	- / 4	0.02	-	n/a
Dibenzo(ah)anthracene	µg/l	- / 4	<0.01	-	n/a
Benzo(ghi)perylene	µg/l	- / 4	0.02	-	n/a
PAH USEPA 16 (Total)	µg/l	- / 4	6.3	-	n/a
Total Petroleum Hydrocarbons					
TPH >C8-C40	µg/l	- / 4	<10	-	74[B]

n/a not available, '-' not calculated as fewer than 3 results or no exceedances. Sources of Generic Assessment Criteria (GAC): A - River Basin Districts Typology, Standards and Groundwater threshold values (WFD) (England & Wales) Directions 2010; B - The Water Framework Directive (Standards and Classification) Directions (England and Wales) 2015; C - Supporting Guidance (WAT-SG-53), Environmental Quality Standards and Standards for Discharge to Surface Waters. V6.1, SEPA, Feb 2018; * hazardous substance (according to Groundwater Directive 2006/118/EC); # assumes 100% bioavailability; DWS; w - The Water Supply (Water Quality) Regulation, 2016; x - WHO Guidelines for Drinking Water Quality. Fourth Edition (2017); y - Petroleum products in drinking water. World Health Organization (WHO), 2008; z - EU drinking water standard, 2017/0332 (COD).

Metals and Inorganics

8.4.4. The concentration of copper was recorded marginally above the GAC in two samples of groundwater collected from WS02 and WS05. Given the absence of significant concentrations of copper in soil samples tested from across the site, and therefore the absence of a significant source, concentrations of copper are not considered to pose a risk to controlled water receptors.

8.4.5. The groundwater sample collected from WS08 recorded cyanide at a concentration marginally above the relevant GAC. The remaining groundwater samples did not encounter cyanide above the laboratory limit of detection. Additionally, concentrations of free cyanide (which is the more toxic form) were not encountered above the laboratory limit of detection in any of the samples analysed. Given this, and the absence significant cyanide concentrations in the soils across the site, this elevated concentration is not considered to pose a risk to controlled water receptors.

Polycyclic Aromatic Hydrocarbons & TPH

8.4.6. PAH compounds anthracene, benzo(a)pyrene and fluoranthene were recorded at concentrations above relevant GAC in the groundwater sample collected from WS08, however, the concentrations remained relatively low and are not considered to be indicative of significant contamination. PAH compounds were not detected above laboratory limits of detection in all other groundwater samples. This indicates that the PAH detected in WS08 is isolated, possibly associated with ashy Made Ground encountered at this location, and is unlikely to pose a wider risk to groundwater quality.

8.4.7. Concentrations of TPH were not recorded above the laboratory limit of detection in any of the groundwater samples obtained.

8.5. Ground Gas

8.5.1. Three rounds of monitoring were conducted between 23rd November and 9th December 2020, with recorded atmospheric pressure ranging from 978 to 998mb. The notable pre-purge results, where carbon dioxide exceeded 1.5%, methane 1% and/or oxygen fell below 18%, are summarised in Table 8.4.

TABLE 8.4: Summary Gas Concentrations and Flow Rates

Borehole	Date	Gas Concentration (%)			Average Flow Rate (l/hr)
		CO_2	CH_4	O_2	
WS02	23/11/20	5.6	0.1	16.7	<0.1
	04/12/20	6.7	<0.1	6.6	<0.1
	09/12/20	8.0	0.1	11.3	3.0
WS03	23/11/20	7.0	0.1	0.2	<0.1
	04/12/20	5.2	<0.1	1.4	1.8
	09/12/20	6.5	<0.1	0.1	<0.1
WS05	04/12/20	0.2	<0.1	17.0	<0.1
WS08	23/11/20	1.5	0.5	17.6	<0.1
WS10	04/12/20	1.9	<0.1	19.2	<0.1
	09/12/20	4.2	0.1	7.6	8.4

*All percentage figures are by measurement of volume. Bracketed figures are post purge. *Gas sample obtained. '-' Results do not exceed thresholds. 'n/r' Positive flow not recorded*

Bulk Gases

8.5.2. The maximum concentration of methane recorded during monitoring was 0.5% v/v in WS08 during the visit of 23rd November 2020.

8.5.3. Elevated concentrations of carbon dioxide were recorded in several installations including WS02, WS03 and WS10 during the monitoring visits. The maximum concentration recorded was 8.0% in WS02 during the visit of 9th December 2020.

8.5.4. Depressed concentrations of oxygen were recorded in all installations on several of the monitoring visits, with the lowest concentration of 0.1 % v/v in WS03 recorded on 9th December 2020. Depressed oxygen concentrations were generally associated with the presence of carbon dioxide.

8.5.5. With the exception of two sporadic results (carbon monoxide at 3ppm in WS08 & hydrogen sulphide at 20ppm in WS03) carbon monoxide and hydrogen sulphide were not recorded at detectable concentrations during any of the monitoring rounds.

8.5.6. Maximum steady state gas flow rates of 3.0 l/hr (WS02), 5.7 l/hr (WS08) and 8.4 l/hr (WS10) were recorded in WS02, WS08 and WS10, respectively. These installations were recorded to be

submerged for all or most of the monitoring programme, or experienced significant fluctuations of groundwater levels, and flow rates are not considered to represent actual site conditions.

8.5.7. Based upon the guidance presented in Table 8.1, an assessment has been made of the requirements for gas protection that consider sources of gas generation, potential exposure routes, and applicable, representative gas flows and concentrations. This is summarised below:

- Potential on-site source of generation: Ground gas generation from Made Ground and infilled areas across the site.
- Potential off-site Source of generation: Any Made Ground and infilled areas local to the site.
- Representative Concentrations and Gas Flows: Conservatively, the highest carbon dioxide concentration of 8.0% v/v will be applied during calculation of the Gas Screening Value. As noted in BS 8485 (Section 6.3.7.1), adopting a Gas Screening Value calculated using the peak flow measurements can result in a disproportionately high gas hazard prediction and assignment of an over-precautionary Characteristic Situation. The majority of recorded positive flow rates can be attributed to flooded response zones within monitoring installations and fluctuating groundwater levels. For calculations of the GSV, the highest recorded flow rate from WS03 (1.8 l/hr), which is closest in proximity to the proposed development, has been used.
- Exposure Routes: Gas at the site primarily presents a concern following ingress into confined spaces both during and after construction.

8.5.8. The Gas Screening Value (GSV) has been calculated using the worst case, representative ground gas concentrations and representative flow rates. The GSV of 0.144 /hr indicates the site is classified as a CIRIA Characteristic Situation 2 and as such, gas protection measures may be required and further consideration is required in this regard, as discussed further below.

8.5.9. A thin veneer of Made Ground was encountered across the majority of the site. Analysis of representative Made Ground samples recorded concentrations of total organic carbon (TOC) ranging from 0.5% to 14%, with an average recorded concentration of 4.5%. Reference to BS 8576:2013 (Figure 6) indicates that Made Ground with a TOC concentration of less than 6% and natural strata with a low degradable organic content have a low – very low potential for ground gas generation.

8.5.10. Two samples of Made Ground recorded concentrations of TOC above 6%, the highest of which was 14% recorded in WS07 and associated with ash and clinker content. As detailed in CL:AIRE RB17 (ISSN 2047-6450, dated Nov 2012) ash and clinker can give high TOC results that do not represent the risk of gas emissions from such material as it is generally not degradable and cannot produce methane or carbon dioxide [14].

8.5.11. Natural soils such as Glacial Till can contain small amounts of organic material. When boreholes are drilled into these soils, this can introduce oxygen which promotes chemical and biological process locally around the well and filter pack leading to high concentrations of carbon dioxide within the well. The rate of gas generation and the volume produced is extremely small and high concentrations in a monitoring well do not indicate a risk to buildings [15].

8.5.12. At this stage, given the limited data set and uncertainties identified above, further monitoring, investigation and risk assessment should be completed to confirm the requirements for ground gas protection measures.

8.5.13. At this stage, assessment of the data indicates that without further assessment, gas protection measures will be required. Reference to Table 4 of BS8485+A1:2019 presents a matrix of different building types against CIRIA Characteristic Situations that provides indicative scores for gas protection. The proposed development comprises a new school which is considered to conform to a Building Type B (currently room sizes, ground floor layout etc. currently unknown) as defined in Table 3 of BS8485+A1:2019 and therefore the gas protection score required is 3.5.

8.5.1. Independent verification of the gas membrane installation must be carried out in accordance with the requirements detailed in CIRIA C735. It is noted that further monitoring and assessment may give potential to downgrade requirements for protection.

9.0 WASTE SOILS

9.1. Hazardous Properties

9.1.1. A formal hazardous properties assessment has not been carried out but the results of the investigation can be used to inform the likely classification of waste soils for disposal. A separate assessment is required for this purpose based upon technical guidance on classification of hazardous waste (Environment Agency: Guidance on the Classification and Assessment of Waste Technical Guidance WM3 Version 1.1, May 2018).

9.2. Inert Soils Description

9.2.1. Uncontaminated natural soils would be considered inert by merit of their visual description and would be expected to be described under EWC 17-05-04 (soil and stones other than those mentioned in 17 05 03).

9.2.2. With respect to non-hazardous Made Ground soils there is a requirement to carry out analysis for Waste Acceptance Criteria (WAC - see below) to inform whether the soils may be suitable for disposal as inert waste; however, for those soils that contain anthropogenic inclusions an assessment of the inclusions is also required in order to determine potential suitability for classification as inert waste, regardless of the WAC result.

9.2.3. Inert waste is defined within the Landfill (England and Wales) Regulations 2002 (as amended) and the EEC Council Decision 2003/33/EC. 'Soils and Stones' can be judged inert where they exclude contamination, topsoil and peat. However, "If the listed wastes are contaminated or contain other material or substances such as metals, asbestos, plastics, chemicals, etc. to an extent which increases the risk associated with the waste sufficiently to justify their disposal in other classes of landfills, they may not be accepted in a landfill for inert waste" (excerpt from Council Decision of 19 December 2002 establishing criteria and procedures for the acceptance of waste at landfills pursuant to Article 16 of and Annex II to Directive 1999/31/EC (2003/33/EC).

9.2.4. The logs indicate that the Made Ground soils are largely free of 'metals, asbestos, plastics, chemicals, etc. to an extent which increases the risk' and hence may be suitable for disposal as inert waste provided the WAC results indicate suitability. However, it will be necessary to inspect soils proposed for inert disposal and confirm this position with the landfill.

9.3. Waste Compliance: WAC Results

9.3.1. Landfill WAC analysis (specifically leaching test results) must not be used for waste classification and hazardous waste assessment purposes. This analysis is only applicable for landfill acceptance and does not give any indication as to whether a waste may be hazardous or non-hazardous.

9.4. Landfill Tax

9.4.1. With respect to soils disposal at landfill reference should be made to HMRC Excise Notice LFT1: a general guide to Landfill Tax to determine the appropriate rate of landfill tax. There are two rates of tax, both of which are charged on a per weight basis: the lower rate applies to those less polluting wastes listed in the Landfill Tax (Qualifying Material) Order 2011, as amended, and the standard rate applies to all other taxable waste.

9.4.2. The only determining factor as to whether waste is lower rated is whether it is listed in the Landfill Tax (Qualifying Material) Order 2011. Whether or not waste is considered to be inert for environmental protection purposes is not relevant to matters of tax liability and a separate assessment should be made for this as the cost differential is significant. Equally, the fact that waste is listed in the Landfill Tax (Qualifying Material) Order 2011 does not mean that the waste is inert for environmental protection purposes.

10.0 GEOTECHNICAL EVALUATION

10.1. Ground Conditions

10.1.1. The ground conditions encountered during the site investigation generally consisted of Made Ground over Glacial Till. The general distribution of each stratum is shown in Table 10.1.

TABLE 10.1: Soil Profile

Stratum	From		To		Thickness (m)
	(m bgl)	(m OD)	(m bgl)	(m OD)	
Made Ground	GL	225.00	1.30	223.70	1.30
Glacial Till	1.30	223.70	>5.45	<219.55	Not proven

10.1.2. The ground model as encountered in Table 10.1 broadly agrees with the conditions anticipated.

10.1.3. Made Ground up to 2.40m bgl was encountered locally (WS05).

10.2. Made Ground

10.2.1. From ground level Made Ground deposits were encountered in all exploratory hole locations. The Made Ground generally comprised mixtures of sandy clay and gravel. The gravel component comprised mudstone, sandstone, limestone, coal, brick and concrete.

10.2.2. WS07 and WS09A terminated within this stratum.

TABLE 10.2: Summary of Soil Parameters for Made Ground

Soil Parameters	Number of tests	Range of results	Characteristic value[1]
Liquid Limit (%)	1	22	22
Plastic Limit (%)	1	Non Plastic	Non Plastic
Plasticity	1	Non Plastic	Non Plastic
Moisture Content (%)	2	12.7 - 15.6	14.1
Organic content (%)	1	0.6	0.6
Water soluble sulphate content (mg/l)	4	11 - 18	14
Soil pH	4	6.9 - 8.1	6.9
Particle Size Distribution	1	Gravel: 34% Sand: 37% Silt: 20% Clay: 9%	N/A
SPT 'N_{60}' Values	6	6.5 – 10.8	7

[1]Cautious estimate used.

10.3. Glacial Till

10.3.1. Below the Made Ground, natural deposits of Glacial Till were encountered in all exploratory holes apart from WS07 and WS09A, which terminated in the Made Ground.

10.3.2. The Glacial Till generally comprised sandy gravel and clay mixtures, with the gravel component consisting of sandstone, mudstone, limestone, siltstone and coal.

TABLE 10.3: Summary of Soil Parameters for Glacial Till

Soil Parameters	Number of tests	Range of results	Characteristic value[1]
Liquid Limit (%)	6	21 - 31	30
Plastic Limit (%)	6	Non Plastic to 15	14
Plasticity Index (%)	6	N/A to 16	16
Modified Plasticity Index (%)	6	4.64 - 7.84	8
Plasticity	6	Non Plastic to Low	Low
Volume Change Potential (NHBC)	6	None	None
Moisture Content (%)	22	8.3 - 29.6	15.3
Organic content (%)	9	0.2 - 3.6	3.6
Water soluble sulphate content (mg/l)	9	10 - 940	940
Soil pH	9	5.2 - 8.6	5.2
Particle Size Distribution	4	Gravel: 31% - 38% Sand: 28% - 40% Silt: 15% - 22% Clay: 9% - 14%	N/A
SPT 'N_{60}' Values	30	3.3 – 37.9	10

[1]Cautious estimate used.

10.3.3. Although described qualitatively on the borehole logs as clay soil, the results of the laboratory testing suggest some areas of the Glacial Till may be granular-dominated. This is reflected in the Non Plastic classification of some samples tested, and the variable moisture content values.

10.3.4. The Particle Size Distribution test results indicate the Glacial Till is generally well graded.

10.4. Buried Concrete

10.4.1. 13 no. soil samples, comprising 4 no. from the Made Ground and 9 no. from the Glacial Till, were subjected to pH and water soluble sulphate determinations. With reference to BRE Digest SD1 (2005 Ed), the results all fell within the design sulphate class of DS-1 with the exception of one sample from the Glacial Till in WS01. In this location a sulphate value of 940mg/l was recorded, which is within the design sulphate class DS-2.

10.4.2. The pH value in WS05 at a depth of 4.50m bgl was recorded as 5.2. This may be due to a more significant presence of coal in the sample. Coal fragments were recorded in the Glacial Till in all locations apart from WS06, therefore it is likely that similar low pH values will be present within the Till.

10.4.3. 4 no. samples of groundwater obtained during the monitoring programme were subjected to sulphate and pH determinations. The highest recorded value was 55.3 mg/l and measured pH values ranged from 6.99 to 7.67, which suggests, with reference to the BRE Digest, a DS-1 classification.

10.5. Groundwater Conditions

10.5.1. Groundwater observations during the field and the subsequent monitoring are described in Section 7 and are summarised in Table 7.2.

10.5.2. Based on the monitoring data, the hydraulic gradient at the site appears to generally follows the natural topography of the area, sloping from the southwest down to the northeast.

10.5.3. The shallow groundwater ingress recorded in WS07 and WS05 may be associated with the school development and the local deep Made Ground encountered in WS05. Conversely, where the site has been subject to cut and fill work to accommodate topography changes, groundwater may be encountered at shallow depth where excavation has locally reduced ground level with respect to the groundwater profile.

11.0 REVISED CONCEPTUAL MODEL

11.1.1. Guidance for contaminated land advocates the assessment of risk by determining the presence of pollutant linkages and weighting the likelihood of harm occurring with the potential severity of that harm. The framework is set out in various publications by the DETR, Environment Agency, Institute for Environment and Health, NHBC and CIRIA.

11.1.2. Tables 6.2 - 6.3 indicate the potential contaminants, pollutant linkages and receptors that have been considered at the site. Following the investigation of these and Generic Quantitative Risk Assessment (for human health, controlled waters and gas) a qualitative risk assessment for each receptor is presented below in Tables 11.1 - 11.5. For the purpose of this assessment, the descriptions of risk presented in Table 6.1 have been used which take into account the magnitude of the source contamination identified, likelihood of exposure via a pathway and significance of harm likely to result on the given receptor:

TABLE 11.1: Groundworkers (Assuming Basic PPE)*

Pathway	Risk	Comment
Ingestion of soil/dust	Low	Redevelopment or maintainance of the site may involve ground workers coming into contact with the underlying soils and water. Only localised PAH contamination has been encountered within hardstanding subbase. Normal Health and Safety precautions associated with a site where potential contamination may exist (of the levels identified), will mitigate the general risk. There is a potential risk if previously unforseen contamination is later found to be present.
Inhalation of soil/dust	Low	
Dermal contact with soil/dust/water	Low	
Inhalation of vapour from soil/dust	Low	
Inhalation of vapour from groundwater	Low	
Migration of soil gases to confined spaces	Low	

* *Separate assessments are required in relation to asbestos risk.*

TABLE 11.2: End Users during Occupation

Pathway	Risk	Comment
Inhalation of dust	Low	Only localised PAH contamination has been encountered and this was restricted to ash and clinker within hardstanding sub base materials which will not be exposed at surface. Elevated concentrations of carbon dioxide have been recorded in a number of installations. Further monitoring and assessment is recommended to confirm the requirement for ground gas protection measures.
Ingestion of soil/dust	Low	
Dermal contact with soil/dust/water	Low	
Consumption of vegetables/plants	N/A	
Inhalation of vapour from soil/dust	Low	
Inhalation of vapour from groundwater	Low	
Migration of soil gases to confined spaces/structure	Low - Moderate	

Pathway	Risk	Comment
Movement of contaminants to engineered structures (e.g. water pipes)	Low	Inspections across former building footprints should be completed post demolition and a watching brief maintained throughout groundworks. There is a potential risk if previously unforeseen contamination is later found to be present.
Uptake by flora/fauna	Low	

TABLE 11.3: Controlled Waters

Pathway	Risk	Comment
Migration of water borne contaminants from site to surface waters	Low	No significant contamination identified on site from analysis of soils and groundwater samples. The potential for lateral and downward migration of mobile contaminants towards surface watercourses and underlying bedrock aquifer will be limited by the presence of cohesive inclusions within the granular Glacial Till.
Migration of water borne contamination from off site	Low	
Migration of contamination from surface and/or subsurface to groundwater	Low	

Table 11.4: Buildings

Pathway	Risk	Comment
Movement of contaminants to engineered structures (e.g. water pipes)	Low - Moderate	Consideration will be required with respect to potable supply pipework due to the presence of Made Ground which has been shown to contain hydrocarbons. Liaison with the water supply provider will be required to determine if remedial actions are required.
Migration and accumulation of flammable gases beneath the building footprint.	Low	Detectable concentrations of methane have not been recorded during monitoring.

TABLE 11.5: Offsite Receptors

Pathway	Risk	Comment
Dermal contact with soil/dust/water	Low	No significant contamination identified on site. Presence of low permeability clay will reduce the potential for migration of contamination to off site receptors.
Inhalation/ingestion of dust	Low	
Inhalation of vapour from soil/dust	Low	
Inhalation of vapour from groundwater	Low	
Migration of soil gases to confined spaces/structure	Low	

Pathway	Risk	Comment
Movement of contaminants to engineered structures (e.g. water pipes)	Low	

12.0 GEOTECHNICAL CONCLUSIONS AND RECOMMENDATIONS

12.1. Introduction

12.1.1. It is proposed to construct a new school building at the site. At the time of the site investigation a number of development options were under consideration, however since the completion of the site investigation the development has been further refined. It is now proposed to construct a new 3-storey building to the northeast of the existing school. Current proposals are indicated in Figure 2 in Appendix A.

12.1.2. Details of the structure and anticipated loadings were under development at the time of the writing of this report, but it is understood that column loads are likely to be c. 1300kN (SLS) if a ground bearing floor slab is used, and c. 1800kN (SLS) if a suspended floor slab is adopted.

12.1.3. This report is based on a preliminary investigation that was designed to give general coverage of the site. Further investigation will be required once proposals are fully developed and a detailed Geotechnical Design Report should be prepared. The primary purpose of this report is to identify risk, allow design development and inform cost estimates.

12.2. Key Considerations

12.2.1. The ground investigation has identified a number of potential geotechnical risks at the site which relate to the site investigation and the proposed location for the new development. These are summarised below and discussed in more detail in the following sections.

- Localised Made Ground to depths up to 2.4m.
- Local soft ground to depths in excess of 3.0m.
- Shallow groundwater level.
- Potential obstructions such as old foundations due to past developments in the Made Ground, and the presence of cobbles within the Glacial Till.
- Construction on a fill platform.
- Ground conditions aggressive to buried concrete.

12.3. Foundations

12.3.1. As described in Section 10, the site is underlain by Made Ground over Glacial Till. Made Ground is not considered to be a suitable founding stratum, and given the potential for raised ground in the development location, it is possible that excavation to reach a natural ground for a foundation formation level may be in excess of 3m in places.

12.3.2. Made Ground was generally encountered up to 1.5m depth across the site. Locally deeper Made Ground was encountered in WS05 to a depth of 2.4m bgl. The location of this exploratory hole is between two existing school buildings, therefore the locally deep Made Ground may be associated with this historic development.

12.3.3. The Glacial Till may have suitable bearing and settlement characteristics to permit shallow foundations, however this will require further assessment through a targeted site investigation once the development plan is finalised.

12.3.4. Traditional pad or strip foundations should be constructed below the Made Ground in the natural Glacial Till. Assuming a minimum foundation depth of 1.80m bgl, a preliminary allowable bearing resistance of 100kN/m^2 has been estimated for the Glacial Till. This is based on an analysis of the SPT data, which can been seen in Figure 3 to comprise a considerable range of values with no clear trend of increasing strength with depth.

12.3.5. When the data for WS01, WS02 and WS03 (located nearest to the proposed development) are considered in isolation and with respect to elevation in m OD (Figure 4), a clearer trend of increasing strength with depth is apparent. It is therefore likely that the allowable bearing capacity for the Glacial Till may be improved, however this is subject to further targeted site investigation.

12.3.6. The location of the new building is on an existing flat platform used as a playing field. The north and east edges of the platform have an even slope of c. 1:2.8 (H:V), with a maximum height of 2.5m. The west side rises with a similar slope angle by 2.0m to another platform playing field. The topography suggests a degree of cut and fill earthworks has been undertaken to form these platforms and accommodate the natural slope of the surrounding land. This is supported by the Made Ground indicated in the Groundsure report [1] to be present on site. That being the case, further assessment of the platform and slopes may be required before a shallow foundation is adopted, to ensure that the existing slopes aren't overloaded by the development.

12.3.7. Shallow excavations should also take into account the potential for groundwater ingress, due to the groundwater levels encountered across the site. Monitoring data indicates the groundwater profile slopes to the northeast, generally following the natural topography of the area.

12.3.8. A deeper piled foundation or ground improvement could be considered as an alternative to shallow foundations should a higher ground bearing resistance be required.

12.3.9. The foundations recommendations will be finalised after the findings and assessment of the additional investigation as proposed in this report.

12.4. Floor slabs

12.4.1. Based on the thickness of the Made Ground, NHBC guidance does not recommend the use of ground bearing floor slabs. However, consideration may be given to using ground improvement within the Made Ground to provide a suitable platform to support a ground bearing slab.

12.4.2. For lightly loaded slabs, consideration may be given to partial removal of the Made Ground (c.600mm) with proof rolling of the formation and the replacement of the screened and sorted Made Ground as an engineered fill, up to the underside of the slab construction.

12.4.3. For more heavily loaded floor slabs consideration should be given to the removal of 1m of the Made Ground followed by screening, sorting and compacting in layers as an engineered fill up to the underside of the slab construction.

12.4.4. Final recommendations for the floor slabs will be provided following the assessment of the additional investigation proposed.

12.5. Road Pavements

12.5.1. Due to the thickness of the Made Ground at the site, pavement surfaces should be constructed in flexible materials such as bituminous compounds or block paving which are more easily able to accommodate ground movement and can be more easily repaired. The formation level should

be rolled and inspected for any soft or loose material. These materials should be removed and replaced with granular fill placed and compacted in accordance with suitable specification. For initial design purposes an initial CBR value of 3% may be assumed.

12.5.2. Laboratory test results suggest soils are likely to be frost susceptible.

12.6. Buried Concrete

12.6.1. In the consideration of sulphate attack on buried concrete, reference has been made to BRE Special Digest 1 which classifies the site as a greenfield site with mobile groundwater conditions. The results of the concrete classification tests received have indicated DS-1, AC-1 classification for Made Ground and DS-2, AC-3z classification for Glacial Till.

12.6.2. Further testing of the ground should be carried out as part of the additional investigations, to ensure this classification is applicable to the finalised location for the proposed development.

12.7. Soakaway Drainage

12.7.1. Based on the presence of shallow groundwater and the well-graded nature of the Glacial Till, soakaway drainage may not be suitable for the site. Additional testing to confirm the suitability of soakaway drainage may be undertaken as part of the targeted site investigation if this option is to be considered as part of the SUDS requirements for the development.

12.8. Excavations

12.8.1. No instability was noted within the inspection pits during the site works, however excavation faces in Made Ground and granular Glacial Till soils cannot be relied on due to the variable granular component of the soils. An allowance should be made for battering faces back to a safe angle of repose, or providing shuttering. Groundwater may be encountered in some shallow excavations, which has the potential to cause further instability in un-supported excavation faces.

12.8.2. Support or battering of the excavation faces to a safe angle of repose will be required for all excavations where man entry is necessary, the nature and extent of which will need to be evaluated under CDM regulations.

12.9. Recommendations for Further Work

12.9.1. As mentioned above, further site investigation and assessment will be required once the development proposals have been finalised, in order to fully quantify the risks and allow detailed design. The ground investigation should be designed based on the requirements of Eurocode 7 part 2 (and the associated national annex) and NHBC standards.

12.9.2. Further investigation and assessment should comprise:

- Additional dynamic continuous sampling within the footprint of the finalised development to provide information about the thickness and nature of the Made Ground and natural soils underlying the proposed development.
- At least three deep boreholes to provide information about the ground conditions at depth and inform pile design if this foundation solution is required.
- In situ geotechnical testing (including SPT testing) and sampling for further geotechnical laboratory testing.

- Additional groundwater monitoring within the footprint of the proposed development.
- Soakaway testing to confirm the suitability of soakaway drainage at the site.
- Preparation of an interpretative report to consider the results of the existing and the additional investigation proposed above.

12.9.3. A provisional layout for the targeted additional site investigation is presented as Figure 5 in Appendix A.

13.0 ENVIRONMENTAL CONCLUSIONS AND RECOMMENDATIONS

13.1. Summary of Risk

13.1.1. The site investigation commissioned by CampbellReith incorporated contamination testing of soil and monitoring of groundwater and ground gas across the site. In addition, available Desk Study information has been consulted.

13.1.2. The site is considered to lie in area of Medium environmental sensitivity with respect to Hydrogeology and a Very High environmental sensitivity with respect to Hydrology. The proposed new school development is considered to be of Medium to High end user sensitivity. The site is considered to present a Low risk in relation to contamination issues.

13.2. Summary of Contamination

13.2.1. Desk study and subsequent site investigation and chemical analysis has identified the following key contamination issues at the site:

- Soils: localised elevated concentrations of PAH compounds within hardstanding subbase material. Asbestos in soils has not been detected.
- Groundwater: localised concentrations of metals and PAH compounds recorded marginally above generic assessment criteria.
- Ground gas: elevated concentrations of carbon dioxide.

13.2.2. A number of actions will be required to address land contamination issues at the site and these are described below. These relate to:

- Additional Monitoring and Assessment
- Outline Remedial Recommendations
- Remediation and Verification Control Documents
- Waste Management

13.3. Additional Site Investigation/Assessment

13.3.1. Consideration should be given to undertaking additional monitoring for bulk gases and assessment to confirm the requirement for gas protection measures.

13.3.2. Additionally, once design of the proposed slab and subformation is known, the ground gas assessment should be refined to confirm if gas protection measures are required. This should be agreed with the Local Authority EHO / CLO.

13.4. Outline Remedial Recommendations

13.4.1. The following section details outline remedial recommendations. These should be considered in light of the recommendations for any further works presented above which could lead to their modification. Detailed remedial works should be finalised in a Groundworks/ Remediation Specification.

13.4.2. A watching brief should be maintained throughout the groundworks in order to identify any previously undetected areas of contamination; such as asbestos containing materials and/or stained/odorous soils. These should be assessed by an Environmental Consultant if identified.

End Users

13.4.3. The assessment generally identified a LOW RISK for site end users associated with contamination at the site, however, localised elevated concentrations of PAH compounds were recorded in subbase materials.

13.4.4. At present, detailed development proposals are still to be confirmed and it is not clear if the subbase materials will be exposed and potentially reused during the proposed redevelopment of the site.

13.4.5. The primary exposure pathways relate to contact, ingestion and/or inhalation of soil particles and, as such, in order to mitigate risks to end users it is recommended that a soft cover system of chemically validated soils is installed within all areas of soft landscaping that directly overlie impacted soils. The thickness of this capping layer should be a minimum of 300mm in communal landscaped areas.

13.4.6. In addition, any excavations should be backfilled with soils which are suitable for use and in accordance with the appropriate Remediation and/or Groundworks Specification compiled by the Engineer.

13.4.7. Imported materials for soft landscaped areas will require provision for testing in accordance with the Remediation Specification and compliance with an agreed set of limiting values will be required. Records as detailed within the Remediation Specification and/or Groundworks Specification should be maintained to certify the source, chemical suitability and appropriate placement of the soils.

Groundworkers

13.4.8. The qualitative assessment identified a potentially LOW RISK to groundworkers who may come into contact with contaminated soils and waters.

13.4.9. The Contractor should prepare risk assessments and method statements in view of the identified and foreseeable ground conditions and include these within the Health and Safety Plan: for example, these should consider worker protection from skin contact, ingestion and inhalation of contaminants, asbestos in soils and ground gas. In order to achieve satisfactory control, CampbellReith recommend that Health and Safety provisions in accordance with HSE Publication HS(G) 66 and CIRIA Report 132 are considered. The Contractor must also control matters such as any contracted CDM responsibilities.

13.4.10. In relation to presence of asbestos in soils, the Contractor should formulate their working arrangements in view of the requirements of the Control of Asbestos Regulations (2012) and the associated ACoP (L143). Additional interpretation on the application of these regulations is presented in publications prepared by CL:AIRE and the Joint Industry Working Group (CAR-SOIL™ Control of Asbestos Regulations 2012, Interpretation for Managing and Working with Asbestos in Soil and Construction and Demolition Materials, 2016; and the associated JIWG decision support tool, 2017). Additional guidance is provided in CIRIA C765, Asbestos in Soil and Made Ground Good Practice Site Guide, 2017.

Controlled Waters

13.4.11. The qualitative assessment identified a potentially LOW RISK for surface water and groundwater due to due to the absence of significant contamination concentrations of both soils and groundwater samples tested. Further, although the Glacial Till encountered on site was noted to be granular, there is sufficient cohesive inclusions to prevent rapid migration of mobile contaminants.

13.4.12. Taking into account the above information remedial works are not required for controlled waters, however, a watching brief should be maintained across the site during groundworks for any areas of unforeseen contamination

Ground Gas/Vapours

13.4.13. The ground gas risk assessment indicates that the site can be classified as a CIRIA Characteristic Situation 2 and gas protection measures are required, however, based on the current data (and potentially design proposals for the slab / subformation) further assessment/investigation may enable these measures to be revised.

Services

13.4.14. The presence of elevated PAH concentrations in the soil indicates a possible need for protection of public water supply pipework, such as the use of organic resistant pipework. The infrastructure designer should assess requirements for pipework with respect to soil contamination and consult statutory utility companies and relevant guidance as necessary. Guidance on this topic is presented in UKWIR Report 'Publication UKWIR Report Ref 10/WM/03/21: Guidance for the Selection of Water Supply Pipes to be used in Brownfield Sites - Final Project Report, as amended by the Contaminated Land Assessment Guidance (Water UK, January 2014) .

13.5. Remediation and Verification Control Documents

13.5.1. Following on from the recommendations made herein, in order to control the environmental works on site and facilitate the collection of records required for the Verification Report, a Remediation/ Groundworks Specification will be required. The Specification should detail necessary requirement for inspections/ record keeping/ actions for unforeseen contamination/ detail the requirements for the control of imported material and waste management.

13.5.2. The Specification will require submission to the Local Authority for review and approval as part of the planning process, to fulfil the requirements of the anticipated land quality planning condition. Failure to submit the required documentation could result in refusal to discharge associated Land Quality Planning Conditions, and discussions should be held with the relevant Officer at an early stage to ensure all necessary information is obtained and collated for their review and approval. Additional discussions may be required with the NHBC and/or Building Control, such matters are not detailed herein. Once approved it will be the Contractor's obligation to fulfil the agreed requirements of the Specification.

13.5.3. Should the groundworks encounter fuel tanks, removal of any such features is required in accordance with an appropriate tank removal specification and Contractor's method statements which meet the requirements of the appropriate Environment Agency Pollution Prevention Guidelines (PPG).

13.6. Waste Management

13.6.1. A hazardous properties assessment of waste soils has not been undertaken as part of this report and is recommended. The soil results can, however, be used by the Contractor as a basis for waste soil classification and disposal purposes; however, additional testing may be required, particularly if non- representative soils are uncovered such as those that are stained, odorous or containing asbestos.

13.6.2. All waste related activities must be undertaken in accordance with the Waste Management and Landfill Regulations. Any proposed reuse of materials must be in accordance with the Waste (England and Wales) Regulations 2011 (as amended). With respect to waste soils disposal, as a minimum, the following information should be collected and retained by the Contractor for subsequent validation:

- source and origin of the waste;
- information on the process producing the waste;
- European Waste Catalogue code and characteristics of material;
- for hazardous waste, definition of the relevant properties according to the Hazardous Waste Directive (Annex III 91/689/EC);
- confirmation that waste is not prohibited waste;
- appearance of the waste;
- landfill class; and,
- Duty of Care records including full and completed chain of custody documentation.

13.6.3. The final waste classification is the responsibility of the Contractor and should be determined in conjunction with the receiving landfill and in liaison with the Environment Agency (and their technical guidance). It is noted that, depending on the landfill selected, additional soils testing information and independent verification of the materials of the materials being received by the landfill may be required.

13.6.4. As the correct classification of waste is likely to have a significant impact on the redevelopment budget, the waste classification should be reviewed independently by a consultant at an early stage in the project management stage. In addition, contractors should be asked to confirm that their tenders consider the full requirements of the Landfill Directive and associated waste legislation. This is to ensure waste is correctly classified and costed at the inception of the project.

13.6.5. The Landfill Directive states that all hazardous and non-hazardous waste requires treatment prior to disposal to landfill. Treatment must provide a 'three – point step'. As such, provision for treating (including physical separation) should be made for all arisings that are likely to be classified as hazardous or non-hazardous so that each of the above three requirements are met.

13.6.6. A separate assessment should be made for the rate of Landfill Tax (where applicable) in accordance with HMRC Excise Notice LFT1.

TECHNICAL REFERENCES

Reference*	Reference Title	Type
[1]	Groundsure Report (Reference GS-6984703), dated August 2020	Report
[2]	British Geological Society, Geological Survey of England and Wales Sheet 77, Rochdale Bedrock and Superficial Edition, 1:50,000. Dated 2008	Plan
[3]	BGS Geology of Britain viewer (http://mapapps.bgs.ac.uk/geologyofbritain/home.html)	Website
[4]	Guidance for the Safe Development of Housing on Land Affected by Contamination R&D66: 2008 Volume 1 (Environment Agency, NHBC and CIEH)	Report
[5]	Flood Map for Planning (https://flood-map-for-planning.service.gov.uk/)	Website
[6]	Radon Atlas for England and Wales (https://www.ukradon.org/information/ukmaps)	Website
[7]	BRE 211: Radon – Guidance on Protective Measures for New Buildings (2015)	BRE Publication
[8]	MAGIC Website (https://www.magic.gov.uk/)	Website
[9]	CIRIA C681 – Unexploded Ordnance (UXO): A guide for the Construction Industry	CIRIA Publication
[10]	Zetica (https://zeticauxo.com/downloads-and-resources/risk-maps/)	Website
[11]	Atkins Utility Search Report, Ref 86404, Version V1, dated 7 July 2020	Report
[12]	Consultants Coal Mining Report (Reference GS-6984702) dated 20 August 2020	Report
[13]	BGS Coal Authority Interactive viewer (http://mapapps.bgs.ac.uk/coalauthority/home.html)	Website
[14]	CL:AIRE Research Bulletin (RB17), A Pragmatic Approach to Ground Gas Risk Assessment. Dated November 2012	Paper
[15]	Card, G; Lucas, J; and Wilson S, Risk and Reliability in Gas Protection Design – 20 Years on. Ground Engineering, Aug/Sept 2019	Paper

ENVIRONMENTAL RISK ASSESSMENT SUPPORTING INFORMATION

Soil Screening Values

The Environment Agency has published non statutory technical guidance for Regulators and their advisors to assess the chronic risk posed to human health from land contamination, known as the Contaminated Land Exposure Assessment (CLEA) Framework.

The CLEA Framework documents and associated risk assessment model are subject to ongoing technical review. In July 2008 guidance documents CLR7 to 10, which previously underpinned the CLEA Framework, were withdrawn. In January 2009 the Environment Agency published CLEA V1.04 risk assessment software and associated guidance documents[4] as a replacement to the previous CLEA UK Beta Version and documents CLR 7 to 10. Further revisions were made in September 2009 to CLEA V1.05 and October 2009 to CLEA 1.06 risk assessment software.

Soil Guideline Values (SGVs) were produced by Defra/EA and Generic Assessment Criteria (GACs) were produced by CampbellReith and others. These were based on the CLEA model and supporting guidance (SR2 and SR3) and where based on a minimal/tolerable level of risk.

In December 2014 DEFRA released final versions of the C4SLs (Category 4 Screening Levels) for 6 No. contaminants (As, benzene, BaP, Cd, Cr VI and Pb) together with a Policy Companion Document and an Erratum. These represent contaminant soil concentrations which present an acceptable (Low) level of risk, within the context of Part 2A, i.e. they are representative of Category 4 sites. In the Contaminated Land Statutory Guidance (April 2012), sites under Part 2A assessments are categorised 1 - 4, with Category 1 being definitely Part 2A and Category 4 definitely not Part 2A ('where there is no risk or the level of risk posed is low').

The C4SLs were produced using the CLEA model and follow the general approach of SR3, although, changes were made to exposure parameters and to the toxicological basis of the assessments. The C4SLs are based on a low level of toxicological concern (LLTC) and are, by definition, less conservative than Health Criteria Values (HCVs) which are the basis for assessments defined in SR2 and used in the generation of SGVs and GACs. They are, therefore, indicative of a low level of risk.

Since their release, DEFRA have confirmed that C4SLs can be used in the planning regime and DCLG (Department for Communities and Local Government) amended Planning Practice Guidance (PPG) on Land Affected by Contamination (12 June 2014)[5] which stated that C4SLs provide a simple test for deciding when land is suitable for use and definitely not contaminated land'. On 03 September 2014 the Secretary for the Environment, Lord de Mauley, issued a letter (attached) to all Local Authorities which references DCLG's PPG and confirms that C4SLs could be used in planning and provide a simple test for establishing when sites are suitable for use.

LQM/CIEH issued S4ULs in December 2014 for 89 contaminants (metals, BTEX, banded TPH, speciated PAH, chlorinated solvents, phenols, chlorophenols, chlorobenzenes, pesticides and a number of miscellaneous others). The S4ULs have generally adopted the revisions to the exposure modelling that were developed in the production of the C4SLs. Critically, however, they are based on HCVs to produce concentrations which are indicative of a minimal/tolerable level of risk.

S4ULs are therefore used as the preliminary stage of soil assessments since they are indicative of minimal/tolerable level of risk. If these are exceeded then the C4SLs are used (if available) to determine if the risk could be described as low.

Where CLEA compliant S4ULs or C4SLs are not available reference is made to Generic Assessment Criteria (GAC) derived using the CLEA UK model (beta version). These are currently used for cyanide. Where referred to, the non-compliant standing of these values is considered.

[4] Environment Agency Report Ref: SC050021/SR2 - *Human Health Toxicological Assessment of Contaminants in Soil.* January 2009. Environment Agency Report Ref: SC050021/SR3 – *Updated background to the CLEA model.* January 2009.

[5] http://planningguidance.planningportal.gov.uk/blog/guidance/land-affected-by-contamination/land-affected-by-contamination-guidance/

Selection of Appropriate [Tier 2] Soil Screening Values

The CLEA model is based upon defined exposure scenarios and six generic land uses have been established for the C4SLs and S4ULs. These set out a discrete set of circumstances where exposure may occur, including a source, the pathways, and the exposed population.

The three generic land use scenarios used in the development of SGVs are:

- commercial/Industrial;
- allotments; and,
- residential with plant uptake,
- residential without plant uptake,
- public open space (residential)
- public open space (parks)

It is noted that the CLEA screening values are generic and not always applicable. Where the CLEA conceptual model is not appropriate it will be necessary to develop site specific Detailed Quantitative Risk Assessment screening values as a further stage of assessment.

It is noted that the CLEA model does not consider risks from contaminated waters beneath the site to human health and the model also assumes that no free product is present. Should such conditions exist at the subject site the requirement for application of an alternative risk assessment model should be assessed. Alternatively, construction workers are potentially exposed to acute risk and therefore require separate consideration.

Statistical Analysis of Soil Analytical Results

Statistical analysis of soil based analytical results has been undertaken in accordance with CL:AIRE Guidance on Comparing Soil Contamination Data with a Critical Concentration (May 2008). The use of the Mean Value Test and Maximum Value Test is still considered appropriate for site assessments. Although the guidance advocates use of the one - sample t test, this is a variation of the mean value test and establishes the confidence level at which the assessor can determine whether a particular screening level has/has not been succeeded. The mean value test used herein is set at the 95th percentile confidence limit in order to be risk conservative.

The Maximum Value Test is a statistical tool that is used to identify outlier values from a numerical distribution of results for a given determinant. These outlier values can be excluded and considered separately, and the remaining values are then used to calculate upper bound 95th percentile values ($95^{\%ile}$) (Mean Value Test) for comparison with the screening values.

The results are reviewed prior to any statistical analysis in order to determine if zoning of the soils is apparent and hence whether the site requires to be divided into averaging areas. Additional tables are presented where appropriate to reflect distinct ground characteristics relevant to the conceptual model.

Water Screening Values

This assessment considers potential risks to controlled waters (groundwater and surface waters) in relation to risks from any historical contamination. The most stringent test is that defined for Contaminated Land under Part 2A of the Environmental Protection Act, 1990. However, it should be recognised that a wider evaluation of risk is considered within the planning regime and CLR 11.

The Environment Agency has a wider policy agenda for the protection of controlled waters that will impinge upon judgements in relation to land contamination issues. This includes those for the Water Framework Directive and Groundwater Directive and wider legislation for both groundwater, surface water and associated elements (such as fisheries)[6].

The results of water analysis have been compared to screening values selected to assess the potential risk to the identified controlled water receptors in the Conceptual Model. The specific standards utilised for this purpose are considered in the assessment table footnotes and typically comprise: Environmental Quality Standards for the protection of aquatic life; Surface Water Standards; EC, UK and WHO Drinking Water Standards; or Background water quality (where no applicable standard exists).

The initial assessment considers the sensitivity of the receptor in the selection of the screening value. Advice for this purpose has been obtained principally from Environment Agency Technical Advice to Third Parties on Pollution of Controlled Waters for Part 2A of the Environmental Protection Act 1990, No 07/02, EA, 2002 (INFO-RA2-3e), as informed by the EA's GP3.

Where a viable pollutant linkage is considered to be present and the screening criteria exceeded, a Qualitative Risk Assessment is presented with associated recommendations. Depending on the specific objectives, policy and practice of the Environment Agency, discussion of water screening values may be subsequently required.

Definitions of Consequence, Probability and Risk

The following classification has been taken from Guidance for the Safe Development of Housing on Land Affected by Contamination R&D66: 2008 Volume 1 (Environment Agency, NHBC and CIEH.

The key to the classification is that the designation of risk is based upon the consideration of both:

a) the magnitude of the potential consequence (i.e. severity).

[takes into account both the potential severity of the hazard and the sensitivity of the receptor]

b) the magnitude of probability (i.e. likelihood).
[takes into account both the presence of the hazard and receptor and the integrity of the pathway]

[6] Refer to Environment Agency Publications for Groundwater Protection Policy and Practice (GP3)

Classification of Consequence

Classification	Definition	Examples
Severe	Highly elevated concentrations likely to result in "significant harm" to human health as defined by the EPA 1990, Part 2A, if exposure occurs. Equivalent to EA Category 1 pollution incident including persistent and/or extensive effects on water quality; leading to closure of a potable abstraction point; major impact on amenity value or major damage to agriculture or commerce. Major damage to aquatic or other ecosystems, which is likely to result in a substantial adverse change in its functioning or harm to a species of special interest that endangers the long-term maintenance of the population. Catastrophic damage to crops, buildings or property.	Significant harm to humans is defined in circular 01.2006 as death, disease*, serious injury, genetic mutation, birth defects or the impairment of reproductive functions. Major fish kill in surface water from large spillage of contaminants from site. Highly elevated concentrations of List I and II substances present in groundwater close to small potable abstraction (high sensitivity). Explosion, causing building collapse (can also equate to immediate human health risk if buildings are occupied).
Medium	Elevated concentrations which could result in "significant harm" to human health as defined by the EPA 1990, Part 2A if exposure occurs. Equivalent to EA Category 2 pollution incident including significant effect on water quality; notification required to abstractors; reduction in amenity value or significant damage to agriculture or commerce. Significant damage to aquatic or other ecosystems, which may result in a substantial adverse change in its functioning or harm to a species of special interest that may endanger the long-term maintenance of the population. Significant damage to crops, buildings or property.	Significant harm to humans is defined in circular 01/2006 as death, disease*, serious injury, genetic mutation, birth defects or the impairment of reproductive functions. Damage to building rendering it unsafe to occupy e.g. foundation damage resulting in instability. Ingress of contaminants through plastic potable water pipes.
Mild	Exposure to human health unlikely to lead to "significant harm". Equivalent to EA Category 3 pollution incident including minimal or short lived effect on water quality; marginal effect on amenity value, agriculture or commerce. Minor or short lived damage to aquatic or other ecosystems, which is unlikely to result in a substantial adverse change in its functioning or harm to a species of special interest that would endanger the long-term maintenance of the population.	Exposure could lead to slight short-term effects (e.g. mild skin rash). Surface spalling of concrete.

Classification	Definition	Examples
	Minor damage to crops, buildings or property.	
Minor	No measurable effect on humans. Equivalent to insubstantial pollution incident with no observed effect on water quality or ecosystems. Repairable effects of damage to buildings, structures and services.	The loss of plants in a landscaping scheme. Discoloration of concrete.

Classification of Probability

Classification	Definition	Examples
High likelihood	There is pollutant linkage and an event would appear very likely in the short-term and almost inevitable over the long-term, or there is evidence at the receptor of harm or pollution.	*a) Elevated concentrations of toxic contaminants are present in soils in the top 0.5m in a residential garden.* *b) Ground/groundwater contamination could be present from chemical works, containing a number of USTs, having been in operation on the same site for over 50 years.*
Likely	There is pollutant 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.	*a) Elevated concentrations of toxic contaminants are present in soils at depths of 0.5-1.0m in a residential garden, or the top 0.5m in public open space.* *b) Ground/groundwater contamination could be present from an industrial site containing a UST present between 1970 and 1990. The tank is known to be single skin. There is no evidence of leakage although there are no records of integrity tests.*
Low likelihood	There is pollutant linkage and circumstances are possible under which an event could occur. However, it is by no means certain that even over a long period such an event would take place, and is less likely in the shorter term.	*a) Elevated concentrations of toxic contaminants are present in soils at depths >1m in a residential garden, or 0.5-1.0m in public open space.* *b) Ground/groundwater contamination could be present on a light industrial unit constructed in the 1990s containing a UST in operation over the last 10 years – the tank is double skinned but there is no integrity testing or evidence of leakage.*
Unlikely	There is pollutant linkage but circumstances are such that it is improbable that an event would occur even in the very long-term.	*a) Elevated concentrations of toxic contaminants are present below hardstanding.* *b) Light industrial units <10 yrs old containing a double-skinned UST with*

Classification	Definition	Examples
		annual integrity testing results available.

Note: A pollution linkage must first be established before probability is classified. If there is no pollution linkage then there is no potential risk. If there is no pollution linkage then there is no need to apply tests for probability and consequence.

For example if there is surface contamination and a principal aquifer is present at depth, but this principal aquifer is overlain by an aquiclude of significant thickness then there is no pollution linkage and the risks to the principal aquifer are not assessed. The report should identify both the source and the receptor but state that because there is no linkage there are no potential risks.

Description of the classified risks

Very high risk
There is a high probability that severe harm could arise to a designated receptor from an identified hazard at the site without remediation action OR there is evidence that severe harm to a designated receptor is already occurring. Realisation of that risk is likely to present a substantial liability to be site owner/or occupier. Investigation is required as a matter of urgency and remediation works likely to follow in the short-term.

High risk
Harm is likely to arise to a designated receptor from an identified hazard at the site without remediation action. Realisation of the risk is likely to present a substantial liability to the site owner/or occupier. Investigation is required as a matter of urgency to clarify the risk. Remediation 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, it is either relatively unlikely that any such harm would be severe, and if any harm were to occur it is more likely, that the harm would be relatively mild. Further investigative work is normally required to clarify the risk and to determine the potential liability to site owner/occupier. Some remediation works may be required in the longer term.

Low risk
It is possible that harm could arise to a designated receptor from identified hazard, but it is likely at worst, that this harm if realised would normally be mild. It is unlikely that the site owner/or occupier would face substantial liabilities from such a risk. Further investigative work (which is likely to be limited) to clarify the risk may be required. Any subsequent remediation works are likely to be relatively limited.

Very low risk
It is a low possibility that harm could arise to a designated receptor, but it is likely at worst, that the harm if realised would normally be mild or minor.

No potential risk
There is no potential risk if no pollution linkage has been established.

LIMITATIONS

Environmental & Geotechnical Interpretative Reports

1. This report provides available factual data for the site obtained only from the sources described in the text and related to the site on the basis of the location information provided by the client.
2. Where any data or information supplied by the client or other external source, including that from previous studies, has been used, it has been assumed that the information is correct. No responsibility can be accepted by CampbellReith for inaccuracies within this data or information. In relation to historic maps the accuracy of maps cannot be guaranteed and it should be recognized that different conditions on site may have existed between and subsequent to the various map surveys.
3. This report is limited to those aspects of historical land use and enquiries related to environmental matters reported on and no liability is accepted for any other aspects. The opinions expressed cannot be absolute due to the limit of time and resources implicit within the agreed brief and the possibility of unrecorded previous uses of the site and adjacent land.
4. The material encountered and samples obtained during on-site investigations represent only a small proportion of the materials present on the site. There may be other conditions prevailing at the site which have not been revealed and which have therefore not been taken into account in this report. These risks can be minimised and reduced by additional investigations. If significant variations become evident, additional specialist advice should be sought to assess the implications of these few findings.
5. The generalised soil conditions described in the text are intended to convey trends in subsurface conditions. The boundaries between strata are approximate and have been developed on interpretations of the exploration locations and samples collected.
6. Water level and gas readings have been taken at times and under conditions stated on the exploration logs. It must be noted that fluctuations in the level of groundwater or gas may occur due to a variety of factors which may differ from those prevailing at the time the measurements were taken.
7. Please note that CampbellReith cannot accept any liability for observations or opinions expressed regarding the absence or presence of asbestos or on any product or waste that may contain asbestos. We recommend that an asbestos specialist, with appropriate professional indemnity insurance, is employed directly by the client in every case where asbestos may be present on the site or within the buildings or installations. Any comments made in this report with respect to asbestos, or asbestos containing materials, are only included to assist the client with the initial appraisal of the project and should not be relied upon in any way.
8. The findings and opinions expressed are relevant to those dates of the reported site work and should not be relied upon to represent conditions at substantially later dates.
9. This report is produced solely for the benefit of the client, and no liability is accepted for any reliance placed upon it by any other party unless specifically agreed in writing.

Appendix A: Figures

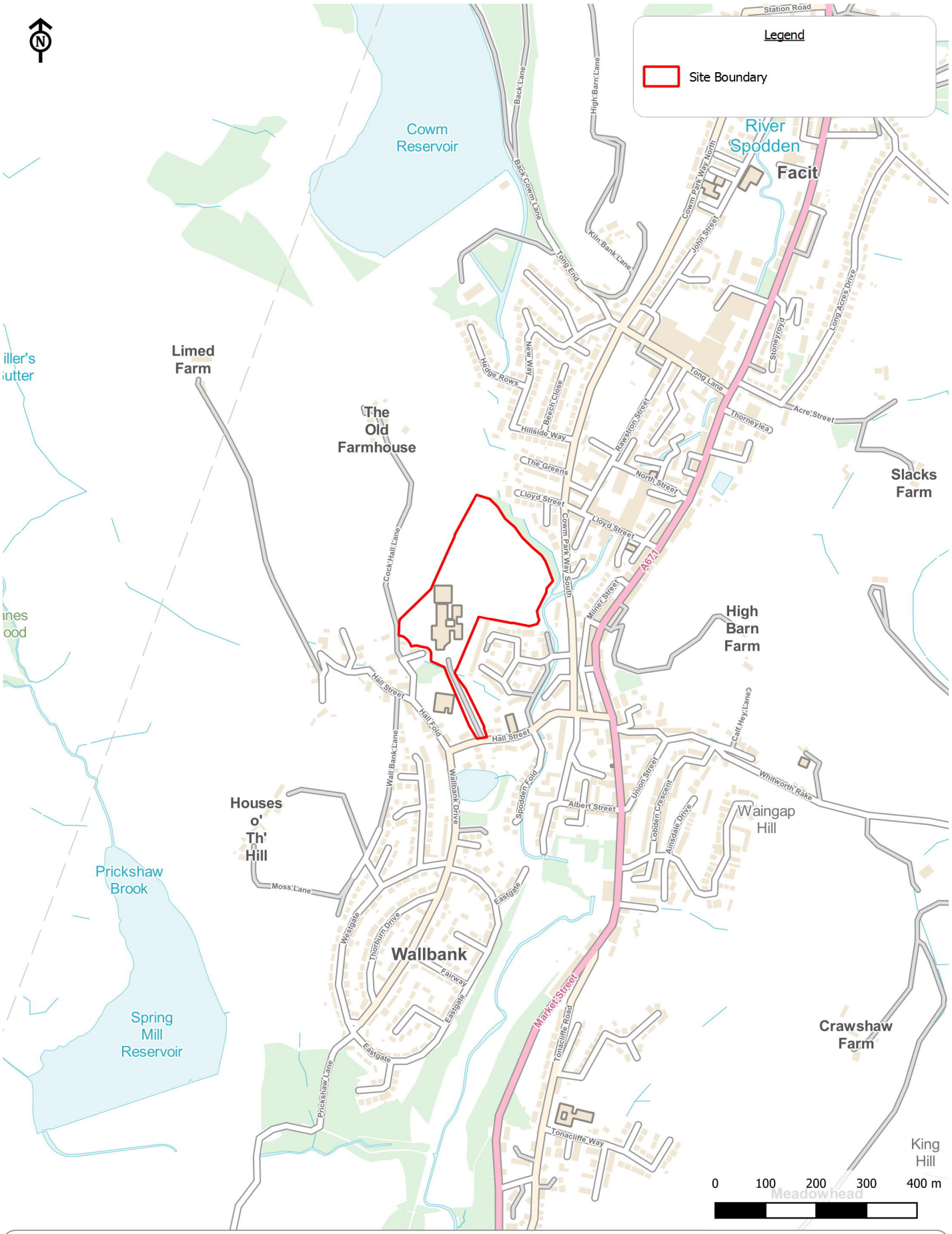
Figure 1: Site Location

Figure 2: Site Layout and Proposed Development

Figure 3: SPT N_{60} Value vs Depth (m bgl)

Figure 4: SPT N_{60} Value vs Level (m OD) – WS01 to WS03 only

Figure 5: Proposed Exploratory Hole Location Plan



Whitworth Community High School

Client: Department for Education

Figure 1:
Site Location Plan

Scale: 1:10000@A4

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Drawn by - Checked by: RP - PK
Drg No - Status/Revision: 13516-CRH-XX-XX-FG-G-7004 - P1
File location: Y:\13500 - 13749\13516 M - Whitworth Community High School, Rochdale\Project_Workspaces\DTS (pdf in Outputs)
Date (Revision History): 03/09/2020 (P1, First Issue, 03/09/20, RP)

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BRISTOL 0117 916 1066 ☐ ☐ DUBAI 00 971 4453 4735
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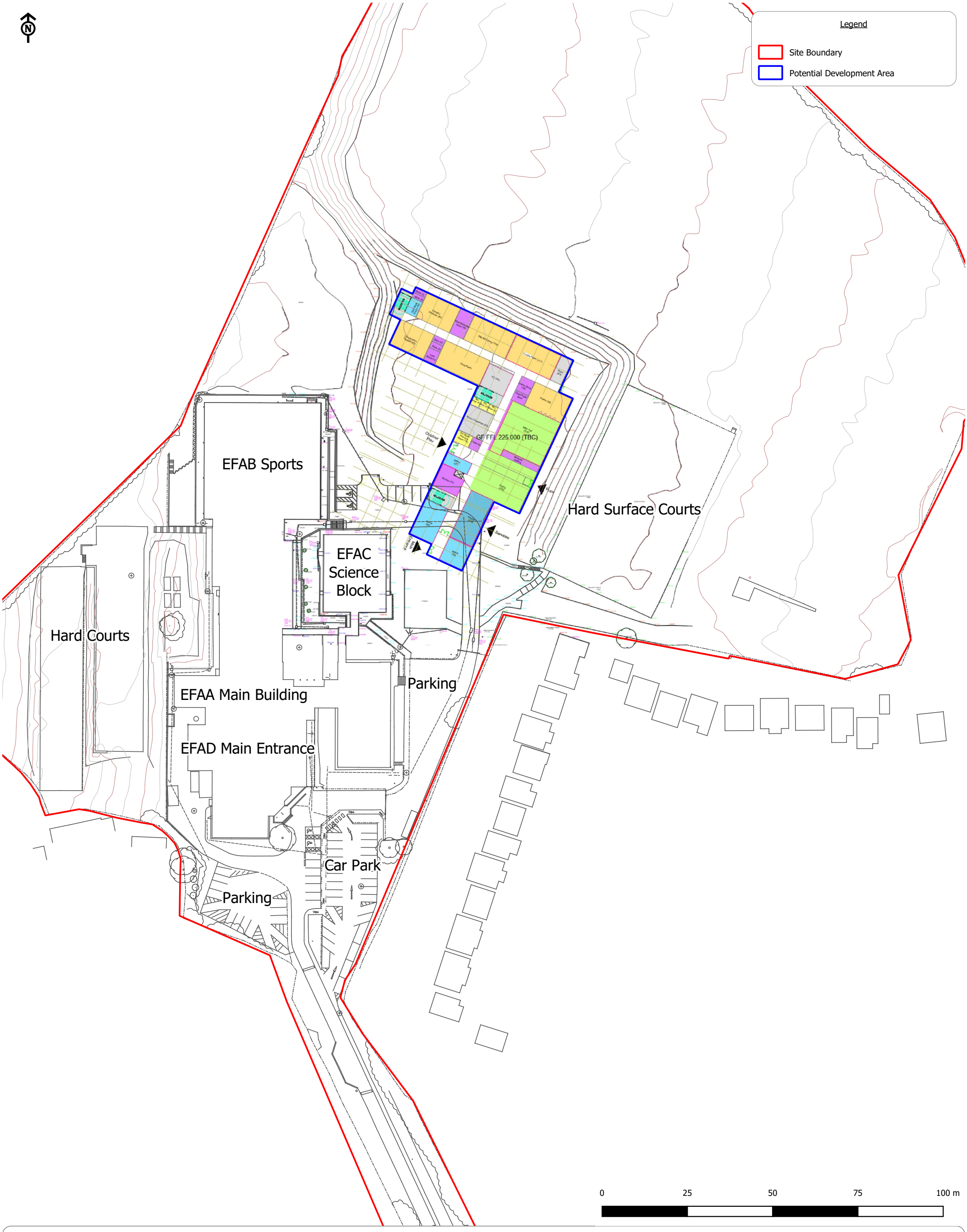

Whitworth Community High School

Client: Department for Education

Figure 2:
Existing Site Layout and Proposed Development

Scale: 1:1000@A3

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Drawn by - Checked by: RP/RLF - PK/KB
Drg No - Status/Revision: 13516-CRH-XX-XX-FG-G-7005 - P2
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Date (Revision History): 19/02/2021 (P1, First Issue, 03/09/20, RP; P2, Development Update, 19/02/21, RLF)

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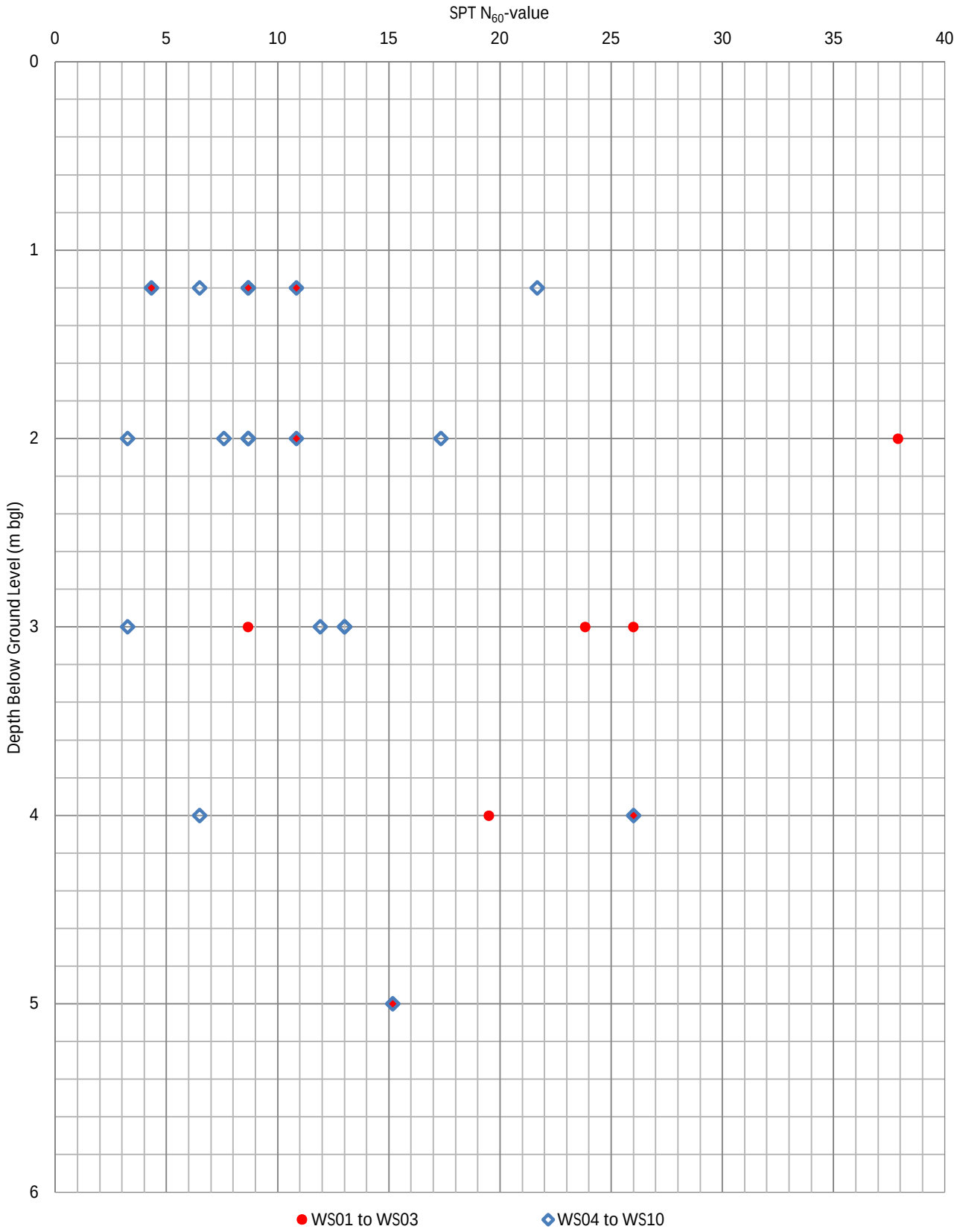
SPT N_{60} Value vs Depth (m bgl)



Proj Name: Whitworth Community High School
Client: Turner & Townsend

Project Number: 13516
Figure No.: 3

Drawn by: KB
Checked: PK
Revision: 0
Date: 19/02/2021

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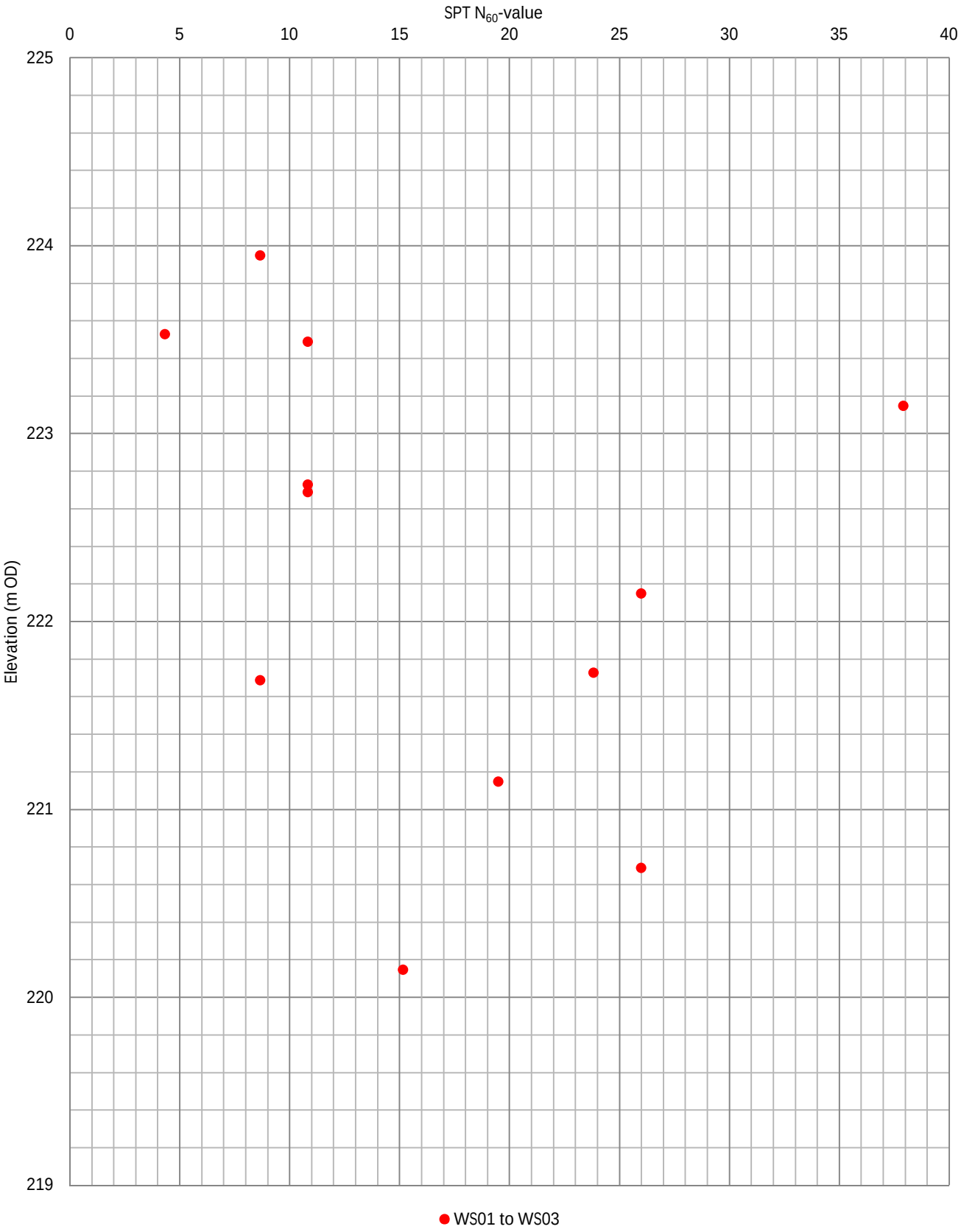
SPT N_{60} Value vs Level (m OD) - WS01 to WS03 only



Proj Name: Whitworth Community High School
Client: Turner & Townsend

Project Number: 13516
Figure No.: 4

Drawn by: KB
Checked: PK
Revision: 0
Date: 19/02/2021

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Hole ID	Easting	Northing	Depth (m)
CP101	388119.485	418019.516	25m
CP102	388162.867	418002.163	25m
CP103	388150.398	417961.596	25m
WS101	388130.862	418003.37	5m
WS102	388147.525	418010.15	5m
WS103	388141.32	417983.833	5m
WS104	388162.12	417984.58	5m

Whitworth Community High School

Client: Department for Education

Figure 5:
Proposed Exploratory Hole Location Plan

Scale: 1:750@A3

WCHS-SRA-00-XX-M3-A-00001_WIP_00_Site_GF-Layout1
Job Number: 13516
Drawn by - Checked by: RLF - KB
Drg No - Status/Revision: 13516-CRH-XX-XX-FG-G-7007 - P1
File location: N:\13500 - 13749\13516 M - Whitworth Community High School, Rochdale\Project_Workspaces (pdf in Outputs)
Date (Revision History): 22/02/2021 (P1, First Issue, 22/02/21, RLF)

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Appendix B: Desk Study Information

Groundsure Report

Historical Maps

Groundsure LOCATION INTELLIGENCE

Enviro+Geo Insight

388130 417955, OL12 8TS

Order Details

Date: 20/08/2020

Your ref: 13516

Our Ref: GS-6984703

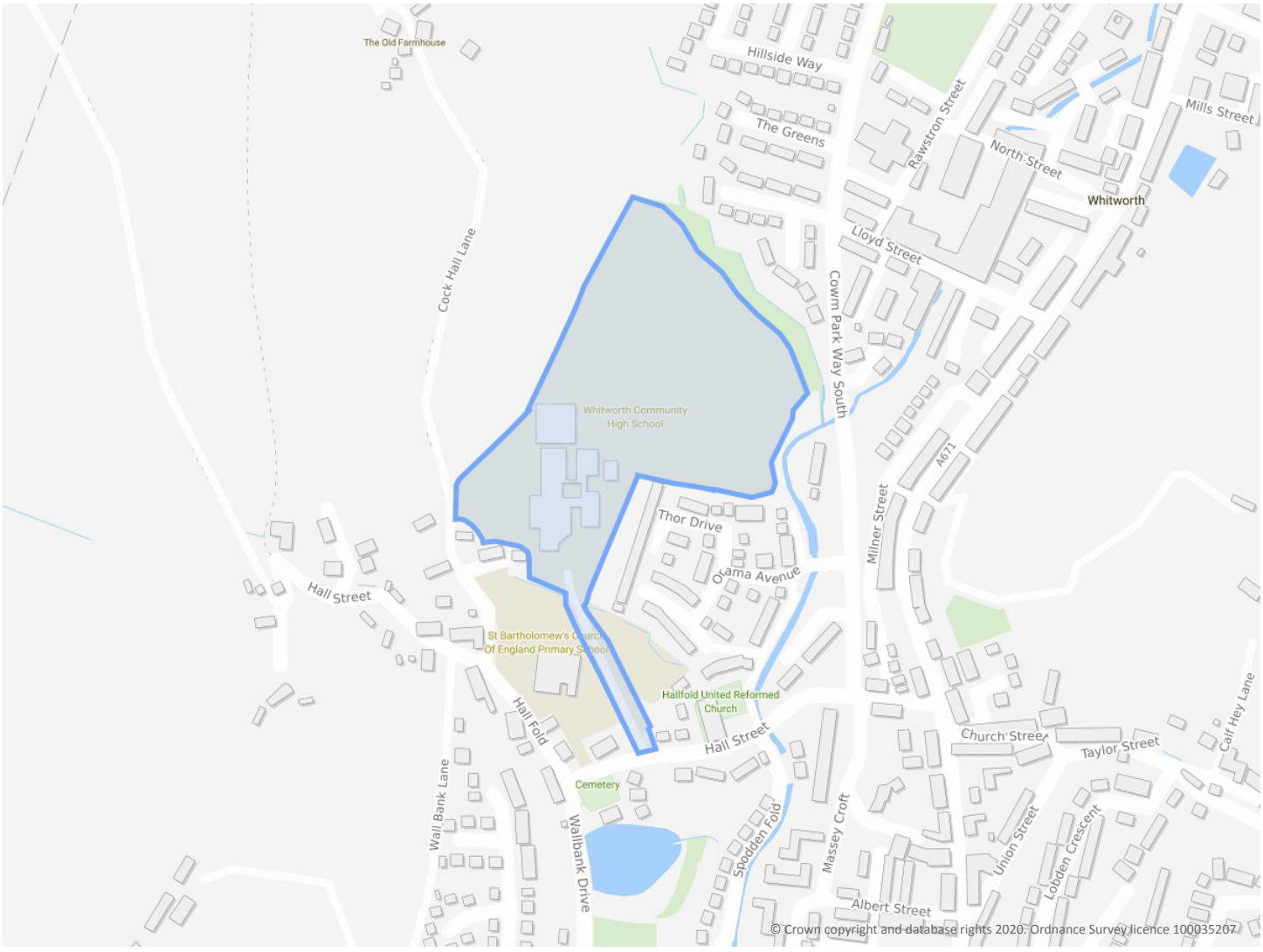
Client: CampbellReith

Site Details

Location: 388207 417985

Area: 5.54 ha

Authority: Rossendale Borough Council



Contact us with any questions at:
info@groundsure.com
08444 159 000

Summary of findings

Page	Section	Past land use	On site	0-50m	50-250m	250-500m	500-2000m
13	1.1	Historical industrial land uses	4	10	55	107	-
20	1.2	Historical tanks	0	2	22	18	-
22	1.3	Historical energy features	0	0	7	9	-
23	1.4	Historical petrol stations	0	0	0	0	-
23	1.5	Historical garages	0	0	5	4	-
24	1.6	Historical military land	0	0	0	0	-
Page	Section	Past land use - un-grouped	On site	0-50m	50-250m	250-500m	500-2000m
25	2.1	Historical industrial land uses	4	14	76	131	-
34	2.2	Historical tanks	0	4	27	27	-
36	2.3	Historical energy features	0	0	13	13	-
37	2.4	Historical petrol stations	0	0	0	0	-
37	2.5	Historical garages	0	0	6	5	-
Page	Section	Waste and landfill	On site	0-50m	50-250m	250-500m	500-2000m
39	3.1	Active or recent landfill	0	0	0	0	-
39	3.2	Historical landfill (BGS records)	0	0	0	1	-
40	3.3	Historical landfill (LA/mapping records)	0	0	5	2	-
40	3.4	Historical landfill (EA/NRW records)	0	0	0	1	-
41	3.5	Historical waste sites	0	0	0	0	-
41	3.6	Licensed waste sites	0	0	0	0	-
41	3.7	Waste exemptions	0	0	2	19	-
Page	Section	Current industrial land use	On site	0-50m	50-250m	250-500m	500-2000m
44	4.1	Recent industrial land uses	1	0	20	-	-
46	4.2	Current or recent petrol stations	0	0	0	0	-
46	4.3	Electricity cables	0	0	0	0	-
46	4.4	Gas pipelines	0	0	0	0	-
46	4.5	Sites determined as Contaminated Land	0	0	0	1	-

46	4.6	Control of Major Accident Hazards (COMAH)	0	0	0	0	-
47	4.7	Regulated explosive sites	0	0	0	0	-
47	4.8	Hazardous substance storage/usage	0	0	0	0	-
47	4.9	Historical licensed industrial activities (IPC)	0	0	0	0	-
47	4.10	Licensed industrial activities (Part A(1))	0	0	0	0	-
47	**4.11**	**Licensed pollutant release (Part A(2)/B)**	0	0	2	2	-
48	4.12	Radioactive Substance Authorisations	0	0	0	0	-
48	**4.13**	**Licensed Discharges to controlled waters**	0	1	1	0	-
49	4.14	Pollutant release to surface waters (Red List)	0	0	0	0	-
49	4.15	Pollutant release to public sewer	0	0	0	0	-
49	4.16	List 1 Dangerous Substances	0	0	0	0	-
49	4.17	List 2 Dangerous Substances	0	0	0	0	-
50	**4.18**	**Pollution Incidents (EA/NRW)**	0	0	4	1	-
50	4.19	Pollution inventory substances	0	0	0	0	-
51	4.20	Pollution inventory waste transfers	0	0	0	0	-
51	4.21	Pollution inventory radioactive waste	0	0	0	0	-

Page	Section	Hydrogeology	On site	0-50m	50-250m	250-500m	500-2000m
52	**5.1**	**Superficial aquifer**	Identified (within 500m)				
54	**5.2**	**Bedrock aquifer**	Identified (within 500m)				
55	**5.3**	**Groundwater vulnerability**	Identified (within 50m)				
57	5.4	Groundwater vulnerability- soluble rock risk	None (within 0m)				
57	5.5	Groundwater vulnerability- local information	None (within 0m)				
58	**5.6**	**Groundwater abstractions**	0	0	0	8	8
63	**5.7**	**Surface water abstractions**	0	0	0	4	7
66	**5.8**	**Potable abstractions**	0	0	0	0	7
68	5.9	Source Protection Zones	0	0	0	0	-
68	5.10	Source Protection Zones (confined aquifer)	0	0	0	0	-

Page	Section	Hydrology	On site	0-50m	50-250m	250-500m	500-2000m
69	**6.1**	**Water Network (OS MasterMap)**	1	15	16	-	-

72	6.2	Surface water features	0	8	9	-	-
72	6.3	WFD Surface water body catchments	1	-	-	-	-
73	6.4	WFD Surface water bodies	0	1	0	-	-
73	6.5	WFD Groundwater bodies	1	-	-	-	-
Page	Section	River and coastal flooding	On site	0-50m	50-250m	250-500m	500-2000m
74	7.1	Risk of Flooding from Rivers and Sea (RoFRaS)	High (within 50m)				
75	7.2	Historical Flood Events	1	0	2	-	-
75	7.3	Flood Defences	0	0	0	-	-
75	7.4	Areas Benefiting from Flood Defences	0	0	0	-	-
76	7.5	Flood Storage Areas	0	0	0	-	-
77	7.6	Flood Zone 2	Identified (within 50m)				
78	7.7	Flood Zone 3	Identified (within 50m)				
Page	Section	Surface water flooding					
79	8.1	Surface water flooding	1 in 30 year, Greater than 1.0m (within 50m)				
Page	Section	Groundwater flooding					
81	9.1	Groundwater flooding	Low (within 50m)				
Page	Section	Environmental designations	On site	0-50m	50-250m	250-500m	500-2000m
82	10.1	Sites of Special Scientific Interest (SSSI)	0	0	0	0	0
83	10.2	Conserved wetland sites (Ramsar sites)	0	0	0	0	0
83	10.3	Special Areas of Conservation (SAC)	0	0	0	0	0
83	10.4	Special Protection Areas (SPA)	0	0	0	0	0
83	10.5	National Nature Reserves (NNR)	0	0	0	0	0
84	10.6	Local Nature Reserves (LNR)	0	0	0	0	1
84	10.7	Designated Ancient Woodland	0	0	0	0	2
84	10.8	Biosphere Reserves	0	0	0	0	0
85	10.9	Forest Parks	0	0	0	0	0
85	10.10	Marine Conservation Zones	0	0	0	0	0
85	10.11	Green Belt	1	0	1	0	3
85	10.12	Proposed Ramsar sites	0	0	0	0	0

86	10.13	Possible Special Areas of Conservation (pSAC)	0	0	0	0	0
86	10.14	Potential Special Protection Areas (pSPA)	0	0	0	0	0
86	10.15	Nitrate Sensitive Areas	0	0	0	0	0
86	10.16	Nitrate Vulnerable Zones	0	0	0	0	0
87	**10.17**	**SSSI Impact Risk Zones**	1	-	-	-	-
88	10.18	SSSI Units	0	0	0	0	0
Page	Section	Visual and cultural designations	On site	0-50m	50-250m	250-500m	500-2000m
89	11.1	World Heritage Sites	0	0	0	-	-
90	11.2	Area of Outstanding Natural Beauty	0	0	0	-	-
90	11.3	National Parks	0	0	0	-	-
90	**11.4**	**Listed Buildings**	0	0	2	-	-
91	11.5	Conservation Areas	0	0	0	-	-
91	11.6	Scheduled Ancient Monuments	0	0	0	-	-
91	11.7	Registered Parks and Gardens	0	0	0	-	-
Page	Section	Agricultural designations	On site	0-50m	50-250m	250-500m	500-2000m
92	**12.1**	**Agricultural Land Classification**	Grade 4 (within 250m)				
93	12.2	Open Access Land	0	0	0	-	-
93	12.3	Tree Felling Licences	0	0	0	-	-
93	12.4	Environmental Stewardship Schemes	0	0	0	-	-
93	12.5	Countryside Stewardship Schemes	0	0	0	-	-
Page	Section	Habitat designations	On site	0-50m	50-250m	250-500m	500-2000m
94	**13.1**	**Priority Habitat Inventory**	2	0	6	-	-
95	13.2	Habitat Networks	0	0	0	-	-
95	**13.3**	**Open Mosaic Habitat**	1	0	0	-	-
95	13.4	Limestone Pavement Orders	0	0	0	-	-
Page	Section	Geology 1:10,000 scale	On site	0-50m	50-250m	250-500m	500-2000m
97	**14.1**	**10k Availability**	Identified (within 500m)				
98	**14.2**	**Artificial and made ground (10k)**	2	2	2	10	-
100	**14.3**	**Superficial geology (10k)**	2	0	3	0	-

101	14.4	Landslip (10k)	0	0	0	1	-
102	14.5	Bedrock geology (10k)	4	2	6	18	-
104	14.6	Bedrock faults and other linear features (10k)	2	1	1	7	-
Page	Section	Geology 1:50,000 scale	On site	0-50m	50-250m	250-500m	500-2000m
105	15.1	50k Availability	Identified (within 500m)				
106	15.2	Artificial and made ground (50k)	0	0	0	2	-
107	15.3	Artificial ground permeability (50k)	0	0	-	-	-
108	15.4	Superficial geology (50k)	2	0	3	0	-
109	15.5	Superficial permeability (50k)	Identified (within 50m)				
109	15.6	Landslip (50k)	0	0	0	0	-
109	15.7	Landslip permeability (50k)	None (within 50m)				
110	15.8	Bedrock geology (50k)	4	2	6	10	-
111	15.9	Bedrock permeability (50k)	Identified (within 50m)				
112	15.10	Bedrock faults and other linear features (50k)	2	1	1	6	-
Page	Section	Boreholes	On site	0-50m	50-250m	250-500m	500-2000m
113	16.1	BGS Boreholes	0	0	1	-	-
Page	Section	Natural ground subsidence					
114	17.1	Shrink swell clays	Very low (within 50m)				
115	17.2	Running sands	Low (within 50m)				
117	17.3	Compressible deposits	Moderate (within 50m)				
119	17.4	Collapsible deposits	Very low (within 50m)				
120	17.5	Landslides	Moderate (within 50m)				
122	17.6	Ground dissolution of soluble rocks	Negligible (within 50m)				
Page	Section	Mining, ground workings and natural cavities	On site	0-50m	50-250m	250-500m	500-2000m
124	18.1	Natural cavities	0	0	0	0	-
125	18.2	BritPits	0	0	1	4	-
126	18.3	Surface ground workings	4	6	38	-	-
128	18.4	Underground workings	0	0	0	4	4
128	18.5	Historical Mineral Planning Areas	0	0	0	0	-

128	**18.6**	**Non-coal mining**	1	1	1	2	5
130	18.7	Mining cavities	0	0	0	0	0
130	18.8	JPB mining areas	None (within 0m)				
130	**18.9**	**Coal mining**	Identified (within 0m)				
130	18.10	Brine areas	None (within 0m)				
131	18.11	Gypsum areas	None (within 0m)				
131	18.12	Tin mining	None (within 0m)				
131	18.13	Clay mining	None (within 0m)				

Page	Section	Radon	
132	**19.1**	**Radon**	Between 3% and 5% (within 0m)

Page	Section	Soil chemistry	On site	0-50m	50-250m	250-500m	500-2000m
134	**20.1**	**BGS Estimated Background Soil Chemistry**	9	6	-	-	-
135	20.2	BGS Estimated Urban Soil Chemistry	0	0	-	-	-
135	20.3	BGS Measured Urban Soil Chemistry	0	0	-	-	-

Page	Section	Railway infrastructure and projects	On site	0-50m	50-250m	250-500m	500-2000m
136	21.1	Underground railways (London)	0	0	0	-	-
136	21.2	Underground railways (Non-London)	0	0	0	-	-
137	21.3	Railway tunnels	0	0	0	-	-
137	**21.4**	**Historical railway and tunnel features**	0	0	21	-	-
138	21.5	Royal Mail tunnels	0	0	0	-	-
138	**21.6**	**Historical railways**	0	1	0	-	-
138	21.7	Railways	0	0	0	-	-
139	21.8	Crossrail 1	0	0	0	0	-
139	21.9	Crossrail 2	0	0	0	0	-
139	21.10	HS2	0	0	0	0	-

Recent aerial photograph

Capture Date: 23/05/2019

Site Area: 5.54ha

Recent site history - 2012 aerial photograph

Capture Date: 26/03/2012

Site Area: 5.54ha

Recent site history - 2000 aerial photograph

Capture Date: 19/06/2000

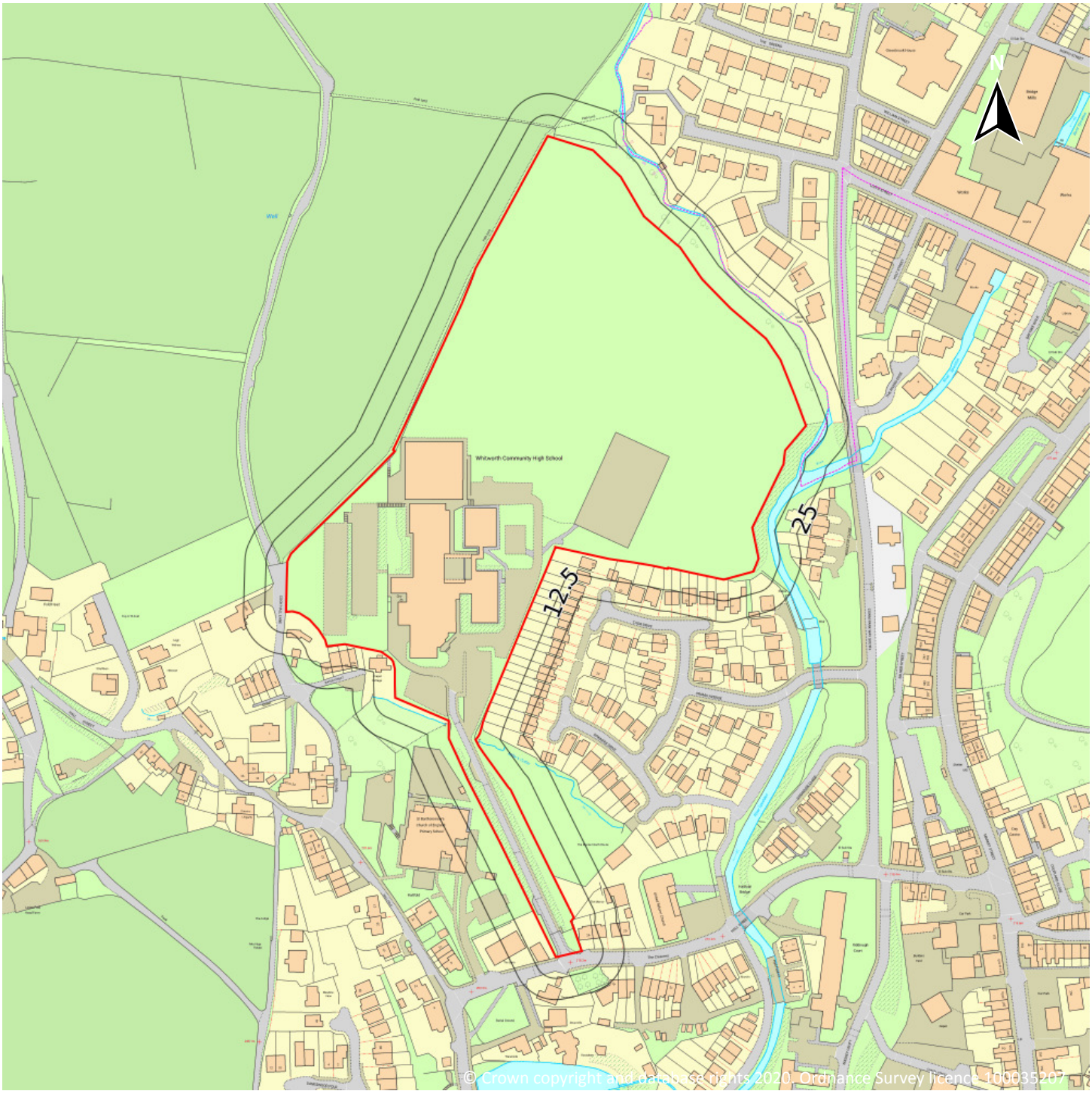
Site Area: 5.54ha

Recent site history - 1999 aerial photograph

Capture Date: 10/09/1999

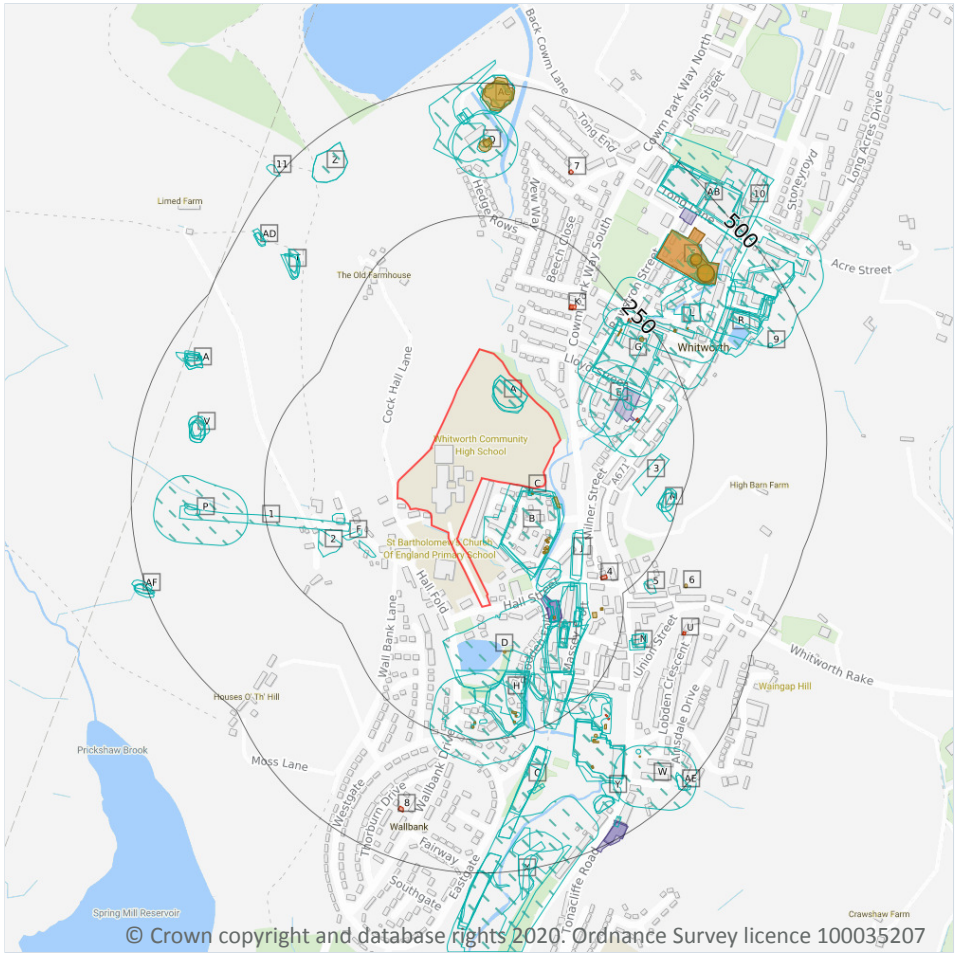
Site Area: 5.54ha

OS MasterMap site plan



Site Area: 5.54ha

1 Past land use



Site Outline

Search buffers in metres (m)

Historical industrial land uses

Historical tanks

Historical energy features

Historical garages

1.1 Historical industrial land uses

Records within 500m	176

Potentially contaminative land use features digitised from historical Ordnance Survey mapping at 1:10,000 and 1:10,560 scale, intelligently grouped into contiguous features. To prevent misrepresentation of the size of historical features at any given time, features are only grouped if they have similar geometries within immediately preceding or succeeding map editions. See section 2 for a breakdown of grouping if required. Grouped and the original un-grouped features can be cross-referenced across sections 1 and 2 using the 'Group ID'.

Features are displayed on the Past land use map on **page 13**

ID	Location	Land use	Dates present	Group ID
A	**On site**	**Unspecified Pit**	**1967**	**727984**

ID	Location	Land use	Dates present	Group ID
A	**On site**	**Unspecified Pit**	**1928**	**763975**
A	**On site**	**Unspecified Pit**	**1949**	**764031**
A	**On site**	**Unspecified Pit**	**1938**	**788784**
B	0m S	Unspecified Mill	1967 - 1979	724557
B	1m S	Unspecified Mill	1949	771281
C	1m S	Unspecified Tank	1949	674537
B	8m S	Unspecified Mill	1938	705708
C	8m S	Unspecified Tanks	1928 - 1938	762908
B	10m S	Cotton Mill	1909 - 1928	769630
C	11m S	Unspecified Tank	1909	674538
D	22m SE	Cotton Mill	1851	751110
C	28m SE	Unspecified Tanks	1928	666389
E	49m E	Unspecified Mill	1938	726741
E	62m E	Unspecified Mill	1949	772393
E	71m E	Unspecified Mill	1928	729063
F	89m SW	Unspecified Ground Workings	1891	647767
G	89m NE	Unspecified Mills	1891	736114
B	92m E	Unspecified Heap	1928	775263
H	92m SE	Unspecified Works	1967	714030
B	96m E	Unspecified Heap	1949	781264
1	99m SW	Tramway Sidings	1909	670755
I	100m E	Railway Sidings	1967	766578
I	102m E	Railway Sidings	1949	737638
J	103m SE	Cuttings	1949	750762
J	104m SE	Cuttings	1891 - 1938	731716
F	105m W	Unspecified Pit	1891 - 1909	701671
F	106m SW	Unspecified Ground Workings	1891	647766
I	108m E	Railway Building	1949	740794

ID	Location	Land use	Dates present	Group ID
I	110m E	Railway Building	1967	737460
G	114m NE	Unspecified Mills	1909	734018
G	115m NE	Unspecified Mills	1928 - 1949	743014
I	115m E	Railway Sidings	1891	747780
I	119m SE	Railway Sidings	1909 - 1928	787292
H	119m S	Unspecified Mills	1890	653217
G	122m NE	Unspecified Mills	1967 - 1979	728155
I	123m E	Railway Sidings	1938	726934
H	125m S	Unspecified Works	1949	757977
H	129m S	Unspecified Works	1909	699052
H	130m S	Unspecified Works	1928	787027
H	133m S	Unspecified Works	1938	727952
E	134m E	Refuse Heap	1928 - 1938	729447
2	135m SW	Unspecified Heap	1928 - 1938	704235
I	138m E	Railway Building	1909 - 1928	783844
I	139m E	Railway Building	1891	708006
I	139m E	Railway Building	1949	753288
I	140m E	Railway Building	1967	751566
I	141m E	Railway Building	1938	757159
H	150m SE	Unspecified Ground Workings	1909 - 1928	754967
H	153m SE	Unspecified Heap	1938	650786
B	153m E	Railway Building	1938 - 1949	772177
I	159m E	Railway Station	1891 - 1938	758002
3	159m SE	Cuttings	1949	642515
I	160m E	Railway Building	1967	670136
I	162m E	Railway Station	1949	696390
H	170m SE	Railway Sidings	1890	693891
H	171m SE	Railway Sidings	1909 - 1938	750659

ID	Location	Land use	Dates present	Group ID
L	195m NE	Unspecified Mill	1891	746545
H	208m S	Gasmeter	1851	659396
H	212m S	Unspecified Tanks	1890	666392
M	213m E	Unspecified Pit	1928 - 1938	709181
M	216m E	Sandstone Quarry	1851	687497
H	217m S	Unspecified Tank	1949	674539
M	219m SE	Unspecified Pit	1949	735225
G	220m NE	Unspecified Tank	1979	674543
H	222m S	Unspecified Tank	1928 - 1938	761621
M	222m SE	Unspecified Pit	1891	743962
H	225m SE	Unspecified Ground Workings	1909	647765
H	231m SE	Refuse Heap	1928 - 1938	783150
L	252m NE	Unspecified Works	1967	678952
5	262m SE	Smithy	1909	692929
H	269m SE	Unspecified Works	1967	678953
H	269m SE	Unspecified Mill	1979	790518
H	270m SE	Unspecified Mill	1890 - 1909	715582
N	270m E	Police Station	1891	717553
H	272m SE	Unspecified Disused Mill	1928 - 1938	759437
N	272m E	Police Station	1938 - 1949	708835
N	272m E	Police Station	1967 - 1979	785114
O	279m S	Cuttings	1938 - 1949	723285
O	280m S	Cuttings	1909	704016
O	280m S	Cuttings	1928	735667
O	280m S	Cuttings	1890	746422
H	282m SE	Refuse Heaps	1909	653402
P	283m W	Colliery	1909	645202
L	304m NE	Cotton Mill	1851	644279

ID	Location	Land use	Dates present	Group ID
O	309m S	Cuttings	1909	709235
Q	322m N	Filter Tank	1938	735588
R	327m NE	Unspecified Mills	1979	775591
R	338m NE	Unspecified Mills	1967	725179
R	338m NE	Unspecified Mill	1938	776987
R	341m NE	Unspecified Mill	1928 - 1938	751479
S	345m NE	Gas Works	1891 - 1909	716830
S	345m NE	Unspecified Commercial/Industrial	1928 - 1938	771682
O	350m S	Woollen Mill	1851	670991
Q	353m N	Unspecified Works	1979	678945
Q	358m N	Unspecified Ground Workings	1967	647750
T	365m NW	Unspecified Heap	1909 - 1928	734131
T	365m NW	Unspecified Ground Workings	1891	647768
T	365m NW	Unspecified Heap	1938	780731
V	367m W	Unspecified Quarry	1979	695917
Q	370m N	Filter Tank	1909 - 1928	730278
P	372m W	Unspecified Heap	1928 - 1938	719349
V	372m W	Unspecified Quarry	1891	741919
V	372m W	Unspecified Quarry	1938 - 1949	747433
T	373m NW	Unspecified Heap	1949	785616
W	373m SE	Unspecified Disused Mill	1949	738931
S	373m NE	Gasometer	1909 - 1928	715498
V	373m W	Unspecified Old Quarry	1909	681168
V	373m W	Unspecified Quarry	1928	722562
P	376m W	Unspecified Heap	1949	769814
S	376m NE	Gasometer	1891	750540
S	378m NE	Unspecified Tank	1938	674544
V	379m W	Unspecified Quarry	1967	760450

ID	Location	Land use	Dates present	Group ID
Q	380m N	Filter Tank	1949	728711
V	380m W	Sandstone Delf	1851	659828
R	382m NE	Unspecified Mill	1949	712528
S	384m NE	Gasometer	1909	655088
S	384m NE	Unspecified Tank	1928	760455
S	384m NE	Unspecified Tank	1891	765579
X	385m S	Sewage Works	1928	718331
R	386m NE	Unspecified Mill	1891	776939
W	387m SE	Chimney	1967	684545
R	388m NE	Unspecified Mill	1928	696265
S	388m NE	Unspecified Tank	1938	784438
Y	397m SE	Unspecified Heap	1928	650789
R	413m NE	Unspecified Mill	1949	711978
Y	413m SE	Unspecified Ground Workings	1909	647762
Y	417m SE	Unspecified Heap	1928 - 1938	714373
Y	417m SE	Unspecified Heap	1890	752838
Z	417m NW	Unspecified Pit	1949	706036
Z	417m NW	Unspecified Pit	1967 - 1979	762414
X	422m S	Sewage Works	1909	705103
Q	423m N	Pumping Station	1909 - 1928	716567
R	423m NE	Unidentified Mills	1851	682706
Q	424m N	Pumping Station	1938	734563
AA	425m NW	Unspecified Old Quarry	1909	681167
AA	425m NW	Unspecified Pit	1928	710223
9	428m E	Chimney	1979	684547
AA	430m NW	Unspecified Pit	1938	720628
AA	430m NW	Unspecified Pit	1891	753959
AA	432m NW	Unspecified Pit	1967 - 1979	696580

ID	Location	Land use	Dates present	Group ID
Q	432m N	Pumping Station	1979	774547
AB	434m NE	Unspecified Mills	1909 - 1938	778299
X	434m S	Refuse Heap	1909 - 1928	754955
AA	436m NW	Sandstone Quarry	1851	687519
AA	437m NW	Unspecified Pit	1949	739584
R	437m NE	Unspecified Mill	1851	771100
AC	444m N	Filter Tanks	1909 - 1928	741047
AB	445m NE	Unspecified Mills	1949	707271
AB	445m NE	Unspecified Works	1967	740531
AC	446m N	Filter Beds	1891	665775
AC	446m N	Filter Tanks	1938	708296
AD	447m NW	Unspecified Heap	1928	701090
AB	448m NE	Unspecified Mills	1979	771707
AD	449m NW	Unspecified Heap	1938	694526
AC	451m N	Filter Tanks	1979	731903
AC	451m N	Filter Tanks	1949	737220
X	455m S	Railway Sidings	1909 - 1928	738090
AD	455m NW	Unspecified Heap	1949	749008
AB	461m NE	Unspecified Mill	1891	706433
X	463m S	Cuttings	1928 - 1938	746627
X	463m S	Cuttings	1890	789206
Y	463m SE	Boiler Works	1851	675179
AE	471m SE	Refuse Heap	1909	677431
X	475m S	Unspecified Ground Workings	1938	647764
AE	475m SE	Unspecified Heap	1928	650787
AF	488m W	Unspecified Old Level	1938	752008
AF	490m W	Unspecified Old Level	1949	738405
AF	491m W	Unspecified Old Level	1928	722341

ID	Location	Land use	Dates present	Group ID
AF	492m W	Old Coal Level	1909	691868
X	494m S	Cuttings	1909	720496
X	495m S	Cuttings	1949	719310
10	496m NE	Refuse Heap	1928 - 1938	787664
11	496m NW	Unspecified Quarry	1891	667744
R	497m NE	Gasometer	1851	655090
X	499m S	Unspecified Ground Workings	1909	647774

This data is sourced from Ordnance Survey / Groundsure.

1.2 Historical tanks

Records within 500m	**42**

Tank features digitised from historical Ordnance Survey mapping at high-detail 1:1,250 and 1:2,500 scale, intelligently grouped into contiguous features. To prevent misrepresentation of the size of historical features at any given time, features are only grouped if they have similar geometries within immediately preceding or succeeding map editions. See section 2 for a breakdown of grouping if required. Grouped and the original un-grouped features can be cross-referenced across sections 1 and 2 using the 'Group ID'.

Features are displayed on the Past land use map on **page 13**

ID	Location	Land use	Dates present	Group ID
C	10m S	Unspecified Tank	1910 - 1929	101444
C	28m SE	Unspecified Tank	1910 - 1929	88648
D	90m S	Unspecified Tank	1910	84109
B	96m S	Unspecified Tank	1962	84105
B	98m S	Unspecified Tank	1985 - 1992	98056
B	98m S	Unspecified Tank	1996	96751
B	102m S	Tanks	1910	87571
B	102m S	Unspecified Tank	1929	104001
B	110m S	Unspecified Tank	1962	100307
B	112m S	Tanks	1910	87572
B	117m S	Unspecified Tank	1929	91370

ID	Location	Land use	Dates present	Group ID
B	119m S	Unspecified Tank	1985 - 1992	91229
B	120m S	Unspecified Tank	1996	100917
I	120m E	Tanks	1910	87573
I	192m E	Tanks	1975 - 1985	90008
G	195m NE	Unspecified Tank	1929	84101
H	204m S	Tanks	1910	87425
I	207m E	Tanks	1985 - 1992	95002
I	209m E	Tanks	1975	96690
H	213m S	Tanks	1962	87574
H	216m S	Unspecified Tank	1962	84110
G	220m NE	Unspecified Tank	1976	84100
H	222m S	Unspecified Tank	1929	84108
H	224m S	Unspecified Tank	1910 - 1929	103048
L	280m NE	Unspecified Tank	1929	84098
L	284m NE	Unspecified Tank	1910	84099
L	304m NE	Unspecified Tank	1929	84102
H	311m SE	Unspecified Tank	1975 - 1993	91862
H	313m SE	Unspecified Tank	1962	84097
H	318m SE	Unspecified Tank	1910	84096
H	319m SE	Tanks	1929	87575
6	323m SE	Unspecified Tank	1962 - 1992	98038
S	349m NE	Gas Works	1891 - 1910	93063
H	358m SE	Unspecified Tank	1975 - 1993	100532
Q	371m N	Filter Tank	1910 - 1929	89539
Q	379m N	Tanks	1976	87427
S	379m NE	Tanks	1929	87578
S	380m NE	Gasometer	1891 - 1910	103161
S	390m NE	Gasometer	1891 - 1910	96738

ID	Location	Land use	Dates present	Group ID
W	399m SE	Unspecified Tank	1910	84095
AC	448m N	Filter Tanks	1910 - 1929	100975
AC	455m N	Filter Tanks	1976	103695

This data is sourced from Ordnance Survey / Groundsure.

1.3 Historical energy features

Records within 500m	**16**

Energy features digitised from historical Ordnance Survey mapping at high-detail 1:1,250 and 1:2,500 scale, intelligently grouped into contiguous features. To prevent misrepresentation of the size of historical features at any given time, features are only grouped if they have similar geometries within immediately preceding or succeeding map editions. See section 2 for a breakdown of grouping if required. Grouped and the original un-grouped features can be cross-referenced across sections 1 and 2 using the 'Group ID'.

Features are displayed on the Past land use map on **page 13**

ID	Location	Land use	Dates present	Group ID
E	146m E	Electricity Substation	1970 - 1996	50399
E	147m E	Electricity Substation	1976	55603
K	160m NE	Electricity Substation	1970 - 1976	50478
K	161m NE	Electricity Substation	1996	58953
4	201m SE	Electricity Substation	1975 - 1996	47737
G	227m NE	Electricity Substation	1970	57858
G	228m NE	Electricity Substation	1976 - 1996	55066
H	299m SE	Electricity Substation	1975	45489
H	307m SE	Electricity Substation	1993	45490
S	349m NE	Gas Works	1891 - 1910	49013
U	365m E	Electricity Transformer	1975	46548
U	366m E	Electricity Substation	1992	45488
7	367m NE	Electricity Substation	1976 - 1992	46738
S	380m NE	Gasometer	1891 - 1910	49719
S	390m NE	Gasometer	1891 - 1910	49499

ID	Location	Land use	Dates present	Group ID
8	405m S	Electricity Substation	1975	45486

This data is sourced from Ordnance Survey / Groundsure.

1.4 Historical petrol stations

Records within 500m	0

Petrol stations digitised from historical Ordnance Survey mapping at high-detail 1:1,250 and 1:2,500 scale, intelligently grouped into contiguous features. To prevent misrepresentation of the size of historical features at any given time, features are only grouped if they have similar geometries within immediately preceding or succeeding map editions. See section 2 for a breakdown of grouping if required. Grouped and the original un-grouped features can be cross-referenced across sections 1 and 2 using the 'Group ID'.

This data is sourced from Ordnance Survey / Groundsure.

1.5 Historical garages

Records within 500m	9

Garages digitised from historical Ordnance Survey mapping at high-detail 1:1,250 and 1:2,500 scale, intelligently grouped into contiguous features. To prevent misrepresentation of the size of historical features at any given time, features are only grouped if they have similar geometries within immediately preceding or succeeding map editions. See section 2 for a breakdown of grouping if required. Grouped and the original un-grouped features can be cross-referenced across sections 1 and 2 using the 'Group ID'.

Features are displayed on the Past land use map on **page 13**

ID	Location	Land use	Dates present	Group ID
I	96m E	Garage	1996	15879
I	103m E	Garage	1962 - 1985	19731
I	107m E	Garage	1992	15502
I	107m E	Garage	1975	16482
E	115m E	Garage	1970	14589
AB	430m NE	Garage	1976 - 1992	17845
Y	467m SE	Garage	1962	15886
Y	471m SE	Garage	1975	16798
Y	472m SE	Garage	1993	17055

This data is sourced from Ordnance Survey / Groundsure.

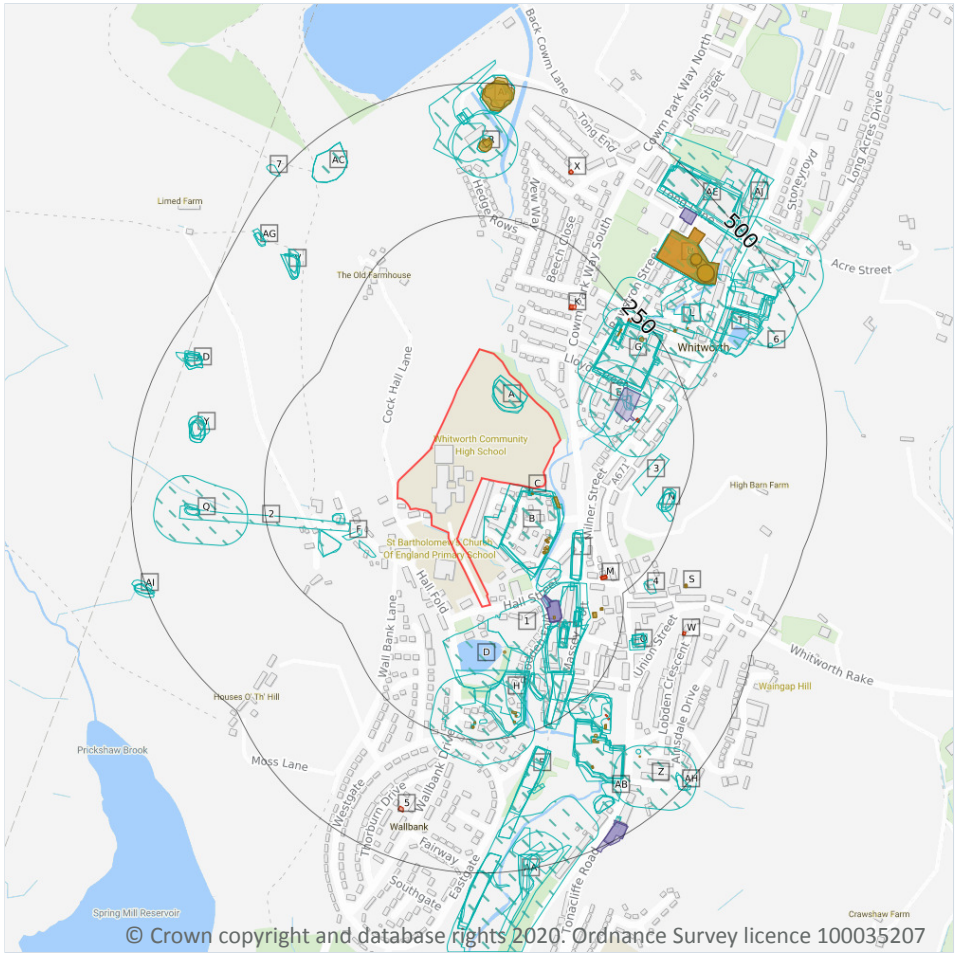
1.6 Historical military land

Records within 500m	0

Areas of military land digitised from multiple sources including the National Archives, local records, MOD records and verified other sources, intelligently grouped into contiguous features.

This data is sourced from Ordnance Survey / Groundsure / other sources.

2 Past land use - un-grouped



Site Outline

Search buffers in metres (m)

Historical industrial land uses

Historical tanks

Historical energy features

Historical garages

2.1 Historical industrial land uses

Records within 500m	225

Potentially contaminative land use features digitised from historical Ordnance Survey mapping at 1:10,000 and 10,560 scale. Any records shown are available intelligently grouped in section 1. Grouped and the original un-grouped features can be cross-referenced across sections 1 and 2 using the 'Group ID'.

Features are displayed on the Past land use - un-grouped map on **page 25**

ID	Location	Land Use	Date	Group ID
A	**On site**	**Unspecified Pit**	**1928**	**763975**
A	**On site**	**Unspecified Pit**	**1967**	**727984**
A	**On site**	**Unspecified Pit**	**1938**	**788784**

ID	Location	Land Use	Date	Group ID
A	**On site**	**Unspecified Pit**	**1949**	**764031**
B	0m S	Unspecified Mill	1967	724557
B	0m S	Unspecified Mill	1979	724557
B	1m S	Unspecified Mill	1949	771281
C	1m S	Unspecified Tank	1949	674537
B	8m S	Unspecified Mill	1938	705708
C	8m S	Unspecified Tanks	1938	762908
B	10m S	Cotton Mill	1928	769630
B	10m S	Cotton Mill	1909	769630
C	11m S	Unspecified Tank	1909	674538
C	11m S	Unspecified Tanks	1928	762908
1	22m SE	Cotton Mill	1851	751110
D	26m S	Cotton Mill	1851	751110
C	28m SE	Unspecified Tanks	1928	666389
E	49m E	Unspecified Mill	1938	726741
E	62m E	Unspecified Mill	1949	772393
E	71m E	Unspecified Mill	1928	729063
F	89m SW	Unspecified Ground Workings	1891	647767
G	89m NE	Unspecified Mills	1891	736114
B	92m E	Unspecified Heap	1928	775263
H	92m SE	Unspecified Works	1967	714030
B	96m E	Unspecified Heap	1949	781264
2	99m SW	Tramway Sidings	1909	670755
I	100m E	Railway Sidings	1967	766578
I	102m E	Railway Sidings	1949	737638
J	103m SE	Cuttings	1949	750762
J	104m SE	Cuttings	1909	731716
J	104m SE	Cuttings	1928	731716

ID	Location	Land Use	Date	Group ID
J	105m SE	Cuttings	1938	731716
J	105m SE	Cuttings	1891	731716
F	105m W	Unspecified Pit	1891	701671
F	106m SW	Unspecified Ground Workings	1891	647766
I	108m E	Railway Building	1949	740794
I	110m E	Railway Building	1967	737460
F	111m W	Unspecified Pit	1909	701671
G	114m NE	Unspecified Mills	1909	734018
G	115m NE	Unspecified Mills	1928	743014
I	115m E	Railway Sidings	1891	747780
G	118m NE	Unspecified Mills	1938	743014
I	119m SE	Railway Sidings	1928	787292
I	119m SE	Railway Sidings	1909	787292
H	119m S	Unspecified Mills	1890	653217
G	122m NE	Unspecified Mills	1967	728155
G	122m NE	Unspecified Mills	1979	728155
G	123m NE	Unspecified Mills	1949	743014
I	123m E	Railway Sidings	1938	726934
H	125m S	Unspecified Works	1949	757977
H	129m S	Unspecified Works	1909	699052
H	130m S	Unspecified Works	1928	787027
H	133m S	Unspecified Works	1938	727952
E	134m E	Refuse Heap	1928	729447
F	135m SW	Unspecified Heap	1938	704235
F	137m SW	Unspecified Heap	1928	704235
E	138m E	Refuse Heap	1938	729447
I	138m E	Railway Building	1928	783844
I	138m E	Railway Building	1909	783844

ID	Location	Land Use	Date	Group ID
I	139m E	Railway Building	1891	708006
I	139m E	Railway Building	1949	753288
I	140m E	Railway Building	1967	751566
I	141m E	Railway Building	1938	757159
H	150m SE	Unspecified Ground Workings	1928	754967
H	150m SE	Unspecified Ground Workings	1909	754967
H	153m SE	Unspecified Heap	1938	650786
B	153m E	Railway Building	1938	772177
B	155m E	Railway Building	1949	772177
I	159m E	Railway Station	1928	758002
I	159m E	Railway Station	1909	758002
3	159m SE	Cuttings	1949	642515
I	160m E	Railway Building	1967	670136
I	162m E	Railway Station	1949	696390
I	162m E	Railway Station	1938	758002
I	162m E	Railway Station	1891	758002
H	170m SE	Railway Sidings	1890	693891
H	171m SE	Railway Sidings	1928	750659
H	171m SE	Railway Sidings	1909	750659
H	177m SE	Railway Sidings	1938	750659
L	195m NE	Unspecified Mill	1891	746545
H	208m S	Gasmeter	1851	659396
H	212m S	Unspecified Tanks	1890	666392
N	213m E	Unspecified Pit	1928	709181
N	216m E	Sandstone Quarry	1851	687497
H	217m S	Unspecified Tank	1949	674539
N	219m SE	Unspecified Pit	1949	735225
G	220m NE	Unspecified Tank	1979	674543

ID	Location	Land Use	Date	Group ID
H	222m S	Unspecified Tank	1928	761621
N	222m SE	Unspecified Pit	1938	709181
N	222m SE	Unspecified Pit	1891	743962
H	225m S	Unspecified Tank	1938	761621
H	225m SE	Unspecified Ground Workings	1909	647765
H	231m SE	Refuse Heap	1938	783150
H	233m SE	Refuse Heap	1928	783150
L	252m NE	Unspecified Works	1967	678952
4	262m SE	Smithy	1909	692929
H	269m SE	Unspecified Works	1967	678953
H	269m SE	Unspecified Mill	1979	790518
H	270m SE	Unspecified Mill	1909	715582
O	270m E	Police Station	1891	717553
H	272m SE	Unspecified Disused Mill	1928	759437
O	272m E	Police Station	1967	785114
O	272m E	Police Station	1949	708835
O	273m E	Police Station	1938	708835
O	274m E	Police Station	1979	785114
H	275m SE	Unspecified Disused Mill	1938	759437
P	279m S	Cuttings	1949	723285
P	280m S	Cuttings	1909	704016
P	280m S	Cuttings	1938	723285
P	280m S	Cuttings	1928	735667
P	280m S	Cuttings	1890	746422
H	282m SE	Refuse Heaps	1909	653402
Q	283m W	Colliery	1909	645202
L	304m NE	Cotton Mill	1851	644279
H	306m SE	Unspecified Mill	1890	715582

ID	Location	Land Use	Date	Group ID
P	309m S	Cuttings	1909	709235
R	322m N	Filter Tank	1938	735588
T	327m NE	Unspecified Mills	1979	775591
T	338m NE	Unspecified Mills	1967	725179
T	338m NE	Unspecified Mill	1938	776987
T	341m NE	Unspecified Mill	1928	751479
T	343m NE	Unspecified Mill	1938	751479
U	345m NE	Unspecified Commercial/Industrial	1928	771682
U	345m NE	Gas Works	1909	716830
U	345m NE	Gas Works	1891	716830
U	348m NE	Unspecified Commercial/Industrial	1938	771682
P	350m S	Woollen Mill	1851	670991
R	353m N	Unspecified Works	1979	678945
R	358m N	Unspecified Ground Workings	1967	647750
V	365m NW	Unspecified Heap	1928	734131
V	365m NW	Unspecified Heap	1909	734131
V	365m NW	Unspecified Heap	1938	780731
V	365m NW	Unspecified Ground Workings	1891	647768
Y	367m W	Unspecified Quarry	1979	695917
R	370m N	Filter Tank	1928	730278
R	370m N	Filter Tank	1909	730278
Q	372m W	Unspecified Heap	1938	719349
Y	372m W	Unspecified Quarry	1938	747433
Y	372m W	Unspecified Quarry	1891	741919
V	373m NW	Unspecified Heap	1949	785616
Z	373m SE	Unspecified Disused Mill	1949	738931
Q	373m W	Unspecified Heap	1928	719349
U	373m NE	Gasometer	1928	715498

ID	Location	Land Use	Date	Group ID
U	373m NE	Gasometer	1909	715498
Y	373m W	Unspecified Old Quarry	1909	681168
Y	373m W	Unspecified Quarry	1928	722562
Q	376m W	Unspecified Heap	1949	769814
U	376m NE	Gasometer	1891	750540
U	378m NE	Unspecified Tank	1938	674544
Y	379m W	Unspecified Quarry	1967	760450
Y	379m W	Unspecified Quarry	1949	747433
R	380m N	Filter Tank	1949	728711
Y	380m W	Sandstone Delf	1851	659828
T	382m NE	Unspecified Mill	1949	712528
U	384m NE	Unspecified Tank	1928	760455
U	384m NE	Gasometer	1909	655088
U	384m NE	Unspecified Tank	1891	765579
AA	385m S	Sewage Works	1928	718331
T	386m NE	Unspecified Mill	1891	776939
Z	387m SE	Chimney	1967	684545
T	388m NE	Unspecified Mill	1928	696265
U	388m NE	Unspecified Tank	1938	784438
AB	397m SE	Unspecified Heap	1928	650789
T	413m NE	Unspecified Mill	1949	711978
AB	413m SE	Unspecified Ground Workings	1909	647762
AB	417m SE	Unspecified Heap	1938	714373
AB	417m SE	Unspecified Heap	1928	714373
AB	417m SE	Unspecified Heap	1890	752838
AC	417m NW	Unspecified Pit	1967	762414
AC	417m NW	Unspecified Pit	1949	706036
AC	417m NW	Unspecified Pit	1979	762414

ID	Location	Land Use	Date	Group ID
AA	422m S	Sewage Works	1909	705103
R	423m N	Pumping Station	1928	716567
R	423m N	Pumping Station	1909	716567
T	423m NE	Unidentified Mills	1851	682706
R	424m N	Pumping Station	1938	734563
AD	425m NW	Unspecified Pit	1928	710223
AD	425m NW	Unspecified Old Quarry	1909	681167
6	428m E	Chimney	1979	684547
AD	430m NW	Unspecified Pit	1938	720628
AD	430m NW	Unspecified Pit	1891	753959
AD	432m NW	Unspecified Pit	1967	696580
AD	432m NW	Unspecified Pit	1979	696580
R	432m N	Pumping Station	1979	774547
AE	434m NE	Unspecified Mills	1928	778299
AE	434m NE	Unspecified Mills	1909	778299
AA	434m S	Refuse Heap	1928	754955
AD	436m NW	Sandstone Quarry	1851	687519
AD	437m NW	Unspecified Pit	1949	739584
T	437m NE	Unspecified Mill	1851	771100
AE	438m NE	Unspecified Mills	1938	778299
AF	444m N	Filter Tanks	1928	741047
AF	444m N	Filter Tanks	1909	741047
AE	445m NE	Unspecified Mills	1949	707271
AE	445m NE	Unspecified Works	1967	740531
AF	446m N	Filter Tanks	1938	708296
AF	446m N	Filter Beds	1891	665775
AG	447m NW	Unspecified Heap	1928	701090
AE	448m NE	Unspecified Mills	1979	771707

ID	Location	Land Use	Date	Group ID
AG	449m NW	Unspecified Heap	1938	694526
AF	451m N	Filter Tanks	1949	737220
AF	451m N	Filter Tanks	1979	731903
AA	455m S	Railway Sidings	1928	738090
AG	455m NW	Unspecified Heap	1949	749008
AE	461m NE	Unspecified Mill	1891	706433
AA	463m S	Cuttings	1938	746627
AA	463m S	Cuttings	1928	746627
AA	463m S	Cuttings	1890	789206
AB	463m SE	Boiler Works	1851	675179
AA	471m S	Refuse Heap	1909	754955
AA	471m S	Railway Sidings	1909	738090
AH	471m SE	Refuse Heap	1909	677431
AA	475m S	Unspecified Ground Workings	1938	647764
AH	475m SE	Unspecified Heap	1928	650787
AI	488m W	Unspecified Old Level	1938	752008
AI	490m W	Unspecified Old Level	1949	738405
AI	491m W	Unspecified Old Level	1928	722341
AI	492m W	Old Coal Level	1909	691868
AA	494m S	Cuttings	1909	720496
AA	495m S	Cuttings	1949	719310
AJ	496m NE	Refuse Heap	1928	787664
7	496m NW	Unspecified Quarry	1891	667744
T	497m NE	Gasometer	1851	655090
AJ	498m NE	Refuse Heap	1938	787664
AA	499m S	Unspecified Ground Workings	1909	647774

This data is sourced from Ordnance Survey / Groundsure.

2.2 Historical tanks

Records within 500m	**58**

Tank features digitised from historical Ordnance Survey mapping at high-detail 1:1,250 and 1:2,500 scale. Any records shown are available intelligently grouped in section 1. Grouped and the original un-grouped features can be cross-referenced across sections 1 and 2 using the 'Group ID'.

Features are displayed on the Past land use - un-grouped map on **page 25**

ID	Location	Land Use	Date	Group ID
C	10m S	Unspecified Tank	1910	101444
C	10m S	Unspecified Tank	1929	101444
C	28m SE	Unspecified Tank	1910	88648
C	28m SE	Unspecified Tank	1929	88648
D	90m S	Unspecified Tank	1910	84109
B	96m S	Unspecified Tank	1962	84105
B	98m S	Unspecified Tank	1985	98056
B	98m S	Unspecified Tank	1992	98056
B	98m S	Unspecified Tank	1996	96751
B	102m S	Tanks	1910	87571
B	102m S	Unspecified Tank	1929	104001
B	110m S	Unspecified Tank	1962	100307
B	112m S	Tanks	1910	87572
B	117m S	Unspecified Tank	1929	91370
B	119m S	Unspecified Tank	1985	91229
B	119m S	Unspecified Tank	1992	91229
B	120m S	Unspecified Tank	1996	100917
I	120m E	Tanks	1910	87573
I	192m E	Tanks	1985	90008
I	194m E	Tanks	1975	90008
G	195m NE	Unspecified Tank	1929	84101
H	204m S	Tanks	1910	87425
I	207m E	Tanks	1985	95002

ID	Location	Land Use	Date	Group ID
I	207m E	Tanks	1992	95002
I	209m E	Tanks	1975	96690
H	213m S	Tanks	1962	87574
H	216m S	Unspecified Tank	1962	84110
G	220m NE	Unspecified Tank	1976	84100
H	222m S	Unspecified Tank	1929	84108
H	224m S	Unspecified Tank	1910	103048
H	224m S	Unspecified Tank	1929	103048
L	280m NE	Unspecified Tank	1929	84098
L	284m NE	Unspecified Tank	1910	84099
L	304m NE	Unspecified Tank	1929	84102
H	311m SE	Unspecified Tank	1975	91862
H	312m SE	Unspecified Tank	1993	91862
H	313m SE	Unspecified Tank	1962	84097
H	318m SE	Unspecified Tank	1910	84096
H	319m SE	Tanks	1929	87575
S	323m SE	Unspecified Tank	1992	98038
S	324m SE	Unspecified Tank	1975	98038
S	324m SE	Unspecified Tank	1962	98038
U	349m NE	Gas Works	1891	93063
U	349m NE	Gas Works	1910	93063
H	358m SE	Unspecified Tank	1975	100532
H	358m SE	Unspecified Tank	1993	100532
R	371m N	Filter Tank	1910	89539
R	371m N	Filter Tank	1929	89539
R	379m N	Tanks	1976	87427
U	379m NE	Tanks	1929	87578
U	380m NE	Gasometer	1891	103161

ID	Location	Land Use	Date	Group ID
U	380m NE	Gasometer	1910	103161
U	390m NE	Gasometer	1891	96738
U	390m NE	Gasometer	1910	96738
Z	399m SE	Unspecified Tank	1910	84095
AF	448m N	Filter Tanks	1910	100975
AF	448m N	Filter Tanks	1929	100975
AF	455m N	Filter Tanks	1976	103695

This data is sourced from Ordnance Survey / Groundsure.

2.3 Historical energy features

Records within 500m	**26**

Energy features digitised from historical Ordnance Survey mapping at high-detail 1:1,250 and 1:2,500 scale. Any records shown are available intelligently grouped in section 1. Grouped and the original un-grouped features can be cross-referenced across sections 1 and 2 using the 'Group ID'.

Features are displayed on the Past land use - un-grouped map on **page 25**

ID	Location	Land Use	Date	Group ID
E	146m E	Electricity Substation	1996	50399
E	146m E	Electricity Substation	1970	50399
E	147m E	Electricity Substation	1976	55603
K	160m NE	Electricity Substation	1976	50478
K	161m NE	Electricity Substation	1970	50478
K	161m NE	Electricity Substation	1996	58953
M	201m SE	Electricity Substation	1985	47737
M	201m SE	Electricity Substation	1992	47737
M	202m SE	Electricity Substation	1975	47737
M	202m SE	Electricity Substation	1996	47737
G	227m NE	Electricity Substation	1970	57858
G	228m NE	Electricity Substation	1976	55066
G	229m NE	Electricity Substation	1996	55066

ID	Location	Land Use	Date	Group ID
H	299m SE	Electricity Substation	1975	45489
H	307m SE	Electricity Substation	1993	45490
U	349m NE	Gas Works	1891	49013
U	349m NE	Gas Works	1910	49013
W	365m E	Electricity Transformer	1975	46548
W	366m E	Electricity Substation	1992	45488
X	367m NE	Electricity Substation	1992	46738
X	367m NE	Electricity Substation	1976	46738
U	380m NE	Gasometer	1891	49719
U	380m NE	Gasometer	1910	49719
U	390m NE	Gasometer	1891	49499
U	390m NE	Gasometer	1910	49499
5	405m S	Electricity Substation	1975	45486

This data is sourced from Ordnance Survey / Groundsure.

2.4 Historical petrol stations

Records within 500m	0

Petrol stations digitised from historical Ordnance Survey mapping at high-detail 1:1,250 and 1:2,500 scale. Any records shown are available intelligently grouped in section 1. Grouped and the original un-grouped features can be cross-referenced across sections 1 and 2 using the 'Group ID'.

This data is sourced from Ordnance Survey / Groundsure.

2.5 Historical garages

Records within 500m	11

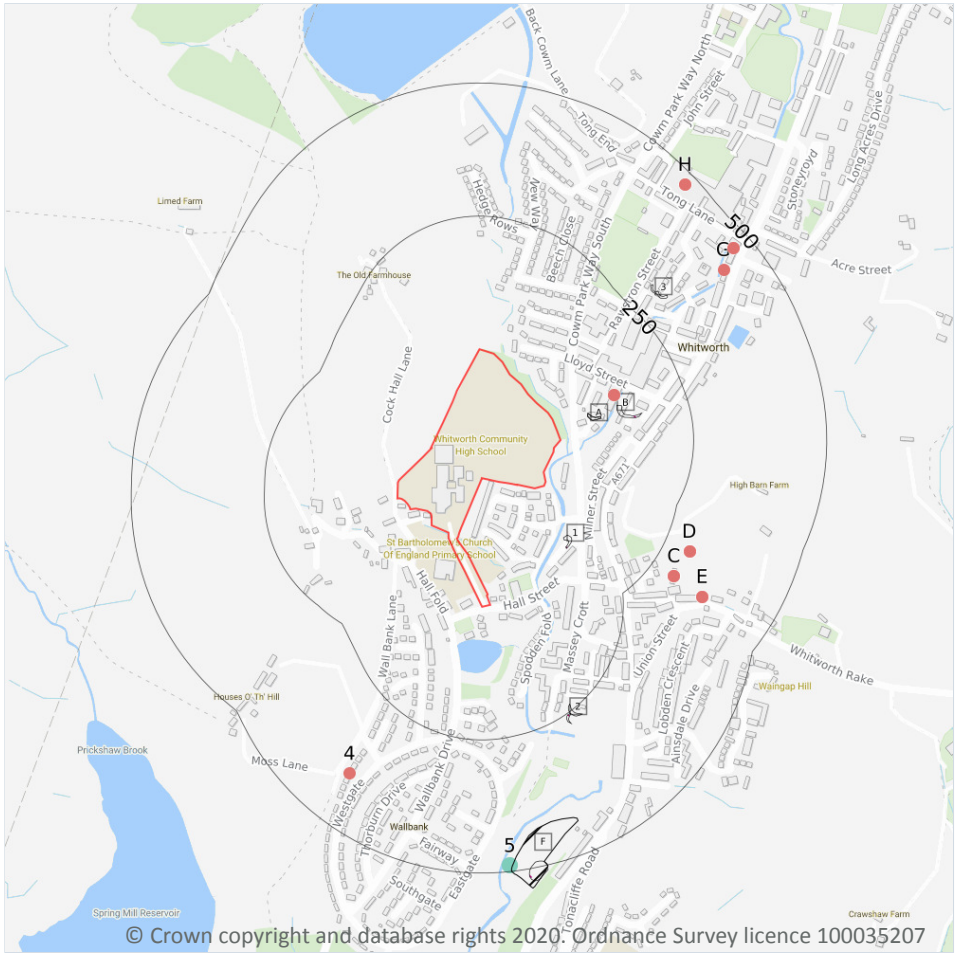
Garages digitised from historical Ordnance Survey mapping at high-detail 1:1,250 and 1:2,500 scale. Any records shown are available intelligently grouped in section 1. Grouped and the original un-grouped features can be cross-referenced across sections 1 and 2 using the 'Group ID'.

Features are displayed on the Past land use - un-grouped map on **page 25**

ID	Location	Land Use	Date	Group ID
I	96m E	Garage	1996	15879
I	103m E	Garage	1962	19731
I	107m E	Garage	1985	19731
I	107m E	Garage	1992	15502
I	107m E	Garage	1975	16482
E	115m E	Garage	1970	14589
AE	430m NE	Garage	1976	17845
AE	431m NE	Garage	1992	17845
AB	467m SE	Garage	1962	15886
AB	471m SE	Garage	1975	16798
AB	472m SE	Garage	1993	17055

This data is sourced from Ordnance Survey / Groundsure.

3 Waste and landfill



3.1 Active or recent landfill

Records within 500m	0

Active or recently closed landfill sites under Environment Agency/Natural Resources Wales regulation.

This data is sourced from the Environment Agency and Natural Resources Wales.

3.2 Historical landfill (BGS records)

Records within 500m	1

Landfill sites identified on a survey carried out on behalf of the DoE in 1973. These sites may have been closed or operational at this time.

Features are displayed on the Waste and landfill map on **page 39**

ID	Location	Address	BGS Number	Risk	Waste Type
5	490m S	Sewage Works, Market St, Whitworth	2737	No risk to aquifer	N/A

This data is sourced from the British Geological Survey.

3.3 Historical landfill (LA/mapping records)

Records within 500m	**7**

Landfill sites identified from Local Authority records and high detail historical mapping.

Features are displayed on the Waste and landfill map on **page 39**

ID	Location	Site address	Source	Data type
A	63m E	Refuse Tip	1962 mapping	Polygon
A	63m E	Refuse Tip	1970 mapping	Polygon
1	102m SE	Refuse Tip	1962 mapping	Polygon
B	119m E	Refuse Tip	1962 mapping	Polygon
2	239m SE	Refuse Tips	1962 mapping	Polygon
3	300m NE	Refuse Tip	1962 mapping	Polygon
F	489m S	Refuse Tip	1975 mapping	Polygon

This data is sourced from the Ordnance Survey/Groundsure and Local Authority records.

3.4 Historical landfill (EA/NRW records)

Records within 500m	**1**

Known historical (closed) landfill sites (e.g. sites where there is no PPC permit or waste management licence currently in force). This includes sites that existed before the waste licensing regime and sites that have been licensed in the past but where a licence has been revoked, ceased to exist or surrendered and a certificate of completion has been issued.

Features are displayed on the Waste and landfill map on **page 39**

ID	Location	Details		
F	422m S	Site Address: Sewage Works, Market Street, Tonacliffe, Whitworth, Lancashire Licence Holder Address: -	Waste Licence: - Site Reference: K1/14/023 Waste Type: - Environmental Permitting Regulations (Waste) Reference: - Licence Issue: - Licence Surrender: -	Operator: Whitworth Urban District Council Licence Holder: Whitworth Urban District Council First Recorded 01/01/1948 Last Recorded: 01/01/1970

This data is sourced from the Environment Agency and Natural Resources Wales.

3.5 Historical waste sites

Records within 500m	**0**

Waste site records derived from Local Authority planning records and high detail historical mapping.

This data is sourced from Ordnance Survey/Groundsure and Local Authority records.

3.6 Licensed waste sites

Records within 500m	**0**

Active or recently closed waste sites under Environment Agency/Natural Resources Wales regulation.

This data is sourced from the Environment Agency and Natural Resources Wales.

3.7 Waste exemptions

Records within 500m	**21**

Activities involving the storage, treatment, use or disposal of waste that are exempt from needing a permit. Exemptions have specific limits and conditions that must be adhered to.

Features are displayed on the Waste and landfill map on **page 39**

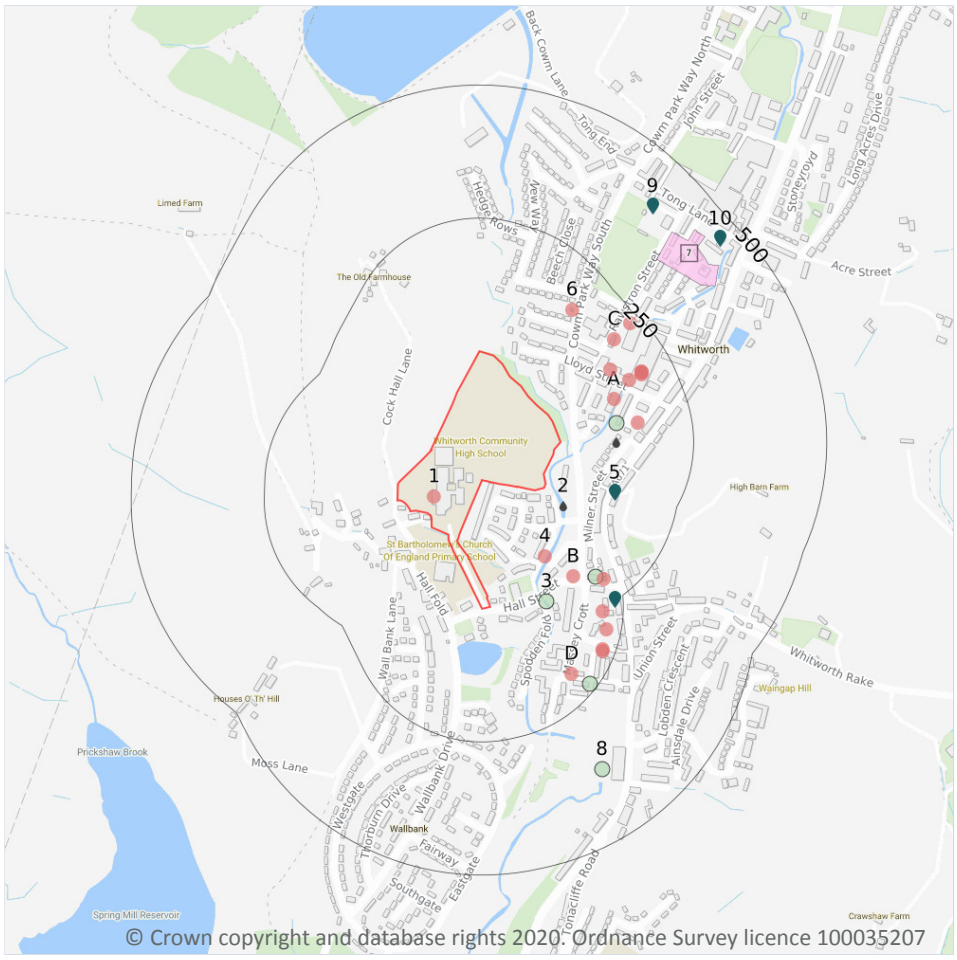
ID	Location	Site	Reference	Category	Sub-Category	Description
B	123m E	-	WEX235481	Storing waste exemption	Not on a farm	Storage of waste in secure containers
B	123m E	-	WEX235481	Storing waste exemption	Not on a farm	Storage of waste in a secure place
C	297m SE	HORSECROFT FARM, TAYLOR STREET, WHITWORTH, ROCHDALE, OL12 8PT	WEX196484	Disposing of waste exemption	On a Farm	Deposit of waste from dredging of inland waters

ID	Location	Site	Reference	Category	Sub-Category	Description
C	297m SE	HORSECROFT FARM, TAYLOR STREET, WHITWORTH, ROCHDALE, OL12 8PT	WEX196484	Disposing of waste exemption	On a Farm	Burning waste in the open
C	297m SE	HORSECROFT FARM, TAYLOR STREET, WHITWORTH, ROCHDALE, OL12 8PT	WEX196484	Using waste exemption	On a Farm	Use of waste in construction
C	297m SE	HORSECROFT FARM, TAYLOR STREET, WHITWORTH, ROCHDALE, OL12 8PT	WEX196484	Using waste exemption	On a Farm	Use of waste for a specified purpose
C	297m SE	HORSECROFT FARM, TAYLOR STREET, WHITWORTH, ROCHDALE, OL12 8PT	WEX196484	Disposing of waste exemption	On a Farm	Deposit of agricultural waste consisting of plant tissue under a Plant Health notice
D	300m SE	Horsecroft Farm Taylor Street Rochdale ol12 8pt	EPR/PE5081MJ/A001	Disposing of waste exemption	Agricultural Waste Only	Deposit of waste from dredging of inland waters
D	300m SE	Horsecroft Farm Taylor Street Rochdale ol12 8pt	EPR/PE5081MJ/A001	Disposing of waste exemption	Agricultural Waste Only	Deposit of agricultural waste consisting of plant tissue under a Plant Health notice
D	300m SE	Horsecroft Farm Taylor Street Rochdale ol12 8pt	EPR/PE5081MJ/A001	Disposing of waste exemption	Agricultural Waste Only	Burning waste in the open
D	300m SE	Horsecroft Farm Taylor Street Rochdale ol12 8pt	EPR/PE5081MJ/A001	Using waste exemption	Agricultural Waste Only	Use of waste for a specified purpose
E	363m SE	Horsecroft Farm, Taylor Street, Whitworth, OL12 8PT	WEX043837	Disposing of waste exemption	On a farm	Deposit of waste from dredging of inland waters
E	363m SE	Horsecroft Farm, Taylor Street, Whitworth, OL12 8PT	WEX043837	Disposing of waste exemption	On a farm	Deposit of agricultural waste consisting of plant tissue under a Plant Health notice
E	363m SE	Horsecroft Farm, Taylor Street, Whitworth, OL12 8PT	WEX043837	Disposing of waste exemption	On a farm	Burning waste in the open
E	363m SE	Horsecroft Farm, Taylor Street, Whitworth, OL12 8PT	WEX043837	Using waste exemption	On a farm	Use of waste for a specified purpose

ID	Location	Site	Reference	Category	Sub-Category	Description
4	401m SW	68, WESTGATE, WHITWORTH, ROCHDALE, OL12 8UW	WEX147707	Storing waste exemption	Not on a farm	Storage of waste in a secure place
G	424m NE	603 Market Street ROCHDALE Lancashire OL12 8QS	EPR/NF0403TM/A001	Treating waste exemption	Non-Agricultural Waste Only	Sorting and de-naturing of controlled drugs for disposal
G	464m NE	603, MARKET STREET, WHITWORTH, ROCHDALE, OL12 8QS	WEX132731	Storing waste exemption	Not on a farm	Storage of waste in secure containers
G	464m NE	603, MARKET STREET, WHITWORTH, ROCHDALE, OL12 8QS	WEX132731	Treating waste exemption	Not on a farm	Sorting and de-naturing of controlled drugs for disposal
H	477m NE	Anglo Social Tong Lane Rochdale Lancashire OL12 8BG	EPR/KE5743NK/A001	Using waste exemption	Both agricultural and non-agricultural waste	Spreading waste on agricultural land to confer benefit
H	477m NE	Anglo Social Tong Lane Rochdale Lancashire OL12 8BG	EPR/KE5743NK/A001	Using waste exemption	Both agricultural and non-agricultural waste	Use of waste for a specified purpose

This data is sourced from the Environment Agency and Natural Resources Wales.

4 Current industrial land use



4.1 Recent industrial land uses

Records within 250m	21

Current potentially contaminative industrial sites.

Features are displayed on the Current industrial land use map on **page 44**

ID	Location	Company	Address	Activity	Category
1	**On site**	**Chimney**	**Lancashire, OL12**	**Chimneys**	**Industrial Features**
A	122m E	Works	Lancashire, OL12	Unspecified Works Or Factories	Industrial Features
4	125m S	Tank	Lancashire, OL12	Tanks (Generic)	Industrial Features

ID	Location	Company	Address	Activity	Category
A	144m NE	Works	Lancashire, OL12	Unspecified Works Or Factories	Industrial Features
A	150m E	Electricity Sub Station	Lancashire, OL12	Electrical Features	Infrastructure and Facilities
A	163m NE	Works	Lancashire, OL12	Unspecified Works Or Factories	Industrial Features
B	165m E	Electricity Sub Station	Lancashire, OL12	Electrical Features	Infrastructure and Facilities
6	166m NE	Electricity Sub Station	Lancashire, OL12	Electrical Features	Infrastructure and Facilities
C	189m NE	C P S	The Engine House Brookside Mill, North Street, Whitworth, Rochdale, Lancashire, OL12 8RE	Distribution and Haulage	Transport, Storage and Delivery
A	190m NE	Works	Lancashire, OL12	Unspecified Works Or Factories	Industrial Features
A	192m NE	Whitworth Car Care Centre Ltd	Unit 6 Brookside Mill, North Street, Whitworth, Rochdale, Lancashire, OL12 8RE	Vehicle Repair, Testing and Servicing	Repair and Servicing
A	192m NE	Valemill Pallets Ltd	Unit 1-4 Brookside Mill, North Street, Whitworth, Rochdale, Lancashire, OL12 8RE	Packaging	Industrial Products
A	192m NE	Steve Parkers	Lloyd Street, Whitworth, Rochdale, Lancashire, OL12 8AA	Vehicle Parts and Accessories	Motoring
A	192m NE	Minky	Valemill, Robinson Street, Rochdale, Lancashire, OL16 1TA	Cleaning Equipment and Supplies	Industrial Products
D	198m SE	Gas Governor Station	Lancashire, OL12	Gas Features	Infrastructure and Facilities
B	205m SE	Electricity Sub Station	Lancashire, OL12	Electrical Features	Infrastructure and Facilities
B	211m E	Tank	Lancashire, OL12	Tanks (Generic)	Industrial Features
B	222m E	Depot	Lancashire, OL12	Container and Storage	Transport, Storage and Delivery
B	226m E	Field Motor Services Ltd	Pilot Works, Chapel Street, Whitworth, Rochdale, Lancashire, OL12 8PP	Vehicle Repair, Testing and Servicing	Repair and Servicing
B	228m E	Works	Lancashire, OL12	Unspecified Works Or Factories	Industrial Features
C	232m NE	Electricity Sub Station	Lancashire, OL12	Electrical Features	Infrastructure and Facilities

This data is sourced from Ordnance Survey.

4.2 Current or recent petrol stations

Records within 500m	0

Open, closed, under development and obsolete petrol stations.

This data is sourced from Experian.

4.3 Electricity cables

Records within 500m	0

High voltage underground electricity transmission cables.

This data is sourced from National Grid.

4.4 Gas pipelines

Records within 500m	0

High pressure underground gas transmission pipelines.

This data is sourced from National Grid.

4.5 Sites determined as Contaminated Land

Records within 500m	1

Contaminated Land Register of sites designated under Part 2a of the Environmental Protection Act 1990.

Features are displayed on the Current industrial land use map on **page 44**

ID	Location	Description	Site name	Category	Year identified
7	349m NE	former Whitworth Vale Gas Works	Brenbar Crescent, Whitworth	Potentially Contaminated Land	Not specified

This data is sourced from Local Authority records.

4.6 Control of Major Accident Hazards (COMAH)

Records within 500m	0

Control of Major Accident Hazards (COMAH) sites. This data includes upper and lower tier sites, and includes a historical archive of COMAH sites and Notification of Installations Handling Hazardous Substances (NIHHS) records.

This data is sourced from the Health and Safety Executive.

4.7 Regulated explosive sites

Records within 500m	0

Sites registered and licensed by the Health and Safety Executive under the Manufacture and Storage of Explosives Regulations 2005 (MSER). The last update to this data was in April 2011.

This data is sourced from the Health and Safety Executive.

4.8 Hazardous substance storage/usage

Records within 500m	0

Consents granted for a site to hold certain quantities of hazardous substances at or above defined limits in accordance with the Planning (Hazardous Substances) Regulations 2015.

This data is sourced from Local Authority records.

4.9 Historical licensed industrial activities (IPC)

Records within 500m	0

Integrated Pollution Control (IPC) records of substance releases to air, land and water. This data represents a historical archive as the IPC regime has been superseded.

This data is sourced from the Environment Agency and Natural Resources Wales.

4.10 Licensed industrial activities (Part A(1))

Records within 500m	0

Records of Part A(1) installations regulated under the Environmental Permitting (England and Wales) Regulations 2016 for the release of substances to the environment.

This data is sourced from the Environment Agency and Natural Resources Wales.

4.11 Licensed pollutant release (Part A(2)/B)

Records within 500m	4

Records of Part A(2) and Part B installations regulated under the Environmental Permitting (England and Wales) Regulations 2016 for the release of substances to the environment.

Features are displayed on the Current industrial land use map on **page 44**

ID	Location	Address	Details	
5	130m E	European Metal Recycling, Market Street, Whitworth, Rossendale, OL12 8QN	Process: Waste Oil Burner 0.4 MW Status: Historical Permit Permit Type: Part B	Enforcement: No Enforcements Notified Date of enforcement: No Enforcements Notified Comment: No Enforcements Notified
B	234m E	Field Motor Services, Pilot Mill, Chapel Street, Whitworth, Rochdale, OL12 8PP	Process: Waste Oil Burner 0.4 MW Status: New Legislation Applies Permit Type: Part B	Enforcement: No Enforcements Notified Date of enforcement: No Enforcements Notified Comment: No Enforcements Notified
9	408m NE	Whitworth Quarry, Aggregate Industries UK Ltd, Tong Lane, Whitworth, Rochdale, OL12 8BE	Process: Quarry Processes Status: Historical Permit Permit Type: Part B	Enforcement: No Enforcements Notified Date of enforcement: No Enforcements Notified Comment: No Enforcements Notified
10	462m NE	Pbw Metals Ltd, Tong Lane, Whitworth, Rochdale, Lancashire, OL12 8BG	Process: Non-ferrous Metal Foundry Processes Status: Historical Permit Permit Type: Part B	Enforcement: No Enforcements Notified Date of enforcement: No Enforcements Notified Comment: No Enforcements Notified

This data is sourced from Local Authority records.

4.12 Radioactive Substance Authorisations

Records within 500m	**0**

Records of the storage, use, accumulation and disposal of radioactive substances regulated under the Radioactive Substances Act 1993.

This data is sourced from the Environment Agency and Natural Resources Wales.

4.13 Licensed Discharges to controlled waters

Records within 500m	**2**

Discharges of treated or untreated effluent to controlled waters under the Water Resources Act 1991.

Features are displayed on the Current industrial land use map on **page 44**

ID	Location	Address	Details	
2	49m SE	WHITWORTH SSO, COWM PARK WAY SOUTH, WHITWORTH, ROSSENDALE, LANCASHIRE	Effluent Type: SEWAGE DISCHARGES - SEWER STORM OVERFLOW - WATER COMPANY Permit Number: 016950443 Permit Version: 1 Receiving Water: RIVER SPODDEN	Status: PRE NRA LEGISLATION WHERE ISSUE DATE 01-SEP-89 (HISTORIC ONLY) Issue date: - Effective Date: 26/10/1983 Revocation Date: -

ID	Location	Address	Details	
A	104m E	BOWER RES DEVELOPMENT SWO, OFF LLOYD STREET, WHITWORTH, ROCHDALE, GREATER MANCHESTER	Effluent Type: MISCELLANEOUS DISCHARGES - SURFACE WATER Permit Number: 016991423 Permit Version: 1 Receiving Water: RIVER SPODDEN	Status: REVOKED - UNSPECIFIED Issue date: - Effective Date: 19/05/1989 Revocation Date: 01/11/1994

This data is sourced from the Environment Agency and Natural Resources Wales.

4.14 Pollutant release to surface waters (Red List)

Records within 500m	0

Discharges of specified substances under the Environmental Protection (Prescribed Processes and Substances) Regulations 1991.

This data is sourced from the Environment Agency and Natural Resources Wales.

4.15 Pollutant release to public sewer

Records within 500m	0

Discharges of Special Category Effluents to the public sewer.

This data is sourced from the Environment Agency and Natural Resources Wales.

4.16 List 1 Dangerous Substances

Records within 500m	0

Discharges of substances identified on List I of European Directive E 2006/11/EC, and regulated under the Environmental Damage (Prevention and Remediation) Regulations 2015.

This data is sourced from the Environment Agency and Natural Resources Wales.

4.17 List 2 Dangerous Substances

Records within 500m	0

Discharges of substances identified on List II of European Directive E 2006/11/EC, and regulated under the Environmental Damage (Prevention and Remediation) Regulations 2015.

This data is sourced from the Environment Agency and Natural Resources Wales.

4.18 Pollution Incidents (EA/NRW)

Records within 500m	5

Records of substantiated pollution incidents. Since 2006 this data has only included category 1 (major) and 2 (significant) pollution incidents.

Features are displayed on the Current industrial land use map on **page 44**

ID	Location	Details	
3	106m E	Incident Date: 16/02/2003 Incident Identification: 137224 Pollutant: Oils and Fuel Pollutant Description: Petrol	Water Impact: Category 3 (Minor) Land Impact: Category 4 (No Impact) Air Impact: Category 4 (No Impact)
A	110m E	Incident Date: 09/09/2003 Incident Identification: 188762 Pollutant: Oils and Fuel Pollutant Description: Unidentified Oil	Water Impact: Category 3 (Minor) Land Impact: Category 4 (No Impact) Air Impact: Category 4 (No Impact)
B	193m SE	Incident Date: 23/02/2003 Incident Identification: 138716 Pollutant: Oils and Fuel Pollutant Description: Unidentified Oil	Water Impact: Category 3 (Minor) Land Impact: Category 4 (No Impact) Air Impact: Category 4 (No Impact)
D	236m SE	Incident Date: 03/09/2003 Incident Identification: 187172 Pollutant: Specific Waste Materials Pollutant Description: Tyres	Water Impact: Category 4 (No Impact) Land Impact: Category 3 (Minor) Air Impact: Category 4 (No Impact)
8	369m SE	Incident Date: 31/07/2007 Incident Identification: 519089 Pollutant: Organic Chemicals/Products Pollutant Description: Dyes and Inks	Water Impact: Category 1 (Major) Land Impact: Category 3 (Minor) Air Impact: Category 4 (No Impact)

This data is sourced from the Environment Agency and Natural Resources Wales.

4.19 Pollution inventory substances

Records within 500m	0

The pollution inventory (substances) includes reporting on annual emissions of certain regulated substances to air, controlled waters and land. A reporting threshold for each substance is also included. Where emissions fall below the reporting threshold, no value will be given. The data is given for the most recent complete year available.

This data is sourced from the Environment Agency and the Scottish Environment Protection Agency.

4.20 Pollution inventory waste transfers

Records within 500m	0

The pollution inventory (waste transfers) includes reporting on annual transfers and recovery/disposal of controlled wastes from a site. A reporting threshold for each waste type is also included. Where releases fall below the reporting threshold, no value will be given. The data is given for the most recent complete year available.

This data is sourced from the Environment Agency and the Scottish Environment Protection Agency.

4.21 Pollution inventory radioactive waste

Records within 500m	0

The pollution inventory (radioactive wastes) includes reporting on annual releases of radioactive substances from a site, including the means of release. Where releases fall below the reporting threshold, no value will be given. The data is given for the most recent complete year available.

This data is sourced from the Environment Agency and the Scottish Environment Protection Agency.