

Tetrosyl, Bury

Phase 1 Preliminary Risk Assessment

Job Number: LKC 23 1650

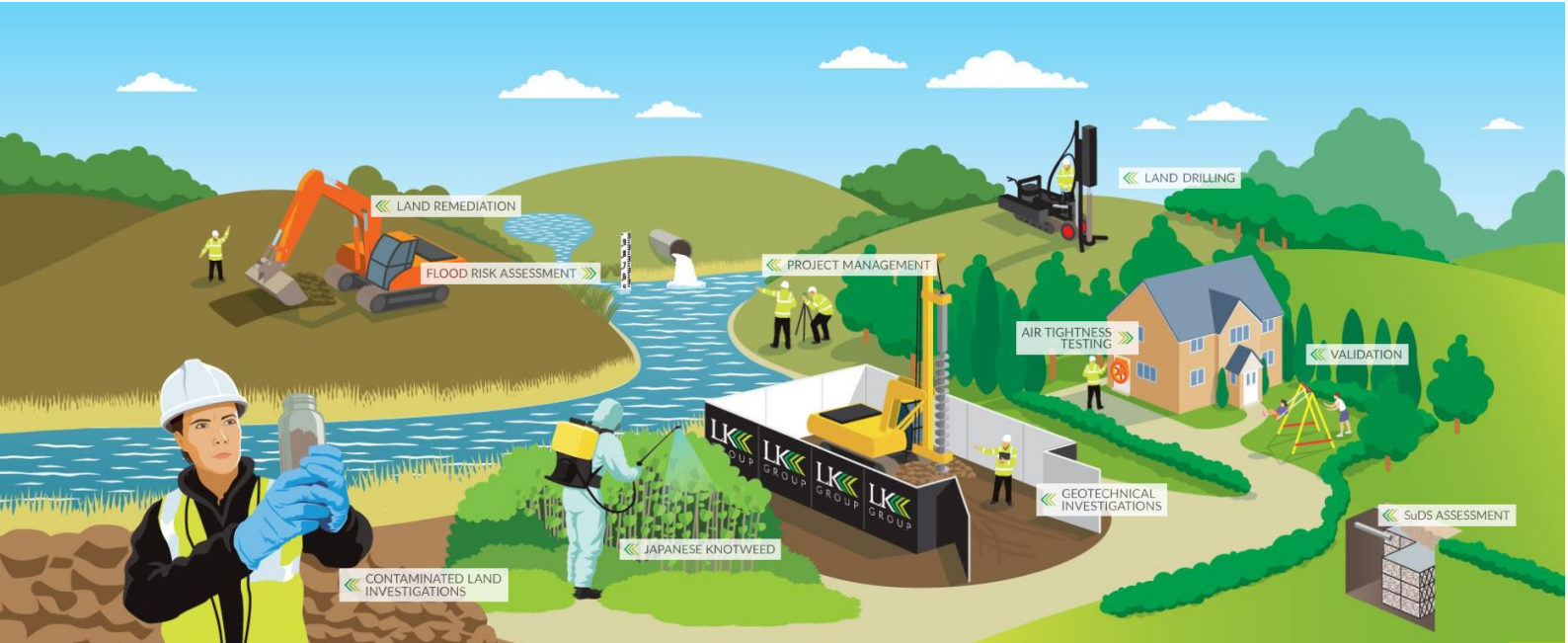
Date: January 2024

Client: Tetrosyl Group Ltd



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1. Introduction

LK Consult Ltd (LKC) has been commissioned to carry out a Phase 1 Preliminary Risk Assessment (PRA) for Tetrosyl Group Ltd, Bury.

In accordance with current guidance (including LCRM¹ and the National Planning Policy Framework (NPPF)²), the PRA will include a site reconnaissance, site history, geology, hydrogeology, hydrology, mineral search, and a landfill search. Information gathered from the desk study and site reconnaissance will be used to develop a contamination conceptual model for the site.

In addition, the information gathered will be used to identify potential geotechnical constraints associated with the redevelopment of the site.

Based on the findings of this report, an appropriate site investigation can be derived, if required.

A summary of the site details is presented in Table 1-1. Figure 1 indicates the site location and boundary plan. Figure 2 indicates the proposed development.

Location	North-western end of Bridge Hall Lane, Bury, within Tetrosyl Group Ltd factory site. Centred at National Grid Reference 382870E 410870N.
Area	4300m ² .
Topography	86-90 metres above ordnance datum (AOD). Site has a moderate slope down to the southwest.
Current Site Use	Vacant land north of Tetrosyl warehouses, east of Bridge Hall Lane.
Proposed Development	Construction of Pump Room, 2no. Sprinkler Tanks and a GRP Kiosk.

Table 1-1: Summary of site details.

2. Historical Review

2.1. Historical Map Review

In compiling the site history, LKC consulted Envirocheck historical mapping (Appendix A) and aerial photography.

Table 2-1 summarises features on site. Table 2-2 summarises potentially contaminative land uses within approximately 50m and potentially infilled features within approximate 250m.

Site Features	Location on Site	Dates Present		Comments
		From	To	
Mill Buildings	Central and E	1891	1984	Buildings associated with paper mill. Buildings extended towards western portion of site by 1956 mapping. No longer present on 1990 mapping.
Tanks	NE	1958	1984	2no. tanks on 1958 mapping, associated with paper mill. Additional tanks noted by 1968 mapping (4no. in total).
Electrical Substation	NW	2023	2023	

Table 2-1: Summary of site features. Dates are based on available historical map editions.

Surrounding Area Features	Distance (m)	Direction	Dates Present		Comments
			From	To	
Bridge Hall Paper Mills / Works	Adjacent	E / SE	1851	1984	Labelled as mill from 1851-1989 mapping. Labelled as 'Works' from 1990 mapping onwards. Building reduced in size by 1990 mapping and only present adjacent to the south-east of site.
Reservoir	100	W	1851	1984	No longer present on 1990 mapping.
Filter Beds	10	NW/W	1891	1938	No longer present on 1956 mapping.
Filter Beds	205	W	1891	1938	No longer present on 1956 mapping.
Railway Lines and Embankments	100	E	1893	1970	Railway no longer present on 1984 mapping.
Electrical Substation	15	N	1968	2023	
Works	20	SW	1984	2023	Annotated as 'Bridge Hall Works (Factory)' on 2023 mapping.
Works/Factory	33	N	1990	2023	Footprint of building present prior to 1990, however not labelled as 'Works' until 1990 mapping, and as 'Factory' on 2023 mapping.

Table 2-2: Summary of potentially contaminative features within 50m and potentially infilled features within 250m. Dates are based on available historical map editions.

The 1984 mapping showing the extent of the works / paper mill buildings and tanks is shown on Plate 2-1..

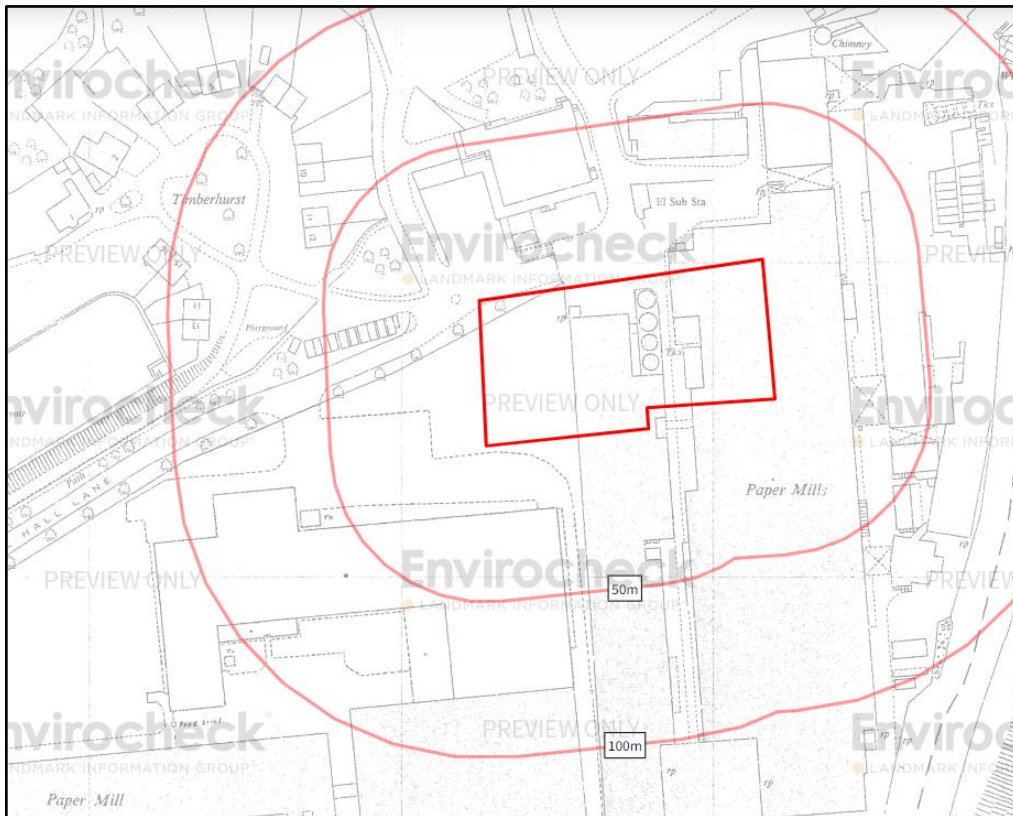


Plate 2-1: Extract from 1984 mapping.

2.2. Additional Historical Information

A prior ground investigation was carried out by Dunelm Geotechnical and Environmental in 2023. One rotary open hole borehole with rotary core follow on was carried out within the east of the existing site area, with a monitoring well being installed as part of the site investigation.

The borehole was carried out to 10m depth, identifying 4.3m of made ground, followed by clay presumed to be the weathered rockhead. Solid mudstone was found between 5.50mbgl and 10mbgl.

The monitoring well was installed to a depth of 6.50mbgl, with a response zone between 4.00 and 6.50mbgl, though no information on monitoring taken place is available at this time.

3. Environmental Setting

A summary of environmental settings is presented in Table 3-1, based on a review of available environmental data.

Categories ^(data sources)			Details
Geology ^{1, 2, 3}	Artificial Ground		No BGS recorded artificial ground.
	Superficial Deposits		Alluvium (Clay, Silt, Sand and Gravel) mapped across southeast of site. Till (diamicton) mapped across northwest of site
	Bedrock		Great Arch Sandstone mapped across eastern portion of site. Pennine Lower Coal Measures (Sandstone, siltstone and mudstone) mapped across western portion of site. Coal seam subcropping across the centre of site, orientated approx. NW-SE.
	BGS Logs (100m)		BH Ref: SD81SW504, 90m E: made ground to 3.5m, weak weathered MUDSTONE to 10m.
Hydro-geology ¹	Aquifer Designation	Superficial	Secondary Undifferentiated.
		Bedrock	Secondary A Aquifer.
	Source Protection Zone (SPZ)		Site not within an SPZ.
	Groundwater Abstractions (100m)		64m E, Chemicals: Process Water
Hydrology ¹	Surface Watercourses (100m)		River Roch 77m SE, flowing SW.
	Flooding Risk ^{1, 4}		Flood Zone 1.
	Surface Water Abstractions (100m)		64m E, Chemicals: Process Water.
	Discharge Consents (onsite)		Trade discharge into River Roch (authorization revoked).
	Pollution Incidents (onsite)		None.
Minerals & Mining ^{1,5}	Coal Mining		Within a Coal Reporting Area. Within a Development High Risk Area.
	Surface Mineral Extractions (250m)		None.
	Non-Coal Mining Area		No Hazard.
Ground Stability ¹	Collapsible Ground		Very low hazard.
	Compressible Ground		Moderate hazard in E/S. No hazard elsewhere.
	Ground Dissolution		No hazard.
	Landslide		Very low hazard.
	Running Sand		Low hazard.
	Shrinking / Swelling Clay		No hazard.

Table 3-1: Summary of the environmental setting.

Notes: Distance in brackets is the distance from site that features are included. Where no distance given, features relate to onsite only.

Data Sources:

1 Envirocheck Report (Appendix A & B).

2 BGS Sheet 85 1:50,000.

3 <http://mapapps2.bgs.ac.uk/geoindex/home.html>

5 The Coal Authority Web Mapping Services (WMS) /

<http://coal.decc.gov.uk/en/coal/cms/publications/data/map/map.aspx>.

Categories ^(data sources)		Details
Landfill Sites (250m) ¹	Known / Registered	3no. Landfills Prettywood Sand Quarry (79m E) Prettywood West Extension Landfill Site (79m E) Bury New Road (135m E)
	Potentially Infilled Land (non-water and water), based on Envirocheck Report	2no. features: 40m NW and 41m NW.
	Potentially Infilled Sites, based on LKC historical review	2no. features: See Table 2-1 and Table 2-2.
Radon Potential ¹		1-3% of homes above Action Level. No protective measures are necessary in the construction of new dwellings or extensions. (England)
Designated Sites (50m) ¹		None.
Contemporary Trade Directory (50m) ¹		None.
Fuel Station Entries (50m) ¹		None.
Unexploded Ordnance Risk (UXO) – Zetica Risk Map	Zetica Risk Map ⁶	Bomb Risk: Low. Strategic Targets: None identified within 100m.

Table 3-2 (continued): Summary of the environmental setting.

Notes: Distance in brackets is the distance from site that features are included. Where no distance given, features relate to onsite only.

Data Sources:

1 Envirocheck Report (Appendix A & B).

6 Zetica UXO Unexploded Bomb Risk Map (Appendix D).

4. Site Reconnaissance

A site reconnaissance was carried out on 11-12-23.

Relevant features identified on site are summarised below:

- The site is located in the northeast of the Tetrosyl compound. It comprises predominantly vegetated ground with a road and associated kerbs and pavements running north-south through the area. Pavement is raised, approximately 35 cm high.
- The site slopes down to the southwest.
- Made ground is present on the site surface including demolition rubble.
- Bunds are present along the south and eastern edge of the site, composed of demolition rubble.
- Site access: Access to the wider Tetrosyl complex is via the security building off Bridge Hall Lane. The investigation area is accessed via the grounds of the complex. A gap in the existing fencing is present which allows access onto the investigation area.
- Evidence of previous intrusive investigation noted - monitoring well is present towards the west of the site.
- Multiple manholes are present along the western edge of the site.

The surrounding area comprises a storage yard to the north, a slope down to the River Roch to the east, a storage warehouse to the south, and an access road, further landscaping and an electrical substation to the west.

Site photographs are provided in Table 4-2.

	
Photograph 1: View across site from western boundary.	Photograph 2: View of site access via northern edge of site.



Photograph 3: Raised lip on east and south edge of site concealing the downwards slope.



Photograph 4: Multiple manholes and service access covers on northwest corner of site.



Photograph 5: Existing groundwater monitoring well.



Photograph 6: View from southwest facing north, showing change in elevation on site and proposed kiosk location.

Table 4-1: Site photographs.

Site features are also shown on Plate 4-1.



Plate 4-1: Plan showing relevant site features.

5. Preliminary Conceptual Model

5.1. Introduction

The aim of the conceptual model is to provide a preliminary assessment of the likelihood of a pollutant linkage for each potential combination of contaminant, pathway, and receptor. A conceptual model can be used to make an informed decision on the contamination risks associated with the site and whether further site investigation work is required.

The sections below are therefore divided into potential contaminant, potential pathway and potential receptor as described in LCRM³, on the premise that, if there is no pollutant linkage, then there will be no risk to the receptor. The final section provides an assessment of the potential pollutant linkages that may still be present on the site if redevelopment were to occur.

5.2. Potential Contaminants

Potential viable contamination sources are detailed in Table 5-1. These are split into onsite sources, offsite sources and underlying geology.

Potential Source	Contaminants
On site	
Deep made ground below some or all of the site (e.g., former cellars, recorded deep made ground onsite.)	Demolition rubble, ash, and clinker: asbestos, heavy metals, sulphates, PAHs ⁴ . Other fill material sources: unknown organic / inorganic compounds. If organic / putrescible material: hazardous gas (principally carbon dioxide and methane).
Demolished buildings	Asbestos containing material (ACM).
Paper Mill / Works	Inorganic compounds, chlorinated organic solvents, organic compounds. If coal fired boiler: heavy metals, sulphates and PAHs; if gas or oil powered boiler: oils and fuel. Asbestos may have been used within the building as insulation and lagging or as roofing and cladding ⁵ .
Current electricity substation (post 1980s)	Assuming ongoing maintenance, hardstood ground and no Polychlorinated biphenyl (PCBs) use: no significant contamination anticipated.
Former tanks	Petroleum hydrocarbons, oils, fuels.
Surrounding Area	
Surrounding land uses (paper mill, works, factory)	Potential source identified: Inorganic compounds, chlorinated solvents, organic compounds, heavy metals, sulphates, PAHs, asbestos.
Old electricity substation (pre 1980s)	Polychlorinated Biphenyl (PCBs) and transistor oils (localised to north boundary of site)
Landfills / offsite potentially infilled features within 250m	Given size, distance and age of features, there is considered to be a source of hazardous gas (principally carbon dioxide and methane).

Table 5-1: Potential contamination sources.

Underlying Geology	
Pennine Lower Coal Measures	Ground Gas (principally carbon dioxide and methane) ⁶ . Potentially worked shallow coal seams could be a source of ground gas.
Radon Affected Area	1-3% of homes above Action Level. No protective measures are necessary in the construction of new dwellings or extensions. No further consideration required.
Superficial / Bedrock	Alluvium and Glacial Till over Pennine Lower Coal Measures. No significant contamination sources identified.

Table 5-2: Potential contamination sources (continued).

5.3. Potential Receptors

Potential receptors are detailed in Table 5-2.

Receptors	
Human health	Future site users (including visitors, and site workers). As the proposed development is for commercial / industrial use, the most sensitive receptors (children) have not been included in this assessment.
Controlled waters	River Roch 74m southeast – not considered a significant receptor due to distance from site Secondary A Aquifer, Secondary Undifferentiated Aquifer
Buildings.	
Development will not be used for drinking water, however contamination of water pipes is possible.	

Table 5-3: Potential receptors.

5.4. Potential Pathways

Potential pathways are detailed in Table 5-3.

Pathways		
Soil	Human health ⁷ (commercial land use with no soft landscaping)	Inhalation of vapours outside. Inhalation of vapours inside. Omitted: ingestion of soil, ingestion of soil-derived indoor dust, dermal contact with soil, dermal contact with soil-derived indoor dust, inhalation of soil-derived outdoor dust, inhalation of soil-derived indoor dust, ingestion of contaminated home-grown produce and ingestion of soil attached to home-grown produce, windblow dust
Soil	Direct contact with receptors (services).	
Groundwater	Infiltration into the ground, through potentially contaminated material (contamination possibly going into solution).	
Groundwater and gas	Migration through potentially permeable strata and preferential pathways. Superficial (Till) likely to be low permeability. Superficial (sand and gravel) is likely to be relatively permeable. Bedrock (mudstone, siltstone, sandstone) likely to be variably permeable. Preferential pathways: services, possible shallow worked coal seams.	
Gas	Migration into buildings (e.g., via services) and accumulation of gases in confined spaces (potentially causing explosion if methane is present).	

Table 5-4: Potential pathways.

5.5. Preliminary Contamination Conceptual Model

The Preliminary Contamination Conceptual Model is illustrated in Table 5-4.

Generic potential pollutant linkages are described along with an assessment of the risk based upon guidance on probabilities and consequences outlined in CIRIA C552⁸.

In order to assess the potential risk for each pollutant linkage, an assessment of the magnitude of the potential consequence (severity) of the risk occurring and the magnitude of the probability (likelihood) of the risk occurring has been considered and classified. This is based on the guidance provided in CIRIA C552 and further details including a risk matrix is provided in Appendix E.

The probability is based on the site history, site reconnaissance, environmental setting, pathways, and receptors.

Reasonable worst-case consequence has been assumed at this stage.

Where LKC identified a low to very low risk, targeted or low-density intrusive investigation work, a watching brief (during construction work) or no investigation work will be recommended. This will be dependent on the nature of the site and the proposed development.

Where the risk falls into the moderate/low risk, LKC will undertake an assessment to establish what further work will be required.

Where LKC identifies a moderate or higher risk, intrusive investigation work or precautionary remediation is recommended.

Recommendations are discussed further in Section 7.

Due to the minor consequence associated with the phytotoxic effect to flora (i.e., loss of plants in a landscaping scheme), the overall risk for the majority of sites will be very low to low. Where soils contain significant concentrations of heavy metals, in general there will other pollutant linkages (i.e., the risk to human health) that will trigger the requirement for remediation (e.g., a clean environmental cover system). As such the risk to flora associated with phytotoxic contaminants will not be considered further.

The risk to buildings associated with elevated sulphate will be considered as part of the geotechnical assessment and will not be included in the contamination risk assessment.

It should be noted that there may be risk from short term exposure from contaminated soil to site workers. The Preliminary Contamination Conceptual Model deals with long term exposure to key receptors. Acute risks can be easily mitigated by good environmental management of the site during site works. Standard health and safety precautions (as per HSE guidance⁹) should be adopted by all workers involved with site enabling and construction works. Therefore, this receptor is not considered in the contamination conceptual model.

PL	Contaminants of Concern (source)	Pathway	Receptor	Probability	Consequence	Risk
1	Asbestos, heavy metals, sulphates, PAHs, petroleum hydrocarbons, other organic / inorganic contaminants (made ground, paper mill)	No viable pathways (dermal contact, inhalation, ingestion).	-			
2	Petroleum hydrocarbons, naphthalene (made ground, paper mill, works, tanks, surrounding industrial use)	Inhalation of vapours. Migration via permeable strata and preferential pathways.	Future site users.	Low Likelihood	Medium	Moderate/Low
3	Hazardous gas: methane, carbon dioxide (landfills/offsite potentially infilled features within 250m, deep made ground, Pennine Lower Coal Measures)	Migration via permeable strata and preferential pathways. Inhalation of gas. Explosion in confined spaces.	Future site users. Buildings.	Low Likelihood	Severe	Moderate
4	Chlorinated organic solvents, PAHs, metals, petroleum hydrocarbons (made ground, paper mill, works, tanks, surrounding industrial use)	Migration via permeable strata and preferential pathways. Perched waters migration.	Groundwater	Likely	Medium	Moderate
5	Petroleum hydrocarbons, naphthalene (made ground, paper mill, works, tanks)	No viable pathways (potable pipework not expected)	-			

Table 5-5: Preliminary Contamination Conceptual Model.

Notes: PL = Pollutant Linkage. Contaminant of Concern (CoC) - See Table 5-1 for contamination sources. See Section 7 for recommendations.

6. Preliminary Geotechnical Risk Assessment

Table 6-1 summarises the possible geotechnical constraints of the site, based on the site history, environmental settings and site reconnaissance. Investigation work will be required to confirm the risks and provide a detailed geotechnical assessment and foundation design.

Coal Mining	Site is within a development high risk area. Further assessment is required.
Slope Stability	Slope stability should be investigated for kiosk location.
Envirocheck Ground Stability Hazards	Moderate Risk identified for Compressible Ground. Further action required (see below).
Made Ground	Unknown depth and constituent of made ground across the site. Dunelm Geotechnical and Environmental report indicates relatively deep made ground (>3.00m). Unlikely to be a suitable founding stratum unless engineering work is undertaken.
Superficial	Unknown strength of soils for foundation design. Clay / sand anticipated below the site. Strata may be variable giving differential settlement.
Bedrock	Dunelm Geotechnical and Environmental recorded mudstone bedrock at a depth of 5.50mbgl. Depth to bedrock should be confirmed.
Groundwater	Unknown depth and variability of groundwater. Shallow / fluctuating groundwater can affect the strength of the soil, particularly in granular ground. Shallow groundwater can also affect construction works.
Plasticity	Plasticity of clay deposits should be confirmed, particularly where trees are present or proposed, to identify the shrink / swell risk. Clay recorded on site.
Sulphate	Unknown sulphate content of the made ground and natural.
Road / Pavement Design	Unknown CBR values for footpath and road design.

Table 6-1: Summary of geotechnical constraints.

7. Summary Conclusions and Recommendations

7.1. Summary Conclusions

Table 7-1 summarises the site details, historical review, environmental settings and site reconnaissance.

Current Site Use & Pertinent Features	Vacant land north of Tetrosyl warehouses, east of Bridge Hall Lane. Ground is comprised of demolition rubble from previous developments on site.
Proposed Development	Construction of Pump Room, 2no. Sprinkler Tanks and a GRP Kiosk.
Main Historical Features	Onsite: Mill Buildings, Electrical Substation, Road, tanks. Surrounding Area: Bridge Hall Paper Mill, Tetrosyl Works, Reservoir, Filter Beds, Electrical Substation
Geology / Hydrogeology	Artificial: No BGS recorded artificial. Superficial: Southeast of site: Alluvium (Clay, Silt, Sand and Gravel), Secondary undifferentiated aquifer. Northwest of Site: Diamicton Till, Secondary A Aquifer. Bedrock: West of site- Pennine Lower Coal Measures. Secondary A Aquifer. East of site- Grand Arch Sandstone, Secondary A Aquifer.
Landfills / Infilled ground	Recorded Landfills within 250m. Potentially infilled ground identified.
Other Relevant Environmental Settings etc.	The site is within a development high risk area. A coal mining risk assessment has been carried out under separate cover. Further assessment is required.

Table 7-1: Summary of site details, historical review, environmental settings and site reconnaissance.

A preliminary contamination conceptual model has been produced by LKC, which is summarised in Table 7-2.

Pollutant Linkage	Contaminants	Risk
PL1: Contaminants posing a risk to receptors via dermal contact, inhalation, ingestion (no viable pathway).	Asbestos, heavy metals, sulphates, PAHs	-
PL2: Volatile contaminants posing a risk to receptors via the inhalation of vapours.	Petroleum hydrocarbons, naphthalene	Moderate / Low
PL3: Gas posing a risk to buildings and receptors via the migration of gas into building causing explosion and asphyxiation.	Hazardous Gas (Carbon Dioxide, Methane)	Moderate
PL4: Mobile contamination posing a risk to controlled waters via the migration through permeable strata.	Chlorinated organic solvents, PAHs, metals, petroleum hydrocarbons	Moderate
PL5: Organic contaminants posing a risk to water pipes (no viable pathway).	Petroleum hydrocarbons, naphthalene	-

Table 7-2: Summary risk table.

A preliminary geotechnical assessment has been carried out by LKC. Table 7-3 summarises the geotechnical constraints.

Coal Mining	A coal mining risk assessment has been carried out separately. Intrusive Shallow Mining Investigation required to confirm the instability risk.
Slope Stability	Slope stability should be confirmed for the kiosk location.
Made Ground	Deep made ground present on site.

Table 7-3: Summary of geotechnical constraints.

Superficial	Unknown strength of soils for foundation design.
Bedrock	Mudstone bedrock recorded at 5.50mbgl by prior ground investigation. Depth to bedrock should be confirmed.
Groundwater	Unknown depth and variability of groundwater.
Plasticity	Plasticity of clay deposits should be confirmed.
Sulphate	Unknown sulphate content of the made ground and natural.
Road / Pavement Design	Unknown CBR values for footpath and road design should be calculated.

Table 7-4: Summary of geotechnical constraints (continued).

Based upon the available information, LKC conclude there is a viable contamination and geotechnical risk and therefore further assessment is recommended.

7.2. Recommendations

Recommendations are provided in Table 7-4.

Contamination Status	There is sufficient information on the potential contaminative status of the site to allow conditional approval of a planning application, based on the proposed end use detailed in the PRA.
Further Assessment Recommendations	Phase 2 intrusive investigation required. Phase 2 investigation to be carried out in line with current guidance, including BS10175 ¹⁰ , BS5930 ¹¹ CIRIA C665 ¹² , RB17 ¹³ and BS8485 ¹⁴ . 'Exploratory investigation': 1 sample per 25-50m square centres. Or 'detailed investigation': 1 sample per 10-25m square centres. Plus, targeted investigation locations in areas of concern (contamination and geotechnical).
Local Authority Approval	Conditional planning approval is likely to require an agreed detailed scope of work.
Type of Investigation Work	Boreholes and / or trial pits.
PL 2	Intrusive investigation work recommended to confirm ground conditions across the site. Testing of contaminants of concern based on preliminary conceptual model and field observations (PID tests and visual / olfactory evidence).
PL 3	Gas monitoring required. Gas monitoring: monitoring wells to be installed in boreholes, monitoring frequency and period subject to anticipated risk.
PL 4	Groundwater sampling. Groundwater samples to be collected from monitoring wells and tested for contaminants of concern based on preliminary conceptual model and ground conditions encountered.
Reporting	Information from the above can be used to carry out a contamination and geotechnical assessment and provide a remediation strategy for the site.

Table 7-5: Recommendations.

Further considerations are summarised in Table 7-5.

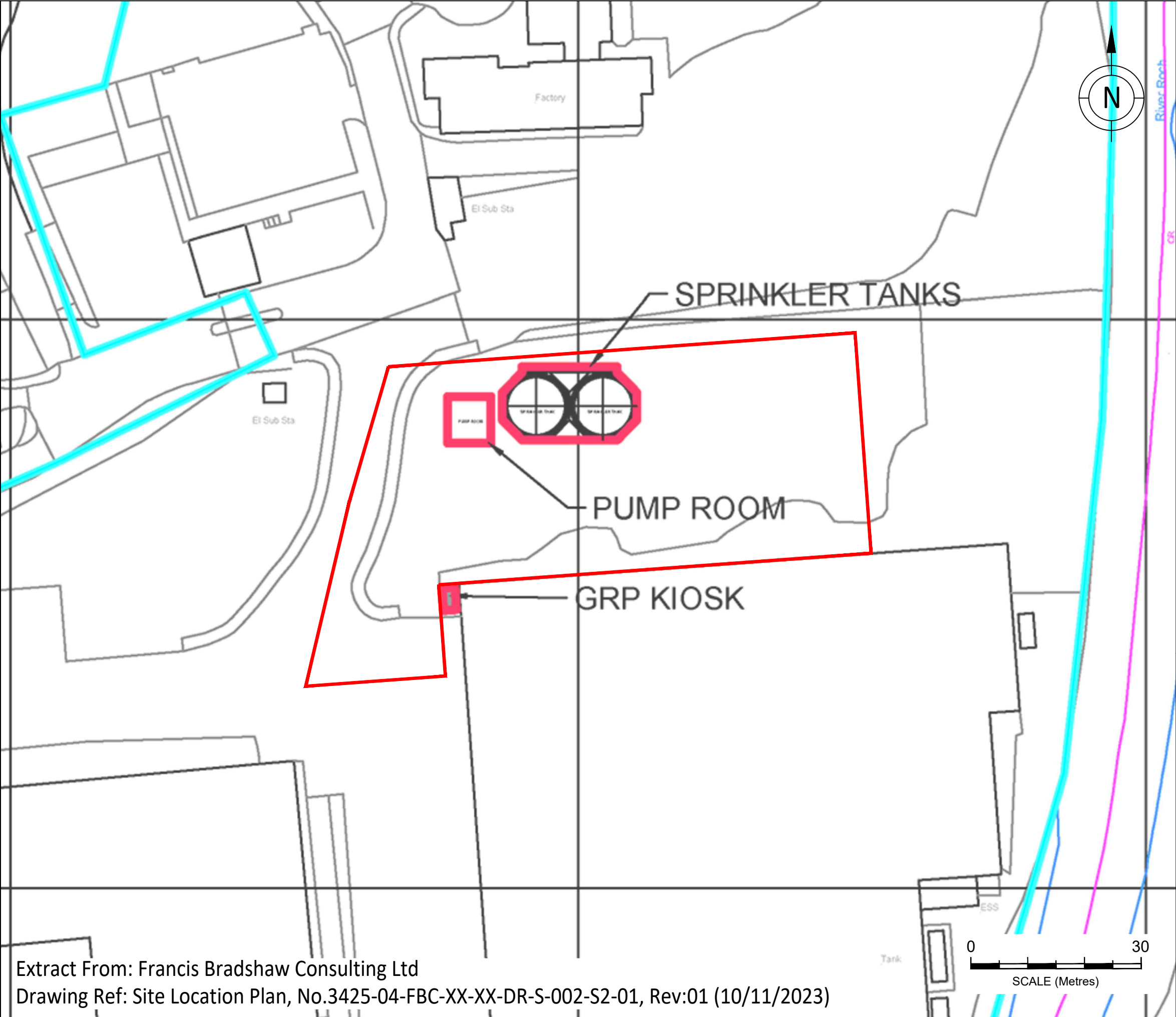
Waste Characterisation	As part of earthworks, the classification of the soils will be required to determine the most appropriate waste disposal route.
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Table 7-6: Further considerations.

Figures



Client: Tetrosyl Group Ltd				Title: Site Location & Boundary Plan		
Site: Tetrosyl Group Ltd. Bury				Scale (see scale bar): 1:25,000 & 1:1000 @ A4		
Job No.: LKC 23 1650	Drawn By: CD	Checked By: CW	Drawn: Dec 2023	Figure: 1	Revision:	



KEY

Site Boundary

Ownership Boundary

Sampling Locations and features annotated by LK Consult Ltd are approximate and are based upon observed measurements unless otherwise stated. Do not scale from this drawing and work from marked dimensions only. All dimensions and features should be confirmed on site by the Contractor. Where this drawing includes information provided to LK Consult Ltd by others, LK Consult Ltd gives no warranty, representation or assurance as to the accuracy of such information.

LK

CONSULT LIMITED

Client:

Tetrosyl Group Ltd

Site:

Tetrosyl Group Ltd, Bury

Title:

Proposed Development Plan

Job No.:

LKC 23 1650

Scale (See Scale Bar):

See Scale Bar

Figure:

2

Revision:

Drawn By:

AC

Checked By:

CD

Drawn:

Dec 2023

Appendix A – Historical Maps

Appendix B – Envirocheck Report

Appendix C – Historical Boreholes

Appendix D – Zetica UXO Unexploded Bomb Risk Map

Appendix E – Risk Evaluation

RISK EVALUATION

The method for risk evaluation is a qualitative method of interpreting the output from the risk estimation stage of the assessment, based on CIRIA 552¹⁵. It involves the classification of the:

- Magnitude of the potential consequence (severity) of the risk occurring (Table A).
- Magnitude of the probability (likelihood) of the risk occurring (Table B).

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

Table A. Classification of Consequence

Probability (Likelihood)	
Classification	Definition
High Likelihood	There is a pollutant linkage and an event that either appears very likely in the short term and almost inevitable over the long term, or there is evidence at the receptor of harm or pollution.
Likely	There is a 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.
Low Likelihood	There is a pollutant linkage and circumstances are possible under which an event could occur. However, it is by no means certain that even over a longer period such event would take place and is less likely in the shorter term.
Unlikely	There is a pollutant linkage, but circumstances are such that it is improbable that an event would occur in the very long term.

Table B. Classification of Probability.

These classifications are then compared to indicate the risk presented by each pollutant linkage (Table C). It is important that this classification is only applied where there is a possibility (which can range from high likelihood to unlikely) of a pollutant linkage existing.

		Consequence			
		Severe	Medium	Mild	Minor
Probability	High Likelihood	Very High Risk	High Risk	Moderate Risk	Moderate / Low Risk
	Likely	High Risk	Moderate Risk	Moderate / Low Risk	Low Risk
	Low Likelihood	Moderate Risk	Moderate / Low Risk	Low Risk	Very Low Risk
	Unlikely	Moderate / Low Risk	Low Risk	Very Low Risk	Very Low Risk

Table C. Comparison of Consequence against Probability

Once the risk has been determined the corresponding action can be assessed (Table D).

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

Table D. Description of the Classification and Likely Action Required.

Where a very low risk is identified no specific remediation is required.

Where a low risk is identified, some form of remediation may be required depending on the pollutant linkage, the type and concentration of contaminants present and the proposed development.

Where there is a moderate/low risk is identified, an assessment will be undertaken to establish what category the pollutant linkage will fall into.

Where LKC identifies a moderate or higher risk, remediation or further investigation work is recommended.

Appendix F - References

- ¹ Environment Agency, October 2020, "Land contamination risk management (LCRM). How to assess and manage the risks from land contamination".
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- ¹¹ The British Standards Institution (BSI), May 2020, "Code of practice for ground investigations", BS 5930:2015+A1:2020.
- ¹² CIRIA, December 2007, "Assessing risks posed by hazardous ground gases to buildings", C665.
- ¹³ CL:AIRE, November 2012, "A Pragmatic Approach to Ground Gas Risk Assessment", RB 17.
- ¹⁴ The British Standards Institution (BSI), January 2019, "Code of practice for the design of protective measures for methane and carbon dioxide ground gases for new buildings", BS 8485:2015+A1:2019.
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