

Site Investigations



Geologists



Environmental &  
Geotechnical  
Engineers



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FAO Rachael Kelly  
Mitsubishi Chemicals UK

13<sup>th</sup> November 2023

## CONTAMINATION ASSESSMENT

### Proposed New Building at Mitsubishi Chemicals, Haverton Hill S230718

Dear Rachael,

#### INTRODUCTION

The testing in this report was carried out by Solmek to the instructions of Mitsubishi Chemicals located within their Haverton Hill Site, Billingham.

#### Scope of Works

The client is considering construction of a proposed Utilities building. The client required a contamination assessment of the as dug material around the site.

An environmental assessment was requested. The information provided in this report is based on the investigation fieldwork, testing, analysis and is subject to the comments and approval of the various regulatory authorities.

There may be other conditions prevailing on the site which have not been disclosed by this investigation and which have not been taken into account by this report. Solmek reserve the right to alter conclusions and recommendations should further information be available or provided. Any schematic representation or opinion of the possible configuration of ground conditions between exploratory holes is conjectural and given for guidance only and confirmation of intermediate ground conditions should be considered if deemed necessary.

#### FIELDWORK

Four soil samples (TPA01 0.00-0.20m, TPA01 0.40-0.50m, TPA02 0.20-0.50m and TPA02 0.40-0.50m) were collected by Solmek. The samples were collected on 29<sup>th</sup> September 2023. Two boreholes (BH01 and BH02) were attempted to be sunk on the site, however concrete was encountered at 0.25mbgl in BH02 and frequent concrete cobbles at 1.00mbgl in BH01 prevented progression so drilling was terminated.

#### CONTAMINATION TESTING

To provide information upon the possibility of ground contamination four samples were selected for shallow contamination testing. The end use is a less sensitive commercial development. The following samples were tested:

- TPA01 0.00-0.20m,
- TPA01 0.40-0.50m,
- TPA02 0.20-0.50m
- TPA02 0.40-0.50m

The samples selected are considered to provide coverage of the various types of made ground deposits encountered which are likely to be encountered during the future site development by construction workers. The



samples were selected for the following tests:

- 4no Metals, semi-metals, non-metals, inorganic determinands
- 4no Asbestos identification screenings
- 4no Speciated Polyaromatic Hydrocarbons (PAHs)
- 4no Total Petroleum Hydrocarbon Criteria Working Group fractions (TPH CWG)
- 2no Waste Acceptance Criteria (WAC)

### Test Results

Based on the proposed development at the site, the test results have been compared to a series of LQM/CIEH Suitable 4 Use Levels (S4UL) based on a commercial land use. The latest LQM/CIEH S4UL were published in December 2014. In the absence of LQM/CIEH S4UL, Category 4 Screening Levels (March 2014), EA CLEA Thresholds (from Version 1.06, May 2011) and EA Lower Tier Threshold values have been adopted. The value for lead has been compared with the Category 4 Screening Level (March 2014) developed by Contaminated Land: Applications In Real Environments (CL:AIRE).

The test results are appended to this letter report and a summary is provided below in Tables 1 & 2.

**TABLE 1: SUMMARY OF INORGANIC CONTAMINATION TESTING RESULTS (COMMERCIAL)**

Determinant	Units	Number of Samples above Level of Detection	Minimum Level	Maximum Level	Commercial Value	Number of Results Exceeding Threshold Value
<b>Metals</b>						
Cadmium	mg/kg	3	<0.1	0.4	190	0
Chromium III	mg/kg	4	6.6	31	8600	0
Copper	mg/kg	4	10	120	68000	0
Lead	mg/kg	4	22	56	2300*	0
Inorganic Mercury	mg/kg	4	0.84	3.2	1100	0
Nickel	mg/kg	4	8	21	980	0
Zinc	mg/kg	4	91	330	730000	0
<b>Semi metals and non metals</b>						
Arsenic	mg/kg	4	5.3	20	640	0
Boron	mg/kg	4	0.3	3.6	240000	0
Selenium	mg/kg	0	<0.5	-	12000	0
<b>Inorganic chemicals</b>						
Cyanide (total)	mg/kg	3	<0.1	0.6	1580**	0
W.S. Sulphate	mg/l	4	30	640	2000^	0
<b>Other</b>						
pH	pH	-	8.8	9.4	<5.5^	0
* Category 4 Screening Levels, March 2014						
** CLEA Software Version 1.06 (pH7 and 1%SOM)						
^ EA Threshold Values						

### Metals, Semi Metals and Non-Metals

No samples indicated raised levels of contamination above the S4UL threshold values.

### Inorganic Chemicals

Soluble sulphates (potentially aggressive to foundation concrete) were recorded between 30 and 640mg/l. None of the samples were elevated above levels affecting human health however one of the four samples was raised above the BRE Special Digest 1 500mg/l limit for the sulphate classification of concrete.

The results of the pH testing were between 8.8 and 9.4. These pH levels are consistent with alkaline conditions.

### Organic Chemicals

The organic thresholds vary depending on the levels of soil organic matter (SOM). The average SOM recorded across the site was 1.175% therefore a SOM of 1.00% has been used to determine the S4UL thresholds. Table 2, below, summarises the results.

**TABLE 2: SUMMARY OF ORGANIC CONTAMINATION TESTING RESULTS (COMMERCIAL)**

Determinand	Units	Number of Samples above LOD	Minimum Level	Maximum Level	S4UL 1% SOM	S4UL 2.5% SOM	S4UL 6% SOM	Number of Results Exceeding Threshold Value
<b>TPH Aliphatic Fractions</b>								
C5-6	mg/kg	0	<0.01	-	<b>3200</b>	5900	12000	0
C6-8	mg/kg	0	<0.01	-	<b>77800</b>	17000	40000	0
C8-10	mg/kg	0	<0.01	-	<b>2000</b>	4800	11000	0
C10-12	mg/kg	0	<1.5	-	<b>9700</b>	23000	47000	0
C12-16	mg/kg	0	<1.2	-	<b>59000</b>	82000	90000	0
C16-35	mg/kg	0	<3.4	-	<b>1600000</b>	1700000	1800000	0
<b>TPH Aromatic Fractions</b>								
C5-7 (Benzene)	mg/kg	0	<0.01	-	<b>26000</b>	46000	86000	0
C7-8 (Toluene)	mg/kg	0	<0.01	-	<b>56000</b>	110000	180000	0
C8-10	mg/kg	0	<0.01	-	<b>3500</b>	8100	17000	0
C10-12	mg/kg	0	<0.9	-	<b>16000</b>	28000	34000	0
C12-16	mg/kg	0	<0.5	-	<b>36000</b>	37000	38000	0
C16-21	mg/kg	0	<0.6	-	<b>28000</b>	28000	28000	0
C21-35	mg/kg	0	<1.4	-	<b>28000</b>	28000	28000	0
<b>Speciated PAH</b>								
Naphthalene	mg/kg	0	<0.10	-	<b>190</b>	460	1100	0
Acenaphthylene	mg/kg	0	<0.10	-	<b>83000</b>	97000	100000	0
Acenaphthene	mg/kg	0	<0.10	-	<b>84000</b>	97000	100000	0
Fluorene	mg/kg	0	<0.10	-	<b>63000</b>	68000	71000	0
Phenanthrene	mg/kg	2	<0.10	0.9	<b>22000</b>	22000	23000	0
Anthracene	mg/kg	2	<0.10	0.2	<b>520000</b>	540000	540000	0
Fluoranthene	mg/kg	3	<0.10	2.1	<b>23000</b>	23000	23000	0
Pyrene	mg/kg	3	<0.10	2.2	<b>54000</b>	54000	54000	0
Benz' (a)anth' ene	mg/kg	2	<0.10	1.3	<b>170</b>	170	180	0
Chrysene	mg/kg	2	<0.10	1.4	<b>350</b>	350	350	0
Benz' (b)fluor' ene	mg/kg	1	<0.10	1.4	<b>44</b>	44	45	0
Benz' (k)fluor' ene	mg/kg	1	<0.10	1.0	<b>1200</b>	1200	1200	0
Benz' (a)pyrene	mg/kg	1	<0.10	1.6	<b>35</b>	35	36	0
Id' (123cd)pyrene	mg/kg	1	<0.10	0.8	<b>500</b>	510	510	0
Diben(ah)anth'ene	mg/kg	1	<0.10	0.2	<b>3.5</b>	3.6	3.6	0
Benz (ghi)per' ene	mg/kg	1	<0.10	0.9	<b>3900</b>	4000	4000	0
Total PAH	mg/kg	2	<1.60	14	<b>1000*</b>	1000*	1000*	0
<b>Other</b>								
Phenol	mg/kg	0	<0.30	-	<b>760</b>	1500	3200	0
* EA Threshold Values								

None of the samples were above the commercial S4UL thresholds for PAH and TPHCWG.

### Asbestos

From the four samples subject to asbestos screening no fibres were detected.

### CONTAMINATION ASSESSMENT

Assessment of the various receptors that may be affected by operations on the site are discussed below.

#### Users of the Site Once Development is Complete

The users of the site, particularly construction workers, are likely to be exposed to contaminants present in the soils beneath the site during redevelopment work. **Potential** exposure pathways include dermal absorption after contact with contaminated ground, inhalation of soil or dust, inhalation of volatised compounds, and inadvertent soil ingestion. Moreover a risk to ground/surface water receptors exists through leaching of contaminants.

To establish if the levels of contaminants present on site may pose a risk to the health of the future users of the site the results of the contamination testing have been compared to a series of LQM S4UL thresholds based on commercial end use (see Tables 1 and 2).

In terms of metals, semi-metals, non-metals and inorganic determinants none of the four samples subject to



testing returned any values above relevant threshold values. Similarly, speciated PAH determinants as well as TPH were all low and below threshold values considered to caused long term harm to human health for a commercial/industrial land use.

Based on the **shallow** soil contamination testing, it is considered that the levels of contamination are generally unlikely to pose a significant risk to future users of the site as soft landscaping is not proposed in the final development. The proposed development will in effect severe any potential pathways for contaminants to end users of the site.

However, during the site works if any zones of odorous, brightly coloured or suspected contaminated ground are encountered then work should cease in that area until the material has been tested. The results of the tests will determine whether or not remediation will be required.

The current legislation on waste involves the categorization of materials into inert waste, non-reactive hazardous wastes and hazardous wastes. The determination of the category depends on DEFRA landfill directive waste acceptance criteria (WAC) testing. Material taken off site may be subject to WAC by the appropriate waste disposal company.

### Waste Acceptance Criteria Testing

The current legislation on waste involves the categorisation of materials into Inert Waste, Non-Reactive Hazardous Wastes and Hazardous Wastes. The determination of the category depends on DEFRA landfill directive WAC. Material taken off site may be subject to WAC testing by the appropriate waste disposal company.

The results of the two inert WAC tests on the samples generally showed values of 10:1 leachate within the Inert Waste Category. Sulphate was raised above the inert waste category in the sample from TPA02 (0.40-0.50m).

The decision of the waste category is purely down to the discretion of the particular waste company used to remove the spoil. If any zones of odorous, brightly coloured or suspected contaminated ground are encountered then work should cease in that area until the material has been tested. The results of the tests will determine whether or not remediation will be required.

### Construction Workers and Users of Surrounding Sites

As good practice, full PPE must be employed in accordance with HSE guidance and safeguards should be taken to limit dust during ground works, and access to the public should be restricted. Construction workers should use gloves as a precaution when handling any fill materials as the pH levels in the soil were highly alkaline. Provision of suitable hygiene facilities are needed for site workers. Wheel washers should be provided and used for any vehicle entering or leaving site to prevent cross contamination.

Although asbestos was not detected from the soil samples subjected to testing within this investigation, the possibility exists that asbestos containing materials may still be present on site and currently lie undetected. It

is therefore advised that a 'watching brief' is undertaken during the any excavation works and advice sought if asbestos is found or suspected.

During dry weather, any excavations may require clean water to be sprinkled at shallow depth to prevent excess dust escaping to off-site receptors. Monitoring of dust concentrations during construction should be given careful consideration to ensure occupational exposure levels are not exceeded. Works should be undertaken in line with BRE: *The Control of Dust and Emissions from Construction and Demolition, Best Practice Guidance*.

### Vegetation

No soft landscaping is proposed in the development.

### Construction Materials

Materials at risk from potential soil contamination include inorganic matrices such as cement and concrete and also organic material; e.g. plastics and rubbers. Acid ground conditions and elevated levels of sulphates can accelerate the corrosion of building materials. Plastics and rubbers are generally used for piping and service

ducts and are potentially attacked by a range of chemicals, most of which are organic, particularly petroleum based substances. Drinking water supplies can be tainted by substances that can penetrate piping and water companies enforce stringent threshold values.

BRE Special Digest One: “*Concrete in Aggressive Ground*”: 2005 3<sup>rd</sup> Edition has been used to assess the risks posed to underground concrete and to establish the design measures required to mitigate the risks. The results of the pH and water-soluble sulphate tests (when converted to total potential sulphate) fall into Class DS-2 ACEC (Class AC-2) requirements for concrete protection. This assumes mobile groundwater conditions.

The levels of potential contaminants should be compared to thresholds supplied in the UK Water Industry Research (UKWIR) publication “Guidance for the selection of Water Supply Pipes to be used in Brownfield Sites” (January 2011). A Brownfield Site is defined in the document as “Land or premises that have previously been used or developed that may be vacant or derelict”. It should be noted that Brownfield sites may not be contaminated. The guidance does not apply to Greenfield Sites however water companies may have their own assessment criteria which should be checked by the developer.

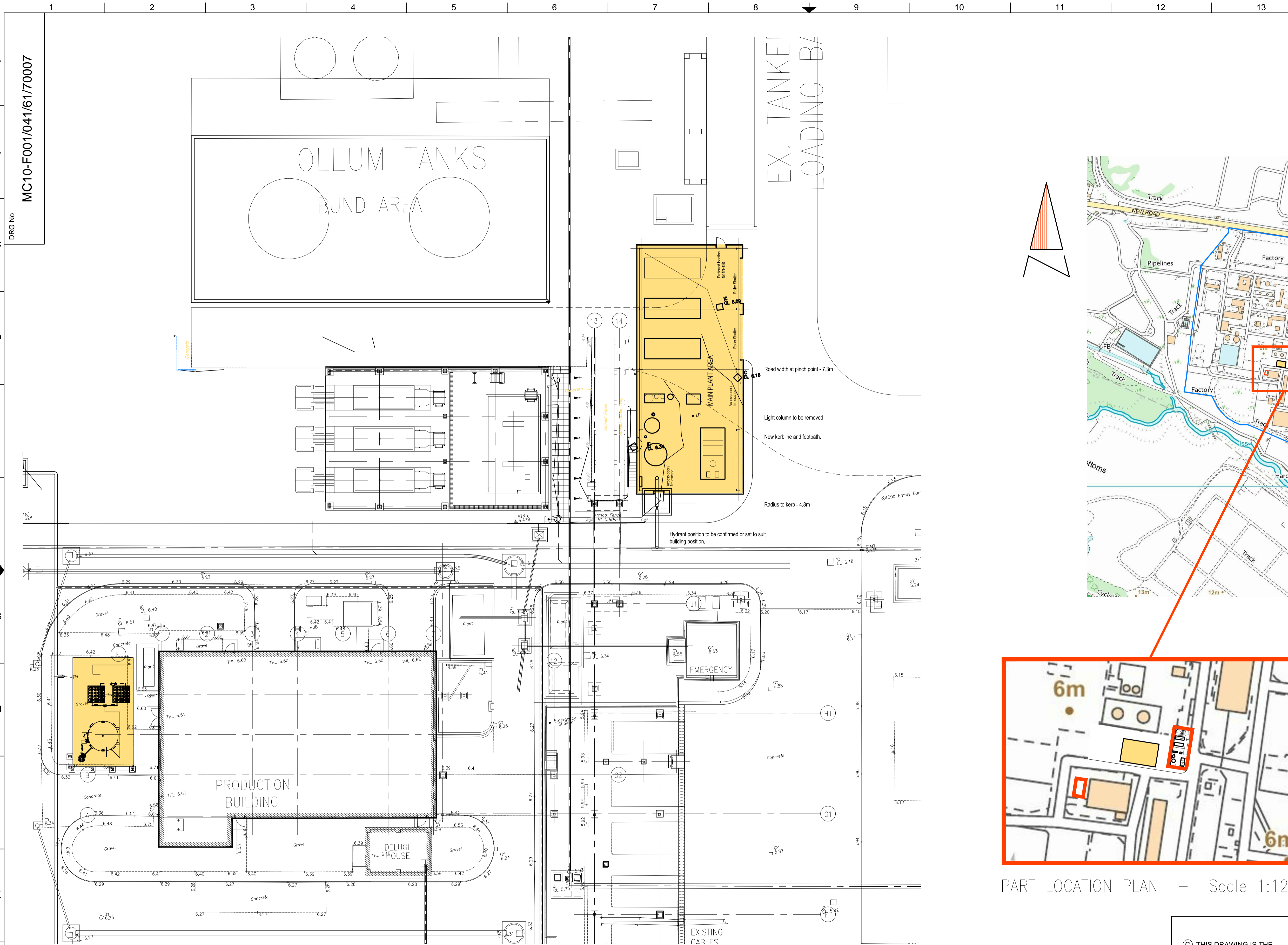
The concentrations of the selected determinants should be compared to the attached pipe material selection table and Consultation with the appropriate water supply company is required to identify the most suitable service fabric. However, the pH within the ground is too high to use copper pipes.

Yours sincerely,



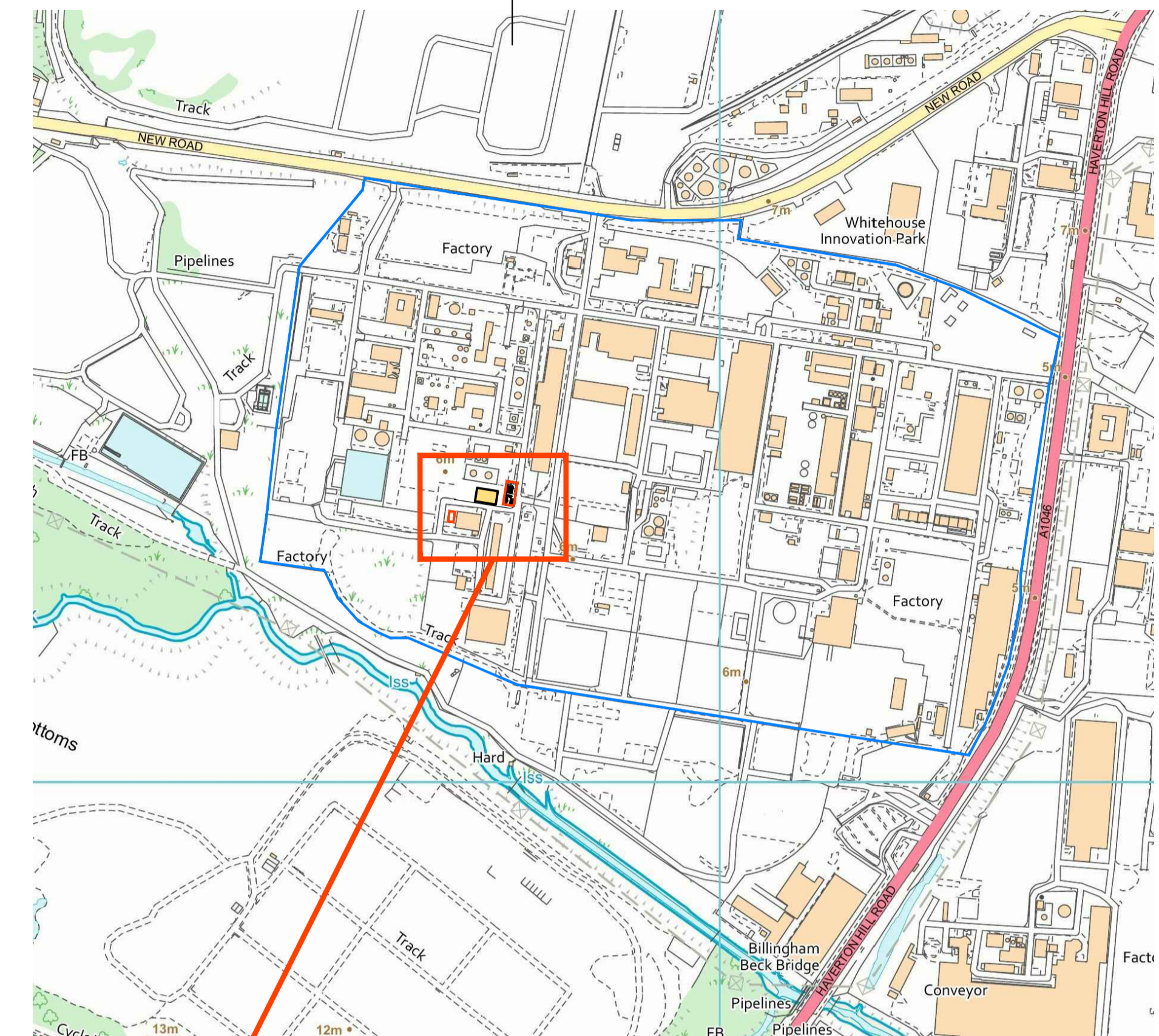
Deryck Simpson  
On behalf of Solmek Ltd.



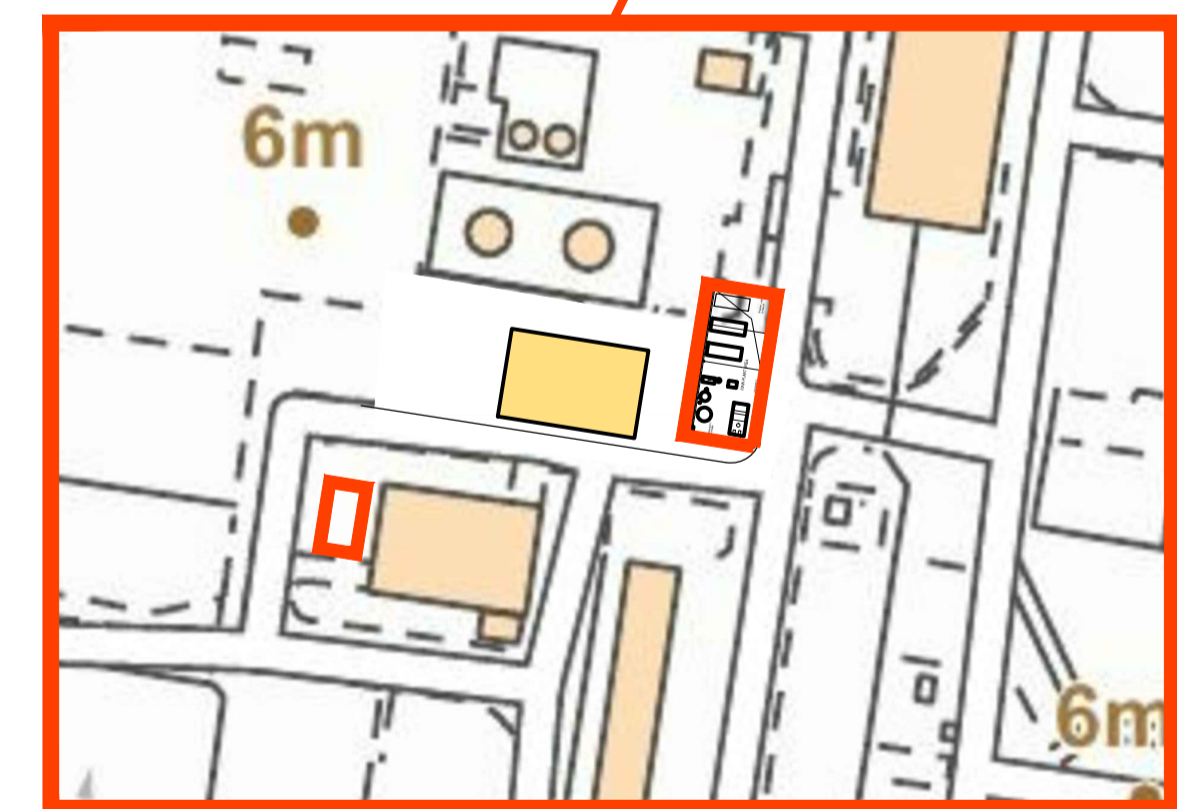


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REFERENCE DRGS, NOTES ETC



LOCATION PLAN - Scale 1:5000



PART LOCATION PLAN - Scale 1:1250

**CAUTION ! EXISTING SERVICES**  
 EVERY EFFORT IS MADE TO SHOW BURIED SERVICES ON DRAWINGS BUT FULL INFORMATION IS ONLY AVAILABLE ON SITE ONCE WORK HAS BEGUN.  
 THE CONTRACTOR MUST BE SATISFIED THAT THE AREA IS CLEAR OF ALL SERVICES PRIOR TO COMMENCING PILING OR EXCAVATION WORK.

PROPOSED SITE PLAN - Scale 1:200

REV NO	A	DATE	REV NO	DATE	REV NO	DATE	REV NO	DATE	REV NO	DATE	REV NO	DATE	REV NO	DATE	REV NO	DATE	REV NO	DATE	REV NO	DATE
DRN	NDP	06/06/23	DRN		DRN		DRN		DRN		DRN		DRN		DRN		DRN		DRN	
CHK	PM		CHK		CHK		CHK		CHK		CHK		CHK		CHK		CHK		CHK	
ISSUED FOR APPROVAL																				

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ORIGINAL		CLIENT	
SIZE A1	BY	DATE	MITSUBISHI CHEMICAL UK ELECTROLYTE DIVISION UTILITIES BUILDING - N2
DRAWN	NDP	25.05.23	PROJECT
CHECKED	PM	06.06.23	TITLE
TECH APP	PM	06.06.23	SITE AND LOCATION PLAN
ADMIN APP			SCALE
CLIENT APP			1:200@A1
CAD REF: Autocad		DRG No	REV
FILE LOCATION: J/221310/Arch/Issue		MC10-F001/041/61/70007	A



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# Borehole Log

Scale 1:50 Sheet 1 of 1

## BH01

<b>Contract no:</b> S230718	<b>Site:</b> Proposed New Building at Mitsubishi Chemicals, Haverton Hill	<b>Driller:</b> Bainbridge Brothers Ltd	<b>GL (AOD):</b>
<b>Client:</b> Mitsubishi Chemical Group		<b>Plant used:</b> Mini Rig	<b>Easting:</b>
<b>Method:</b> Small Percussive		<b>Started:</b> 07/08/2023	<b>Northing:</b>
		<b>Ended:</b> 07/08/2023	<b>Logged:</b> AL
		<b>Backfilled:</b> 07/08/2023	<b>Status:</b> DRAFT

Backfill / Installation	Legend	Depth (m)	Level (m AOD)	Stratum Description	Samples and Insitu Testing		
					Depth (m)	Type	Results
		0.00 - 0.20		MADE GROUND: Greyish brown gravelly sand. Sand is fine to coarse. Gravel is fine to coarse subangular to rounded of limestone, mudstone, concrete and sandstone.	0.00 - 0.20	B+ES	
		0.40 - 0.60			0.40 - 0.60	B+ES	
		0.60 - 0.90		MADE GROUND: Light grey slightly clayey slightly gravelly sand. Sand is fine to coarse. Gravel is fine to coarse angular to subrounded of mudstone, sandstone and concrete. (Frequent concrete cobbles)	0.90 - 1.00	B+ES	
		1.00		End of Borehole at 1.000m			

Hole Diameter				Casing Depths		General Remarks	Chiselling			Ground Water				
Depth Base (m)	Diameter (mm)	Depth Base (m)	Diameter (mm)	From (m)	To (m)		Time (hr)	Depth Strike (m)	Depth Casing (m)	Depth Sealed (m)	Time Elapsed (min)	Water Level (m)		
						1.2m Hand excavated inspection pit dug. No groundwater encountered.								







# DETS

## Certificate of Analysis

*Certificate Number* 23-23421

*Issued:* 13-Oct-23

*Client* SOLMEK  
12 Yarm Road  
Stockton On Tees  
Cleveland  
TS18 3NA

*Our Reference* 23-23421

*Client Reference* S230718

*Order No* SOL7725

*Contract Title* MITSUBISHI CHEMICALS

*Description* 4 Soil samples, 2 Leachate samples.

*Date Received* 03-Oct-23

*Date Started* 03-Oct-23

*Date Completed* 13-Oct-23

*Test Procedures* Identified by prefix DETSn (details on request).

*Notes* Opinions and interpretations are outside the laboratory's scope of ISO 17025 accreditation. This certificate is issued in accordance with the accreditation requirements of the United Kingdom Accreditation Service. The results reported herein relate only to the material supplied to the laboratory. This certificate shall not be reproduced except in full, without the prior written approval of the laboratory.

*Approved By*



Kirk Bridgewood  
General Manager



## Summary of Chemical Analysis

### Matrix Descriptions

*Our Ref* 23-23421

*Client Ref* S230718

*Contract Title* MITSUBISHI CHEMICALS

Sample ID	Depth	Lab No	Completed	Matrix Description
TPA01	0.00-0.20	2242245	13/10/2023	Brown gravelly, sandy CLAY including odd rootlets
TPA01	0.40-0.50	2242246	13/10/2023	Brown gravelly, sandy CLAY including odd rootlets
TPA02	0.20-0.50	2242247	13/10/2023	Brown very gravelly, sandy CLAY including odd rootlets
TPA02	0.40-0.50	2242248	13/10/2023	Brown gravelly, sandy CLAY including odd rootlets (Possible made ground - brick)

# Summary of Chemical Analysis

## Soil Samples

Our Ref 23-23421  
 Client Ref S230718  
 Contract Title MITSUBISHI CHEMICALS

Lab No	2242245	2242246	2242247	2242248
Sample ID	TPA01	TPA01	TPA02	TPA02
Depth	0.00-0.20	0.40-0.50	0.20-0.50	0.40-0.50
Other ID				
Sample Type	SOIL	SOIL	SOIL	SOIL
Sampling Date	29/09/2023	29/09/2023	29/09/2023	29/09/2023
Sampling Time	n/s	n/s	n/s	n/s

Test	Method	LOD	Units				
<b>Metals</b>							
Arsenic	DETSC 2301#	0.2	mg/kg	13	5.3	18	20
Boron, Water Soluble (2.5:1)	DETSC 2311#	0.2	mg/kg	2.1	0.3	3.4	3.6
Cadmium	DETSC 2301#	0.1	mg/kg	0.3	< 0.1	0.4	0.4
Chromium	DETSC 2301#	0.15	mg/kg	21	6.6	21	31
Copper	DETSC 2301#	0.2	mg/kg	120	10	52	49
Lead	DETSC 2301#	0.3	mg/kg	46	22	51	56
Mercury	DETSC 2325#	0.05	mg/kg	3.2	0.84	2.8	3.1
Nickel	DETSC 2301#	1	mg/kg	20	8.0	18	21
Selenium	DETSC 2301#	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
Zinc	DETSC 2301#	1	mg/kg	210	91	270	330
<b>Inorganics</b>							
pH	DETSC 2008#		pH	8.8	8.9	9.4	9.1
Cyanide, Total	DETSC 2130#	0.1	mg/kg	0.6	< 0.1	0.2	0.3
Organic matter	DETSC 2002#	0.1	%	1.1	0.4	1.5	1.7
Sulphate Aqueous Extract as SO4 (2:1)	DETSC 2076#	10	mg/l	230	30	640	480
<b>Petroleum Hydrocarbons</b>							
Aliphatic C5-C6: HS_1D_AL	DETSC 3321*	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01
Aliphatic C6-C8: HS_1D_AL	DETSC 3321*	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01
Aliphatic C8-C10: HS_1D_AL	DETSC 3321*	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01
Aliphatic C10-C12: EH_CU_1D_AL	DETSC 3072#	1.5	mg/kg	< 1.5	< 1.5	< 1.5	< 1.5
Aliphatic C12-C16: EH_CU_1D_AL	DETSC 3072#	1.2	mg/kg	< 1.2	< 1.2	< 1.2	< 1.2
Aliphatic C16-C21: EH_CU_1D_AL	DETSC 3072#	1.5	mg/kg	< 1.5	< 1.5	< 1.5	< 1.5
Aliphatic C21-C35: EH_CU_1D_AL	DETSC 3072#	3.4	mg/kg	< 3.4	< 3.4	< 3.4	< 3.4
Aliphatic C5-C35: EH_CU+HS_1D_AL	DETSC 3072*	10	mg/kg	< 10	< 10	< 10	< 10
Aromatic C5-C7: HS_1D_AR	DETSC 3321*	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01
Aromatic C7-C8: HS_1D_AR	DETSC 3321*	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01
Aromatic C8-C10: HS_1D_AR	DETSC 3321*	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01
Aromatic C10-C12: EH_CU_1D_AR	DETSC 3072#	0.9	mg/kg	< 0.9	< 0.9	< 0.9	< 0.9
Aromatic C12-C16: EH_CU_1D_AR	DETSC 3072#	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
Aromatic C16-C21: EH_CU_1D_AR	DETSC 3072#	0.6	mg/kg	< 0.6	< 0.6	< 0.6	< 0.6
Aromatic C21-C35: EH_CU_1D_AR	DETSC 3072#	1.4	mg/kg	< 1.4	< 1.4	< 1.4	< 1.4
Aromatic C5-C35: EH_CU+HS_1D_AR	DETSC 3072*	10	mg/kg	< 10	< 10	< 10	< 10
TPH Ali/Aro Total C5-C35: EH_CU+HS_1D_Total	DETSC 3072*	10	mg/kg	< 10	< 10	< 10	< 10
<b>PAHs</b>							
Naphthalene	DETSC 3301	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1
Acenaphthylene	DETSC 3301	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1
Acenaphthene	DETSC 3301	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1
Fluorene	DETSC 3301	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1
Phenanthrene	DETSC 3301	0.1	mg/kg	0.9	< 0.1	0.8	< 0.1
Anthracene	DETSC 3301	0.1	mg/kg	0.2	< 0.1	0.2	< 0.1

## Summary of Chemical Analysis Soil Samples

Our Ref 23-23421

Client Ref S230718

Contract Title MITSUBISHI CHEMICALS

<b>Lab No</b>	2242245	2242246	2242247	2242248
<b>Sample ID</b>	TPA01	TPA01	TPA02	TPA02
<b>Depth</b>	0.00-0.20	0.40-0.50	0.20-0.50	0.40-0.50
<b>Other ID</b>				
<b>Sample Type</b>	SOIL	SOIL	SOIL	SOIL
<b>Sampling Date</b>	29/09/2023	29/09/2023	29/09/2023	29/09/2023
<b>Sampling Time</b>	n/s	n/s	n/s	n/s

Test	Method	LOD	Units				
Fluoranthene	DETSC 3301	0.1	mg/kg	1.0	< 0.1	2.1	0.7
Pyrene	DETSC 3301	0.1	mg/kg	1.0	< 0.1	2.2	0.7
Benzo(a)anthracene	DETSC 3301	0.1	mg/kg	0.4	< 0.1	1.3	< 0.1
Chrysene	DETSC 3301	0.1	mg/kg	0.4	< 0.1	1.4	< 0.1
Benzo(b)fluoranthene	DETSC 3301	0.1	mg/kg	< 0.1	< 0.1	1.4	< 0.1
Benzo(k)fluoranthene	DETSC 3301	0.1	mg/kg	< 0.1	< 0.1	1.0	< 0.1
Benzo(a)pyrene	DETSC 3301	0.1	mg/kg	< 0.1	< 0.1	1.6	< 0.1
Indeno(1,2,3-c,d)pyrene	DETSC 3301	0.1	mg/kg	< 0.1	< 0.1	0.8	< 0.1
Dibenzo(a,h)anthracene	DETSC 3301	0.1	mg/kg	< 0.1	< 0.1	0.2	< 0.1
Benzo(g,h,i)perylene	DETSC 3301	0.1	mg/kg	< 0.1	< 0.1	0.9	< 0.1
PAH 16 Total	DETSC 3301	1.6	mg/kg	4.0	< 1.6	14	< 1.6
<b>Phenols</b>							
Phenol - Monohydric	DETSC 2130#	0.3	mg/kg	< 0.3	< 0.3	< 0.3	< 0.3

# WASTE ACCEPTANCE CRITERIA TESTING ANALYTICAL REPORT

Our Ref 23-23421

Client Ref S230718

Contract Title MITSUBISHI CHEMICALS

Sample Id TPA01 0.00-0.20

Sample Numbers 2242245 2242249

Date Analysed 12/10/2023

Test Results On Waste			WAC Limit Values		
Determinand and Method Reference	Units	Result	Inert Waste	SNRHW	Hazardous Waste
DETSC 2084# Total Organic Carbon	%	2.5	3	5	6
DETSC 2003# Loss On Ignition	%	2.4	n/a	n/a	10
DETSC 3321# BTEX	mg/kg	< 0.04	6	n/a	n/a
DETSC 3401# PCBs (7 congeners)	mg/kg	< 0.01	1	n/a	n/a
DETSC 3311# EPH (C10 - C40): EH_1D_Total	mg/kg	91.0	500	n/a	n/a
DETSC 3301 PAHs	mg/kg	4.0	100	n/a	n/a
DETSC 2008# pH	pH Units	8.8	n/a	>6	n/a
DETSC 2073* Acid Neutralisation Capacity (pH4)	mol/kg	< 1.0	n/a	TBE	TBE
DETSC 2073* Acid Neutralisation Capacity (pH7)	mol/kg	< 1.0	n/a	TBE	TBE

Test Results On Leachate			WAC Limit Values		
Determinand and Method Reference	Conc in Eluate ug/l	Amount Leached* mg/kg	Limit values for LS10 Leachate		
	10:1	LS10	Inert Waste	SNRHW	Hazardous Waste
DETSC 2306 Arsenic as As	1.8	0.018	0.5	2	25
DETSC 2306 Barium as Ba	19	0.19	20	100	300
DETSC 2306 Cadmium as Cd	< 0.030	< 0.02	0.04	1	5
DETSC 2306 Chromium as Cr	0.87	< 0.1	0.5	10	70
DETSC 2306 Copper as Cu	0.99	< 0.02	2	50	100
DETSC 2306 Mercury as Hg	0.028	< 0.002	0.01	0.2	2
DETSC 2306 Molybdenum as Mo	2.9	< 0.1	0.5	10	30
DETSC 2306 Nickel as Ni	< 0.50	< 0.1	0.4	10	40
DETSC 2306 Lead as Pb	0.59	< 0.05	0.5	10	50
DETSC 2306 Antimony as Sb	0.69	< 0.05	0.06	0.7	5
DETSC 2306 Selenium as Se	0.68	< 0.03	0.1	0.5	7
DETSC 2306 Zinc as Zn	2.2	0.022	4	50	200
DETSC 2055 Chloride as Cl	3300	< 100	800	15,000	25,000
DETSC 2055* Fluoride as F	470	4.7	10	150	500
DETSC 2055 Sulphate as SO4	32000	320	1000	20,000	50,000
DETSC 2009* Total Dissolved Solids	35000	350	4000	60,000	100,000
DETSC 2130 Phenol Index	< 100	< 1	1	n/a	n/a
DETSC 2033* Dissolved Organic Carbon	2000	< 50	500	800	1000

Additional Information	
DETSC 2008 pH	7.6
DETSC 2009 Conductivity uS/cm	50.0
* Temperature*	19.0
Mass of Sample Kg*	0.100
Mass of dry Sample Kg*	0.093
Stage 1	
Volume of Leachant L2*	0.92
Volume of Eluate VE1*	0.87

TBE - To Be Evaluated
SNRHW - Stable Non-Reactive
Hazardous Waste

Disclaimer: The WAC limit values are provided for guidance only. DETS does not accept responsibility for errors or omissions. Values are correct at time of issue.

\* DETS are accredited for the testing of leachates and not the leachate preparation stage which is unaccredited.

# WASTE ACCEPTANCE CRITERIA TESTING ANALYTICAL REPORT

Our Ref 23-23421

Client Ref S230718

Contract Title MITSUBISHI CHEMICALS

Sample Id TPA02 0.40-0.50

Sample Numbers 2242248 2242250

Date Analysed 13/10/2023

Test Results On Waste			WAC Limit Values		
Determinand and Method Reference	Units	Result	Inert Waste	SNRHW	Hazardous Waste
DETSC 2084# Total Organic Carbon	%	2.4	3	5	6
DETSC 2003# Loss On Ignition	%	3.0	n/a	n/a	10
DETSC 3321# BTEX	mg/kg	< 0.04	6	n/a	n/a
DETSC 3401# PCBs (7 congeners)	mg/kg	< 0.01	1	n/a	n/a
DETSC 3311# EPH (C10 - C40): EH_1D_Total	mg/kg	92.0	500	n/a	n/a
DETSC 3301 PAHs	mg/kg	< 1.6	100	n/a	n/a
DETSC 2008# pH	pH Units	9.1	n/a	>6	n/a
DETSC 2073* Acid Neutralisation Capacity (pH4)	mol/kg	< 1.0	n/a	TBE	TBE
DETSC 2073* Acid Neutralisation Capacity (pH7)	mol/kg	< 1.0	n/a	TBE	TBE

Test Results On Leachate			WAC Limit Values		
Determinand and Method Reference	Conc in Eluate ug/l	Amount Leached* mg/kg	Limit values for LS10 Leachate		
	10:1	LS10	Inert Waste	SNRHW	Hazardous Waste
DETSC 2306 Arsenic as As	3	0.03	0.5	2	25
DETSC 2306 Barium as Ba	36	0.36	20	100	300
DETSC 2306 Cadmium as Cd	< 0.030	< 0.02	0.04	1	5
DETSC 2306 Chromium as Cr	0.62	< 0.1	0.5	10	70
DETSC 2306 Copper as Cu	1.2	< 0.02	2	50	100
DETSC 2306 Mercury as Hg	0.017	< 0.002	0.01	0.2	2
DETSC 2306 Molybdenum as Mo	21	0.21	0.5	10	30
DETSC 2306 Nickel as Ni	0.71	< 0.1	0.4	10	40
DETSC 2306 Lead as Pb	0.14	< 0.05	0.5	10	50
DETSC 2306 Antimony as Sb	2.9	< 0.05	0.06	0.7	5
DETSC 2306 Selenium as Se	1.7	< 0.03	0.1	0.5	7
DETSC 2306 Zinc as Zn	< 1.3	< 0.01	4	50	200
DETSC 2055 Chloride as Cl	5900	< 100	800	15,000	25,000
DETSC 2055* Fluoride as F	520	5.2	10	150	500
DETSC 2055 Sulphate as SO4	130000	1300	1000	20,000	50,000
DETSC 2009* Total Dissolved Solids	87000	870	4000	60,000	100,000
DETSC 2130 Phenol Index	< 100	< 1	1	n/a	n/a
DETSC 2033* Dissolved Organic Carbon	3400	< 50	500	800	1000

Additional Information	
DETSC 2008 pH	7.3
DETSC 2009 Conductivity uS/cm	124.0
* Temperature*	19.0

Mass of Sample Kg*	0.110
Mass of dry Sample Kg*	0.097
Stage 1	
Volume of Leachant L2*	0.958
Volume of Eluate VE1*	0.9

TBE - To Be Evaluated  
SNRHW - Stable Non-Reactive  
Hazardous Waste

Disclaimer: The WAC limit values are provided for guidance only. DETS does not accept responsibility for errors or omissions. Values are correct at time of issue.

\* DETS are accredited for the testing of leachates and not the leachate preparation stage which is unaccredited.

## Summary of Asbestos Analysis

### Soil Samples

*Our Ref* 23-23421

*Client Ref* S230718

*Contract Title* MITSUBISHI CHEMICALS

Lab No	Sample ID	Material Type	Result	Comment*	Analyst
2242245	TPA01 0.00-0.20	SOIL	NAD	none	Barry Kelly
2242246	TPA01 0.40-0.50	SOIL	NAD	none	Barry Kelly
2242247	TPA02 0.20-0.50	SOIL	NAD	none	Barry Kelly
2242248	TPA02 0.40-0.50	SOIL	NAD	none	Barry Kelly

Crocidolite = Blue Asbestos, Amosite = Brown Asbestos, Chrysotile = White Asbestos. Anthophyllite, Actinolite and Tremolite are other forms of Asbestos. Samples are analysed by DETSC 1101 using polarised light microscopy in accordance with HSG248 and documented in-house methods. NAD = No Asbestos Detected. Where a sample is NAD, the result is based on analysis of at least 2 sub-samples and should be taken to mean 'no asbestos detected in sample'. Key: \* - not included in laboratory scope of accreditation.

## Information in Support of the Analytical Results

Our Ref 23-23421  
 Client Ref S230718  
 Contract MITSUBISHI CHEMICALS

### Containers Received & Deviating Samples

Lab No	Sample ID	Date Sampled	Containers Received	Holding time exceeded for tests	Inappropriate container for tests
2242245	TPA01 0.00-0.20 SOIL	29/09/23	GJ 250ml, PT 1L x2		BTEX / C5-C10
2242246	TPA01 0.40-0.50 SOIL	29/09/23	GJ 250ml, PT 1L x2		BTEX / C5-C10
2242247	TPA02 0.20-0.50 SOIL	29/09/23	GJ 250ml, PT 1L x2		BTEX / C5-C10
2242248	TPA02 0.40-0.50 SOIL	29/09/23	GJ 250ml, PT 1L x2		BTEX / C5-C10
2242249	TPA01 0.00-0.20 LEACHATE	29/09/23	GJ 250ml, PT 1L x2		
2242250	TPA02 0.40-0.50 LEACHATE	29/09/23	GJ 250ml, PT 1L x2		

Key: G-Glass P-Plastic J-Jar T-Tub

DETS cannot be held responsible for the integrity of samples received whereby the laboratory did not undertake the sampling. In this instance samples received may be deviating. Deviating Sample criteria are based on British and International standards and laboratory trials in conjunction with the UKAS note 'Guidance on Deviating Samples'. All samples received are listed above. However, those samples that have additional comments in relation to hold time, inappropriate containers etc are deviating due to the reasons stated. This means that the analysis is accredited where applicable, but results may be compromised due to sample deviations. If no sampled date (soils) or date+time (waters) has been supplied then samples are deviating. However, if you are able to supply a sampled date (and time for waters) this will prevent samples being reported as deviating where specific hold times are not exceeded and where the container supplied is suitable.

### Soil Analysis Notes

Inorganic soil analysis was carried out on a dried sample, crushed to pass a 425µm sieve, in accordance with BS1377.

Organic soil analysis was carried out on an 'as received' sample. Organics results are corrected for moisture and expressed on a dry weight basis.

The Loss on Drying, used to express organics analysis on an air dried basis, is carried out at a temperature of 28°C +/-2°C.

### Disposal

From the issue date of this test certificate, samples will be held for the following times prior to disposal :-

Soils - 1 month, Liquids - 2 weeks, Asbestos (test portion) - 6 months



## Information in Support of the Analytical Results

List of HWOL Acronyms and Operators

Acronym	Description
HS	Headspace analysis
EH	Extractable Hydrocarbons - i.e. everything extracted by the solvent
CU	Clean-up - e.g. by florisil, silica gel
1D	GC - Single coil gas chromatography
2D	GC-GC - Double coil gas chromatography
Total	Aliphatics & Aromatics
AL	Aliphatics only
AR	Aromatics only
#1	EH_2D_Total but with humics mathematically subtracted
#2	EH_2D_Total but with fatty acids mathematically subtracted
_	Operator - underscore to separate acronyms (exception for +)
+	Operator to indicate cumulative eg. EH+HS_Total or EH_CU+HS_Total

Det	Acronym
Aliphatic C5-C6	HS_1D_AL

## Appendix A - Details of Analysis

Method	Parameter	Units	Limit of Detection	Sample Preparation	Sub-Contracted	UKAS	MCERTS
DETSC 2002	Organic matter	%	0.1	Air Dried	No	Yes	Yes
DETSC 2003	Loss on ignition	%	0.01	Air Dried	No	Yes	Yes
DETSC 2008	pH	pH Units	1	Air Dried	No	Yes	Yes
DETSC 2076	Sulphate Aqueous Extract as SO <sub>4</sub>	mg/l	10	Air Dried	No	Yes	Yes
DETSC 2084	Total Organic Carbon	%	0.5	Air Dried	No	Yes	Yes
DETSC 2119	Ammoniacal Nitrogen as N	mg/kg	0.5	Air Dried	No	Yes	Yes
DETSC 2130	Cyanide free	mg/kg	0.1	Air Dried	No	Yes	Yes
DETSC 2130	Cyanide total	mg/kg	0.1	Air Dried	No	Yes	Yes
DETSC 2130	Phenol - Monohydric	mg/kg	0.3	Air Dried	No	Yes	Yes
DETSC 2130	Thiocyanate	mg/kg	0.6	Air Dried	No	Yes	Yes
DETSC 2301	Arsenic	mg/kg	0.2	Air Dried	No	Yes	Yes
DETSC 2301	Barium	mg/kg	1.5	Air Dried	No	Yes	Yes
DETSC 2301	Beryllium	mg/kg	0.2	Air Dried	No	Yes	Yes
DETSC 2301	Cadmium Available	mg/kg	0.1	Air Dried	No	Yes	Yes
DETSC 2301	Cadmium	mg/kg	0.1	Air Dried	No	Yes	Yes
DETSC 2301	Cobalt	mg/kg	0.7	Air Dried	No	Yes	Yes
DETSC 2301	Chromium	mg/kg	0.15	Air Dried	No	Yes	Yes
DETSC 2301	Copper	mg/kg	0.2	Air Dried	No	Yes	Yes
DETSC 2301	Manganese	mg/kg	20	Air Dried	No	Yes	Yes
DETSC 2301	Molybdenum	mg/kg	0.4	Air Dried	No	Yes	Yes
DETSC 2301	Nickel	mg/kg	1	Air Dried	No	Yes	Yes
DETSC 2301	Lead	mg/kg	0.3	Air Dried	No	Yes	Yes
DETSC 2301	Selenium	mg/kg	0.5	Air Dried	No	Yes	Yes
DETSC 2301	Zinc	mg/kg	1	Air Dried	No	Yes	Yes
DETSC 2311	Boron (water soluble)	mg/kg	0.2	Air Dried	No	Yes	Yes
DETSC 2321	Total Sulphate as SO <sub>4</sub>	%	0.01	Air Dried	No	Yes	Yes
DETSC 2325	Mercury	mg/kg	0.05	Air Dried	No	Yes	Yes
DETSC 3049	Sulphur (free)	mg/kg	0.75	As Received	No	Yes	Yes
DETSC 3072	Ali/Aro C10-C35	mg/kg	10	As Received	No	Yes	Yes
DETSC 3072	Aliphatic C10-C12	mg/kg	1.5	As Received	No	Yes	Yes
DETSC 3072	Aliphatic C10-C35	mg/kg	10	As Received	No	Yes	Yes
DETSC 3072	Aliphatic C12-C16	mg/kg	1.2	As Received	No	Yes	Yes
DETSC 3072	Aliphatic C16-C21	mg/kg	1.5	As Received	No	Yes	Yes
DETSC 3072	Aliphatic C21-C35	mg/kg	3.4	As Received	No	Yes	Yes
DETSC 3072	Aromatic C10-C12	mg/kg	0.9	As Received	No	Yes	Yes
DETSC 3072	Aromatic C10-C35	mg/kg	10	As Received	No	Yes	Yes
DETSC 3072	Aromatic C12-C16	mg/kg	0.5	As Received	No	Yes	Yes
DETSC 3072	Aromatic C16-C21	mg/kg	0.6	As Received	No	Yes	Yes
DETSC 3072	Aromatic C21-C35	mg/kg	1.4	As Received	No	Yes	Yes
DETSC 3303	Acenaphthene	mg/kg	0.03	As Received	No	Yes	Yes
DETSC 3303	Acenaphthylene	mg/kg	0.03	As Received	No	Yes	Yes
DETSC 3303	Benzo(a)pyrene	mg/kg	0.03	As Received	No	Yes	Yes
DETSC 3303	Benzo(a)anthracene	mg/kg	0.03	As Received	No	Yes	Yes
DETSC 3303	Benzo(b)fluoranthene	mg/kg	0.03	As Received	No	Yes	Yes
DETSC 3303	Benzo(k)fluoranthene	mg/kg	0.03	As Received	No	Yes	Yes
DETSC 3303	Benzo(g,h,i)perylene	mg/kg	0.03	As Received	No	Yes	Yes
DETSC 3303	Dibenzo(a,h)anthracene	mg/kg	0.03	As Received	No	Yes	Yes
DETSC 3303	Fluoranthene	mg/kg	0.03	As Received	No	Yes	Yes

## Appendix A - Details of Analysis

Method	Parameter	Units	Limit of Detection	Sample Preparation	Sub-Contracted	UKAS	MCERTS
DETSC 3303	Indeno(1,2,3-c,d)pyrene	mg/kg	0.03	As Received	No	Yes	Yes
DETSC 3303	Naphthalene	mg/kg	0.03	As Received	No	Yes	Yes
DETSC 3303	Phenanthrene	mg/kg	0.03	As Received	No	Yes	Yes
DETSC 3303	Pyrene	mg/kg	0.03	As Received	No	Yes	Yes
DETSC 3311	C10-C24 Diesel Range Organics (DRO)	mg/kg	10	As Received	No	Yes	Yes
DETSC 3311	C24-C40 Lube Oil Range Organics (LORO)	mg/kg	10	As Received	No	Yes	Yes
DETSC 3311	EPH (C10-C40)	mg/kg	10	As Received	No	Yes	Yes
DETSC 3321	Benzene	mg/kg	0.01	As Received	No	Yes	Yes
DETSC 3321	Ethylbenzene	mg/kg	0.01	As Received	No	Yes	Yes
DETSC 3321	Toluene	mg/kg	0.01	As Received	No	Yes	Yes
DETSC 3321	Xylene	mg/kg	0.01	As Received	No	Yes	Yes
DETSC 3321	m+p Xylene	mg/kg	0.01	As Received	No	Yes	Yes
DETSC 3321	o Xylene	mg/kg	0.01	As Received	No	Yes	Yes
DETSC 3401	PCB 28 + PCB 31	mg/kg	0.01	As Received	No	Yes	Yes
DETSC 3401	PCB 52	mg/kg	0.01	As Received	No	Yes	Yes
DETSC 3401	PCB 101	mg/kg	0.01	As Received	No	Yes	Yes
DETSC 3401	PCB 118	mg/kg	0.01	As Received	No	Yes	Yes
DETSC 3401	PCB 153	mg/kg	0.01	As Received	No	Yes	Yes
DETSC 3401	PCB 138	mg/kg	0.01	As Received	No	Yes	Yes
DETSC 3401	PCB 180	mg/kg	0.01	As Received	No	Yes	Yes
DETSC 3401	PCB Total	mg/kg	0.01	As Received	No	Yes	Yes
DETSC 3521	Ali/Aro C10-C35	mg/kg	10	As Received	No	Yes	Yes
DETSC 3521	Aliphatic C10-C12	mg/kg	1.5	As Received	No	Yes	Yes
DETSC 3521	Aliphatic C10-C35	mg/kg	10	As Received	No	Yes	Yes
DETSC 3521	Aliphatic C12-C16	mg/kg	1.2	As Received	No	Yes	Yes
DETSC 3521	Aliphatic C16-C21	mg/kg	1.5	As Received	No	Yes	Yes
DETSC 3521	Aliphatic C21-C35	mg/kg	3.4	As Received	No	Yes	Yes
DETSC 3521	Aromatic C10-C12	mg/kg	0.9	As Received	No	Yes	Yes
DETSC 3521	Aromatic C10-C35	mg/kg	10	As Received	No	Yes	Yes
DETSC 3521	Aromatic C12-C16	mg/kg	0.5	As Received	No	Yes	Yes
DETSC 3521	Aromatic C16-C21	mg/kg	0.6	As Received	No	Yes	Yes
DETSC 3521	Aromatic C21-C35	mg/kg	1.4	As Received	No	Yes	Yes

Method details are shown only for those determinands listed in Annex A of the MCERTS standard. Anything not included on this list falls outside the scope of MCERTS. No Recovery Factors are used in the determination of results. Results reported assume 100% recovery. Full method statements are available on request.

End of Report

## **♣Solmek conditions of offer, notes on limitations & basis for contract (ref: version1/2023)**

These conditions accompany our tender and supercede any previous conditions issued. Solmek will prepare a report solely for the use of the Client (the party invoiced) and its agent(s). No reliance should be placed on the contents of this report, in whole or in part by 3<sup>rd</sup> parties. The report, its content and format and associated data are copyright, and the property of Solmek. Photocopying of part or all of the contents, transfer or reproduction of any kind is forbidden without written permission from Solmek. A charge may be levied against such approval, the same to be made at the discretion of Solmek.

Solmek cannot be held liable and do not warrant, or otherwise guarantee the validity of information provided by third parties and subsequently used in our reports. Solmek are not responsible for the action negligent of otherwise of subcontractors or third parties.

Site investigation is a process of sampling. The scope and size of an investigation may be considered proportional to levels of confidence regarding the ground and groundwater conditions. The exploratory holes undertaken investigate only a small volume of the ground in relation to the overall size of the site, and can only provide a general indication of site conditions. The opinions provided and recommendations given in this report are based on the ground conditions as encountered within each of the exploratory holes. There may be different ground conditions elsewhere on the site which have not been identified by this investigation and which therefore have not been taken into account in this report. Reports are generally subject to the comments of the local authority and Environment Agency. The comments made on groundwater conditions are based on observations made at the time that site work was carried out. It should be noted that mobile contamination, ground gas levels and groundwater levels may vary owing to seasonal, tidal and/or weather related effects. Solmek cannot be held liable for any unrecorded or unforeseen obstructions between exploratory boreholes and trial pits. This includes instances where previous structures on the site (buried man made structures) or the presence of boulder clay (cobbles and/or boulder obstructions) have been anticipated. All types of piling operations should make allowance for obstructions within the construction budget to accommodate this. Unrecorded ancient mining may occur anywhere where seams that have been worked and influence the rock and soil above. Dissolution cavities can occur where gypsum or chalk is present. Rotary drilling is the recommended technique to prove the integrity of the rock.

Where the scope of the investigation is limited via access to information, time constraints, equipment limitations, testing, interpretation or by the client or his agents budgetary constraints, elements not set out in the proposal and excluded from the report are deemed to be omitted from the scope of the investigation.

Desk studies are generally prepared in accordance with RICS guidelines. Environmental site investigations are generally undertaken as 'exploratory investigations' in accordance with the definitions provided in paragraph 5.4 of BS 10175:2011 in order to confirm the conceptual assumptions. You are advised to familiarize yourself with the typical scope of such an investigation. No pumping of water will be undertaken unless a licence or facilities/equipment have been arranged by others.

Where the type, number or/and depth of exploratory hole is specified by others, Solmek cannot and will not be responsible for any subsequent shortfall or inadequacy in data, and any consequent shortfall in interpretation of environmental and geotechnical aspects which may be required at a later date in order to facilitate the design of permanent or temporary works.

All information acquired by Solmek in the course of investigation is the property of Solmek, and, only also becomes the joint property of the Client only on the complete settlement of all invoices relating to the project. Solmek reserve the right to use the information in commercial tendering and marketing, unless the Client expressly wishes otherwise in writing. The quoted rates do not include VAT, and payment terms are 30 days from dispatch of invoice from our offices. Quotes are subject to a site visit.

We have allowed for 1 mobilisation and normal working hours unless otherwise stated. The scope of the investigation may be reviewed following the desk study and/or fieldwork. The presence or otherwise of Japanese Knotweed or other invasive plants can be difficult to identify especially during winter months. If Japanese Knotweed or other invasive species are suspect, it should be confirmed by an ecologist. We have not allowed for acquiring services information, and cannot be responsible for damage to underground services or pipes not shown to us or not clearly shown on plans. Costs incurred will be passed on to you, and in commissioning Solmek you understand and accept that you/your agent have a contractual relationship with Solmek & you accept this. Our rates assume unobstructed, reasonably level and firm access to the exploratory positions and adequate clear working areas and headroom. We have priced on the basis that you or your client have the necessary permissions, wayleaves and approvals to access land. All boreholes and pits are backfilled with arisings except where gas monitoring pipes are installed with stopcock covers. Solmek are not responsible for any uneven surfaces as a result of siteworks and rutting and backfilled excavations may require re-levelling and/or making good by others after fieldwork is complete, and Solmek has not allowed for this. No price has been provided or requested for a return visit to remove pipework and covers. Hourly rates apply to consultancy only and do not include expenses unless otherwise shown. If warranties are required, legal costs incurred will be passed on to you assuming Solmek agree to complete such warranties, modified or otherwise and you understand and agree to pay all costs.

We reserve the right to pursue full payment of the invoice prior to release of any information including reports. We advise you/your client that we may elect to pursue our statutory rights under late payment legislation, and will apply 8% to the base rate for unreasonably late payments. Solmek are exempt from the CIS Scheme. Solmek offer to undertake work only in strict accordance with conditions covered by our current insurances, which are available for inspection. Solmek are not responsible for acts, negligent or otherwise of subcontractors and as a matter of policy cannot indemnify any other parties. Professional indemnity Insurance is limited to ten times the invoice net total except where stated otherwise by Solmek. Solmek give notice that consequential loss as a direct or indirect result of Solmek's activities or omission of the same are excluded.

**UK BACKGROUND**

**Environmental Protection Act 1990: Part 2A Revised Statutory Guidance (April 2012)**

This revised document explains how the Local Authority should decide if land, based on a legal interpretation, is contaminated. The document replaces the previous guidance given in Annex 3 of DEFRA Circular 01/2006, issued in accordance with section 78YA of the 1990 Environmental Protection Act.

The main objectives of the Part 2A regime are to *“identify and remove unacceptable risks to human health and the environment”* and to *“seek to ensure that contaminated land is made suitable for its current use”*.

Part 2A uses a risk based approach to defining contaminated land whereby the “risk” is interpreted as *“the likelihood that harm, or pollution of water, will occur as a result of contaminants in, on or under the land”* and by *“the scale and seriousness of such harm or pollution if it did occur”*.

For a relevant risk to exist a contaminant, pathway and receptor linkage must be present before the land can be considered to be contaminated. The document explains that *“for a risk to exist there must be contaminants present in, on or under the land in a form and quantity that poses a hazard, and one or more pathways by which they might significantly harm people, the environment, or property; or significantly pollute controlled waters.”*

A conceptual model is used to develop and communicate the risks associated with a particular site.

To determine if land is contaminated the local authority use various categories from 1 to 4. Categories 1 and 2 include *“land which is capable of being determined as contaminated land on grounds of significant possibility of significant harm to human health.”*

Categories 3 and 4 *“encompass land which is not capable of being determined on such grounds”*.

**PRELIMINARY CONCEPTUAL MODEL**

Preliminary Conceptual Models are undertaken in accordance with CIRIA C552. The Preliminary Conceptual Model assesses the consequence and the likelihood of a risk being realised to provide a risk classification, using the tables detailed below.

**CONSEQUENCE OF RISK BEING REALISED (Based on C552 CIRIA, 2001)**

<b>Classification</b>	<b>Definition</b>	<b>Example</b>
<b>Severe</b>	Short-term (acute) risk to human health, the environment, an element of the development or other aspect with is likely to result in <i>significant harm, damage or both.</i>	High concentrations of cyanide on the surface of an informal recreational area. Major spills of contaminants from site into controlled water. High concentrations of explosive gas in the subsurface environment that have a clear unobstructed pathway into buildings.
<b>Moderate</b>	Chronic damage to human health, a plausible chance that an event will occur, although the timeline is not immediate to be in the short-term.	Appreciable concentration of contamination that over the longer-term will cause significant harm i.e. high lead concentration in topsoil. Shallow mine workings that are potentially unstable but may remain in a satisfactory or stable conditions for a number of years.
<b>Mild</b>	Low level pollution of non-sensitive water, a feasible hazardous scenario although the timeline of such occurring can probably be considered in 10's of years.	The effect of high sulphate concentrations on structural concrete. Pollution of non-classified groundwater.
<b>Minor</b>	Harm, although not necessarily significant to human health, or with respect to other aspects of the development, which are considered implausible in terms of occurrence, or will have little consequential impact.	The presence of contaminants at such low concentrations that protective equipment is required during site works. Any damage to structures is minimal and will not be structural in characteristics.

## PROBABILITY OF RISK BEING REALISED (C552 CIRIA, 2001)

Classification	Definition
High Likelihood	There is a viable 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 that the receptor has been harmed or polluted.
Likely	There is a viable pollutant linkage and all 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 viable 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 viable pollutant linkage but circumstances are such that it is improbable that an event would occur even in the very long term.

## RISK CLASSIFICATION MATRIX (C552 CIRIA, 2001)

Risk = Probability x Consequence		Consequence			
		Severe	Moderate	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

## HUMAN RECEPTORS

Human exposure to contaminants present in soils can occur via several pathways. Direct exposure pathways include dermal absorption after contact with contaminated ground, inhalation of soil or dust, inhalation of volatilised compounds, and inadvertent soil ingestion (or deliberate soil ingestion in the case of some children). Other indirect pathways include human ingestion of plants grown in contaminated soil or contaminated ground or surface water. Contaminants associated with wind blown dust can affect humans on surrounding sites.

## VEGETATION

Plants can be affected by soil contamination in a number of ways resulting in growth inhibition, nutrient deficiencies and yellowing of leaves. Contaminants are taken up by plants through the roots and through foliage. Contaminants identified as being highly phytotoxic include boron, cadmium, copper, lead, nickel, and zinc.

To establish if the levels of contaminants present on a site may pose a risk to vegetation the results of the contamination testing are compared to a series of threshold values published in 'Code of Good Agricultural Practice for the Protection of Soil'.

## GROUNDWATER AND SURFACE WATER RECEPTORS

The principal pathway by which soil contamination may reach the water environment is through a slow seepage or leaching to groundwater or surface water. The potential for contaminants to migrate along such pathways is dependent on the chemical and physical characteristics of the contaminants and the local hydrogeology. Surface watercourses may also accumulate contamination as contaminated sediments are deposited within the water body.

Where the site investigated overlies major/principal aquifers (and in some cases minor/secondary aquifers depending on certain conditions), groundwater Source Protection Zones and areas in close proximity to groundwater abstractions, contamination test results have been compared with the Water Supply (Water Quality) Regulations 1989 and The Water Supply (Water Quality) Regulations 2000.

Should a surface water receptor, such as a fresh water environment (river, canal, stream, lake etc), or marine environment be considered sensitive in relation to a site, then test results are compared with DEFRA & SEPA Environmental Quality Standards (2004). Many of the Environmental Quality Standards are hardness (CaCO<sub>3</sub>) depended. Where no hardness values are available, Solmek assume conservative values (of between 0 and 50mg/l).

In the absence of vulnerable ground and surface water environments, Solmek may compare any test results with the Environment Agency Leachate Quality Threshold Values.

## DETAILED QUANTITATIVE RISK ASSESSMENT (DQRA)

In line with Environment Agency's guidance document Environment Agency *Land Contamination Risk Management*, which replaced the now-withdrawn *Contaminated Land Report 11 – Model Procedures for the Management of Land Contamination (2004)*, a DQRA for groundwater/human health may be required following a Phase 2 investigation and before the preparation of a Phase 3 Remediation Strategy. For human health DQRA, a site specific assessment criteria is undertaken using CLEA Software Version 1.06. For groundwater DQRA, the Environment Agency Remedial Targets Worksheet Version 3.1 is used.

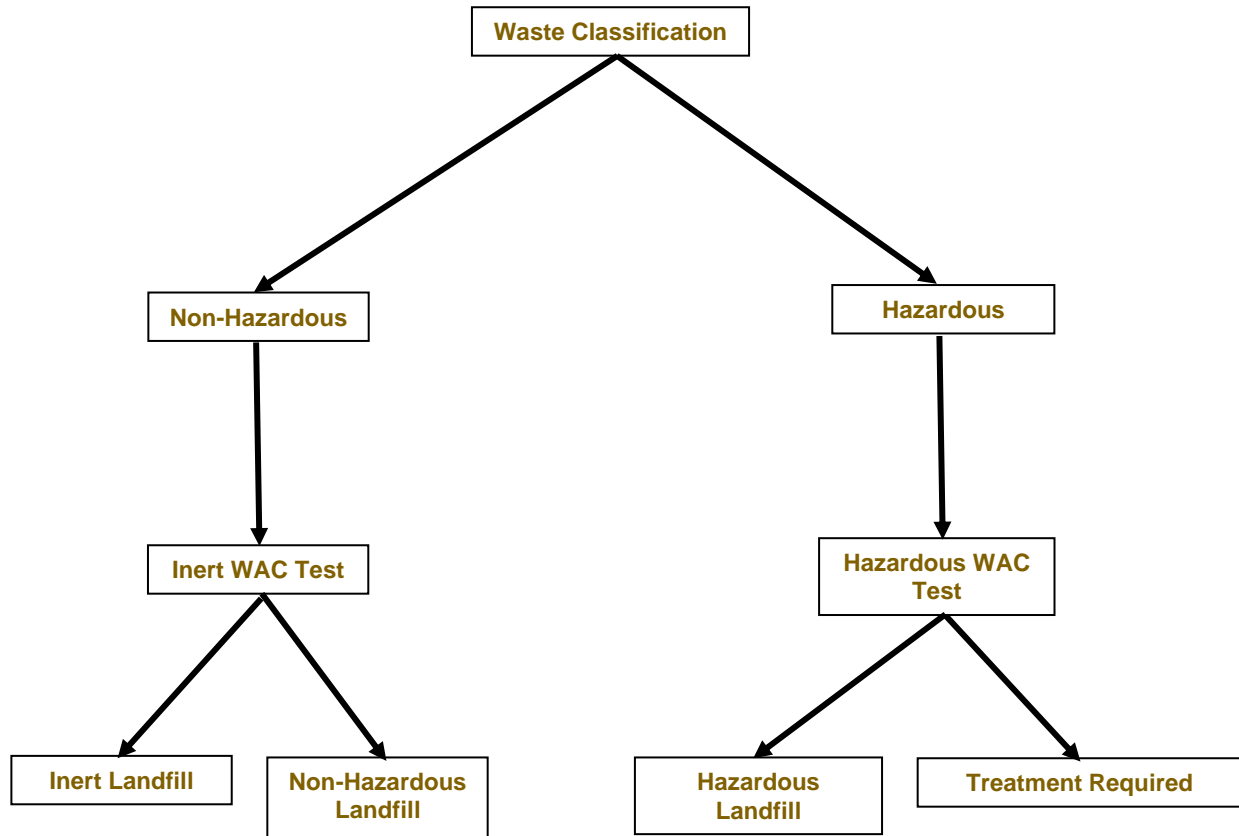
## WASTE CLASSIFICATION AND WASTE ACCEPTANCE CRITERIA

During the site strip and construction activities, material may be required to be removed from site. Any such material would require classification, in line with Environment Agency Technical Guidance *Waste Classification: Guidance on the classification and assessment of waste (2015)*. This would classify the material as either Non-Hazardous or Hazardous Waste.

Once the material has been classified, determining the suitable landfill for disposal is governed by landfill directive Waste Acceptance Criteria (WAC) testing, with landfills categorized as Inert Waste, Stable Non-Reactive Hazardous Waste and Hazardous Waste. The WAC testing relates to materials that are to be exported from a site/development to landfill, and do not directly relate to human health specifically. The testing results are generally presented as certificates which can be used by site owners/contractors etc, which should be presented to the accepting waste facility or waste contractor.

If waste classification and/or WAC testing are not undertaken, material taken off site may be subject to WAC testing by the appropriate waste disposal company. The decision on whether or not to accept waste, or whether further testing is required, is at the discretion of the waste disposal company.

The below flow chart provides further information on the waste classification process.



## CONSTRUCTION MATERIALS

Materials at risk from possible soil contaminants include inorganic matrices such as cement and concrete and also organic material such as plastics and rubbers. Acid ground conditions and high levels of sulphates can accelerate the corrosion of building materials. Where pH and soluble sulphate analysis has been undertaken, Solmek compare the test results with the guidelines presented within BRE Special Digest 1, 2005 (3<sup>rd</sup> Edition) 'Concrete in Aggressive Ground'. Plastics and rubbers are generally used for piping and service ducts and are potentially attacked by a range of chemicals, most of which are organic, particularly petroleum based substances. Drinking water supplies can be tainted by substances that can penetrate piping and water companies enforce stringent threshold values.

The levels of potential contaminants should be compared to thresholds supplied in the UK Water Industry Research (UKWIR) publication "Guidance for the selection of Water Supply Pipes to be used in Brownfield Sites" (January 2011). A Brownfield Site is defined in the document as "Land or premises that have not previously been used or developed that may be vacant or derelict". It should be noted that Brownfield sites may not be contaminated. The guidance does not apply to Greenfield Sites however water companies may have their own assessment criteria which should be checked by the developer. The table below outlines the pipe material selection threshold concentrations.

Parameter group	Pipe Material (Threshold concentrations in mg/kg)					
	PE	PVC	Barrier pipe (PE-AL-PE)	Wrapped Steel	Wrapped Ductile Iron	Copper
Extended VOC suite by purge and trap or head space and GC-MS with TIC	0.5	0.125	Pass	Pass	Pass	Pass
+ BTEX + MTBE	0.1	0.03	Pass	Pass	Pass	Pass
SVOCs TIC by purge and trap or head space and GC-MS with TIC (aliphatic and aromatic C5-C10)	2	1.4	Pass	Pass	Pass	Pass
+ Phenols	2	0.4	Pass	Pass	Pass	Pass
+ Cresols and chlorinated phenols	2	0.04	Pass	Pass	Pass	Pass
Mineral oil C11-C20	10	Pass	Pass	Pass	Pass	Pass
Mineral oil C21-C40	500	Pass	Pass	Pass	Pass	Pass
Corrosive (Conductivity, Redox and pH)	Pass	Pass	Pass	Corrosive if pH <7 and conductivity >400µS/cm	Corrosive if pH <5, Eh not neutral and conductivity >400µS/cm	Corrosive if pH <5 or >8 and Eh positive
Specific suite identified as relevant following site investigation						
Ethers	0.5	1	Pass	Pass	Pass	Pass
Nitrobenzene	0.5	0.4	Pass	Pass	Pass	Pass
Ketones	0.5	0.02	Pass	Pass	Pass	Pass
Aldehydes	0.5	0.02	Pass	Pass	Pass	Pass
Amines	Fail	Pass	Pass	Pass	Pass	Pass

## REQUIREMENTS OF PARTIES WITHIN THE DEVELOPMENT PROCESS

Interested parties involved in the development process may use the data in different ways and there may be varying views and interpretation of the factual data. Local Authority staff may have a view on contamination and human health and the wider environment. The Environment Agency are concerned principally with the protection of Controlled waters. Building insurers, funders and purchasers may be primarily concerned with issues of potential commercial blight. Purchasers are also not always fully informed, and perceptions on issues associated with risk can affect the decision to purchase. Developers and construction organisations will focus on financial aspects of dealing with the contamination in the context of the development and construction programme.

## RISKS & LIABILITIES FROM CONTAMINATION

In simple terms, risks associated with contamination may be considered in terms of 1) statutory risks and 2) development related risks. If contamination is severe or forms a potential hazard based on its potential to affect groundwater, surface water or human health, a statutory risk may be present, and as such, if the risk is not reduced, criminal proceedings may be instigated by a government body or local authority.

If the contamination is less severe or not considered to be mobile, it may be considered a commercial liability which could, in theory remain untreated, but which may at a later date affect the value of the property, or, with changing legislation, become a statutory risk. Commercial liabilities could give rise to civil proceedings by third parties if there are grounds for action.