

**SAMLESBURY AERODOME  
BUILDING**

**REMEDIATION STRATEGY**

**Rev P01**

**DEC 2025**

**Project 7274**

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**Document Revision Record**

<b>Issue</b>	<b>Details of Revision</b>	<b>Prepared by</b>	<b>Checked by</b>	<b>Date</b>	<b>Position</b>
P01	Draft report for comment	G Taylor	T Royle	18/12/25	Director



The Phase 1 Geo-environmental report prepared by TRP and the Phase 2 a physical ground investigation was undertaken by Sub Surface provide the information required for discharge of item (b) of Condition 11

This report provides details of the remediation strategy for the site as required to discharge item (c) of Condition 11

The report provides a summary of the desk study and investigations undertaken, outlines the remediation objectives and requirements necessary to protect receptors and render the site suitable for the proposed development.

The strategy has been developed in accordance with the Environment Agency Land Contamination Risk Management (LCRM) guidance as updated in June 2025

## 2.0 THE PROJECT

The proposed extension comprises a single-storey portalised steel frame with full overhead crane coverage and a deep reinforced concrete raft foundation [REDACTED]. The extension is to be constructed on an area of existing car park within the development site. The development will abut a number of existing Buildings.

The general scope of the project comprises:

- Stripping of the existing car park, relocation of existing chiller equipment and demolition of the small plant room attached to a neighbouring building.
- Reduce existing ground levels by approximately 1.0-1.5m.
- Construction of foundations and steel frame forming the superstructure.
- Construction of external plant area.
- Construction of external works including hard paving.

Drainage and infrastructure associated with the extension and external paved areas. The development is to be constructed on a small, confined site and due to space constraints no soft landscaping is to be incorporated into the design

The proposed 3D view of proposed building is shown in Fig 2.1 below.

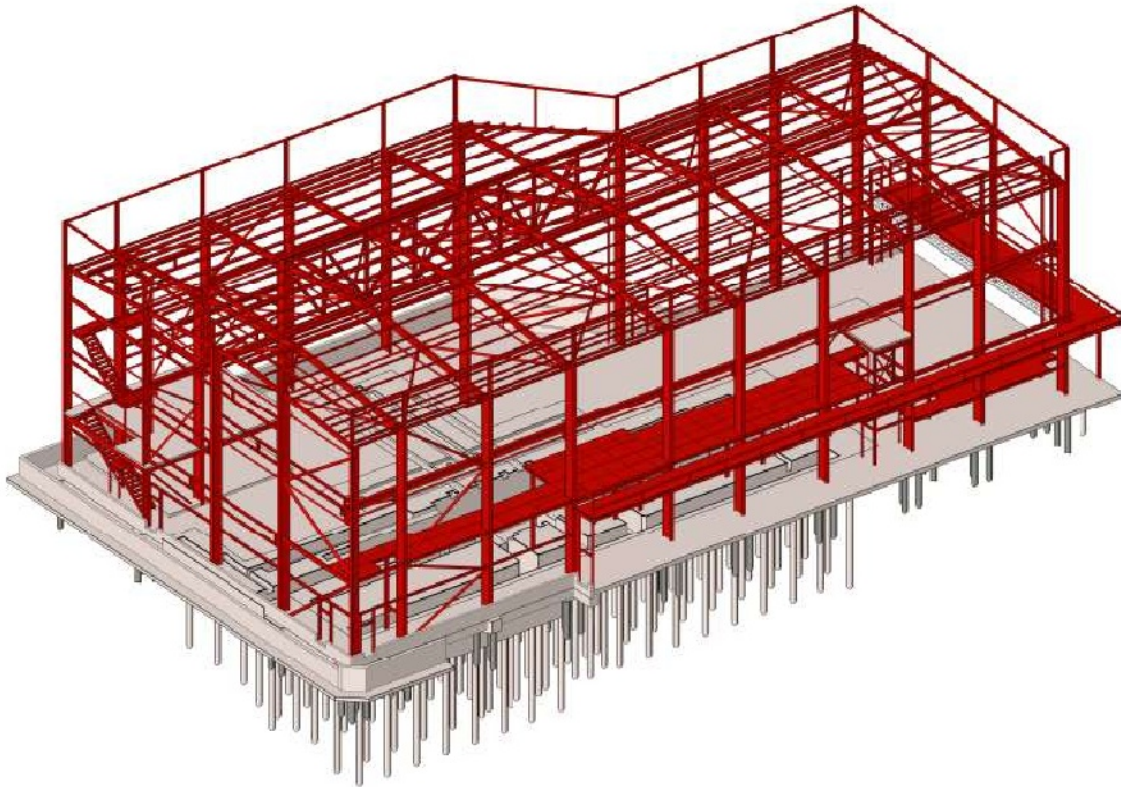


Figure 2.1: 3D view of structure

### **3.0 THE SITE**

#### **3.1 Description and history of the site**

The site, a former World War 2 airfield, is located in Balderston, Blackburn. The site is located between Myerscough Smithy Road (A59) to the north and Preston New Road (A677) to the south. The area of Mellor Brook lies just over 1km to the east, Turner Green lies approximately 1.5km to the west and Samesbury town centre is located almost 4km to the west. The site is outlined in yellow on the aerial view in Fig 3.1.1 below.

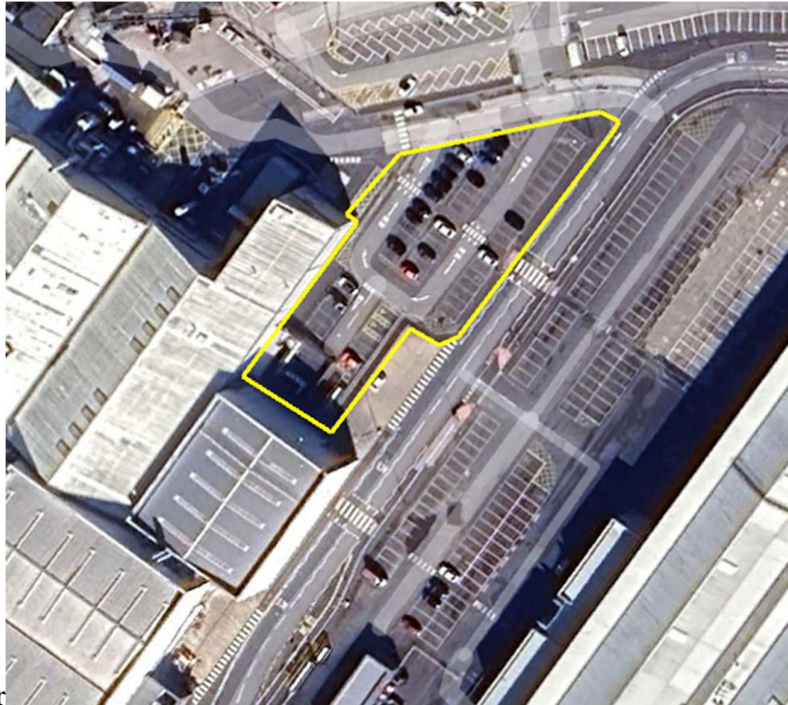


Fig 3.1.1 Ariel view of site with site boundary outlined

The area of the extension is currently occupied by a ground level car park with macadam paving, raised concrete kerbs and surface water drainage provision. There is a small chiller compound adjacent to the gable wall of neighbouring building which is to be relocated. There is a small plant room on the side wall of an existing building in the northwest corner of the site which is to be demolished.

The topographical survey indicates the level of the existing car park generally falls from around 73.40m adjacent to the road down to 72.40m adjacent to south west corner. The finished floor level in neighbouring buildings is at approximately 72.54m based upon threshold survey information.

The Site at Samesbury was formerly a World War 2 airfield which was subsequently developed for aircraft component manufacture and assembly. Prior to the war the site was undeveloped open farmland.

The ordnance survey mapping of 1892 shows the site of the extension to be open fields as shown outlined in Fig 2 below. There are ponds indicated in the vicinity of the site but not beneath the proposed development site. There are no watercourses on or in the vicinity of the site.

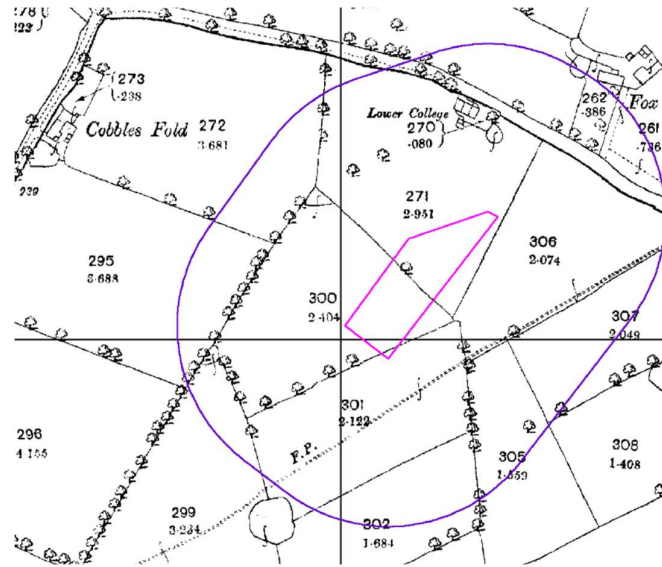


Fig 3.1.2 Ordnance Survey Map of 1892

The ordnance survey map of 1912 shows a drain or ditch running across the northern half of the site which connects to a field boundary, possibly also a ditch crossing the central area of the site as shown in Fig 3.1.3 below.

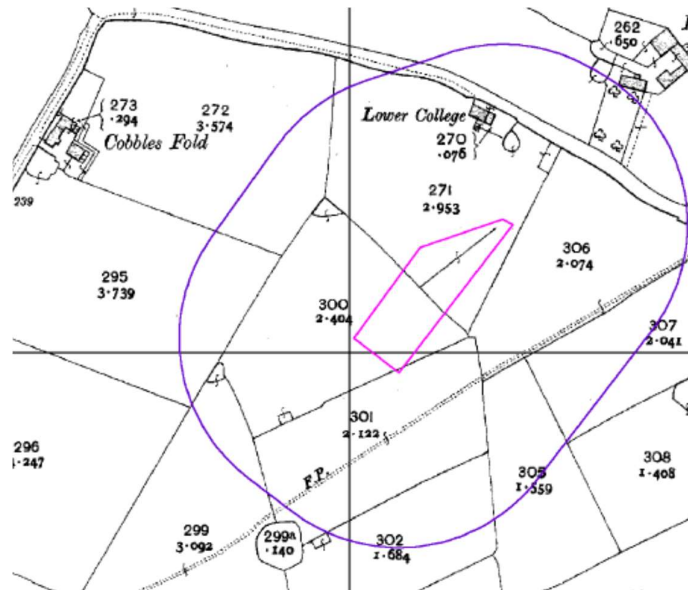


Fig 3.1.3 Ordnance Survey Map of 1912

The historic mapping indicates that the neighbouring western building was constructed between 1988 and 2000. It was extended to the north alongside the proposed building extension site at some time prior to 2000 based on Google Earth historic mapping.



Fig 4 Google Earth Photograph of 2000

The mapping confirms that there has been no development on the site of the proposed extension other than construction of the ground level car park.

Potential contamination associated with former use of the site includes:

- Made Ground under car park and potentially infilled drainage ditches.
- Potential for localized contamination associated with car park use (heavy metals & hydrocarbons)
- Any organic rich soils associated with former drainage ditches may also be a potential source of hazardous ground gases.

### 3.2 Topography

The topographical survey confirms that the site is generally level at 73.1-73.2m AOD. Retaining walls are provided locally where the ground drops down to the entrance of the neighbouring building at 72.5m AOS and along the line of a narrow path on the western boundary providing access to the western neighbouring building

The proposed ground floor level in the new extension is 72.54m, which taking account of the floor slab and sub base thickness will require ground levels across the site to be lowered by approximately 1.45m.

### 3.3 Geology

The source geological information is from the British Geological Survey (BGS) Geological Map of Great Britain. In addition, information has been obtained from the BGS website.

Geological Mapping Summary	
Strata	Description
Made Ground	None shown
Superficial Strata	Diamicton (Glacial Till also know as Boulder Clay)
Bedrock	Mudstone (Silsden Formation)

Geological Mapping Summary	
Strata	Description
Faults	None within close proximity to the site.

British Geological Survey (BGS) provides online access to a large number of borehole logs at locations across the United Kingdom. There are no historical BGS boreholes located within 1 km of the site.

The site is located within a lower probability radon area (less than 1% of homes are estimated to be at or above the Action level). No radon protection measures will be required in the construction of new buildings or extensions.

### 3.4 Landfill and Waste

Local Authority landfill coverage information was supplied by South Ribble Borough Council, Ribble Valley Borough Council and Lancashire County Council to the Environment Agency.

No waste sites are listed within 1 km of the site.

At least 9 infilled field ponds are located within 250 m of the site, the nearest located 50 m to the north-east. These were infilled by the 1940s, when the airfield was constructed. In addition, two drains were also located on site during this time period.

Any made ground and organic naturally occurring soils associated with infilled ponds and drainage ditches can be considered potential sources of hazardous ground gas.

### Hydrology and Hydrogeology

Environment Agency Groundwater Vulnerability maps have been consulted and the information is presented in the table below.

Environment Agency Vulnerability Summary	
Strata	Majority of site
Superficial	Potentially Low Vulnerability Secondary Undifferentiated Aquifer
Bedrock	Potentially Low Vulnerability Secondary A Aquifer
Source Protection Zone (SPZ)	The site is not located within any source protection zones

The groundwater vulnerability potential has been assessed as low.

The closest surface water feature is a pond located 115 m to the south-west. Aside from other field ponds in the local area, Huntley Brook is located 370 m to the south-west and Mellor Brook is located 390 m to the north-east.

Environment Agency Main River Mapping confirmed the nearest main river is the River Ribble located 1.2 km north of the site as shown in Fig 3.4.1 below.

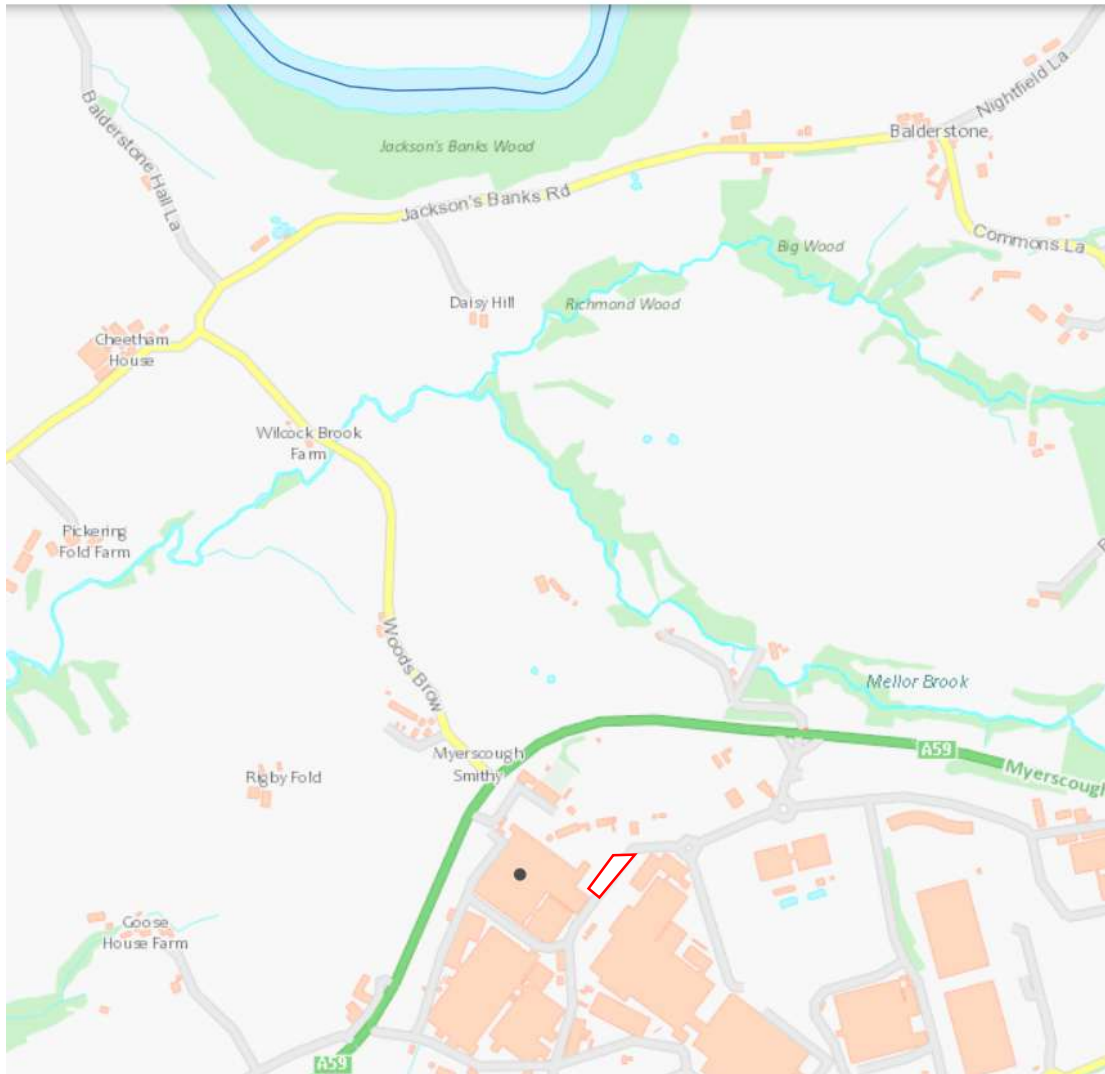


Figure 3.4.1: Environment Agency Main River Mapping

The Envirocheck data report records no surface water/groundwater abstraction licences within 2km of the site.

One discharge consent (lapsed) is recorded within 250 m of the site, located 240 m to the north-east, relating to sewage discharge into Mellor Brook.

One Category 2 – significant pollution incident to controlled waters is recorded within 250 m of the site. This relates to the spillage of gas oil into Mellor Brook, 210 m to the north of the site in 1994. Given the distance from the site and the time elapsed since the incident, this is not considered to pose a contamination risk to the site.

### **3.5 Flood Risk**

Environment Agency Flood Mapping indicates that the site is in Flood Zone 1 (low probability of flooding). Flood Zone 1 land has been assessed as having 0.1% (1 in 1000 year) chance of flooding from rivers or the sea in any given year. The location of the site is outlined in red in Fig 3.5.1 below.



Figure 3.5.1: Flood Map for Planning reproduced from the Environment Agency website.

Environment Agency advice for developments indicates that a flood risk assessment (FRA) will not normally be required for a site in Flood Zone 1 with an area of less than 1 hectare unless it could be affected by sources of flooding other than rivers or the sea, e.g. reservoirs or water drains. As site area is less than 1 hectare, a flood risk assessment is not required for this development.

Environment Agency surface water flood mapping indicates that there is a risk of surface water flooding on the site along the path at the side the western building. The car park drains to a series of surface water gullies along the sidewall of this building and this represents the lowest part of the site, with an annual probability of exceedance of 1 in 30. There is no identified risk of surface water flooding elsewhere on the proposed development site. The extent of surface water flooding with an annual probability of 1 in 30 is shown in the mapping in Fig 3.5.2 below.

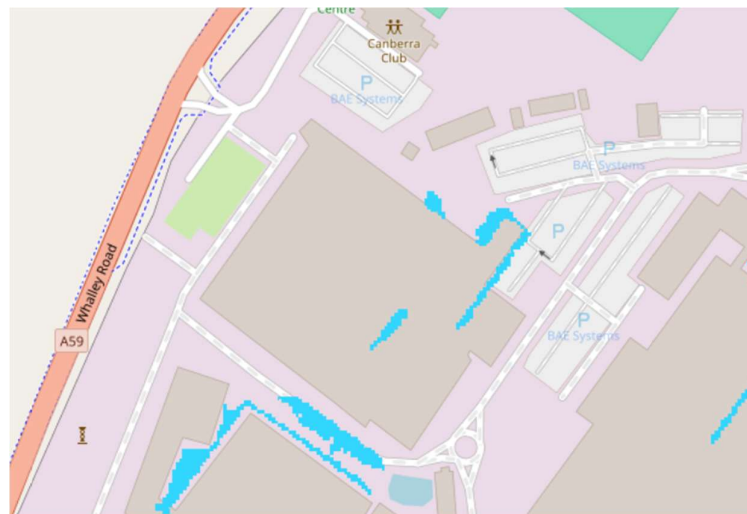


Figure 3.5.2: Environment Agency surface water flood mapping 1 in 30 Year

The extent of surface water flooding with an annual probability of exceedance of up to 1 in 100 is shown in Fig 3.5.3 below. The potential zone of surface water flooding is similar to the 1 in 30-year event.

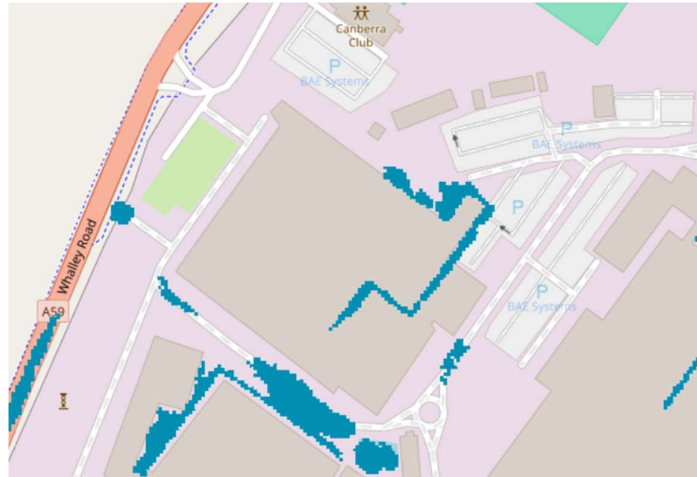


Figure 3.5.3: Environment Agency surface water flood mapping 1 in 30 – 1 in 100 Year

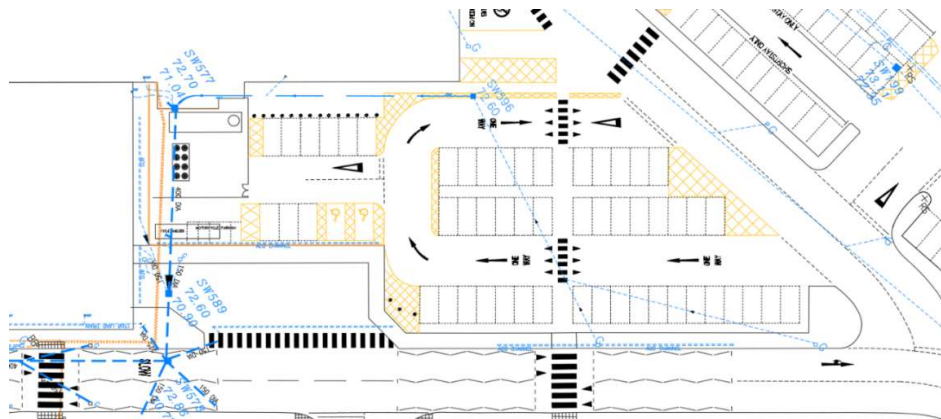
### 3.6 Existing Services

A below ground services survey has been undertaken by Survey Operations in June 2025.

The services identified on the site include surface water, electric and telecoms which form the supplies to the surrounding existing buildings and below ground foul and surface water drainage serving the buildings.

There are electric and telecoms cables running north-west through the middle of the car park. Cables are typically at 600-800mm depth and will need to be lowered protected during the works.

A 150mm diameter surface drain runs parallel to the external wall of the adjacent building and picking up discharge from gullies along the edge of the car park, a gully along the pedestrian crossing of the access road and roof drainage the building to the north. This leads into a manhole with two other pipe inflows; from surveys these look to be carrying surface water flows from the roof of the north building. A 450mm surface water drain then turns to run parallel to the gable wall of the garage to the western building before connecting to a main sewer in the access road. The 450mm diameter surface water sewer which crosses the car park under the proposed extension runs at a depth of approximately 1.5m below the FFL of the western building. This existing drainage can be seen below in Fig 3.6.1.



## **4.0 SITE ASSESSMENT AND INVESTIGATIONS**

### **4.1 Phase 1 Environmental Desktop Appraisal**

A Phase 1 geo-environmental desk study report for the site was prepared by TRP Consulting in September 2024.

The report highlights that there was potential contamination associated with former uses on the site due to:

- Made Ground under car park and potentially infilled drains
- Potential for localised contamination associated with car park use (heavy metals & hydrocarbons)
- Any organic rich soils associated with former drains
- Closely located Aircraft works, distribution centres and cleaning services

An intrusive site investigation was recommended to be conducted to refine the risk assessment by identifying the nature of the superficial strata and actual levels of contamination, focussing on potential contamination included groundwater and gas / volatile vapour monitoring.

The report also states that the site has been classified as low risk in terms of unexploded ordnance but vigilance should be exercised in all investigations and subsequent excavation works on the site.

### **4.2 Phase 2 Intrusive Site Investigation**

A Phase 2 physical ground investigation was undertaken on the site by Sub Surface Midlands Ltd in June 2025 based on a scope of works provided by TRP Consulting.

The investigation was intended to confirm the following:

- The succession of superficial strata across the site and in particular the depth of made ground.
- Geotechnical parameters for design of foundations, floor slabs and external areas. It is envisaged that piled foundation will be required to support the superstructure [REDACTED]
- Ground water levels across the site.
- Contamination levels in superficial strata and groundwater in order to assess hazards to the development and to classify materials for disposal.
- Concentrations of methane and carbon dioxide in boreholes together with gas flow rates necessary to design any gas protection measures for the development.

The ground investigation comprised the following:

- 4 Nr. cable percussive boreholes taken to 25m below ground level with full sampling and testing.
- 3 Nr mini boreholes taken down to depths of 3m below ground level
- Groundwater monitoring in 4 nr. boreholes to determine the hydrological regime at the site.

- Ground gas monitoring in 3 Nr. boreholes to determine the characteristic gas regime at the site
- Investigation, sampling and testing to determine the nature, thickness and geotechnical parameters for the drift deposits across the site to inform the foundation design and to determine whether the fill materials can be reused on- site.
- Investigation, sampling and testing to determine contamination levels in made ground and natural soils encountered in boreholes. It is assumed that 4Nr samples will be tested from each of the boreholes and 2 Nr from trial pits
- CBR testing to provide information for design of construction platforms and hard paving

#### **4.2.1 Findings**

##### ***Geology***

The general succession of strata across the site was found to comprise Made Ground overlying cohesive drift deposits.

Made Ground within the existing building footprint was found to depths of 1.20 and 1.80 metres whilst outside the building Made Ground was found to depths 0.5 and 0.5 metres.

The Made Ground was found to predominantly soft to very soft brownish grey, grey and dark grey slightly gravelly slightly sandy silty clays, ashy in places, the gravel sized fragments comprising brick, stone and occasional concrete, bituminous macadam and clinker.

The cohesive drift deposits were found to be soft becoming firm, stiff and very stiff brown and occasionally grey mottled slightly gravelly slightly sandy silty clays, the gravel comprising sandstone, siltstone and quartz, to the base of the boreholes.

##### ***Groundwater***

No groundwater was encountered in the during drilling of exploratory holes.

Monitoring of standpipes installed in BH2, BH3 and BH4 between 24<sup>th</sup> march 2025 and 13<sup>th</sup> June 2025 found groundwater to be at 0.52m to 1.12m, 1.78m to 3.95m and 0.96m to 1.28m depth respectively.

##### ***Contamination- Soil***

Chemical testing was undertaken on 14 soil samples and results compared against published generic assessment criteria (GACs) and compared to guideline values for commercial and industrial use.

When compared with published guideline value, the contamination analysis determined elevated levels of a number of contaminants with varying distribution, as tabulated below.

Determinant	Expl. Hole No.	Depth (m)	Recorded Level (mg/kg)	Published Guideline Value (mg/kg)
Dibenzo(ah)anthracene	BH3	0.50 – 1.20	7.0	3.6
	BH4	0.30 – 0.50	6.1	
	M3	0.30 – 0.45	8.1	
Benzo(b)fluoranthene	M3	0.30 – 0.45	76	45
Benzo(a)pyrene	M3	0.30 – 0.45	93	36

Fig 4.2.1.1 Assessment of soil contamination

Waste Classification has been undertaken in accordance with guidance given in the Environment Agency technical guidance document WM3 ‘Guidance on the classification and assessment of waste’ 1<sup>st</sup> edition v1.2.GB (2021) using the HazWasteOnline™ assessment tool.

A summary of the LpW/EWC code for each sample can be seen within Fig 4.2.1.2-4 below.

Location	Depth (m)	Waste Classification	Hazard Properties	LoW/EWC Code
BH1	0.40 – 0.60	Hazardous	HP 8 : Corrosive	17 05 03*
BH2	0.40 – 1.00	Hazardous	HP 8 : Corrosive	17 05 03*
BH3	0.20 – 0.50	Hazardous	HP 8 : Corrosive	17 05 03*
BH4	0.30 – 0.50	Hazardous	HP 8 : Corrosive	17 05 03*
M1	0.40 – 0.50	Non Hazardous	-	17 05 04
M3	0.30 – 0.45	Non Hazardous	-	17 05 04

Fig 4.2.1.2 Waste classification of made ground (gravel)

Four of the six samples were found to be hazardous and if intended to dispose of the excavated material to landfill, all Made Ground material consisting of gravel should be given a LoW/EWC code of 17 05 03\* and described as ‘soil and stones containing hazardous substances’. The material should be disposed of at a registered Hazardous landfill.

Location	Depth (m)	Waste Classification	Hazard Properties	LoW/EWC Code
BH2	1.00 – 1.20	Non Hazardous	-	17 05 04
BH3	0.50 – 1.20	Non Hazardous	-	17 05 04
BH4	0.50 – 1.20	Non Hazardous	-	17 05 04
M3	0.80 – 0.90	Non Hazardous	-	17 05 04

Fig 4.2.1.3 Waste classification of made ground (clay)

Location	Depth (m)	Waste Classification	Hazard Properties	LoW/EWC Code
BH1	0.60 – 1.20	Non Hazardous	-	17 05 04
BH4	1.70	Non Hazardous	-	17 05 04
M1	0.60 – 0.80	Non Hazardous	-	17 05 04
M2	0.60 – 0.70	Non Hazardous	-	17 05 04

Fig 4.2.1.4 Waste classification of natural clay

All samples in the clay made ground and natural clay were found to be non-hazardous and should be given a LoW/EWC code of 17 05 04 and described as 'soil and stones other than those mentioned in 17 05 03\*'. The material should be disposed of at a registered Non Hazardous landfill.

WAC Analysis has been carried out on two of the six samples in Fig 4.2.1.2 (BH1 and BH2) and one of the four samples in Fig 4.2.1.3 (BH3). The samples taken in the locations of BH1 and BH2 at a depth of 0.4m show elevated levels of Total Organic Carbon when compared with the threshold for hazardous waste at 5.6% and 10% respectively versus 6%. Therefore, the Made Ground characterised in Fig 4.2.1.2 may need treatment to reduce Total Organic Carbon levels before being accepted at a registered Hazardous landfill site, however, it should be noted that each landfill site has differing threshold levels.

The following summary of the contamination can be seen as follows:

**TABLE 11 WASTE CLASSIFICATION AND EWC CODE (MADE GROUND GRAVEL)**

Waste Classification	Hazard Properties	Description	LoW/EWC Code	Destination
Hazardous	HP8: Corrosive	Soil and stones containing hazardous substances	17 05 03*	Hazardous Landfill *

\* Following potential treatment to reduce the levels of Total Organic Carbon

**TABLE 12 WASTE CLASSIFICATION AND EWC CODE (MADE GROUND CLAY)**

Waste Classification	Hazard Properties	Description	LoW/EWC Code	Destination
Non Hazardous	None	Soil and stones other than those mentioned in 17 05 03*.	17 05 04	Non-Hazardous Landfill

Fig 4.2.1.4 Summary of waste classification

**Contamination- Groundwater**

Groundwater samples taken from the standpipes installed in BH2, BH3 and BH4 were analysed for a suite of determinants in accordance with the Conceptual Ground Model.

The results of the groundwater analyses indicate that 'controlled waters' are potentially at risk from zinc (dissolved), total TPH (C10–C40), anthracene, fluoranthene, benzo(b)fluoranthene, benzo(a)pyrene, indeno(1,2,3-c,d)pyrene, benzo(g,h,i)perylene, and total PAHs in BH2, BH3 and BH4.

On the basis that none of the levels exceed the UK DWS level which is a post treatment standard and as such is very stringent, it was concluded that these exceedances were not of concern and no further analysis was required.

**Ground Gases**

Ground gas monitoring was undertaken on six scheduled occasions. No elevated levels of methane or gas flows were detected; however, elevated levels of carbon dioxide and depleted levels of associated oxygen were detected throughout the site.

The levels of gas have been assessed in accordance with British Standard 8485, published in June 2015 and updated in January 2019. Table 2, indicates that the site falls into Characteristic Situation 1 (CS1).

Table 4 of BS.8485:2015+A1:2019, indicates that for a CS1 no protection and remedial measures required for residential development.

#### **Foundations- Buried Concrete**

Determination of pH on twenty-three soil samples gave values in the range of 7.2 to 12.0. Soluble sulphate concentrations were also determined for twelve soil samples and the results ranged from < 0.02 to 0.12 g/l.

The results indicate that the Design Sulphate Class for the site should be DS-1.

Based on the Design Sulphate Class for the site together with the site and groundwater conditions an Aggressive Chemical Environment for Concrete (ACEC) classification of AC-1 should be used for design and specification of concrete mixes used in the substructure

### **4.3 Detailed UXO Risk Assessment**

In August 2025, a detailed risk assessment on unexploded ordnance had been completed by Brimstone. The following conclusion was found within the report:

- No high explosive bombing incidents are recorded in the vicinity of the site and no immediately obvious evidence of bomb damage is visible within the site boundary or in the surrounds. The site almost certainly experienced a frequent level of access and presented ground conditions predominately conducive to the visual detection of UXB's. Consequently, any evidence of a UXB is considered unlikely to have occurred unnoticed. There, a **Low Risk** of encountering German UXBs has been assessed across the site.
- Three HAA batteries were constructed within 15km of Samlesbury immediately prior to WWII. Luftwaffe activity was infrequent over the wider area and therefore, these guns would not have expended a vast quantity of ammunition. Consequently, there is not an elevated likelihood of unexploded AA shells striking the site, and a **Low Risk** from unexploded AA shells has been assessed.

The risk mitigation recommendations are as such:

- UXO Safety Awareness Briefings: To all personnel conducting intrusive works on site. An essential part of the H&S Plan for a site. Conforms to the requirements of CDM2015. – Recommended prior to all intrusive works commencing.
- EOD Engineer – On-Site Supervision: Watching brief for open excavations below WWII ground level. Portable magnetometer instruments for clearing ground ahead of borehole positions and shallow excavations (where / when appropriate). Positive identification of suspicious (non UXO) objects. Liaison during confirmed UXO incidents. Provision of additional UXO Safety Awareness Briefings. Recommended watching brief of all open excavations.

## 5.0 RISK ASSESSMENT

Based on the findings of the Sub Surface physical ground investigation the conceptual ground model set out in the Phase 1 Desk study has been reviewed and updated for the purpose of establishing the strategy for remediation.

### 5.1 Sources of Contamination

The sources and nature of contamination identified are set out in the table below.

Source	Contaminants	Assessment of Contamination
Made Ground (gravel)	Metals, PAHs, elevated TOC, other contaminants identified in soil testing	Several samples classified as hazardous waste (LoW/EWC 17 05 03). Material requires disposal at a hazardous landfill and may need treatment to reduce TOC prior to acceptance. Elevated contaminants present but assessed against commercial/industrial criteria.
Made Ground (clay)	Metals, PAHs, general Made Ground contaminants	All samples classified as non-hazardous (LoW/EWC 17 05 04). Suitable for disposal at a non-hazardous landfill. No significant contamination requiring further action.
Natural Clay	Minor background metals/PAHs	All natural clay samples non-hazardous (LoW/EWC 17 05 04). No significant contamination.
Groundwater	Dissolved zinc, TPH (C10–C40), PAHs (anthracene, fluoranthene, benzo(b)fluoranthene, benzo(a)pyrene, indeno(1,2,3-cd)pyrene, benzo(g,h,i)perylene)	Detected contaminants below UK Drinking Water Standards. Considered not a risk to controlled waters. No further investigation required.

### 5.2 Receptors

The list of potential receptors to the effects of the contaminants identified in the original Phase 1 Environmental Desk Study has been expanded to encompass the wider context of the proposed development on the site.

The range of potential receptors is set out below:

- Current and future Site users
- Construction workers involved in the Proposed Development
- Below ground structures and services
- General landscaping, plants, shrubs and trees
- Groundwater and the underlying secondary aquifer
- Surface water features

**5.3 Pathways**

Contaminants could pose a hazard to potential receptors via preferential pathways such as: inhalation and ingestion of soil dust, direct dermal contact with or ingestion of exposed soils, inhalation of vapours from the ground or migration and accumulation of ground gas. Contaminated material could pose a hazard to groundwater and adjacent watercourses through surface water run off or through lateral and vertical sub surface migration of mobile contaminants in groundwater.

**5.3 Pollutant Linkage**

The presence of contaminants above normal threshold levels does not in itself indicate the potential for harm to occur. The potential for harm is dependent on identifying a plausible Pollutant Linkage i.e. linkage between the contaminant and the receptor.

The Phase 1 Geo-environmental desk study considered a series of plausible ‘source-pathway-receptor’ pollutant linkages These potential linkages have been reviewed and the risk assessment updated in the following table.

**5.4 Risk Assessment**

Source/Hazard	Pathway	Receptor	Evaluation of Risk
Onsite Contaminated Made Ground	Direct contact, ingestion or inhalation of contaminated soils or dust or volatilised compounds.	Current site users Users of future development	Elevated levels of PAHs (dibenzo[ah]anthracene, benzo[b]fluoranthene, benzo[a]pyrene) identified in near surface Made Ground. <b>'Low Risk'</b> to site users with buildings or hardstanding covering site
Onsite Contaminated Made Ground	Direct contact, ingestion or inhalation of contaminated soils or dust or volatilised compounds.	Construction Workers	Exposure during earthworks is possible; PAHs present in near surface soils. <b>'Moderate Risk'</b> minimised with PPE, dust suppression, and safe handling procedures; remedial measures may be required for areas where exposure cannot be controlled.
Off Site Made Ground, aerodrome, tanks, distribution centre and cleaning services	Vertical and lateral migration of potential contaminants through groundwater	Groundwater, underlying secondary aquifers	Elevated TPH (C10–C40) and PAHs present; to protect controlled waters, a remediation scheme is recommended to reduce contaminant concentrations or limit migration. <b>'Low Risk'</b> for controlled waters if remediation or containment measures are implemented.
On and Off-site leachable contamination	Vertical and lateral migration of potential contaminants through groundwater	Surface water features, ponds and water courses	Leachable contaminants could migrate to surface water; risk can be mitigated by controlling subsurface migration. <b>'Low Risk'</b> provided remedial or containment measures are adopted.
On and Off site contaminated ground	Vertical and lateral migration of potential contaminants through groundwater	Below ground services and structures	Minimal risk to buried structures; <b>'Low Risk'</b> with standard protective measures. Remediation or containment could further reduce migration potential.

Source/Hazard	Pathway	Receptor	Evaluation of Risk
Onsite contaminated ground	Uptake of contamination from soil	Planting	No soft landscaping currently proposed; <b>'No Risk'</b> for current plans. If soft landscaped areas are included, further sampling and potential remediation required.
Made Ground Land Fill Gas Volatile Vapours	Lateral and vertical migration and accumulation of gases in confined spaces	Future site users Construction workers	<b>'Low to Moderate Risk'</b> site classified as falling into CS1. No protective measures are required in construction of new development.
Unexploded Ordnance UXO Explosion	Direct Contact	Construction workers	<b>'Low to Moderate Risk'</b> The site was checked and no evidence of UXO identified with a "Low Risk" being defined within Brimstone Report

## **6.0 REMEDIATION REQUIREMENTS**

The ground investigation and risk assessment has identified a number of issues that will need to be accounted for in the design and construction of the proposed industrial extension to protect future site occupants and operatives during construction works.

The results of contamination testing and monitoring set out in Section 5.0 above have identified specific remediation works that will be necessary to enable the site for development or to address current impacts on the environment allowing for the reduction of ground levels on site by approximately 1.45m.

The following Hazards/ Risks need to be addressed.

### **6.1 Made Ground - Contamination**

Made ground, possible dating from construction in the late 1930's is present across the footprint of the proposed extension to depths of 1.2-1.8m. The construction of the proposed development will require reduced level excavations down to approximately 1.45m below existing ground level to accommodate the new floor and base construction. The bulk of the made ground will be removed from site, but some areas will remain capped off by buildings and hard paving

Chemical testing of made ground (gravel) across the site generally identified levels of contamination to be above the published guideline values, with elevated levels of dibenzo(ah)anthracene, benzo(b)fluoranthene and benzo(a)pyrene present. The pathway from the source to site operative during earthworks, the end users of the development and any proposed planting (receptors) will need to be removed by precautions and/or remedial measures.

The samples also showed elevated levels of Total Organic Carbon and may need treatment to reduce the Total Organic Carbon levels being accepted at a registered Hazardous landfill site.

### **6.2 Ground Gases**

The levels of ground gas and flow rates recorder during the period of monitoring confirm that the site falls into Characteristic Situation 1 (CS1). Table 4 of BS.8485:2015+A1:2019, indicates that for a CS1 no protection or remedial measures are required and no further action is required.

### **6.3 Protection of Below Ground Structures**

Determination of pH and Soluble sulphate concentrations indicate that the Design Sulphate Class for the site should be DS-1.

Aggressive Chemical Environment for Concrete (ACEC) classification of AC-1 should be used for design and specification of concrete mixes used in the substructure.

This has been incorporated in the Specification for Concrete Works issue by TRP and no further action is required.

#### **6.4 Unexploded Ordnance UXO**

The Phase 1 Desk Study highlighted the potential for the presence of unexploded ordnance (UXO) associated with German bombing of the site during the second World War.

Brimstone provided a risk assessment of the site which defined the site as “Low Risk”.

UXO Safety Awareness Briefings are recommended to all on-site prior to any works commencing and a watching brief should be provided for all open excavations.

### **7.0 PROPOSED STRATEGY FOR IMPLEMENTATION OF REMEDIATION**

#### **7.1 Objectives**

The objectives of the remediation strategy are as follows:

- To remove or reduce significant pollution linkages to protect construction workers and future Site users.
- To undertake testing and classification of excavated made ground to ensure disposal to suitably licenced waste facility This would include addressing any issues of total organic carbon by onsite or offsite treatment if necessary
- To achieve remediation within the timescales required by the development.
- To implement works in accordance with good technical practice, legislative framework and regulatory requirements.
- To satisfy the requirements of the Local Planning Authority and Building Control.

#### **7.2 Overview**

The key elements of the remediation are as follows:

- Protection of workers during construction
- Careful observation during earthworks to identify any evidence of Asbestos.
- Testing and classification of made ground for off-site disposal
- Collection and control of groundwater and surface water during construction to avoid silt laden or contaminated discharge to the surface water drainage network
- Disposal of surplus materials to a suitable waste facility and treatment to reduce Total Organic Carbon.
- Protection to underground structures and services
- Protection of future Site users through:
  - i) Provision of hard cover and capping materials
  - ii) Importing of clean uncontaminated material for infilling and clean capping of soft landscaped areas
  - iii) All below ground services shall be laid in a clean service corridor.

Site works should be supervised throughout by a suitable qualified Engineer, who will report to the Project Manager. Supervision may be part-time for certain activities but must be full-time during the removal of any specifically identified contaminated soil/ fill and any placement of fill

to an engineering specification. The Engineer should keep TRP Consulting informed of the general progress and findings throughout the course of the remediation works.

If any unexpected contamination is identified that requires treatment or remediation the approved remediation strategy will need to be amended and agreed with the local planning authority.

If any unusual or potentially contaminated ground conditions are encountered during the remediation works, other than Made Ground (gravel) as discussed in Section 7.4 below, the Engineer should immediately seek further advice from TRP Consulting. Any suspicious contaminated soil/fill should be placed in temporary stockpiles on hardstanding or Visqueen, suitably covered and bunded. Analysis for an appropriate range of determinands should be undertaken depending upon the quantities and characteristics of the contaminated soils.

All additional materials deemed to be unsuitable should be removed from Site and disposed of to a suitably licensed waste disposal facility.

### **7.3 Timetable of Remediation Works**

Remediation will be undertaken prior to the development being completed.

### **7.4 Collection of groundwater and surface water during construction**

To ensure that the groundwater and surface water are not polluted by uncontrolled discharge of suspended solids (silts etc.) a groundwater monitoring system should be instigated by the main contractor. A contingency plan will be put in place to limit off-Site movement of groundwater.

### **7.5 Control, testing and disposal of waste.**

Earthworks of the Site and reducing of site levels by approximately 1.45m within the building footprint will generate a quantity of waste material that will need to be removed from the Site.

Characterisation of waste soil is the responsibility of the waste producer. The proposed waste disposal site should be consulted to confirm their laboratory testing requirements and the requirements shared with the groundworkers and haulage contractors.

Waste characterisation should be undertaken including a Hazardous Waste assessment in accordance with current Environment Agency guidance (WM3). Waste Acceptance Criteria (WAC) testing should be undertaken on samples of surplus material to confirm the suitability of the proposed off-site disposal facility.

The Main Contractor shall include copies of all laboratory test certificates in the remediation Validation Report.

Where Total Organic Carbon has been determined to be greater than the allowable limits to the specified Hazardous waste landfill, the soil should be treated in a manner (Bioremediation, soil washing or off-site thermal treatment) to reduce the Total Organic Carbon prior to its disposal.

Materials removed from the site shall be transported under appropriate duty of care to a waste management facility permitted to that type of waste. The haulier will be a permitted waste carrier and will provide evidence of registration before removing any waste. All waste transfer records included in the Validation Report.

All vehicles carrying contaminated material should be securely sheeted and the wheels and undercarriages cleaned before leaving site to prevent contaminated material from being deposited on public roads.

#### **7.6 Provision of hardcover, capping and imported fill materials**

Proposals for the validity analysis of imported materials will be agreed with the Local Planning Authority prior to materials being imported onto Site. Current guidance indicates that the proposed methodology should include the sampling frequency, testing schedules, criteria against which the analytical results will be assessed (as determined by the risk assessment) and source material information.

Imported topsoil should be as specified in BS 3883:2007 as suitable for their intended purpose and tested for contaminants that are considered harmful to human health as set out below.

Imported materials shall be validated by independent third-party testing of the materials deposited on site by sampling from trial pits made in the deposited material. Suppliers generic testing data will not be accepted. The suite of contaminants to be tested shall include asbestos

All testing laboratories shall hold MCERTS accreditation where available otherwise UKAS accreditation. The Main Contractor is to include copies of all laboratory test certificates in the package of information required to prepare the Validation Report

The following criteria are therefore proposed.

##### **Testing Regime:**

- the sampling frequency for imported cover shall be at least 1 sample per 40 m<sup>3</sup> for soils that are from a natural source and for recycled or manufactured topsoil (or where the source of the soil is unknown) a sampling frequency of 1 sample per 20 m<sup>3</sup> is required - in any case a minimum of 3 samples are required.
- validation sampling frequency 1:1000m<sup>3</sup> per cubic metre for granular material from all sources for use below hardstanding
- minimum of three samples per soil type will be tested in accordance with the generic assessment criteria

##### **Soil Analysis:**

Soils will be tested for a suite of contaminants comprising:

arsenic, cadmium, chromium, chromium hexavalent, copper, lead, mercury, nickel, selenium, zinc, pH, sulphide, sulphate, cyanide, MTBE, benzene/ ethylbenzene/ toluene/ xylene (BTEX), total petroleum hydrocarbons criteria working group (TPHCWG), polynuclear aromatic hydrocarbons (PAHs) total and phenols concentrations. Asbestos shall also be included in the suite of contaminants to be tested.

##### **Acceptance Criteria:**

Soils test results will be compared to the most recently available acceptance criteria for a standard land use of residential without home grown produce. The relevant criteria are set out below:

- EA Soil Guideline Values 2009 (SGVs)
- CL:AIRE 2009 values (GACs)

- DEFRA 2014 values (C4SLs)
- CIEH/LQM 2014 values (S4ULs)

The topsoil will be validated following importation to the Site.

### 7.7 Unexploded Ordnance UXO

Advice should be sought from a suitably experienced UXO specialist on measures to be implemented during piling and bulk excavation works.

As a minimum, an UXO awareness induction should be conducted with all personnel involved with earthworks or other intrusive works.

An emergency response procedure shall be prepared and implemented to respond to the possible discovery of UXO.

The specialist shall maintain a watching brief during the course of the works.

### 7.8 Below ground Services

All below ground services shall be laid in trenches backfilled with clean inert imported granular material, MOT Type 2 or similar. All services shall be bedded in accordance with relevant engineers' details. Reuse of surplus excavated granular made ground in backfilling service trenches will not be permitted due to potential asbestos contamination.

### 7.9 Summary of Remediation Requirements and Control Measures

The ground investigation and remediation strategy have identified requirements for remediation and control measures to be implemented protect future site occupants and operatives during construction works.

The requirements are summarised in the following table.

Source/Hazard	Remediation Required	Construction Control Measures
<b>Contaminated made ground (gravel)</b>	<ol style="list-style-type: none"> <li>1. <b>Required</b> – test results above guideline values and LoW/EWC code of 17 05 03* given</li> <li>2. Treatment or removal of any contaminated materials identified</li> <li>3. Reduction of total organic content may be required</li> </ol>	<ol style="list-style-type: none"> <li>1. Provision of PPE and safe methods of working to protect operatives</li> <li>2. Hardcapping to all surfaces</li> <li>3. Bioremediation, soil washing or off-site thermal treatment to reduce total organic content</li> </ol>
<b>Contaminated Groundwater</b>	<ol style="list-style-type: none"> <li>1. <b>None Required</b> – test results below UK DWS level</li> </ol>	<ol style="list-style-type: none"> <li>1. Control of surface water during construction to avoid discharge of silt laden run off</li> </ol>
<b>Ground gases methane &amp; carbon dioxide</b>	<ol style="list-style-type: none"> <li>1. <b>None Required</b> – Site classified as Characteristic Gas Situation CS1, no protection measure required</li> </ol>	<ol style="list-style-type: none"> <li>1. Possible depleted oxygen - Implement confined space procedures for entry to deep excavations manholes or inspection chambers</li> </ol>
<b>Unexploded Ordnance UXO</b>	<ol style="list-style-type: none"> <li>1. <b>None Required</b></li> </ol>	<ol style="list-style-type: none"> <li>1. Watching brief / monitor excavations for evidence of UXO with a suitably trained person(s)</li> <li>2. Provide UXO safety awareness briefing / training for ground works operatives</li> </ol>

### 7.10 Standard of Remediation and Verification

Planning Condition 11 requires that details of a Verification Plan to demonstrate the effectiveness of the remediation carried out must be submitted to and approved in writing by the Local Planning Authority.

Remediation will be undertaken, and Verification provided in accordance with the agreed plan to ensure that the Site is suitable for its proposed end-use. Specific requirements for the Verification Report are set out in section 8.0.

The Verification report must

- demonstrate that the risk has been reduced and the remediation objectives and criteria have been met.
- provide a quantitative assessment of the remediation performance using the lines of evidence approach in the verification plan.
- produce a verification report to show that remediation has been successful.
- create a final record of the land quality.

The report must include, if applicable, details of any unexpected contamination and how this was dealt with.

Records will be strictly maintained at all stages of the process for inclusion in the verification report.

The verification report will be compiled on completion of the works. This will provide a complete record of the remediation activities and data collected as part of the verification plan to support compliance with remediation objectives and criteria. The report will include:

- Details of preparatory and remediation works undertaken together with validation.
- General Site photographs during Site clearance
- Results of visual inspections on completion of Site clearance
- Test results to classify all materials to be disposed of off-Site
- Plans indicating the locations of all stockpiling and testing of materials.
- Test certificates for imported material.
- Photographs showing placement of imported materials.
- The depth of cover shall be demonstrated by photographic evidence by excavating trial pits and including a measurement staff or similar measuring device.

## **8.0 VERIFICATION REPORT**

A Verification Report is prepared to demonstrate compliance with the remediation objectives and record that control measures and due care were adopted during development. The Main Contractor shall collate the necessary factual records to show that the works have been carried out and these shall be used as evidence to support the Verification Report.

The Verification Report should contain details of the following:

### ***Basic Site Details:***

- site name and address
- site ownership and current status
- location, national grid reference and general description of the site
- site plan
- size of site
- contact details for relevant organisations.

### ***Remediation works***

- Objectives of the remediation works
- Site specific details of the remediation works, ground conditions encountered, remediation methodology, Site management procedures, phasing of works/ timescales, details of licences, etc.
- Validation: Details of how the remediation controls will be validated to ensure that the objectives have been met. This should include details on the sampling strategy, chemical analysis, use of on-Site observations and visual /olfactory evidence and clean-up standards ( i.e. contaminant concentrations)
- Test results for validation of all imported material
- WAC test results including details of material tested, sampling rates and locations
- Chain of custody documents, including laboratory certificates, material type and quantities for materials removed from and imported to site;
- Engineer's field notes and photographs of contamination encountered during the works (if applicable);
- Evidence of compliance with consents, licenses, permits or other authorisations.
- Copies of any correspondence with the regulatory authorities and any site visit notes
- Drawings showing the location and extents of contamination encountered, positions of stockpiles, buried obstructions removed and retained, verification sampling positions.
- Evidence of the depth of capping installed in the form of photographs (incorporating a measure), 'before and after' topographical surveys or depth testing in-situ. In addition, the depth of cover shall be demonstrated by photographic evidence by excavating trial pits and including a measurement staff or similar measuring device
- Photographs of site arrangements, excavations, stockpiles, protection measures

The final Completion and Validation Report should be compiled on completion of the works and include evidence that the remedial works have been successfully carried out in accordance with the agreed remediation strategy to the agreed standard.

**9.0 RELEVANT LEGISLATION**

- The Environmental Protection Act 1990
- The Environment Act 1995
- Duty of Care Regulations 1991
- Hazardous Waste (England and Wales) Regulations 2005
- Waste Management Licensing Regulations 1994 (as amended)
- Environmental Permitting (England and Wales) Regulations 2010
- Management of Health & Safety at Work Regulations 1999
- Personal Prospective Equipment at Work Regulations 2022
- Construction Design and Management Regulations (CDM) 2015
- Control of Asbestos Regulations 2012