



GROUNDTECH
CONSULTING

MANCHESTER ROAD, LINTHWAITE

REMEDIAL SPECIFICATION

MR BEN GOOD

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For and Behalf of Groundtech Consulting

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Plans		
<i>Plan Reference</i>	<i>Revision</i>	<i>Title</i>
GRO-25333-P01	-	Project Location Plan
UG_1837_LAN_SEC_DRW_02	6	Landscape Sections



1.0 INTRODUCTION

1.1 Background

This Remedial Specification has been produced on behalf of Mr Ben Good and relates to the remediation of a site at Manchester Road, Linthwaite.

Earliest historical maps indicate the site has been occupied by a reservoir associated with Royd House Brick Works in the immediate surrounding area. The only other historical feature is a track that ran through site associated with the adjacent quarry. The site is currently and has most recently been utilised as a hardcore and tarmac surfaced car park. Anecdotal evidence indicates a possible tank was present onsite in the northern area. The site is bounded by two sandstone brick built retaining walls, one which runs along the south eastern boundary and a second along the north western boundary.

A summary of the findings of the investigations is outlined in *Section 2.0*.

1.2 Proposed Works

Remediation will be undertaken at the site to prepare it for development of the residential units as shown on the '*Landscape Sections' UG_1837_LAN_SEC_DRW_02 Rev. 6*. It is proposed to construct two dwellings on the 0.04 Hectare site with associated garden areas and infrastructure.

Redwaters (Yorkshire) Ltd have submitted a planning application to Kirklees Council. This Remedial Specification has been commissioned to facilitate the discharge of any pre-commencement planning conditions that are likely to be enforced with regard to land contamination.

The Full planning permission (2022/62/94124/W) is for the erection of a pair of semi-detached dwellings with associated landscaping and car parking.

The planning decision was granted on 13th December 2023.

1.3 Objectives

The objective of this Remedial Specification is to present details of the remedial objectives, how the remediation of the site will be implemented and to outline how the works will be validated. This Remedial Specification details how the works will be permitted under the current regulatory regime.

The remediation will ensure that upon completion of the residential development, it can be demonstrated that the ground and groundwater conditions at the site are appropriate for its intended use and risks to identified receptors have been reduced to an acceptable level.

The following Remedial Specification includes the protection measures required during the enabling works phase and to be installed in the construction phase of the redevelopment for a residential end use with plant uptake.

This is a dynamic document that may require updating at certain stages of the process, the revisions should be undertaken in agreement with the relevant regulatory bodies. In addition, this Remedial Specification is subject to the approval of the regulators pre-commencement.

1.4 Remediation Specification Scope

The scope of the Remedial Specification is in accordance with LCRM is as follows:

- *Summary of the Conceptual Site Model*
- *Summary of the Pollution Linkage Risk Assessment*
- *Remediation Options Appraisal including detailed assessment of preferred options*
- *Implementation of preferred remedial solution*
- *Specification for the remediation works*

1.5 Sources of Information

In preparing the Remedial Specification the following documents were reviewed and should be read in conjunction with this report:

- *Phase 1 Geo-Environmental Investigation produced by IGE Consulting referenced 3836-01A dated March 2023.*
- *Phase 2 Geo-Environmental Investigation produced by IGE Consulting referenced 3836-02 dated August 2023.*
- *Piling Risk Assessment produced by IGE Consulting referenced 3836-03 dated November 2023*

2.0 CONCEPTUAL SITE MODEL

2.1 Site Details

The site is rectangular in shape and circa 0.04 hectares in area. The site slopes down by circa 3m from 145.50m AOD in the south of the site to 142.25m AOD in the north of the site, adjoining onto Hoyle Ing Road at the north eastern boundary of the site. The site is currently utilised as a car park and is entirely surfaced by tarmac. Two retaining walls are indicated on site, one along the south eastern boundary and a second along the north western boundary. Both walls are of sandstone block construction and appeared to be in good condition during the site walkover conducted by IGE Consulting. Shrubbery and vegetation are also present along the boundaries of the site.

Residential properties are present to the north and east of the site. The south of the site is occupied by a densely vegetated field and industrial warehouse buildings are located to the west of the site.

2.2 Site History and Consultations

Earliest historical maps from 1892 indicate that a reservoir was present on site associated with the adjacent brick works. This was shown until 1968 when it was suspected to have been infilled. From 1968, a track is shown to run through the centre of the site associated with a former quarry that was present circa 50m to the south west of the site, which is now recorded as Road House Tip. Sloping ground was also indicated onsite and in the surround area on historic maps which indicates that quarry and tip features may have extended onto site. From 1993 the site is shown to be a car park, no change is shown following this date.

The surrounding area was historically occupied by several industrial land uses including a quarry 20m south west, unspecified tank 25m south east, brick works 28m west, dye works 29m north west and mills 136m north west. A pond was also historically recorded 5m south east which is assumed to have now been backfilled.

2.3 Geology and Hydrogeology

Made Ground is indicated to be present on site based on BGS records and due to the historic land uses.

The site is not indicated to be underlain by any superficial deposits. The bedrock geology underlying the site is indicated to be the Midgely Grit Formation consisting of Sandstone (Secondary A Aquifer).

A previous Ground Investigation undertaken 5m south east of the site recorded Topsoil/Made Ground to a depth of between 0.15m and 0.5m begl overlying residually weathered Millstone Grit Member recovered as very soft to soft brown slightly gravelly Clay and clayey Silt to depths of between 1.4m and 3.3m begl overlying firm to stiff Clay to 4.0m begl where the boreholes were terminated.

The site is not within a SPZ however, it is indicated to lie 22m south of a Source Protection Zone, Zone II, Outer Catchment. The nearest active groundwater abstraction point is 273m north of site relating to commercial, industrial and public services at Titanic Mills. The nearest active potable abstraction point is at the same location as above 273m north of the site.

2.4 Hydrology

The nearest surface water feature is the River Colne, located 140m north east of the site.

Environment Agency information indicates that the site lies in Flood Zone 1 with respect to flooding from Rivers and Sea.

With respect to surface water flooding, the site is at negligible risk, with the highest risk within 50m being 1 in 100 years, 0.1m to 0.3m.

There are two historic surface water abstraction points within 2km of site, the closest being 118m north relating to general use from the River Colne.

2.5 Preliminary Conceptual Site Model

The following risks were determined by IGE Consulting:

Receptor	Risk	Discussion
Risk to Human Health	Moderate to High	Made Ground anticipated beneath the site and deep Made Ground may be present in areas of the site associated with the former reservoir and quarry/tip if extended onto site. Sources of contamination include reservoir, brick works, adjacent dye works and tanks. There is also potential for hydrocarbon contamination to be present due to the sites use as a car park. Anecdotal evidence has indicated a possible tank was recorded in the north.
Risk to Controlled Waters	Moderate to Low	The risk to the Secondary A Bedrock Aquifer is considered to be moderate due to the possible infilled reservoir and refused tip if encroaching site, however groundwater is anticipated at greater than 20m begl therefore the likelihood of migration is low. The risk to the River Colne is low given the distance to site allowing for attenuation of any possible contaminants.
Risk from Ground Gas	High	Deep Made Ground is anticipated to be present on site due to the proximity to the former quarry/refuse tip and recorded historic reservoir on site which has been backfilled.

2.6 Ground Model

Scope of Works

The following site works were undertaken as part of the intrusive investigation by IGE Consulting on 7th June 2023.

- 4 No. dynamic sampling boreholes (DS01 to DS04) were drilled to a maximum depth of between 3.5m and 5.35m begl
- 2 No. retaining wall foundation inspection pits (FIP01 and FIP02) were excavated to depths of between 0.3m and 0.4m begl

Made Ground

Made Ground was encountered across the site to a maximum depth of between 2.2m and 4.9m begl and generally comprised reddish brown sand/gravel to depths of between 2.2m and 3.5m begl, overlying very soft to soft grey mottled black gravelly clay to a depth of between 3.6m and 4.9m begl.

Made Ground was not encountered in DS04 in the south west due to it being located in a relatively undisturbed area of the site.

The Made Ground on the site is indicated to be mostly associated with the former reservoir which covered most of site.

Natural Ground

No superficial deposits were encountered during the Ground Investigation, confirming geological records.

Bedrock

The Marsden Formation recovered as light brown Sand and Gravel was encountered beneath the Made Ground to depths of between 3.74m and 5.45m begl.

Groundwater

Perched groundwater was encountered in DS01 to DS03 between 1.7m and 2.2m begl in the Made Ground.

Watching Brief

A watching brief was maintained during the Ground Investigations for visual and olfactory evidence of potential contamination.

Hydrocarbon odours and associated black staining were recorded in DS01 between 1.7m and 3.5m begl and DS02 between 3.0m and 3.6m begl. PID readings of all environmental samples were taken during the Ground Investigation and readings of between 0ppm and 1.0ppm were recorded. The majority of PID readings were recorded <0.5ppm, readings between 0.5ppm and 1.0ppm were recorded in 6 samples only in DS02, DS03 and FIP01.

2.7 Geo-Environmental Testing Results – Soils

The following testing has been carried out by IGE Consulting:

- 12 No. Metals
- 12 No. speciated Polycyclic Aromatic Hydrocarbons (PAHs)
- 8 No. Total Petroleum Hydrocarbons (TPH CWG inc BTEX)
- 4 No. Asbestos screening
- 1 No. Volatile Organic Compounds (VOCs)

Metals

Elevated levels of arsenic, lead and cadmium were recorded in DS01 to DS03 in the granular and cohesive Made Ground when compared with residential screening values with plant uptake (2.5% organic matter). The source of the elevated heavy metals is considered to be associated with the minor constituents in the Made Ground associated with the backfill of the former reservoir.

Speciated Polycyclic Aromatic Hydrocarbons (PAHs)

Elevated concentrations of several PAHs were recorded in the granular and cohesive Made Ground of DS01 between 0.3m and 2.3m begl.

The source of the elevated PAHs is considered to be coal derived from the minor constituents in the Made Ground associated with the backfill of the former reservoir.

Total Petroleum Hydrocarbons (TPH) inc BTEX

Elevated concentrations of heavy range aromatic hydrocarbons were identified in DS01 at 2.3m begl in the granular Made Ground. Black staining and a hydrocarbon odour was also identified at this depth. All other

speciated hydrocarbons were recorded below the screening values. All BTEX were recorded below limits of detection apart from in DS01, however the detectable levels were still below residential screening values.

The concentrations indicate that the contamination is diesel fuel sourced from historic reservoir. There is also anecdotal evidence that a tank was present on site which could contribute to the contamination if spills occurred.

Volatile Organic Compounds (VOCs)

Testing for VOCs was undertaken in one sample from DS01 at 2.3m begl due to the visual and olfactory evidence of contamination noted during the Ground Investigation. No other samples were tested for VOCs due to the low PID readings recorded during the Ground Investigation.

No elevated CoC were recorded in this sample and the majority of VOCs were recorded below the laboratory limits of detection. This is with the exception of 1,3,5-Trimethylbenzene which was recorded at a concentration of 31.7µg/kg however no screening value is available for this compound. The source of the detection is considered to be from degraded fuel/oil associated with the former reservoir.

Asbestos

None of the samples screened through laboratory testing identified asbestos fibres.

2.8 Groundwater Testing Results

Two groundwater samples were taken from DS01 and DS02 and were tested for the same suite of determinants as the soils outlined above, apart from VOCs. VOCs were not tested for due to the very low PID readings recorded during the Ground Investigation and limited VOCs identified in the Made Ground.

Elevated concentrations of arsenic and benzo(a)pyrene were recorded in both samples of the perched groundwater tested. The source is considered to be associated with the backfilled reservoir.

In addition, elevated concentrations of heavy end speciated hydrocarbons have been recorded in both samples, the source of the hydrocarbons is indicated to be the backfill material associated with the reservoir.

The elevated CoC are confined to the perched groundwater in the Made Ground associated with the backfill of the reservoir. The screening values are based on drinking water standards and the site is not within a drinking water protected area or underlain by a protective aquifer. As a minimum, if encountered, all free phase should be removed from excavations in accordance with this remediation specification.

All other determinants were recorded at levels below the drinking water standard screening values.

2.9 Ground Gas

No methane (CH₄) has been recorded within the standpipes. Detectable levels of carbon dioxide (CO₂) were recorded in the standpipes, up to a maximum level of 4.7%v/v. Peak and steady values were recorded at similar concentrations.

No flow rates were recorded during the monitoring period.

Based on the gas monitoring the site lies within CS1 and no gas protection measures are required, however it was proposed by IGE Consulting to classify the site as CS2 based on the proximity to the former quarry/tip.

It was concluded that ground gas protection measures are required for the proposed development.

The site does not lie within an area where radon protective measures are required for the proposed development.

2.10 Outline Remedial Strategy

Soils

Based on the site being developed residentially with private gardens, elevated concentrations of arsenic, lead, cadmium, speciated PAHs and heavy range aromatic TPHs have been in the Made Ground. No asbestos was detected in any of the samples screened through laboratory testing.

IGE have classified the north western area of the site at DS01 as a hotspot based on the olfactory evidence of contamination and significantly high geo-environmental testing results at this location. The contaminated material (both soils and groundwater) should be removed in order to mitigate against the risk to future site end users. Material should be excavated to a depth of 3.5m begl and a minimum of 5m x 5m in area and be disposed of to a licensed waste facility. Based on the source of the contamination being backfill with the reservoir, it is likely that a larger area will be required to be excavated and validated. A watching brief should be in place for all groundworks for visual/olfactory evidence of contamination.

In areas of the proposed residential gardens, a clean cover system comprising 600mm of clean topsoil and subsoil was recommended, this should include a demarcation layer at the base of the cover system comprising of 100mm to 200mm of gravel or geotextile membrane.

The depth of the cover system placed, and chemical suitability of the material should be validated.

Controlled Waters

Groundwater testing has recorded elevated CoC confined within the perched Made Ground material, associated with the backfill of the reservoir. The groundwater in the area was not considered a sensitive resource and present at circa 20m begl. Made Ground or natural clay layer is present beneath the impacted material onsite and significant distance is present to the nearest surface water receptor to allow for attenuation. The risk to controlled waters was deemed as *Low*, however remedial measures consisting of the removal of the impacted material is required as a minimum during the works. The sources of contamination in the surrounding area including nearby refuse tip and likely to be more harmful to the aquifer than the former reservoir or possible tank on the site. In addition, a piling risk assessment has been produced with steel piles recommended to prevent impaction of the aquifer.

Gas Precaution Measures

The site was classified as Characterisation Situation 2 (CS2) due to the proximity to ground gas generating sources such as a quarry and landfill and ground gas protection measures were recommended.

A minimum of 3.5 points of protection is required for the residential development in accordance with BS 8485.

Watching Brief and Regulatory Compliance

A watching brief should be in place during the enabling works for any unidentified contamination. If previously unidentified contamination is encountered, work should cease in that area and Geo-Environmental Consultant contacted for advice. Removal of the impacted material at DS01 is required during the enabling works.

2.11 Geotechnical

The most suitable foundation solution for the proposed development were considered to be steel tubular piles bearing into the underlying bedrock deposits due to the deep Made Ground which is contaminated with residual diesel.

Heave Precautions

Two samples of cohesive Made Ground and two samples of the weathered bedrock were tested during the Ground Investigation. The Clay was classified as having a medium volume change potential in accordance with NHBC Chapter 4.2.

Heave precautions were recommended where foundations are within influence of trees however are not likely to be needed as Clay is not present within tree influence depth.

Floor Slab

Due to the depth of Made Ground encountered, suspended floor slabs were recommended for the proposed development.

Retaining Structures

Two foundation inspection pits were carried out along the existing retaining walls and were terminated at 0.3m and 0.4m begl beneath the base of the foundations. The foundations were constructed of sandstone cobbles/boulders which is in-line with the retaining wall construction. It was anticipated that the retaining walls will be retained for the proposed development.

The development is indicated to be constructed on a split level due to the sloping nature of the site.

Concrete classification

The results of laboratory pH and sulphate content indicate that ACEC Class between AC-1 and AC-5 and sulphate class DS-1 and DS-4 conditions prevail in accordance with BRE Special Digest 1 "Concrete in aggressive ground" 2005.

3.0 POLLUTION LINKAGE ASSESSMENT REVIEW

The following section summarises the revised pollution linkage assessment undertaken in the Geo-Environmental Appraisal produced by IGE Consulting.

3.1 Human Health

Receptor	Level of Risk	Comments
Site End Users (Soils)	Moderate to High	Deep Made Ground recorded and elevated levels of arsenic, lead, cadmium, PAHs and heavy range aromatic compounds were recorded in the Made Ground. Proposed development comprises soft landscaping and remedial measures required.
Site End Users (Vapours)	Low	Laboratory testing show none of the hydrocarbons are within the volatile range. All PIDs were below 1ppm.
Site End Users (Ground Gas)	Moderate to Low	Ground Gas assessment places site in CS2 and gas protective measures are required. No radon precautions are required.
Adjacent Site Users	Low	No mobile contamination has been identified on site.

3.2 Controlled Waters

Receptor	Level of Risk	Comments
Groundwater	Low	Only perched groundwater identified in the Made Ground and groundwater anticipated to be at significant depth. A Made Ground or natural clay layer is present beneath the impacted material onsite. The sources in the surrounding area including nearby refuse tip and likely to be more harmful to the aquifer than the former reservoir or possible tank onsite. Steel piles required to create seal. Remediation in the form of removal and validation of contaminated material to be undertaken during works.
Surface Water Features	Low	Gross contamination not present and significant distance to surface water features is enough to allow considerable attenuation.

3.3 Groundworkers

Receptor	Level of Risk	Comments
Contractors	Moderate to High	During remediation phase based on elevated heavy metals, PAHs and hydrocarbons in Made Ground soils.

4.0 REMEDIATION PROPOSALS AND APPRAISAL

Remediation will be undertaken to ensure the site is suitable for its proposed residential end use which comprises the construction of a pair of semi detached dwellings with associated gardens and car parking.

The required level of remediation, to the satisfaction of the relevant regulators and discharge planning conditions, will be accomplished through a combination of techniques as outlined in the subsequent sections.

The implementation of the remediation proposals will be in accordance with the following documented quality assurance procedures:

1. **Detailed Remediation Specification** which outlines the requirements to demonstrate the effectiveness of the remediation in order to meet the remediation objectives. These are detailed in the following sections of this report.
2. **Verification Report** which will provide a complete record of the remediation activities undertaken during the works phase as part of the verification plan to support compliance with remediation objectives and criteria. The report will also contain descriptions of the works including photographic evidence and details of any unexpected conditions encountered during the remedial works and how they were dealt with.
3. **Cover System Validation Report** which will validate the suitability and depth of cover system in garden areas.
4. **Ground Gas Protection Measures Validation Report** which will validate the suitability and installation of ground gas protection measures.

In addition to the above, the preferred contractor will be required to secure all necessary permits and licences to allow remediation to be undertaken and prepare appropriate health and safety risk assessments and method statements in accordance with CDM Regulations 2015 and other relevant legislation. All roles and responsibilities should be agreed/delegated at a pre-start meeting.

4.1 Outline Remediation Proposals

Based upon the findings of the Ground Investigation, risk assessment and the remediation options appraisal in accordance with LCRM, the following remediation processes will be carried out to produce a site which is suitable for its proposed residential end use and adhere with the General Requirements set out in *Appendix 2*.

The following remediation works will be undertaken to deliver the site suitable for the defined residential end use.

The following works are considered necessary during the works phase:

- *Vegetation clearance*
- *Break out of all hardsurfacing and processing*
- *Removal of contaminated soils and groundwater near DS01 in the north west of site*
- *Appropriate materials management of soils*
- *Offsite disposal of unsuitable or excess material*



- *Placement of piling mat*
- *Watching brief for unidentified contamination*
- *Undertake all of the above in a safe manner with respect to party walls and surrounding properties*
- *Excavations for foundations*
- *Excavations for service runs and drainage*
- *Installation of correct level potable water supply pipe*
- *Placement of clean cover system in areas of gardens and soft landscaping*
- *Installation of ground gas protection measures*

All works need to be undertaken in accordance with the Remedial Specification. Following completion of the works phase, validation reports will be required to be submitted to the regulators for approval.

4.2 Project Setup and Management

Prior to commencement of site activities, detailed planning of the project shall be undertaken including liaison with the client, supervising consultant, contractors and regulators. The Remedial Specification should be submitted to the relevant regulators for approval prior to commencement.

The project is to be operated under the Construction, Design and Management (CDM) Regulations, (2015).

5.0 IMPLEMENTATION OF SITE REMEDIATION PROCESSES

5.1 General

The following remedial works are required to break pollution linkages, to reduce risks to an acceptable level and make the site suitable for the proposed residential end-use.

5.2 Implementation

Activity 1 - Pre-Start, Demolition and Site Clearance

Consideration into the surrounding retaining walls and neighbouring residential properties should be undertaken during the demolition works. The hand dug inspection pits and visual inspection undertaken along the existing retaining walls indicate the walls are in good condition.

The works contractor shall be responsible for the true and proper setting-out of the works.

The works contractor shall investigate the features of the structures, ascertain if shock or vibration could damage surrounding property or equipment therein or buried utilities and check the existence of toxic or flammable substances. The eastern area is residential however the main concern would be the boundary walls to the east and west of site. It is not anticipated that the boundary walls would need to be rebuilt based on the findings of the IGE investigation. It is recommended that a structural assessment is carried out by a suitably qualified structural engineer prior to commencement of the works.

The contractor is to ensure that the records are current and complete through discussion with all appropriate statutory bodies and is responsible for all disconnection, diversion, sealing or removing of existing services as necessary (unless otherwise advised by the client).

Trees, boundaries and other features of interest, which are to be retained, shall be clearly identified and protected by a robust fence to avoid accidental impact damage and prevent excavation within the root zone of influence of foundations. All works shall be undertaken in accordance with BS 5387: 1991 'Trees in relation to Construction'. All other trees and shrubs shall be grubbed up and disposed of appropriately off site.

Prior to any works, the site shall be cleared of rubbish, debris and approved vegetation. Topsoil is present in the western section of the site, laboratory testing undertaken has found no elevated concentrations of CoC in the single sample screened. Additional testing of the natural topsoil is required once stockpiled separately from the rest of the material to determined suitability for reuse.

All movement of materials shall be recorded and records shall be kept detailing the nature and quantity of materials, haulier details, final destination and any other relevant information.

Water or liquids shall not be pumped or emptied into the existing sewers/drainage system without the appropriate treatment and written permission of the relevant authority. If mobile tankers/bowsers are to be used, then disposal shall be at suitably licensed facilities in accordance with current legislation.

Activity 2 - Break out of Hardstanding and Processing

The works contractor shall demolish, break up and remove all below ground structures. These include, but are not limited to slabs, drains, hardsurfacing, foundations, relic structures, utility ducts, etc.

The site is currently covered by hardstanding tarmac associated with its use as a car park.



The contractor shall provide adequate protection against collapse of the excavations and suitable groundwater control measures shall be put in place until the voids are backfilled to a suitable geotechnical specification. Adequate protection should also be implemented around the site boundary where required due to the difference in levels.

All unsuitable materials are to be removed from site to a suitably licensed facility.

Testing of processed material should be in accordance with Activity 8 listed below.

Activity 3 - Removal of Hydrocarbon Impacted Soils

Olfactory evidence of hydrocarbon contamination and elevated concentrations of PAHs and heavy range aromatic speciated hydrocarbon compounds were encountered in DS01 to a depth of 2.3m begl. Hydrocarbon impacted perched groundwater was also encountered at DS01 and DS02. The area of the impacted material should be excavated, delineated and impacted material removed from site.

Any free phase hydrocarbon encountered during the enabling works should be delineated, excavated and removed off site to an appropriately licenced waste disposal facility.

The contractor will need to have an experienced geo-environmental engineer present during hotspot excavation to inspect for suspect material and oversee validation of soils. Validation is to be undertaken on behalf of the contractor by Groundtech Consulting.

Validation of the removal of any hotspots is proposed by the geo-environmental testing of samples obtained from the sides and base of hotspot excavations. A 25m² validation grid (base and sides) is proposed.

The quantity of materials excavated will be obtained and waste transfer notes provided by the client for inclusion in the enabling works validation report.

Validation is to be undertaken on behalf of the works contractor by Groundtech Consulting in accordance with the appended Remedial Target Values (RTVs). However, remediation of this material will largely be based on observations due to the obvious nature where staining and obvious odours have been noted during the investigation works. PID screening will be undertaken however given the heavy end nature of impaction, the removal will largely be based on observations.

All materials excavated from the hotspot excavations will be disposed of to a licensed waste disposal facility. The excavations should be backfilled with suitably clean imported material.

Activity 4 - Reuse of Soils, Importation and Placement of Soils

Testing of soils prior to placement is required as set out in the is Remedial Specification.

If, in the opinion of the Consultant, the material is not suitable for use, the contractor is to remove and dispose of it in accordance with the Remedial Specification.

Activity 5 - Off-Site Disposal of Unsuitable or Surplus Material

Any soils to be removed from site are to be removed to a licensed waste management facility. The waste is to be taken by a registered waste carrier in accordance with applicable Waste Management Regulations.

All testing to allow disposal of waste is to be undertaken by the contractor.



Waste consignment/transfer notices will be required and are to be retained by the enabling works contractor. Copies of all waste consignment/transfer notices are to be provided to Groundtech Consulting for inclusion in a validation report.

Activity 6 - Watching Brief

A watching brief should be maintained for the duration of the works for visual or olfactory evidence of contamination. If identified, work should cease in that area and Groundtech Consulting consulted for advice and to revise the Remedial Specification, if required. There is also anecdotal evidence that a tank was formerly present in the north west of the site.

Activity 7 - Placement of Piling Mat/Working Platform

Steel tubular piles are to be installed for the proposed structures due to the deep Made Ground, soft Clay deposits and contaminated material encountered during the Ground Investigation, this affects all plots on site. A piling mat is required to be designed and placed prior to installation of pile foundations.

Activity 8 - Validation Criteria During Works

The following sections detail validation criteria to be used during the works.

Testing

All testing during the works shall be undertaken by the works contractor and all sampling, logging, and testing of soils shall be undertaken in accordance with BS 5930:2020 'Code of Practice for Site Investigations' and BS 10175:2011+A1:2019 'Investigation of Potentially Contaminated Sites – Code of Practice'.

The works contractor shall undertake all testing at a laboratory which holds UKAS and MCERTS accreditation for the specific tests. The Consultant shall be given sufficient time to review the content of the testing and the associated test results.

Hydrocarbon Impacted Soils

Validation of the impacted soils around DS01 will be undertaken by the geo-environmental testing of the sides and base of excavations. A 25m² validation grid (on all sides and base) is required. Validation sampling is to be undertaken by an experienced geo-environmental engineer on behalf of the works contractor and samples are to be tested in accordance with the Remediation Target Values (RTV) as presented in *Appendix 4*. PID screening will also be undertaken to validate the excavations however the assessment will be largely visual. The following suites of testing is required:

- *Speciated Total Petroleum Hydrocarbons TPH (TPH CWG)*
- *Soil Organic Matter (SOM)*

General Reuse

The following is required to allow re-use of soils:

- *No visual contamination (oil staining etc.)*
- *Minimal deleterious material (organics, wood, metal etc.)*
- *No visible Asbestos Containing material (ACM)*

The visual requirements in the list above are to be confirmed by a suitably qualified geo-environmental engineer.



Activity 9 - Contractors Validation Records

The works contractor shall maintain a daily written and photographic record of the works undertaken.

All records provided by the works contractor shall be available to the Client and Groundtech Consulting for comment along with all geo-environmental data.

Activity 10 - Installation of Correct level of Potable Water Supply Pipe

The correct potable water pipework is to be installed for all plots by the works contractor in accordance with local water company risk assessment. The works are to be validated by the ground works contractor, who is to provide to Groundtech Consulting:

- *Provision of delivery tickets showing correct potable supply pipework has been delivered to site*
- *Photographic proof that the correct potable supply pipework (or similar) has been installed*

Activity 11 - Installation of the Cover System in Areas of Soft Landscaping

A clean cover system is required in garden areas to reduce the risk to an acceptable level. The cover system installation by the ground works contractor should be undertaken in the following steps:

1. *Undertake geo-environmental testing and assessment of all imported soils (cohesive and granular) to establish they are suitable for use. Groundtech Consulting should be provided with the testing certificates prior to import and additional testing may be required.*
2. *In areas where trees are planned as part of the landscaping the cover system should be increased to allow for the root ball. The dimensions of the tree pit (if required) are to be specified by a qualified arboriculturist.*
3. *Install house drainage and other services and storing excavated clean soils appropriately for re-use in gardens.*
4. *Validation of the cover system to be undertaken by Groundtech Consulting.*

The cover system requirements are set out below based on the specific use:

Specific Use	Requirements
<i>Private gardens and soft landscaped areas</i>	<i>The cover system should comprise 600mm of topsoil and subsoil (minimum of 150mm of topsoil) over a demarcation layer (Geotextile membrane or 100mm Type 1).</i>

Sourcing of Material for the Cover System

Topsoil is present in the western area of site and additional testing is required to determine suitability for reuse, it is anticipated that import of topsoil and subsoils will be required to form the cover system. Any imported soils should be from a source not expected to be contaminated and meet both physical and chemical criteria, as detailed in this Remedial Specification.

Prior to importation of topsoil, subsoil or granular material from a commercial supplier, certification should be obtained from the supplier detailing the source site, its previous and current land use and relevant test results. A copy of this should also be forwarded to Groundtech Consulting for review and comparison against the import criteria.

If the proposed source is not from a commercial supplier, Groundtech Consulting recommend that the source is tested to confirm it is appropriate for use prior to import.

Requirements of Cover System Soils

Any imported materials are to be tested by the contractor in accordance with this Remedial Specification to demonstrate they are suitable from a geo-environmental engineering perspective.

Any imported soils should be from a source not expected to be contaminated and meet both physical and chemical criteria, as detailed in this Remedial Specification.

Prior to importation of topsoil, subsoil or granular material from a commercial supplier, certification should be obtained from the supplier detailing the source site, its previous and current land use and relevant test results. A copy of this should also be forwarded to Groundtech Consulting for review and comparison against the import criteria.

Imported material should be free from:

- *Asbestos, metal, plastic, wood, glass, tarmac, brick, paper, concrete, or other potentially hazardous foreign material which could cause injury*
- *Aggressive / invasive weeds (especially Japanese Knotweed and Giant Hogweed) and bulk vegetative growth*

If the material is not from a supplier, it is recommended that testing is undertaken at the source to determine if the materials are likely to be suitable prior to import. Geo-environmental testing will also be required once the material arrives at site to confirm the soils imported are the same as those sampled at the donor site.

The results of geo-environmental testing for imported material are to be compared with the criteria presented in *Appendix 4*. If any of these thresholds are exceeded the material shall be considered unsuitable unless treatment, further testing and risk assessment shows it to be satisfactory.

Testing of the cover system and imported material should be undertaken in accordance with YALPAG cover system guidance as summarised below.

Type	Number of samples	Testing schedule
<i>Virgin Quarried Material</i>	<i>1 or 2 depending on the type of stone utilised</i>	<i>Standard metals/metalloids As, Cd, Cr, CrVI, Cu, Hg, Ni, Pb, Se, Zn)</i>
<i>Crushed Hardcore stone/brick</i>	<i>Minimum 1 per 1000m³</i>	<i>Standard metals/metalloids (As above) speciated PAH, Asbestos</i>
<i>Greenfield Manufactured Soils</i>	<i>Minimum of 3 or 1 per 250m³ (whichever is greater)</i>	<i>Standard metals/metalloids (As above), speciated PAH, Asbestos</i>
<i>Brownfield Screened Soils</i>	<i>Minimum 6 or 1 per 100m³ (whichever is greater)</i>	<i>Standard metals/ metalloids (As above), speciated PAH, TPH (CWG) Asbestos. Any additional analysis dependant on the history of the donor site</i>

Imported topsoil and subsoil for the cover system should be as agreed with the client and where possible should conform to BS 3882:2015 and BS 8601:2013. It should be noted that clay soils are not recommended as they are likely to become waterlogged during handling and placement.

Activity 12 - Ground Gas Protection Measures

The IGE Consulting Phase 2 Investigation classified the site as Characterisation Situation 2 (CS2) and ground gas protective measures will be required in the proposed development.

As the site is to be developed residentially, the building type is A and 3.5 points of protection are required.

The 3.5 points can be achieved by a combination of two or more of the following three types of protection measures to achieve the required score:

Protection Measure	Details	Points of Protection
Structural Barrier/Floor Slab	Cast in situ monolithic reinforced ground bearing raft or reinforced cast in situ suspended floor slab with minimal penetration	1.5
Ventilation Protection Measures	Passive sub floor dispersal layer of good performance	1.5
Gas resistant Membrane	Gas resistant membrane (including methane) meeting the criteria outlined in Table 7 of BS 8485:2020	2.0

The gas protection details are to be detailed by the architect or the Structural Engineer.

Gas protection is to be installed by the ground works contractor (or specialist contractor on their behalf). The ground gas protection should be installed with all due regard to best practice and guidance.

Validation and verification will be undertaken by Groundtech Consulting in accordance with C735 to the required to the scope agreed with Kirklees Council.

6.0 SUPERVISION, VERIFICATION AND REPORTING

Necessary changes to the agreed Implementation Plan, arising during the course of the works, are to be agreed in writing with the Local Authority and Environment Agency prior to being undertaken on site.

It is recommended that details of the environmental works undertaken, the rationale and design for the implementation of this strategy and verification details of the works undertaken are appended to the deeds for the property to ensure the site is sold with full knowledge of the works undertaken and the ground conditions present.

6.1 Site Supervision

Remediation works are to be undertaken with a part time site watching brief by Groundtech Consulting (The Consultant).

6.2 Collection of Samples

All sampling, logging and testing of soils shall be undertaken in accordance with BS 5930:2020 'Code of Practice for Site Investigations' and BS 10175:2011+A2:2019 'Investigation of Potentially Contaminated Sites – Code of Practice'.

Soils for inorganic analysis will be sealed in air-tight polythene tubs, and soils for organic analysis will be sealed in amber glass jars with the minimal practicable headspace.

All samples shall be scheduled on chain of custody forms prior to being dispatched to the UKAS accredited laboratory for analysis.

All testing should be undertaken at a laboratory which holds UKAS and MCERTS accreditation for the specific tests.

6.3 Works Validation

On receipt of the records from the works contractor, to demonstrate that all of the works have been undertaken in accordance with the Remedial Specification, Groundtech Consulting will provide a validation report.

The report will be prepared by Groundtech Consulting and will provide a summary of the key elements of work and will be referenced to the agreed redevelopment strategy and planning requirements with supporting information presented within appendices.

This shall be based upon LCRM, and specifically will include supporting information as summarised below:

- *Records of works undertaken, and associated validation/monitoring records obtained from the contractor as detailed above*
- *Final status of remediation and confirmation of remedial objectives to satisfy the planning conditions*
- *Site stripping and clearance activities undertaken during remediation*
- *Records of any asbestos encountered during the works (type location and action)*
- *Records of laboratory analytical and in-situ field test results, including:*
 - *Laboratory results and location plan for each test*
 - *Copies of the certificates for geo-environmental testing*

- *Approximate quantities for all materials removed from the site*
- *Copies of all consignment notes, in particular those relating to the hazardous waste regulations, details of waste facilities where materials were disposed of*

Potable Water Supply Pipe Installation

It is the responsibility of the works contractor to record photographic evidence of the installation of pipework. This photographic evidence is to be provided to Groundtech Consulting for inclusion in the Verification Report.

Ground Gas Verification

Ground gas mitigation measures shall be installed by the ground works contractor in accordance with CIRIA 665 and BS:8485. Validation of ground gas membranes will be undertaken in accordance with CIRIA 735. The ground gas membrane validation sheet is provided in *Appendix 5*.

Cover System

Verification of cover system thickness is required. Testing of imported soils will be required in accordance with this Remedial Specification. Groundtech Consulting should be notified when the cover system has been placed and will undertake a visual inspection. The cover system validation pits will be undertaken at a frequency of one pit per plot.

If the cover system is deemed to be inadequate, Advice on remedial measures will be provided. Verification of the cover system will only be carried out where the cover system has been completed.

The cover system validation report will include:

- *Confirmation of the source of imported material*
- *Confirmation of the physical suitability of the material as per Section*
- *Confirmation that the geo-environmental test results pass when compared to the appended RTVs*



7.0 MATERIALS MANAGEMENT

Confirmatory Testing for Material for On Site Reuse - Excavated Material

Any site won Topsoil should be retested to confirm suitability for reuse prior to use within the cover system.

Materials found to be out of specification should be disposed to a suitably licenced waste disposal facility.

Confirmatory Testing for Material for Offsite Disposal

Any material requiring disposal during any phase of works shall be disposed offsite to a suitably licensed waste disposal facility.

Confirmatory Testing for Imported Material

Imported soil will be tested to determine it is suitable for use in accordance with this specification.

The contractor importing the material is to provide laboratory testing results to Groundtech Consulting to prove the suitability of the material to be brought on to site in line with the requirements specified in this Remedial Specification. Once the soils are present on site, additional testing will be undertaken.



8.0 CONTINGENCY PLAN AND AREAS OF UNEXPECTED CONTAMINATION

There is potential for areas of unexpected contamination to be present, due to the former use of the site. The strategy for unexpected contamination must be relayed to all site personnel during the works phase and outline a clear allocation of responsibility for reporting and dealing with contamination.

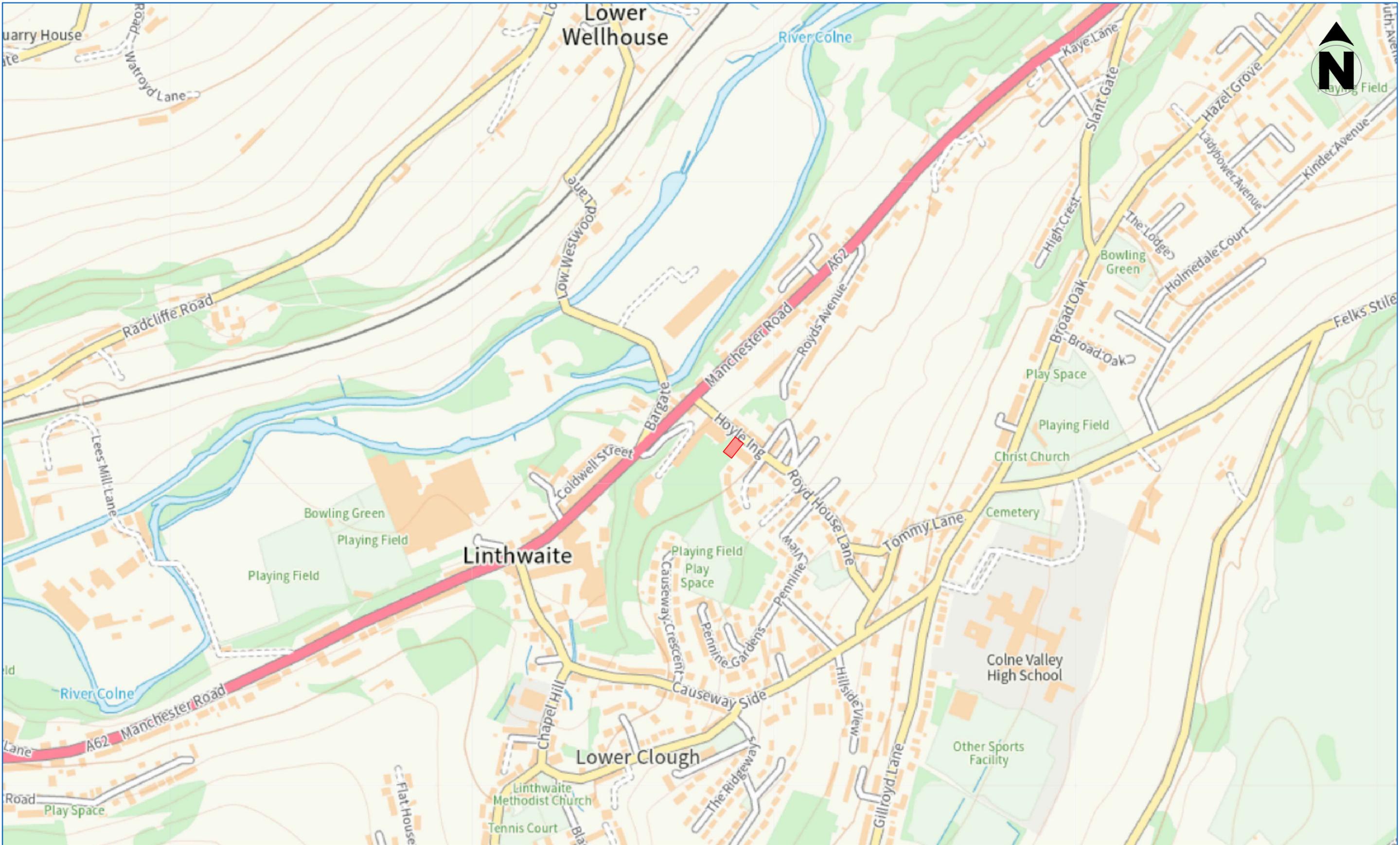
Any member of the workforce entering the site to undertake any excavation must be made aware of the potential to discover contamination and the requirement to report this to the client and Groundtech Consulting.

A report will be prepared by Groundtech Consulting and submitted to the regulatory parties, the Local Authority and the Environment Agency where groundwater may potentially have been impacted.

If additional materials are identified, these materials will be subject to the procedures stated in this Remedial Specification.



APPENDIX 1 - Plans



CLIENT MR BEN GOOD
PROJECT TITLE MANCHESTER ROAD, LINTHWAITE
PLAN TITLE PROJECT LOCATION PLAN

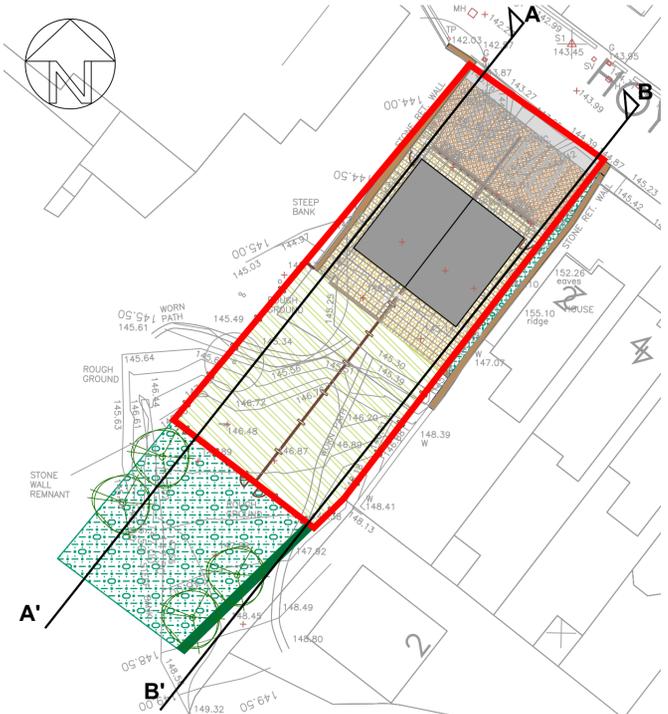
DATE OCTOBER 2025
SCALE NTS
PLAN NUMBER GRO-25333-P01

Rev.	Details	Date

Status	
Preliminary	
Draft	
Issued	●
For Comment	
Approved	

Notes	● Site Location
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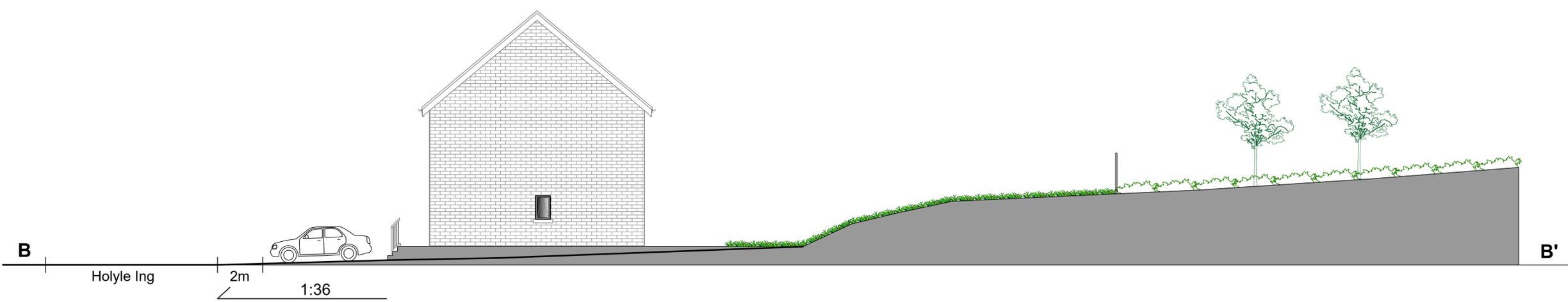




Section Location Plan - 1:300 @ A1



AA' Section
1:100 @ A1



BB' Section
1:100 @ A1

Do not scale this drawing (printed or electronic version).
Contractors must check all dimensions from site.
This drawing is copyright and is for use on this site only. This drawing should be read in conjunction with all relevant consultants drawings and specialist subcontractors / supply chain drawings and specifications.
All works to be carried out in accordance with the latest British Standards / Codes of Practice unless specifically directed otherwise in the specification.
Responsibility for the reproduction of this drawing in paper form, or issued in electronic format, lies with the recipient to check that all information has been replicated in full and is correct when compared to the original paper or electronic image.
Graphical representations of equipment on this drawing have been co-ordinated, but are approximations only. Please refer to the specifications and / or details for actual sizes and / or specific contractor construction information.

Notes:-



P06	29/11/23	UPDATED ISSUED	TH	SA
P05	09/06/23	UPDATED ISSUED	TH	SA
P04	05/06/23	UPDATED ISSUED	TH	SA
P03	01/06/23	UPDATED ISSUED	TH	SA
P02	13/02/23	UPDATED ISSUED	TH	SA
P01	09/02/23	FIRST ISSUED	TH	SA
REV.	DATE	DESCRIPTION	DRAWN	CHKD



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Deva City Office Park, Trinity Way,
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Client:	REDWATERS		
Project:	Land adjoining 2 Hoyle Ing		
Title:	LANDSCAPE SECTIONS		
Issue:	PLANNING		
Drawn:	TH	Checked:	SA
Approved:	MK		
Project:	UG1837	Scale @ A1:	See Labels
Date:	09/02/23		
Dwg No:	UG_1837_LAN_SEC_DRW_02	Revision:	P06



APPENDIX 2 - General Requirements

1. Compliance with Legislation and Standards

The works are to be undertaken in compliance with all relevant British Standards, codes of practice, regulations, guidance and legislation. Whilst not an exhaustive list, works shall be in compliance with the latest revision of all relevant legislation, HSE Guidelines and good working practice including, but not be limited to, the following:

- *The Health and Safety at Work etc. Act 1974.*
- *Construction Health Safety and Welfare Regulations 1996.*
- *Health and Safety Executive 'Protection of Workers and the General Public during Redevelopment of Contaminated Land' HS (G) 66, HMSO 1991.*
- *The Construction, Design and Management Regulations 2007.*
- *The Control of Substances Hazardous to Health Regulations 2002 (COSHH Regulations).*
- *The Control of Asbestos Regulations, 2012.*

The Contractor is responsible for obtaining all necessary approvals, licences, consents and permits from regulatory bodies and third parties prior to commencement.

2. Licences, Permits and Consents

Any conditions associated planning permission should be addressed prior to carrying out the works.

It will be a requirement of the Contractor to obtain any of the necessary permits and undertake the appropriate notifications and assessments.

The Contractor should only expect approvals have been sought by others where explicitly provided to the Contractor or advised in writing.

3. Health and Safety Requirements

The Principal Contractor must manage the risks in accordance with their legal requirements and all works are to be undertaken in compliance with all relevant regulations, guidance and legislation. A Construction Phase Health and Safety Plan (CPHASP) will be required to be submitted to the CDM co-ordinator, the Client and the LPA in advance of mobilisation to site. The CPHASP will be passed to the Site Manager who will implement all Health and Safety measures on site. The Site Manager will fully induct the Site Operatives prior to commencement of any works. The CPHASP will be kept as an open document and will be adapted as required to during the project. As a minimum this will include:

- *Welfare arrangements, storage and security.*
- *Air monitoring requirements (and action levels), if required.*
- *Traffic management plan.*
- *Segregation of working areas and site welfare (and decontamination units if required).*
- *Site inductions, daily safety briefings and toolbox talks.*
- *Activity specific risk assessments.*
- *Method statement briefings.*
- *Daily inspection records.*
- *Permits to work.*

During the works it will be necessary to protect the health and safety of the site personnel.

General guidance on these matters is given in the Health and Safety Executive (HSE) document 'Protection of Workers and the General Public during the Redevelopment of Contaminated Land' HS (G) 66. In summary, the following measures are suggested to provide a minimum level of protection:

- *All ground workers should be issued with protective clothing (including high visibility clothing), hard hats, footwear and gloves, personnel instructed as to how it should be used.*
- *All personnel shall wear hard hats, high visibility clothing and protective footwear at all times.*
- *Ensure that everyone on site complies with the health and safety plan.*
- *Take reasonable steps to ensure that only authorised persons are allowed on site.*
- *Display, where they can be easily read, any notification that has been sent to the Health and Safety Executive.*
- *Hand washing and boot cleaning facilities shall be provided.*
- *No smoking except in designated areas.*
- *Good practices relating to personal hygiene shall be adopted.*
- *Prepare method statements for construction operations as required by the Principal Designer.*
- *Provide the CDM Co-ordinator with any other relevant information.*

Before site operations are commenced, the necessary COSHH Assessments, Method Statements and Health and Safety Plans should be completed, approved to the Principal Designers satisfaction and issued in accordance with the CDM Regulations.

The Construction Phase Health and Safety Plan (CPHASP) should pay particular attention to the following hazards which may be encountered:

- *Potentially hazardous or contaminated materials used or encountered on site.*
- *Deep excavations.*
- *The potential for ground gases and risks on confined spaced entry.*
- *Working in the vicinity of existing underground or overhead services.*
- *Working in confined spaces.*
- *Working on, or in the vicinity of highways.*
- *Working with materials which have the potential to contain asbestos and the risk of inhalation of asbestos fibres.*
- *Manual handling.*
- *The potential for fire.*
- *Working with electrical apparatus in the vicinity of mobile plant and the potential presence of water.*
- *Poor lighting.*
- *The potential for falling/slipping/tripping and sustaining injury.*
- *The possibility for biological agents to be present, including, but not limited to: psittacosis, leptospirosis (Weill's disease), tetanus, legionella, human waste.*
- *Working in the vicinity of voids and openings.*

The Contractor shall take all necessary safety precautions throughout the ground treatment operations and shall comply with the Health and Safety at Work Act 1974 or any subsequent re-enactment thereof.

The Contractor shall submit for approval all necessary method statements to the Client prior to commencing the works.

The Contractor shall provide details of emergency procedures. Emergency services shall be informed of the site operations prior to commencement.

All statutory records to be kept in the site manager's office and these may include (not an exhaustive list and note not all may be required):

- *ASB NNLW1 – Notification of non-licensed asbestos work if the work is deemed not be requiring a licence (if required).*
- *Appropriate licence with regards to CAR 1012 if the work is deemed to require a licence.*
- *HSE Notification F10.*
- *Construction Phase Health and Safety Plan.*
- *Method Statements and Risk Assessments; Environmental Permit deployment form and associated paperwork.*
- *Discharge Consents for disposal of groundwater.*
- *Competence records (including asbestos awareness training and face-fit test records).*
- *Utility records.*
- *Plant and machinery maintenance records.*
- *Duty of Care paperwork.*

In addition, it is recommended that:

- *Asbestos Awareness training/briefing to be given to all staff.*
- *Background and ongoing air dust monitoring to be undertaken to check for presence of asbestos fibres during the works.*
- *Licensed asbestos contractors are employed to manage the licensed asbestos controlled areas, all other operatives involved in the operations must have appropriate training to satisfy the requirements of the Control of Asbestos Regulations 2012.*

4. Site Establishment and Security

Prior to the commencement of any works, the contractor, in conjunction with the Client and the Supervising Engineer, shall establish the boundaries of the site and working areas.

The Contractor shall make adequate provision to secure the site boundary and prevent unauthorised access onto the site during the course of the works.

Prior to the commencement of any works, the contractor, shall undertake a dilapidation survey of all adjacent features/construction including but not limited to boundary walls/ fences, adjacent footpath and road constructions etc. The survey is to be agreed with the Client or their representative prior to commencing any work on site.

The Contractor shall be responsible for all costs associated with rectification of damage to adjacent features/construction including but not limited to properties, boundary walls/ fences, adjacent footpath and road constructions etc. resulting from the demolition works.

The Contractor is to provide surveying capability as set out in this document facilitate the above. Prior to the completion of the works the Contractor is to discuss the continuation of the site security, including the fences, with the client and acceptable arrangements for continued security are to be agreed prior to the removal of the contractor's security provision.

5. Traffic Safety and Management

The Contractor shall comply in all respects with Chapter 8 of the Traffic Signs Manual for works on or affected the public highway and/or private roads forming the highway access to/from the site. The Enabling Works Contractor shall obtain all necessary consents from the Local Highway Authority for works on the public highway.

On-site access and haul routes should be provided and maintained by the Enabling Works Contractor in such a manner so as not to endanger either the user, those working in the vicinity of such accesses/haul routes and or the Works. Access to the site will be agreed with the Clients prior to commencement.

Suitable precautions shall be taken to prevent the spread of mud and debris on the public highways. Regular inspections of the public highway adjacent to the site shall be carried out. If deemed necessary by the Contractor, the Client or the Supervising Engineer, the highway shall be swept regularly to remove any mud, slurry or dust deposited by vehicles entering or departing the site. If the Supervising Engineer considers that significant amounts of any detritus have been deposited on the public highway then operations shall be temporarily suspended until appropriate cleaning operations have been undertaken.

The Contractor is to co-operate with other Contractors if they are present during the works. The proposed works will generate a number of vehicle movements associated with the removal of soils and delivery to site of materials. Consideration should be given to the route and the timing of these vehicle movements, to minimise risk and disturbance to sensitive locations (such as schools, residential areas).

Risks associated with the transport of soils that are potentially containing contaminated, such as dust emission, should be appropriately managed.

6. Welfare Facilities

Site cabins and welfare facilities will be established at a location to be agreed with the Supervising Engineer.

The Contractor is deemed to have made provision and arrangements for all temporary utilities associated with the welfare facilities.

7. Working Hours

Noisy operations such as the use of hydraulic breakers shall be restricted to operating times as specified by the Client and by the Planning Permission. It is understood that these are 8:30 am to 5:30 pm, or other hours agreed with the Local Authority, Monday to Friday and 9.00 am to 1.00pm on Saturday. No working shall take place on Sunday or Bank Holidays.

Prior to commencement the Contractor is to make contact with the Local Authority to establish if any further restrictions apply.

8. Mobile Plant

Mobiles plant shall be operated by suitably trained and qualified operators experienced for each item of plant. When not in use all plant shall be locked to prevent all plant shall be locked to prevent unauthorised operation.

All traffic entering or working on site shall comply with a maximum 10 mph speed limit.

Fuelling of any plant shall be undertaken in a designated area and all above ground fuel storage tanks shall comply with the requirements of the Pollution Prevention Guidelines PPG2. Specifically, any storage tanks used should:

- *Be sited within an oil-tight secondary containment system such as an impermeable bund.*
- *The secondary containment must provide storage for at least 110% of the tanks maximum capacity.*
- *Be located within a secure area.*
- *All taps and valves should be fitted with a lock and kept locked shut when not in use. Maintenance of mobile plant should be undertaken in a designated area, unless absolutely necessary.*

Waste oil, hydraulic fluid etc. should not be tipped directly or discharged on to site. Such materials shall be stored separately, in a secure bunded area, for off-site disposal. Waste oil may be a special waste and disposal shall be undertaken by a registered carrier in accordance with the Duty of Care Regulations.

A spill kit shall be kept on site in an accessible place adjacent to the designated refuelling area.

9. Unexploded Ordnance (UXO)

The site is in an area which is considered to be at a low risk with regards to UXO and mitigation measures are not required.

10. Surveying

The Contractor shall provide full time surveying personnel and equipment to undertake the following activities and any other requirement for topographical information relating to the project that arises through the duration of the enabling works contract. The survey personnel and equipment should be capable of providing accurate levels and co-ordinates in relation to the national grid and topographical survey provided within 1 day of request.

The following key activities are covered by the requirements for surveying:

- *Confirmation of topographical survey on possession of the site, and setting out of the site boundary.*
- *Confirmation of positions of existing utilities and site features.*
- *Surveying the base and extent of all excavations and remaining obstructions prior to backfilling.*
- *All setting out and levelling relating to delivery of the enabling works.*
- *The location of sub-structures removed.*
- *Interim surveys to be undertaken during the infilling works to provide information on issues such as depth of excavation, progress of earthwork, quantities of materials, testing depths and locations etc.*
- *The location and elevation of test samples and locations.*
- *As built survey information.*

The Contractor is required to undertake all necessary topographical survey works to verify these levels before the commencement of the contract. Should the Contractor find any discrepancies on the drawings they are to refer the matter to the Engineer for verification before proceeding with the part of the works affected.

The Contractor shall undertake a topographical survey following completion of the enabling works.

All topographical surveys shall include levels at maximum 10m spacing and details of any features, changes in slope, structures, services and any other features of interest.

All of the above features shall be surveyed for line and level at the site boundary and marked on a plan. Levels shall be to Ordnance Datum and locations to National Grid. The survey shall be calibrated against existing site surveys and benchmarks in the vicinity of the site.

11. Testing

The Contractor shall be responsible for undertaking all testing necessary to satisfy the Supervising Engineer that the works have been carried out in accordance with, and comply with this Remedial Specification.

All soils and geo-environmental testing shall be carried out by a UKAS and MCERTS accredited laboratory, with accreditation for the specific analysis, to the approval of the Supervising Engineer.

12. Offsite Disposal

Materials for offsite disposal shall be sampled and analysed, by the contractor, at rates sufficient to allow the material to be adequately classified by assessment.

WAC testing should be undertaken on material exported from site to landfill, or other appropriately licensed facility. Material shall be hauled by a registered waste carrier in accordance with the requirements of the Duty of Care Regulations, 1991, Environmental Permitting (England and Wales) Regulations 2016 and where appropriate the Special Waste Regulations, 1996 and Hazardous Waste (England and Wales) Regulations 2005. A transfer note shall be completed, signed and retained by all parties involved. The transfer note shall state the volume of waste, the nature of the material and statement to the chemical composition. The waste transfer notes shall be kept by the Contractor for a period of at least 2 years.

13. Contamination

Contractors should be made aware of the possibility of encountering contaminants within soils or groundwater at the site (including asbestos) through 'toolbox' talks.

Safe working procedures should be implemented in accordance with CIRIA132 and good standards of personal hygiene should be observed and appropriate levels of PPE provided and utilised.

Eating, drinking and smoking should be strictly prohibited in the development site other than in designated mess areas.

14. The Control of Noise, Vibration and Dust Nuisance

The Contractor shall comply with the recommendations for practical measures to reduce noise and vibration set out in BS5228-1:2009 and BS5228-2:2009 and with any specific Principal Contractor requirements.

The Contractor shall take all reasonable measures to prevent dust nuisance from being generated by construction traffic, etc.

If necessary working methods will be altered in order to ensure that the level of noise generated from the works is within published tolerable limits.

The requirements of the LPA are to be sought and undertaken.

General

No fires shall be permitted on site.

Dust Mitigation

Appropriate measures shall be implemented at all times during the demolition and enabling works to minimise any dust emissions.

Any main temporary haul roads shall, where practical to do so, be constructed of crushed hardcore products. The haul roads shall be maintained for the duration of their use to minimise any build-up of loose spoil etc.

Traffic both entering and working on site shall obey a maximum speed limit of 10 mph. Wagons that are to be used for the haulage of any contaminated material from site shall be appropriately sealed or sheeted to prevent the release of fugitive dust.

Mobile water bowsers and sprayers shall be available on site at all times to water unpaved haul roads and working areas. The water spray may include chemical dust suppressants or wetting agents to improve dust control. An adequate supply of water shall be maintained on site at all times to allow for dust suppression activities to be carried out at short notice.

Where mobile water bowsers are not effective in suppressing dust then vapour masts shall be used. Such vapour masts shall be deployed at 20m centres on the downwind side of haul roads or excavations giving rise to significant dust or emissions of odour.

Air quality and dust monitoring stations will be set up and monitored by the Contractor to record the dust concentrations during the works.

With regards to stockpiles:

- *Stockpiles should be kept to a minimum to reduce 'wind whip' causing potentially hazardous material to be blown from the pile.*
- *Stockpiles should be placed on a suitable polythene membrane in a bunded area to prevent any cross contamination and care should be taken not to pierce the sheeting when placing the bulky elements of the material.*
- *Stockpiles should be dampened down or covered to prevent dust, whilst the final choice should be made by the Contractor based on site constraints, but the options include covering with plastic/polythene membrane, or by a layer of clean soil material.*
- *The drop distance from excavator bucket to stockpile will be kept as short as reasonably practicable to reduce dust.*

Odour

In general terms the excavation works are not considered likely to give rise to any significant odour problems. However; possible 'hotspots' of hydrocarbon contamination cannot be discounted and it is advised that odours are assessed by twice daily inspections of all Site boundaries.

If highly odorous materials are encountered, which may give rise to nuisance to neighbouring properties, appropriate vapour masts shall be deployed to provide suitable odour control. Any odorous materials shall be covered at the end of each working day and any stockpiles will be located away from any sensitive areas.

Plant and machinery shall be serviced regularly to ensure that exhaust fumes are compliant with best practice and relevant regulations.

Noise

The requirements of the Local Planning Authority and BS 5228: 1997 'Noise and vibration control on construction sites' shall be adhered to at all times.

All machinery shall be fitted with effective silencers and shall be serviced at regular intervals. No items of plant shall be operated with engine covers raised.

The location of any crushing plant shall take into consideration the location of neighbouring properties and other noise sensitive receptors and shall be located away from these areas and located adjacent to proposed stockpile locations where possible.

15. Asbestos in Soils

The Contractor must manage the risks in accordance with their legal requirements and will need to prepare appropriate health and safety documentation.

No asbestos was detected in any of the samples screened during the Ground Investigation.

16. Water Quality Controls

The Contractor shall provide for such measures as may be necessary to ensure that water, whether groundwater, from precipitation or any other source does not accumulate in excavations or on sub-grades.

Adequate drainage sumps will be installed during works and cut off trenches/dewatering measures will be used as required to manage surface water run-off, to prevent any water from entering watercourses, either directly as surface water run-off, or indirectly via the surface water drainage systems; If materials escape, appropriate the Contractor is to undertake (at their cost) appropriate remedial action as soon as possible.

17. Utilities

Utility records are to be provided by the Client for information purposes within the enabling works documentation. However, the Contractor shall be responsible for liaison with the statutory utility providers to ensure all service records are current and correct. The Contractor is also responsible for the safe disconnection of existing utilities entering the site, except those which are to remain operational.

Prior to site work commencing, the position of all utilities indicated as on site or offsite but close to the site boundary shall be determined and clearly identified where on site. The locations should be confirmed on site by appropriate investigation, observations and survey. Any discrepancies between the anticipated positions and confirmed locations are to be reported to the Supervising Engineer.

All retained manholes should be located and clearly identified on site to prevent damage. The location, depth, diameter and invert level of each manhole and the size and depth of all stream connections shall be recorded. Where drains or sewers are to be grubbed up the downstream ends should be plugged prior to commencement to prevent offsite systems becoming blocked or contaminated.

Where existing drains or sewers are to remain, CCTV surveys are to be provided by the contractor. These surveys must be undertaken on commencement prior to any physical work and on completion to demonstrate no damage has occurred.

Where damage has occurred, any remedial work must be agreed with the Supervising Engineer and relevant authority/owner prior to repairs commencing. The repair costs will be borne by the contractor.

All utilities on site that are to be retained through the works are to be positively located on site, reliance shall not be placed on existing records. Utilities are to be visibly marked and protected for the duration of the works. Appropriate methods are to be put in place to ensure all site staff working in the vicinity of retained utilities are fully briefed.

The Contractor is responsible for ensuring that all hydrant covers, stop tap boxes manhole covers and the like are raised or lowered to suit the finished levels associated with the proposed enabling works plateaus and future construction thicknesses.

Following the completion of the works, a survey plan of the location of terminated services is to be provided.

18. Damage to Property

All works are to be undertaken in accordance with the Party Wall etc Act 1996. The Contractor shall ensure that all precautions are taken in order to avoid any damage to existing property arising from the Works and shall be responsible for same in the event that any damage should arise from his failure to exercise due care.

Any adjacent structures, services and the like shall be inspected prior to commencement of the Works for evidence of existing defects and, if necessary, a dilapidation survey shall be carried out by the contractor, with the agreement of the Client and/or the Supervising Engineer, prior to works commencing on site. A re-inspection shall take place

on completion of the Contract to verify that no damage or deterioration of the said structure, service or apparatus has occurred as a result of the Works. A schedule of the findings of this re-inspection shall be circulated to all parties concerned for their records.

The Contractor shall execute the works with care so as to avoid damage to existing structures and drains or other services to be retained.

All fences, trees, paths, shrubs, grassed areas and other surfaces required to be retained shall be protected by the Contractor from spillage and damage caused by site operations and upon completion of the works they shall be handed over in an undamaged and proper state to the satisfaction of the Engineer.

Refer to landscape architect drawings and specifications that define the areas that require protection. The Contractor shall not raise or lower the ground level beneath the spread of the branches of any tree to be retained without the approval of the Engineer.

19. Drawings and Supplied Information

Whilst efforts have been made to ensure that the information provided to the Contractor is correct and current, the Contractor is responsible for corroborating the existing information with the benefit of their site presence and to report any discrepancies encountered or anticipated to the Supervising Engineer immediately.

Where cutting and filling operations are to be carried out the Contractor is to undertake comparative assessments with the benefit of existing information, additional survey and their anticipated sequence of work to ensure sufficient and suitable material is available to undertake the works as proposed. Any anticipated shortfall or surplus is to be report immediately.

20. Photographs

A detailed dilapidation survey shall be undertaken of the site and adjacent properties including joint site boundaries, in conjunction with adjacent land owners. Such survey shall include roads, footpaths, street lighting and road signs. A copy of the survey, including record photographs shall be provided to the Client within seven days of commencement of site works.

The Contractor is to provide on-site a digital camera and e-mail facilities to enable electronic transfer of site photographs and other information for the full duration of the contract. Progress photographs are to be taken at least weekly across all parts of the site for inclusion within the contractor's report. Photographs are to be made available to the Engineer/Client in electronic format should they be requested during the contract. Record photographs should be provided as part of the validation information



APPENDIX 3 - Remediation Options Appraisal

Introduction

This Options Appraisal has been undertaken in general accordance with Options Appraisal of LCRM 'Model Procedures for Management of Land Contamination'. There are four main stages to this appraisal:

1. *Identifying Key Risk Drivers.*
2. *Identifying viable remediation options for each relevant pollutant linkage.*
3. *Carrying out a detailed evaluation of viable remediation options to identify the most appropriate option for each pollution linkage.*
4. *Producing a remediation strategy that reduces all relevant pollutant linkages to an acceptable level.*

Key Risk Drivers for Remedial Action

Groundtech Consulting have identified that the key risk drivers requiring remediation are:

- *Elevated levels of heavy metals, PAHs and hydrocarbons in the Made Ground*
- *Hydrocarbon contamination in DS01*
- *Hydrocarbon impacted perched groundwater in DS01 and DS02*
- *Ground Gas risk classified as CS2*

The following sections of this report are intended to identify suitable and practical remedial techniques which can be applied in order to achieve a site which is suitable for the proposed residential development.

Grubbing up of the Made Ground and cut/fill balance exercise will remove, as far as practicable, all underground obstructions and create a development platform, which is geotechnically suitable for development.

Ground gas risks and potable water pipelines are not discussed in the Remediation Options Assessment as they are mitigated by measures outlined British Standards and by good practice.

Remediation Options and Evaluation of Feasibility

Preliminary Assessment of Remediation Options

Investigation and risk assessment has concluded that the requires remediation to reduce the risk to receptors to an acceptable level.

The objectives of the remediation are to remove one or more elements of each of the *source-pathway-receptor* linkages.

The initial screening process considers the available remedial techniques based on following key criteria:

- *Effectiveness* - *the strategy must work within the context of the site and be effective in the removal of contamination linkages.*
- *Practicality* - *the strategy has to have been successfully used in similar situations on other sites and readily available within the UK market. Novel solutions or those still in the research stage are not considered here.*
- *Durability* - *the strategy needs to be durable and not reliant on ongoing maintenance to continue being effective.*
- *Relative Cost* - *the strategy must not be excessive cost.*
- *Relative Operational Time* - *the strategy should work in a feasible and realistic time scale.*
- *Sustainability* - *more sustainable options are preferred.*

The table below summarises all of the accepted remedial techniques readily available and assess each against the six key parameters listed above.

In the first instance, the feasibility of each of the listed remedial option is assessed in terms of effectiveness at treating the contamination, which is broken down into; effective (Y), partially effective (P) or ineffective (N).

The techniques are then assessed in terms of relative cost ranging from negligible cost (£) through moderately expensive (££) to prohibitively expensive (£££+).

The timescale the remedial technique is operational has been generally assessed in units of weeks, months, years and decades. The longevity of the technique should be for the duration of the development to be effective.

The main reasons for rejection of a remedial option are generally the ongoing operational constraints, the cost and the ineffectiveness to mitigate the risk from all contaminants present. In some situations, several treatment options may be applicable and will therefore be considered as part of the appraisal.

Viable Remedial Options

As described above, certain technologies were rejected based on the above reasons. The short-list of options presented below represents those technologies which were not rejected at the pre-screening process and as such, are taken forward to the options appraisal process:

- *Watching brief during works*
- *Installation of a cover system in garden areas*
- *Further investigation and hotspot removal*
- *Materials management*
- *Disposal of unsuitable soils*

Cover System

A cover system is a proven technology for mitigating the risk from numerous contaminants. The process comprises the placement of a cover system to form a barrier between the contaminated Made Ground and site users breaking the pollution linkage.

This option is technically simple and represents a low-cost strategy that can be implemented rapidly, subject to favourable site levels to accommodate the cover system.

The timescale for installing a barrier is relatively quick allowing for rapid completion of the remediation objectives and this remediation solution could be designed and implemented within a matter of weeks/months.

Materials Management

This process can be carried out a low cost ensuring contaminated soils are at a greater depth or beneath proposed hardsurfacing.

Hotspot Removal

This will be carried out to remove any hydrocarbon impacted soils identified.

Disposal of excess or unsuitable soils

Disposal involves the removal of contaminated soils and disposal at an appropriately licensed waste management facility or surplus material potentially to a recycling facility. The benefits of excavation and disposal is short term implementation and the soils can be removed with a high degree of certainty by meeting proposed RTVs.



The cost of the method however can be significant depending on the classification and end disposal route, particularly in comparison to a cover system. The option will also take up valuable landfill space and present a significant carbon footprint in terms of vehicle movements.

The technique can be combined with other remedial options such as reuse of general Made Ground.

The watching brief will enable olfactory/visual contamination to be identified and can be effective, this method is combined with the disposal of unsuitable soils.

Applicability of Remediation Options and Initial Assessment – Soils

Remedial Activity	Effective on Asbestos	Effective on Metals	Effective on PAHs	Effective on TPHs	Relative Cost	Relative Operational Time	Comments (Practicality/Sustainability/Durability)	Feasibility
Containment - Cover System	n/a	Y	Y	Y	£	Weeks	<p>A 600mm cover system is to be placed in garden areas to mitigate against contaminated Made Ground with elevated heavy metals, PAHs and hydrocarbons.</p> <p>Cover system to be inclusive of a minimum 150mm topsoil and 450mm subsoil overlying a demarcation membrane/100mm Type 1 material.</p>	Y – In conjunction with materials management.
Excavation and Disposal	n/a	Y	Y	Y	££	Weeks to months	<p>Hydrocarbon impacted material identified during the Ground Investigation should be excavated, delineated and all impacted material removed from site to a suitable licensed waste disposal facility.</p> <p>The sides and base of the excavation should be validated through laboratory testing to confirm all impacted material has been removed from site.</p>	Y – in conjunction with materials management and watching brief.
Containment - hydraulic barriers	n/a	Y	Y	Y	£££	Months	Not Required and not cost beneficial for size of development.	n/a
Containment - in ground barriers	n/a	Y	Y	Y	£££	Months	Not Required and not cost beneficial for size of development.	n/a

Remedial Activity	Effective on Asbestos	Effective on Metals	Effective on PAHs	Effective on TPHs	Relative Cost	Relative Operational Time	Comments (Practicality/Sustainability/Durability)	Feasibility
<i>Soil flushing</i>	<i>n/a</i>	<i>Y</i>	<i>Y</i>	<i>N</i>	<i>£££</i>	<i>Months</i>	<i>Not Required and not cost beneficial for size of development.</i>	<i>n/a</i>
<i>Surface amendments</i>	<i>n/a</i>	<i>Y</i>	<i>Y</i>	<i>Y</i>	<i>£££</i>	<i>Months</i>	<i>Not Required and not cost beneficial for size of development.</i>	<i>n/a</i>
<i>Soil washing</i>	<i>n/a</i>	<i>Y</i>	<i>Y</i>	<i>N</i>	<i>£££</i>	<i>Months</i>	<i>Not Required and not cost beneficial for size of development.</i>	<i>n/a</i>
<i>Hydraulic binders (such as cement)</i>	<i>n/a</i>	<i>Y</i>	<i>Y</i>	<i>Y</i>	<i>££</i>	<i>Weeks to months</i>	<i>Not Required and not cost beneficial for size of development.</i>	<i>n/a</i>
<i>Vitrification</i>	<i>n/a</i>	<i>Y</i>	<i>N</i>	<i>N</i>	<i>£££</i>	<i>Months</i>	<i>Not Required and not cost beneficial for size of development.</i>	<i>n/a</i>
<i>Incineration</i>	<i>n/a</i>	<i>N</i>	<i>Y</i>	<i>Y</i>	<i>£££</i>	<i>Months</i>	<i>Not Required and not cost beneficial for size of development.</i>	<i>n/a</i>
<i>Thermal desorption</i>	<i>n/a</i>	<i>N</i>	<i>N</i>	<i>Y</i>	<i>£££</i>	<i>Months</i>	<i>Not Required and not cost beneficial for size of development.</i>	<i>n/a</i>



APPENDIX 4 - Remedial Target Values

Generic Assessment Criteria (GAC)								
Proposed End Use	Unit	Residential with Plant Uptake			Commercial			Source
SOM	%	1	2.5	6	1	2.5	6	
Arsenic	mg/kg	37	37	37	640	640	640	LQM S4ULs
Beryllium	mg/kg	1.7	1.7	1.7	12	12	12	LQM S4ULs
Boron (water soluble)	mg/kg	290	290	290	240000	240000	240000	LQM S4ULs
Cadmium	mg/kg	11	11	11	190	190	190	LQM S4ULs
Chromium (Total)	mg/kg	910	910	910	8600	8600	8600	LQM S4ULs
Chromium (VI)	mg/kg	6	6	6	33	33	33	LQM S4ULs
Copper	mg/kg	2400	2400	2400	68000	68000	68000	LQM S4ULs
Lead	mg/kg	200	200	200	2300	2300	2300	DEFRA C4SLs
Organic Mercury	mg/kg	1.2	1.2	1.2	26	26	26	LQM S4ULs
Nickel	mg/kg	130	130	130	980	980	980	LQM S4ULs
Selenium	mg/kg	250	250	250	12000	12000	12000	LQM S4ULs
Vanadium	mg/kg	410	410	410	9000	9000	9000	LQM S4ULs
Zinc	mg/kg	3700	3700	3700	730000	730000	730000	LQM S4ULs
Aliphatic EC 5 - 6	mg/kg	42	78	160	3200 (304) ^{sol}	5900 (558) ^{sol}	12000 (1150)	LQM S4ULs
Aliphatic EC 6 - 8	mg/kg	100	230	530	7800 (144) ^{sol}	17000 (322) ^{sol}	40000 (736) ^{sol}	LQM S4ULs
Aliphatic EC 8 - 10	mg/kg	27	65	150	2000 (78) ^{sol}	4800 (190) ^{sol}	11000 (451) ^{vap}	LQM S4ULs
Aliphatic EC 10 - 12	mg/kg	130 (48) ^{vap}	330 (118) ^{vap}	760 (283) ^{vap}	9700 (48) ^{sol}	23000 (118) ^{vap}	47000 (283) ^{vap}	LQM S4ULs
Aliphatic EC 12 - 16	mg/kg	1100 (24) ^{sol}	2400 (59) ^{sol}	4300 (142) ^{sol}	59000 (24) ^{sol}	82000 (59) ^{sol}	90000 (142) ^{sol}	LQM S4ULs
Aliphatic EC 16 - 35	mg/kg	65000 (8.48)	92000 (21) ^{f, sol}	110000 ^f	1600000 ^f	1700000 ^f	1800000 ^f	LQM S4ULs
Aliphatic EC 35 - 44	mg/kg	65000 (8.48)	92000 (21) ^{f, sol}	110000 ^f	1600000 ^f	1700000 ^f	1800000 ^f	LQM S4ULs
Aromatic EC 5 - 7	mg/kg	70	140	300	26000 (1220)	46000 (2260)	86000 (4710)	LQM S4ULs
Aromatic EC 7 - 8	mg/kg	130	290	660	56000 (869) ^{vap}	110000 (1920)	180000 (4360)	LQM S4ULs
Aromatic EC 8 - 10	mg/kg	34	83	190	3500 (613) ^{vap}	8100 (1500) ^{vap}	17000 (3580)	LQM S4ULs
Aromatic EC 10 - 12	mg/kg	74	180	380	16000 (364) ^{sol}	28000 (899) ^{sol}	34000 (2150)	LQM S4ULs
Aromatic EC 12 - 16	mg/kg	140	330	660	36000 (169) ^{sol}	37000	38000	LQM S4ULs
Aromatic EC 16 - 21	mg/kg	260 ^f	540 ^f	930 ^f	28000 ^f	28000 ^f	28000 ^f	LQM S4ULs
Aromatic EC 21 - 35	mg/kg	1100 ^f	1500 ^f	1700 ^f	28000 ^f	28000 ^f	28000 ^f	LQM S4ULs
Aromatic EC 35 - 44	mg/kg	1100 ^f	1500 ^f	1700 ^f	28000 ^f	28000 ^f	28000 ^f	LQM S4ULs
Benzene	mg/kg	0.087	0.17	0.37	27	47	90	LQM S4ULs
Toluene	mg/kg	130	130	130	56000 (869)	110000 (1920)	180000	LQM S4ULs
Ethyl Benzene	mg/kg	47	110	260	5700	13000	27000	LQM S4ULs
Xylene - o	mg/kg	60	140	330	6600	15000	33000	LQM S4ULs
Xylene - m	mg/kg	59	140	320	6200	14000	31000	LQM S4ULs
Xylene - p	mg/kg	56	130	310	5900	14000	30000	LQM S4ULs
MTBE (methyl tert-butyl ether)	mg/kg	49	84	160	7900	13000	24000	CL:AIRE 2010
Acenaphthene	mg/kg	210	510	1100	84000 (57) ^{sol}	97000 (141) ^{sol}	100000	LQM SAULs
Acenaphthylene	mg/kg	170	420	920	83000 (86.1) ^{sol}	97000 (212) ^{sol}	100000	LQM S4ULs
Anthracene	mg/kg	2400	5400	11000	520000	540000	540000	LQM S4ULs
Benz(a)anthracene	mg/kg	7.2	11	13	170	170	180	LQM S4ULs
Benzo(a)pyrene	mg/kg	2.2	2.7	3	35	35	36	LQM S4ULs
Benzo(b)fluoranthene	mg/kg	2.6	3.3	3.7	44	44	45	LQM S4ULs
Benzo(ghi)perylene	mg/kg	320	340	350	3900	4000	4000	LQM S4ULs
Benzo(k)fluoranthene	mg/kg	77	93	100	1200	1200	1200	LQM S4ULs
Chrysene	mg/kg	15	22	27	350	350	350	LQM S4ULs
Dibenz(ah)anthracene	mg/kg	0.24	0.28	0.3	3.5	3.6	3.6	LQM S4ULs
Fluoranthene	mg/kg	280	560	890	23000	23000	23000	LQM S4ULs
Fluorene	mg/kg	170	400	860	63000 (30.9) ^{sol}	68000	71000	LQM S4ULs
Indeno(123-cd)pyrene	mg/kg	27	36	41	500	510	510	LQM S4ULs
Naphthalene	mg/kg	15 ^f	36 ^f	85 ^f	1600 ^f	3700 ^f	8400 ^f	LQM S4ULs
Phenanthrene	mg/kg	95	220	440	22000	22000	23000	LQM S4ULs
Pyrene	mg/kg	620	1200	2000	54000	54000	54000	LQM S4ULs

Generic Assessment Criteria (GAC)								GROUNDTECH CONSULTING
Proposed End Use	Unit	Residential with Plant Uptake			Commercial			Source
SOM	%	1	2.5	6	1	2.5	6	
Phenol	mg/kg	120	200	380	440	690	1300	LQM S4ULs
Chlorophenols	mg/kg	0.87 ^g	2	4.5	3500	4000	4300	LQM S4ULs
Pentachlorophenol	mg/kg	0.22	0.52	1.2	400	400	400	LQM S4ULs
Carbon disulphide	mg/kg	0.14	0.29	0.62	11	22	47	LQM S4ULs
Hexachlorobutadiene	mg/kg	0.29	0.7	1.6	31	66	120	LQM S4ULs
1,1,1,2 Tetrachloroethane	mg/kg	1.6	3.4	7.5	270	550	1100	LQM S4ULs
1,1,1 Trichloroethane	mg/kg	8.8	18	39	660	1300	3000	LQM S4ULs
Trichloroethene	mg/kg	0.016	0.034	0.075	1.2	2.6	5.7	LQM S4ULs
Tetrachloromethane (Carbon Tetrachloride)	mg/kg	0.026	0.056	0.13	2.9	6.3	14	LQM S4ULs
1,2-Dichloroethane	mg/kg	0.0071	0.011	0.019	0.67	0.97	1.7	LQM S4ULs
Chloroethene (Vinyl chloride)	mg/kg	0.00064	0.00087	0.0014	0.059	0.077	0.12	LQM S4ULs
Trichloromethane (Chloroform)	mg/kg	0.91	1.7	3.4	99	170	350	LQM S4ULs
Tetrachloroethene	mg/kg	0.18	0.39	0.9	19	42	95	LQM S4ULs
Hexachlorobenzene	mg/kg	1.8 (0.2) ^{vap}	3.3 (0.5) ^{vap}	4.9	110 (0.2) ^{vap}	120	120	LQM S4ULs
Pentachlorobenzene	mg/kg	5.8	12	22	640 (43) ^{sol}	770 (107) ^{sol}	830	LQM S4ULs
1,2,4,5-Tetrachlorobenzene	mg/kg	0.33	0.77	1.6	42 (19.7) ^{sol}	72 (49.1) ^{sol}	96	LQM S4ULs
1,2,3,5-Tetrachlorobenzene	mg/kg	0.66	1.69	3.7	49 (39.4) ^{vap}	120 (98.1) ^{vap}	240 (235) ^{vap}	LQM S4ULs
1,2,3,4-Tetrachlorobenzene	mg/kg	15	36	78	1700 (122) ^{vap}	3080 (304) ^{vap}	4400 (728) ^{vap}	LQM S4ULs
1,3,5-Trichlorobenzene	mg/kg	0.33	0.81	1.9	23	55	130	LQM S4ULs
1,2,4-Trichlorobenzene	mg/kg	2.6	6.4	15	220	530	1300	LQM S4ULs
1,2,3-Trichlorobenzene	mg/kg	1.5	3.6	8.6	102	250	590	LQM S4ULs
1,4-dichlorobenzene	mg/kg	61 ^f	150 ^f	350 ^f	4400 ^f (224) ^{vap}	10000 ^f (540)	25000 ^f (1280)	LQM S4ULs
1,3-dichlorobenzene	mg/kg	0.4	1	2.3	30	73	170	LQM S4ULs
1,2-Dichlorobenzene	mg/kg	23	55	130	2000 (571) ^{sol}	4800 (1370) ^{sol}	11000 (3240)	LQM S4ULs
Chlorobenzene	mg/kg	0.46	1	2.4	56	130	290	LQM S4ULs
Gamma-Hexachlorocyclohexane	mg/kg	0.06	0.14	0.33	67	69	70	LQM S4ULs
Beta-Hexachlorocyclohexane	mg/kg	0.085	0.2	0.46	65	65	65	LQM S4ULs
Alpha-Hexachlorocyclohexane	mg/kg	0.23	0.55	1.2	170	180	180	LQM S4ULs
Beta-Endosulfan	mg/kg	7	17	39	6300 (0.00007)	7800 (0.0002)	8700	LQM S4ULs
Alpha-Endosulfan	mg/kg	7.4	18	41	5600 (0.003) ^{vap}	7400 (0.007) ^{vap}	8400 (0.016) ^{vap}	LQM S4ULs
Dichlorvos	mg/kg	0.032	0.066	0.14	140	140	140	LQM S4ULs
Atrazine	mg/kg	3.3	7.6	17.4	9300	9400	9400	LQM S4ULs
Dieldrin	mg/kg	0.97	2	3.5	170	170	170	LQM S4ULs
Aldrin	mg/kg	5.7	6.6	7.1	170	170	170	LQM S4ULs
HMX	mg/kg	5.7	13	26	110000	110000	110000	LQM S4ULs
2,4,6-Trinitrotoulene	mg/kg	1.6	3.7	8.1	1000	1000	1000	LQM S4ULs
RDX	mg/kg	120	250	540	210000	210000	210000	LQM S4ULs

All material should be screened for asbestos and have nil asbestos

^{sol} S4UL exceeds the solubility saturation limit (which is presented in brackets)

^{vap} S4ULS presented exceeds the vapour saturation limit, which is presented in brackets

^f For naphthalene, the S4UL is based on a comparison of inhalation exposure with the TDI_{inhal} for localised affects

^f S4UL based on comparison of inhalation exposure with inhalation TDI for localised effects

^{dir} S4ULs based on a threshold protective direct skin contact with phenol (guideline in brackets based on health effects following long term exposure provided for illustration only)



APPENDIX 5 - Ground Gas Membrane Validation Record Sheet

Gas Protection Validation Record

Job No: GRO-25333
Client: Mr Ben Good
Site Name: Manchester Road, Linthwaite
Plot Number:

Property Type				Gas Protection Type	Passive
Det	Semi	Town House	Apt		
Attached Garage		Commercial	Floor Type		Beam and Block

Ventilated Sub Floor	✓/✗	Inspection Date	Inspected By:	Photos:	Notes
Void Former					1
Void Height					2
External Wall Air Bricks					3
Internal Sleeper Wall Vents					4
Subfloor Passed (If not, detail why and next steps)					5

Gas Barrier	✓/✗	Inspection Date	Inspected By:	Photos:	Notes
Membrane Type					6
Extent of Coverage					7
Underside of membrane					8
Slab/membrane condition					9
Laps and joints					10
Damp-proof course					11
Service entries and seals					12
Cavity inspection					13
Repairs Undertaken (If required)					14

This plot has inspection



APPENDIX 6 - Limitations



Limitations

This contract was completed by Groundtech Consulting on the basis of a defined programme and scope of works and terms and conditions agreed with the client. This report was compiled with due skill and care, taking into consideration the project brief provided, project objectives, agreed scope of works, prevailing site conditions and budget allocation.

Other than that defined in the paragraph above, Groundtech Consulting provides no other accountability or warranty whether express or implied, is made in relation to the services. Unless otherwise agreed this report has been prepared exclusively for the use and reliance of the client in accordance with generally accepted industry practices and for the intended purposes as stated in the agreement under which this work was completed. This report may not be relied upon, or transferred to, by any other party without the written agreement of a Director of Groundtech Consulting. A third party who relies on this report, does so at their own and sole risk and no liability to such parties is provided by Groundtech Consulting.

It is the understanding of Groundtech Consulting that this report is to be used for the intended purpose as set out in the introduction. The purpose was instrumental in determining the scope and level of the services provided. Should the purpose of the report or the proposed end use of the site change, this report will no longer be directly applicable, and its validity readdressed. No reliance upon the report in the revised situation should be assumed by the client without the permission of Groundtech Consulting.

The report was written in 2018, later changes in legislation, statutory requirements and industry best practices have not been considered and this should be allowed for. Ground conditions can also change and should be investigated if there is any significant delay in acting on the findings of this report. The period of time may result in changes in site conditions, regulatory or other legal provisions, technology or economic conditions which could render the report inaccurate or unreliable. The information and conclusions in this report should not be relied upon in the future without the written confirmation from Groundtech Consulting that it is safe to do so.

The observations and conclusions outlined in this report are based exclusively on the services that were provided as set out in the agreement between the client and Groundtech Consulting.

Groundtech Consulting are not liable for the existence of any condition, the discovery of which would require additional investigation outside the agreed scope of works or core competency. The services provided are based upon Groundtech Consulting observations of existing physical conditions at the site gained from site reconnaissance together with interpretation of information including documentation, obtained from third parties and from the client on the history and usage of the site. The findings and recommendations contained in this report are based in part upon information provided by third parties, and Groundtech Consulting assume the information to be correct.

No responsibility can be accepted for errors for third party information presented in this report. Groundtech Consulting were not authorised to independently verify the accuracy or completeness of information, documentation or materials received from the client or third parties, including laboratories and information services, during the performance of the services. Groundtech Consulting are not liable for any inaccurate information, misrepresentation of data or conclusions, which may inform the scope of investigation undertaken by Groundtech Consulting and forms the contract with the client.

Where field investigations have been carried out these have been restricted to a level of detail required to achieve the stated objectives of the work. Ground conditions can also be variable due to its heterogeneous properties and as investigation exploratory locations only allow examination of the ground at discrete



locations. The potential exists for ground conditions to be encountered which are different to those considered in this report, particularly between exploratory holes. The extent of the limited area depends on the soil and groundwater conditions, together with other constraints such as the position of any existing structures and underground utilities. Geo-Environmental testing was carried out for a limited number of parameters [as stipulated in the contract] based on an understanding of the available operational and historical information, and it should not be inferred that other chemical species are not present.

The groundwater conditions entered on the exploratory hole records are those observed at the time of investigation. The groundwater level often has not had time to reach equilibrium and a monitoring period is required. Furthermore, groundwater levels are subject to seasonal variation or changes in local drainage conditions and higher groundwater levels may occur at other times of the year than were recorded during this investigation.

Any site drawings provided in this report are not meant to be an accurate base plan, but are preliminary and used to present the general relative locations of features on, and surrounding, the site.

