Phase III Remediation & Validation Strategy Proposals

At

Benchill Road, Manchester

Client: Wythenshawe Community Housing Group

Reference: 33029-SUT-ZZ-00-RP-G-7301

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SUTCLIFFE INVESTIGATIONS

Phase III Remediation & Validation Strategy Proposals

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1 Introduction

1.1 Terms of Reference

Sutcliffe Investigations were instructed by Wythenshawe Community Housing Group to design an appropriate remediation strategy for the proposed development at Benchill Road, Manchester, M22 8LF.

The site is centred on National Grid Reference (NGR) 382600, 388380. The site area is approximately 0.53ha.

This report provides details on the protocols to be adopted during remedial works required to be undertaken on the site to ensure that any risks associated with long term human health are mitigated.

The soil sampling strategy and chemical analysis proposals set out in this document are produced in light of a Phase I Preliminary Risk Assessment (PRA) and Phase II Interpretive Ground Assessment produced by Sutcliffe Investigations for this site. This report and the outlined strategy should therefore be read in conjunction with:

- 33029-SUT-ZZ-00-RP-G-7101 – Phase I PRA Report (November 2022)
- 33029-SUT-ZZ-00-RP-G-7201 – Phase II Interpretive Ground Assessment Report (November 2023)

1.2 Development Proposal & Legislative Context

Development Proposal

The proposed development for the site is for 23No. residential properties with associated private and communal gardens and vehicle parking facilities. The proposed development is presented as *Drawing Ref: 8933-MDA-ST-XX-DR-A-902 REV G* produced by Michael Dyson Associates Ltd.

Site History

The earliest available historical map (1877) showed the site to comprise of a few buildings of unknown use in the southern half of the site and woodland in the northern half of the site. A pond was noted to encroach onto the south-western corner of the site however, it was no longer mapped by the 1934 – 1935 mapping. No significant changes were noted until the 1960 mapping when the buildings and woodland were no longer mapped. By 1977 a small building of unknown use was noted in the south-eastern section of the site. By 1990 the small building was no longer mapped, and a large building was noted in the centre of the site. By 1999 slight changes were noted to the building footprint. The aerial photography dated 2000 showed hardstanding on-site was used for vehicle parking. No further significant changes or features were noted on-site from the available historical mapping.

Legislative Context

The presence of contaminants which may pose a risk to human health or the environment, is a material planning consideration and it remains the responsibility of the developer to ensure safe development.

For planning it should be considered whether the site is suitable for its new use, and the responsibility for securing a safe development (including cumulative effects of pollution on health, and the potential sensitivity of the proposed development to adverse effects from pollution,) rests with the developer and/or landowner. Planning is concerned with the site's proposed use not its current use, where the amount of contamination is expected to be low relative to the level of risk. This is the opposite to Part 2A which considers high levels (significant harm) and the current use of the site.

Section 57 of the Environment Act 1995 adds Part 2A (ss.78A-18YC) to the Environmental Protection Act 1990 and contains the legislative framework for identifying and dealing with contaminated land. Where development is undertaken on land which may be affected by contamination, the National Planning Policy Framework, paragraph 120 to 122 considers pollution and remediation. This links the contaminated land regime within the development process.

1.3 Aims & Objectives

This report provides details of the remedial options applicable for a residential development with associated private and communal gardens.

It also provides procedures to be implemented, in order to verify the remedial measures. The remediation strategy report is required to provide information to regulatory authorities to satisfy planning conditions relating to contaminated land aspects on the site.

This document outlines Sutcliffe Investigations proposals for Remediation Strategies, and includes the following:

- Validation and verification of a 600mm capping layer.
- Validation of installed gas protection measures compliant with a Characteristic Situation 2.
- Validation of imported top and sub soils required to facilitate landscape proposals.

2 Land Contamination Risks

2.1 Revised Conceptual Model

Based on the findings of the human health risk assessment as completed by Sutcliffe, the conceptual model has been revised and has been presented within the Ground Assessment Report ref. 33029-SUT-ZZ-00-RP-G-7201.

2.2 Discounted Contaminant Linkages

Controlled Waters – Groundwater Resources

The UK DWS Leachate screening identified concentrations of Arsenic, Lead and Benzo(a)pyrene that could pose a risk to the Secondary B Aquifer. However, due to the likely depth of groundwater and the effects of natural attenuation, the risk is unlikely to be significant.

Controlled Waters – Surface Water Resources

The EQS Leachate screening identified concentrations of Copper, Lead, Zinc, Anthracene, Fluoranthene, Benzo(b)fluoranthene, Benzo(k)fluoranthene, Benzo(a)pyrene, Benzo(ghi)perylene and Indeno(123cd)pyrene that could pose a risk to the local surface water features. However, the nearest surface water feature is noted 205m north of the site, and relates to a stream, as such the risk is unlikely to be significant.

2.3 Remaining Potential Contaminant Linkages

Long Term Human Health

Elevated levels of C16 to C21 Aromatic, C21 to C35 Aromatic, Benzo(b)fluoranthene, Benzo(a)pyrene and Dibenzo(ah)anthracene were noted with statistical analysis indicating the presence of site wide contamination that will require remediation to be safe for Human Health.

Ground Gas

Based on the quantitative and qualitative assessment of the risk associated with ground gas, the site should be classified as a **Characterisation Situation 2** indicating gas protective measures are required.

Using BS8485:2015+A1:2019, "*Code of Practice for the Design of Protective Measures for Methane and Carbon Dioxide Ground Gases for New Buildings"* a total of 3.5 points is required for the proposed end use, *Table 2.1* details the protection measures required to achieve this point total.

Table 2.1: BS8485 (2015+A1:2019) Point Score Summary

GAS PROTECTION SCORES FOR THE STRUCTURAL BARRIER	
Floor and substructure design	SCORE
Precast suspended segmental subfloor (i.e. beam and block)	**0**

GAS PROTECTION SCORES FOR VENTILATION PROTECTION MEASURES			
Protection Element System		Comments	SCORE
Passive sub floor dispersal layer: Media used to provide the dispersal layer are: • Clear void; • Polystyrene void former blanket; • Geocomposite void former blanket; • No-fines gravel layer with gas drains; • No-fines gravel layer.	Very good performance	• The ventilation effectiveness of different media depends on a number of different factors including the transmissivity of the medium, the width of the building, the side ventilation spacing and type and the thickness of the layer. • The selected score should be assigned taking into account the recommendations in Annex B of BS8485:2015. • Passive ventilation should be designed to meet at least "good performance".	**2.5**

GAS PROTECTION SCORE FOR THE GAS RESISTANT MEMBRANE		
Protection Element System	Comments	SCORE
Gas resistant membrane meeting all of the following criteria: • Sufficiently impervious to the gases with a methane gas transmission rate <40.0 ml/day/m2/atm (average) for sheet and joints (tested in accordance with BS ISO 15105-1 manometric method; • Sufficiently durable to remain serviceable for the anticipated life of the building and duration of gas emissions; • Sufficiently strong to withstand in-service stresses (e.g. settlement if placed below a floor slab); • Sufficiently strong to withstand the installation process and following trades until covered (e.g. penetration from steel fibres in fibre reinforced concrete, penetration of reinforcement ties, tearing due to working above it, dropping tools etc); • Capable, after installation, of providing a complete barrier to the entry of the relevant gas; and, • Verified in accordance with CIRIA C735.	The performance of membranes is heavily dependent on the quality and design of the installation, resistance to damage after installation and integrity of joints. For example, a minimum 0.40mm thickness (equivalent to 370g/m^2 for polyethylene) reinforced membrane (virgin polymer) meets the performance criteria opposite. If a membrane is installed that does not meet all the criteria opposite, then the score is zero.	**2**

Certification that these passive protection measures have been installed correctly should be provided.

An example of a suitable gas protection membrane and a membrane validation pro forma is presented as *Appendix A.*

3 Remediation Strategy

3.1 Overview

The recommendations provided below are considered appropriate for the site based on the site investigation and the combined risk assessments completed by Sutcliffe (ground gas and long-term human health) and details recommended remediation and validation works.

3.2 Additional Works Required to Assess Outstanding Contaminant Linkages

Post demolition sampling will be required following the demolition of the onsite building.

3.3 Regulatory Approval

Consultation with Manchester City Council Contaminated Land Officer is recommended regarding the acceptability of the validation proposal.

Council validation requirements are presented in *Appendix B.*

3.4 Remedial Works

Development Area

Given the extent of the identified contamination a site strip will be required to a depth of 600mm, with a clean validated capping layer being placed in all gardens, both private and communal and all soft landscaped areas to bring site levels back up.

Elsewhere on site (areas of hardstanding) reduced site levels will be as per foundation design given the extent of contamination and the identified long term human health risks, remedial works will be required to ensure that the site is “fit for purpose”, assuming a residential (with garden) end use.

Remedial works will need to comprise the emplacement of a minimum 600mm clean validated capping system in all garden and soft landscaped areas.

It would be anticipated that the remainder of the site that is not formed of gardens/landscaping will be covered by hardstanding, this along with the capping system would provide a break layer to source pathway receptor linkages.

Additionally, if identified during post demolition sampling, when working in areas where asbestos has been identified and as part of the work to remove this material from site, all works must be undertaken in line with JIWG / CLAIRE CAR-Soil 2016 to ensure that works which are licensable, non-licensable and non-notifiable are correctly defined when undertaken.

This will ensure that any identified asbestos is removed in a safe and correct manner to a suitable waste facility in line with its classification.

Human Health - Ground Gas

Ground gas monitoring has indicated elevated levels of Carbon Dioxide on site and due to the highest recorded concentrations, a Characterisation Situation 2 is recommended and as such gas protection measures will be required as part of the development of the site.

Gas protection measures should include a ventilated sub-floor void and a suitable gas membrane in accordance with the requirements of BS8485:2015+A1:2019 as set out in Table 2.1 of this report.

An example of a suitable gas protection membrane and a membrane validation pro forma are presented in Appendix A.

3.5 Proposed Capping Thickness – Soft Landscaping Area

Following the excavation of existing material to a depth of 600mm bgl in the development area to facilitate the removal of contamination, levels will need to be raised.

Reinstatement to achieve finished site levels will be required and will include the importation of clean validated top and sub soils, comprising a geotextile membrane, 400-450mm subsoil, overlain by minimum 150-200mm topsoil in the development area.

3.6 Soil Validation Sampling & Testing

Soil Sampling

In accordance with the current requirements of the regulatory authorities, validation samples will be collected from all materials that are to be subject to movement and reuse under the protocols outlined within this Remediation Strategy, or for materials to be imported onto site to facilitate the proposed residential development.

Soil samples destined for chemical analysis will be collected at regular intervals in appropriate sampling containers. All samples will subsequently be stored in cooled boxes prior to submission to a UKAS / MCERTS accredited laboratory.

All samples will be collected using appropriate PPE and sampling equipment that will be cleaned at each sampling location.

The sampling frequency for materials to be managed under the Remediation Strategy is presented within *Table 3.1* and *Table 3.2*.

Table 3.1: Testing Frequency for Material Use on Site (Imported)

Material Use	Testing Frequency
Subsoil Greenfield Source *(450mm garden cover)*	1 Sample per 200m^3 (Minimum 3 samples)
Subsoil Brownfield Source *(450mm garden cover)*	1 Sample per 50m^3 (Minimum 3 samples)
Topsoil Greenfield Source *(150mm garden cover)*	1 Sample per 200m^3 (Minimum 3 samples)
Topsoil Brownfield Source *(150mm garden cover)*	1 Sample per 50m^3 (Minimum 3 samples)

Table 3.2: Testing Frequency for Material Use on Site (Site Generated)

Material Use	Testing Frequency
Site Generated 6F2	1 Sample Per 1000m^3 (Minimum 3 samples)
Site Won Made Ground General Backfill	1 Sample Per 250m^3 (Minimum 3 samples)
Site Won Natural Backfill	1 Sample Per 2000m^3 (Minimum 3 samples)
Site generated Sub-Soil *(450mm garden cover)*	1 Sample Per 250m^3 (Minimum 3 samples)
Site Generated Topsoil Cover *(150mm garden cover)*	1 Sample per 50m^3 (Minimum 3 samples)
Hotspot Validation Samples	1 Sample per 10m of linear excavation to base and sidewall.

Imported Soil Validation Testing

Imported material needs to be compliant with BS3882: 2015 Specification for Topsoil and BS8601: 2013 Specification for Subsoil and requirements for use.

The typical testing suite will comprise:

Arsenic, boron, cadmium, chromium (total and hexavalent), copper, lead, mercury, nickel, selenium, vanadium, zinc, water soluble sulphate, pH, USEPA PAH 16, asbestos (presence or absence) and organic matter.

Where the source is 'brownfield' or to site source unknown, the soil will additionally be tested for the following:

Speciated banded petroleum hydrocarbons (TPHCWG), benzene, toluene, ethylbenzene and xylene (BTEX), MTBE, cyanide suite, boron and phenol.

Site Generated Soil Validation Testing

The typical testing suite will comprise:

Arsenic, boron, cadmium, chromium (total and hexavalent), copper, lead, mercury, nickel, selenium, vanadium, zinc, water soluble sulphate, pH, USEPA PAH 16, asbestos (presence or absence) and organic matter, speciated banded petroleum hydrocarbons (TPHCWG), benzene, toluene, ethylbenzene and xylene (BTEX), MTBE, cyanide suite, boron and phenol.

Dependant on this additional sampling and assessment consideration will be given to its emplacement within garden areas.

3.7 Soil Validation Criteria

Generic Soil Assessment Criteria – Imported Top & Sub soils

The results of the topsoil and subsoil samples may be contrasted to contemporary UK soil assessment criteria.

With regards to the soil risk assessment for imported top and sub soils Sutcliffe will use the following hierarchy:

- LQM Suitable 4 Use Levels (S4ULs).

- ATRISK Soil Screening Values (SSVs) and DEFRA Generic Assessment Criteria (GACs).
- DEFRA Category 4 Screening Levels (C4SLs) for Lead.

Based upon the above we will use the LQM S4ULs. These use similar assumptions and land uses to C4SLs. However, toxicological information has been based on 'minimal risk' as per previous guidelines and assumptions.

If contaminants are not present as S4ULs, then we propose to use ATRISK SSVs or CL:AIRE GACs. These follow the 'minimal' risk principle and more stringent exposure parameters and will be conservative. The only exception to this is for Lead where the C4SL is used.

3.8 Capping Layer Depth Validation

The depth of the capping layer on site will be demonstrated by excavating a hole and collecting photographic evidence. The photographs will show the location of the validation, the downhole view and the depth using a levelling staff.

3.9 Site Completion Report

The site completion report will include details of the imported soil validation and photographs of the soil depth placed across the site as well as photographic evidence and details of the gas protection measures.

The site wide planning conditions may only be discharged once Manchester City Council are satisfied that, in accordance with the National Planning Policy Framework (NPPF):

- The site is suitable for its new use
- Adequate site investigation information, prepared by a competent person, is presented.

3.10 Additional Remedial Requirements

Site Material Management Plan (SMMP)

It is advised that an appropriate SMMP is designed for the scheme and prior to the commencement of any works and maintained throughout the development of the scheme. All waste transfer notes will need to be retained and documented to allow ease of review by the regulators.

Material Reuse

Should any material from the site be reused an assessment for suitability for use would be required.

Unexpected Contamination

In the event that during the development works if unexpected contamination is identified then all works should cease and the appointed environmental consultant notified.

Documentation

On completion of the remedial works detailed within *Section 3.4* of this report, a Phase IV Completion Report will be required and will need to include the following documentation:

- Waste consignment notes for contaminated material removed from site, including details of the recipient waste facility.
- Consignment notes for top/sub soils imported to site.
- Photographic log pre & post site reduction.
- Photographic log of the gas membrane installation.
- Independent certification of guarantee from third party confirming the suitability of gas membrane installation.

Appendix A – Gas Protection Membrane Specification & Membrane Validation Proforma

Protech GM Super

GAS PROTECTION

• HIGH RISK CHARACTERISTIC SITES •

REGULATIONS COMPATIBILITY TABLE

	CIRIA 665 CHARACTERISTIC SITUATION 2	CIRIA 665 CHARACTERISTIC SITUATION 3-6	BS8485 CHARACTERISTIC SITUATION 2	BS8485 CHARACTERISTIC SITUATION 3-6	BRE 211 RADON	NHBC AMBER 1	NHBC AMBER 2 & RED
METHANE	✓	✓	✓	✓	N/A	✓	✓
CARBON DIOXIDE	✓	✓	✓	✓	N/A	✓	✓
RADON	N/A	N/A	N/A	N/A	✓	N/A	N/A

DESCRIPTION

Protech GM Super is a high performance proprietary reinforced gas barrier, that incorporates a 12 micron aluminium foil layer, for maximum protection against ground-borne gases. This has been specifically designed to conform with the latest guidance documents. Due to its unique composition, the membrane is extremely robust and flexible and, therefore, easy to install on site. The membrane also provides protection from damp when placed below the slab and, therefore, there is no need to install a separate DPM.

SPECIFICATION

CIRIA C665, BS8485:2015 & Local Authority Ground Gas Handbook recommended that gas membranes are specified on the basis of the 'need to survive' construction, i.e. use one that is puncture and tear resistant.

Thickness should not be the main determinant of the suitability of a membrane for a particular site, although it can indirectly influence some key performance parameters.

In practise, because of the nature of construction sites, the durability, survivability and robustness of membranes are equally important than purely permeability to gas.

Protech GM Super incorporates a reinforced grid to ensure that maximum protection is achieved when installed to manufacturers' instructions.

The need for high quality workmanship during installation should not be under-estimated. The health and safety of the occupants of the building is dependent on its satisfactory performance. If installed incorrectly or damaged during the construction process, the membrane is rendered ineffective and will fail to provide adequate protection against the ingress of ground gas or vapours.

TYPICAL PROPERTIES	
Roll Length	50m
Width	2m
Weight	370g/m^2
Thickness	0.4mm
Colour	Green / Silver
Methane Permeability (ISO 15105-1)	≤ 0.1 ml/day/m^2

REQUIRED ACCESSORIES

- Protech GM Super Starter Band (1m x 50m)
- Protech GM Tape
- Protech GM Tophats
- Protech SAGM (Self Adhesive Gas Membrane)
- Protech GM Flashing Strip
- Protech GM Super Corner Units
- Protech GM Primer
- Protech GM 3mm Protection Board
- Protech GM Protection Fleece
- Protech 125

VENTING

On sites where venting is required, our Provoid Venting System should be used. We can provide design advice for both passive and active venting systems to suit individual site requirements.

BBA APPROVAL INSPECTION TESTING CERTIFICATION CERTIFICATE 11/4868

BGA British Geomembrane Association

BSI

CE

Revised April 2021

Visual Inspection of Gas Protection Measures

Site Name:	Gas characteristic situation:
Job Number:	Type of development and building/block checked: residential/commercial/other
Date:	Building description:
Visit by:	Foundation type: suspended floor/raft/other
Weather at time of inspection:	Gas protection type: passive/active

No.	Item	Comments (see notes)
1 Gas membrane		
1.1	Condition if sub-grade and underside of gas membrane	
1.2	Gas membrane type	
1.3	Gas membrane condition	
1.4	Joining tape product	
1.5	Lapping design	
1.6	Laps. Welds and joints seals	
1.7	Service entries seals	
2 Passive venting		
2.1	Sub-floor void	
2.2	External wall airbricks	
2.3	Internal sleeper walls	
2.4	External vent trenches/ducts	
3 Active venting		
3.1	System details	
Additional Notes:		

Notes: inspection checklist

1.1	Underside of gas membrane	Check that the sub grade does not contain rough/uneven surfaces, is appropriately clean and that there are no hard/sharp objects. That protective sand blinding or geotextile (if specified) is present and meets the design criteria.
1.2	Gas membrane type	Manufacturer and product specification, gauge, colour, brand/name, material batch/roll numbers, storage arrangements (protected from dirt/damage?)
1.3	Gas membrane condition	Open punctures, tears, rips, stretching? Excessive footprints/evidence of traffic? Presence of debris? Repairs? Signs of weakness such as raised or sunken indentations? Protection plan in place to restrict access to lain gas membrane?
1.4	Joining tape product	Product type, brand, thickness, material, width, colour? Use of double sided tape?
1.5	Lapping design	Joints lapped and sealed in accordance with manufacturer's requirements/ specification? Minimum overlap insured? Sections taped twice?
1.6	Laps and joints sealed	Welds complete? Appropriate joining/double sided tape used?
1.7	Service entries sealed	Top hats seal arrangements fixed around service entries? Use of Jubilee clips?
2.1	Sub-floor void	Is a check possible? Void former? Gravel (type/specification)? Height of void space? Is it clear?
2.2	External wall airbricks	Numbers, size, positions as design drawing?
2.3	Internal sleeper walls	Ventilation holes (honeycomb brickwork/pipe crossings?) – size, spacing, location in accordance with design?
2.4	External vent trenches/ducts	Located and constructed in accordance with design drawings? If open-topped gravel – gravel type/presence of fines? If pipe or other vent, check position and construction for functionality and absence of blockages. Ability of void former to withstand bearing of the superstructure?
3.1	Active venting	Type of air supply: mechanical, natural, combined? Location/condition/number of fans and vents? Location and size of inlets? Provision of air-cleaning devices and air heaters? Supply and exhaust ductwork? Alarm provision/installation? Gas monitoring system in under-floor void?

Photographs

No.	Description

The gas protection measures inspected:	a Are acceptable and comply with the specification
	b Are acceptable but attention is drawn to issues related to item no.
	c Are not acceptable due to issues related to item no.

Name: **Signature:** **Date:**

Appendix B – Council Validation Requirements

Planning Guidance in Relation to Ground Contamination: Guidance Note for Applicants, Developers, Land Owners and Consultants

Version 6.00
September 2016

Environmental Protection Group
Contaminated Land Section

A flow chart showing a typical example of the contaminated land planning procedure can be found in Appendix A, together with a checklist in Appendix B outlining the information required in support of a planning application. It is strongly recommended these are consulted prior to submission of information, as reports which fail to consider the issues outlined in this document will be considered unsatisfactory.

MANCHESTER CITY COUNCIL

www.manchester.gov.uk

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OVERVIEW

Many areas of the City have previously been occupied by a variety of industrial activities. Historically, the predominant industries included textile and dye works, heavy engineering works, chemical works, gas works and brickworks. In general, early industrialists had little or no knowledge of the environmental effects of their manufacturing processes or operating practices. Consequently, over a period of time a particular site may have been home to a variety of industries, each of which may have left substances in the ground that may be hazardous to human health and the environment. Additionally, more recent activities may also have had a detrimental impact on the environment. As the Government encourages more redevelopment on brownfield land, developers now have to take into account the possibility of land contamination. The purpose of this guide is to make applicants, developers and their advisors aware of the information that Manchester City Council (MCC) requires in assessing an application for planning consent on land that may be affected by the presence of contamination.

In order to assess submitted information, the Contaminated Land Section (CLS) would expect a developer to demonstrate that due consideration has been given to the guidance contained within this document.

For more detail on the underpinning principles on which this document is based, the reader is directed to CLR11 Model Procedures for the Management of Land Contamination[1] (CLR 11), which can be downloaded free of charge from the Environment Agency website (www.environment-agency.gov.uk) and National Planning Policy Framework (NPPF) which is also available free of charge, from the Office of the Deputy Prime Minister website, (www.odpm.gov.uk).

IMPORTANT

This Guidance Note is written to serve as an informative and helpful source of advice. Readers must note that legislation, guidance and practical methods may be subject to change. This Council has taken all reasonable precautions to ensure the information is correct. However, the Council, its officers, servants, or agents, will not accept any liability for loss or damage caused by any person relying on this information, or for any errors or omissions in the information provided.

1.0 WHAT IS CONTAMINATED LAND?

Local Authorities are responsible for addressing contaminated land issues within two separate regimes: the Contaminated Land Regime (commonly known as Part 2A) and the Planning Regime (Development Control).

1.1 Definition under Part 2A of the Environmental Protection Act 1990

The definition of contaminated land (from Section 78A(2) of the Environmental Protection Act 1990) is:

> " *…any land which appears to the local authority in whose area it is situated to be in such a condition, by reason of substances in, on or under the land, that:*
>
> *(a) significant harm is being caused or there is the significant possibility of such harm being caused; or*
>
> *(b) pollution of controlled waters is being, or is likely to be, caused…*"

With respect to controlled waters, the Water Act 2003 (Chapter 37, Section 86) has amended the second limb of the definition so that it applies only where:

> *"**significant** pollution of controlled waters is being caused, or there is a **significant possibility** of such pollution being caused "*

Part 2A of the Environmental Protection Act 1990, as inserted by Section 57 of the Environment Act 1995, was brought into force on 01 April 2000. It requires all local authorities to identify contaminated land in its area and secure its remediation to a condition suitable for its current use.

To fall within the Part 2A definition, the land when assessed in the context of its current use must be capable of causing significant harm to human health or other specified receptors and/or pollution of controlled waters. Development of land will have to take into account Part 2A because a change in the use of the land may bring the development inside the statutory definition of contaminated land by creating a pollutant linkage.

A key element of the Part 2A regime is the **Source-Pathway-Receptor pollutant linkage** concept. Each element is defined as follows:

- the **source** is the contamination in, on or under the land
- the **pathway** is the route by which the contamination reaches the receptor;
- and, the **receptor** is defined as living organisms, ecological systems or property which may be harmed.

Without the clear identification of all three elements of the pollutant linkage, land cannot be identified as contaminated land under the regime (Table 1).

Table 1 Examples of Pathways and Effects from Land Contamination

HUMAN HEALTH
1) *Uptake of contaminants by food plants grown in contaminated soil* – heavy metals (e.g. cadmium, lead) and persistent organic pollutants including certain pesticides and veterinary products may result in an accumulation in food plants to concentrations where they exceed legal limits and/or may pose a hazard to human health. Uptake will depend on concentration in soil, its chemical form, soil pH, plant species and prominence in diet.
2) *Ingestion and inhalation* – substances may be ingested directly by young children playing on contaminated soil, by eating plants which have absorbed metals or are contaminated with soil or dust. Ingestion may also occur via contaminated water supplies. Metals, some organic materials and radioactive substances may be inhaled from dusts and soils.
3) *Skin contact* – soils containing tars, oils and corrosive substances may cause irritation to the skin through direct contact. Some substances (e.g. phenols) maybe absorbed into the body through the skin or through cuts and abrasions.
4) *Irradiation* – As well as being inhaled and absorbed through the skin, radioactive materials emitting gamma rays can cause a radiation response at a distance from the material itself.
5) *Fire and explosion* – materials such as coal, coke particles, oil, tar, pitch, rubber, plastic and domestic waste are all combustible. If heated by contact with buried power cables or careless disposal of hot ashes they may ignite and burn underground. Both underground fires and biodegradation of organic materials may produce toxic or flammable gases. Methane and other gases may explode if allowed to accumulate in confined spaces.
BUILDINGS
1) *Fire and explosion* – underground fires may cause ground subsidence and cause structural damage to buildings. Accumulations of flammable gases in confined spaces leads to a risk of explosion. Underground fires may damage building services.
2) *Chemical attack on building materials and services* – sulphates may attack concrete structures. Acids, oils and tarry substances may accelerate corrosion of metals or attack plastics, rubber and other polymeric materials used in pipe work and service conduits or as jointing seals and protective coatings to concrete and metals.
3) *Physical* – blast-furnace and steel making slag (and some natural materials) may expand if ground conditions are changed by development. Degradation of fills may cause settlement and voids in buried tanks and drums may collapse as corrosion occurs or under loading from construction traffic.
NATURAL ENVIRONMENT
1) *Phytotoxicity (prevention/inhibition of plant growth)* – some metals essential for plant growth at low levels are phytotoxic at higher concentrations. Methane and other gases may give rise to phytotoxic effects by depleting the oxygen content in the root zone.
2) *Contamination of water resources* – soil has a limited capacity to absorb, degrade or attenuate the effects of pollutants. When this is exceeded, polluting substances may enter into surface and groundwater.
3) *Ecotoxicological effects* – contaminants in soil may affect microbial, animal and plant populations. Ecosystems or individual species on the site, in surface waters or areas affects by migration from the site may be affected.

1.2 Planning definition

The planning system uses a slightly different definition for contaminated land, which is not based solely on the legal definition set out in Part 2A. A wider range of contamination and receptors is relevant to planning but the degree of harm or pollution and the approach to remediation are essentially the same.

However, to avoid confusion with the term 'Contaminated Land' the planning regime uses the wider term "*land affected by contamination*". This is intended to cover all cases where:

> "*the actual or suspected presence of substances in, on or under the land may cause risks to people, human activities or the environment, regardless of whether or not the land meets the statutory definition in Part 2A*".

The NPPF states that:

> *"As a minimum, the land should not be capable of being determined as contaminated land under Part 2A of the Environmental Protection Act 1990"*

The principal difference is that under the planning system, risks have to be assessed based upon the new or intended use of the land, rather than the existing use.

However, the principles underlying both regimes are fundamentally the same, namely, the identification and remediation of land that may pose a risk to human health and/or the environment.

Typical causes of land contamination include previous industrial or commercial usage, mining, and the landfilling of wastes. Land can also become contaminated due to its proximity to contaminated areas.

Part 2A was designed and intended to encourage voluntary remediation and should only be used where no appropriate alternative solution exists. The Contaminated Land Strategy published by the Council provides details of the planning system to ensure land is made suitable for use when it is redeveloped and/or encouraging polluters and owners of land to deal with problems without the need for Part 2A to be used directly.

1.3 Types of contamination

Contaminating substances may include,

- Metals e.g. cadmium, arsenic, lead, iron, nickel, chromium
- Inorganic compounds e.g. cyanide, ammonium, chlorides
- Organic substances e.g. oils, petrol, solvents, phenols, PAHs, PCBs
- Gases e.g. methane, carbon dioxide, hydrogen sulphide, volatiles
- High or low pH

Contamination may not occur solely as a result of human activities and land can be contaminated as a result of its natural state. For example, in Greater Manchester, marsh gas can cause a contamination problem, particularly in areas previously occupied by moss land.

2.0 ROLES AND RESPONSIBILITIES

2.1 Role of the Owner/Developer

Where development is proposed, the developer is responsible for ensuring that development is safe and suitable for use for the purpose for which it is intended.

The developer is therefore responsible for determining whether land is suitable for a particular development, or can be made so by remedial action. In order to demonstrate this, the developer should determine:

i whether the land in question is already affected by contamination through source –pathway – receptor pollutant linkages;

ii whether the proposed development will create new linkages, e.g. new pathways by which existing contaminants might reach existing or proposed receptors; and

iii what action is needed to break those linkages and avoid new ones, deal with any unacceptable risks and enable safe development and future occupancy of the site and neighbouring land.

A potential developer will need to satisfy the local authority that unacceptable risk from contamination will be successfully addressed through remediation without undue environmental impact during and following the development.

In doing so, a developer should be aware that actions or omissions on their part could lead to liability being incurred under Part 2A, e.g. where development fails to address an existing unacceptable risk or creates such a risk by introducing a new receptor or pathway.

Where an agreed remediation scheme includes future monitoring and maintenance schemes, arrangements will need to be made to ensure that any subsequent owner is fully aware of these requirements and assumes ongoing responsibilities that remain with the new landowner.

2.2 Role of the LPA

The LPA has a duty to take account of all material planning considerations including land contamination during the preparation of Local Plans and when considering an application for planning permission. Usually where there is reason to believe land may be contaminated, or the proposed development is of particular sensitivity e.g. housing a full assessment may be required in advance of planning approval being issued, a planning condition requiring assessment of possible contamination may be recommended by the LPA and applied to the decision notice.

When considering development on land affected by contamination, the principal objective of the LPA is to ensure that any unacceptable risks to human health, property and/or the wider environment are identified so that appropriate action can be considered and then taken to address those risks. In achieving this objective, the LPA should assist in providing the necessary confidence to owners and occupiers of

the land after development, regarding the condition and the ranking of the land in relation to relevant environmental protection regimes, such as Part 2A.

2.3 Role of the Environmental Protection Team

Neighbourhood Officers within the Environmental Protection team are responsible for addressing contaminated land issues using Part 2A and the planning system. The Environmental Protection Team and also the EA act as consultees to the LPA regarding risks to human health and controlled waters.

2.4 Role of other organisations

The EA are a consultee for any planning applications, where development is proposed on potentially contaminated land. Where the EA are consulted and land contamination is an issue they will seek to implement the objective of the water framework directive to prevent and limit the entry of pollutants into groundwater.

Within the LPA, Building Control will also need to be satisfied that any risks to the development from potential contamination have been adequately addressed. The Building Regulations 2000 require developers to demonstrate that hazards from potential contamination have been properly assessed and appropriate measures put in place to address any risk.

3.0 THE PLANNING PROCEDURE

The actual or possible presence of contamination is a material planning consideration. Planning advises that as a precautionary approach, the possibility of contamination should be assumed when considering planning applications in relation to all land subject to or adjacent to previous industrial use and also where uses are being considered that are particularly sensitive to contamination, e.g. housing, schools, hospitals and children's play areas.

Where development is proposed on land that is or may be affected by contamination, an assessment of risk should be carried out by the applicant for consideration by the Local Planning Authority (LPA) before the application is determined. Any existing or new unacceptable risks should be identified and proposals made to deal with them effectively as part of the development process.

When a planning application is made, the planning officer will consult with the Contaminated Land Section and the application (with supporting information) will be assessed to determine whether there is the potential for contamination to influence the site, whether suitable measures have been proposed to address any risks and whether the proposed development is acceptable.

Other statutory bodies and relevant local authority departments may also be consulted as necessary, including English Nature, Natural England and the departments for building control, conservation and archaeology, and engineering.

If there is the potential for contamination to affect the site, or the end-use is particularly sensitive, recommendations will be made that certain conditions be imposed upon the development. These are intended to ensure that the site is made suitable for its proposed end use and ensure the safety of site workers, future site users and the protection of the environment.

It is essential that the developer and their agents provide as much information to the LPA at every stage of the planning process. Withholding information, however trivial, may cause a delay to the application. The onus is on the applicant to keep the LPA well informed about the development at all times so that decisions can be made swiftly and the application process completed as quickly as possible.

For large developments on sites where serious contamination is known, or is likely to be present, it is strongly recommended that a pre-application consultation with the LPA be undertaken. It may save both time and money if a thorough pre-application consultation takes place prior to submission of a full planning application.

A flowchart showing a typical example of the contaminated land planning procedure can be found in Appendix A.

4.0 CRITERIA USED FOR ASSESSING THE SUBMITTED INFORMATION

Information submitted in support of planning applications must be of an acceptable minimum standard in order to satisfy the LPA. The guidance contained within this section aims to inform developers of the procedural requirements of a risk-based approach to land contamination, as defined in current UK legislation and guidance.

A detailed technical framework for investigating and dealing with land affected by contamination is contained within CLR 11. The process involves identifying, making decisions on, and taking appropriate action to deal with, land contamination in a way that is consistent with government policies and legislation within the UK.

The approach outlined in this Manchester City Council Guidance Note is consistent with the CLR 11 technical framework and is based on a staged or tiered approach to risk assessment, which includes the following three key elements:

- Risk Screening
- Generic Quantitative Risk Assessment (GQRA)
- Detailed Quantitative Risk Assessment (DQRA)

Risk screening generally involves developing a conceptual model (Section 4.1), which identifies whether there could be any potentially unacceptable risks at the site. The conceptual model may then be used to determine if any further assessment is required. If this preliminary assessment clearly demonstrates that contamination at the site poses no unacceptable risks (i.e. no source-pathway-receptor relationships) then quantitative assessments may not be required.

The procedure for investigating a potentially contaminated site would be expected to meet the criteria outlined in British Standard (BS) 10175 (2011) Investigation of Potentially Contaminated Sites – Code of Practice[3]. Typical components of a report submitted in support of a planning application would generally include the following four components:

- Preliminary Risk Assessment (PRA) (often referred to as a Phase 1 Investigation or Desk Study)
- Phase 2 Investigation (intrusive investigation)
- Remediation Strategy
- Verification Report

A more detailed checklist of LPA requirements in relation to each of these components can be found in Appendix B.

4.1 Preliminary Risk Assessment (PRA)

A PRA (sometimes referred to as a Phase 1 investigation) should provide a preliminary qualitative assessment of risk by interpreting information on a site's history, considering the likelihood of contamination being present and making an initial hazard assessment. The PRA typically consists of a **desk study**, **site reconnaissance**, development of a **conceptual model** and a basic **hazard assessment**.

The **desk study** comprises a search of available information and historical maps, which can be used to identify the likelihood of contamination being present. The two main indicators for the likely presence of contamination at a site are past industrial uses and/or close proximity to a landfill. A detailed appraisal of documentary research can be found in CLR 3 Documentary Research on Industrial Sites[4]. For details of information required for a typical desk study see Appendix B.

A simple **site reconnaissance** survey of the site is conducted to identify if there are any obvious signs of contamination at the surface. Further information regarding site inspection can be found in CLR 2 Guidance on Preliminary Site Inspection of Contaminated Land[5].

A **conceptual model** is a representation (text and/or graphics) of the relationship(s) between contamination source(s), pathway(s) and receptor(s) developed on the basis of hazard identification. Developing a conceptual model should be viewed as an iterative process that should be refined during subsequent phases of assessment. For details of information required for a conceptual model see Appendix B.

Using the information gathered, the conceptual model of the site is constructed and a basic **hazard assessment** is carried out.

4.2 Phase 2 investigation

A Phase II investigation aims to reduce the uncertainties identified in the initial conceptual model by quantifying potential contamination at the site. The data obtained will be used to inform a decision as to whether the site is potentially harmful. A Phase II report generally consists of an intrusive site investigation and a subsequent risk assessment. The investigation process should seek to clearly identify and characterise plausible source-pathway-receptor linkages at the site and provide information for the refinement of the initial conceptual model.

4.3 Remediation strategy

This is a document detailing what action is to be carried out so that contamination no longer presents a risk to site users, property or ecological systems. It may include measures such as the removal of contamination, encapsulation of the contaminants, treatment of the contaminants or measures to break the pollution linkages. Please note that Government policy encourages sustainable methods of remediation.

A remediation strategy should be submitted where a site investigation identifies levels of contamination that will require remediation prior to the site being suitable for its intended use. This statement should include full details of how the contamination problem at the site will be addressed and demonstrate that the standard of remediation work complies with current best practice and guidance. This must be approved by the LPA before any remedial actions at the site commence.

4.4 Verification report

Where contamination has been found and/or remediated, the developer will be required to submit a verification report. In certain circumstances it may be necessary for the developer to conduct post-completion monitoring. This should be undertaken

to the approval of the LPA and results of the monitoring should be submitted for review. For limited remediation works or protective works a verification statement alone may be acceptable, but prior confirmation of this should be obtained from the LPA.

The verification report should provide confirmation that all measures outlined in the approved remediation statement have been successfully completed, including where appropriate, validation testing.

Recommendations to discharge contaminated land conditions will only be made once the Contaminated Land Section has received and approved a satisfactory verification report.

5.0 GENERIC GUIDANCE

The complexity of contaminated land technical guidance, coupled with individual site variability, makes it difficult to produce comprehensive guidance applicable to every situation.

However, when assessing the adequacy of a site investigation, a number of common problems frequently arise. These generally relate to areas where technical guidance may be complex or incomplete. In an attempt to minimise the occurrence of these problems, the CLS apply consistent criteria for certain technical aspects of a site investigation. This section is intended to highlight recurring problem areas and key points that are of particular importance.

5.1 Obtaining representative samples

All sampling strategies should be designed to provide data that is representative of the site conditions as a whole. Sampling should be undertaken in accordance with recognised sample collection methodology and guidance, with reference made to recommendations within BS 10175. Reference to the historical site information obtained from the desk study is essential in order to target possible sources of contamination and to ensure that an appropriate suite of analysis is performed. Justification for the chosen sampling regime and analysis suite should be clearly set out in the site investigation report.

5.2 Sample analysis

A suitably accredited laboratory should be used to undertake analysis of samples. The site investigation should include a detailed plan showing the location of sampling points and accreditation details of the laboratory used, together with summary tables of results. A full set of results should be included in the report submitted and an electronic (pdf) form from the laboratory that undertook the analysis should also be submitted.

5.3 Generic and detailed quantitative risk assessment (GQRA and DQRA)

The Department for Environment, Food and Rural Affairs (Defra) formally withdrew the 1987 ICRCL trigger and action values in December 2002, following the implementation of the Contaminated Land Exposure Assessment Model (CLEA) and associated publication of the Soil Guideline Values (SGVs).

In 2008, the CLEA UK model and the SGVs were withdrawn by Defra and a revised CLEA model known as CLEA 1.04 was launched. MCC would expect all future site investigations to make no reference to the withdrawn standards.

Generic and detailed QRA should now be carried out using assessment criteria derived using the new CLEA model (1.06). Where site-specific target levels are used they should be calculated based on suitable and reasonable assumptions as well as current best practice and associated briefing notes and guidance. Reference should also be made to statistical analysis of the resulting data from the intrusive

investigation.

More recently the following criteria have been released Category 4 Screening Levels (C4SLs) (replaced SGVs) and Suitable 4 Use Values (S4ULs) (replaced LQM/CIEH GACs). Where these values exist they should be used instead of the SGVs and LQM/CIEH GACs

The CLR7 report '*Assessment of Risks to Human Health from Land Contamination: An Overview of the Development of Soil Guideline Values and Related Research*' was withdrawn in 2008. Consultants when assessing site investigation data should adopt a suitable statistical approach. The CIEH and CL:AIRE set out in the document '*Guidance on Comparing Soil Contamination Data with a Critical Concentration*'[6] an approach that is a useful starting point for statistically assessing data.

It is usually inappropriate to apply quantitative criteria developed outside the UK, to UK sites, as assumptions underlying the models used to derive these criteria often reflect different behaviour patterns, local soil types or other technical factors.

Where other contaminated land quantitative criteria are used e.g. Dutch or USEPA, the reasoning behind not using current UK guidance should be given and their use must be fully justified and referenced within the report. This would be expected to include a discussion of the conceptual model and assumptions used to derive the generic criteria together with an assessment of the underpinning toxicological data.

5.4 Assessment criteria for ground gas

If the development is situated within 250m of a landfill site, or is suspected of having the potential to generate ground gas, it will be necessary to assess the potential risk and, if required, to incorporate appropriate gas protection measures into the development design.

Guidance for assessment of the risks associated with the presence of methane and carbon dioxide within ground gas can be found in;

- Assessing Risks Posed by Hazardous Gas Ground Gases to Buildings (CIRIA C665)[7]
- BRE Report 414 publication Protective Measures for Housing on Gas Contaminated Land[8]
- Guidance on Evaluation of Development Proposals on Sites where Methane and Carbon Dioxide are present[9]
- Code of Practice for the characterisation and remediation of ground gas in affected developments[10]
- Local Authority Guide to Ground Gas[11], and
- Development on Land Potentially Affected by Hazardous Ground Gas[12].

The guidance in CIRIA C665 sets out a phased, risk-based approach to ground gas assessment. An assessment should comprise:

- A desk study and development of conceptual site model.
- A site investigation and risk assessment.
- A remediation strategy, if required.
- A validation report to confirm that the remedial measures have been

successfully implemented.

Where the desk study identifies a potential ground gas risk, gas monitoring is required. Measurements should be taken from suitably installed and equipped monitoring boreholes and the details and locations of the boreholes should be supplied. The spacing and number of the monitoring wells required at a site depends on the generating potential of the gas source (identified during the desk study and first phase site investigation) and the sensitivity of the end-use (housing being the most sensitive). The response zone of a borehole should be designed to intersect the suspected sources of gas. Spike testing and data obtained from trial pit installations are not acceptable for gas risk assessment.

The number of monitoring visits required, and the length of time monitoring should be carried out over, depends on the generating potential of the gas source and sensitivity of the end-use. For example, a site which is to be developed for residential properties with gardens, which is situated over a very low gas generating source (i.e. made ground greater than 1 metre thick) may require a minimum of 6 visits over 3 months, while residential with housing over a very high gas generating source (i.e. a modern landfill) may require 24 visits over 24 months. In order to obtain any worthwhile data to use in a risk assessment, at least two readings over the monitoring period should cover the 'worst case' scenario i.e. low and falling atmospheric pressure (below 1000 millibars) and different weather conditions such as rainfall, frost and dry.

Monitoring should be undertaken in accordance with the CIRIA C665 guidance; where deeper made ground (greater than 1 metre deep), organic material or hydrocarbon spills are unexpectedly encountered, additional monitoring should be considered.

Once sufficient gas monitoring data has been obtained, a ground gas risk assessment should be carried out to determine if gas protection measures are required. CIRIA C665 sets out two risk assessment methodologies:

- Modified Wilson and Card methodology (for use on all development types except low rise houses with gardens). The gas regime characteristic situation determines the number and type of protection measures required.
- NHBC Traffic Light System, proposed by Boyle and Witherington (for use on developments with conventional low-rise housing with gardens with block and beam floor and ventilated underfloor void only). Gas results are initially compared to Typical Maximum Concentrations and then to Gas Screening Values if the Typical Maximum Concentrations are exceeded. The worst-case protection measures are adopted.

It should also be noted that when submitting ground gas monitoring data a current calibration certificate for all machines used for the gas monitoring should also be submitted.

5.5 Cover Systems

The main function of an **engineered cover system** should be to provide a safe and permanent barrier between any 'significant' levels of buried contamination and residents/site users.

It is not uncommon for developers to include a **simple cover system** into garden and landscaped areas. This is done in order to provide a reduction in the hazard to human health in situations where 'marginally' elevated levels of contaminants have been encountered, as well as to provide a suitable medium for plant growth.

There is currently no definitive guidance available that is able to adequately address the design of either of these cover systems. Therefore the CLS considers that where cover systems are used there should be no distinction between 'marginal' and 'significant' levels of contamination.

5.5.1 Depth of cover systems and capping layers

Where used as a capping layer of cover system, fill materials should be installed at prescribed depths according to their soil type and the role they play within the cover system. As cover systems are almost always site-specific, the various depth of fill can vary greatly depending on how complex or engineered the cover system is to be, but there are a few minimum standards to be observed, which are described below.

Typical cover system design requires a capillary break layer at its base, which is then overlain by various depths/types of fill material. These individual layers working in unison form the cover system or capping layer.

The minimum acceptable total depth for fill materials (including the break layer) within private garden areas should be 600 mm. This figure is recommended and has been adopted for the following reasons:

1. Root systems for shrubs are typically up to 600 mm;
2. Excavations are unlikely to be deeper than 600 mm in typical gardening activities;
3. Bio-turbation (soil-mixing by biological organisms) is typically limited to the top 600 mm of the soil profile;
4. Excavations by children or pets are unlikely to exceed 600 mm.

The minimum acceptable total depth for fill materials (including the break layer) within areas of soft-landscaping, common areas or public open spaces is 450 mm. This relaxation of cover depth is designed to reflect the reduced risk afforded by diminished exposure of human health receptors to potentially contaminated soils within these public areas via direct contact (dermal, ingestion, inhalation).

5.5.2 Depth of growing medium and planting

In certain circumstances, where it can be demonstrated that future activities will not result in soil mixing, it may be acceptable to use a shallower depth of cover material. A robust case would need to first be presented for prior approval from the LPA. An additional consideration when planting landscaped areas is that BS 3882[13] recommends the rooting depths in Table 2.

Table 2 Idealised total growth medium rooting depths for various vegetation types

Total Minimum Rooting Depth	Vegetation Type			
	GRASS	PLANTS	SHRUBS	TREES
	450mm	450mm	600mm	900mm

5.5.3 Sampling Ratios

When a cover system is used, a desk study should be provided with details of the source of the cover material. It should be demonstrated that the soil is free from contamination by supplying results of analytical tests. Justification for the analytical suite used should be included. Sampling densities should be justified and based on the findings of a desk study. It would be expected as an absolute minimum sampling would consist of at least three samples for each source used. One sample for every 200m^3 from proven 'greenfield' sources and one sample every 50m^3 from 'unknown', 'mixed' or 'brownfield' sources. MCC would also expect to see on site sampling and not just sampling at source to confirm that the soil delivered to the site is suitable for use. Table 3 summarises the recommended sampling frequencies depending on the soil source and end use.

Table 3 Sampling frequencies recommended by the Environmental Protection Team for imported or site-won fill materials

Intended End-Use	SOURCE/ORIGIN OF FILL MATERIAL			
	GREENFIELD	REMEDIATED	BROWNFIELD	UNKNOWN
GARDENS	1:200m^3	1:100m^3	1:50m^3	1:50m^3
SOFT-LANDSCAPING	1:200m^3	1:150m^3	1:150m^3	1:150m^3
OTHER	1:200m^3	1:200m^3	1:200m^3	1:200m^3

5.5.4 On-site of Off-site Validation

Fill material imported onto site should be stored in a designated area, which is clearly identified on an appropriate scale plan. Stockpile management protocols consistent with best practice apply.

The Environmental Protection Team does not routinely accept off-site validation of fill material (whether this is top-soil, sub-soil or other substrate), as this often results in chemical testing of different material to that actually imported to site. It is therefore difficult to prove the exact chemical nature of the material eventually imported, as off-site validation tends to involve composite samples taken from a 'typical batch' of the material intended for import. As such, validation testing of imported fill materials should be carried out in-situ, after materials have been imported to site.

5.5.5 Documentary Evidence

- **Chemical analysis**: All raw laboratory data should be submitted with the analytical test certificate;

- **Statistical analysis of datasets**: Calculations in line with CIEH/CL:AIRE guidance should be provided;
- **Photographic evidence**: Photographs of installed remedial measures (of any type) are required. Photographic evidence should be representative and where necessary, include a scale/ruler. This is of particular importance when photographing cover depths to verify the agreed depth of cover has been installed;
- **Plans**: Showing pertinent information relating to remediation, such as stockpile locations, areas subject to remedial measures or areas of further investigation;
- **Import/export data**: Pertinent data relating to fill materials/wastes, including volumetric data (i.e. how much was imported to site), source data (i.e. where the material came from) and waste transfer data (where applicable).

5.5.6 Obtaining Representative Samples

All sampling strategies should be designed to provide data that is representative of the site conditions as a whole. Sampling should be undertaken in accordance with recognised sample collection methodology and guidance, with reference made to recommendations within the British Standard BS10175 guidance document. It is essential to derive a CSM using the information obtained from the PRA to target possible sources of contamination and also to ensure that an appropriate suite of analysis is performed. Justification for the chosen sampling regime and analysis suite should be clearly set out in the site investigation report.

A suitably accredited laboratory should be used to undertake analysis of samples. The site investigation should include a detailed plan showing the location of sampling points and accreditation details of the laboratory used, together with summary tables of results. A full set of results, including exploratory hole logs, should be submitted.

5.6 Human Remains and / or Burial Sites

If you have been made aware through means such as historical records that the site is on or adjacent to an existing or former burial ground that may contain human remains, you must contact Environmental Health at the earliest opportunity.

If at any time during site investigation works, ground-works or excavating on a site within the boundary of Manchester City Council you discover human remains, suspected human remains or bones of an unknown type you must stop all works, secure the area and contact the Police and Environmental Health for advice. Environmental Health can be contacted through the City Councils contact centre on 0161 234 5004.

5.7 Japanese Knotweed

Japanese knotweed is a very invasive species of plant which is not native to the British Isles. Since it was introduced into the UK as an ornamental garden plant in the mid-nineteenth century it has spread across the UK, particularly along watercourses, transport routes and waste areas. Japanese knotweed is not just a problem for our

native wildlife; the vigorous growth can also damage buildings and hard surfaces. Once established underneath or around the built environment, it can be particularly hard to control.

Neither the Environment Agency or the Local Authority are responsible for controlling Japanese Knotweed, other than that growing on their own land. Managing knotweed is the responsibility of the owner/occupier of a site.

Link to Environment Agency **Japanese Knotweed** Guidance:

http://www.environment-agency.gov.uk/homeandleisure/wildlife/31364.aspx

Link to Environment Agency **Invasive Species** Guidance:

http://www.environment-agency.gov.uk/homeandleisure/wildlife/31350.aspx

Contact Details for the **Environment Agency**

Telephone: 08708 506 506 (Mon-Fri, 8am - 6pm)

E-mail: enquiries@environment-agency.gov.uk

Postal Address: National Customer Contact Centre, PO Box 544 Rotherham S60 1B

5.8 Asbestos

With regard to the MCC CLS there are three issues related to asbestos that we may be contacted in relation to and they are;

1. Dealing with asbestos as part of a contaminated land condition or in relation to the planning process,
2. Concerned members of the public thinking about asbestos in their homes, in/on neighbours property or on current developments close by, and;
3. Members of the public working and being exposed to asbestos in their workplace.

Asbestos and Contaminated Land

If the presence of asbestos within made ground is suspected or within a building due for demolition then contact the Environmental Protection Team on Tel: 0161 234 5004

Asbestos, Neighbours and Current Developments

If the issue is with members of the public having concerns with their house, neighbours or building sites dealing with asbestos sheeting or similar, then please see our guidance document:

http://www.manchester.gov.uk/downloads/download/4234/asbestos

Asbestos at Work

If the issue is work related then please review the Health and Safety Executive website at the following link for information and contact details:

http://www.hse.gov.uk/asbestos/

6.0 REFERENCES

1. Department of Environment, Food & Rural Affairs/Environment Agency, 2004, CLR Report No 11, **Model Procedures for the Management of Land Contamination.**
2. Department of the Environment, 2004, PPS23, **Planning & Pollution Control.**
3. British Standards Institute, 2011, BS10175, **Investigation of Potentially Contaminated Sites – Code of Practice.**
4. Department of the Environment, 1994, CLR Report No 3, **Documentary Research on Industrial Sites.**
5. Department of the Environment, 1994, CLR Report No 2, **Guidance on Preliminary Site Inspection of Contaminated Land.**
6. Chartered Institute of Environmental Health (CIEH) / Contaminated Land: Applications in Real Environments (CL:AIRE), 2008, **Guidance on Comparing Soil Contamination Data with a Critical Concentration.**
7. CIRIA, C665, 2007, **Assessing risks posed by hazardous ground gases to buildings.**
8. Building Research Establishment 414 (2001) **Protective Measures for Housing on Gas Contaminated Land.**
9. National House Building Council (NHBC), Report Edition No. 4 (March 2007) **Guidance on Evaluation of Development Proposals on Sites where Methane and Carbon Dioxide are present.**
10. British Standards Institute BS 8485 (2007) **Code of practice for the characterisation and remediation of ground gas in affected development**, Draft for Public Comment.
11. Chartered Institute of Environmental Health (2008) **Local Authority Guide to Ground Gas.**
12. Greater Manchester Public Protection Partnership (GMPPP) Briefing Note BN01/2008 (2008) **Development on Land Potentially Affected by Hazardous Ground Gas.**
13. British Standards Institute BS 3882 (2007) **Specification for Topsoil and requirements for use.**

Additional Reference Material

- Chartered Institute of Environmental Health, 2001, **Local Authority Guide to the Application of Part 2A of the Environmental Protection Act 1990.**
- Department of the Environment, 1994, CLR Report No 1, **A Framework for Assessing the Impact of Contaminated Land on Groundwater and Surface Water.**
- Department of Environment, Transport and Regions, Circular 02/2000 **Contaminated Land: Implementation of the Part 2A of the Environmental Protection Act 1990.**

- Department of the Environment, 1994, CLR Report No 4, **Sampling Strategies for Contaminated Land.**
- Department of Environment, Transport and Regions, 1997, CLR Report No 12, **A Quality Approach for Contaminated Land Consultancy** [section 3.4 'Reporting'].
- Department of Environment, Transport and Regions, 2000, **Guidelines for Environmental Risk Assessment & Management**, Revised Departmental Guidance.
- Environment Agency, 1999, R&D Publication 20, **Methodology for the Derivation of Remedial Targets for Soil and Groundwater to Protect Water Resources.**
- Environment Agency, March 2010, GPLC1 – **Guiding Principles for Land Contamination.**
- Environment Agency, March 2010, GPLC2 – **FAQs, Technical Information, Detailed.**

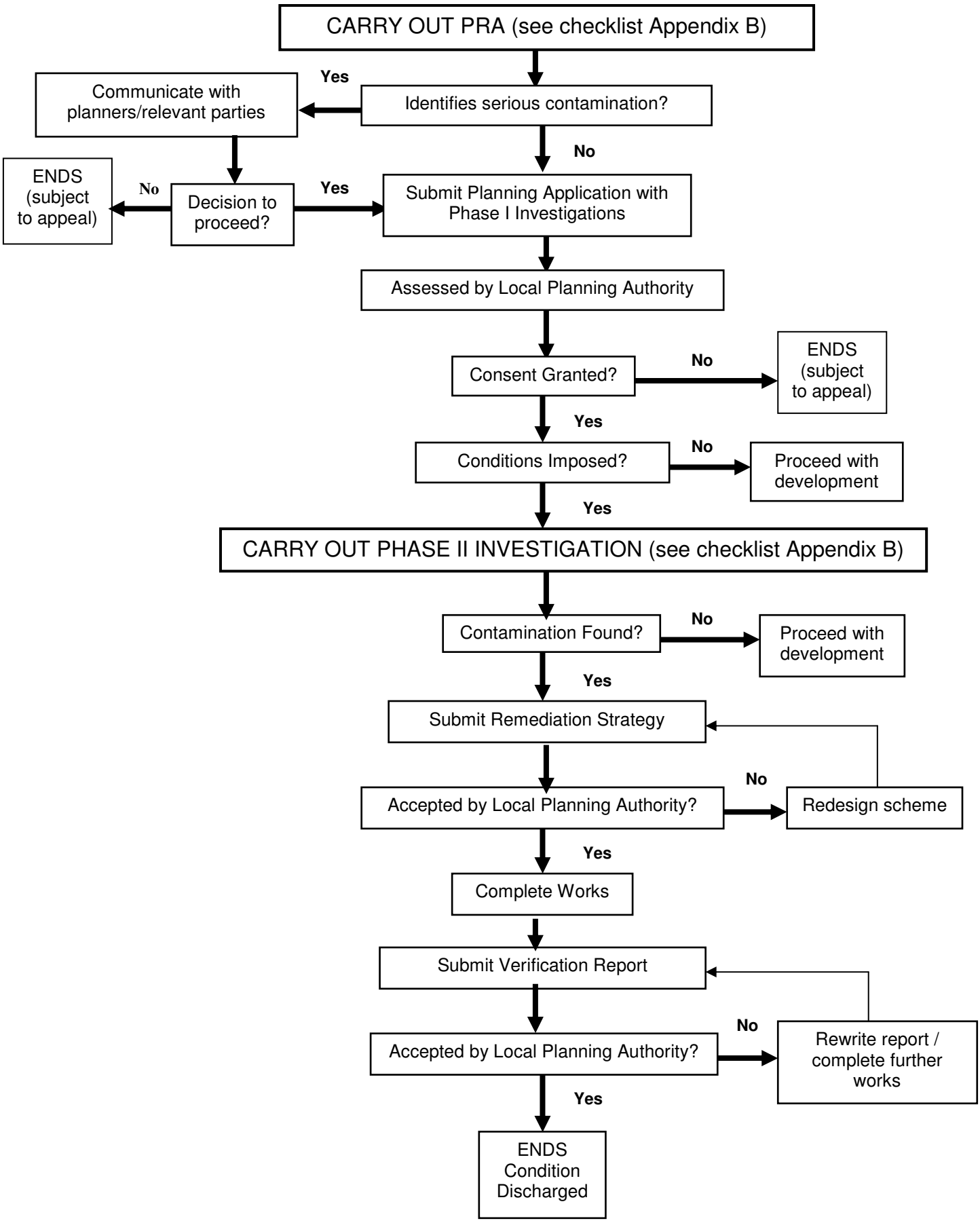
Advice and References

- Environment Agency, March 2010, GPLC3 – **Reporting Checklists**
- Environment Agency, February 2010, SC030114, **Evidence, Verification of Remediation of Land Contamination**
- Harris, M R, Herbert, S M & Smith, M A, 1995-1998, CIRIA Special Publications 101-112, **Remedial Treatment for Contaminated Land, 12 Volumes**
- Health & Safety Executive, 1991, **Protection of Workers & the General Public during the Development of Contaminated Land**
- National House Building Council (NHBC), 1999, NHBC Standards Chapter 4.1, **Land Quality – Managing Ground Conditions**
- The LQM/CIEH **Generic Assessment Criteria for Human Health Risk Assessment**, 2nd Edition, Land Quality Press, 2009.

Acknowledgements

MCC would like to acknowledge the work of the MAPAC planning guidance sub-group.

APPENDIX A - FLOWCHART SHOWING A TYPICAL EXAMPLE OF THE CONTAMINATED LAND PLANNING PROCEDURE



APPENDIX B – CHECKLIST OUTLINING THE INFORMATION REQUIRED IN SUPPORT OF A PLANNING APPLICATION

PRELIMINARY RISK ASSESSMENT

Desk Study

- A site description.
- A detailed site plan showing the site location, extent and boundary.
- A review of historical information including copies of historical maps where available.
- Background information on past and present uses of the site and its surrounding area.
- Background information on the nature of any hazards and potential sources identified.
- An appraisal of the site's environmental setting including:
    - Geology, hydrology and hydrogeology.
    - Information on coal workings and other extractive industries.
    - Waste management issues and landfill sites.
    - Water abstractions and discharges, pollution incidents, IPPC Part A and B, and radon.
    - Drainage and services.
- A review of previous desk studies or site investigations.
- Risk screening by means of an initial conceptual model, which should generally include the following.
    - Source characterisation.
    - Migration pathway descriptions.
    - Environmental receptor identification and discussion.
    - Identification of potential pollution linkages.
    - Description of the limitations and uncertainties inherent in the conceptual model.
- Recommendations and conclusions.

PHASE II INVESTIGATION

Site Investigation

Site Investigation Methodology including:

- A clear investigation scheme, based on findings of desk study.
- Methods of investigation with justification of the methodology and investigation techniques used.
- Justification of exploration locations and a plan showing their position.
- Sampling and analytical strategy.
- Coverage of investigations (statistical significance - targeted and non-targeted)
- Environmental monitoring including water sampling and gas monitoring/sampling.

Results and findings of investigation including:

- Ground, groundwater and gas conditions encountered.
- Presentation of laboratory analysis, sampling and monitoring results.
- Discussion of any ground contamination (soil/gas/water) encountered.

Refine conceptual model.

Qualitative and quantitative risk assessments (clearly identifying pollutant linkages).

Recommendations for remediation.

Recommendations for further investigation (if required).

REMEDIATION STRATEGY

• Clear remediation strategy.
• Detailed outline of works to be carried out.
  - Description of ground conditions.
  - Type, form and scale of contamination to be remediated.
• Consents, agreements and licenses (waste management issues).
• Implementation and validation of remediation.
  - Use of on-site observations and visual evidence.
  - Chemical analysis/monitoring data.
  - Proposed clean up standard.
  - Construction Quality Assurance.

VERIFICATION REPORT

• Details of works carried out and contamination encountered during investigation.
• Details and justification of any changes from the original remediation strategy.
• Demonstration of compliance and description of validation methods.
  - Laboratory and *in-situ* results.
  - Monitoring results for groundwater and gases.
  - Summary data plots and tables relating to clean up criteria.
  - Plans showing treatment areas and details of any differences from the original remediation strategy.
  - Photographic and other media records.
  - Waste management details and records.

• Ongoing environmental monitoring or works to be carried out.
• Confirmation that remediation objectives have been met.

APPENDIX C – FREQUENTLY ASKED QUESTIONS

How much of the work can I do without employing a consultant?
Simply determining whether land contamination is likely to be an issue is relatively straight-forward. Researching the history and uses of a site at the local studies unit of a library, and making enquiries of the Council and other agencies, can be carried out by competent developers.

Can the Council advise on employing a consultant or contractor?
The Council cannot recommend any consultant or contractor. Lists can be found in telephone and trade directories. There are websites that may help to identify consultants and contractors with suitable experience. Advice may be given as to the type of expertise a consultant or contractor might be expected to demonstrate.

Who should I address correspondence to within the Council?
Once a contaminated land condition has been placed on an application all correspondence relating to the subsequent assessment process should be directed to the Contaminated Land Section.

Contaminated Land Section
Environmental Services
Manchester City Council
Hammerstone Road
Gorton
Manchester
M18 8EQ

Telephone 0161 234 1363

A contaminated land officer assigned to the development whilst it is being built will then deal with the application and keep the appropriate planning officer informed of the progress of the application.

When should I contact the Environment Agency?
Although local authorities are the primary regulators of Part 2A, the Environment Agency assume the role when contamination is found to impact on controlled waters. Therefore, if a development is likely to impact on either surface waters or groundwater the advice of the Agency should be sought.

APPENDIX D – USEFUL CONTACTS

British Standards Institute (BSI)
389 Chiswick High Road
London
W4 4AL
Tel: 020 8996 9001
Fax: 020 8996 7001
www.bsi-global.com

Construction Industry Research & Information Group (CIRIA)
6 Storey's Gate
Westminster
London
SW1 P 3AU
Tel: 020 722 8891
Fax: 020 7222 1708
www.ciria.org.uk

Department of Environment, Food and Rural Affairs (DEFRA)
3/B4 Ashdown House
123 Victoria Street, London
SW1 6DE
Tel: 020 7944 5287
Fax: 020 7944 5279
www.defra.gov.uk

Environment Agency (EA)
Contaminated Land Section
Appleton House,
430 Birchwood Boulevard,
Warrington, Cheshire,
WA3 7WD
Tel: 08708 506506
www.environment-agency.gov.uk

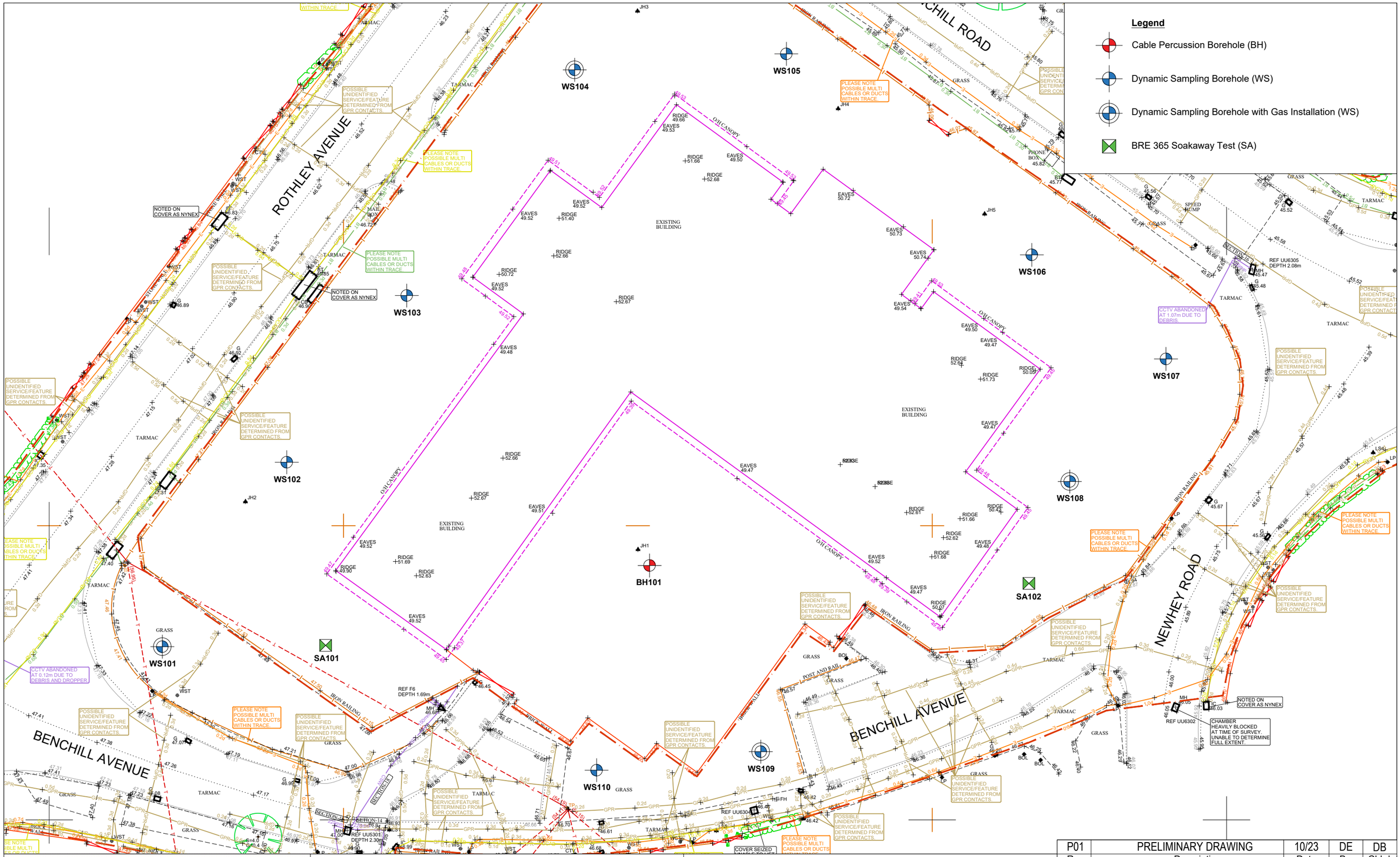
Land Condition Specialists
www.silc.org.uk

Manchester Area Pollution Advisory Committee
www.mapac.org.uk

The National House Building Council
Buildmark House, Chiltern Avenue
Amersham, Bucks
HP6 5AP
Tel: 01494 735363
www.nhbc.org.uk

WRc Plc
Frankland Road, Blagrove
Swindon, Wiltshire
SN5 8YF
Tel: 01793 865000
Fax: 01793 865001
www.wrcplc.co.uk

Drawing Ref. – 33029-SUT-ZZ-00-DR-G-7251 – Site Investigation on Existing Layout



Sutcliffe

Structural & Civil Engineering
Geotechnical & Environmental Investigations
Building Surveying
Pre Planning Services

Liverpool Head Office: 0151 227 3155
Manchester Office: 0161 817 5180
North Wales Office: 01978 664 071
London Office: 020 8016 4320

www.sutcliffe.co.uk

Drawing Status
FOR INFORMATION

Client
WYTHENSHAWE CHG

Project
BENCHILL ROAD
MANCHESTER

Drawing Title
SITE INVESTIGATION LOCATIONS
ON EXISTING PLAN

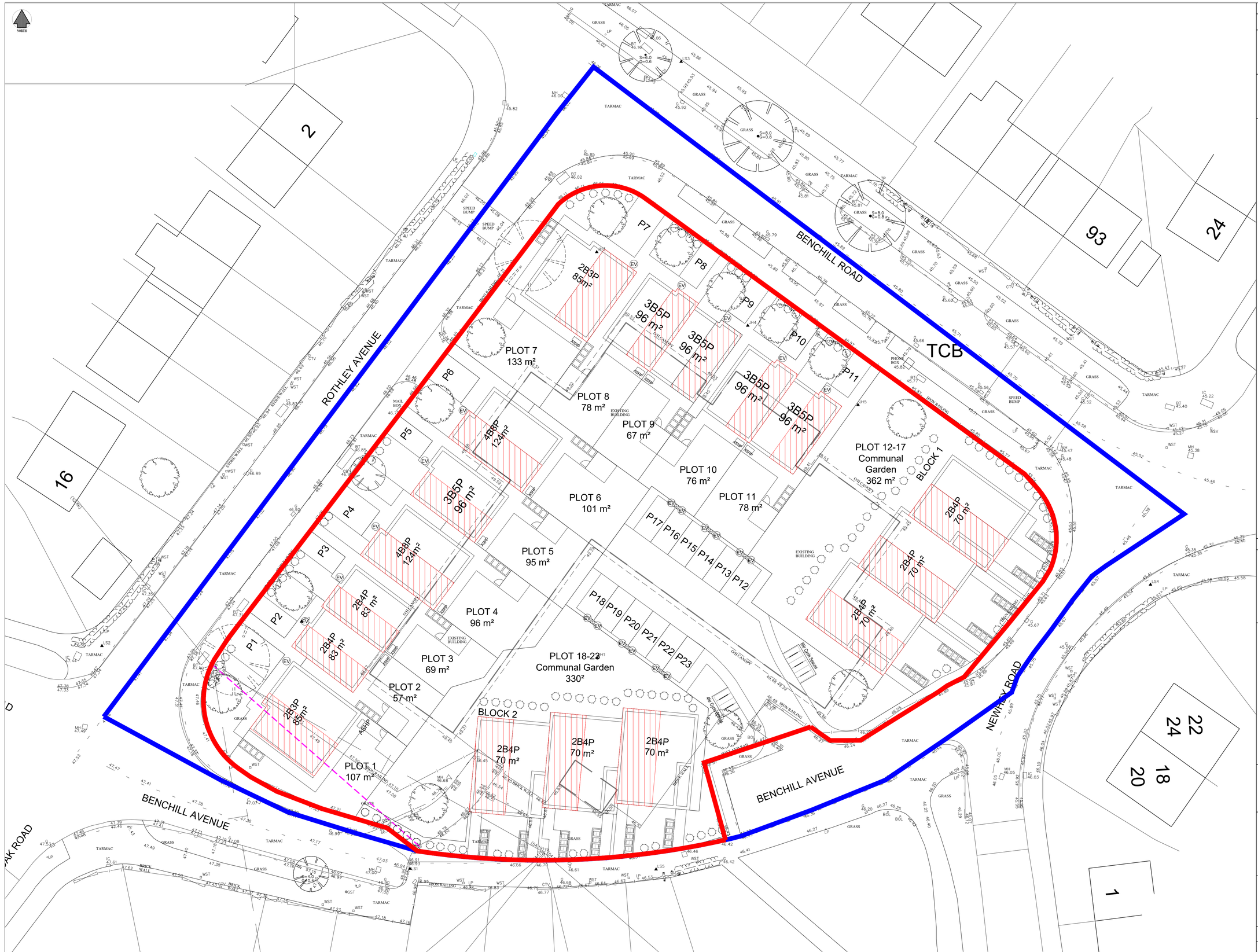
Rev	Description	Date	By	Chkd
P01	PRELIMINARY DRAWING	10/23	DE	DB

Date	Drawn By	Checked By
OCT 2023	D EVANS	D BOWEN

Scale at A1	Project Number	Status	Revision
NTS	33029LG	P	01

Sheet Number
33029-SUT-ZZ-00-DR-G-7251

Drawing Ref. – *8933-MDA-ST-XX-DR-A-902 REV G* – Proposed Layout



PROPOSED SITE PLAN - Scale 1:200

1:200
0 2 4 6 8 10 metres

SAFETY, HEALTH AND ENVIRONMENTAL INFORMATION:

IN ADDITION TO THE HAZARDS / RISKS NORMALLY ASSOCIATED WITH THE TYPES OF WORK DETAILED ON THIS DRAWING, NOTE THE FOLLOWING;

Significant Residual Risks :	
Action to be Taken :	Refer to Health and Safety Plan

NOTES:

- OTHER LAND IN APPLICANTS OWNERSHIP
- PLANNING APPLICATION BOUNDRY
- BUILDING DEMOLITION
- ASSUMED OVERHEAD FIBRE CABLES
- EXISTING TREES
- REMOVED EXISTING TREES
- PROPOSED TREES
- PLANTING/BUSHES
- SHED
- BIN STORE
- EV charger provision point / EV charger
- Indicative position of air source heat pump
- Indicative position of PV panels on roofs

Accommodation Schedule
2Nr 2-Bed 3 Person Bungalows
2Nr 2-Bed 4 Person Houses
12Nr 2-Bed 4 Person Flats
5Nr 3-Bed 5 Person Houses
1Nr 4-Bed 8 Person House
1Nr 4-Bed 8 Person Accessible House

Total - 23Nr Dwellings

Parking Standards
1Nr Parking spaces per House
1Nr Parking spaces per Flat

Total - 23Nr Parking Spaces

REV	DATE	AMENDMENTS	BY	APR'D
G	12.12.2023	Bungalow width increased by brick lenght	AP	PS
F	23.11.23	Parth to northern corner of Block 1 diverted to help create compliant gradient	AP	DC
E	24.10.23	Path to apartment in Block 2 diverted around telephone pole	AP	DC
D	12.10.23	Indicative position of ASHP and PV panels added	AP	DC
C	16.08.23	2B3P House Type footprint updated to reflect M4(3) changes	AP	DC
B	13.06.23	Dwellings updated to reflect house types design floor plans	AP	PT
A	22.05.23	1nr Bungalow to be relocated to the opposite corner of the site	AP	DC

Do not scale from this drawing.
All dimensions must be checked on site by the Contractor prior to the commencement of any fabrication or building works.
Where applicable, dimensions and details are to be read in conjunction with specialist consultants' drawings and/or other specifications; any disparity is to be brought to the attention of Michael Dyson Associates Limited prior to the commencement of any fabrication or building works.
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CLIENT :
Wythenshawe Community Housing

PROJECT :
The Enterprise Centre
Benchill Road
Wythenshawe

TITLE :
Proposed Site Plan

DRAWN BY :	AP	APPROVED BY :	PT
DATE :	26.04.23	DATE :	
SCALE :	1:200 @ A1	ORIGINAL DRAWING SIZE 841 x 594 - A1	
DRAWING No :	8933-MDA-ST-XX-DR-A-902	REV :	E