

IGE

consulting

Huyton Cricket Club, Huyton

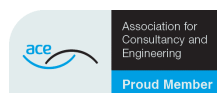
Remedial Strategy Report and Earthworks Strategy

For: Breck Homes Ltd



Job Number:		4334
Report Reference:		4334-04
Issue Status / Revision:	First Issue	
Date:	April 2026	
Written By:	Aga Stefanowicz MEarthSci, FGS	
Checked By:	Angharad Jones BSc (Hons), FGS, MIEEnvSoc, CEnv	
Authorised By:	Andrew Edwards MSc, PIEMA, MIEEnvSoc, FGS, CEnv	
Previous Revisions and Date:		
IGE Consulting Ltd, 1st Floor, 15 Oxford Court, Manchester, M2 3WQ 		

This report has been prepared for the sole use of Breck Homes Ltd. It must not be copied or passed onto any third party or used for any purpose other than which it was prepared without the permission of the author. This report is copyright.



CONTENTS

1.0	INTRODUCTION
1.1	Scope
1.2	Brief
1.3	Summary of Phase 2 Geo-Environmental Investigation Findings
2.0	PREPARATORY AND ENABLING WORKS
2.1	Proposed Levels
2.2	Enabling Works
2.3	Definition of Waste: Code of Practice
2.4	General Fill Chemical Testing Criteria
2.5	Decommissioning of Boreholes
2.6	Enabling Works Verification Report
3.0	EARTHWORKS SPECIFICATION
3.1	Geotechnical Site Classification
3.2	Site Preparation
3.3	Classification Testing
3.4	Treatment of Fill Materials
3.5	Material Handling
3.6	Compaction Regime
3.7	Supervision and Records
3.8	Protection of Fill
3.9	Specification Testing
3.10	Testing Frequency
3.11	Actions in Respect to Non-Compliant Fill
3.12	Verification Report
4.0	REMEDIAL STRATEGY FOR HUMAN HEALTH
4.1	Installation of a Clean Cover System
4.2	Validation of Clean Cover System
5.0	OTHER REMEDIAL REQUIREMENTS
5.1	Discovery Strategy
5.1	Design Variation

APPENDICES

APPENDIX 1	LIMITATIONS OF INVESTIGATION WORK AND REPORT
APPENDIX 2	FIGURES AND DRAWINGS
	- Proposed Development Plan, taken from Breck Homes, Proposed Site Layout – Option A, Rev E, dated June 2025
	- SI-01 Site Location Plan
APPENDIX 3	DISCOVERY STRATEGY

1.0 INTRODUCTION

This Remedial Strategy Report has been prepared at the request of Breck Homes Ltd. Instructions to proceed with this report were received in February 2026. This report primarily follows the findings and recommendations of the IGE Consulting Phase 2 Geo-Environmental Investigation Report (Ref. 4334-02, Rev A, Feb 2026).

This report pertains to a c. 2.26 Ha site located to the north of Huyton Lane, Huyton, c. 10.0km north of Liverpool City Centre, at the approximate post code L36 7XH. The National Ordnance Survey Grid Reference for the centre of the site is 344429E, 391316N.

The site currently comprises a vacant plot of land, formerly a cricket club and bowling green, with associated hardstanding in the north-western site section and a disused grade II listed cricket club pavilion building. The site is bound by residential properties to the north, west and south and Huyton Lane to the east and south-east. Access to the site is off the unnamed track running from Huyton Lane along the north-eastern site boundary. An aerial photo of the site is included below, and a site location plan is included in Appendix 2.



Figure 1: Aerial image of the site dated September 2022.

1.1 Scope

This Remedial Strategy Report has been undertaken to determine the remedial requirements of the site based upon the site investigation works. It is the Client's intention to retain the pavilion building and develop the site into a low-rise residential development comprising 69 No. semi-detached, terraced houses and an apartment block with associated private gardens, soft landscaping and access roads.

A proposed development plan is contained in Appendix 2 with an extract below:

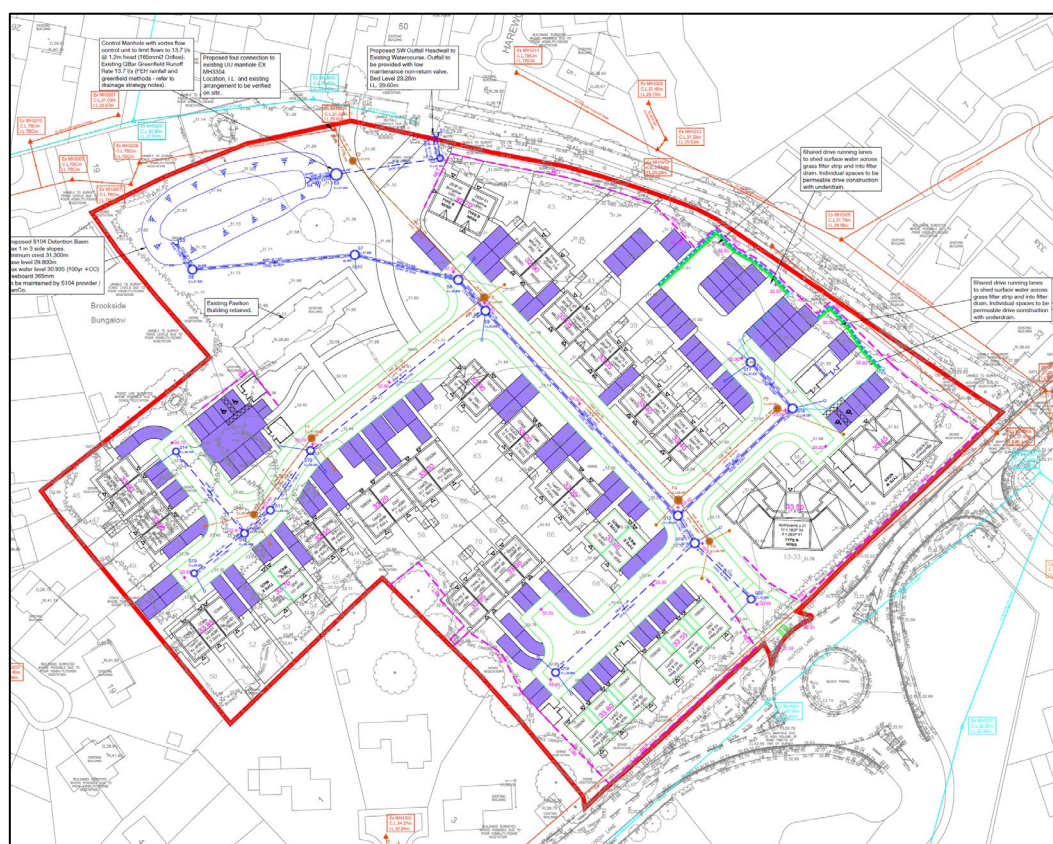


Figure 2: Extract of the preliminary drainage layout

1.2 Brief

This report has been undertaken following the findings and recommendations of the IGE Consulting *Phase 2 Geo-Environmental Investigation*. Based on the ground investigation findings, this report will outline the remedial strategy with regard to human health, controlled waters and ground gas risk on site.

The limitations of the report are contained in Appendix 1.

1.3 Summary of Phase 2 Geo-Environmental Investigation Findings

IGE Consulting have undertaken an intrusive investigation of the site in September 2025, which comprised 13 No. dynamic sampling boreholes and 21 No. mechanically excavated trial pits undertaken spatially across the site.

1.3.1 Ground Conditions

The typical ground conditions encountered across the site are as follows:

- **Made Ground Topsoil** comprising dark brown slightly gravelly very clayey fine to coarse SAND with frequent rootlets to a depth of 0.30m to 0.70m bgl (33.20m to 30.91m AOD), underlain by:
- **Glacial Till** comprising stiff orangish brown slightly gravelly sandy CLAY with occasional gravel to cobble sized pockets of reddish brown clayey fine to coarse SAND to a depth of between 4.00m at least 5.45m bgl (28.45m and at least 26.10m AOD).

Spatially across the site, 12 No. exploratory holes encountered Glacial Till comprising bands of medium dense to dense, brown clayey fine to coarse SAND or brown slightly gravelly very sandy SILT (behaving as a coarse soil) at a depth from between 0.50m to 5.00m (31.10m to 27.50m AOD) to a depth of between 3.00m to at least 5.45m bgl (30.50m and 27.00m AOD). The thicknesses of these deposits ranged from 0.10m to at least 1.45m (average thickness 0.65m).

1.3.2 Chemical Testing

20 No. samples from across site have been submitted for environmental analysis. The following exceedances were recorded.

A single exceedance of lead was recorded within the Made Ground tested from TP03 at 0.40m bgl. The GAC for lead is noted to be 200 mg/kg and the sample from TP03 recorded a concentration of 220 mg/kg. No other exceedances of heavy metals or metalloids, or other contaminants, were recorded in any of the remaining samples submitted for laboratory analysis. No asbestos was recorded in any of the Made Ground samples submitted for analysis.

As a result of the ground investigation works, remedial measures are required for the proposed soft landscaped areas to negate exposure pathway risks with existing site materials where Made Ground is present. However, a site wide level increase will be required therefore remedial works will be required which are detailed further in Section 4.0.

The risk of volatile / VOCs is regarded as negligible due to the lack of evidence for the potential sources of VOCs on site, consequently contaminative pathways for vapours are not considered.

1.3.3 Ground Gas Monitoring

IGE Consulting have undertaken ground gas monitoring over 6 No. visits within 4 No. boreholes. During all visits the response zones of all ground gas monitoring wells were noted to be flooded despite the water being bailed out during each visit, with the exception of DS01 during the first visit. Therefore, the majority of the ground gas monitoring data is deemed unreliable in accordance with BS8485:2015 + A1 2019. The ground gas monitoring results have been excluded from the below table and the following assessment. The results from 1 No. visit at DS01 has been summarised below:

Gas Monitoring Well	Steady O ₂ Concentration (%)	Peak CO ₂ Concentration (%)	Peak CH ₄ Concentration (%)	Peak H ₂ S Concentration (ppm)	Atmospheric Pressure (mbar)	Steady Gas Flow (l/hr)
DS01	19.9	0.50	0.1	1	1022 - 1024	0.1

Ground gas monitoring was undertaken utilising a GFM 4300 gas analyser. Results in grey are at the instrument detection limit.

All monitoring wells were recorded to be flooded, with the exception of 1 No. visit from DS01, and therefore a lack of ground gas monitoring data is available. As a result, although a GSV has been calculated based on one visit undertaken in DS01, the GSV is not considered a suitable parameter to determine the ground gas risk on site and greater consideration should be given to the conceptual site model. No significant sources of ground gas have been identified on or off site and therefore no contaminant linkages exist. As a result, the ground gas risk on-site is deemed to be **very low** and in-line with Characteristic Situation 1 (CS1). Therefore, no ground gas protection measures are deemed necessary in the proposed development, in-line with BS8485 + A1 (2019).

1.3.4 Radon

The Indicative Atlas of Radon in England and Wales produced by the Health Protection Agency and British Geological Survey indicates that the site lies within a lower probability area, less than 1% of homes are above the action level. Consequently, no radon protection measures are necessary in the construction of new dwellings or extensions.

1.3.5 Floor Slabs

Based on proposed site levels which includes an upfill across much of the site, suspended floor slabs are anticipated to be necessary in-line with NHBC / Premier Guidance.

1.3.6 Foundations

A detailed foundation zoning plan based upon proposed levels has not yet been undertaken, however, the foundations across the majority of the site are likely to comprise a traditional strip or mass fill trench foundations bearing onto the underlying Glacial Till. Assuming a traditional strip or trench foundation of 600mm width laid at least 200mm into the suitable founding strata, a minimum allowable net bearing pressure of at least 125kN/m² (75 kN load) with differential settlement less than 25mm should be readily achievable.

Numerous exploratory holes encountered bands of Glacial Till comprising silt and sand at depths from between 0.50m to 5.00m (31.10m to 27.50m AOD) to a depth of between 3.00m to at least 5.45m bgl (30.50m and 27.00m AOD). Given the range in thicknesses within the bands, foundation deepening may be required, subject to site levels, to ensure that foundations are constructed upon a single stratum.

Heave precaution and foundation deepening may also be required in-line with Premier / NHBC Guidance given the presence of low and medium volume change potential soils. Given the presence of numerous established trees around the site boundary, it is likely that mass fill trench foundations will be required.

Due to the proposed upfill across areas of the site, a piled foundation solution or ground improvement by vibratory stone columns may be required.

Plots 46 – 49

During the ground investigation, exploratory holes could not be undertaken within a section of the western site area due to the presence of Japanese Knotweed (marked in blue on the plan). Based on the remainder of the site, strip/trench foundations are likely to be suitable for plots 46 to 49, however, detailed foundation design cannot be undertaken until further work is completed in this area following treatment of the Japanese Knotweed.

Plots 55 – 60

An existing low pressure gas main crosses the southwestern site section within the vicinity of plots 55 to 60 (marked in red on the plan) at an unknown depth. Although the main is likely to be diverted, an assessment of the impact of existing services upon the proposed foundations should be made before selecting a final foundation solution for these plots.

1.3.7 Remedial Measures

The following remedial measures are based on the findings of the aforementioned Phase 2 Geo-Environmental Investigation and have been split into enabling works (i.e. remedial works undertaken during initial earthworks and site preparation) and build phase aspects.

2.1 Proposed Levels

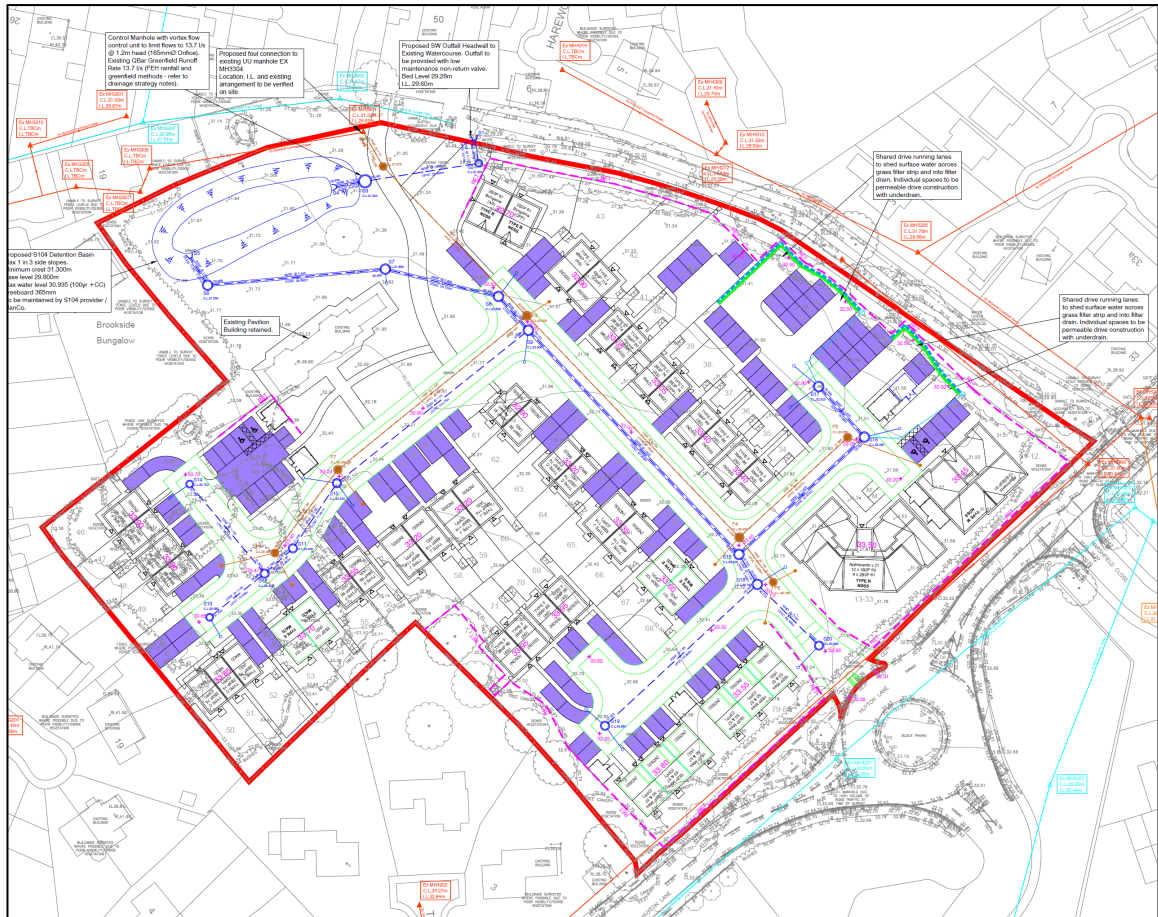


Figure 11: Extract of the preliminary drainage plan

Based on the preliminary proposed drainage plan, following topsoil strip (0.35m average thickness of topsoil) there is an upfill requirement required across the entire site.

Plot Number	Proposed Finished Floor Level (m AOD)	Existing Ground Level (Average) (m AOD)	Underside of Topsoil (0.35m average thickness used) (m AOD)	Upfill From Underside of Topsoil to FFL (m)	Upfill From Underside of Topsoil to Post Earthworks Ground Level (FFL - 600mm) (m)
1 - 12	33.45	31.55	31.20	2.25	1.65
13 - 33	33.50	31.80	31.45	2.05	1.45
34 - 35	33.40	31.95	31.60	1.80	1.20
36 - 37	33.40	31.90	31.55	1.85	1.25
38 - 19	33.05	31.95	31.60	1.45	0.85
40 - 41	33.05	31.75	31.40	1.65	1.05
42 - 43	32.90	31.40	31.05	1.85	1.25

44 - 45	32.70	31.40	31.05	1.65	1.05
46 - 47	33.90	33.35	33.00	0.90	0.30
48 - 49	33.90	33.40	33.05	0.85	0.25
50 - 52	33.85	33.45	33.10	0.75	0.15
53 - 54	33.70	33.20	32.85	0.85	0.25
55 - 56	33.55	33.00	32.65	0.90	0.30
57 - 58	33.20	32.70	32.35	0.85	0.25
59 - 60	33.20	32.40	32.05	1.15	0.55
61 - 62	32.90	32.05	31.70	1.20	0.60
63 - 64	33.20	32.30	31.95	1.25	0.65
65 - 66	33.35	32.40	32.05	1.30	0.70
67 - 68	33.60	32.40	32.05	1.55	0.95
69 - 70	33.95	32.55	32.20	1.75	1.15
71 - 72	33.95	32.90	32.55	1.40	0.80
73 - 78	33.80	32.70	32.35	1.45	0.85
79 - 84	33.55	32.30	31.95	1.60	1.00

2.2 Enabling Works

Enabling works will be required prior to development to physically prepare the site for the development, this will include the following:

- Clearance of any fly tipping and stockpiling of surface materials;
- Stripping of vegetation;
- Decommissioning of existing ground gas and groundwater monitoring wells (further detailed in Section 2.4 below)
- Removal of significant organic material / deleterious materials (trees / branches) within the made ground
- As noted in Section 2.1, site levels are to increase across the majority of the site and as such materials are to be imported. It is recommended that if soils are to be imported and CL:AIRE DoW:CoP applies, a Material Management Plan (MMP) is undertaken, as discussed in Section 2.3 and material placed to the earthworks specification included in Section 3.0.
- Testing of any site won and general fill (i.e. civils arisings) in-line with the general fill criteria outlined below. However, given that no significant turnover of existing site soils is anticipated other than civils arisings, testing of imported soils as use of general fill (i.e. not garden POS soils) in-line with the below strategy is recommended.
- Install a temporary working platform in line with BRE470 with appropriate in-situ testing undertaken to validate the installation. The access of the piling rig onto site and its movement across the site should be considered within the

design. It is recommended that plate incremental tests at appropriate pressures are completed following installation of the temporary working platforms to ensure that they have been installed correctly.

2.3 Definition of Waste: Code of Practice

Due to the recommended handling and re-use of excavated site-won materials, it is possible to avoid complex waste legislation by utilising the Definition of Waste: Code of Practice (2011, DoW:CoP). This allows assessment of whether or not excavated materials are waste, and when excavated and treated waste can be classified as 'no longer waste'.

In line with DoW:CoP, a robust, site-specific material management plan (MMP) inclusive of a tracing system will need to be undertaken and adhered to and verified in an appropriate verification report. This must be reviewed by a 'Qualified Person' who must provide a Declaration to the EA prior to works within the MMP being commenced. A detailed DoW:CoP MMP cannot be undertaken until the remedial strategy has been approved but this should include details of the source (including source testing) of all materials imported into site. The site should be zoned using a 50m x 50m grid and given a zone number (A1, B2 etc). Utilising this system, a record should be kept of all material imported onto site and its intended destination and use. All imported material should be recorded in a tracking document and the following information noted:

- Material Origin
- Intended Destination (grid square)
- Material description / classification
- Date imported
- Quantity imported (no. of loads and volume)
- Temporary storage location (if applicable). Each stockpile on site should be numbered and its location recorded.
- Testing results (chemical and geotechnical, report number noted). Testing should meet the below Acceptability Criteria outlined in Section 2.2.

This will ensure that all material on site is fully traceable, chemically validated and suitable for its intended use.

2.3.1 Export of Materials

Any soils to be removed from site must be classified in accordance with WM3 under the definition of waste and chemically tested to determine their destination, i.e. reuse or landfill. Waste ticket records must also be retained as proof of the export of materials from site.

2.3.2 Stockpile Management

During the course of the development there will be areas of stockpiled soils intended for use within areas of soft landscaping. These will have been subjected to testing and approved for use on site.

It is imperative that the stockpiles are well managed to avoid inadvertent mixing or depositing of surplus or deleterious materials that would compromise the continued use. We would recommend that the site management reviews the proposed positions for placement of stockpiles and places either fencing or warning signs to ensure compliance.

2.4 **General Fill Chemical Testing Criteria**

A cut and fill calculation has yet to be undertaken, however, there will likely be a net fill requirement.

The site won Glacial Till is deemed suitable for re use on site as general fill and within garden areas. Any material imported onto site must be chemically suitable for its intended use. Consequently, a distinction should be made between material intended for use in garden areas within 600mm of finished garden level and any soils intended for use as general fill outside of garden areas of below 600mm of finished garden level. Materials intended for use within 600mm of finished garden level within proposed gardens must meet the requirements detailed in Section 4.0 below. Materials intended for use as general fill (outside of within 600mm of finished garden level in proposed gardens) must meet the requirements for general fill detailed below

The following targets for 'General Fill' are proposed to address any material imported onto site to achieve proposed levels. General Fill is material used primarily to raise levels, specifically not within areas of private gardens, public open space, or

soft landscaping i.e. below -600mm finished levels. The following validity samples must be taken during the enabling works phase:

Soil	Testing Frequency	Testing Suite	Acceptability Criteria
Site-won aggregate (if applicable)	1 per 1000m ³ of crush	A	Asbestos <0.01%. Where placed within -1.0m of finished level, <0.001%
Imported aggregate	1 per 500m ³	A	Asbestos <0.01%. Where placed within -1.0m of finished level, <0.001%
Imported General Fill	1 per 1000m ³	As below Acceptability Criteria for General Fill	General Fill
Sides and base of excavated and removed hotspots (if applicable)	1 sample every 10m ² from sides and base of excavation, min 1 every face	As below Acceptability Criteria for General Fill plus contaminants of concern based on hotspot removed	General Fill
Stockpiles post processing (to determine whether they can be re-placed or the need for removal, if applicable)	1 per 50m ³	As below Acceptability Criteria for General Fill plus contaminants of concern based on hotspot removed	General Fill
Validation of completed 'cells' (if applicable)	1 sample per 25m x 25m grid cell	As below Acceptability Criteria for General Fill	General Fill

- 1) 'General Fill' is material used primarily to raise levels, specifically not within areas of private gardens, public open space, or soft landscaping, e.g. 6F2.
- 2) Imported aggregate should also contain <1% deleterious anthropogenic materials (by eye).

Testing Suites:

- A. Asbestos ID, Asbestos quantification.
- B. pH, total and free cyanide, soluble sulfate, organic matter.
- C. Arsenic, Beryllium, Boron, Cadmium, Chromium (III and VI) Copper, Lead, Inorganic Mercury, Nickel, Selenium, Vanadium, Zinc.
- D. Speciated PAHs: Naphthalene, Acenaphthylene, Acenaphthene, Fluorene, Phenanthrene, Anthracene, Fluoranthene, Pyrene, Benzo(a)anthracene, Chrysene, Benzo(b)fluoranthene, Benzo(k)fluoranthene, Benzo(a)pyrene, Indeno(1,2,3-cd)pyrene, Dibenz(a,h)anthracene, Benzo(ghi)perylene.
- E. Total (non-speciated) PAHs.
- F. Speciated Total Petroleum Hydrocarbons (TPH): Aliphatic >EC5 - EC6, >EC6 - EC8, >EC8 - EC10, >EC10 - EC12, >EC12 - EC16, >EC16 - EC21, >EC21 - EC35, and > EC35 - EC44, and Aromatic >EC5 - EC7, >EC7 - EC8, >EC8 - EC10, >EC10 - EC12, >EC12 - EC16, >EC16 - EC21, >EC21 - EC35, > EC35 - EC44.
- G. Total Petroleum Hydrocarbons (TPH): TPH EC6 – EC40.
- H. BTEX: Benzene, Toluene, Ethylbenzene, p- & m-xylene, o-xylene. Methyl tertiary butyl ether (MTBE).

Once tested, the results are to be compared against the following Acceptability Criteria for General Fill:

Suite	Determinand (mg/kg unless stated)	Acceptability Criteria for General Fill
A	Asbestos (%)	See Above
B	pH	>5 - <10 ⁽³⁾
	Total Cyanide	0.5 ⁽³⁾
	Free Cyanide	0.5 ⁽³⁾

	Soluble Sulfate (mg/l)	500 ⁽³⁾
C	Arsenic	640
	Beryllium	12
	Boron	240000
	Cadmium	190
	Chromium (III)	8600
	Chromium (VI)	33
	Copper	68000
	Lead	2330 ⁽¹⁾
	Inorganic Mercury	1100
	Nickel	980
	Selenium	12000
	Vanadium	9000
	Zinc	730000
E	Total PAHs	200 ⁽⁴⁾
G	TPH > EC6 - EC40	1000 ⁽⁴⁾

LQM/CIEH S4ULs for Human Health Risk Assessment (3rd edition, 2015) used unless stated:

- 1) Category 4 Screening Levels (March 2014)
- 2) CL:AIRE Soil GAC for Human Health Assessment (January 2010)
- 3) In-house screening criteria used as no GAC methodology currently exists
- 4) This limit only applies to imported material, not to in-situ soil.

Assumed 1% SOM (most conservative) for those values dependent upon SOM.

ND = Not Detected

LOD = Limit of Detection

*Exceeds vapour saturation limit

**Exceeds solubility saturation limit

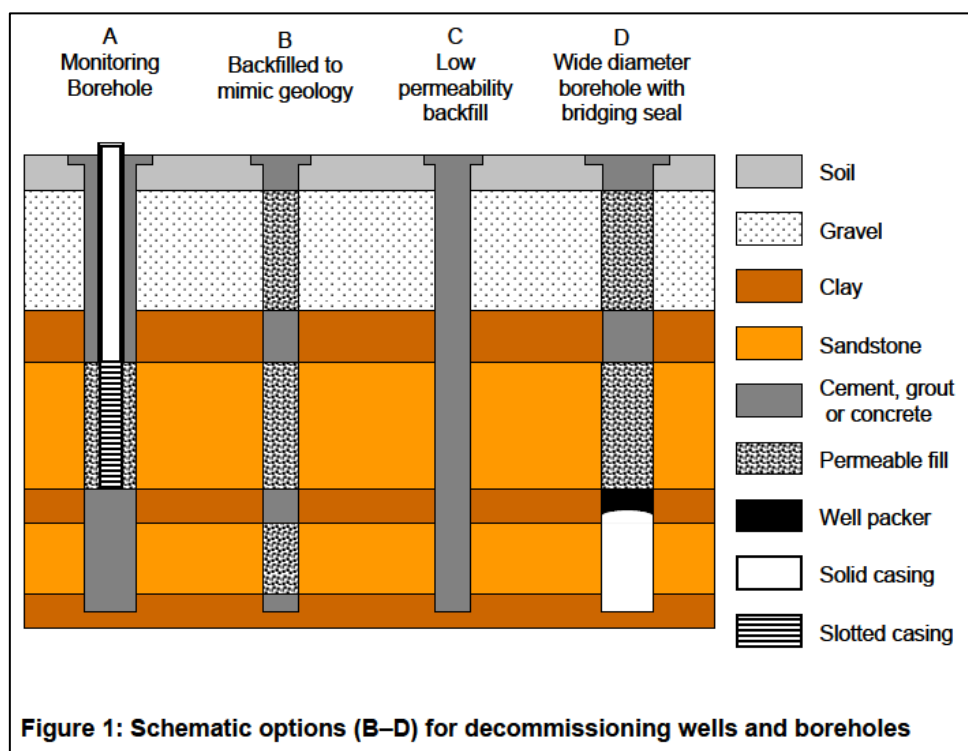
The general fill will also be subject to geotechnical testing as detailed within the Earthworks Specification included as Section 3.0 below, including grading on a 1 in 1000m³ rate.

There will be a need to import recycled aggregate material for use in construction which will need to demonstrate compliance with the Waste Framework Directive and comply with the following:

- The aggregate will be produced under a WRAP/Factory Production Control as required by the European standards;
- It will conform to the requirements of the appropriate specification for the use for which it is destined (considered likely to be 6F5 produced in accordance with Table 6/1 of the Specification for Highways Works);
- It will not require further processing, including size reduction, prior to final use;
- It must contain less than 1% of cohesive materials, metals, wood, plastic, rubber and gypsum plaster, in line with the limits set within the aggregate's standards;
- It must contain asbestos at < 0.001%.

2.5 Decommissioning of Boreholes

It is imperative that all boreholes drilled into the site are located and appropriately grouted to negate any possible preferential ground gas pathways. Utilising guidance provided in the Environment Agency's '*Good practice for decommissioning redundant boreholes and wells*' (October 2012), it is prudent to secure redundant borehole to ensure that no groundwater pollution can occur. The Environment Agency (EA) offer advice on the methods of sealing wells to ensure that the preferential pathway is removed. The following diagram taken from the EA guidance shows a monitoring well (A) and 3 No. options for decommissioning (B, C and D):



It is considered prudent to utilise Option C – low permeability backfill, shown in the diagram above, to adequately seal the borehole. The guidance recommends that ‘the backfill materials must be clean, inert and non-polluting’, e.g. bentonite. It is recommended to remove the standpipe and seal with bentonite to ground level. This will be sufficient to prevent contaminant transport.

2.6 Enabling Works Verification Report

Following completion of the above enabling works, a verification report will need to be produced to demonstrate compliance with the MMP if one is required, earthwork specification and above general fill acceptability criteria.

3.0 EARTHWORKS SPECIFICATION

Due to the proposed level changes across site including an upfill across most of the site, an Earthworks Specification has been undertaken for the site in line with NHBC Chapter 4.6 and based on finalised proposed levels. If DoWCoP applies, A DoWCoP Materials Management Plan may also be required for the site in conjunction with the below earthworks specification.

The earthworks specification shall include relevant conditions to be satisfied during construction to ensure the following are met:

- materials are chemically suitable for the project and the surrounding environment
- materials should be durable, and not prone to deterioration or non-biodegradable
- earthworks should provide a stable finished surface that will limit post-construction settlement or movement within the engineered fill
- the earthworks should provide a surface of sufficient stiffness and/or shear strength for the intended use.

The earthworks specification is based on industry guidance such as the Specification for Highway Works, BS EN 16907 'Earthworks', ICE Publishing – Earthworks: A Guide '2nd Edition', and previous experience. Once agreed with NHBC, the earthworks specification should not be amended on site without prior agreement with NHBC.

3.1 Geotechnical Site Classification

Geotechnical design is covered in BS EN 1997, with earthworks specifically covered by the requirements set out in BS 6031 (Code of practice for earthworks) and BS EN 16907 (Earthworks). Based on the nature of the site, the scale and extent of the earthworks and utilising Table 4 of NHBC Chapter 4.6, the site is classified as a **Geotechnical Category 1 (Geo Cat 1)** in accordance with BS EN 1997-1 and are required to be designed by an appropriately qualified and experienced person.

3.2 Site Preparation

Prior to the placement of any soils the following steps should be undertaken for the wider site:

- The site should be prepared in accordance with the earthworks specification with all vegetation, topsoil, fly tipped, and unsuitable materials (see Section 3.2.1 below) removed prior to filling.
- The formation should be prepared by proof rolling with any hard or soft spots identified and remediated in accordance with the earthworks specification. Temporary drainage may be required to keep the formation dry.
- Although no significant obstructions have been encountered on the site, the below strategy should be utilised where a site turnover is required including removal of any remaining subterranean obstructions, as well as excavation, segregation, screening and sorting of material type (i.e. Made Ground and natural soils) as deemed necessary;
 - to at least 2m below any proposed foundation and within a 2.0m plot envelope
 - to 500mm below bedding level of any drainage feature and 1000mm finished garden and external levels.
- Site constraints and features to be preserved (for example monitoring wells, public rights of way, watercourses and trees to be retained) must be clearly identified and all necessary protection and safety measures must be implemented.
- Where the sub-formation is sloped, the sides should be stepped at a maximum height of 600mm to allow the engineered fill to be benched into the existing natural ground.

3.2.1. Unsuitable Ground Conditions

Prior to the execution of earthworks filling, unsuitable materials should be removed from the formation level including:

- topsoil, tree roots, highly organic matters, or other degradable materials
- frozen soils
- excessively wet or soft soils such as silty soils or clays with an undrained shear strength of less than 40kPa, where not treated to adjust their soil properties

- contaminated soils, and soils containing slag or combustible materials.

Unsuitable materials may be treated, in some circumstances, to adjust and improve the soil properties. Further assessment would be required to determine their suitability after treatment and prior to any subsequent placement as engineered fill.

3.3 Classification Testing

Details of considerations regarding the acceptability of materials for reuse as engineered fill are provided in NHBC Chapter 4.6 Table 3 below:

Material description	Examples of material	Details on acceptability for reuse as fill
Suitable sources for fill materials	- natural sands and gravels - clays with a plasticity index of less than 40% and undrained shear strength in excess of 40kPa - chalk (structured chalk of grades C5 to A1 only) - crushed rock - crushed concrete, brick or stone	Typically, the material would be acceptable to NHBC for engineered fill, provided that it complies with appropriate classification criteria. For material that is solely crushed brick, further assessment of strength will be required to ensure its durability.
Hazardous materials	- reactive materials - materials that include sulfides or sulfates, eg gypsum - organic materials - materials that cause noxious fumes, rot, undue settlement or damage to surrounding materials	Appropriate testing required to demonstrate their suitability.
Fill material requiring NHBC acceptance	- unburnt colliery spoil or shale (carbonaceous mudstone) with excessive coal or pyrite content - colliery shale (ie, burnt shale or red blaze) - steel slags - furnace ashes and other products of combustion - material obtained from demolition without screening, crushing and processing - soils with a silt content greater than 20% and where it will alter the behaviour of the overall engineered fill - highly variable materials - on wet sites, or sites with a high-water table, crushed or broken bricks which have no limit on their soluble salt content (as defined in BS EN 771) - high plasticity site won clays with a plasticity index of 40% or greater - PFA (excluding lagoon PFA)	Not to be used as engineered fill unless a written agreement has been obtained from NHBC (appropriate testing and supporting technical report to be provided to demonstrate their suitability). Sulfate-resisting cement to be used where PFA fill⁽¹⁾ are present.
Unsuitable fill materials	- soils containing topsoil or significant organic matter (such as leaves or wood) greater than 6% by volume - degradable, reactive or non-durable materials - expansive materials, (ie, steel slag and gypsum containing materials) where testing has not determined their risk - materials capable of releasing contaminants or hazardous gases - combustible materials (ie, materials with a high calorific value greater than 7MJ/kg) placed within the top 1m of the finished development platform - materials containing significant amounts of plaster, plastic or rubber over 2% by weight - materials containing harmful substances which pose a risk to human health and the environment - structureless chalk (with grades Dm and Dc) - materials that are not generally used as engineered fill on residential sites - Lagoon PFA and other saturated materials like tailings and sludges	Fill containing these constituents are NOT acceptable for use.

All earthworks materials should comply with Clause 601 of the Specification for Highway Works and shall fall into the Classes of Material determined by testing and defined in Table 6/1 of Manual of Contract Documents for Highway Works (MCDHW): Volume 1: Specification for Highway Works (SHW) and NHBC Chapter 4.6 (2024).

A testing frequency of **1 per 500m³** of material is considered suitable for the proposed earthworks in line with Table 6/1 and should be completed prior to any earthworks.

If different strata are encountered across the site that fall into different classes as defined above, then an approximate volume of each strata will be calculated and the sampling frequency altered to suit.

The Contractor shall be responsible for classifying earthworks materials and for ensuring that all materials incorporated in the permanent works are acceptable. Contract-specific Classification and Acceptability Criteria are as given in SHW Table 6/1. It is currently anticipated that all noncontaminated material arising from the site will conform to one or other of the classes once sorting crushing and screening has taken place.

However should materials excavated not conform to the classification and acceptability Criteria given in the tables it should be classified as Class U1A material. Class U1A material shall be dealt with in accordance with SHW Appendix 6/1. Any contaminated material: Class U1B and U2 shall be dealt with in accordance with SHW Appendix 6/2.

3.3.1 Processing of Unacceptable Material (Class U1A)

Unacceptable material Class U1A arising from excavations on site shall as far as practicable be processed to render it acceptable for use as General Fill of Classes 1A, 1B, 2A, 2B, 2C, 4 or 6F2 as appropriate to the grading of the material being treated.

3.4 Treatment of Fill Materials

The following techniques may be used to modify the moisture content of materials to render them suitable for use as engineered fill:

- placement in windrows or layers with mechanical turning as required for drying purposes
- the addition of lime and/or cement, typically up to 2% by weight to reduce the moisture content to nearer the optimum moisture content (OMC) for maximum dry density

- the addition of water by spraying or similar to increase the moisture content to nearer the OMC for maximum dry density.

The following techniques are not acceptable to NHBC for the treatment of materials for use as engineered fill:

- stabilisation to improve strength by the addition of over 2% lime or the addition of any cement or other hydraulic materials
- the addition of chemical binders or grouts.

3.5 Material Handling

Imported fill should be subject to periodic inspection from the donor site prior to arrival at the site and regular inspections once delivered. Classification testing should be undertaken as required prior to placement, particularly where the material is not provided with independent certification and where visual assessment suggests the material classification varies.

Engineered filling should not be undertaken in inclement weather conditions. Where the engineered fill is cohesive, placement and filling should be paused during extended periods of rain. For sensitive materials like chalk, care should be taken not to over-compact the fill further than specified.

Engineered fill must be placed and compacted in accordance with the specification, within a defined moisture content range close to the optimum moisture content as derived from relevant laboratory testing. For cohesive fill materials, the moisture content is critical in achieving the desired dry density. Engineered fill that is compacted too dry of the optimum moisture content (OMC) risks being vulnerable to collapse settlement or heave when wetted. Engineered fill that is compacted too wet of optimum moisture content risks being too weak to provide adequate support without excessive settlement.

3.6 Compaction Regime

Placement and compaction of engineered fill should be undertaken in layers of controlled depth using appropriate plant. Acceptable methods are considered to be

those based on the recommendations from The Specification for Highways Works (SHW) Table 6/4.

The type and size of the compaction plant should be based on the volume or depth of engineered fill to be placed, the classification of the fill to be compacted, and the specification requirements.

Engineered fill should proceed in near horizontal layers (to assist in shedding surface waters) with each layer fully compacted before commencing the following layer. The maximum layer thickness for method compaction should be based on the type of fill material, the classification of the fill material, placement and the method and plant employed.

For **end product compaction**, an uncompacted layer thickness of up to 250mm subject to site-specific requirements would be acceptable. The maximum particle size should not be greater than 1/3 of the compacted layer thickness or 75mm, whichever is lower.

Filling activities should be planned and carried out so that:

- vibrations do not disturb existing or nearby properties, excavations, slopes, buildings, services or infrastructure
- filling and earthwork machinery does not overload retaining features, slopes, buried services or infrastructure
- ground movement including around the area of filling does not harm adjacent buildings, services or infrastructure
- temporary slopes (filled or in cut) are safe and stable
- under compaction and over-compaction are avoided
- the rate of placement of fill does not result in excess pore water pressure leading to failure of the underlying ground.

3.7 Supervision and Records

The developer or builder must arrange for a suitable site supervision and recording of the works, the recording of the site works should be in accordance with the requirements of the earthworks specification. Guidance on the level of information

that is required to demonstrate the quality of the works is available in BS EN 16907-5.

3.8 Protection of Fill

Compacted engineered fill should be protected from deterioration due to trafficking, poor weather and pooling surface water. Suitable measures include laying the surface to falls to assist drainage or use of a durable granular sealing layer or sacrificial layer.

3.9 Specification Testing

The foundations on site will be constructed within natural deposits or piled (if significant fill is present or within areas of tree influence). No foundations will be constructed on placed engineered fill. Consequently, the earthworks specification on site applies solely to the proposed highways and external areas and gardens and not foundations. Consequently, the following specification options are deemed applicable based on the nature of the works:

Specification	Acceptance Criteria
End Product	>95% Maximum Dry Density (MDD) and <5% air voids.
Method	>90% Maximum Dry Density (MDD) and <10% air voids

An end product specification with an acceptance criteria of >95% Maximum Dry Density (MDD) and <5% air voids is deemed conservative given the nature of the proposed earthworks onsite (most notably filling of <5m).

A method specification could be applied with an acceptance criteria of >90% Maximum Dry Density (MDD) and <10% air voids, in line with NHBC Chapter 4.6 where a method specification is recommended for a depth of fill <5m. In order to apply a method specification, the following would need to be known in line with Table 5 of NHBC Chapter 4.6:

- The thickness of fill layers to be compacted
- Type of compaction plant
- Number of passes required.

The above should be determined based on the information contained in The Specification for Highways Works (SHW) Table 6/4 and the classification testing detailed in Section 3.3.

Fill compaction is most commonly established by comparing the in-situ dry densities and moisture contents with the laboratory determined maximum dry density and optimum moisture content. NHBC will normally accept engineered fill verified to achieve the criteria below:

The in-situ densities of engineered fill may be measured using sand replacement tests (SRTs), nuclear density tests (NDTs) or electromagnetic density gauges (EDGs). Where NDTs or EDGs are used, the results should be regularly calibrated against SRTs. Where there is variation in the fill materials, the use of NDT results to assess compaction may not be reliable.

3.10 Testing Frequency

The frequency of testing for classification, compliance and performance purposes should be determined according to site conditions, fill materials and their consistency, filling techniques and the proposed end use as stated in the earthwork's specification.

In situ testing should be based on a minimum number and grid with each and every layer tested, e.g. 1 per 25m x 25m grid per layer and a minimum of 3 per layer per day.

Based on Table 10 of NHBC Chapter 4.6 a minimum of **3 tests per 1,000m³** of placed engineered fill will be acceptable for end product compliance testing.

Variation to the above may be necessary where differing material types are to be used. Test types and frequencies should be reviewed according to the results obtained and site conditions. Where there is greater variation in site conditions or results than anticipated, an increased frequency of testing will be required.

Conversely and where agreed with NHBC, a decrease in test frequency may be acceptable where consistency in test results is being achieved.

3.11 Actions in Respect to Non-Compliant Fill

Where testing indicates compacted engineered fill does not fully comply with the requirements of the earthworks specification, appropriate action should be agreed as soon as possible with NHBC. Possible actions include:

- drying of engineered fill material prior to further placement of subsequent layers
- excavation and replacement of the engineered fill represented by the test failure
- additional compaction (if the failure is shallow or at the surface) and retesting
- undertaking appropriate performance testing.

If the non-compliant engineered fill is regarded as a marginal outlier and represents part of a normal spread of test data, it may potentially be deemed acceptable without further action. It should be recorded in the Earthworks Verification Report.

The possible extent of non-compliant engineered fill needs to be carefully assessed, as well as whether the non-compliance may indicate unsuitable placement and compaction techniques, or poor site conditions, excessively variable fill or unsuitable material. Where there is a divergence from the earthworks specification, the designer should be notified and advice sought.

Remedial action needs to be carefully undertaken and recorded, avoiding disturbance to previously placed compliant engineered fill.

3.12 Verification Report

The earthworks verification report should give details as appropriate of the following:

- The contractors and personnel responsible for the filling work, including details of supervision and testing
- Preparation works prior to earthworks filling

- Reference to the earthworks specification and method statement(s)
- Sources of material used as engineered fill and their material classification
- Any treatment, reconditioning or remediation of proposed engineered fill
- Plant and methods used
- As built survey records, including post-topsoil strip level or formation level for the earthworks, reduced levels following earthworks cuttings, final as-built or post-earthworks filling formation level, plan(s) and other drawings as appropriate that show the extent and depth of earthworks filling
- All test results and certificates
- Progress photographs and surveys
- Progress reports and site diaries, with details of weather/site conditions and any agreed variations or changes to the specification
- Graphical representation of the classification and compliance test data as show in Figure 7
- Changes and amendments to design and earthworks specification
- Records of remedial actions in areas of non-compliance
- Problems experienced, and solutions and methods used to overcome the issues
- Confirmation that the works comply with the earthworks specification and are suitable to support the proposed foundation types, where applicable (all non-compliances or departures from the earthworks specification should be clearly identified and suitably assessed)
- Drawings showing known obstructions and any relevant features under or within the engineered fill
- Information required by the builder to safely undertake follow-on works in the ground, including any special precautions which should be undertaken or unusual constraints that exist, and any residual risks (for example further measures may be required where upfilling or an increase in ground levels post-remediation are likely to be proposed)

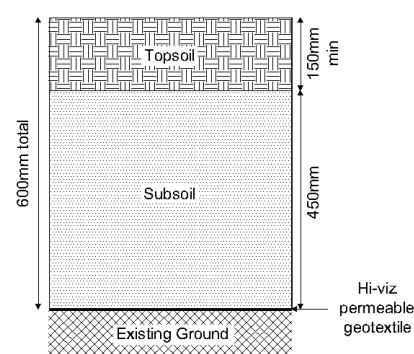
4.0 REMEDIAL STRATEGY FOR HUMAN HEALTH

The proposed development is to include private gardens and areas of soft landscaping. The IGE Consulting Phase 2 Geo-Environmental Investigation report recommended a cover system in these areas where Made Ground is present to break any pathways between the existing site soils and the end user. However, proposed levels have since been received which indicates that an upfill is required across the site, which is greater than 1m in areas. Therefore, a clean cover system will be required in all private gardens and areas of soft landscaping due to the placement of materials rather than the risk posed by the existing Made Ground.

4.1 Installation of a Clean Cover System

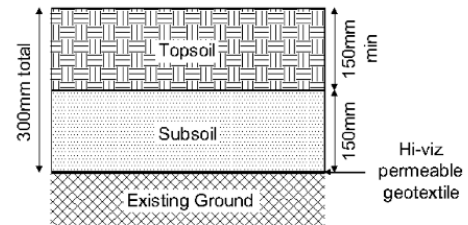
The cover system for the private rear gardens is to be 600mm thick and consistent with the recommendation of the Liverpool City Council 'Requirements for Contaminated Land Validation' (2010), where Made Ground is present to greater than 600mm below finalised garden levels (300mm in areas of soft landscaping and front gardens). The following procedure is outlined for use in private gardens and in areas of soft landscaping:

1. Excavate to 600mm bgl in private rear gardens (300mm in front gardens and soft landscaping areas).
2. A 600mm clean cover system is recommended to be added to the proposed private rear gardens (300mm in soft landscaping areas). This is to consist of:
 - No less than 150mm and no more than 300mm suitable topsoil, underlain by:
 - Suitable subsoil to a total (topsoil + subsoil) depth of 600mm (300mm in areas of soft landscaping), underlain by:
 - A high vis geotextile marker; and
 - Validated in line with the below strategy.



Where Made Ground is shallower than 600mm in garden areas or shallower than 300mm in soft landscaped areas / public open space, excavating to the required depth for a cover system in these areas would constitute source removal. Therefore, where this is the case, the following procedure is proposed:

1. Excavate to the base of the Made Ground (<600mm in gardens and <300mm in soft landscaping areas). A clean cover system is not necessary.



2. Add suitable subsoil and topsoil to create a garden / soft landscaping to the client's specification.
3. Validate in line with the below strategy.

4.2 Validation of Clean Cover System

Once the 600mm clean cover system is required to break contaminative linkages (300mm in areas of soft landscaping), validation requirements in line with Liverpool City Council 'Requirements for Contaminated Land Validation' (2010) include:

- Details of the source of the cover material;
- Chemical test results to demonstrate that the soil is free from contamination and 'suitable for use' in-line with the below chemical testing suites and rates;
- Waste transfer notes to provide evidence of source; and
- Confirmation of cover depth by either measurement tape or topographical survey with photographs at a frequency of:
 - One pit per 25m grid within the POS_{resi} ('amenity space'); and
 - One pit per three plots across all private front and rear gardens.

Based on the initial chemical test results, the underlying subsoils are deemed suitable for re-use subject to further testing in-line with the below. Based on the site history, any site won subsoil will be classed as brownfield soil.

However, Topsoil Made Ground was also noted on site with evidence of clinker and ash within the material. The Made Ground Topoil and natural Topsoil were mixed

and therefore segregating the material is unlikely to be feasible. Therefore, it is recommended that following a Topsoil stirp the material is stockpiled and further visual inspection and chemical testing undertaken to determine the suitability for re-use within private gardens or areas of POS. Some physical processing may also be required. Based on an average thickness of 0.35m there is anticipated to be c. 7,500m³ of material which may be suitable for re-use, subject to further chemical testing and determination of anthropogenic content as less than 5% is considered acceptable.

Imported topsoil and subsoil is required to be tested at source prior to import to confirm suitability. Detailed information will also be required regarding the source of any imported topsoil and subsoil (i.e. site history, whether the site is greenfield or brownfield). At source testing will be provided by the supplier or haulage broker or will be based on an appropriate ground investigation report (if the material is a byproduct of an existing ground investigation) and the testing will be re-assessed against the below acceptability criteria by IGE to determine suitability prior to import. If no testing is available testing will be undertaken in-line with the below criteria

All topsoil and subsoil, whether site-won or imported is required to be tested at the following frequency:

Source	Material End Use	Sampling Frequency ¹	Testing Suites ³ (see below)
Greenfield Source:	Topsoil	1 per 200m ³	A, B, C, D, F
	Subsoil	1 per 200m ³	A, B, C, D, F
Brownfield Source:	Topsoil	1 per 50m ³	A, B, C, D, F, H
	Subsoil	1 per 100m ³	A, B, C, D, F
	General Fill ²	1 per 1000m ³	A, B, C, E, G

3) Minimum 3 samples regardless of volume.

4) 'General Fill' is material used primarily to raise levels, specifically not within areas of private gardens, public open space, or soft landscaping, e.g. 6F2.

5) In addition to the standard suites given, the laboratory testing suite should include any additional contaminants of concern based on the source of the samples.

Testing Suites:

I. Asbestos ID, Asbestos quantification.

J. pH, total and free cyanide, soluble sulfate, organic matter.

K. Arsenic, Beryllium, Boron, Cadmium, Chromium (III and VI) Copper, Lead, Inorganic Mercury, Nickel, Selenium, Vanadium, Zinc.

- L. Speciated PAHs: Naphthalene, Acenaphthylene, Acenaphthene, Fluorene, Phenanthrene, Anthracene, Fluoranthene, Pyrene, Benzo(a)anthracene, Chrysene, Benzo(b)fluoranthene, Benzo(k)fluoranthene, Benzo(a)pyrene, Indeno(1,2,3-cd)pyrene, Dibenz(a,h)anthracene, Benzo(ghi)perylene.
- M. Total (non-speciated) PAHs.
- N. Speciated Total Petroleum Hydrocarbons (TPH): Aliphatic >EC5 - EC6, >EC6 - EC8, >EC8 - EC10, >EC10 - EC12, >EC12 - EC16, >EC16 - EC21, >EC21 - EC35, and > EC35 - EC44, and Aromatic >EC5 - EC7, >EC7 - EC8, >EC8 - EC10, >EC10 - EC12, >EC12 - EC16, >EC16 - EC21, >EC21 - EC35, > EC35 - EC44.
- O. Total Petroleum Hydrocarbons (TPH): TPH EC6 – EC40.
- P. BTEX: Benzene, Toluene, Ethylbenzene, p- & m-xylene, o-xylene. Methyl tertiary butyl ether (MTBE).

Once tested, the results are to be compared against the following Acceptability Criteria:

Suite	Determinand (mg/kg unless stated)	Acceptability Criteria for:	
		Private Gardens	Public Open Space (residential)
A	Asbestos (%)	ND	ND
B	pH	>6 - <8 ⁽³⁾	>6 - <8 ⁽³⁾
	Total Cyanide	0.5 ⁽³⁾	0.5 ⁽³⁾
	Free Cyanide	0.5 ⁽³⁾	0.5 ⁽³⁾
	Soluble Sulfate (mg/l)	500 ⁽³⁾	500 ⁽³⁾
C	Arsenic	37	79
	Beryllium	1.7	2.2
	Boron	290	21000
	Cadmium	11	120
	Chromium (III)	910	1500
	Chromium (VI)	6	7.7
	Copper	2400	12000
	Lead	200 ⁽¹⁾	630 ⁽¹⁾
	Inorganic Mercury	40	120
	Nickel	130	230
	Selenium	250	1100
	Vanadium	410	2000
	Zinc	3700	81000
D	Naphthalene	2.3	4900
	Acenaphthylene	170	15000
	Acenaphthene	210	15000
	Fluorene	170	9900
	Phenanthrene	95	3100
	Anthracene	2400	74000
	Fluoranthene	280	3100
	Pyrene	620	7400
	Benzo(a)anthracene	7.2	29
	Chrysene	15	57
	Benzo(b)fluoranthene	2.6	7.1
	Benzo(k)fluoranthene	77	190
	Benzo(a)pyrene	2.2	5.7
	Indeno(1,2,3-cd)pyrene	27	82
	Dibenz(a,h)anthracene	0.24	0.57
	Benzo(ghi)perylene	320	640
E	Total PAHs		
F	TPH-CWG - Aliphatic >EC5 - EC6	42	570000
	TPH-CWG - Aliphatic >EC6 - EC8	100	600000
	TPH-CWG - Aliphatic >EC8 - EC10	27	13000
	TPH-CWG - Aliphatic >EC10 - EC12	130	13000
	TPH-CWG - Aliphatic >EC12 - EC16	1100	13000
	TPH-CWG - Aliphatic >EC16 - EC21	65000	250000
	TPH-CWG - Aliphatic >EC21 - EC35		
	TPH-CWG - Aliphatic > EC35 - EC44	65000	250000
	TPH-CWG - Aromatic >EC5 - EC7	70	56000
	TPH-CWG - Aromatic >EC7 - EC8	130	56000
	TPH-CWG - Aromatic >EC8 - EC10	34	5000
	TPH-CWG - Aromatic >EC10 - EC12	74	5000
	TPH-CWG - Aromatic >EC12 - EC16	140	5100
	TPH-CWG - Aromatic >EC16 - EC21	260	3800
	TPH-CWG - Aromatic >EC21 - EC35	1100	3800
	TPH-CWG - Aromatic > EC35 - EC44	1100	3800
G	TPH > EC6 - EC40		
H	Benzene	0.087	72
	Toluene	130	56000
	Ethylbenzene	47	24000
	p & m-xylene	56	41000
	o-xylene	60	41000
	MTBE (Methyl Tertiary Butyl Ether)	LOD ⁽³⁾	LOD ⁽³⁾

LQM/CIEH S4ULs for Human Health Risk Assessment (3rd edition, 2015) used unless stated:

- 5) Category 4 Screening Levels (March 2014)
- 6) CL:AIRE Soil GAC for Human Health Assessment (January 2010)
- 7) In-house screening criteria used as no GAC methodology currently exists
- 8) Hazardous waste thresholds. This limit only applies to imported material, not to in-situ soil.

Assumed 1% SOM (most conservative) for those values dependent upon SOM.

ND = Not Detected

LOD = Limit of Detection

*Exceeds vapour saturation limit

**Exceeds solubility saturation limit

The above acceptability criteria for PAHs for imported topsoil and subsoil are based on the published LQM/CIEH S4ULs (2015) for each individual PAH and not based on the Category 4 Screening Level using benzo(a)pyrene as a surrogate marker. This is as the source of the imported material is unknown therefore using the surrogate marker approach may not be suitable as the distribution of PAHs in the imported material may not be similar to those in the Culp et al. (1998)¹ study. Once chemical testing had been undertaken on imported soil and the distribution of PAHs compared to the distribution in the Culp et al. (1998) study, it may be suitable to use the surrogate marker approach / C4SL.

Clean Cover System Verification Report

The verification report shall include, as a minimum, the following:

- Site Name / location, developer name, development use
- Plot No / description of landscaped area (incl. plan of inspection areas) and National Grid Reference
- Inspection visit date
- Description of remediation (as per agreed Remediation Strategy including depths / thickness checks, topographical readings)
- Material tracking information (including way tickets etc.)
- Name of groundwork's remediation contractor
- Name of supervising environmental consultant
- Site Specific chemical analysis results
- Verification Photographs (inc. remarks)
- Pass/fail and if material fails, how will this be managed i.e. removed, treated
- Detail any further remedial works and/or inspection
- 'Signed off'

¹ Culp et al. (1998), *A comparison of the tumors induced by coal tar and benzo[a]pyrene in a 2-year bioassay*, **Carcinogenesis**, vol.19, no.1, pp.117–124.

5.0 OTHER REMEDIAL REQUIREMENTS

5.1 Discovery Strategy

In the event of unexpected contamination being discovered, the Discovery Strategy must be followed – this is contained in Appendix 3.

5.2 Design Variation

Following any variation in a finalised proposed development layout and / or detailed design including earthworks design it is recommended that the above conclusions are re-appraised to determine their suitability.

APPENDIX 1

LIMITATIONS OF INVESTIGATION WORK AND REPORT

LIMITATIONS OF REPORT

This consultancy report was compiled and carried out by IGE Consulting Limited ('IGE') for the client, as defined in the main report (the 'client'), on the basis of a defined programme and scope of works and the terms of a contract between IGE and the client. IGE undertook this with all reasonable skill and care, taking into account the limits of the scope of works required by the client, the prevailing site conditions, the time scale involved and the resources, including financial and manpower resources, agreed between IGE and the client. IGE cannot accept responsibility to any parties whatsoever, following the issue of this report, for any matters arising which may be considered outwith the agreed scope of works.

Unless otherwise agreed this report has been prepared exclusively for the use and reliance of the client in accordance with generally accepted consulting practices. This report may not be relied upon, or transferred to, by any other party without the written agreement of its author. If a third party relies on this report, it does so wholly at its own and sole risk and IGE disclaims any liability to such parties.

It is IGE's understanding that this report is to be used for the purpose described in the 'Brief' section of this report. That purpose was a significant factor in determining the scope and the services to be provided. Should the purpose for which the report is used, or the proposed use of the site change, this report may no longer be valid and any further use of, or reliance upon the report in those circumstances by the client without IGE's review and advice shall be at the client's sole and own risk.

The information contained in this report is protected by disclosure under Part 3 of the Environmental Information Regulations 2004 pursuant to the provisions of Regulation 12(5) without the consent in writing of a Director of IGE.

This report is a function of the date it was written and should be read in light of any subsequent changes in legislation, statutory requirements and industry practices. Ground conditions can also change over time and further investigations or assessment should be made if there is any significant delay in acting on the findings of this report. The passage 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 contained in this report should not be relied upon in the future without the written advice of IGE. In the absence of such written advice of IGE, reliance on the report in the future shall be at the client's own and sole risk. Should IGE be requested to review the report in the future, IGE shall be entitled to additional payment at the then existing rate or such other terms as may be agreed between IGE and the client.

The observations and conclusions described in this report are based solely upon the scope of works agreed between the client and IGE. IGE has not performed any observations, investigations, studies or testing not specifically set out or mentioned within this report. IGE is not liable for the existence of any condition, the discovery of which would require performance of services not otherwise contained in the agreed scope of works. For the avoidance of doubt, this report is strictly limited to the nature of contamination contained within the ground and groundwater at the site. The report does not cover environmental aspects such as air or noise pollution and ground vibrations and the like. In addition, ecological matters relating to wildlife, flora and fauna have not been investigated as part of this report. In particular, the site has not been inspected for the presence or otherwise of invasive species (e.g. Japanese Knotweed). It is recommended that the client appoints a specialist in this subject to carry out a detailed inspection / survey of the site if its presence is suspected. Where mention has been made to the suspected presence asbestos or asbestos-containing materials this is for indicative purposes only and does not constitute or replace full and proper surveys.

Throughout the report the term 'geotechnical' is used to describe aspects relating to the physical nature of the site (such as foundation requirements) and the term 'geo-environmental' is used to describe aspects relating to ground-related environmental issues (such as potential contamination). However, it should be appreciated that this is an integrated investigation and these two main aspects are inter-related. The geo-environmental sections are written in broad agreement with BS 10175:2026

LIMITATIONS OF INVESTIGATION WORK

Desk Study References

This report is based upon IGE's observations of existing physical conditions at the site gained from a walkover survey of the site together with IGE's interpretation of information including documentation, obtained from third parties and from the client on the history and usage of the site. Reliance has been placed on this publicly available data obtained from the sources identified in the main report. When using the information, it has been assumed that it is correct. The findings and recommendations contained in this report are based in part upon information provided by third parties, and whilst IGE have no reason to doubt the accuracy and that it has been provided in full from those it was requested from, the items relied on have not been verified. No responsibility can be accepted for errors within third party items presented in this report. IGE did not attempt to independently verify the accuracy or completeness of information, documentation or materials received from the client or third parties, including laboratories and information services. IGE is not liable for any inaccurate information or conclusions, the discovery of which inaccuracies required the doing of any act including the gathering of any information which was not reasonably available to IGE and including the doing of any independent investigation of the information provided to IGE except when otherwise provided in the terms of the contract between the client and IGE.

Historical Mapping

Historical Ordnance Survey maps do not provide a comprehensive description of a site history. They provide details of the site from a date prior to the publication of the map (i.e. a snapshot in time). The period between map editions can be substantial (i.e. several decades). Not all map series are available for every date range in many areas of the UK and therefore there will be gaps in this mapped record for some sites. Potentially contaminative land uses could have been present and removed during such periods and may therefore not form a part of this particular record. In addition, there will be potentially contaminative land uses which are not identified on the map records such as small scale storage / use of hazardous materials, illegal / unlicensed waste disposal activities etc. Different map series identify different features utilising different symbols which can result in features that remain on-site being removed from maps. Some features are also not mapped for security reasons (e.g. airfields and other military installations). These areas are mostly shown as blank areas on historical maps.

Site Walkover

During the site walkover reasonable effort has been made to obtain an overview of the site conditions. However, during the site walkover no attempt has been made to enter areas of the site that are unsafe or present a risk to health and safety, are locked, barricaded, overgrown, or the location of the area has not been made known or accessible.

Flooding

Flooding in this report is defined as flooding caused by the sea, ditches, rivers, streams, ponds, lakes, reservoirs and the like. It does not extend to flooding caused by surcharged piped drainage systems and investigations into flooding of this nature are excluded from this report.

Extent of Contamination Studies

Site sensitivity assessments have been made based on available information at the time of writing and are ultimately for the decision of the regulatory authorities.

The conclusions and recommendations sections of the report provide an overview and guidance only and should not be specifically relied upon without considering the context of the reporting in full. The conclusions resulting from this study are not necessarily indicative of future conditions or operating practices at or adjacent to the site.

Intrusive Investigation

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 and as investigation excavations 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. The explored extent of the site area depends on the soil and groundwater conditions, together with the position of any current structures and underground facilities and natural and other activities on site. In addition, chemical analysis was carried out for a limited number of parameters, 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 normal speed of investigation usually does not permit the recording of an equilibrium water level for any one water strike. Moreover, 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.

Exploratory Holes

Where exploratory holes have been carried out as part of this investigation, the spacing has been determined to provide a reasonable indication of the general ground conditions across the site, but the number has ultimately been limited by commercial constraints. The findings of the exploratory holes relate specifically to the exploratory hole locations and are no absolute guarantee of the ground conditions between such locations. Due allowance should be made for the possibility of variation in conditions between exploratory hole locations.

Extent of Contamination Testing

The extent of contaminated land testing carried out on samples obtained from the site has been determined in accordance with the latest legal guidance issued by the government to provide, with reasonable certainty, the probable general levels of contamination present on site that could pose a significant hazard to human health or waters. The extent of site investigation works including chemical testing has also been limited by reasonable commercial constraints. Although extensive testing of samples has been carried out, the volume of samples taken for testing are a minute fraction of the total volume of soils and groundwater present on site. Therefore, there is a residual risk that undetected pockets of contamination may be present on site, situated between testing locations.

When investigating or developing potentially contaminated land it is important to recognise that sub-surface conditions may vary spatially and temporally. The absence of certain ground, ground gas, contamination or groundwater conditions at the positions tested is not a guarantee that such conditions do not exist anywhere across the site. Site sensitivity assessments have been made based on available information at the time of writing and are ultimately for the decision of the regulatory authorities. The conclusions resulting from this study are not necessarily indicative of future conditions or operating practices at or adjacent to the site.

Extent of Geo-Environmental Studies

This report is strictly limited to the nature of contamination contained within the ground and groundwater at the site. The report does not cover environmental aspects such as air or noise pollution and ground vibrations and the like. In addition, ecological matters relating to wildlife, flora and fauna have not been investigated as part of this report. In particular, the site has not been inspected for the presence or otherwise of invasive species e.g. Japanese Knotweed. It is recommended that the Client appoints a specialist in this subject to carry out a detailed inspection / survey of the site if its presence is suspected. Where mention has been made to the identification asbestos or asbestos-containing materials this is for indicative purposes only and does not constitute or replace a full and proper survey. If an Unexploded Ordnance (UXO) report has been obtained within the report, it has been so on the basis of Health and Safety concerns and no assessment has been made other than transcribing the

recommendations of the sub-contractor contained within the report. In terms of a potential contaminative source, unless ordnance has been manufactured / stored on site, UXOs will only be determined as a contaminative source following a positive identification on site.

PLANNING CONTEXT

Planning Policy Wales (PPW) sets out the national land-use planning framework for Wales, emphasising the central role of the planning system in delivering **sustainable development** and improving environmental, social and economic well-being. PPW forms part of the Welsh Government's national planning policy and is supplemented by Technical Advice Notes and related guidance.

PPW highlights that **sustainable management of natural resources** and **placemaking** are key principles guiding planning decisions. This includes ensuring that development protects Wales' natural assets, minimises pollution, and supports a resilient, low-carbon environment. Audit Wales emphasises that sustainability is central to Welsh planning policy, particularly in relation to reducing environmental impacts and making best use of land.

Previously Developed Land and Effective Use of Land

PPW recognises the importance of making efficient use of land and encourages the redevelopment of **previously developed (brownfield) land**, where this is suitable for the intended use. This aligns with wider Welsh policy objectives to regenerate degraded or underused land and contribute positively to sustainable place-making. Audit Wales notes that making best use of brownfield land is a key aspect of sustainable development in Wales.

In this context, PPW supports opportunities to address issues such as **despoiled, degraded or contaminated land** through appropriate remediation and redevelopment where necessary to ensure sites are suitable for future use.

Natural Environment and Pollution Considerations

PPW requires that new development must not cause, or be exposed to, **unacceptable risks from pollution**—including soil, air, water, and noise pollution—or from **land instability**. While PPW does not reproduce the NPPF's wording, it similarly emphasises that planning authorities must consider the environmental risks arising from ground conditions and ensure proposals protect human health, biodiversity, controlled waters, and the wider environment. Natural Resources Wales (NRW) identifies land contamination as a potentially significant risk to human health, ecosystems, property and water quality, requiring proper assessment and management during planning.

Contaminated Land, Suitability for Use and Regulatory Requirements

In Wales, responsibilities relating to contaminated land arise through both the planning system and **Part 2A of the Environmental Protection Act 1990**, implemented via the Contaminated Land (Wales) Regulations. The Welsh Land Contamination Working Group notes that local authorities must identify and assess potentially contaminated land, ensuring it is appropriately remediated to protect public health and the environment.

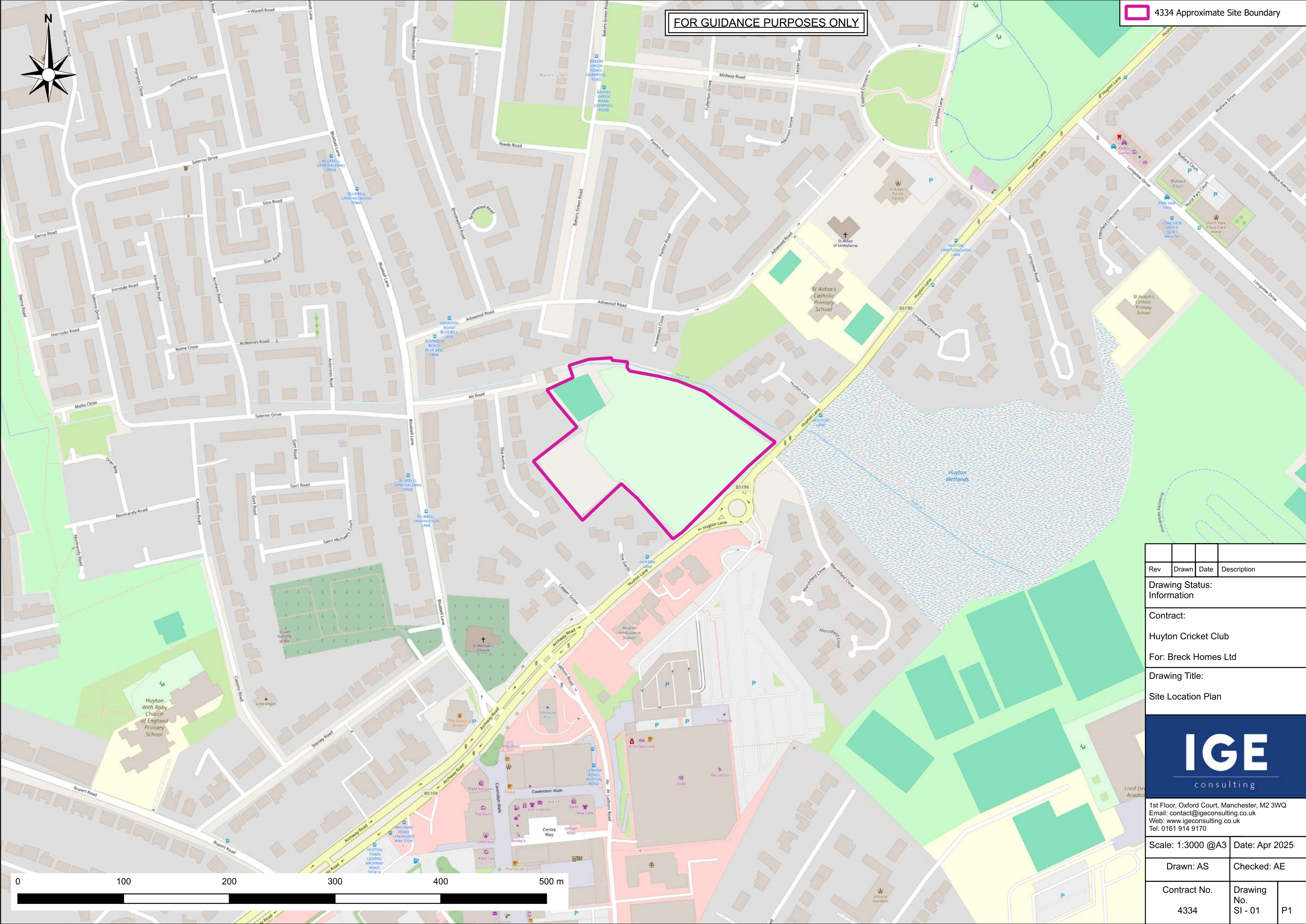
Guidance such as *Development of Land Affected by Contamination: A Guide for Developers* (WLGA & Environment Agency Wales) provides good-practice expectations for risk assessment, remediation and verification to ensure land is suitable for its proposed use. This guidance outlines the need for competent professionals to undertake site investigations and prepare the technical information required to support planning decisions.

Competency and Site Investigation Requirements

Planning submissions must be supported by **adequate site investigation information** prepared by competent and appropriately qualified professionals. Welsh guidance emphasises that developers are responsible for identifying the presence, scale and significance of contamination and undertaking necessary remediation so that the land is suitable for the proposed end use. This report has been prepared and authorised by personnel who are competent in accordance with recognised Welsh land contamination guidance and good practice.

APPENDIX 2

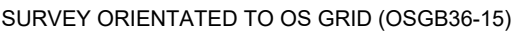
FIGURES AND DRAWINGS



FOR GUIDANCE PURPOSES ONLY

4334 Approximate Site Boundary

Rev	Drawn	Date	Description
Drawing Status: Information			
Contract: Huyton Cricket Club			
For: Breck Homes Ltd			
Drawing Title: Site Location Plan			
IGE consulting 1st Floor, Oxford Court, Manchester, M2 3WQ Email: contact@igeconsulting.co.uk Web: www.igeconsulting.co.uk Tel: 0161 914 9170			
Scale: 1:3000 @A3		Date: Apr 2025	
Drawn: AS		Checked: AE	
Contract No. 4334		Drawing No. SI - 01	P1



FEATURES	SURVEY ANNOTATIONS
----------	--------------------

LEVEL PREFIX ANNOTATIONS		WO WASH OUT UTL UNABLE TO LIFT UTS UNABLE TO SURVEY
ASL ARCH SPRING LEVEL	GEO TECHNICAL INFORMATION TRIAL HOLE / PIT TH BORE HOLE BH WINDOW SAMPLE WS MONITORING POINT MP PROBE HOLE PH	
BD BACK DEPTH		
BL BACK ROAD		
CL COVER LEVEL		
DH TOP OF DOOR		
DTL DEPTH TO CROWN		
FFH FINISHED FLOOR LEVEL		
IL INVERT LEVEL		
PL PARASIT LEVEL		
RL ROOF/ROOF LEVEL		
SL SOFFIT LEVEL		
TOP TOP OF FENCE		
TOP TOP OF PIPE		
TOP TOP OF WALL		
THR TREE HEIGHT		
THW THRESHOLD LEVEL		
WL WATER LEVEL		
WS WINDOW SILL		
WSF WINDOW SOFFIT		

ONLY MANHOLES AND SERVICES SHOWN WERE VISIBLE AT THE TIME OF SURVEY.
 MAN ENTRY TO SEWERS HAS NOT BEEN UNDERTAKEN, DEPTHS, PIPESIZES ETC
 ARE MEASURED FROM GROUND LEVEL.
 DRAINAGE INFORMATION MUST BE CHECKED AND VERIFIED PRIOR TO ANY WORK
 COMMENCING.
 BOUNDARIES SHOWN ARE PHYSICAL AND MAY NOT REPRESENT LEGALLY CONVEYED
 OWNERSHIP.
 TREE SPREADS ARE SYMBOLIC ONLY AND ARE REPRESENTATIVE OF THE
 AVERAGE SPREAD, THE TREE CANOPY LAYER DENOTES THE TREES EXTREMITY.

ALL LEVELS ARE RELATED TO O.S DATUM (OSGB36-15)
ESTABLISHED AT SE1 USING THE LEICA SMARTNET GPS NETWORK

© SurveyEng Limited 2024
Reproduction in whole or in part by any means is prohibited
without the prior permission of SurveyEng Limited.

 **SurveyEng Ltd**
Land Surveyors & Engineers

14 GREEN MILL
WESTHOUGHTON
BOLTON
LANCS
BL5 3GE

TEL/FAX: 0800 772 3040
MOB: 07850069993
info@surveyeng.co.uk

PROJECT TITLE
HUYTON CRICKET CLUB

DRAWING DETAIL

TOPOGRAPHICAL LAND SURVEY

KNOTWEED SURVEY

DRAWING NUMBER BR.TS.28	REVISION A
----------------------------	---------------

		SURVEY STATIONS		
Name		Easting	Northing	Height
CC4		335667.156	382169.068	35.378
SE1		344559.806	391308.986	32.109
SE1A		344509.924	391257.479	32.997
SE2		344489.224	391234.221	32.819
SE2A		344469.671	391236.420	32.929
SE3		344530.000	391328.585	31.939
SE4		344464.312	391307.267	32.197
SE5		344390.309	391371.301	31.349
SE6		344393.230	391275.555	33.783
TG1		344411.294	391386.114	33.413
TG2		344356.959	391390.834	32.734



Housetype	m²	Ft²	Total No.	Total m²	Total Ft²
Type B - 2B3P Bungalow (NDSS)	61	657	4	244	2626
Type C - 2B3P House Type (NDSS & M4(2))	74	797	9	666	7169
Type CC - 2B3P House Type (NDSS & M4(2))	74	797	1	74	797
Type F - 3B4P House Type (NDSS)	86	926	13	1118	12034
Type G - 3b4P U/P House Type (NDSS)	90	969	1	90	969
Type I - 3b5P Corner Turner HT (NDSS & M4(2))	106	1141	2	212	2282
Type J - 4b6P House Type (NDSS & M4(2))	114	1227	6	684	7363
Type L1 - 1B2P Maisonette GF M4(3)	65	700	6	390	4198
Type L2 - 2B3P Maisonette FF (NDSS)	72	775	6	432	4650
Type M - 2b3P Apartments (NDSS)	61	657	12	732	7879
Type N1 - 1b2p Apartment (NDSS)	50	538	6	300	3229
Type N2 - 2b3p Apartment (NDSS)	61	657	6	366	3940
Type N3 - 2b3p Apartment (NDSS)	50	538	6	300	3229
Type N4 - 2b3p Apartment (NDSS)	61	657	3	183	1970
TOTAL	81		81	5791	62334

	Site Area		Density		Footage			
	Ha	Ac	Un/Ha	Un/Ac	m²/Ha	m²/Ac	Ft²/Ha	Ft²/Ac
Gross	2.21	5.46	36.65	14.83	2620.36	1060.42	28205.31	11414.30
Nett	1.80	4.45	45.00	18.21	3217.22	1301.97	3217.22	14014.23

HOUSE TYPE KEY:

- TYPE B 2B3P BUNGALOW 61**
- TYPE C 2B3P HOUSE TYPE 74**
- TYPE F 3B4P HOUSE TYPE 86**
- TYPE G 3B4P FLYOVER HOUSE TYPE 90**
- TYPE I 3B6P CORNER HOUSE TYPE 106**
- TYPE J 4B6P HOUSE TYPE 114**
- TYPE L1 1B2P 65 (GF)
TYPE L2 2B3P 72 (FF)**
- TYPE M1 2B3P 61 (GF)
TYPE M2 2B3P 61 (FF)**
- TYPE N1 1B2P 50
TYPE N2 2B3P 61
TYPE N3 1B2P 50
TYPE N4 2B3P 61**

INDICATES CIRCULATION SPACE

0 5 10 15 20 25
SCALE BAR

E	JUNE 25	SHW	PLOTS 42-43 SWAPPED WITH PLOTS 63 & 64
D	JUNE 26	SHW	PLOTS 42-43 MOVED OUT OF FLOOD RISK AREA
C	MAY 25	SHW	PLANNERS COMMENTS ENDORSED
B	MAY 25	SHW	REAR GARDEN AREAS UPDATED FOR PLOTS 01-45
A	MAY 25	SHW	PLOTS 62-64 & 81-82 UPDATED
REV	DATE	DRAWN	DESCRIPTION
TITLE: PROPOSED SITE LAYOUT			
Breck Homes 20 Scepters Court Bamber Bridge Preston PR5 5AW Tel: 01525 587 000 Email: hello@breck.co.uk www.breck.co.uk/homes			
PROJECT: HUYTON LANE, KNOWSLEY			
DATE: MARCH 25	SCALE: 1:500 @ A1	JOB REF: -	DRAWING NUMBER: Huyton Lane / Proposed Site Layout - Option A
			REV: E

APPENDIX 3

DISCOVERY STRATEGY



DISCOVERY STRATEGY

Office 16
Bartle House
Oxford Court
Manchester
M2 3WQ

Tel: 0161 914 9171
Email: contact@igeconsulting.co.uk
Web: www.igeconsulting.co.uk

What to Look Out For

Potentially contaminative material can be identified as follows:

- Appears oily / has an iridescent sheen
- Hydrocarbon odour e.g., oily or petroleum odour
- Solvent odour e.g., sharp or sweet odour
- Waste materials e.g., metals, plastic etc.
- Asbestos e.g., fibrous sheeting / roofing / board / lagging etc.
- 'Landfill' odour e.g., rotten / putrefying / leachate odour

Or any other material that looks man-made or does not match its surroundings – if in doubt, check.

Procedure for Discovery of Unexpected Contamination

If any of the above material is discovered, the following procedure must be carried out:

- a) Stop works in the area of the contamination discovery.
- b) Inform the Site Manager.
- c) Record the visual and olfactory evidence of contamination.
- d) Suitably qualified geo-environmental engineer to investigate the contamination; take samples, photographs and in-situ tests and discover the extents of the contamination, and to identify potential contaminants and specify chemical testing, if necessary.
- e) Either dig out the contaminated material and stockpile, on an impermeable membrane if necessary, or leave in-situ whilst awaiting chemical test results, if needed – whichever presents the least risk.



IGE Consulting Ltd
Registered in England No 10780128



- f) Suitably qualified geo-environmental engineer to re-visit the site's risk assessment, taking into account the newly discovered contamination and recommend remediation, if necessary, or other next steps.
- g) If the risk assessment and remediation strategy is changed as a result, the Local Authority and/or the Environment Agency should be informed and/or consulted.
- h) Lastly, undertake remediation of the affected area if this has been deemed appropriate.

Procedure for Discovery of an Unexpected Tank

Former industrial sites may contain unrecorded underground storage tanks (USTs).

Follow the below steps if a UST is found:

- a) Stop works in the area of the UST discovery.
- b) Inform the Site Manager.
- c) Suitably qualified geo-environmental engineer to investigate the tank, including measuring the size, contents, condition, and visual and olfactory evidence of contamination. Geo-environmental engineer to record the location of the tank on a site plan, take photographs, and sample the contents to send for chemical testing to determine the contents.
- d) Suitably qualified contractor to empty the tank and dispose of contents at a suitably licensed disposal facility.
- e) Suitably qualified contractor to undertake integrity testing in line with the 'Blue Book' method (APEA / EI '*Design, Construction, Modification, Maintenance and Decommissioning of Petrol Filling Stations*' 4th ed. (April 2018)), to determine whether the tank is intact or has been compromised.
- f) Suitably qualified geo-environmental engineer to undertake a risk assessment based on the contents of the tank and the results of the integrity testing, to determine whether to decommission the tank and leave in-situ or to remove the tank.
- g) Suitably qualified contractor to clean and 'inert' the tank, and provide a gas safe certificate, in line with the 'Blue Book' method.

- h) Suitably qualified contractor to either decommission the tank in-situ in line with the 'Blue Book' method or remove the tank and dispose of at an appropriate facility.
- i) If excavated and removed, suitably qualified geo-environmental engineer to investigate the base and the sides of the resultant excavations and if any contamination is found, undertake the Procedure for Discovery of Unexpected Contamination above.

APPENDIX 4

EXAMPLE CLEAN COVER SYSTEM REQUIREMENTS

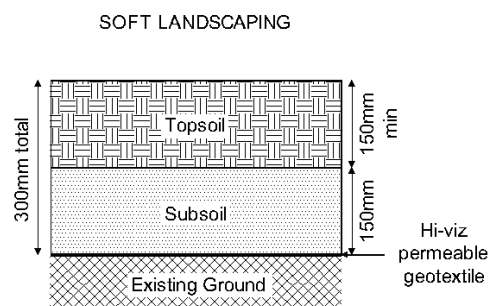
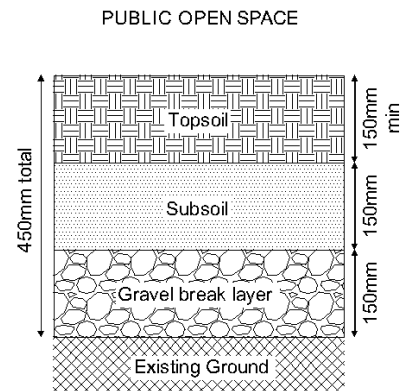
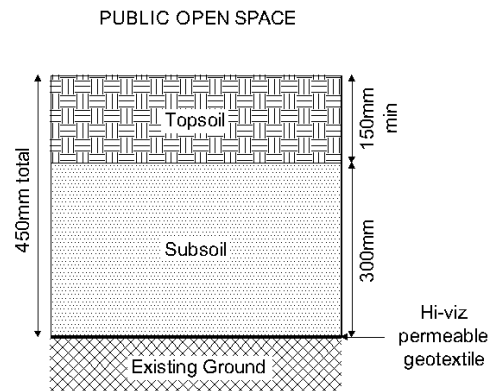
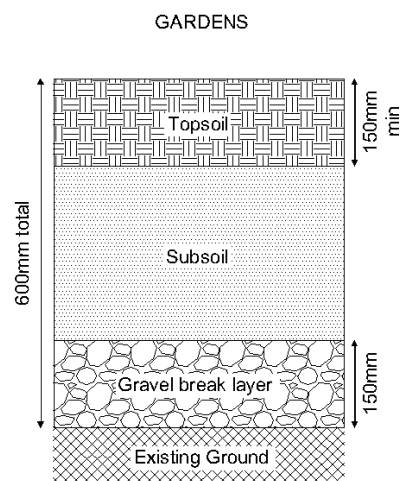
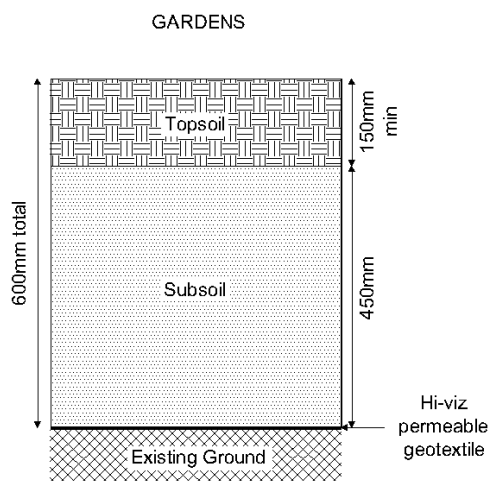
EXAMPLE CLEAN COVER SYSTEM REQUIREMENTS

The following diagrams show example clean cover system installations for gardens, public open space, and soft landscaping:



1st Floor
15 Oxford Court
Manchester
M2 3WQ

Tel: 0161 914 9171
Email: contact@igeconsulting.co.uk
Web: www.igeconsulting.co.uk



Refer to site specific Remediation Strategy for recommended installation.

EXAMPLE INSTALLATION OF CLEAN COVER SYSTEM

The following example shows the clean cover system installation in line with the following requirements:

- A 600mm clean cover system comprising:
 - A minimum of 150mm topsoil, underlain by
 - 300mm subsoil, underlain by
 - 150mm gravel break layer
 - A hi-viz geotextile marker

It should be noted that most cover systems require **either** a gravel break layer **or** a hi-viz geotextile marker, but the below example uses both:

Figure 1: First, the gardens are dug out to 600mm below FFL and lined with a hi-viz geotextile marker:



Figure 2: The geotextile is overlain by a 150mm clean stone break layer.



Figure 3: The break layer is overlain by 300mm sub-soil, seen here before spreading across the garden:



Figure 4: The sub-soil is overlain by 150mm topsoil to FFL:



Figure 5: The gardens are finished with turf. The overall cover system depth is 600mm:



EXAMPLE CLEAN COVER SYSTEM VALIDATION

The following example shows validation of a clean cover system in line with the following requirements:

- A 600mm clean cover system comprising:
 - A minimum of 150mm topsoil, underlain by
 - 450mm subsoil

Best practice requires three photos as follows:



Photograph 1 – Identifies the plot number and shows the validation dig location in relation to the plot.

Photograph 2 – Shows the validation depth clearly, using a staff and a marker which crosses the hole. Shows the topsoil and subsoil, and the base of the hole.

Photograph 3 – Shows the validation hole in context. The plot being validated can be seen, along with nearby plots.

The validation should be written up into a Verification Log, shown below:



15 Oxford Court, Manchester, M2 3WQ
email: contact@igeconsulting.co.uk
web: www.igeconsulting.co.uk

Verification Log

Project Name:	
Project Number:	
Location:	
Client:	
Remediation Requirements:	
Validation Requirements:	
Plot Number:	
Grid reference:	
Inspection date:	
Engineer:	
Photographs:	
Photographs shows	
This plot has PASSED / FAILED* verification (<i>delete as appropriate</i>)	
*Proposed further remedial works (if FAILED):	
An additional inspection IS / IS NOT required for this plot (<i>delete as appropriate</i>)	

CLEAN COVER SYSTEM TESTING RATES

Soils intended for use in private gardens, public open space, and soft landscaping must be tested to confirm their suitability for use.

Imported topsoil and subsoil is required to be tested at source prior to import to confirm suitability. All topsoil and subsoil, whether site-won or imported is required to be tested at the following frequency:

Source	Material End Use	Sampling Frequency ¹	Testing Suites ³ (see below)
Greenfield Source:	Topsoil	1 per 200m ³	A, B, C, D, F
	Subsoil	1 per 200m ³	A, B, C, D, G
Brownfield Source:	Topsoil	1 per 50m ³	A, B, C, D, F
	Subsoil	1 per 100m ³	A, B, C, D, G
	General Fill ²	1 per 1000m ³	A, B, C, E, H

- 1) Minimum 3 samples regardless of volume.
- 2) 'General Fill' is material used primarily to raise levels, specifically not within areas of private gardens, public open space, or soft landscaping, e.g. 6F2.
- 3) In addition to the standard suites given, the laboratory testing suite should include any additional contaminants of concern based on the source of the samples.

Testing Suites:

- A.** Asbestos ID, Asbestos quantification.
- B.** pH, total and free cyanide, soluble sulphate, organic matter.
- C.** Arsenic, Beryllium, Boron, Cadmium, Chromium (III and VI) Copper, Lead, Inorganic Mercury, Nickel, Selenium, Vanadium, Zinc.
- D.** Speciated PAHs: Naphthalene, Acenaphthylene, Acenaphthene, Fluorene, Phenanthrene, Anthracene, Fluoranthene, Pyrene, Benzo(a)anthracene, Chrysene, Benzo(b)fluoranthene, Benzo(k)fluoranthene, Benzo(a)pyrene, Indeno(1,2,3-cd)pyrene, Dibenzo(a,h)anthracene, Benzo(ghi)perylene.
- E.** Total (non-speciated) PAHs.
- F.** Speciated Total Petroleum Hydrocarbons (TPH): Aliphatic >EC5 - EC6, >EC6 - EC8, >EC8 - EC10, >EC10 - EC12, >EC12 - EC16, >EC16 - EC21, >EC21 - EC35, and > EC35 - EC44, and Aromatic >EC5 - EC7, >EC7 - EC8, >EC8 - EC10, >EC10 - EC12, >EC12 - EC16, >EC16 - EC21, >EC21 - EC35, > EC35 - EC44.
- G.** 3-band Total Petroleum Hydrocarbons (TPH): TPH EC6-10, EC10-25, EC25-40.
- H.** Total Petroleum Hydrocarbons (TPH): TPH EC6 – EC40.

Once tested, the results are to be compared against the following Acceptability Criteria:

CLEAN COVER SYSTEM ACCEPTABILITY CRITERIA

Soils intended for use in private gardens, public open space, and soft landscaping must be tested at the rates outlined above and compared to the following acceptability criteria, to confirm their suitability for use:

Suite	Determinand (mg/kg unless stated)	Acceptability Criteria for:			
		Private Gardens	Public Open Space (residential)	Soft Landscaping or Public Open Space (Park)	General Fill
A	Asbestos (%)	ND	ND	ND	<0.001 – 0.01%
B	pH	>6 - <8 ⁽³⁾	>6 - <8 ⁽³⁾	>6 - <8 ⁽³⁾	>5 - <10 ⁽³⁾
	Total Cyanide	0.5 ⁽³⁾	0.5 ⁽³⁾	0.5 ⁽³⁾	0.5 ⁽³⁾
	Free Cyanide	0.5 ⁽³⁾	0.5 ⁽³⁾	0.5 ⁽³⁾	0.5 ⁽³⁾
	Soluble Sulphate (mg/l)	500 ⁽³⁾	500 ⁽³⁾	500 ⁽³⁾	500 ⁽³⁾
C	Arsenic	37	79	170	640
	Beryllium	1.7	2.2	63	12
	Boron	290	21000	46000	240000
	Cadmium	11	120	560	190
	Chromium (III)	910	1500	33000	8600
	Chromium (VI)	6	7.7	220	33
	Copper	2400	12000	44000	68000
	Lead	200 ⁽¹⁾	630 ⁽¹⁾	1300	2330 ⁽¹⁾
	Inorganic Mercury	40	120	240	1100
	Nickel	130	230	800	980
	Selenium	250	1100	1800	12000
	Vanadium	410	2000	5000	9000
	Zinc	3700	81000	170000	730000
D	Naphthalene	2.3	4900	1200	
	Acenaphthylene	170	15000	29000	
	Acenaphthene	210	15000	29000	
	Fluorene	170	9900	20000	
	Phenanthrene	95	3100	6200	
	Anthracene	2400	74000	150000	
	Fluoranthene	280	3100	6300	
	Pyrene	620	7400	15000	
	Benzo(a)anthracene	7.2	29	49	
	Chrysene	15	57	93	
	Benzo(b)fluoranthene	2.6	7.1	13	
	Benzo(k)fluoranthene	77	190	370	
	Benzo(a)pyrene	2.2	5.7	11	
	Indeno(1,2,3-cd)pyrene	27	82	150	
	Dibenz(a,h)anthracene	0.24	0.57	1.1	
	Benzo(ghi)perylene	320	640	1400	
E	Total PAHs				1000 ⁽⁴⁾
F	TPH-CWG - Aliphatic >EC5 - EC6	42	570000	95000	
	TPH-CWG - Aliphatic >EC6 - EC8	100	600000	150000	
	TPH-CWG - Aliphatic >EC8 - EC10	27	13000	14000	
	TPH-CWG - Aliphatic >EC10 - EC12	130	13000	21000	
	TPH-CWG - Aliphatic >EC12 - EC16	1100	13000	25000	
	TPH-CWG - Aliphatic >EC16 - EC21	65000	250000	450000	
	TPH-CWG - Aliphatic >EC21 - EC35				
	TPH-CWG - Aliphatic > EC35 - EC44	65000	250000	450000	
	TPH-CWG - Aromatic >EC5 - EC7	70	56000	76000	
	TPH-CWG - Aromatic >EC7 - EC8	130	56000	87000	
	TPH-CWG - Aromatic >EC8 - EC10	34	5000	7200	
	TPH-CWG - Aromatic >EC10 - EC12	74	5000	9200	
	TPH-CWG - Aromatic >EC12 - EC16	140	5100	10000	
	TPH-CWG - Aromatic >EC16 - EC21	260	3800	7600	
	TPH-CWG - Aromatic >EC21 - EC35	1100	3800	7800	
	TPH-CWG - Aromatic > EC35 - EC44	1100	3800	7800	

G	TPH > EC6 - EC40				5000 ⁽⁴⁾
H	Benzene	0.087	72	90	
	Toluene	130	56000	87000*	
	Ethylbenzene	47	24000	17000*	
	p & m-xylene	56	41000	17000**	
	o-xylene	60	41000	17000*	
	MTBE (Methyl Tertiary Butyl Ether)	LOD ⁽³⁾	LOD ⁽³⁾	LOD ⁽³⁾	

LQM/CIEH S4ULs for Human Health Risk Assessment (3rd edition, 2015) used unless stated:

- 1) Category 4 Screening Levels (March 2014)
- 2) CL:AIRE Soil GAC for Human Health Assessment (January 2010)
- 3) In-house screening criteria used as no GAC methodology currently exists
- 4) Hazardous waste thresholds. This limit only applies to imported material, not to in-situ soil.

Assumed 1% SOM (most conservative) for those values dependent upon SOM.

ND = Not Detected

LOD = Limit of Detection

*Exceeds vapour saturation limit

**Exceeds solubility saturation limit

IGE

consulting

IGE Consulting Ltd: 1st Floor, 15 Oxford Court, Manchester, M2 3WQ

