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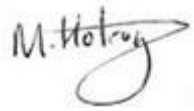
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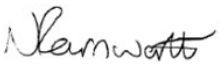
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1 INTRODUCTION

This Remediation Strategy has been prepared by Curtins for The Message (the Client) to provide guidance with respect to remedial requirements for the proposed development site, known as Embassy Village in Manchester, M14 4NU.

The proposed development comprises the construction of new permanent accommodation, comprising converted shipping containers, for the homeless to be located beneath the existing railway arches. The development will also include associated amenities including a village hall, staff pod, outside space with landscaping, potentially a allotment/growing area, and sports areas.

Construction works are to be phased over 3 phases. Landscaping plans and phasing drawings are enclosed in Appendix A.

The site has been characterised through ground investigation(s) undertaken by Ian Farmers on behalf of Curtins during 2022 (Ref 1). A supplementary ground investigation was undertaken by Ian Farmers during 2023 (Ref 2).

A site location plan is presented in *Figure 1* with the site boundary outlined in pink.

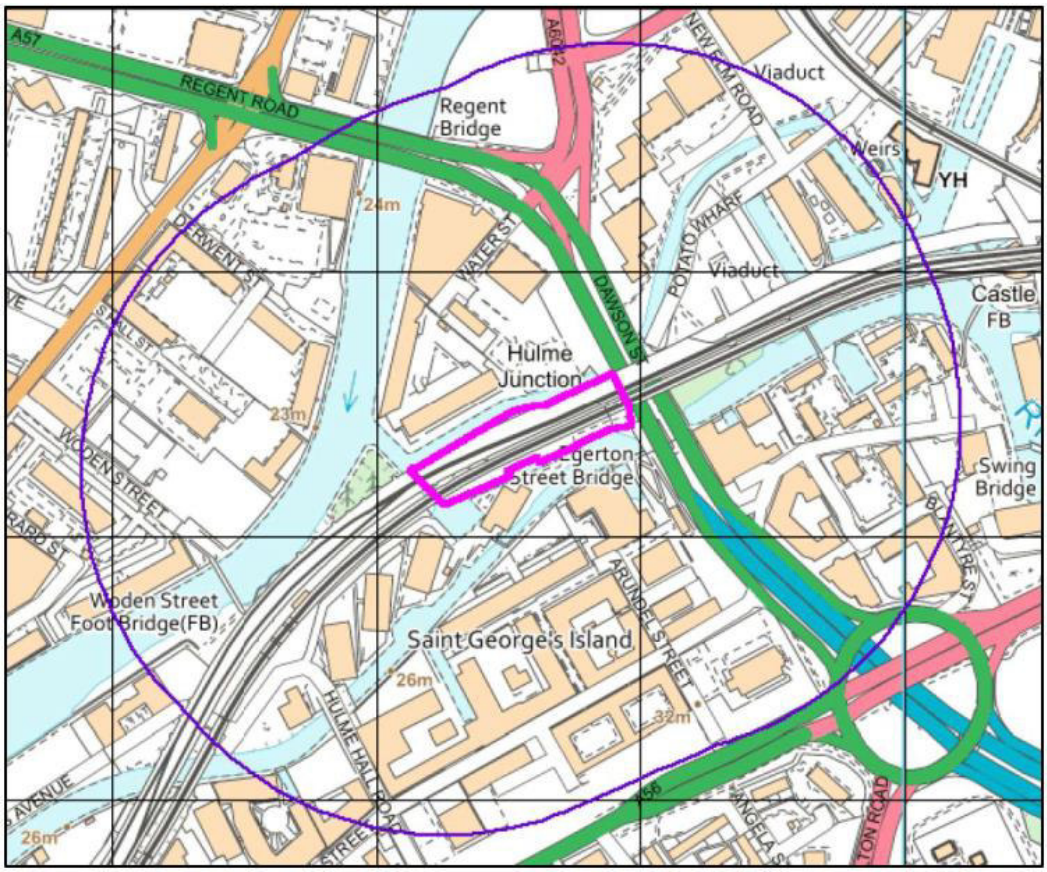


Figure 1 – Site Location Plan

The site is located under and adjacent to masonry railway arches, including an operational Network Rail railway and the Transport for Greater Manchester (TfGM) Metrolink overhead. The site is bound by the Bridgewater Canal at the south and the River Medlock to the north.

Some of the arches on the east of the site are infilled with disused commercial units, the remainder of the arches are open and vacant. The site is accessed from/Edgerton Street at the east of the site. the access road slopes down moderately towards the west on to site, the topography is then relatively level with the surface covered by hardstanding or gravel.

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1.1 Requirements of the Remediation Strategy

The Remediation Strategy is to account for the following;

- A description of the materials likely to be encountered by the developer and their contractor/sub-contractors;
- Proposals for excavations with respect to the materials likely to be encountered;
- Revised risk ratings associated with ground contamination and primary pollutant linkages remaining;
- Recommendations for the specification of imported soils where used in areas of soft landscaping;
- Recommendations for appropriate PPE;
- Recommendations for managing asbestos appropriately during construction;
- Recommendation for provision of a soil contamination and asbestos contamination watching brief during demolition, remediation, earthworks and construction works and a strategy for handling potentially contaminative incidents; and
- Proposals for the verification of remedial measures, including a regime for verification and chemical analysis of imported soils.

1.2 Definitions

In this document the following definitions apply:

Contractor Refers to the appointed contractor responsible for undertaking the remediation works.

Site Manager Refers to a representative of the appointed contractor resident on site.

Engineer Refers to a suitably qualified representative from Curtins, who would not normally be resident on site.

1.3 References

The Remediation Strategy has been prepared with reference to the following existing reports;

- **Reference 1:** Ian Farmer Associates (2022) Factual Report on Ground Investigation Ref. 2230462 (00).
- **Reference 2:** Ian Farmer Associates (2023) Factual Report on Ground Investigation Ref. 2230942 (00).
- **Reference 3:** Curtins (2022) Embassy Village Phase 2 Ground Investigation Ref. 079942-CUR-XX-XX-RP-G-00002 (P01).

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2 GROUND CONDITIONS

The following sections present a summary of the ground conditions identified during the Ian Farmers 2022 and 2023 ground investigation(s). The exploratory hole logs are presented in *Appendix A*.

2.1 Made Ground

Made Ground typically comprised a surface covering of either concrete or granular made ground deposits with granular made ground deposits underlying and some cohesive inclusions. Made Ground was encountered to a maximum depth of 3.80m bgl.

Surface covering typically comprised of hardstanding concrete or tarmacadam from ground level to maximum depths ranging between 0.05m and 0.30m bgl. Where concrete was not recorded, a granular surface cover of brown slightly silty slightly to very gravelly fine sand with rare to occasional cobbles was encountered.

This was typically underlain by granular Made Ground comprising brown or black slightly gravelly slightly silty fine and medium sand, with fragments of brick, concrete, ash, clinker, sandstone and mudstone, or very sandy, occasionally silty, gravel of limestone, sandstone, ash, clinker, concrete and brick in the east and southeast of the site.

Cohesive made ground of clay was encountered within six locations within the central south and northwest corner of the site, comprising brown, slightly sandy, slightly gravelly clay or small areas of orange-brown slightly sandy slightly gravelly clay with fragments of mudstone, brick, siltstone, sandstone with rare cobbles and rare timber and rare glass. A silt made ground was encountered within seven locations, described as slightly gravelly, sandy silt with rare broken pottery. Gravel is angular to subangular, fine and medium including coal, sandstone, slate and brick. Alluvium Deposits

Natural cohesive deposits considered to be representative of alluvium were encountered underlying the Made Ground deposits recoded between 1.20m and 3.80m bgl, recorded to maximum depths of 5.45m. Cohesive alluvium deposits were typically described as a soft to firm, brown sandy occasionally silty clay. Localised deposits of organic cohesive alluvium were identified within one location which was described as a soft, black, slightly sandy silt/clay with an organic odour.

Granular alluvium deposits were encountered from depths of between 0.60m and 7.00m bgl, recorded to a maximum depth of 8.10m bgl. This deposit was typically described as a reddish brown, silty, fine and medium sand with pockets of brown, slightly gravelly, very silty, fine and medium sand with occasional cobbles.

2.2 Bedrock (Chester Formation)

The Chester Formation bedrock was encountered underlying the Alluvium deposits from 7.00m bgl to a maximum depth of 13.10m bgl. The bedrock was described as a weak to medium strong sandstone with closely to medium spaced fractures.

2.3 Observed Potential Contamination

During the initial ground investigation it was not possible to complete two exploratory hole locations due to the presence of asbestos within the proposed location.

2.4 Groundwater

Groundwater strikes were noted within the Made Ground in four locations recorded between 0.58m and 1.05m bgl. Additionally, groundwater strikes in the alluvium were recorded within eight locations recorded between 3.00m and 7.00m bgl.

Groundwater is likely to be encountered within the alluvium deposits. Perched water is likely to be encountered in shallow Made Ground soils.

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3 GROUND & GROUNDWATER CONTAMINATION

3.1 Ground Contamination

As part of the 2022 ground investigation a total of thirteen samples of Made Ground were obtained, in addition to two natural soils samples, and scheduled for soil chemical analysis. The chemical analysis suite included a broad range of potential contaminants of concern including heavy metals and non-metals, cyanide, PAHs (USEPA 16), TPHs and asbestos.

Due to the proposed end use of the site two different categories for screening have been selected to account for the general residential with soft landscaping and the potential localised proposed allotments. At the time of writing, it is not known where the proposed allotments will be located and as such the entire site has been screened against both an *Allotment* and *Residential with home grown produce* end use scenario. Residential Generic Assessment Criteria (GAC) for 6% SOM for Made Ground and 1% SOM for natural soils are presented within the following sections.

3.2 PAH and TPH Contamination

During the 2022 ground investigation elevated concentrations of polycyclic aromatic hydrocarbons were recorded within five samples obtained from Made Ground soils, with respect to the nominated GAC. Additionally, elevated Total Petroleum Hydrocarbons were recorded within one sample obtained from Made Ground soils. The findings are summarised below in Table 1 and 2.

Table 1 – 2022 Ground Investigation PAHs and TPH Exceedances in Relation to 'Allotment' GACs (S4ULs).

Exploratory Hole I.D.	Depth (m bgl)	Determinant	Exceedance (mg/kg)	GAC mg/kg (6%)
WS01	0.50	Benzo(a)anthracene	18.5	13
		Benzo(a)pyrene	12.5	3.5
		Benzo(b)fluoranthene	12	3.9
		Dibenzo(ah)anthracene	1.57	0.43
WS04B	0.20	Benzo(a)pyrene	6.51	3.5
		Benzo(b)fluoranthene	7.08	3.9
		Dibenzo(ah)anthracene	0.82	0.43
WS07A	0.20	Benzo(a)pyrene	5.77	3.5
		Benzo(b)fluoranthene	5.33	3.9
		Dibenzo(ah)anthracene	0.75	0.43
WS14	0.20	Benzo(a)pyrene	4.09	3.5
		Dibenzo(ah)anthracene	0.47	0.43
WS01	0.50	Aromatic TPH EC12 – EC16	249	130

Table 2 – 2022 Ground Investigation PAHs Exceedances in Relation to 'Residential with Homegrown Produce' GACs (S4ULs).

Exploratory Hole I.D.	Depth (m bgl)	Determinant	Exceedance (mg/kg)	GAC mg/kg (6%)
WS01	0.50	Benzo(a)anthracene	18.5	13
		Benzo(a)pyrene	12.5	3
		Benzo(b)fluoranthene	12	3.7
		Dibenzo(ah)anthracene	1.57	0.3
WS04B	0.20	Benzo(a)pyrene	6.51	3
		Benzo(b)fluoranthene	7.08	3.7

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Exploratory Hole I.D.	Depth (m bgl)	Determinant	Exceedance (mg/kg)	GAC mg/kg (6%)
		Dibenzo(ah)anthracene	0.82	0.3
WS07A	0.20	Benzo(a)pyrene	5.77	3
		Benzo(b)fluoranthene	5.33	3.7
		Dibenzo(ah)anthracene	0.75	0.3
WS08	0.25	Dibenzo(ah)anthracene	0.39	0.3

3.3 Metal and Semi-Metal Contamination

During the 2022 ground investigation a range of elevated concentrations of metals and semi metals were recorded with Made Ground soils. The findings are summarised below in Table 3 and 4.

Table 3 – 2022 Ground Investigation Metal & Semi-Metal Exceedances in Relation to 'Allotment" GACs (Made Ground)

Exploratory Hole I.D.	Depth (m bgl)	Determinant	Exceedance (mg/kg)	GAC mg/kg (6%)
WS01	0.50	Cadmium	5.7	1.8
		Lead	548	80
		Zinc	2870	620
WS01	2.8	Cadmium	1.9	1.8
WS02	0.50	Cadmium	6.1	1.8
		Chromium VI	2	1.8
		Lead	389	80
		Nickel	88	53
		Zinc	4990	620
WS04B	0.20	Cadmium	20.2	1.8
		Chromium VI	2	1.8
		Lead	489	80
		Zinc	14900	620
WS07A	0.20	Cadmium	2.8	1.8
		Lead	2380	80
WS08	0.25	Cadmium	3.6	1.8
		Lead	2980	80
		Copper	579	520
		Zinc	3250	620
WS09	0.50	Cadmium	4.3	1.8
		Lead	445	80
		Copper	679	520
		Zinc	960	620
WS10	0.30	Cadmium	5	1.8
		Lead	562	80
		Zinc	1680	620
WS11A	0.50	Lead	238	80
		Copper	735	520
WS12	0.30	Cadmium	3.4	1.8

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Exploratory Hole I.D.	Depth (m bgl)	Determinant	Exceedance (mg/kg)	GAC mg/kg (6%)
		Lead	212	80
		Copper	721	520
WS13	0.20	Lead	180	80
WS114	0.20	Cadmium	2.6	1.8
		Lead	849	80
WS114A	0.50	Lead	657	80

Table 4 – 2022 Ground Investigation Metal & Semi-Metal Exceedances in Relation to 'Allotment" GACs (Natural Soils)

Exploratory Hole I.D.	Depth (m bgl)	Determinant	Exceedance (mg/kg)	GAC mg/kg (1%)
WS13	1.70	Lead	154	80

Table 5 – 2022 Ground Investigation Metal & Semi-Metal Exceedances in Relation to 'Residential with Homegrown Produce' GACs.

Exploratory Hole I.D.	Depth (m bgl)	Determinant	Exceedance (mg/kg)	GAC mg/kg (6%)
WS01	0.50	Lead	548	200
WS02	0.50	Arsenic	40	35 / 40
		Lead	389	200
		Zinc	4990	3700
WS04B	0.20	Cadmium	20.2	10
		Lead	489	200
		Zinc	14900	3700
WS07A	0.20	Lead	2380	200
WS08	0.25	Lead	2980	200
WS09	0.50	Lead	445	200
WS10	0.30	Lead	562	200
WS11A	0.50	Lead	238	200
WS12	0.30	Lead	212	200

3.4 Asbestos Contamination

During the 2022 ground investigation suspected asbestos was identified within a cement roof, within "Archway 4". Suspected asbestos containing materials may also be present as material coverings for windows within "Archway 6".

All soil samples obtained during the ground investigation were screened for asbestos. During laboratory analysis, one sample (WS14 at 0.20m bgl) was positively identified as containing asbestos comprising amosite loose fibres. Subsequently, asbestos quantification was undertaken on this sample which confirmed the concentration of asbestos was <0.001% $^{w}/_{w}$. The findings are summarised below in Table 3.

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Table 6 – 2022 Ground Investigation Asbestos Quantification

Exploratory Hole I.D.	Depth (m bgl)	Strata	Asbestos Type	Bulk Fibre (% $^{w}/_{w}$)
WS14	0.20	Made Ground	Amosite Loose Fibres	<0.001

3.5 Ground Gas

A total programme of six gas monitoring visits gas were undertaken between the 12th May 2022 and 5th July 2022 in various atmospheric conditions. Monitoring has been undertaken in a range of atmospheric conditions, including rising and falling barometric state. It is considered that a representative dataset has been obtained.

Methane concentrations were recorded below the instruments limit of detection within all boreholes across the monitoring programme. The greatest concentration of carbon dioxide was recorded in in WS08 on the fourth monitoring visit at 3.5% $^{v}/_{v}$.

The assessment, in accordance with BS8485:2019 determined a hazardous gas flow rate (Q_{hg}) of 0.0035l/hr for carbon dioxide. Using the Q_{hg} for carbon dioxide as the gas screening value (GSV) for the site, the site was classified was a Characteristic Situation 1 (CS-1) gas regime, therefore not requiring ground gas protection measures.

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4 CONCEPTUAL SITE MODEL

A Conceptual Site Model (CSM) for the site has been developed as part of the Curtins site investigation(s) that was undertaken at the site and considered based on the current works proposed.

The CSM details a number of pollutant linkages at the site, however, based on the risk assessments undertaken, the potential contaminant linkages (PCLs) listed in *Table 4* were identified as requiring remediation to enable the safe re-development of the site.

Table 7 – Potential Contaminant Linkages

PCL	Sources	Receptor	Risk	Potential Pathway	Remediation Recommended
1	Made Ground soils containing elevated concentrations of asbestos fibres and buildings contains potential asbestos containing materials (ACM).	**On-Site** Construction workers	**Moderate/ Low**	Direct contact, dermal uptake, soil and dust ingestion and inhalation of dust and fibres.	Undertake a demolition asbestos survey of buildings/structures located on-site. Appropriate PPE for construction staff and suitable asbestos management measures during construction, detailed in an Asbestos Management Plan.
2		**On-Site** Residents and staff	**Moderate/ Low**	Direct contact, dermal uptake, soil and dust ingestion and inhalation. Inhalation of dust and fibres	Provision of a suitable thickness of clean inert cover in all areas of soft landscaping, allotments, and tree pits as part of future development works.
3		**Off-Site** Residents and passers-by.	**Moderate/ Low**	Dust / fibre release and migration off-site, followed by inhalation of dust and fibres	Suitable asbestos management measures during construction detailed in an Asbestos Management Plan.
4	Made Ground soils containing elevated concentrations of Polycyclic Aromatic Hydrocarbons (PAHs), lead and arsenic in relation to *Residential with home grown produce GAC.* Made Ground soils containing elevated concentrations of Polycyclic Aromatic Hydrocarbons (PAHs), Total Petroleum Hydrocarbons (TPHs), lead, arsenic, cadmium, chromium VI, Nickel, Zinc and Copper in relation to *Allotment* GAC.	**On-Site** Construction workers.	**Moderate/ Low**	Direct contact, dermal uptake, soil and dust ingestion and inhalation.	Appropriate PPE for construction staff. Construction and Environmental Management Plan to be used during construction works.
5		**On-Site** Residents and staff, and allotment grown produce	**Moderate/ Low**	Direct contact, dermal uptake, soil and dust ingestion and inhalation.	Provision of a suitable thickness of clean inert cover in all areas of soft landscaping, allotments, and tree pits as part of future development works.
6		**Off-Site** Residents and passers-by.	**Moderate/ Low**	Soil and dust migration followed by direct contact, ingestion and inhalation.	Construction and Environmental Management Plan to be used during construction works.

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Section 7.0 presents a strategy for handling unexpected contamination or contaminative incidents. It is further recommended that watching brief/periodic site visits are undertaken by a Geo-Environmental Engineer to record any unexpected contamination as outlined in Section 7.3.

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5 REMEDIAL WORKS

With reference to the conceptual site model and the potential contaminant linkages detailed in Table 4 remedial actions are recommended in order for the site to be brought up to a condition that is deemed 'suitable for use'. Recommendations are also made for further works:

- **Remedial Action 1:** Suitable contamination and asbestos management measures during construction.
- **Remedial Action 2:** Installation of a suitable thickness of clean inert cover in all areas of soft landscaping.

5.1 Remedial Action 1 – Contamination and Asbestos Management During Construction

Under current health and safety legislation, employers are required to carry out their own appropriate risk assessments and mitigation to protect themselves and their employees, other human receptors and the environment from potential contamination. Such risks must be adequately mitigated by law, specifically the Construction Design Management (CDM) Regulations, 2015 which require that potential risks to human health and the environment from construction activities are appropriately identified and all necessary steps taken to eliminate / manage that risk.

It has been assumed that any future construction works on site will be undertaken in compliance with these requirements to address PCLs 1, 3, 4 and 6 (*Table 4*).

CL:AIRE have published guidance to aid in the classification of remediation works on Asbestos Containing Soils (ACS) compliant with Control of Asbestos Regulations 2012 (CAR). This is detailed in CL:AIRE (2016) "Control of Asbestos Regulations 2012 - Interpretation for Managing and Working with Asbestos in Soil and Construction and Demolition Materials: Industry Guidance.

Any works with asbestos containing soils are required to determine their classification in accordance with Control of Asbestos Regulations 2012. The specialist groundworks contractor is therefore to designate the works based on the investigation results but utilising their own additional testing and delineation if they deem it to be required. Subsequently the specialist groundworks contractor is to compile a method statement to establish an appropriate management, monitoring and supervisory procedure for the movement of soils. The specialist remediation contractor is to be responsible for management and record keeping as detailed in their method statement document.

Where, from the site investigations, materials are known to contain asbestos fibers good practice (JIWG CAR-Soil and CAR 2012) prescribes such material to be segregated to ensure materials would not cross-contaminate other soils and to reduce the risk of further fiber release to site workers.

Table 3 in *Section 3* and *Table 4* in *Section 4* above should be consulted together with Curtins Exploratory Hole Plan Drawings in *Appendix A* (Ref. 077442-CUR-00-XX-DR-GE-002).

Concentrations of asbestos fibres encountered within one sample of Made Ground soil by IFA was relatively low at <0.001% w/w. Materials containing asbestos >0.1% w/w would be classed as hazardous waste.

Good practice prescribes that any fragments or asbestos containing materials where identified should be picked where possible and to be kept separated in line with those from any soil arisings. This is typically carried out by picking visible fragments at the point of excavation. Such operations are carried out by suitably qualified staff, wearing disposal overalls (type 5/6), gloves and fine dust (FPP3) masks in combination with adoption of dust suppression techniques and monitoring or other applicable methods as recommended by the Asbestos Management Specialist. The qualified staff are to be trained in the identification of asbestos at source. The qualification and competencies of all operatives undertaking monitoring and calibration documentation of equipment should be provided to the Engineer.

It may be possible to use Made Ground soils as general fill subject to in situ trial tests and where managed appropriately by the Method Statement compiled by the Asbestos Management Specialist.

An asbestos survey should be undertaken for existing buildings/units and the risk appropriately managed by the contractor.

5.2 Remedial Action 2 – Engineered Capping

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The primary PCL identified at the site relates to the direct contact, dermal uptake, soil and dust ingestion and inhalation of asbestos fibres in soil and soils and soil derived dust, and elevated concentrations of PAHs, lead and arsenic in Made Ground soils (PCL2 and PCL5 in *Table 4*).

The primary PCL identified at the site relates to the direct contact, dermal uptake, soil and dust ingestion and inhalation of asbestos fibres in soil and soil derived dust, and elevated concentrations of PAHs, TPHs, lead, arsenic, cadmium, chromium VI, nickel, zinc and copper.

The potential for exposure to asbestos fibres and PAH or metal contaminated soils is highest within soft landscaped areas where receptors (maintenance staff and public) at the site are most likely to come in contact with the contaminated Made Ground soils. Additionally, the potential for soil and dust ingestion of elevated concentrations of PAHs, TPHs, heavy metals and semi metals is highest within the proposed allotment area where receptors (residents) are most likely to come into contact with Made Ground soils.

Hardstanding, including the building footprints, vehicular tarmac, pedestrian tarmac and concrete and block paving are considered sufficient to break the potential contaminant linkage, PCL2 and PCL5 detailed in *Table 4* and therefore no specific remediation measures, above activities required for construction, are considered necessary if and where these are installed at the site.

For all soft landscaped areas and allotments, a clean cover layer is recommended. It is therefore recommended that verified clean capping, is installed, as detailed in Table 5.

Table 8 - Capping Thickness Requirements

Soil Type	Allotments	Soft Landscaping	Tree Pits
Topsoil	Minimum 150mm*	Minimum 150mm*	Minimum 150mm*
Subsoil	450mm**	300mm**	750mm**
Geotextile membrane	High visibility geotextile membrane required beneath sub-soil	High visibility geotextile membrane required beneath sub-soil	Not required
Total Capping Thickness	**Minimum 600mm**	**Minimum 450mm**	**Minimum 900mm**

* Minimum thickness of topsoil to be used in all areas. Additional topsoil may be used where landscape architect specification indicates this is required.
** Where additional topsoil is utilised, the resultant thickness of subsoil may be reduced to meet the minimum capping requirements.

This is anticipated to provide adequate protection of human health with consideration of likely exposure and is in accordance with Manchester City Council's Planning & Contaminated Land Technical Guidance (2021) and should be incorporated in all proposed soft landscaped areas.

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6 SPECIFICATION FOR SITE WON AND IMPORTED SOILS

This section outlines the required chemical testing specification that the proposed engineered capping must meet to satisfy Remedial Action 2 along with a chemical testing specification.

6.1.1 Off-Site Sources

It is anticipated that materials may be imported to the site for use in constructing the clean engineered capping across the site's soft landscaping areas. It is strongly recommended that materials are sourced from reputable suppliers and comprise materials that have been suitably processed to produce standardised materials.

It is not recommended that materials are imported directly from 'donor' development sites. Imported material will also require verification testing to ensure suitability for reuse, and it is strongly advised that the Contractor undertake their own independent verification testing if accepting material from a third party, rather than relying on supplier reports.

It is anticipated that crushed hardcore stone and brick may be imported for use in earthworks such as in construction of piling mat.

6.1.2 On-site Sources

Based on the findings of the Site Investigation, it is considered highly unlikely that the general shallow Made Ground could be considered 'uncontaminated', 'clean' or 'suitable' material for re-use as a subsoil or topsoil in soft landscaped areas due to the presence of asbestos fibres, PAHs, lead and arsenic at a number of locations across the site, as well as due to the physical natures of the existing site soils.

6.2 Imported Topsoil

Imported Topsoil will invariably be required and should be supplied and placed in accordance with the Architects' specification but generally it is anticipated that all topsoil will be a minimum of 150mm thick in proposed soft landscaped areas (as part of the 600mm overall layer thicknesses as detailed in *Section 5.0*). Where topsoil is imported, it is to be 'Multipurpose' in accordance with BS 3882:2015 'Specification for Topsoil and Requirements for Use'.

The topsoil should also be confirmed to be 'suitable for use' as per the analysis outlined in *Section 6.5*

6.3 Imported Subsoil

Where imported subsoil is required as part of the growing medium this can be cohesive or granular but should be free-draining and confirmed to be 'suitable for use' as per the analysis outlined in Section 6.4 and compliant with BS8601:2013 'Specification for subsoil and requirements for use'.

6.4 Chemical Composition of Soils

All materials used in capping should not contain concentrations of contaminants that present an unacceptable risk to the health of future site occupants or off-site receptors.

The Contractor shall be responsible for demonstrating that imported material is 'clean' and therefore suitable for use as part of the engineered capping or else as fill material. This will include the recovery of samples for laboratory testing from both the material source and verification testing of material following delivery to site. The required testing frequencies for materials source types are detailed below. Other sources may be applicable, however testing frequencies shall be confirmed with the Engineer prior to acceptance.

Table 9 - Environmental Chemistry Testing Frequency for Soils

Imported Soils	Testing Frequency
Greenfield	On Site Verification: One sample every 200m^3 used (or a minimum of 3 No. samples, whichever is greater), testing to be undertaken once material is imported to site.

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Imported Soils	Testing Frequency
Remediated Soils	On Site Verification: One sample every 100m^3 used (or a minimum of 3 No. samples, whichever is greater), testing to be undertaken once material is imported to site.
Brownfield	On Site Verification: One sample every 50m^3 used (or a minimum of 3 No. samples, whichever is greater), testing to be undertaken once material is imported to site.

The environmental chemistry testing requirements and frequency are as detailed in Table 6 and Table 7. Additions to the suite and frequency of sampling may be required based on the source of imported materials. For example, if the imported Topsoil is not naturally sourced, e.g., recycled soil, or from a brownfield site, further chemical determinants may be added to the chemical analysis suite at the discretion of the Engineer.

Table 10 - Environmental Chemistry Analysis Suite for Soils

Suite Reference	Environmental Chemistry Analysis
Greenfield, Brownfield or Remediated Soils	Total metals: Arsenic, cadmium, chromium, chromium VI, lead, mercury, selenium, copper, nickel, zinc, water soluble boron; pH Soil Organic Matter Asbestos Screening Polycyclic Aromatic Hydrocarbons by GC-MS (Detection Limit 0.1mg/kg for each compound) Total Petrol Hydrocarbons (Full TPHCWG analysis – aromatic/aliphatic split, Detection Limit 0.01mg/kg for each banding C5 to C10 and 1mg/kg for bandings above C10)

Assessment criteria: Concentrations of the above determinants shall not exceed the 'Residential without Home Grown Produce' screening criteria or 'Allotments' in soft landscaping and allotments respectively (contained within Appendix B).

Definition of 'clean': Where ALL concentrations are less than these values the soils shall be defined as 'clean'. No asbestos shall be detected in soils described as 'clean'.

Soil organic matter (SOM): A review of the thresholds may be made for specific soil sources whereby the Soil Organic Matter ranges.

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7 STRATEGY FOR HANDLING POTENTIALLY CONTAMINATED SOILS AND CONTAMINATIVE INCIDENTS ON SITE

7.1 Contaminated Soils

Surplus soils to be removed from site, which have been identified as unsuitable for re-use should be loaded onto a lorry, covered securely, and transported directly to the landfill facility.

Where stockpiling is unavoidable, the stockpile should be located on an impermeable membrane and be covered also with a low permeability membrane at the end of each working day. Where soils are wet when excavated, measures should be taken to ensure there is no runoff from the soils onto the surrounding soils.

Duty of Care: Under his duty of care, the Principal Contractor shall ensure the proper and safe disposal of waste from each site after it has been passed on to another party. In this respect details of the landfill facility to be used and the company disposing of the waste with regard to hazardous and non-hazardous waste shall be provided to the Site Manager. Copies of Consignment Notices for special waste and Waste Transfer Notes for hazardous and non-hazardous waste shall be kept on site for review by Curtins Consulting.

7.2 Contaminative Incidents

It is possible, however unlikely, that some below ground features / structures exist that have not been recorded on plans and have not been encountered during the ground investigation works. It is possible that unknown/unrecorded substructures (e.g. fuel tanks) may exist which if ruptured may release materials that could contaminate the surrounding soils and groundwater (petroleum hydrocarbons, solvents, for example). In the unlikely event that this occurs an outline strategy is detailed below.

Where such a tank/pipework is damaged during excavation and the contents are released into the surrounding soil, the tank/pipework should be immediately pumped dry into another suitable container and a trench with a low permeability base formed around the tank/pipework to prevent seepage laterally and to collect the contaminant. Where groundwater is encountered in the trench, it should be pumped into a suitable container and tested for the contaminant. All soils affected shall then be tested and removed from site as appropriate.

Where the damage is caused to the underside of a tank and seepage is vertical, the contaminants may present a risk of polluting the groundwater. In this instance and subject to the findings of a risk assessment boreholes may be required to prove and intercept the contaminant. The contaminant will then be pumped into suitable containers.

The procedure outlined in *Section 7.3* should also be adhered too and the Engineer shall approve all proposals for such remediation.

7.3 Unexpected Contamination & Watching Brief

In the event that material is revealed on the site of a nature that does not accord with the previously observed and recorded descriptions, including the potential presence of previously uncharacterised asbestos contamination, the following procedure is to be complied with.

1. Cease and make safe all excavations in this location and report observations to the Site Manager.
2. The Site Manager is to notify the Engineer.
3. Under guidance of the qualified Engineer take representative samples of the suspect materials and forward to a suitably accredited laboratory for analysis.
4. Manchester City Council's Contaminated Land Planning Officer and if relevant the Environment Agency are to be kept fully informed of any such occurrences. The Contaminated Land Planning Officer must agree the strategy for dealing with unexpected contamination before works continue in that area.
5. Await Engineers instructions with respect to re-commencement of the works and or removal from of suspect material to a suitably licensed disposal facility.

Records of any unexpected contamination must be included within the Remediation Completion Report.

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7.4 Health & Safety

This section details health and safety requirements associated with contaminated land but does not seek to cover all aspects to be managed by the Contractor under CDM Regulations and detailed in Method Statements.

The works are likely to generate soils, dust, potentially asbestos containing materials/soils, groundwater, and other materials that may be a risk such as petroleum hydrocarbons and other related chemicals. The Contractor shall incorporate in its health and safety plan provisions for protecting personnel from physical and chemical hazards associated with these materials. The health and safety plan should also incorporate personnel decontamination requirements and facilities.

7.4.1 Contractor Method Statements

The Contractor is required to prepare method statements relating to the separate tasks highlighted and provide these to the client or Principal Designer along with the Engineer for review prior to the commencement of the related works.

The Contractor shall induct all its employees and subcontractors into the relevant aspects of their health and safety plan and method statements prior to each employee and/or subcontractor commencing works on site.

No works shall commence until the clients' nominated Principal Designer has approved the task specific method statement.

7.5 Environmental Controls

Environmental Controls are the responsibility of the Contractor. However, in general this section details specific requirements for potentially contaminated soils and is not intended to cover all aspects to be managed by the Contractor and detailed within their Method Statements.

Without limiting the Contractor's obligations, it shall be their responsibility to comply with all applicable laws, regulations and rules relating to potential contamination with regard to:

- Surface water run-off.
- Airborne particulates/vapours/odour; including asbestos containing materials and fibres, and,
- Control of spillages.

Method statements are to be provided to the Engineer and should incorporate the environmental management measures pertaining to the above factors, with further detail given below.

7.5.1 Surface Water Run-Off

The Contractor is responsible for ensuring that site surface water run-off does not leave the site.

The Contractor is to provide for necessary surface water diversion systems as required to keep the construction area free from excess surface or groundwater that may interfere with the works.

All personnel engaged by the Contractor should be trained in response techniques (e.g., use of absorbent materials, etc.) to ensure that any surface water run-off with fuel leakage impact or associated potentially contaminated soil is managed appropriately.

7.5.2 Airborne Particles/Vapour/Odour

The Contractor is responsible for the implementation of dust suppression in work areas, using water or other means of suppression that are not considered harmful to the environment. The Contractor should also set out procedures for the mitigation of any potential odours that may arise from exposed contaminated soils that could affect off-site users (adjacent residents).

An Asbestos Management Plan must be in place during demolition, earthworks and construction works, to inform procedures and mitigation measures to be implemented during excavation and removal of asbestos containing materials.

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7.5.3 Control of Spillage

During the phase of works, any type of spillage (including fabricating, hydraulic oils, fuels and/or other materials) should be immediately contained, removed, and disposed of, with any further surrounding areas cleaned.

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8 VERIFICATION

Validation visits shall be undertaken by an appropriately qualified environmental engineer throughout the construction phase to ensure that the requirements of the Remediation Strategy have been implemented at the site. This includes periodic visits/watching brief during groundworks. It is anticipated records of the following will be taken during the below phases of work:

- Placement of the requisite of clean capping material in required areas of proposed soft landscaping, including soil chemical analysis results at the required testing frequencies for an appropriate chemical analysis suite, as detailed in Section 6.
- Documentation of general works including records from watching brief, asbestos management procedures, construction and environmental management plan during the works and records of contaminative incidents and any unexpected contamination.

All associated documentation pertaining to the above will be supplied to the Engineer and incorporated within a Completion Report.

Confirmatory analysis is required to confirm the suitability of any imported material, the results of which will be included within the Completion Report. Any additional, confirmatory testing will also be included herein.

Verification through either hand excavated trial pits or comparison of reduced and final level surveys will all be included within the Completion Report to confirm the provision of replaced topsoil.

The frequency and timing of visits by Curtins shall be determined following confirmation of the construction phase programme and the chosen protection elements.

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9 REPORTING

A Completion Report will be required on completion of the works confirming that the remedial works have been completed satisfactorily. The report will contain information including the following:

- Confirmation that the capping has been installed as specified within the various proposed soft landscaped areas, including capping thickness validation records and photographs and record of the high visibility membrane incorporated in required soft landscaped areas;
- Confirmation of imported capping materials suitability for allotments, soft landscaped areas and tree pits including environmental chemistry testing results;
- Records of waste transfer notes and consignment notes for contaminated material disposed of off-site.
- Details and documentation of asbestos management measures utilised during the works;
- Confirmation that the remediation has been undertaken satisfactorily and in accordance with the Remediation Statement;
- Confirmation that the remediation objective has been achieved (see *Section 5.0*);
- Details of any unexpected contamination encountered on site and appropriate measures taken to respond; and

Revised conceptual model showing no potentially significant contaminant linkages remain at the site.

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APPENDICES

Appendix A – Drawings

Appendix B – Screening Criteria for Imported Materials

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Appendix A - Drawings & Specifications

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3. All dimensions are in millimetres unless otherwise stated.
4. All setting out, levels and dimensions to be agreed on site.
5. The dimensions of all materials must be checked on site before being laid out.
6. This drawing must be read with the relevant specification clauses and detail drawings.
7. Order of construction and setting out to be agreed on site.

KEY

- Existing Levels Retained
- Proposed Levels
- Gradient
- Proposed Drainage — Refer to engineer's specifications

Revision	Date	Description	Drawn	Apprvd.
S1-P06	12-01-24	Update to Levels	EKH	KR
S1-P05	04-08-23	Stage 4 Draft Issue	EKH	KR
S1-P04	23-02-23	Stage 3	EKH	KR
S1-P03	13-02-23	Stage 3	EKH	KR
S1-P02	22-03-21	Updated arrangement as part of water safety strategy	CS	GB
S1-P01	08-02-21	First Issue	CS	GB

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Client Embassy

Project Embassy Village

Drg Title Levels Plan

Created on	Created by	Approved by
08/02/2021	CS	GB

Scale	Size	Workstage
1:250	A1	Stage 4

Drg No.	Suitability	Revision
2596-PLA-XX-XX-DR-L-3000	S1	P06

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KEY

S1 **Self Binding Gravel**
50mm depth
Product: Breedon Golden Amber Gravel
Sizes: 12mm
Colours/Finish:Golden
Supplier: Breedon
Bedding and sub base to engineers details and specification.

S2 **Resin Bound Gravel**
Product: Sureset Resin System
Supplier: Sureset
Colour: Aztec Gold
Size: 6mm

S3 **CLAY PAVING**
Product: Novedon DF
Sizes: 65mm(W)x200mm(L)x85mm(D)
Colour/Finish: Standard
Laid:Herringbone pattern
Bedding and sub base to engineers details and specification.
Supplier: Handscape

S4 **Small Unit Permeable Concrete Block Paving**
Product: Hydropave Fusion Duo
Colours: Silver
Finish:Ground Textured
Sizes: 208 (W) x 173 (L) x 60mm (D).
Bond: Stretcher bond.
Supplier: Tobermore

S5 **Large Unit Permeable Concrete Block Paving**
Product: Hydropave Textured Flags
Colours: Natural
Finish:Ground Textured
Sizes: 400(W) x 400(L) x 65mm (D)
Bond: Stretcher bond.
Supplier: Tobermore

S6 **Loose Gravel**
(200mm strip to protect canal wall)
Product: Breedon Buff
Colours: Buff
Sizes: 4/10mm
Supplier: Breedon

S7 **Artificial Turf**

S8 **RUBBER CRUMB SPORTS PITCH**

S9 **Existing cobble paving retained**

S10 **Tarmac**

Revision	Date	Description	Drawn	Apprvd.
S1-P07	12-01-24	Updates to Key	EKH	KR
S1-P06	04-08-23	Updates to Key	EKH	KR
S1-P05	14-03-23	Updates to Key	EKH	KR
S1-P04	22-02-23	Updates to Hardworks	EKH	KR
S1-P03	13-02-23	Stage 3	EKH	KR
S1-P02	22-03-21	Updated arrangement as part of water safety strategy	CS	GB
S1-P01	08-02-21	First Issue	CS	GB

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Client Embassy

Project Embassy Village

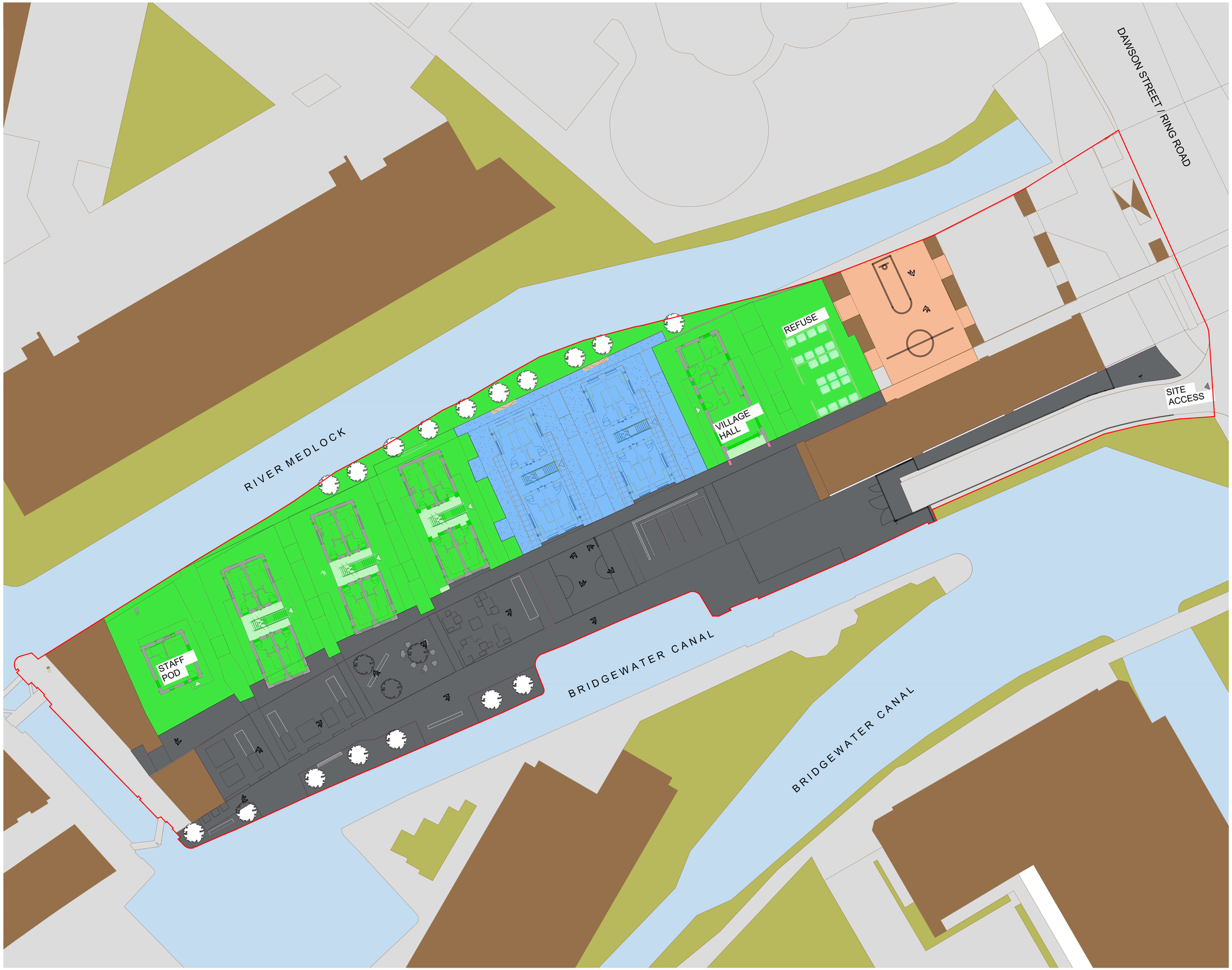
Drg Title Hardworks General Arrangement

Created on	Created by	Approved by
08/02/2021	CS	GB

Scale	Size	Workstage
1:250	A1	Stage 4

Drg No. 2596-PLA-XX-XX-DR-L-1000
Suitability S1
Revision P07

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This drawing contains the following model files: -

13095-AEW-XX-XX-M3-A-0005

CDM 2015

Client notified of duties: **06/09/22**

Principal Designer: **C-CDM Services**

Unless noted below, all known hazards have been highlighted on the drawing:

N

- Phase 1 works staff pod. 3 No. accommodation pods, village hall
- Area to be temporarily finished as tarmacadam to provide safe access to development, whilst awaiting Phase 3 landscaping works
- Future Stage - Hoarding Required
- Future Stage

Rev	Date	Description	Drawn by	Checked By
P02	22/03/24	Grey area description updated.	LK	BS
P01	05/12/23	Initial Issue	JFS	BS

Status: S2 — Purpose of Issue: For Information

drawing stage: **STAGE 4 / Co-ordination**

client: **Embassy Village**

project: **Embassy Village**

drawing title: **Proposed Phasing Plan - Phase 1**

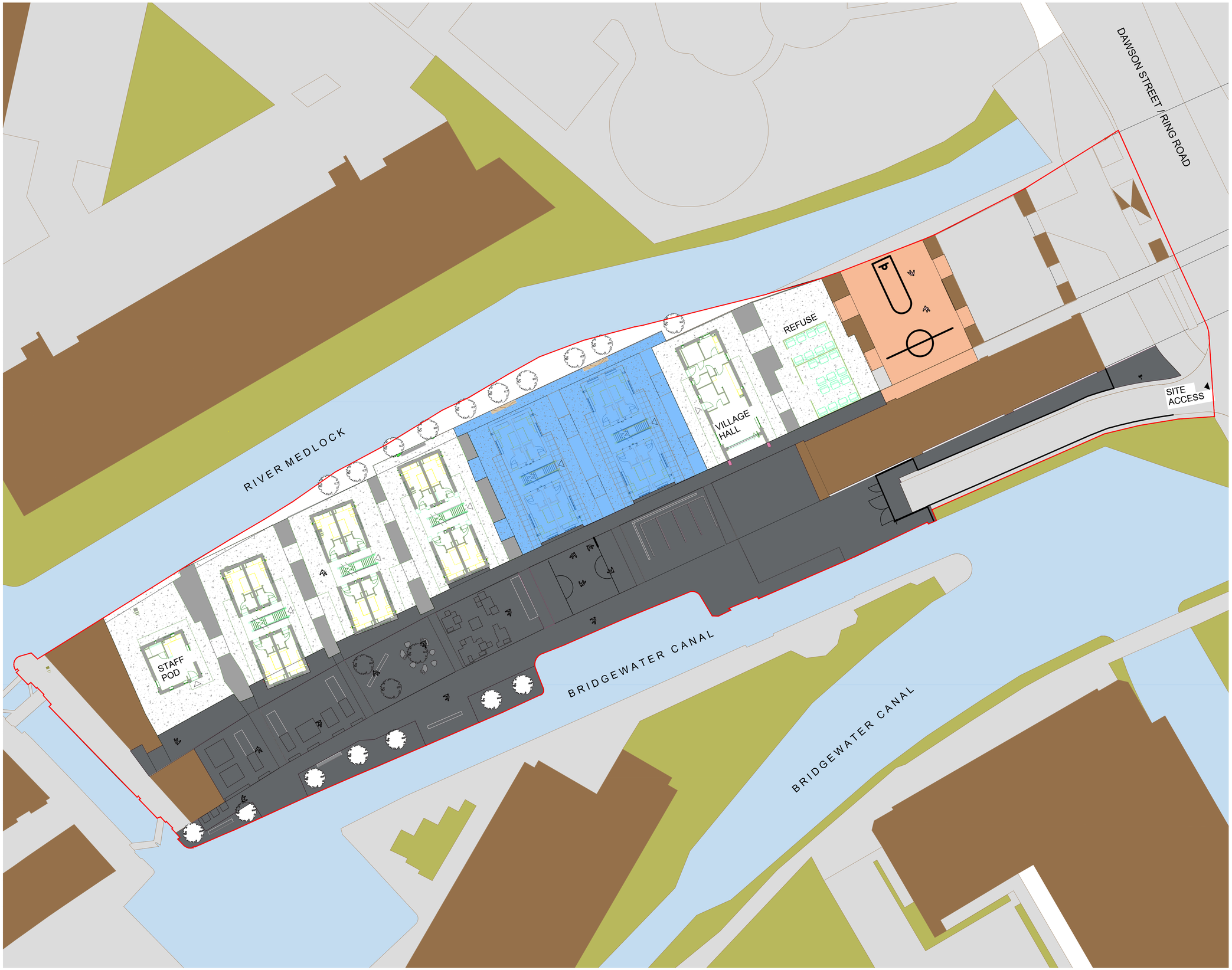
date: 29/11/23 — drawn: JFS

scale @ A1: 1 : 250 — checked: BS

Rev: **P02**

Dwg No: **13095-AEW-SI-00-DR-A-1013**

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13095-AEW-XX-XX-M3-A-0005

CDM 2015

Client notified of duties: **06/09/22**

Principal Designer: **C-CDM Services**

Unless noted below, all known hazards have been highlighted on the drawing:

N

Area to be temporarily finished as tarmacadam to provide safe access to development, whilst awaiting Phase 3 landscaping works

Future Stage - Hoarding Required

Future Stage

Rev	Date	Description	Drawn by	Checked By
P02	22/03/24	Grey area description updated.	LK	BS
P01	05/12/23	Initial Issue	JFS	BS

Status: S2 — Purpose of Issue: For Information

drawing stage: **STAGE 4 / Co-ordination**

client: **Embassy Village**

project: **Embassy Village**

drawing title: **Proposed Phasing Plan - Phase 2**

date: 29/11/23 — drawn: JFS

scale @ A1: 1 : 250 — checked: BS

Rev **P02**

Dwg No **13095-AEW-SI-00-DR-A-1013**

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This drawing contains the following model files: -

13095-AEW-XX-XX-M3-A-0005

CDM 2015

Client notified of duties: **06/09/22**

Principal Designer: **C-CDM Services**

Unless noted below, all known hazards have been highlighted on the drawing:

Phase 3 works
Landscaping

N

Rev	Date	Description	Drawn by	Checked By
P01	05/12/23	Initial Issue	JFS	BS

Status: S2 — Purpose of Issue: For Information

drawing stage: **STAGE 4 / Co-ordination**

client: **Embassy Village**

project: **Embassy Village**

drawing title: **Proposed Phasing Plan - Phase 3**

date: 29/11/23 — drawn: JFS

scale @ A1: 1 : 250 — checked: BS

Rev: **P01**

Dwg No: **13095-AEW-SI-00-DR-A-1015**

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Appendix B - Screening Criteria for Imported Materials

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Adopted Soil Generic Assessment Criteria
Sandy loam with 6% SOM

curtins

Contaminants	Residential with home grown produce	Residential without home grown produce	Allotments	Commercial	Public open space near residential housing POS_{resi}	Public park POS_{park}
Metals						
Beryllium	*1.7*	*1.7*	*35*	*12*	*2.2*	*63*
Boron	*290*	*11,000*	*45*	*240,000*	*21,000*	*46,000*
Cadmium	**10**[13] 22	**85**[13] 150	**1.8** 3.9	**230** 410	*120* 220	*560* 880
Chromium III	*910*	*910*	*18,000*	*8,600*	*1,500*	*33,000*
Chromium VI	*6* 21	*6* 21	*1.8* 170	*33* 49	*7.7* 21	*220* 250
Lead	200	310	80	2,300	630	1,300
Mercury *(elemental)*	**1**	**1**	**26**	**26**	*16*	**26**[8] [*30*]
Mercury (inorganic)	**170**	**240**	**80**	**3600**	*120*	*240*
Nickel	*130*[10]	*180*[10]	*53*[11]	*980*[10]	*230*	*800*
Vanadium	*410*	*1200*	*91*	*9000*	*2000*	*5000*
Copper	*2400*	*7100*	*520*	*68000*	*12000*	*44000*
Zinc	*3700*	*40000*	*620*	*730000*	*81000*	*170000*
Semi-Metals and non-metals						
Arsenic	**32**[12] 37	**35**[12] 40	**43**[12] 49	**640**[12] 640	*79* 79	*170* 170
Antimony		***550***		***7500***	***1500***	***3300***
Selenium	**350**	**600**	**120**	**13000**	*1100*	*1800*
Inorganic chemicals						
Cyanide	34	34	34	34	34	34
Organic contaminants						
Aliphatic risk banded hydrocarbons - TPHCWG method						
$EC_{>5}$ - EC_6	*160*	*160*	*3900*	*12000*	*600000*	*180000*
$EC_{>6}$ - EC_8	*530*	*530*	*13000*	*40000*	*620000*	*320000*
$EC_{>8}$ - EC_{10}	*150*	*150*	*1700*	*11000*	*13000*	*21000*
EC_{10}-EC_{12}	*760*	*770*	*7300*	*47000*	*13000*	*24000*
EC_{12}-EC_{16}	*4300*	*4400*	*13000*	*90000*	*13000*	*26000*
$EC_{>16}$ - EC_{35}	*110000*	*110000*	*270000*	*1800000*	*250000*	*490000*
$EC>_{35}$ - EC_{44}	*110000*	*110000*	*270000*	*1800000*	*250000*	*490000*
Aromatic risk banded hydrocarbons - TPHCWG method						
$EC>_5$ - EC_7	*300*	*1400*	*57*	*86000*	*56000*	*92000*
$EC>_7$ - EC_8	*660*	*3900*	*120*	*180000*	*56000*	*100000*
$EC_{>8}$ - EC_{10}	*190*	*270*	*51*	*17000*	*5000*	*9300*
EC_{10} - EC_{12}	*380*	*1200*	*74*	*34000*	*5000*	*10000*
EC_{12} - EC_{16}	*660*	*2500*	*130*	*38000*	*5000*	*10000*
$EC_{>16}$ - EC_{21}	*930*	*1900*	*260*	*28000*	*3800*	*7800*
$EC_{>21}$ - EC_{35}	*1700*	*1900*	*1600*	*28000*	*3800*	*7900*
$EC>_{35}$ - EC_{44}	*1700*	*1900*	*1600*	*28000*	*3800*	*7900*
Aliph + Arom EC >44-70	*1900*	*1900*	*3000*	*28000*	3800	7900
Aromatic						
Benzene	**0.33** 0.87	**1.0** 3.3	**0.07** 0.18	**95** 98	*73* 140	*110* 230
Ethyl benzene	**350**	**840**	**90**	**2800**[8] [66000]	**2800**[8] [*25000*]	**2800**[8] [*27000*]
Toluene	**610**	**2700**	**120**	**4400**[8] [190000]	**4400**[8] [*56000*]	**4400**[8] [*100000*]
Xylene[9]	**230**	**290**	**160**	**2600**[8] [32000]	**2600**[8] [*43000*]	**2600**[8] [*31000*]
Phenol	**420**	**520**	**280**	**3200**[14] (38000)	**3200**[14] (*10000*)	**3200**[14] (*9300*)
Polycyclic Aromatic Hydrocarbons (PAH)						
Naphthalene	*13*	*13*	*24*	*1100*	*4900*	*3000*
Acenaphthylene	*920*	*6000*	*160*	*100000*	*15000*	*30000*
Acenaphthene	*1100*	*6000*	*200*	*100000*	*15000*	*30000*
Fluorene	*860*	*4500*	*160*	*71000*	*9900*	*20000*
Phenanthrene	*440*	*1500*	*90*	*23000*	*3100*	*6300*
Anthracene	*11000*	*37000*	*2200*	*540000*	*74000*	*150000*
Fluoranthene	*890*	*1600*	*290*	*23000*	*3100*	*6400*
Pyrene	*2000*	*3800*	*620*	*54000*	*7400*	*15000*
Benz(a)anthracene	*13*	*15*	*13*	*180*	*29*	*62*
Chrysene	*27*	*32*	*19*	*350*	*57*	*120*
Benzo(b)fluoranthene	*3.7*	*4.0*	*3.9*	*45*	*7.2*	*16.0*
Benzo(k)fluoranthene	*100*	*110*	*130*	*1200*	*190*	*440*
Benzo(a)pyrene	*3.0* 5.0	*3.2* 5.3	*3.5* 5.7	*36* 77	*5.7* 10	*13* 21
Indeno(123cd)pyrene	*41*	*46*	*39*	*510*	*82*	*180*
Dibenzo(ah)anthracene	*0.3*	*0.32*	*0.43*	*3.6*	*0.58*	*1.4*
Benzo(ghi)perylene	*350*	*360*	*640*	*4000*	*640*	*1600*
Chlorinated Aliphatic Hydrocarbons						
Vinyl chloride	*0.0014*	*0.0015*	*0.0018*	*0.12*	*3.5*	*5.4*
Trichloroethene (TCE)	*0.075*	*0.08*	*0.21*	*5.7*	*120*	*120*
1,1,1,2 Tetrachlorethane	*6.4*	*8.2*	*4.4*	*560*	*1400*	*2100*
Tetrachlorethene (PCE)	*0.90*	*0.92*	*3.6*	*95*	*1400*	*1500*
1,1,1 Trichlorethane	*39*	*40*	*240*	*3000*	*140000*	*100000*

Notes

1. All values above are in mg/kg
2. **Numbers in bold are SGVs or GAC that are derived based on SGV report input parameters**, *numbers in italics are S4ULs*, ***numbers in bold-italics are based on EIC/AGS/CL:AIRE numbers & input parameters*** and underlined numbers are C4SLs
3. Soil organic matter (SOM) is assumed to be 6% - DEFAULT VALUE
4. Soil type is assumed to be sandy loam - DEFAULT SOIL TYPE
5. For residential, the building type is conservatively assumed to be a small terrace house where the development includes bungalows change to more conservative bungalow setting in computer model
6. For commercial, the building type is conservatively assumed to be a pre 1970s office building, where the proposed development comprises houses, flat with living spaces changes setting in model accordingly
7. For classrooms consider increasing the dust loading fator in the 'Soil and Building Data' of the CLEA 1.04 model from 50 to 100µg m^{-3}
8. Based on vapour saturation limt as suggested by EA / [ ] model value
9. Lowest of o-, m- and p-xylene
10. Based on comparison of inhalation exposure with inhalation TDI
11. Based on comparison of oral, dermal, and inhalation exposure with the oral TDI
12. Based on a comparison of oral and dermal soil exposure with oral Index Dose only
13. Averaged over and based on lifetime exposure
14. Based on critical concentration for skin irritation in humans arising from contact with phenol in aqueous solution (number in brackets based on health effects following long term exposure for illustration)
15. NA: Not applicable

Adopted Soil Generic Assessment Criteria
Sandy loam with 2.5% SOM

curtins

Contaminants	Residential with home grown produce	Residential without home grown produce	Allotments	Commercial	Public open space near residential housing POS_{resi}	Public park POS_{park}
Metals						
Beryllium	*1.7*	*1.7*	*35*	*12*	*2.2*	*63*
Boron	*290*	*11,000*	*45*	*240,000*	*21,000*	*46,000*
Cadmium	**10**[13] 22	**85**[13] 150	**1.8** 3.9	**230** 410	*120* 220	*560* 880
Chromium III	*910*	*910*	*18,000*	*8,600*	*1,500*	*33,000*
Chromium VI	*6* 21	*6* 21	*1.8* 170	*33* 49	*7.7* 21	*220* 250
Lead	200	310	80	2,300	630	1,300
Mercury *(elemental)*	**1**	**1**	**26**	**26**	*16*	**26**[8] [*30*]
Mercury (inorganic)	**170**	**240**	**80**	**3600**	*120*	*240*
Nickel	*130*[10]	*180*[10]	*53*[11]	*980*[10]	*230*	*800*
Vanadium	*410*	*1200*	*91*	*9000*	*2000*	*5000*
Copper	*2400*	*7100*	*520*	*68000*	*12000*	*44000*
Zinc	*3700*	*40000*	*620*	*730000*	*81000*	*170000*
Semi-Metals and non-metals						
Arsenic	**32**[12] 37	**35**[12] 40	**43**[12] 49	**640**[12] 640	*79* 79	*170* 170
Antimony		***550***		***7500***	***1500***	***3300***
Selenium	**350**	**600**	**120**	**13000**	*1100*	*1800*
Inorganic chemicals						
Cyanide	34	34	34	34	34	34
Organic contaminants						
Aliphatic risk banded hydrocarbons - TPHCWG method						
$EC_{>5}$ - EC_6	*78*	*78*	*1700*	*5900*	*590000*	*130000*
$EC_{>6}$ - EC_8	*230*	*230*	*5600*	*17000*	*610000*	*220000*
$EC_{>8}$ - EC_{10}	*65*	*65*	*770*	*4800*	*13000*	*18000*
EC_{10}-EC_{12}	*330*	*330*	*4400*	*23000*	*13000*	*23000*
EC_{12}-EC_{16}	*2400*	*2400*	*13000*	*82000*	*13000*	*25000*
$EC_{>16}$ - EC_{35}	*92000*	*92000*	*270000*	*1700000*	*250000*	*480000*
$EC>_{35}$ - EC_{44}	*92000*	*92000*	*270000*	*1700000*	*250000*	*480000*
Aromatic risk banded hydrocarbons - TPHCWG method						
$EC>_5$ - EC_7	*140*	*690*	*27*	*46000*	*56000*	*84000*
$EC>_7$ - EC_8	*290*	*1800*	*51*	*110000*	*56000*	*95000*
$EC_{>8}$ - EC_{10}	*83*	*110*	*21*	*8100*	*5000*	*8500*
EC_{10} - EC_{12}	*180*	*590*	*31*	*28000*	*5000*	*9700*
EC_{12} - EC_{16}	*330*	*2300*	*57*	*37000*	*5100*	*10000*
$EC_{>16}$ - EC_{21}	*540*	*1900*	*110*	*28000*	*3800*	*7700*
$EC_{>21}$ - EC_{35}	*1500*	*1900*	*820*	*28000*	*3800*	*7800*
$EC>_{35}$ - EC_{44}	*1500*	*1900*	*820*	*28000*	*3800*	*7800*
Aliph + Arom EC >44-70	*1800*	*1900*	*2100*	*28000*	3800	7800
Aromatic						
Benzene	**0.16**	**0.49**	**0.035**	**50**	*72*	*100*
Ethyl benzene	**150**	**380**	**39**	**1200**[8] [35000]	**1200**[8] [*24000*]	**1200**[8] [*22000*]
Toluene	**270**	**1300**	**51**	**1900**[8] [110000]	**1900**[8] [*56000*]	**1900**[8] [*95000*]
Xylene[9]	**98**	**120**	**70**	**1200**[8] [14000]	**1200**[8] [*42000*]	**1200**[8] [*23000*]
Phenol	**290**	**420**	**140**	**1500**[14] (35000)	**1500**[14] (*10000*)	**1500**[14] (*8300*)
Polycyclic Aromatic Hydrocarbons (PAH)						
Naphthalene	*5.6*	*5.6*	*10*	*460*	*4900*	*1900*
Acenaphthylene	*420*	*4600*	*69*	*97000*	*15000*	*30000*
Acenaphthene	*510*	*4700*	*85*	*97000*	*15000*	*30000*
Fluorene	*400*	*3800*	*67*	*68000*	*9900*	*20000*
Phenanthrene	*220*	*1500*	*38*	*22000*	*3100*	*6200*
Anthracene	*5400*	*35000*	*950*	*540000*	*74000*	*150000*
Fluoranthene	*560*	*1600*	*130*	*23000*	*3100*	*6300*
Pyrene	*1200*	*3800*	*270*	*54000*	*7400*	*15000*
Benz(a)anthracene	*11*	*14*	*6.5*	*170*	*29*	*56*
Chrysene	*22*	*31*	*9.4*	*350*	*57*	*110*
Benzo(b)fluoranthene	*3.3*	*4.0*	*2.1*	*44*	*7.2*	*15*
Benzo(k)fluoranthene	*93*	*110*	*75*	*1200*	*190*	*410*
Benzo(a)pyrene	*2.7*	*3.2*	*2*	*35*	*5.7*	*12*
Indeno(123cd)pyrene	*36*	*46*	*21*	*510*	*82*	*170*
Dibenzo(ah)anthracene	*0.28*	*0.32*	*0.27*	*3.6*	*0.57*	*1.3*
Benzo(ghi)perylene	*340*	*360*	*470*	*4000*	*640*	*1500*
Chlorinated Aliphatic Hydrocarbons						
Vinyl chloride	*0.00087*	*0.001*	*0.001*	*0.077*	*3.5*	*5*
Trichloroethene (TCE)	*0.034*	*0.036*	*0.091*	*2.6*	*120*	*91*
1,1,1,2 Tetrachlorethane	*2.8*	*3.5*	*1.9*	*250*	*1400*	*1800*
Tetrachlorethene (PCE)	*0.39*	*0.4*	*1.5*	*42*	*1400*	*1100*
1,1,1 Trichlorethane	*18*	*18*	*110*	*1300*	*140000*	*76000*

Notes

1. All values above are in mg/kg
2. **Numbers in bold are SGVs or GAC that are derived based on SGV report input parameters**, *numbers in italics are S4ULs*, ***numbers in bold-italics are based on EIC/AGS/CL:AIRE numbers & input parameters*** and underlined numbers are C4SLs
3. Soil organic matter (SOM) is assumed to be 2.5% - DEFAULT VALUE
4. Soil type is assumed to be sandy loam - DEFAULT SOIL TYPE
5. For residential, the building type is conservatively assumed to be a small terrace house where the development includes bungalows change to more conservative bungalow setting in computer model
6. For commercial, the building type is conservatively assumed to be a pre 1970s office building, where the proposed development comprises houses, flat with living spaces changes setting in model accordingly
7. For classrooms consider increasing the dust loading fator in the 'Soil and Building Data' of the CLEA 1.04 model from 50 to 100µg m^{-3}
8. Based on vapour saturation limt as suggested by EA / [ ] model value
9. Lowest of o-, m- and p-xylene
10. Based on comparison of inhalation exposure with inhalation TDI
11. Based on comparison of oral, dermal, and inhalation exposure with the oral TDI
12. Based on a comparison of oral and dermal soil exposure with oral Index Dose only
13. Averaged over and based on lifetime exposure
14. Based on critical concentration for skin irritation in humans arising from contact with phenol in aqueous solution (number in brackets based on health effects following long term exposure for illustration)
15. NA: Not applicable

Adopted Soil Generic Assessment Criteria
Sandy loam with 1% SOM

curtins

Contaminants	Residential with home grown produce	Residential without home grown produce	Allotments	Commercial	Public open space near residential housing POS_{resi}	Public park POS_{park}
Metals						
Beryllium	*1.7*	*1.7*	*35*	*12*	*2.2*	*63*
Boron	*290*	*11,000*	*45*	*240,000*	*21,000*	*46,000*
Cadmium	**10**[13] 22	**85**[13] 150	**1.8** 3.9	**230** 410	*120* 220	*560* 880
Chromium III	*910*	*910*	*18,000*	*8,600*	*1,500*	*33,000*
Chromium VI	*6* 21	*6* 21	*1.8* 170	*33* 49	*7.7* 21	*220* 250
Lead	200	310	80	2,300	630	1,300
Mercury *(elemental)*	**1**	**1**	**26**	**26**	*16*	**26**[8] *[30]*
Mercury (inorganic)	**170**	**240**	**80**	**3600**	*120*	*240*
Nickel	*130*[10]	*180*[10]	*53*[11]	*980*[10]	*230*	*800*
Vanadium	*410*	*1200*	*91*	*9000*	*2000*	*5000*
Copper	*2400*	*7100*	*520*	*68000*	*12000*	*44000*
Zinc	*3700*	*40000*	*620*	*730000*	*81000*	*170000*
Semi-Metals and non-metals						
Arsenic	**32**[12] 37	**35**[12] 40	**43**[12] 49	**640**[12] 640	*79* 79	*170* 170
Antimony		***550***		***7500***	***1500***	***3300***
Selenium	**350**	**600**	**120**	**13000**	*1100*	*1800*
Inorganic chemicals						
Cyanide	34	34	34	34	34	34
Organic contaminants						
Aliphatic risk banded hydrocarbons - TPHCWG method						
$EC_{>5}$ - EC_6	*42*	*42*	*730*	*3200*	*570000*	*95000*
$EC_{>6}$ - EC_8	*100*	*100*	*2300*	*7800*	*600000*	*150000*
$EC_{>8}$ - EC_{10}	*27*	*27*	*320*	*2000*	*13000*	*14000*
EC_{10}-EC_{12}	*130*	*130*	*2200*	*9700*	*13000*	*21000*
EC_{12}-EC_{16}	*1100*	*1100*	*11000*	*59000*	*13000*	*25000*
$EC_{>16}$ - EC_{35}	*65000*	*65000*	*260000*	*1600000*	*250000*	*450000*
$EC_{>35}$ - EC_{44}	*65000*	*65000*	*260000*	*1600000*	*250000*	*450000*
Aromatic risk banded hydrocarbons - TPHCWG method						
$EC_{>5}$ - EC_7	*70*	*370*	*13*	*26000*	*56000*	*76000*
$EC_{>7}$ - EC_8	*130*	*860*	*22*	*56000*	*56000*	*87000*
$EC_{>8}$ - EC_{10}	*34*	*47*	*8.6*	*3500*	*5000*	*7200*
EC_{10} - EC_{12}	*74*	*250*	*13*	*16000*	*5000*	*9200*
EC_{12} - EC_{16}	*140*	*1800*	*23*	*36000*	*5100*	*10000*
$EC_{>16}$ - EC_{21}	*260*	*1900*	*46*	*28000*	*3800*	*7600*
$EC_{>21}$ - EC_{35}	*1100*	*1900*	*370*	*28000*	*3800*	*7800*
$EC_{>35}$ - EC_{44}	*1100*	*1900*	*370*	*28000*	*3800*	*7800*
Aliph + Arom EC >44-70	*1600*	*1900*	*1200*	*28000*	3800	7800
Aromatic						
Benzene	**0.08**	**0.3**	**0.017**	**28**	*72*	*90*
Ethyl benzene	**65**	**170**	**16**	**520**[8] [17000]	**520**[8] *[24000]*	**520**[8] *[17000]*
Toluene	**120**	**610**	**22**	**860**[8] [59000]	**860**[8] *[56000]*	**860**[8] *[87000]*
Xylene[9]	**41**	**53**	**28**	**480**[8] [69000]	**480**[8] *[41000]*	**480**[8] *[17000]*
Phenol	**180**	**310**	**66**	**760**[14] (31000)	**760**[14] *(10000)*	**760**[14] *(7600)*
Polycyclic Aromatic Hydrocarbons (PAH)						
Naphthalene	*2.3*	*2.3*	*4.1*	*190*	*4900*	*1200*
Acenaphthylene	*170*	*2900*	*28*	*83000*	*15000*	*29000*
Acenaphthene	*210*	*3000*	*34*	*84000*	*15000*	*29000*
Fluorene	*170*	*2800*	*27*	*63000*	*9900*	*20000*
Phenanthrene	*95*	*1300*	*15*	*22000*	*3100*	*6200*
Anthracene	*2400*	*31000*	*380*	*520000*	*74000*	*150000*
Fluoranthene	*280*	*1500*	*52*	*23000*	*3100*	*6300*
Pyrene	*620*	*3700*	*110*	*54000*	*7400*	*15000*
Benz(a)anthracene	*7.2*	*11*	*2.9*	*170*	*29*	*49*
Chrysene	*15*	*30*	*4.1*	*350*	*57*	*93*
Benzo(b)fluoranthene	*2.6*	*3.9*	*0.99*	*44*	*7.1*	*13*
Benzo(k)fluoranthene	*77*	*110*	*37*	*1200*	*190*	*370*
Benzo(a)pyrene	*2.2*	*3.2*	*0.97*	*35*	*5.7*	*11*
Indeno(123cd)pyrene	*27*	*45*	*9.5*	*500*	*82*	*150*
Dibenzo(ah)anthracene	*0.24*	*0.31*	*0.14*	*3.5*	*0.57*	*1.1*
Benzo(ghi)perylene	*320*	*360*	*290*	*3900*	*640*	*1400*
Chlorinated Aliphatic Hydrocarbons						
Vinyl chloride	*0.00064*	*0.00077*	*0.00055*	*0.059*	*3.5*	*4.8*
Trichloroethene (TCE)	*0.016*	*0.017*	*0.041*	*1.2*	*120*	*70*
1,1,1,2 Tetrachlorethane	*1.2*	*1.5*	*0.79*	*110*	*1400*	*1500*
Tetrachlorethene (PCE)	*0.18*	*0.18*	*0.65*	*19*	*1400*	*810*
1,1,1 Trichlorethane	*8.8*	*9*	*48*	*660*	*140000*	*57000*

Notes

1. All values above are in mg/kg
2. **Numbers in bold are SGVs or GAC that are derived based on SGV report input parameters**, *numbers in italics are S4ULs*, ***numbers in bold-italics are based on EIC/AGS/CL:AIRE numbers & input parameters*** and underlined numbers are C4SLs
3. Soil organic matter (SOM) is assumed to be 1% - DEFAULT VALUE
4. Soil type is assumed to be sandy loam - DEFAULT SOIL TYPE
5. For residential, the building type is conservatively assumed to be a small terrace house where the development includes bungalows change to more conservative bungalow setting in computer model
6. For commercial, the building type is conservatively assumed to be a pre 1970s office building, where the proposed development comprises houses, flat with living spaces changes setting in model accordingly
7. For classrooms consider increasing the dust loading fator in the 'Soil and Building Data' of the CLEA 1.04 model from 50 to 100µg m^{-3}
8. Based on vapour saturation limt as suggested by EA / [ ] model value
9. Lowest of o-, m- and p-xylene
10. Based on comparison of inhalation exposure with inhalation TDI
11. Based on comparison of oral, dermal, and inhalation exposure with the oral TDI
12. Based on a comparison of oral and dermal soil exposure with oral Index Dose only
13. Averaged over and based on lifetime exposure
14. Based on critical concentration for skin irritation in humans arising from contact with phenol in aqueous solution (number in brackets based on health effects following long term exposure for illustration)
15. NA: Not applicable