

10. GROUND CONTAMINATION ASSESSMENT – HUMAN HEALTH

10.1 Introduction

The UK Contaminated Land Regime (CLR) allows for a tiered approach to the assessment of ground contamination which is designed to allow increasingly site-specific assessment. In order to assess the potential risk posed by contaminants contained within the soils at the study area a generic quantitative risk assessment (gQRA) has been undertaken by comparing recorded concentrations of chemical constituents in soil with Generic Assessment Criteria (GAC) to identify whether, at the concentrations recorded, the presence of the constituent has the potential to adversely affect the health of site users (a Tier 1 assessment). GAC are set at levels where potential exposure is deemed to be within acceptable limits.

If the recorded concentrations of a particular constituent are below the GAC then the risk is generally considered to be acceptable and further assessment / or mitigation measures are not required. Where a substance is recorded at concentrations higher than GAC this does not necessarily indicate that a particular risk is present, however, it does typically signify the requirement to undertake further assessment in line with the UK tiered risk assessment framework.

10.2 Assessment Criteria

10.2.1 Generic Assessment Criteria

The following GAC for soils have been utilised for the screening process, in order of preference:

- CL:AIRE published C4SL (DEFRA, 2014);
- CIEH/LQM published S4UL (LQM/CIEH, 2015);
- WYG internal Tier 1 Screening Criteria (issue 15) derived using the derivation tool CLEA version 1.06, in line with the current UK Contaminated Land Regime.

C4SL are currently available for arsenic, benzene, benzo(a)pyrene, cadmium, chromium VI and lead¹. The C4SL were originally developed to support the categorisation of sites in accordance with Part 2A are also, based on DEFRA guidance, considered suitable for use during the assessment of sites as part of the planning process.

¹ Arsenic, benzene, benzo(a)pyrene, cadmium, chromium VI, lead assuming 6% SOM (1% SOM C4SL also published for benzene).

Where C4SLs are not available, 'Suitable for Use Levels' (S4UL) developed by CIEH/LQM have been used. The S4UL provide GAC based on minimal or tolerable risk intended to be protective of human health for individual or mixtures of substances. It is considered conservative and appropriate to use these values for contaminants for which C4SL are unavailable. GAC for volatile and semi-volatile organic compounds (VOC and SVOC) not presented in the S4UL document are sourced from CL:AIRE (CL:AIRE, January 2010).

Where no published screening values are available WYG have derived their own values (easily liberatable cyanide).

The CLEA model states that "For most exposure pathways, the contamination is assumed to be at or within one metre of the surface" (Environment Agency, 2009). It is considered that at depths greater than 1.0m, the probability of human exposure via the direct contact pathways are significantly reduced, leaving inhalation of volatile compounds as the dominant pathway with regard to human health risks. Typically, volatile compounds only significantly affect the indoor inhalation pathway. The same screening concentrations have been used for all depths at this stage, though it is noted that these are highly conservative for depths below 1.00m bgl.

10.2.2 Proposed End Use

Screening criteria have been developed for the following land use scenarios:

- Residential with plant uptake;
- Residential without plant uptake;
- Allotments;
- Public open space (park and residential);
- Commercial / Industrial.

The proposed development on site will consist of the construction of a single storey school building within the grounds of the existing primary school. As the proposed land use does not fall into one of the categories listed above, the screening assessment has been undertaken against the residential without plant uptake scenario to provide a conservative assessment.

10.2.3 Soil Organic Matter

For organic contaminants, the generic soil screening values have been derived for a range of

concentrations of soil organic matter (1%, 2.5%, 6%). In order to provide a conservative assessment the GAC derived for a 1% SOM have been adopted.

10.3 Tier 1 – Soil Screening

A total of three soil samples collected from across the site were submitted for chemical laboratory analysis. Full copies of laboratory certificates for all soil analysis are included in Appendix E.

Comparison of the chemical analysis results with the generic assessment criteria for a residential with plant uptake end use has identified no exceedance with respect to the relevant screening criteria.

A summary table of all the data is also presented in Appendix E for reference.

10.4 Asbestos

Since 2009 there have been laboratory improvements in the detection of asbestos and as such all samples of made ground and natural were subject to an asbestos screen. There is no published screening value for asbestos.

A total of three samples were collected and analysed for the presence of asbestos containing materials. The laboratory results indicated that there were no positive identifications of asbestos within soil samples.

11. GROUND CONTAMINATION ASSESSMENT – WIDER ENVIRONMENT

11.1 Introduction

The potential for contaminated groundwater on site to adversely affect controlled water receptors (groundwater and surface water bodies) has been assessed at this stage by direct comparison of analytical data from the WYG ground investigation with relevant Water Quality Standards (WQS).

Similarly, the potential for soil contamination to impact controlled waters has been assessed by comparing analytical data from soil derived leachate tests directly against WQS.

11.2 Assessment Criteria

In light of the environmental setting of the site under consideration. The following water quality standards have been adopted, in order of preference.

- Water Framework Directive (WFD),
- Environmental Quality Standards (EQS);²
- WHO 2008 - Petroleum Products in Drinking Water (WHO 2008)
- UK Drinking Water Standards³.

11.3 Tier 1 Screening Assessment – Soil Derived Leachate

Soil derived leachate samples can be used to identify potentially mobile contamination within soil samples collected from the site. It should be noted that the laboratory test methodology indicates a potential mobility of contaminants and is usually considered to reflect a worst-case situation and unlikely to represent on-site conditions.

The laboratory preparation of leachate samples is likely to produce higher concentrations of leachable components than conditions encountered on site and as such the following assessment

² Where WFD 2015 are not presented revoked WFD 2010 standards are used

³ WHO 2005; WHO 2008; UK Water Supply Regulations 2010 and 1989 Regulations. Priority given to UK drinking water standards

is considered to be inherently conservative in nature. Furthermore, the resulting data are screened against criteria intended to be protective of water bodies and drinking water supplies and are not intended to assess the potential significance of contaminant mobility.

11.4 Tier 1 Screening Assessment – Soil Derived Leachate

Two soil derived leachate samples were screened against a suite of determinants outlined in Section 11.2.

The following table summarises the determinants which have been identified at concentrations in excess of the relevant WQS screening criteria.

Table 9 – Summary of Exceedances within Soil Derived Leachate Samples

Determinant	Units	Maximum	Minimum	Screening Value	Exceedances	
					No.	Location
TPH Aromatics EC12 - EC16	µg/l	122	10	90 [^]	1	WS03 1.0-1.2
TPH Aromatics EC21 – EC35	µg/l	66	10	0.0082	1	WS03 1.0-1.2
Fluoranthene	µg/l	0.024	0.0058	0.0063 [#]	1	WS01 0.7-1.0
Phenanthrene	µg/l	0.034	0.0054	<0.005 ^{\$}	2	WS03 1.0-1.2, WS01 0.7-1.0
Fluorene	µg/l	0.0054	<0.005	<0.005 ^{\$}	1	WS01 0.7-1.0
Pyrene	µg/l	0.0132	<0.005	<0.005 ^{\$}	1	WS01 0.7-1.0

* Freshwater waters EQS 2015

Inland water EQS 2015

^ WHO Drinking Water Guidelines

\$ LOD in lieu of EQS value

Six determinants (heavy TPH fractions and PAH compounds) were identified within soil derived leachate samples at concentrations in excess of the relevant screening value or LOD.

The majority of the exceedances are considered to be marginal in nature, especially if the conservative nature of the assessment is taken into account. The use of leachate testing and the comparison of the results against water quality standards is an inherently conservative assessment approach. Leachate tests assess the level of contamination that will potentially leach out of material, but as the test uses an acid digestion procedure it is likely to represent a worst-case scenario in comparison with real site conditions. Environmental Quality Standards are limits on the concentration of priority substances and other pollutants in surface water which are set because of the risk that these substances present to the aquatic environment, i.e. they are thresholds which should not be exceeded if good quality status of receiving water is to be maintained. Comparison of leachate test results against these and other water quality standards gives an indication of risk

to the water environment but takes no account of flow pathways or dilution at receptors.

Given that the current site is currently covered with hard standing, which limits water infiltration to the underlying soils, and the proposed development is unlikely to create further pathways with no soft landscaping proposed and retention of area of hardstanding, these marginal exceedances are not considered to be a significant risk to the wider environment. Furthermore the clayey nature of the Glacial Till deposits would afford protection to the groundwater present within the Hughes Member Sandstone. Contamination concentrations would be reduced via the retardation processes as they migrate through the unsaturated zone.

However, to present a conservative assessment, the recorded exceedances in soil derived leachate samples have been carried forward to the risk assessment presented in Section 13.