A47 Wansford to Sutton Dualling

Scheme Number: TR010039

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6.3 Environmental Statement Appendices
Appendix 9.1 – Hierarchy of Screening Criteria for Generic Quantitative Risk Assessment

APFP Regulation 5(2)(a)

Planning Act 2008

Infrastructure Planning (Applications: Prescribed Forms and Procedure) Regulations 2009

July 2021

Infrastructure Planning

Planning Act 2008

The Infrastructure Planning (Applications: Prescribed Forms and Procedure) Regulations 2009

A47 Wansford to Sutton Development Consent Order 202[x]

ENVIRONMENTAL STATEMENT APPENDICES
Appendix 9.1 - Hierarchy of Screening Criteria for Generic Quantitative Risk Assessment

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9.1 Overview of generic soil screening guideline values

Introduction

9.1.1 In order to put the chemical analysis results for the site into context, the data has initially been assessed in relation to several sets of legislative guidelines and other criteria, commonly used for the assessment of land contamination. This is undertaken in consideration of the conceptual model for the site which establishes the pathways and receptors which are applicable.

9.1.2 This approach constitutes a Generic Quantitative Risk Assessment (GQRA). A GQRA may typically involve a site investigation to gather information on the type, levels and extent of contamination present, with comparison against generic assessment criteria (GAC) for various site use scenarios and environmental receptors. Assessment criteria may also take account of specific exposure pathways.

9.1.3 The background and hierarchy to the assessment criteria which have been used to undertake a GQRA in this report are described below. Assessment criteria are now available covering different levels of risk for both planning and Part 2A assessments.

9.2 Land Quality Management (LQM) GAC 2009

9.2.1 In July 2009 Land Quality Management (LQM) published GAC for approximately 80 chemicals or groups of chemicals. These were generated using the updated contaminated land exposure assessment (CLEA) framework and the CLEA software (v1.04). GAC were generated for the standard CLEA land uses using a soil organic matter (SOM) content of 1%, 2.5% and 6%. Transparent explanation of the GAC generation process including all chemical input parameters is provided within the LQM Report.

9.3 The EIC/AGS/CL:AIRE GAC 2010

9.3.1 In January 2010 Contaminated Land: Applications in Real Environments (CL:AIRE) in association with The Environmental Industries Commission (EIC) and The Association of Geotechnical and Geoenvironmental Specialists (AGS) published GAC for 35 contaminants.

9.3.2 GACs for the 35 contaminants were generated using CLEA v1.06 for the three standard CLEA land uses (residential with consumption of homegrown produce,

commercial and allotments) as well as residential without consumption of homegrown produce. The GACs have been generated using a SOM content of 1%, 2.5% and 6%.

9.3.3 The methodology and supporting information for the EIC/AGS GACs is fully documented in the report published by CL:AIRE.

9.4 Category 4 Screening Levels 2014

9.4.1 In March 2014 CL:AIRE published Category 4 Screening Levels (C4SLs) for six contaminants in a project backed by Department of Environment Food, and Rural Affairs (DEFRA). These C4SLs describe low levels of harm which is in contrast to the minimal risk levels described by SGVs.

9.4.2 The underlying assumptions describing the exposure scenarios have been updated from those detailed in the SGV reports such as those describing inhalation rates in line with new research. In addition, the toxicological data for the six contaminants was reviewed and updated where deemed appropriate.

9.4.3 C4SL have been primarily derived to provide screening criteria for Part 2A assessments. Soils with concentrations below the C4SL cannot be determined under Part 2A as contaminated land.

9.4.4 Currently C4SLs have been derived for: arsenic, benzene, benzo(a)pyrene, cadmium, chromium and lead at a SOM of 6%. They are published for the following land use scenarios:

- Residential (with and without homegrown produce)
- Allotments
- Commercial.

9.4.5 They also include two new land use scenarios both based on public open space (POS).

9.4.6 Sweco have produced Sweco C4SL (SC4SL) for the six contaminants at SOMs of 1% and 2.5%.

9.5 LQM Suitable for Use Levels (S4UL) 2015

9.5.1 In January 2015 LQM published Suitable for Use Levels (S4ULs) for a total of 89 chemicals or groups of chemicals which represent a minimal level of risk (equivalent to risk levels used in the derivation of SGVs). These were generated using the updated scenarios found in the C4SL framework, revisions to chemical data and updated toxicological data where available and generated using the

CLEA software (v1.06). Transparent explanation of the S4UL generation process including all chemical input parameters is provided within the LQM Report.

9.5.2 The new S4ULs have been published for five types of land use as follows;

- Residential (with and without consumption of homegrown produce)
- Allotments
- Commercial
- Public Open Space – Parks
- Public Open Space– Residential

9.5.3 All S4ULs are generated based on a standard soil type defined as a sandy loam with a soil organic matter (SOM) content of 1%, 2.5% and 6%.

9.6 Sweco Suitable for Use Criteria (SS4UL)

9.6.1 A series of generic assessment criteria have been generated by Sweco using CLEA (v1.07) for the standard land uses as defined by the CLEA framework for all contaminants for which SGV and associated TOX reports have been published

9.6.2 The SOM parameter is used to predict the level of sorption that will occur between the contaminant and soil particles. It affects the potential mobility of contaminants and therefore influences the predicted exposure by humans to a particular contaminant. Amending the SOM is therefore reflected in either an increase or decrease of the generic screening criteria.

9.6.3 The use of generic assessment criteria generated using SOM concentrations of 1% and 2.5% should be considered where site specific assessment (i.e. analytical results for fraction / total organic carbon) has identified soil conditions that are better characterised by an organic content which is below the 6% assumed in the published SGVs.

9.7 Hierarchy of Generic Assessment Criteria

9.7.1 In all cases, a GAC is only used where the conceptual model for the site indicates that it would be appropriate to use criteria derived for the five standard land uses.

9.7.2 The C4SL for benzo(a)pyrene uses a surrogate for all polycyclic aromatic hydrocarbons (PAHs) and similarly the S4UL also have benzo(a)pyrene as a surrogate for coal tar which can be used as an alternative approach to screening against individual PAHs. The S4ULs also have assessment criteria for individual

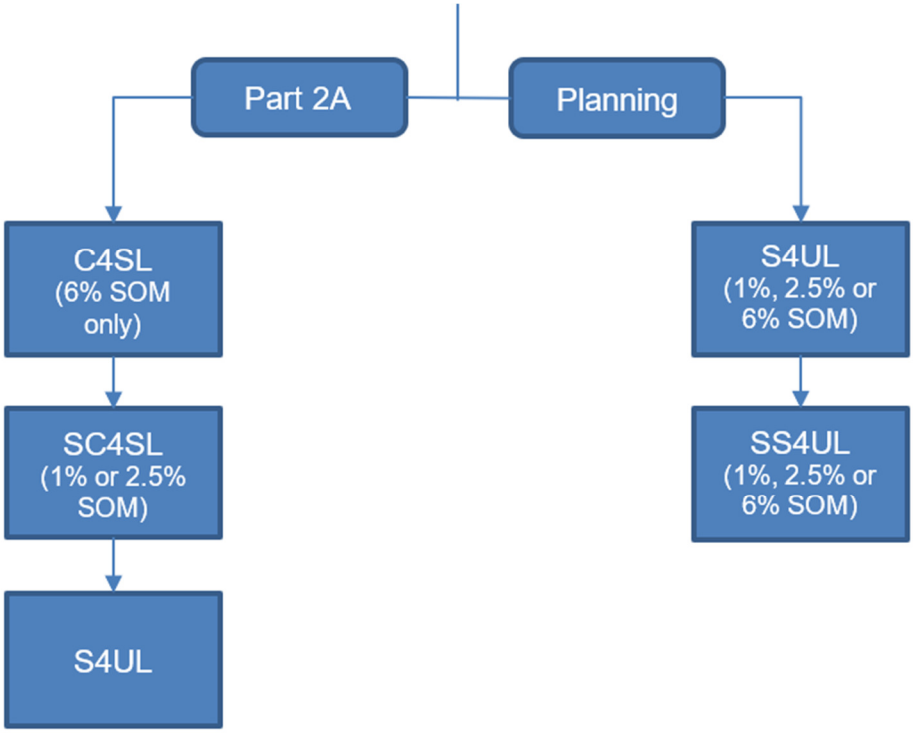
PAHs and Sweco have adopted the approach of screening against the individual PAHs.

9.7.3 When deriving the assessment criteria some criteria are derived at a concentration greater than the chemicals' theoretical solubility limit. The S4ULs are presented in the LQM 2015 report with both the solubility limited value and the human health risk criteria. These solubility limited criteria are indicative of the presence of free product and do not present a concentration where human health risk may necessarily occur. In these cases, Sweco have taken the human health derived criteria as the assessment criteria with the exception of where free product is present.

9.7.4 Similarly, when the vapour saturation limit has been exceeded Sweco have taken the human health derived value as the assessment criteria rather than the vapour saturation limited criteria.

9.7.5 The selection of the appropriate criteria for the assessment is made based on both the end use and the regime (planning or Part 2A) under which the assessment is designed to perform. The choice of criteria is shown in Figure 9-1.

Figure 9-1: GQRA Assessment Criteria Choice Flowchart



Notes:

Category 4 Screening Levels (C4SLs)

9.7.6 The lead C4SL is currently used for both Part 2A and Planning scenarios. The remaining five C4SLs are used for a Part 2A assessment approach. C4SLs have been produced for 6% SOM only.

Sweco Category 4 Screening Levels (SC4SLs)

9.7.7 Sweco calculated C4SL for the six contaminants at 1% and 2.5% SOM to be used where the use of the C4SL for 6% SOM would not be appropriate.

Suitable for Use Levels (S4ULs)

9.7.8 These are used where S4ULs have been published. Based on recorded site conditions the most appropriate S4ULs based on a SOM of 1%, 2.5% or 6% are selected.

Sweco Generic Assessment Criteria (SS4ULs)

9.7.9 For contaminants not included in the S4ULs or C4SLs the SS4ULS will be utilised.

9.7.10 Based on recorded site conditions the most appropriate Sweco SS4UL based on a SOM of 1%, 2.5% or 6% are selected.

Extractable Petroleum Hydrocarbons (EPH)

9.7.11 The EPH chemical analysis completed as part of the Sweco Limited soil sampling exercise has been reported in carbon band ranges, for example EPH >C10-C20, inclusive of both aliphatic and aromatic compounds. The most conservative assessment criteria within the relevant carbon band range for either aliphatic or aromatic has been selected from the available GAC as the assessment criteria for each reported EPH carbon band.

Total Mercury

9.7.12 No assessment screening criteria is currently available for concentrations of total mercury measured in soil, with S4UL available for elemental mercury, methyl mercury and inorganic mercury.

9.7.13 The concentrations of total mercury in soils reported by the laboratory have been screened against assessment criteria for inorganic mercury. As stated in the mercury SGV report, total mercury concentrations can normally be compared with the inorganic mercury SGV because the equilibrium concentrations of elemental and methyl mercury compounds is likely to be very low.

9.7.14 Consideration should be given in the conceptual site model as to whether available information indicates elemental mercury may have been introduced into the soil by anthropogenic activity. Similarly, where there are peaty or flooded soils, or soils amended with sewage sludge, these more reducing soil conditions may trigger increased methylation. In these cases, screening against the elemental or methyl mercury S4UL may be more applicable.

Cyanide

9.7.15 The assessment criteria for free and complex cyanide has been derived for an acute exposure scenario based on a single dose of soil ingested by a three year old female child. The criteria have been derived outside of the CLEA model utilising data and methodology produced by the Environment Agency TOX reports and CLEA regime.

9.7.16 The Tolerable Daily Intake has been sourced from the DEFRA and Environment Agency R &D TOX 51 report on inorganic cyanide.

9.7.17 The three year old child has been chosen as the receptor as this is taken to be the youngest age a child will be able to be independent from their parents i.e. mobile enough to leave their protection and therefore access and consume a source of cyanide. The body weight used is sourced from Technical Review 2, Environment Agency, 2009 and is the mean body weight for a three year old female child.

9.7.18 A single 5g dose has been used which approximates to a teaspoon of soil.

9.7.19 These criteria are used in both the Part 2A and planning assessments.

9.8 Soil leachability and groundwater

9.8.1 Leachability analysis provides an indication of the potential for contaminants to be mobilised from soil through percolation of rain water and impact groundwater quality beneath the site. Assessment has been undertaken on the leachability analysis results, relating to the potential impact on surface water quality.

9.8.2 Potential impacts on surface water quality which may occur through a linkage between groundwater on the site and a nearby surface water course are assessed through comparison to the environmental quality standards (EQS) presented in parts 1, 2 and 3 of Schedule 3 of The Water Framework Directive

[1] DEFRA/Environment Agency, 2002. Contaminants in Soil: Collation of Toxicological Data and Intake Values for Humans. Inorganic Cyanide.
[2] Environment Agency, 2009. A review of body weight and height data used within the Contaminated Land Exposure Assessment model (CLEA).

(Standards and Classification) Directions (England and Wales) 2015. In the absence of these values, the 2004 EQS criteria have been used.

9.9 References

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- DEFRA. SP1010: Development of Category 4 Screening Levels for Assessment of Land Affected by Contamination – Policy Companion Document. December 2014.
- The Water Framework Directive (Standards and Classification) Directions (England and Wales) 2015.

9.10 Glossary

Term	Definition
SGV	Soil Guideline Value published by DEFRA in accordance with the CLEA framework published in August 2009 for an SOM of 6% based on minimal level of risk
Sweco GAC	Assessment criteria generated by Sweco for contaminants with SGV at 1% and 2.5% SOM.
LQM GAC	2009 assessment criteria developed by LQM.
EIC/AGS/CL:AIRE GAC	2010 assessment criteria.
C4SL	2014 assessment criteria based on a low level of harm at 6% SOM.
SC4SL	Sweco assessment criteria for contaminants with a C4SL at 1% and 2.5% SOM.
S4UL	LQM 2015 updates in line with C4SL but still minimal risk levels.
SS4UL	Sweco assessment criteria based on S4UL methodology using other readily available contaminant toxicological data such as that from EIC 2010 work.
Free product	An organic contaminant such as PAHs present in concentrations above the saturation point of the soil or solubility concentration in water resulting in a visible product in situ.