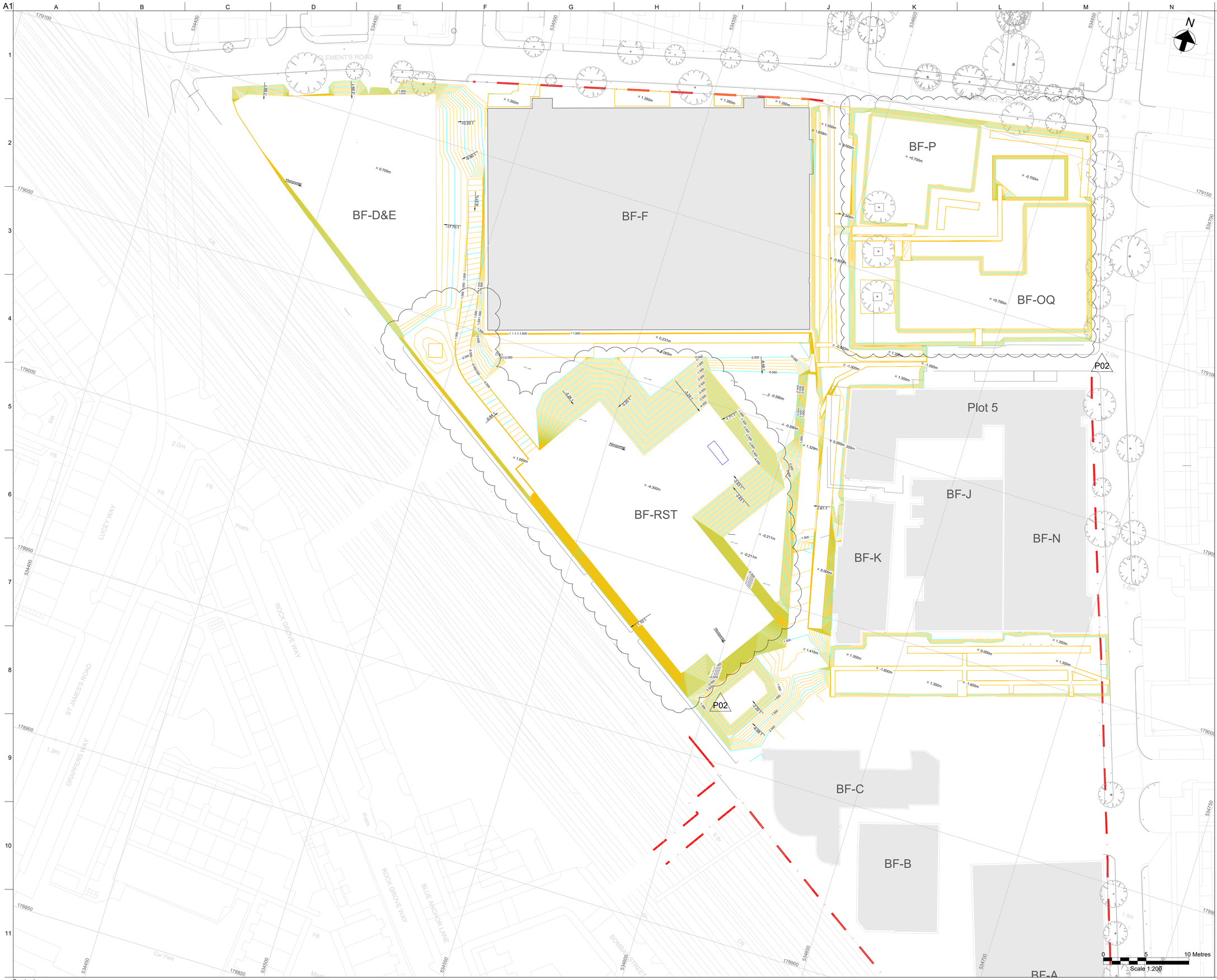

Notes

1. This drawing is for information purposes only and is subject to design development in future design stages.
2. This drawing compares proposed formation levels with estimated existing to give an indication of earthworks required to achieve proposed scheme.
3. Bulk excavation levels do not allow for localised pit excavation. It is assumed this will be undertaken under a different contract.
4. Please refer to sketch BER-ARP-BFXXX-XX-SK-D-82003 for proposed excavation contours.
5. The volumes provided on this drawing are for are indicative and are information only. The volumes have been produced from assumptions on existing and proposed levels. It is expected that the Contractor confirm and validate all excavation volumes.
6. For all excavations in close proximity to Building BF-F, please refer to AKTII design information for proposed excavation methodology.

Issue	Date	By	Chkd	Appd
P02	05/06/20	MA	CM	RR
Tender Addendum				
P01	18/03/19	BK	CM	RR
Controlled Issue - Aconex				

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Client
Grosvenor Group

Job Title
The Bermondsey Project
Biscuit Factory - Phase 1
Enabling and Demolition Works

Key Plan

Drawing Title
Biscuit Factory
External Areas Earthworks
Indicative Formation Levels
Contours

Scale at A1 1:1000

Discipline Civil

Job No **237092-00**

Drawing Status **For Information**

Drawing No **BER-ARP-BFXXX-XX-SK-D-82003**

Appendix B

GENERAL LIMITATIONS

REPORT LIMITATIONS - GROUND RISK AND REMEDIATION

GENERAL

1. WSP UK Limited has prepared this report solely for the use of the Client and those parties with whom a warranty agreement has been executed, or with whom an assignment has been agreed and outlined in the body of the report.

2. Unless explicitly agreed otherwise, in writing, this report has been prepared under WSP UK Limited standard Terms and Conditions as included within our proposal to the Client.

3. Project specific appointment documents may be agreed at our discretion and a charge may be levied for both the time to review and finalise appointments documents and also for associated changes to the appointment terms. WSP UK Limited reserves the right to amend the fee should any changes to the appointment terms create an increase risk to WSP UK Limited.

4. The report needs to be considered in the light of the WSP UK Limited proposal and associated limitations of scope. The report needs to be read in full and isolated sections cannot be used without full reference to other elements of the report and any previous works referenced within the report.

PHASE 1 GEO ENVIRONMENTAL AND PRELIMINARY RISK ASSESSMENTS

Coverage: *This section covers reports with the following titles or combination of titles: phase 1; desk top study; geo environmental assessment; development appraisal; preliminary environmental risk assessment; constraints report; due diligence report; geotechnical development review; environmental statement; environmental chapter; project scope summary report (PSSR), program environmental impact report (PEIR), geotechnical development risk register; and, baseline environmental assessment.*

5. The works undertaken to prepare this report comprised a study of available and easily documented information from a variety of sources (including the Client), together with (where appropriate) a brief walk over inspection of the Site and correspondence with relevant authorities and other interested parties. Due to the short timescales associated with these projects responses may not have been received from all parties. WSP UK Limited cannot be held responsible for any disclosures that are provided post production of our report and will not automatically update our report.

6. The opinions given in this report have been dictated by the finite data on which they are based and are relevant only for the purpose for which the report was commissioned. The information reviewed should not be considered exhaustive and has been accepted in good faith as providing true and representative data pertaining to site conditions. Should additional information become available which may affect the opinions expressed in this report, WSP UK Limited reserves the right to review such information and, if warranted, to modify the opinions accordingly.

7. It should be noted that any risks identified in this report are perceived risks based on the information reviewed. Actual risks can only be assessed following intrusive investigations of the site.

8. WSP UK Limited does not warrant work / data undertaken / provided by others.

REPORT LIMITATIONS - GROUND RISK AND REMEDIATION

INTRUSIVE INVESTIGATION REPORTS

Coverage: *The following report titles (or combination) may cover this category of work: geo environmental site investigation; geotechnical assessment; GIR (Ground Investigation reports); preliminary environmental and geotechnical risk assessment; and, geotechnical risk register.*

9. The investigation has been undertaken to provide information concerning either:

- **i.** The type and degree of contamination present at the site in order to allow a generic quantitative risk assessment to be undertaken; or
- **ii.** Information on the soil properties present at the site to allow for geotechnical development constraints to be considered.

10. The scope of the investigation was selected on the basis of the specific development and land use scenario proposed by the Client and may be inappropriate to another form of development or scheme. If the development layout was not known at the time of the investigation the report findings may need revisiting once the development layout is confirmed.

11. For contamination purposes, the objectives of the investigation are limited to establishing the risks associated with potential contamination sources with the potential to cause harm to human health, building materials, the environment (including adjacent land), or controlled waters.

12. For geotechnical investigations the purpose is to broadly consider potential development constraints associated with the physical property of the soils underlying the site within the context of the proposed future or continued use of the site, as stated within the report.

13. The amount of exploratory work, soil property testing and chemical testing undertaken has necessarily been restricted by various factors which may include accessibility, the presence of services; existing buildings; current site usage or short timescales. The exploratory holes completed assess only a small percentage of the area in relation to the overall size of the Site, and as such can only provide a general indication of conditions.

14. The number of sampling points and the methods of sampling and testing do not preclude the possible existence of contamination where concentrations may be significantly higher than those actually encountered or ground conditions that vary from those identified. In addition, there may be exceptional ground conditions elsewhere on the site which have not been disclosed by this investigation and which have therefore not been taken into account in this report.

15. The inspection, testing and monitoring records relate specifically to the investigation points and the timeframe that the works were undertaken. They will also be limited by the techniques employed. As part of this assessment, WSP UK Limited has used reasonable skill and care to extrapolate conditions between these points based upon assumptions to develop our interpretation and conclusions. The assumption made in forming our conclusions is that the ground and groundwater conditions (both chemically and physically) are the same as have been encountered during the works undertaken at the specific points of investigation. Conditions can change between investigation points and these interpretations should be considered indicative.

16. The risk assessment and opinions provided are based on currently available guidance relating to acceptable contamination concentrations; no liability can be accepted for the retrospective

effects of any future changes or amendments to these values. Specific assumptions associated with the WSP UK Limited risk assessment process have been outlined within the body or associated appendix of the report.

17. Additional investigations may be required in order to satisfy relevant planning conditions or to resolve any engineering and environmental issues.

18. Where soil contamination concentrations recorded as part of this investigation are used for commentary on potential waste classification of soils for disposal purposes, these should be classed as indicative only. Due consideration should be given to the variability of contaminant concentrations taken from targeted samples versus bulk excavated soils and the potential variability of contaminant concentrations between sampling locations. Where major waste disposal operations are considered, targeted waste classification investigations should be designed.

19. The results of the asbestos testing are factually reported and interpretation given as to how this relates to the previous use of the site, the types of ground encountered and site conceptualisation. This does not however constitute a formal asbestos assessment. These results should be treated cautiously and should not be relied upon to provide detailed and representative information on the delineation, type and extent of bulk ACMs and / or trace loose asbestos fibres within the soil matrix at the site.

20. If costs have been included in relation to additional site works, and / or site remediation works these must be considered as indicative only and must be confirmed by a qualified quantity surveyor.

EUROCODE 7: GEOTECHNICAL DESIGN

21. On 1st April 2010, BS EN 1997-1:2004 (Eurocode 7: Geotechnical Design – Part 1) became the mandatory baseline standard for geotechnical ground investigations.

22. In terms of geotechnical design for foundations, slopes, retaining walls and earthworks, EC7 sets guidance on design procedures including specific guidance on the numbers and spacings of boreholes for geotechnical design, there are limits to methods of ground investigation and the quality of data obtained and there are also prescriptive methods of assessing soil strengths and methods of design. Unless otherwise explicitly stated, the work has not been undertaken in accordance with EC7. A standard geotechnical interpretative report will not meet the requirements of the Geotechnical Design Report (GDR) under Eurocode 7. The GDR can only be prepared following confirmation of all structural loads and serviceability requirements. The report is likely to represent a Ground Investigation Report (GIR) under the Eurocode 7 guidance.

DETAILED QUANTITATIVE RISK ASSESSMENTS AND REMEDIAL STRATEGY REPORTS

23. These reports build upon previous report versions and associated notes. The scope of the investigation, further testing and monitoring and associated risk assessments were selected on the basis of the specific development and land use scenario proposed by the Client and may not be appropriate to another form of development or scheme layout. The risk assessment and opinions provided are based on currently available approaches in the generation of Site Specific Assessment Criteria relating to contamination concentrations and are not considered to represent a risk in a specific land use scenario to a specific receptor. No liability can be accepted for the retrospective effects of any future changes or amendments to these values, associated models or associated guidance.

REPORT LIMITATIONS - GROUND RISK AND REMEDIATION

24. The outputs of the Detailed Quantitative Risk Assessments are based upon WSP UK Limited manipulation of standard risk assessment models. These are our interpretation of the risk assessment criteria.

25. Prior to adoption on site they will need discussing and agreeing with the Regulatory Authorities prior to adoption on site. The regulatory discussion and engagement process may result in an alternative interpretation being determined and agreed. The process and timescales associated with the Regulatory Authority engagement are not within the control of WSP UK Limited. All costs and programmes presented as a result of this process should be validated by a quantity surveyor and should be presumed to be indicative.

GEOTECHNICAL DESIGN REPORT (GDR)

26. The GDR can only be prepared following confirmation of all structural loads and serviceability requirements. All the relevant information needs to be provided to allow for a GDR to be produced.

MONITORING (INCLUDING REMEDIATION MONITORING REPORTS)

27. These reports are factual in nature and comprise monitoring, normally groundwater and ground gas and data provided by contractors as part of an earthworks or remedial works.

28. The data is presented and will be compared with assessment criteria.

Appendix C

2020 WSP RISK ASSESSMENT METHODOLOGY

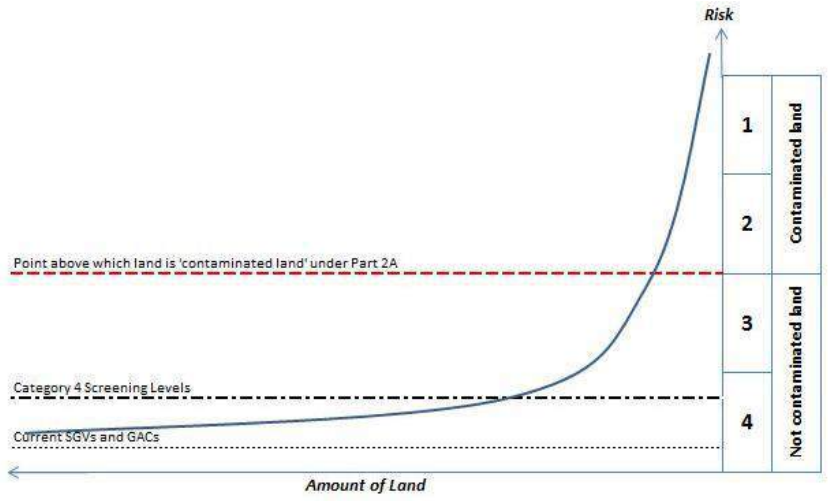
METHODOLOGY FOR THE DERIVATION OF GENERIC QUANTITATIVE ASSESSMENT CRITERIA TO EVALUATE RISKS TO HUMAN HEALTH FROM SOIL & GROUNDWATER CONTAMINATION

UK APPROACH

In the UK, the potential risks to human health from contamination in the ground are usually evaluated through a generic quantitative risk assessment (GQRA) approach. This allows generic and conservative exposure assumptions to be readily applied to risk assessments, and can be a useful tool for rapidly screening data and to identify those contaminants or scenarios that could benefit from further investigation and/or site-specific detailed quantitative risk assessment (DQRA). Current industry good practice is to use the approach presented in the Environment Agency (EA) publications SR2[1] and SR3[2]. This approach allows the derivation of Generic Assessment Criteria (GACs), primarily for chronic exposure.

In April 2012, the Department of Environment, Food and Rural Affairs (Defra) published updated statutory guidance[3] which introduced a four category approach to determining whether land in England and Wales is contaminated or not on the grounds of significant possibility of significant harm (SPOSH). **Figure 1** presents a graphical representation of the categories.

Figure 1: Four Categories for Determining if Land Represent a SPOSH



Cases classified as Category 1 are considered to be SPOSH based on actual evidence or an unacceptably high probability of harm existing. Category 4 cases are those where there is no risk, or a low risk of SPOSH.

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[1] Environment Agency '*Human Health Toxicological Assessment of Contaminants in Soil',* Report SC050021/SR2. January 2009.
[2] Environment Agency '*Updated Technical Background to the CLEA Model*,' Report SC050021/SR3. January 2009.
[3] Defra '*Environmental Protection Act 1990: Part 2A Contaminated Land Statutory Guidance'.* April 2012.

GACs represent a minimal risk level, well within Category 4. A 2014 publication by Contaminated Land: Applicatons in Real Environments (CL:AIRE),SP1010[4] and endorsed by Defra[5] provided an approach to determine Category 4 Screening Levels (C4SLs) which are higher than the GACs whilst being "more pragmatic but still strongly precautionary". It also provided C4SLs for six contaminants of concern. Although the C4SLs were designed to support Part 2A assessments to determine 'contaminated land' they are specifically mentioned, along with reference to the Part 2A statutory guidance, by the Department for Communities and Local Government (DCLG) for use in a planning context[6].

An updated version the Contaminated Land Exposure Assessment (CLEA) Workbook (v1.071) was released by the EA in September 2015 to take into account the publication of SP1010. The updates comprised: additional toxicity data for the six chemicals for which C4SLs were derived; two new public open space land use scenarios; updated exposure parameters; options to run the model using C4SL exposure assumptions; and increased functionality. There were no changes to algorithms, so it is still possible to replicate the withdrawn SGVs using the input parameters held within v1.071.

It should be noted that the four category approach has not been adopted in Scotland under Part 2A or the planning regime. The Part 2A statutory guidance applicable in Scotland (Paper SE/2006/44 dated May 2006) does not reflect the changes introduced by Defra in April 2012 which allow for the use of C4SLs within Part 2A risk assessments. Additionally, it is considered that the principal of 'minimal risk' should still apply under planning in Scotland, based on current guidance.

WSP APPROACH

Following the withdrawal of the SGVs, and in the absence of an industry-wide, accepted set of GACs it is down to individual practitioners to derive their own soil assessment criteria. WSP has used the approach provided within SR2, SR3, SP1010, CLEA Workbook v1.071 and SR4[7] to produce a set of minimal risk GACs. The chemical-specific data within two key publications were considered during their production: CL:AIRE 2010[8] and LQM 2015[9]. Both documents provide comprehensive sets of GACs for different contaminants of concern.

The LQM Suitable For Use Levels (S4ULs) have selected exposure parameters consistent with the C4SL exposure scenarios. This approach was rejected by WSP as not representing minimal risk. However, the LQM S4UL document was critically reviewed and the approach and chemical input parameters were utilised where considered to be appropriate.

An industry-led C4SL Working Group is in the process of deriving a larger set of C4SLs in the near future, for approximately 20 contaminants. This will include a critical review of the chemical input data for all selected substances, and may therefore lead to further amendments to the chemical input data used in the WSP in-house screening values. It is considered likely that the contaminant list will

[4] CL:AIRE *'Development of Category 4 Screening Levels for Assessment of Land Affected by Contamination'* SP1010, Final Project Report (Revision 2). September 2014.
[5] Defra 'SP1010: *Development of Category 4 Screening Levels for Assessment of Land Affected by Contamination – Policy Companion Document'*. December 2014.
[6] DCLG Planning Practice Guidance '*Land Affected by Contamination'*, particularly Paragraphs 001 and 007. Ref IDs: 33-001-20140306 & 33-007-20140612.
[7] Environment Agency '*CLEA Software (Version 1.05) Handbook (and Software)',* Report SC050021/SR4. September 2009.
[8] CL:AIRE 'The EIC/AGS/CL:AIRE *Soil Generic Assessment Criteria for Human Health Risk Assessment'.* ISBN 978-1-05046-20-1. January 2010.
[9] Nathanail et al '*The LQM/CIEH S4ULs for Human Health Risk Assessment'*, Land Quality Press, ISBN 978-0-9931084-0-2. 2015.

crossover with the 2009 EIC/AGS/CL:AIRE GACs. As such, this document was not critically reviewed by WSP.

WSP's current approach to the assessment of risks to human health is to continue to evaluate minimal risk through the use of in-house derived GACs, and to use the published C4SLs as a secondary tier of assessment until such time as additional C4SLs are published and/or in-house values are derived.

EXPOSURE MODELS

LAND USES

WSP has largely adopted the exposure assumptions of the generic land use scenarios included within SR3, with two additional public open space scenarios included from within SP1010 and two bespoke exposure scenarios (highways):

- Residential with homegrown produce consumption;
- Residential without homegrown produce consumption;
- Allotments;
- Commercial;
- Public open space near residential housing (POS_{resi});
- Public park (POS_{park});
- Highways (surface soils); and
- Highways (subsurface soils).

Exceptions are described in the following Sections.

SOIL PROPERTIES

SR3 assumes a sandy loam soil with a pH of 7 and a Soil Organic Matter (SOM) content of 6% for its generic land uses, based on the geographical spread of topsoils in the UK. WSP has adopted these default values. In addition, GACs based on an SOM of 1% and 2.5% have been derived, based on common experience of the nature of Made Ground and lack of topsoil on many brownfield sites.

RECEPTOR CHARACTERISTICS AND BEHAVIOURS

SP1010 provides some updated exposure parameters for long-term inhalation rates[10] and the consumption rates for homegrown produce[11] compared to those provided in SR3. This data was used to derived WSP's GACs.

The changes in inhalation rates do not apply to the allotment generic land use scenario, as these are based on the breathing rates for short-term exposure of light to moderate intensity activity which were derived from a study that was not updated in USEPA 2011, so the SR3 rates were retained.

[10] USEPA, National Centre for Environmental Assessment '*Exposure Factors Handbook: 2011 Edition*' EPA/600/R-09/052F. September 2011.
[11] National Diet and Nutrition Survey 2008/2009 to 2010/2011.

HIGHWAYS EXPOSURE SCENARIOS

Human health GAC for a Highways exposure scenario have been derived. The site area is defined by publicly accessible land adjacent to highways, comprising both hard and soft landscaped areas. Exposure is considered to be largely transitory.

There are no publicly available GAC for this exposure scenario. Consequently, WSP have derived GAC for the following exposure scenarios:

- à Highways (surface soils); and
- à Highways (sub-surface soils).

Surface soils GAC are for soil at ground level and within 300mm of the surface. Conversely, subsurface GAC are for soils at a depth exceeding 0.3m bgl. These GAC are not to be used as import criteria.

The critical receptor is a young female child, CLEA age classes 4-9. This is consistent with the critical receptor for the POS(resi) exposure scenario, and considered to be appropriate for a child potentially playing outside without direct adult supervision.

For all GAC, a sandy loam soil and a soil organic matter content of 1% is assumed. There is no building on site.

Exposure scenarios for surface and subsurface soils are detailed below. These are considered to be conservative estimtes, due to the mostly transitory use of publically accessible lands adjacent to highways.

HIGHWAYS GAC (SURFACE SOILS)

The relevant exposure pathways include direct soil and dust ingestion, dermal contact (outdoors) and the inhalation of outdoor dust and vapour.

The exposure frequency is 170 days per annum, and the occupancy period outdoors is 1 hour per day (as per the POS (resi) exposure scenario). The soil and dust ingestion rate has been set at 50 mg/day, consistent with a POS(park) exposure scenario.

HIGHWAYS GAC (SUBSURFACE SOILS)

The single relevant exposure pathway is the inhalation of outdoor vapour. Direct exposure pathways are not viable due to the depth of the soils below ground level.

The exposure frequency is 170 days per annum, and the occupancy period outdoors is 1 hour per day (as per the POS (resi) exposure scenario). The soil and dust ingestion rate has been set to zero, as direct exposure pathways to soils at this depth are not viable.

CHEMICAL DATA

PHYSICO-CHEMICAL PARAMETERS

Physico-chemical properties for the contaminants for which GACs have been derived have been obtained following critical review of the following hierarchy of data sources:

1. Environment Agency/Defra SGV reports where available;
2. Environment Agency '*Compilation of Data for Priority Organic Pollutants for Derivation of Soil Guideline Values*', Report SC050021/SR7, November 2008; and
3. Published fate and transport reviews within Nathanail et. al 2015 and CL:AIRE 2010.

Where appropriate, and where sufficient data is available, values were adjusted to reflect a UK soil temperature of 10ºC (e.g. K_{aw}).

TOXICOLOGICAL DATA

Toxicological data for the derivation of minimal risk Health Criteria Values (HCV) for each contaminant was selected with due regard to the approach presented in SR2. Where appropriate, the following hierarchy of data sources was used:

1. UK toxicity reviews published by authoritative bodies including:
   - EA;
   - Public Health England (PHE);
   - Committee on Toxicity of Chemicals in Food, Consumer Products and the Environment (COT); and
   - Committee on Carcinogenicity of Chemicals in Food, Consumer Products and the Environment (COC).
2. Authoritative European sources such as European Food Standards Agency (EFSA)
3. International organisations including:
   - World Health Organisation (WHO); and
   - Joint FAO/WHO Expert Committee on Food Additives (JECFA).
4. Authoritative country-specific sources including:
   - United States Environmental Protection Agency (USEPA);
   - US Agency for Toxic Substances and Disease Registry (ATSDR);
   - US Integrated Risk Information System (IRIS); and
   - Netherlands National Institute for Public Health and the Environment (RIVM).

Factors such as the applicability of the data to human health (e.g. epidemiological vs. animal studies), the quality of the data, the level of uncertainty in the results and the age of the data were also taken into account in the final selection. Details for specific substances are available on request.

MEAN DAILY INTAKES

Estimations of background exposure for each threshold substance have been updated. In line with the SR2 approach, the exposure from non-threshold substances in the soil does not take into account exposure from other sources, and as such GACs were derived without consideration of the Mean Daily Intake (MDI) for those substances.

The data published by the EA in its series of TOX reports between 2002 and 2009 was evaluated to determine whether the values were considered to remain valid today. Values from these current UK published sources were not amended unless they were considered to be significantly different so that the GACs remained as comparable as possible with the revoked SGVs.

ORAL MEAN DAILY INTAKES

Oral MDI were generally estimated as the sum of exposure via the ingestion of food and drinking water using the default adult physiological parameters presented in Table 3.3 of SR2.

Data on the exposure of substances from food ingestion was generally obtained from UK Total Diet Studies (TDS) published by the Food Standards Agency (FSA) and its predecessor the Ministry of Agriculture, Fisheries and Food (MAFF) and from studies commissioned by COT. Where no UK-specific data was available, MDI were derived from the European Food Safety Authority (EFSA), Health Canada and US sources. This was a rare occurrence, and in these instances, the data was evaluated to determine its applicability to the UK.

Data on the concentrations of substances in tap water was obtained from a variety of sources. UK data was used where available, with preference given to Drinking Water Inspectorate (DWI) 2014 data from water company tap water testing (LOD, 1st and 99th percentile data is available). Where the substance was not included in tap water testing, other UK sources of information were considered including:

- à DWI data from water company tap water testing from previous years;
- à COT; and
- à FSA.

Where UK data was not available, a number of other data sources were considered, largely WHO International Programme on Chemical Safety (IPCS) Concise International Chemical Assessment Documents (CICADs) and background documents for the development of Guidelines for Drinking Water Quality, using professional judgement on the relevance of the data to the UK. The final decision on the MDI from drinking water was made using professional judgement on the balance of relevance and probability, taking into account the detection limit where not detected, Koc and solubility, reduction in use of the substance, banned substances, tight controls (e.g. on explosives) and with due consideration to the SR2 instruction that “if no data or information in background exposure are available, background exposure should be assumed to be negligible and the MDI set to zero….”.

Data from other countries was generally not used because it was considered that the hydrogeology of these countries along with industrial practices were unlikely to be reflective of the UK.

INHALATION MEAN DAILY INTAKES

Inhalation MDIs were based on estimates of average daily exposure by the inhalation pathway and calculated using the default adult physiological parameters presented in Table 3.3 of SR2.

The inhalation MDIs were generally estimated using background exposure data from the UK, derived from Defra's UK-AIR: Air Information Resource[12], which provides ambient air quality data from a number of sites forming a UK-wide monitoring network. The MDIs for heavy metals were based on rolling annual average metal mass concentration data from Defra's UK Heavy Metals Monitoring Network from the period October 2009 to September 2010[13].

Information for some substances was obtained from UK sources including Environment Agency TOX reports and data from the UK Expert Panel on Air Quality Standards (EPAQS). Where recent UK data was not available, data was sourced from the International Programme on Chemical Safety (IPCS), the World Health Organisation (WHO), the Agency for Toxic Substances and Diseases Registry (ATSDR), Health Canada, and various other peer-reviewed sources summarised by LQM/CIEH[14].

For other substances, where no data or information on background exposure was available, background exposure was assumed to be negligible and the MDI set at 0.5*TDI in accordance with guidance in SR2.

PLANT UPTAKE

Soil to plant concentration factors are available in CLEA v1.071 for arsenic, cadmium, hexavalent chromium, lead, mercury, nickel and selenium. For all remaining inorganic chemicals, concentration factors were obtained using the PRISM model. Substance-specific correction factors have been selected in accordance with the guidance established within SR3. This is consistent to the approach utilised in the derivation of the LQM S4UL and the EIC/AGS/CL:AIRE GAC.

Where there is a lack of appropriate data to enable the derivation of specific soil to plant concentrations factors for organic chemicals, plant uptake was modelled within CLEA v1.071 using the generic equations recommended within SR3, as follows:

- Green Vegetables – Ryan et al. (1988);
- Root Vegetables – Trapp (2002);
- Tuber Vegetables – Trapp et al. (2007); and
- Tree Fruit – Trapp et al. (2003).

There are no suitable models available for modelling uptake for herbaceous fruit or shrub fruit. Exposure is considered negligible.

[12] Crown 2016 copyright Defra via uk-air.defra.gov.uk, licenced under the Open Government Licence (OGL).
[13] Defra, 2013 Spreadsheet of historic data for multiple years for the Metals network. Available online at: http://uk-air.defra.gov.uk/data/metals-data. [Accessed 13/03/2016].
[14] LQM/CIEH, 2015. The LQM/CIEH S4ULs for Human Health Risk Assessment.

SOIL SATURATION LIMITS

GACs are not limited to their theoretical soil saturation within CLEA, although where either the aqueous or the vapour-based saturation is exceeded, this is highlighted within the Workbook (compared with the lower of the two values). This affects pathways which depend on partitioning calculations so in reality this only affects the vapour pathways and is relevant to organic substances and other substances, such as elemental mercury, that have a significant volatile component. However, the Workbook highlights saturation for direct contact pathways to indicate to the user where further qualitative consideration of free phase contamination at the surface may be required.

Where the lower of the two saturation limits is exceeded and the vapour pathway is the only exposure route being considered, the chronic risks to human health are likely to be negligible. Further evaluation could be undertaken using an alternative model suitable for evaluating non-aqueous phase liquids (NAPLs), such as the Johnson & Ettinger (J&E) approach described in USEPA 2003. However, WSP considers that if NAPLs are suspected, given the known limitations and over-simplifications of J&E, soil vapour monitoring is a more accurate way of assessing potential risks.

Where the lower saturation limit is exceeded for the vapour pathway and a number of exposure routes are being considered, then the contribution from the NAPL via vapour inhalation to the overall exposure can be evaluated using the procedure provided in SR4. WSP would evaluate this as part of a DQRA process or through soil vapour monitoring on-site to determine site-specific soil vapour concentrations.

CHEMICAL SPECIFIC ASSUMPTIONS

CYANIDES

Cyanide has high acute toxicity, and short term exposure is an important consideration when assessing the risks from soils contaminated with cyanide. The primary risk to human receptors from free cyanide in soils is an acute risk.

There is no current UK guidance available for calculating acute risks from free cyanide. Consequently, GAC for acute exposure were derived using the algorithms presented in MADEP 1992[15] and assuming a one-off ingestion of 10g of soil (this conservative value has been taken as an upper bound estimate for a one-off soil ingestion rate amongst children). Receptor body weights have been selected according to the critical receptor for each exposure scenario. The lowest of the chronic and acute GAC for each land use scenario were adopted by WSP.

LEAD

The SGV for lead was withdrawn by the EA in 2009, and in 2011 the EA withdrew their published TOX report in light of new scientific evidence. The C4SL for lead was derived using the latest scientific evidence from a large human dataset. As such, no chemical-specific margin was applied in the derivation of the C4SL for lead. It may be possible for WSP to derive a GAC for lead using the same dataset and applying a chemical-specific margin, but the value is likely to be lower than UK natural background concentrations. Therefore, WSP has adopted the toxicological data used to derive the C4SLs in deriving the GAC for lead until such time as alternative GACs are published by an authoritative body. The relative bioavailability was set at 100% in line with the approach taken for other GACs, whereas the C4SL assumes 60% for soil and 64% for airborne dust. Thus, the WSP GAC are lower than the C4SLs.

[15] MADEP '*Background Documentation for the Development of an "Available Cyanide" Benchmark Concentration'* 1992. http://www.mass.gov/dep/toxics/cn_soil.htm

POLYCYCLIC AROMATIC HYDROCARBONS

WSP's approach to the assessment of polycyclic aromatic hydrocarbons (PAHs) uses the surrogate marker approach. BaP was used as a surrogate marker for all genotoxic PAHs in line with the Health Protection Agency 2010[16] recommendations and SP1010. This assumes that the PAH profile of the data is similar to that of the coal tars used in the Culp *et al* oral carcinogenicity study from which the toxicity data for BaP was produced. In reality, this profile has been shown by HPA to be applicable on the majority of contaminated sites based on assessment of sites across the country.

The alternative is the Toxic Equivalency Factor (TEF) approach which uses a reference compound and assigns TEFs for other compounds based on estimates of potency. Key uncertainties with this approach include the assumption that all compounds have the same toxic mechanism of action within the body and that no compounds with a greater potency than the reference compound are present. It is considered by the HPA that the TEF approach is likely to under predict the true carcinogenicity of PAHs and therefore favours the surrogate marker approach.

For these reasons, WSP considers that the adoption of BaP as a surrogate marker for genotoxic PAHs, as opposed to the TEF approach, is reasonable. In rare cases where the PAH profile may differ from the wide definitions of the Culp *et al* study the user should discuss their project with an experienced risk assessor. In addition, WSP has derived a GAC for naphthalene, which is commonly a risk driver due to its high volatility, relative to other PAH compounds.

TRIMETHYLBENZENES

The GAC for trimethylbenzenes can be used for the assessment of any individual isomer (1,2,3-trimethylbenzene, 1,2,4-trimethylbenzene or 1,3,5-trimethylbenzene), or a mixture of the three isomers.

CHEMICAL GROUPS

For a number of chemical groups, the available toxicity data is for combinations of chemicals. Given that the physico-chemical parameters may differ between the chemicals, the GACs for the chemicals within the groups have been calculated and then the lowest GAC selected to represent the entire group. This was the approach taken by the EA for m-, o- and p-xylenes, and has also been adopted by WSP for:

- 2-chlorophenol, 2,4-dichlorophenol, 2,4,6-trichlorophenol and 2,3,4,6-tetrachlorophenol;
- 2-, 3- and 4-methylphenol (total cresols);
- aldrin and dieldrin; and
- α- and β-endosulphan.

[16] HPA Contaminated Land Information Sheet '*Risk Assessment Approaches for Polycyclic Aromatic Hydrocarbons (PAHs)* 2010

EXPOSURE TO VAPOURS

INHALATION OF MEASURED VAPOURS

WSP has derived a set of soil vapour GACs (GAC_{sv}) that allow for the assessment of measured site soil vapour concentrations, using J&E, in order to establish potential risks via indoor inhalation of vapours. This methodology enables a more robust assessment of exposure via the inhalation of soil vapours indoors than using CLEA-derived soil GAC, as it is based upon measured soil vapour concentrations beneath the site. It also allows for the assessment of vapours from all source terms (i.e. groundwater, soil or NAPL). Outdoor inhalation was not included. WSP considers that the indoor inhalation pathway is the significantly dominant risk-driver.

The generic land use scenarios within CLEA (residential and commercial) that were used to derive the soil GAC were used to define the receptor and building characteristics for the soil vapour GAC. Only residential and commercial generic land use scenarios include the indoor inhalation of vapours pathway.

The GAC_{sv} were derived for three different soil types; sand, sandy loam and clay, reflecting the importance of this parameter within the J&E model. A depth to contamination of 0.85 m below the base of the building foundation was assumed (i.e. 1 m below ground level). This differs from the depth assumed for the soil GAC (0.5 m bgl), but was selected by WSP as a reasonable worst case scenario.

It is acknowledged that the J&E commonly over-predicts indoor vapour concentrations. In particular, it will significantly over-predict vapour concentrations for suspended floor slabs, which many new builds are constructed with, it does not take into account lateral migration and assumes an infinite source of contamination at steady state conditions. In addition, it is common for soil gas/vapour wells to be installed with at least 1 m of plain riser at the surface and this equates to a total depth of 0.85 m below the building foundation plus a 0.15 m thick foundation, and so is more representative of the depth that samples will be taken from.

The TDSIs and IDs for each substance were converted from $\mu gkg^{-1}_{bw}day^{-1}$ to μgm^{-3} using the standard conversions quoted in Table 3.3 of SR2, thereby replacing the need to model C_{air} in the equation:

$$C_{air} = \alpha . C_{vap} . 1{,}000{,}000 cm^3 m^{-3}$$

Where:

C_{air} is the concentration of vapours within the building, mg^{-3}
α is the steady state attenuation coefficient between soil and indoor air, dimensionless
C_{vap} is the soil vapour concentration, $mgcm^{-3}$

The target concentrations within indoor air for each substance (C_{air}) are a function of receptor inhalation rates and occupancy periods, as defined by the site conceptual exposure model (assuming standard CLEA occupancy periods and receptors).

The attenuation factor was calculated using J&E (Equation 10.4 in SR3) and the resulting C_{vap} is equivalent to the GAC_{sv} for the modelled exposure scenario.

Where reported soil vapour concentrations exceed the relevant saturated vapour concentration, free product may occur, and the user should discuss their project with an experienced risk assessor.

INHALATION OF GROUNDWATER-DERIVED VAPOURS

WSP has derived a set of groundwater GACs (GAC_{gw}) to evaluate the potential risks through the indoor inhalation of groundwater-derived vapours by first applying the approach described above for the derivation of the WSP GAC_{sv} to determine the acceptable concentration in soil vapour directly above the water table.

The depth to groundwater was assumed to be 1 m bgl (i.e. 0.85 m below the base of the building foundation). This depth was considered to be more representative of commonly encountered groundwater conditions than the 0.5 m below the base of the building foundation (i.e. 0.65 m bgl) that is used by CLEA for an unsaturated source present in the overlying soil.

The GAC_{gw} was then back-calculated from the GAC_{sv} using the air-water partition coefficient (K_{aw}) for each substance.

The WSP Groundwater Vapour GAC are protective against a dissolved phase contaminant source only. If the presence of NAPL is suspected, the risks from this source will need to be assessed. Where reported groundwater concentrations exceed the relevant solubility limit, free product may occur, and the user should discuss their project with an experienced risk assessor.

WSP APPROACH

OVERVIEW

WSP follows the RTM approach in England and Wales and the WAT-PS-10-01 approach in Scotland to assess the potential or actual risks to water bodies on sites that it investigates. In deriving a hierarchy of assessment concentrations with which to quantify the risks, WSP uses relevant EU and UK legislation and World Health Organisation (WHO) guidance, considers the background quality of the water resources and takes account of the current and feasible future uses of the resource. In Scotland the assessment concentrations are referred to as '*assessment limits'* and in England as *'target concentrations'*.

For all substances that are detected in groundwater, the quantitative risk assessment is undertaken by comparing the modelled or actual concentration in water to an appropriate published standard where one is available; this is the target concentration / assessment limit. The selection of the standards is described in further detail in the following Sections.

Where hazardous substances are either detected in soil leachates or are calculated using theoretical partitioning equations, an evaluation is undertaken to determine if discernible concentrations have entered the groundwater. This information is used to determine the most appropriate target concentration / assessment limit to adopt with which to evaluate the potential risks from the contaminants in the unsaturated zone. Where no published standards are available, WSP determines on a case-by-case basis whether site-specific or chemical-specific targets should be derived through additional research or studies.

WSP seeks to ensure that the best available limit of detections (LOD) are achieved for analysis that it commissions. Where this is the case and the LOD is greater than a published target standard, WSP will not conclude that a potential risk exists to the relevant water body. This is in line with the approach that the EA and SEPA take in determining the classification status of the water bodies.

APPROACH TO HAZARDOUS SUBSTANCES

For sites in England and Wales, WSP evaluates the soil leachate analytical results or theoretical partitioning calculations for hazardous substances as listed on the EA website[7] (updated 13 January 2017). For sites in Scotland, the MRVs provided in Annex 4 of WAT-PS-10-01 are used and these are the same as those produced by the EA. Where an MRV is not available, the limit of detection is used for hazardous substances.

Where groundwater analytical results are also available these are evaluated alongside the unsaturated concentration data to determine if the hazardous substances have entered the groundwater by a discernible amount (taken to be the MRV or limit of detection). If hazardous substances are detected in the groundwater, then the quantitative risk assessment of the soil concentrations continues using published standards appropriate for drinking water (see *'Impact to Drinking Water'* below). If the hazardous substances have not yet entered the groundwater, then the soil concentrations are evaluated using the MRVs/LODs.

[7] https://www.gov.uk/government/publications/values-for-groundwater-risk-assessments/hazardous-substances-to-groundwater-minimum-reporting-values

IMPACT TO AQUATIC LIFE IN SURFACE WATERS

Although the surface water EQSs are primarily designed to support the EA and SEPA in their programmes of classification and monitoring of the quality of surface water bodies across England, Wales and Scotland under their WFD and EQSD obligations, the EQSs are also commonly used by contaminated land professionals to quantitatively evaluate the potential impact of site-specific ground contamination to surface waters. This approach is also suggested in RTM and WAT-PS-10-01.

The 2014 and 2015 Standards Directions provide EQSs for the assessment of ecological and chemical surface water body status. When quantifying potential impacts to surface waters, WSP's approach is to focus on the chemical status by evaluating the 'priority' and 'other' pollutants that are listed in those Directions. In addition, the 'specific' pollutants, (which are actually part of the evaluation of ecological status), are also assessed. These three classes of pollutants are used by the EA to mark the boundary between a Good status surface water and failing quality. As such, exceedances of these EQSs can be considered to highlight a potential risk that the surface water will not achieve or maintain its 'Good' status, which contravenes the requirements of the WFD. WSP adopts this approach irrespective of whether the EA or SEPA has determined if the surface water body requires an assessment of chemical status or not, so as to ensure that the requirements of the WFD are met for all surface water bodies that it evaluates in the context of ground contamination.

The EQSs are designed to be applied over a specific period of time. WSP selects the annual average or long term mean as the target concentration for each priority substance, specific pollutant and other pollutant. In most cases, the number of groundwater sampling events will be limited and as such, there are limitations to this approach that WSP highlights on a case by case basis.

A number of EQSs do not come into force until 22 December 2018. WSP may use these values because they can be used as an indicator of long term contamination issues that may pose issues for a site in the near future. This is determined on a case-by-case basis.

Maximum Allowable Concentration (MAC) EQSs are designed to assess acute exposure of the aquatic environment to pollutants. As such, WSP does not consider the use of MACs to be appropriate to use as a target concentration in the majority of cases. An exception could be the evaluation of potential ecological risks to a surface water from a one-off catastrophic spill or leak in an emergency response scenario.

WSP does not assess the potential ecological risks posed by physico-chemical quality elements on a regular basis. pH, dissolved oxygen, biological oxygen demand, acid neutralising capacity, phosphorus, temperature and salinity are considered too unstable to be modelled from groundwater to surface water and these parameters are only measured in the receiving surface water body.

Where a published EQS is not available, WSP follows the WAT-PS-10-01 guidance for sites in Scotland and applies non-WFD EQSs. These comprise repealed Dangerous Substances Directive (DSD) substances as well as EQSs from other sources that should be used with caution. For sites in England and Wales, WSP uses the EA's operational environmental quality standards for Environmental Permitting which are essentially the repealed DSD substances that are applied in Scotland. WSP uses the proposed ethylbenzene EQS from R&D Technical Report P2-115/TR4 2002[8] for sites in England and Wales. This is equivalent to the SEPA non-statutory EQS.

[8] EA '*Proposed Environmental Quality Standards for Ethylbenzene in Water*' R&D Technical Report P2-115/TR4. 2002.

With respect to petroleum hydrocarbons, WSP refers to the CL:AIRE 2017 guidance[9] in order to derive alternative assessment criteria. In cases where no equivalent VOC, SVOC or PAH data is available, the following proxy compounds are used:

- Aromatic EC5-EC7 benzene (EC6.5)
- Aromatic >EC6-EC7 benzene (EC6.5)
- Aromatic >EC6-EC8 benzene (EC6.5)
- Aromatic >EC7-EC8 toluene (EC7.6)
- Aromatic >EC8-EC10 ethylbenzene (EC8.5)
- Aromatic >EC10-EC12 naphthalene (EC11.7)
- Aromatic >EC12-EC16 naphthalene (EC11.7)
- Aromatic >EC16-EC21 anthracene (EC19.4)
- Aromatic >EC21-EC35 benzo(a)pyrene (EC31.3)

IMPACT TO DRINKING WATER

ABSTRACTION FOR PUBLIC POTABLE SUPPLY

In line with the RTM and WAT-PS-10-01, WSP uses drinking water quality standards to evaluate the potential risk to aquifers from both the perspective of current abstraction for potable supply and also to evaluate the risk to future resource potential. The sources of drinking water standards are applied by WSP in the following hierarchy with the UK Drinking Water Standards (DWS) as the first tier:

- UK Water Supply (Water Quality) Regulations of England, Wales and Scotland
- EC Drinking Water Directive 1998
- WHO Drinking Water Guidelines 2011
- WHO Petroleum Products in Drinking Water 2008

RTM does not advocate country-specific standards outside the UK.

In Scotland, SEPA's published Resource Protection Values (RPVs) use the published US EPA National Primary Drinking Water Regulations where they are more conservative than the WHO standards. Where no RPV exists, WSP applies the remainder of the WHO standards as a second, non-statutory tier.

ABSTRACTION FOR PRIVATE SUPPLY

The Private Water Supplies Regulations of England, Scotland and Wales prescribe maximum concentrations and values of inorganic and organic constituents as well as radioactivity and bacteria for natural waters intended for private supply. The concentrations and values are the same as those for public potable supply.

ABSTRACTION FOR BOTTLED WATER

The Natural Mineral Water, Spring Water and Bottled Drinking Water Regulations of England, Scotland and Wales prescribe maximum concentrations and values of inorganic and organic constituents as well as radioactivity and bacteria for natural waters intended for sale for human consumption.

[9] CL:AIRE '*Petroleum Hydrocarbons in Groundwater: Guidance on assessing petroleum hydrocarbons using existing hydrogeological risk assessment methodologies'* v1.1 March 2017.

OTHER RECEPTORS

WSP also considers other less common controlled waters receptors, where applicable, including but not limited to:

- *The Bathing Water Regulations 2013* which provides standards for the classification of the quality of bathing waters at specified locations on the basis of intestinal enterococci and *E. coli* levels.
- *WAT-SG-53, Table 9a: Operational Standards for Aquaculture* which provides the operational water quality standards used by SEPA for regulating the use of chemicals in aquaculture.

Appendix D

SCREENING TABLES

Hover Here for Notes
Matthew Byerly - v9.24 30/05/19
Check here for most recent version

Pick HH GAC from drop-down list below
HH GAC: Res No HG Veg 1% SOM

Soil Analytical Results Screening Sheet

Site Name: Bermondsey Biscuit Factory
Job Number:
Screening Criteria: Res No HG Veg 1% SOM

Determinant	No. Samples	Min mg/kg	Mean mg/kg	Max mg/kg	GAC mg/kg	# GAC Exceeds	TP418 0.50-1.00	TP420 0.40	TP420 0.90	TP420 1.20	TP421 0.30-0.50	TP421 0.50-0.80	TP421 1.20	TP504 1.80-2.00	TP505 0.50	TP505 0.80	TP505 1.20	TP507 0.90	TP509 0.40
pH units	0	< 0	< 0	< 0	No GAC	0													
Arsenic	**32**	< 0	16.26	28	35	0	19	10	16	13	13	22	28	13	19	16	22	16	13
Cadmium	**32**	< 0.2	0.24	0.8	87	0	<	< 0.2	< 0.2	< 0.2	< 0.2	0.8	0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2
Chromium	**32**	< 0	26.19	50	No GAC	0	24	21	32	15	27	30	28	38	18	23	41	26	31
Copper	**32**	< 0	98.63	310	7520	0	190	16	32	20	57	160	220	17	280	170	31	180	110
Lead	**32**	< 0	411.16	1900	188	**19**	**590**	120	130	170	**290**	**1400**	**790**	16	**840**	**630**	28	**370**	**270**
Mercury	**32**	< 0.3	1.98	13	56	0	4	0.4	0.6	< 0.3	< 0.3	< 0.3	4.1	< 0.3	1.3	5.6	< 0.3	2	1.4
Nickel	**32**	< 0	21.74	31	181	0	29	12	22	9.7	17	20	31	25	21	24	28	23	21
Selenium	0	< 0	< 0	< 0	430	0													
Vanadium	0	< 0	< 0	< 0	1170	0													
Zinc	**32**	< 0	200.56	1000	40400	0	140	63	130	71	290	1000	170	48	160	140	64	120	110
Barium	0	< 0	< 0	< 0	1350	0													
Beryllium	0	< 0	< 0	< 0	1.7	0													
Chromium, Hexavalent	**32**	< 1.2	1.20	1.3	4.5	0	<	< 1.2	< 1.2	< 1.2	< 1.2	< 1.2	< 1.2	< 1.2	< 1.2	1.3	< 1.2	< 1.2	< 1.2
Cyanide(Complex)	0	< 0	< 0	< 0	No GAC	0													
Cyanide (Free)	0	< 0	< 0	< 0	15	0													
Cyanide(Total)	0	< 0	< 0	< 0	15	0													
Aliphatics >C8-C10	**32**	< 0.001	< 0.001	< 0.001	27	0	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
Aliphatics >C10-C12	**32**	< 1	1.12	4.9	132	0	<	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	1
Aliphatics >C12-C16	**32**	< 2	3.51	20	1030	0	<	< 2.0	< 2.0	< 2.0	< 2.0	2.3	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	16
Aliphatics >C35-C44	**32**	< 8.4	18.59	93	89100	0	<	< 8.4	< 8.4	< 8.4	< 8.4	37	< 8.4	< 8.4	< 8.4	< 8.4	< 8.4	< 8.4	15
Aromatics >EC8-EC10	**32**	< 0.001	< 0.001	< 0.001	47	0	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
Aromatics >EC10-EC12	**32**	< 1	1.14	2.8	248	0	<	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Aromatics >EC12-EC16	**32**	< 2	3.02	16	1430	0	<	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	3
Aromatics >EC16-EC21	**32**	< 10	15.41	73	1340	0	< 10	< 10	< 10	< 10	< 10	18	< 10	< 10	< 10	< 10	< 10	15	18
Aromatics >EC21-EC35	**32**	< 10	54.13	430	1340	0	12	< 10	< 10	< 10	53	98	< 10	< 10	< 10	< 10	< 10	39	64
Aromatics >EC35-EC44	**32**	< 8.4	31.97	190	1340	0	<	< 8.4	< 8.4	< 8.4	13	29	< 8.4	< 8.4	< 8.4	< 8.4	< 8.4	< 8.4	9.9
Ethylbenzene	0	< 0	< 0	< 0	83	0													
Toluene	0	< 0	< 0	< 0	868	0													
p/m-Xylene	0	< 0	< 0	< 0	79	0													
Xylenes	0	< 0	< 0	< 0	No GAC	0													
Acenaphthene	**32**	< 0.05	0.08	0.65	B(a)P-S.A.	0	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	0.34	< 0.05
Acenaphthylene	**32**	< 0.05	0.07	0.21	B(a)P-S.A.	0	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Anthracene	**17**	#REF!	#REF!	1.5	B(a)P-S.A.	0	< 0.05	< 0.05	0.15	< 0.05	0.15	0.24	< 0.05	< 0.05	< 0.05	0.19	< 0.05	0.59	< 0.05
Benzo(a)Anthracene	**32**	< 0.05	0.79	4.7	B(a)P-S.A.	0	0.29	0.2	0.83	0.38	1.2	1.6	< 0.05	< 0.05	< 0.05	0.55	< 0.05	2	< 0.05
Benzo(a)pyrene	**32**	< 0.05	0.81	5.1	1.7	**3**	0.28	0.21	0.82	0.35	1.2	1.6	< 0.05	< 0.05	< 0.05	0.47	< 0.05	**2.4**	< 0.05
Benzo(b)fluoranthene	**17**	< 0.05	0.99	4.7	B(a)P-S.A.	0	0.41	0.24	0.97	0.47	1.4	1.8	< 0.05	< 0.05	< 0.05	0.75	< 0.05	2.7	< 0.05
Benzo(g,h,i)perylene	**32**	< 0.05	0.52	3.8	B(a)P-S.A.	0	< 0.05	< 0.05	0.56	0.25	0.92	1.2	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	1.2	< 0.05
Benzo(k)fluoranthene	**32**	< 0.05	0.64	5.8	B(a)P-S.A.	0	0.16	0.13	0.54	0.21	0.61	0.90	< 0.05	< 0.05	< 0.05	0.14	< 0.05	1	< 0.05
bis (2-ethylhexyl) phthalate	0	< 0	< 0	< 0	2720	0													
Chrysene	**32**	< 0.05	0.70	4	B(a)P-S.A.	0	0.33	0.19	0.71	0.28	0.96	1.3	< 0.05	< 0.05	< 0.05	0.46	< 0.05	1.8	< 0.05
Dibenzo(a,h)anthracene	**32**	< 0.05	0.08	0.5	B(a)P-S.A.	0	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	0.28	< 0.05
Dibenzofuran	0	#REF!	#REF!	#REF!	#N/A	0													
Fluoranthene	**32**	< 0.05	0.89	10	B(a)P-S.A.	0	0.41	0.24	1.7	0.62	2.2	2.5	< 0.05	< 0.05	< 0.05	0.83	< 0.05	3.8	< 0.05
Fluorene	**32**	< 0.05	0.60	0.43	B(a)P-S.A.	0	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	0.24	< 0.05
Indeno(1,2,3-cd)pyrene	**32**	< 0.05	0.41	2.8	B(a)P-S.A.	0	< 0.05	< 0.05	0.51	0.23	0.72	0.97	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	1.1	< 0.05
Naphthalene	**32**	< 0.05	0.09	0.88	2.3	0	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	0.43	< 0.05
Phenanthrene	**32**	< 0.05	0.73	6.9	B(a)P-S.A.	0	0.36	< 0.05	0.67	< 0.05	0.71	0.90	< 0.05	< 0.05	< 0.05	0.93	< 0.05	2.6	< 0.05
Pyrene	**32**	< 0.05	1.28	9	B(a)P-S.A.	0	0.32	0.24	1.5	0.56	2.0	2.3	< 0.05	< 0.05	< 0.05	0.69	< 0.05	3.3	< 0.05
p-Isopropyltoluene	0	< 0	< 0	< 0	No GAC	0													
Styrene	0	< 0	< 0	< 0	50	0													
1,2-Dichloroethane	0	< 0	< 0	< 0	0.0092	0													
Trichloroethene (TCE)	0	< 0	< 0	< 0	0.017	0													
1-Methylnaphthalene	0	< 0	< 0	< 0	No GAC	0													
2-Methylnaphthalene	0	< 0	< 0	< 0	No GAC	0													
Phenol Index.(AR)	0	< 0	< 0	< 0	No GAC	0													
Coronene	0	< 0	< 0	< 0	No GAC	0													
Methyl tertiary butyl ether (MTBE)	0	< 0	< 0	< 0	104	0													
Total PCB Congeners ICES 7	0	< 0	< 0	< 0	0.44	0													
Speciated Total EPA-16 PAHs	**32**	< 0.8	8.38	51.4	#N/A	0	2.56	1.45	9	3.35	12.1	15.2	< 0.80	< 0.80	< 0.80	5.01	< 0.80	23.8	< 0.80
PCB Congener 077	**31**	< 0.001	< 0.001	< 0.001	#N/A	0	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
PCB Congener 081	**31**	< 0.001	< 0.001	< 0.001	#N/A	0	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
PCB Congener 105	**31**	< 0.001	< 0.001	< 0.001	#N/A	0	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
PCB Congener 114	**31**	< 0.001	< 0.001	< 0.001	#N/A	0	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
PCB Congener 118	**32**	< 0.001	< 0.001	< 0.001	#N/A	0	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
PCB Congener 123	**31**	< 0.001	< 0.001	< 0.001	#N/A	0	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
PCB Congener 126	**31**	< 0.001	< 0.001	< 0.001	#N/A	0	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
PCB Congener 156	**31**	< 0.001	< 0.001	< 0.001	#N/A	0	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
PCB Congener 157	**31**	< 0.001	< 0.001	< 0.001	#N/A	0	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
PCB Congener 167	**31**	< 0.001	< 0.001	< 0.001	#N/A	0	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
PCB Congener 169	**31**	< 0.001	< 0.001	< 0.001	#N/A	0	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
PCB Congener 189	**31**	< 0.001	< 0.001	< 0.001	#N/A	0	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
Total PCBs	**31**	< 0.012	< 0.012	< 0.012	#N/A	0	< 0.012	< 0.012	< 0.012	< 0.012	< 0.012	< 0.012	< 0.012	< 0.012	< 0.012	< 0.012	< 0.012	< 0.012	< 0.012
TPH-CWG - Aliphatic (EC5 - EC44)	**32**	< 10	65.72	550	#N/A	0	< 10	< 10	< 10	< 10	< 10	170	< 10	< 10	< 10	< 10	< 10	< 10	210

B(a)P-S.A. - Benzo(a)pyrene used as surrogate for nonvolatile PAH risks

Soil Analytical Results Screening Sheet

Site Name: Bermondsey Biscuit Factory
Job Number:
Screening Criteria: Res No HG Veg 1% SOM

Determinant	No. Samples	Min mg/kg	Mean mg/kg	Max mg/kg	GAC mg/kg	# GAC Exceeds	TP418 0.50-1.00	TP420 0.40	TP420 0.90	TP420 1.20	TP421 0.30-0.50	TP421 0.50-0.80	TP421 1.20	TP504 1.80-2.00	TP505 0.50	TP505 0.80	TP505 1.20	TP507 0.90	TP509 0.40
TPH-CWG - Aromatic (EC5 - EC44)	32	< 10	92.47	700	#N/A	0	13	< 10	< 10	< 10	75	150	< 10	< 10	< 10	< 10	< 10	55	95

B(a)P-S.A. - Benzo(a)pyrene used as surrogate for nonvolatile PAH risks

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Pick HH GAC from drop-down list below
HH GAC: Res No HG Veg 1% SOM

Soil Analytical Results Screening Sheet

Site Name: Bermondsey Biscuit Factory
Job Number:
Screening Criteria: Res No HG Veg 1% SOM

Determinant	No. Samples	Min mg/kg	Mean mg/kg	Max mg/kg	GAC mg/kg	# GAC Exceeds	TP420 0.4	TP420 0.9	TP420 1.2	TP505 0.5	TP505 0.8	TP505 1.2	TP509 0.4	TP507 0.9	TP418 0.5-1	TP504 1.8-2	TP403 0.3	TP416 0.5	TP416 1	TP416 1.3	TP109 0.50 - 1	TP108 0.50 - 1	TP116 1.2	TP103 1.3	TP119 0.6	TP105 0.30 - 0.50
pH units	0	< 0	< 0	< 0	No GAC	0																				
Arsenic	**32**	< 0	16.26	28	35	0	10	16	13	19	16	22	13	16	19	13	17	20	23	15	15	12	12	2.4	16	18
Cadmium	**32**	< 0.2	0.24	0.8	87	0	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	<0.2	< 0.2	< 0.2	<0.2	0.7	< 0.2	< 0.2	<0.2	0.5	<0.2	<0.2	<0.2	<0.2	<0.2
Chromium	**32**	< 0	26.19	50	No GAC	0	21	32	15	18	23	41	31	26	24	38	20	25	30	50	31	27	23	26	16	26
Copper	**32**	< 0	97.22	310	7520	0	16	32	20	280	170	31	110	180	190	17	97	210	310	20	62	51	45	30	32	37
Lead	**32**	< 0	411.16	1900	188	**19**	120	130	170	**840**	**630**	28	**270**	**370**	**590**	16	**410**	**890**	**350**	54	**370**	87	100	85	82	**220**
Mercury	**29**	#REF!	#REF!	13	56	0	0.4	0.6	< 0.3	1.3	5.6	< 0.3	1.4	2.0	4.0	<0.3	1.4	5.1	2.5	0.4	<0.3	<0.3	<0.3	<0.3	0.9	4
Nickel	**32**	< 0.3	20.14	31	181	0	12	22	9.7	21	24	28	21	23	29	25	21	26	29	29	27	20	17	18	13	19
Selenium	0	< 0	< 0	< 0	430	0																				
Vanadium	0	< 0	< 0	< 0	1170	0																				
Zinc	**32**	< 0	200.56	1000	40400	0	63	130	71	160	140	64	110	120	140	48	260	180	130	70	500	160	270	190	140	490
Barium	0	< 0	< 0	< 0	1350	0																				
Beryllium	0	< 0	< 0	< 0	1.7	0																				
Chromium, Hexavalent	**32**	< 1.2	1.20	1.3	4.5	0	< 1.2	< 1.2	< 1.2	< 1.2	1.3	< 1.2	<1.2	< 1.2	<1.2	<1.2	<1.2	< 1.2	< 1.2	<1.2	<1.2	<1.2	<1.2	<1.2	<1.2	<1.2
Cyanide(Complex)	0	< 0	< 0	< 0	No GAC	0																				
Cyanide (Free)	0	< 0	< 0	< 0	15	0																				
Cyanide(Total)	**19**	< 1	< 1	< 1	15	0														<1	<1	<1	<1	<1	<1	<1
Aliphatics >C8-C10	**19**	< 0.001	< 0.001	< 0.001	27	0														<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Aliphatics >C10-C12	**20**	< 1	1.20	4.9	132	0							1							<1.0	<1.0	4.9	<1.0	<1.0	<1.0	<1.0
Aliphatics >C12-C16	**20**	< 0.2	4.32	20	1030	0							16							<2.0	<2.0	20	<2.0	4.9	2.9	<2.0
Aliphatics >C35-C44	**20**	< 8.4	24.71	93	89100	0							15							<8.4	15	93	24	33	12	65
Aromatics >EC8-EC10	**20**	< 0.001	< 0.001	< 0.001	47	0							<0.001							<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Aromatics >EC10-EC12	**20**	< 1	1.23	2.8	248	0							<1.0							<1.0	<1.0	1.8	<1.0	<1.0	<1.0	<1.0
Aromatics >EC12-EC16	**20**	< 0.2	3.55	16	1430	0							3							<2.0	<2.0	11	<2.0	3.3	<2.0	<2.0
Aromatics >EC16-EC21	**20**	< 10	18.40	73	1340	0							18							<10	<10	67	12	15	16	<10
Aromatics >EC21-EC35	**20**	< 10	78.70	430	1340	0							64							<10	35	430	140	81	79	39
Aromatics >EC35-EC44	**20**	< 8.4	46.11	190	1340	0							9.9							<8.4	25	190	160	42	37	<8.4
Ethylbenzene	**19**	< 0.001	< 0.001	< 0.001	83	0														<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Toluene	**19**	< 0.001	< 0.001	< 0.001	868	0														<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
p/m-Xylene	**19**	< 0.001	< 0.001	< 0.001	79	0														<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Xylenes	0	< 0	< 0	< 0	No GAC	0																				
Acenaphthene	**32**	< 0.05	0.09	0.65	B(a)P-S.A.	0	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	<	< 0.05	0.34	< 0.05	< 0.05	< 0.05	0.34	< 0.05	<0.05	<0.05	<0.05	<0.05	<0.05	0.21	<0.05
Acenaphthylene	**32**	< 0.05	0.06	0.21	B(a)P-S.A.	0	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	<	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Anthracene	**32**	< 0.05	0.17	1.5	B(a)P-S.A.	0	< 0.05	0.15	< 0.05	< 0.05	0.19	<	< 0.05	0.59	< 0.05	< 0.05	0.09	0.46	< 0.05	<0.05	0.16	0.49	0.18	<0.05	0.32	0.11
Benzo(a)Anthracene	**32**	< 0.05	0.79	4.7	B(a)P-S.A.	0	0.20	0.83	0.38	< 0.05	0.55	<	< 0.05	2.0	0.29	< 0.05	0.78	0.27	< 0.05	<0.05	1.1	4.7	1.2	0.34	1.2	0.8
Benzo(a)pyrene	**32**	< 0.05	0.81	5.1	1.7	**3**	0.21	0.82	0.35	< 0.05	0.47	<	< 0.05	**2.4**	0.28	< 0.05	0.72	0.24	< 0.05	<0.05	1.5	**5.1**	1.2	0.48	1.2	1.2
Benzo(b)fluoranthene	**32**	< 0.05	0.95	5.8	B(a)P-S.A.	0	0.24	0.97	0.47	< 0.05	0.75	<	< 0.05	2.7	0.41	< 0.05	0.88	0.27	< 0.05	<0.05	1.4	5.8	1.4	0.64	1.3	1.3
Benzo(g,h,i)perylene	**32**	< 0.05	0.52	3.8	B(a)P-S.A.	0	< 0.05	0.56	0.25	< 0.05	< 0.05	<	< 0.05	1.2	< 0.05	< 0.05	0.44	< 0.05	< 0.05	<0.05	0.98	3.8	0.96	0.35	0.76	0.78
Benzo(k)fluoranthene	**32**	< 0.05	0.41	2.3	B(a)P-S.A.	0	0.13	0.54	0.21	< 0.05	0.14	<	< 0.05	1.0	0.16	< 0.05	0.46	0.15	< 0.05	<0.05	0.85	2.3	0.41	0.19	0.74	0.68
bis (2-ethylhexyl) phthalate	**2**	< 0.05	< 0.05	< 0.05	2720	0																				
Chrysene	**32**	< 0.05	0.71	4	B(a)P-S.A.	0	0.19	0.71	0.28	< 0.05	0.75	<	< 0.05	1.8	0.33	< 0.05	0.71	0.30	< 0.05	<0.05	1	3.7	0.84	0.39	1.1	0.88
Dibenzo(a,h)anthracene	**32**	< 0.05	0.08	0.5	B(a)P-S.A.	0	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	<	< 0.05	0.28	< 0.05	< 0.05	0.11	< 0.05	< 0.05	<0.05	<0.05	0.5	<0.05	<0.05	0.11	<0.05
Dibenzofuran	**10**	< 0.0002	< 0.0002	< 0.05	#N/A	0																<0.0002	<0.0002	<0.0002	<0.0002	
Fluoranthene	**32**	< 0.05	1.40	10	B(a)P-S.A.	0	0.24	1.7	0.62	< 0.05	0.83	<	< 0.05	3.8	0.41	< 0.05	1.6	0.80	< 0.05	<0.05	1.5	6.7	1.7	0.74	2.6	1.2
Fluorene	**31**	< 0.05	0.08	0.43	B(a)P-S.A.	0	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	<	< 0.05	0.24	< 0.05	< 0.05	< 0.05	0.43	< 0.05	<0.05	<0.05	<0.05	<0.05	<0.05	0.15	<0.05
Indeno(1,2,3-cd)pyrene	**32**	< 0.05	0.41	2.8	B(a)P-S.A.	0	< 0.05	0.51	0.23	< 0.05	< 0.05	<	< 0.05	1.1	< 0.05	< 0.05	0.38	< 0.05	< 0.05	<0.05	0.77	2.8	0.66	0.27	0.56	0.6
Naphthalene	**32**	< 0.05	0.09	0.88	2.3	0	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	<	< 0.05	0.43	< 0.05	< 0.05	< 0.05	0.88	< 0.05	<0.05	<0.05	<0.05	<0.05	<0.05	0.09	<0.05
Phenanthrene	**30**	#REF!	#REF!	6.9	B(a)P-S.A.	0	< 0.05	0.67	< 0.05	< 0.05	0.93	<	< 0.05	2.6	0.36	< 0.05	0.52	1.8	< 0.05	<0.05	0.56	1.5	0.51	0.35	2.2	0.27
Pyrene	**30**	#REF!	#REF!	9	B(a)P-S.A.	0	0.24	1.5	0.56	< 0.05	0.69	<	< 0.05	3.3	0.32	< 0.05	1.3	0.68	< 0.05	<0.05	1.5	6.7	1.4	0.65	2.2	1.3
p-Isopropyltoluene	**7**	< 0.001	< 0.001	< 0.001	No GAC	0																<0.001	<0.001	<0.001	<0.001	
Styrene	**7**	< 0.001	< 0.001	< 0.001	50	0																<0.001	<0.001	<0.001	<0.001	
1,2-Dichloroethane	**7**	< 0.001	< 0.001	< 0.001	0.0092	0																<0.001	<0.001	<0.001	<0.001	
Trichloroethene (TCE)	**7**	< 0.001	< 0.001	< 0.001	0.017	0																<0.001	<0.001	<0.001	<0.001	
1-Methylnaphthalene	0	< 0	< 0	< 0	No GAC	0																				
2-Methylnaphthalene	0	< 0	< 0	< 0	No GAC	0																				
Phenol Index (AR)	0	< 0	< 0	< 0	No GAC	0																				
Coronene	0	< 0	< 0	< 0	No GAC	0																				
Methyl tertiary butyl ether (MTBE)	**19**	< 0.001	< 0.001	< 0.001	104	0														<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Total PCB Congeners ICES 7	0	< 0	< 0	< 0	0.44	0																				
Speciated Total EPA-16 PAHs	**32**	< 0.8	8.38	51.4	#N/A	0	1.45	9.00	3.35	<	5.01	<	<	23.8	2.56	<	7.97	6.61	<	<0.80	11.4	44	10.3	4.4	14.7	9.03
PCB Congener 077	**29**	< 0.001	< 0.001	< 0.001	#N/A	0	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001		< 0.001	< 0.001		<0.001	<0.001	<0.001	<0.001		<0.001
PCB Congener 081	**28**	#REF!	#REF!	#REF!	#N/A	0	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001		< 0.001	< 0.001		<0.001	<0.001	<0.001	<0.001		<0.001
PCB Congener 105	**29**	< 0.001	< 0.001	< 0.001	#N/A	0	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001		< 0.001	< 0.001		<0.001	<0.001	<0.001	<0.001		<0.001
PCB Congener 114	**29**	< 0.001	< 0.001	< 0.001	#N/A	0	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001		< 0.001	< 0.001		<0.001	<0.001	<0.001	<0.001		<0.001
PCB Congener 118	**30**	< 0.001	< 0.001	< 0.001	#N/A	0	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001		<0.001	<0.001	<0.001	<0.001		<0.001
PCB Congener 123	**29**	< 0.001	< 0.001	< 0.001	#N/A	0	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001		< 0.001	< 0.001		<0.001	<0.001	<0.001	<0.001		<0.001
PCB Congener 126	**29**	< 0.001	< 0.001	< 0.001	#N/A	0	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001		< 0.001	< 0.001		<0.001	<0.001	<0.001	<0.001		<0.001
PCB Congener 156	**29**	< 0.001	< 0.001	< 0.001	#N/A	0	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001		< 0.001	< 0.001		<0.001	<0.001	<0.001	<0.001		<0.001
PCB Congener 157	**29**	< 0.001	< 0.001	< 0.001	#N/A	0	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001		< 0.001	< 0.001		<0.001	<0.001	<0.001	<0.001		<0.001
PCB Congener 167	**29**	< 0.001	< 0.001	< 0.001	#N/A	0	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001		< 0.001	< 0.001		<0.001	<0.001	<0.001	<0.001		<0.001
PCB Congener 169	**29**	< 0.001	< 0.001	< 0.001	#N/A	0	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001		< 0.001	< 0.001		<0.001	<0.001	<0.001	<0.001		<0.001
PCB Congener 189	**29**	< 0.001	< 0.001	< 0.001	#N/A	0	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001		< 0.001	< 0.001		<0.001	<0.001	<0.001	<0.001		<0.001
Total PCBs	**29**	< 0.012	< 0.012	< 0.012	#N/A	0	< 0.012	< 0.012	< 0.012	< 0.012	< 0.012	< 0.012	< 0.012	< 0.012	< 0.012	< 0.012		< 0.012	< 0.012		<0.012	<0.012	<0.012	<0.012		<0.012
Phenol	**32**	< 1	< 1	< 1	280	0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Aliphatic >EC5 - EC35	**21**	< 10	75.67	460	#N/A	0							200						<10	<10	35	460	48	130	61	65

B(a)P-S.A. - Benzo(a)pyrene used as surrogate for nonvolatile PAH risks

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Pick HH GAC from drop-down list below
HH GAC: Res No HG Veg 1% SOM

Soil Analytical Results Screening Sheet

Site Name: Bermondsey Biscuit Factory
Job Number:
Screening Criteria: Res No HG Veg 1% SOM

Determinant	No. Samples	Min mg/kg	Mean mg/kg	Max mg/kg	GAC mg/kg	# GAC Exceeds	TP204 0.70 - 0.80	TP201 0.4	TP209 0.30 - 0.50	TP209 0.70 -1.20	TP421 1.2	TP311 0.60 -1	TP421 0.30 - 0.50	TP421 0.50 - 0.80
pH units	0	< 0	< 0	< 0	No GAC	0								
Arsenic	**32**	< 0	16.26	28	35	0	18	17	15	14	28	21	13	22
Cadmium	**32**	< 0.2	0.24	0.8	87	0	<0.2	<0.2	<0.2	<0.2	0.2	<0.2	<0.2	0.8
Chromium	**32**	< 0	26.19	50	No GAC	0	22	26	19	19	28	20	27	30
Copper	**32**	< 0	97.22	310	7520	0	140	82	62	150	220	24	57	160
Lead	**32**	< 0	411.16	1900	188	**19**	**880**	110	**1900**	**630**	**790**	87	**290**	**1400**
Mercury	**29**	#REF!	#REF!	13	56	0	5	0.4	0.9	13	4.1	<0.3	<0.3	<0.3
Nickel	**32**	< 0.3	20.14	31	181	0	25	27	15	22	31	15	17	20
Selenium	0	< 0	< 0	< 0	430	0								
Vanadium	0	< 0	< 0	< 0	1170	0								
Zinc	**32**	< 0	200.56	1000	40400	0	150	79	420	120	170	38	290	1000
Barium	0	< 0	< 0	< 0	1350	0								
Beryllium	0	< 0	< 0	< 0	1.7	0								
Chromium, Hexavalent	**32**	< 1.2	1.20	1.3	4.5	0	<1.2	<1.2	<1.2	<1.2	<1.2	<1.2	<1.2	<1.2
Cyanide(Complex)	0	< 0	< 0	< 0	No GAC	0								
Cyanide (Free)	0	< 0	< 0	< 0	15	0								
Cyanide(Total)	**19**	< 1	< 1	< 1	15	0	<1	<1	<1	<1	<1	<1	<1	<1
Aliphatics >C8-C10	**19**	< 0.001	< 0.001	< 0.001	27	0	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Aliphatics >C10-C12	**20**	< 1	1.20	4.9	132	0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Aliphatics >C12-C16	**20**	< 0.2	4.32	20	1030	0	<2.0	<2.0	<0.2	<2.0	<2.0	<2.0	<2.0	2.3
Aliphatics >C35-C44	**20**	< 8.4	24.71	93	89100	0	<8.4	<8.4	15	<8.4	<8.4	<8.4	<8.4	37
Aromatics >EC8-EC10	**20**	< 0.001	< 0.001	< 0.001	47	0	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Aromatics >EC10-EC12	**20**	< 1	1.23	2.8	248	0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Aromatics >EC12-EC16	**20**	< 0.2	3.55	16	1430	0	<2.0	<2.0	<0.2	<2.0	<2.0	<2.0	<2.0	<2.0
Aromatics >EC16-EC21	**20**	< 10	18.40	73	1340	0	<10	<10	<10	<10	<10	<10	<10	18
Aromatics >EC21-EC35	**20**	< 10	78.70	430	1340	0	<10	22	11	<10	<10	<10	53	98
Aromatics >EC35-EC44	**20**	< 8.4	46.11	190	1340	0	<8.4	<8.4	<8.4	<8.4	<8.4	<8.4	13	29
Ethylbenzene	**19**	< 0.001	< 0.001	< 0.001	83	0	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Toluene	**19**	< 0.001	< 0.001	< 0.001	868	0	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
p/m-Xylene	**19**	< 0.001	< 0.001	< 0.001	79	0	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Xylenes	0	< 0	< 0	< 0	No GAC	0								
Acenaphthene	**32**	< 0.05	0.09	0.65	B(a)P-S.A.	0	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Acenaphthylene	**32**	< 0.05	0.06	0.21	B(a)P-S.A.	0	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Anthracene	**32**	< 0.05	0.17	1.5	B(a)P-S.A.	0	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	0.15	0.24
Benzo(a)Anthracene	**32**	< 0.05	0.79	4.7	B(a)P-S.A.	0	<0.05	0.23	<0.05	<0.05	<0.05	0.15	1.2	1.6
Benzo(a)pyrene	**32**	< 0.05	0.81	5.1	1.7	**3**	<0.05	0.33	<0.05	<0.05	<0.05	<0.05	1.2	1.6
Benzo(b)fluoranthene	**32**	< 0.05	0.95	5.8	B(a)P-S.A.	0	<0.05	0.36	<0.05	<0.05	<0.05	<0.05	1.4	1.8
Benzo(g,h,I)perylene	**32**	< 0.05	0.52	3.8	B(a)P-S.A.	0	<0.05	0.31	<0.05	<0.05	<0.05	<0.05	0.92	1.2
Benzo(k)fluoranthene	**32**	< 0.05	0.41	2.3	B(a)P-S.A.	0	<0.05	0.15	<0.05	<0.05	<0.05	<0.05	0.61	0.9
bis (2-ethylhexyl) phthalate	**2**	< 0.05	< 0.05	< 0.05	2720	0								
Chrysene	**32**	< 0.05	0.71	4	B(a)P-S.A.	0	<0.05	0.2	<0.05	<0.05	<0.05	0.23	0.96	1.3
Dibenzo(a,h)anthracene	**32**	< 0.05	0.08	0.5	B(a)P-S.A.	0	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Dibenzofuran	**10**	< 0.0002	< 0.0002	< 0.05	#N/A	0			<0.0002	<0.0002	<0.0002	<0.0002		
Fluoranthene	**32**	< 0.05	1.40	10	B(a)P-S.A.	0	<0.05	0.29	<0.05	<0.05	<0.05	0.3	2.2	2.5
Fluorene	**31**	< 0.05	0.08	0.43	B(a)P-S.A.	0	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	
Indeno(1,2,3-cd)pyrene	**32**	< 0.05	0.41	2.8	B(a)P-S.A.	0	<0.05	0.23	<0.05	<0.05	<0.05	<0.05	0.72	0.97
Naphthalene	**32**	< 0.05	0.09	0.88	2.3	0	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Phenanthrene	**30**	#REF!	#REF!	6.9	B(a)P-S.A.	0	<0.05	<0.05	<0.05	<0.05	<0.05	0.17	0.71	0.9
Pyrene	**30**	#REF!	#REF!	9	B(a)P-S.A.	0	<0.05	0.34	<0.05	<0.05	<0.05	0.28	2	2.3
p-Isopropyltoluene	**7**	< 0.001	< 0.001	< 0.001	No GAC	0			<0.001		<0.001	<0.001		
Styrene	**7**	< 0.001	< 0.001	< 0.001	50	0			<0.001		<0.001	<0.001		
1,2-Dichloroethane	**7**	< 0.001	< 0.001	< 0.001	0.0092	0			<0.001		<0.001	<0.001		
Trichloroethene (TCE)	**7**	< 0.001	< 0.001	< 0.001	0.017	0			<0.001		<0.001	<0.001		
1-Methylnaphthalene	0	< 0	< 0	< 0	No GAC	0								
2-Methylnaphthalene	0	< 0	< 0	< 0	No GAC	0								
Phenol Index.(AR)	0	< 0	< 0	< 0	No GAC	0								
Coronene	0	< 0	< 0	< 0	No GAC	0								
Methyl tertiary butyl ether (MTBE)	**19**	< 0.001	< 0.001	< 0.001	104	0	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Total PCB Congeners ICES 7	0	< 0	< 0	< 0	0.44	0								
Speciated Total EPA-16 PAHs	**32**	< 0.8	8.38	51.4	#N/A	0	<0.80	2.44	<0.80	<0.80	<0.80	1.13	12.1	15.2
PCB Congener 077	**29**	< 0.001	< 0.001	< 0.001	#N/A	0	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
PCB Congener 081	**28**	#REF!	#REF!	#REF!	#N/A	0	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
PCB Congener 105	**29**	< 0.001	< 0.001	< 0.001	#N/A	0	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
PCB Congener 114	**29**	< 0.001	< 0.001	< 0.001	#N/A	0	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
PCB Congener 118	**30**	< 0.001	< 0.001	< 0.001	#N/A	0	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
PCB Congener 123	**29**	< 0.001	< 0.001	< 0.001	#N/A	0	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
PCB Congener 126	**29**	< 0.001	< 0.001	< 0.001	#N/A	0	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
PCB Congener 156	**29**	< 0.001	< 0.001	< 0.001	#N/A	0	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
PCB Congener 157	**29**	< 0.001	< 0.001	< 0.001	#N/A	0	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
PCB Congener 167	**29**	< 0.001	< 0.001	< 0.001	#N/A	0	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
PCB Congener 169	**29**	< 0.001	< 0.001	< 0.001	#N/A	0	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
PCB Congener 189	**29**	< 0.001	< 0.001	< 0.001	#N/A	0	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Total PCBs	**29**	< 0.012	< 0.012	< 0.012	#N/A	0	<0.012	<0.012	<0.012	<0.012	<0.012	<0.012	<0.012	<0.012
Phenol	**32**	< 1	< 1	< 1	280	0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Aliphatic >EC5 - EC35	**21**	< 10	75.67	460	#N/A	0	<10	<10	87	<10	<10	<10	<10	130

B(a)P-S.A. - Benzo(a)pyrene used as surrogate for nonvolatile PAH risks

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Pick HH GAC from drop-down list below
HH GAC: Res No HG Veg 1% SOM

Soil Analytical Results Screening Sheet

Site Name: Socotec - Biscuit Factory
Job Number: 70075582
Screening Criteria: Res No HG Veg 1% SOM

Determinant	No. Samples	Min mg/kg	Mean mg/kg	Max mg/kg	GAC mg/kg	# GAC Exceeds	TP411 0.8	TP413 0.8	WS12 1.8	WS13 0.4	WS13 0.8	BH4A 2	BH6 3.5	BH6 5.5	WS8 2	WS8 2.6	WS5 0.4	WS5 0.9	BH13 0.8	BH11 0.4
pH units	19	7.6	8.88	11.3	No GAC	0	10.7	8.5	8.2	8.2	7.6	8.6	8.8	9.2	8.7	8.6	10.9	8	7.7	11.3
Arsenic	19	< 0	14.28	25	35	0	14.0	18.0	14.5	15.29	20.3	10.9	14.3	14.6	4.2	15.8	10.0	14.8	16.7	15.6
Cadmium	19	< 0.2	0.25	0.55	87	0	<0.20	0.24	<0.2	<0.205	0.35	<0.2	<0.2	<0.2	<0.2	<0.2	<0.21	0.28	0.55	0.29
Chromium	19	< 0	22.06	30.4	1590	0	26.0	23.2	25.9	16.22	20.3	22.8	19.4	30.4	24.9	20.1	19.3	25.3	24.1	19.6
Copper	19	< 0	67.73	293	7520	0	56.0	22.5	15.1	40.44	159.1	18.8	8.6	8	9.6	8.9	55.1	126.4	153.6	54.7
Lead	19	< 0	334.91	1360	188	10	1270	99.3	21.5	1360	517.6	94	10.8	6.4	10.5	5.7	98.8	352.0	397.1	242.7
Mercury	19	< 0.5	1.09	3.26	56	0	<0.51	3.26	<0.5	0.749	3.22	<0.51	<0.5	<0.5	<0.5	<0.5	<0.51	1.64	1.35	1.72
Nickel	19	< 0	21.60	29.7	181	0	19.7	26	19.9	17.04	29.4	19.3	18.0	29	13.9	19.6	14.0	26.0	24.9	19.0
Selenium	19	< 0.5	15.39	1	430	0			<0.5	<0.51	1	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	0.6	0.7	<0.5
Zinc	17	#REF!	#REF!	1130	40400	0	118	164.8	47	101.93	157.7	41.7	25.9	21	30.9	24.8	91.7	155.6	131.8	155.5
Hexavalent Chromium	17	< 0.1	0.32	0.3	4.5	0	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1			<0.1	<0.1	<0.1	<0.1	0.3	<0.1
Boron	13	#REF!	#REF!	7	10500	0			1.9	2.16	7.0	1.3	<0.5	<0.5	<0.5	0.7	0.8	2.6	3	0.9
Aliphatics >C8-C10	15	< 0.217	1.27	15.3	27	0	<0.231	<0.296	<0.248	<0.2427	<0.272	<0.244	15.3	0.306					<0.274	<0.238
Ethylbenzene	13	< 0.0102	0.02	0.094	83	0	<0.0115	<0.0148	<0.0124	<0.01214	<0.0136	<0.0122	0.094	<0.0108						
Toluene	13	< 0.01045	< 0.01045	< 13	868	0	<0.0115	<0.0148	<0.0124	<0.01214	<0.0136	<0.0122	<0.0111	<0.0108						
p/m-Xylene	11	#REF!	#REF!	0.243	79	0	<0.0231	<0.0296	<0.0248	<0.02427	<0.0272	<0.0244	0.243	<0.0215						
Xylenes	12	#VALUE!	#VALUE!	0.243	No GAC	0	<0.0346	<0.0444	<0.0371	<0.03641	<0.0409	<0.0366	0.243	<0.0323						
Acenaphthene	19	< 0.08	0.12	0.566	B(a)P-S.A.	0	<0.09	<0.12	<0.10	<0.097	<0.11	<0.10	0.57	<0.1	<0.09	<0.08	<0.10	<0.10	<0.11	<0.10
Acenaphthylene	19	< 0.08	0.11	0.35	B(a)P-S.A.	0	<0.09	<0.12	<0.10	<0.097	<0.11	<0.10	0.12	<0.1	<0.09	<0.08	<0.10	<0.10	<0.11	0.11
Anthracene	19	< 0.08	0.21	1.57	B(a)P-S.A.	0	<0.09	<0.12	<0.10	<0.097	<0.11	<0.10	0.57	<0.1	<0.09	<0.08	<0.10	<0.10	<0.11	0.32
Benzo(a)Anthracene	19	< 0.08	0.33	3.2	B(a)P-S.A.	0	0.28	0.31	<0.10	<0.097	<0.11	<0.10	<0.09	<0.09	<0.09	<0.08	<0.10	<0.10	<0.11	0.81
Benzo(a)pyrene	19	< 0.08	0.33	3.22	1.7	1	0.29	0.28	<0.10	<0.097	<0.11	<0.10	<0.09	<0.09	<0.09	<0.08	<0.10	<0.10	<0.11	0.84
Benzo(b)fluoranthene	19	< 0.08	0.39	3.95	B(a)P-S.A.	0	0.37	0.36	<0.10	0.121	<0.11	<0.10	<0.09	<0.09	<0.09	<0.08	<0.10	<0.10	<0.11	0.95
Benzo(g,h,i)perylene	19	< 0.08	0.22	1.81	B(a)P-S.A.	0	0.22	0.15	<0.10	<0.097	<0.11	<0.10	<0.09	<0.09	<0.09	<0.08	<0.10	<0.10	<0.11	0.40
Benzo(k)fluoranthene	19	< 0.08	0.19	1.5	B(a)P-S.A.	0	0.16	0.15	<0.10	<0.097	<0.11	<0.10	<0.09	<0.09	<0.09	<0.08	<0.10	<0.10	<0.11	0.38
bis (2-ethylhexyl) phthalate	0	< 0	< 0	< 0	2720	0														
Chrysene	19	< 0.08	0.36	3.68	B(a)P-S.A.	0	0.32	0.34	<0.10	0.121	<0.11	<0.10	<0.09	<0.09	<0.09	<0.08	<0.10	<0.10	<0.11	0.69
Dibenzo(a,h)anthracene	17	#REF!	#REF!	0.46	B(a)P-S.A.	0	<0.09	<0.12	<0.10	<0.097	<0.11	<0.10	<0.09	<0.09	<0.09	<0.08	<0.10	<0.10	<0.11	0.12
Dibenzofuran	2	< 0.084	< 0.084	< 0.1	#N/A	0														
Fluoranthene	19	< 0.08	0.58	6.61	B(a)P-S.A.	0	0.51	0.49	<0.10	<0.097	<0.11	<0.10	<0.09	<0.09	<0.09	<0.08	<0.10	<0.10	<0.11	1.53
Fluorene	19	< 0.08	0.17	1.33	B(a)P-S.A.	0	<0.09	<0.12	<0.10	<0.097	<0.11	<0.10	1.33	<0.09	<0.09	<0.08	<0.10	<0.10	<0.11	<0.10
Indeno(1,2,3-cd)pyrene	19	< 0.08	0.22	1.78	B(a)P-S.A.	0	0.18	0.15	<0.10	<0.097	<0.11	<0.10	<0.09	<0.09	<0.09	<0.08	<0.10	<0.10	<0.11	0.44
Naphthalene	19	< 0.08	0.11	0.27	2.3	0	0.27	<0.12	<0.10	<0.097	<0.11	<0.10	<0.09	<0.09	<0.09	<0.08	<0.10	<0.10	<0.11	<0.10
Phenanthrene	19	< 0.08	0.48	3.46	B(a)P-S.A.	0	0.40	0.40	<0.10	<0.097	0.27	<0.10	2.06	<0.09	<0.09	<0.08	<0.10	0.13	0.12	1.05
Pyrene	19	< 0.08	0.51	5.71	B(a)P-S.A.	0	0.43	0.43	<0.10	<0.097	<0.11	<0.10	0.11	<0.09	<0.09	<0.08	<0.10	<0.10	<0.11	1.36
Phenol Index.(AR)	19	< 0.5	< 0.5	< 0.7	No GAC	0	<0.6	<0.7	<0.6	<0.61	<0.7	<0.6	<0.6	<0.5	<0.6	<0.5	<0.6	<0.6	<0.7	<0.6
Coronene	0	< 0	< 0	< 0	No GAC	0														
Methyl tertiary butyl ether (MTBE)	6	< 0.0209	< 0.0209	< 0.0296	104	0	<0.0231	<0.0296					<0.0222	<0.0215						
Total PCB Congeners ICES 7	0	< 0	< 0	< 0	0.44	0														
Aliphatics >C7-C8	2	#REF!	#REF!	#REF!	853	#REF!	<0.231	<0.296	<0.248	<0.2427	<0.272	<0.244	<0.222	<0.215	<0.228	<0.209	<0.243	<0.260	<0.274	<0.238
Aliphatics >C5-C6	2	#REF!	#REF!	#REF!	42	#REF!	<0.231	<0.296	<0.248	<0.2427	<0.272	<0.244	<0.222	<0.215	<0.228	<0.209	<0.243	<0.260	<0.274	<0.238
Total PAH (Sum of USEPA 16)	13	< 0.215	< 0.215	< 37.6	#N/A	0			<1.58	<1.590	<1.9	<1.56	<5.05	<1.38					<1.77	<9.26
Cyanide (Free)	19	< 0.5	< 0.5	< 0.7	15	0	<0.6	<0.7	<0.6	<0.61	<0.7	<0.6	<0.6	<0.5	<0.6	<0.5	<0.6	<0.6	<0.7	<0.6
TPH Ali Band >C10-C12	19	< 1.5	6.15	35.6	132	0	<4.66	<5.99	<4.98	<4.879	<5.48	<4.96	35.6	<4.30	<4.73	<4.36	<5.00	<5.25	<1.5	<1.5
TPH Ali Band >C12-C16	17	< 4.18	24.66	339	1030	0	6.68	<5.99	<4.98	<4.879	<5.48	<4.96	339	<4.30	<4.73	<4.36	<5.00	<5.25		
TPH Ali Band >C16-C21	19	< 1.2	32.39	526	#N/A	0	11.8	<5.99	<4.98	<4.879	<5.48	<4.96	526	5.96	<4.73	<4.36	<5.00	<5.25	<1.2	<1.2
TPH Ali Band >C21-C35	19	< 1.5	18.73	148	#N/A	0	24.9	<13.11	<10.89	<10.680	<11.99	<10.85	148	<9.42	20.4	<9.54	13.7	17.7	<1.5	<1.5
TPH Ali Band >C8-C10	19	< 3.4	4.87	7.51	27	0	<4.66	<5.99	<4.98	<4.879	<5.48	<4.96	7.51	<4.30	<4.73	<4.36	<5.00	<5.25	<3.4	<3.4
TPH Ali Band >C8-C40	19	< 0.9	77.96	1060	#N/A	0	46.1	<29.9	<24.9	<24.39	<27.4	<24.8	1060	<21.5	29.5	<21.8	<25.0	<26.2	<0.9	<0.9
TPH Aro Band >C10-C12	17	< 4.18	5.08	9.12	248	0	<4.61	<5.93	<4.95	<4.854	<5.45	<4.88	9.12	<4.30	<4.55	<4.19	<4.85	<5.19		
TPH Aro Band >C12-C16	19	< 0.5	14.66	199	1430	0	<4.61	<5.93	<4.95	<4.854	5.65	<4.88	199	<4.30	<4.55	5.39	<4.85	<5.19	<0.5	<0.5
TPH Aro Band >C16-C21	19	< 0.6	22.94	347	1340	0	<4.61	<5.93	<4.95	<4.854	7.26	<4.88	347	<4.30	<4.55	<4.19	<4.85	<5.19	<0.6	<0.6
TPH Aro Band >C21-C35	19	< 1.4	22.38	142	1340	0	<10.10	<12.98	<10.84	<10.631	22.1	<10.70	142	9.68	14.7	16.0	20.0	26.6	<1.4	<1.4
TPH Aro Band >C8-C10	17	< 4.18	7.54	14.3	47	0	<4.61	<5.93	7.18	5.959	11.83	6.48	14.3	9.42	<4.55	<4.19	9.56	5.31		
TPH Aro Band >C8-C40	17	< 20.9	72.81	715	#N/A	0	<23.1	<29.6	<24.8	<24.27	47.5	<24.4	715	26.3	23.8	25.9	35.6	41.2		
Total Organic Carbon	10	< 0	3.81	8.7	#N/A	0	1.58	8.7							0.20	0.09	0.86	6.3	8.5	3.70
o-Xylene	11	< 10.8	< 10.8	< 14.8	#N/A	0	<11.5	<14.8	<12.4	<12.14	<13.6	<12.2	<11.1	<10.8						
GRO (>C8 - C10)	2	< 0.231	< 0.231	< 0.296	#N/A	0	<0.231	<0.296												
Cyanide (Total)	13	< 0.5	< 0.5	< 0.7	#N/A	0	<0.6	<0.7		<0.61	<0.7	<0.6	<0.6	<0.5			<0.6	<0.6	<0.7	<0.6
Benzene	2	#REF!	#REF!	#REF!	0.38	0	<0.0115	<0.0148	<0.0124	<0.01214	<0.0136	<0.0122	<0.0111	<0.0108						
Soil Organic Matter	7	< 0	5.21	22.1	#N/A	0			0.49	3.35	22.1	0.73								
1,2,4-Trichlorobenzene	3	< 0.000108	< 0.000108	< 0.000122	2.6	0							<0.000111	<0.000108						
1,2-Dichlorobenzene	3	< 0.000108	< 0.000108	< 0.000122	24	0							<0.000111	<0.000108						
1,3-Dichlorobenzene	3	< 0.000108	< 0.000108	< 0.000122	0.44	0							<0.000111	<0.000108						
1,4-Dichlorobenzene	3	< 0.000108	< 0.000108	< 0.000122	6.6	0							<0.000111	<0.000108						
1-Methylnaphthalene	3	< 0.000108	0.00	0.00266	#N/A	0							0.00266	<0.000108						
2,4,5-Trichlorophenol	3	< 0.000108	0.00	0.000112	#N/A	0							0.000112	<0.000108						
2,4,6-Trichlorophenol	3	< 0.000108	0.00	0.00012	#N/A	0							0.00012	<0.000108						
2,4-Dichlorophenol	3	< 0.000108	< 0.000108	< 0.000122	#N/A	0							<0.000111	<0.000108						
2,4-Dimethylphenol	3	< 0.000108	< 0.000108	< 0.000122	281	0							<0.000111	<0.000108						
2,4-Dinitrophenol	3	< 0.000538	< 0.000538	< 0.000608	#N/A	0							<0.000555	<0.000538						
2,4-Dinitrotoluene	3	< 0.000215	< 0.000215	< 0.000243	169	0							<0.000222	<0.000215						
2,6-Dinitrotoluene	3	< 0.000538	< 0.000538	< 0.000608	81	0							<0.000555	<0.000538						
2-Chloronaphthalene	3	< 0.000108	< 0.000108	< 0.000122	5.4	0							<0.000111	<0.000108						
2-Chlorophenol	3	< 0.000108	< 0.000108	< 0.000122	49	0							<0.000111	<0.000108						
2-Methylnaphthalene	3	< 0.000108	< 0.000108	< 0.000122	#N/A	0							<0.000111	<0.000108						
2-Methylphenol	3	< 0.000108	< 0.000108	< 0.000122	#N/A	0							<0.000111	<0.000108						
2-Nitroaniline	3	< 0.000538	< 0.000538	< 0.000608	#N/A	0							<0.000555	<0.000538						
2-Nitrophenol	3	< 0.000108	< 0.000108	< 0.000122	#N/A	0							<0.000111	<0.000108						
3- & 4-Methylphenol	3	< 0.000108	< 0.000108	< 0.000122	#N/A	0							<0.000111	<0.000108						
3-Nitroaniline	2	#VALUE!	#VALUE!	#VALUE!	#N/A	0							<0.0161	<0.0156						
4,6-Dinitro-2-methylphenol	3	< 0.000215	< 0.000215	< 0.000243	#N/A	0							<0.000222	<0.000215						
4-Bromophenyl-phenylether	3	< 0.000108	< 0.000108	< 0.000122	#N/A	0							<0.000111	<0.000108						
4-Chloro-3-methylphenol	3	< 0.000108	< 0.000108	< 0.000122	#N/A	0							<0.000111	<0.000108						
4-Chloroaniline	3	< 0.000538	< 0.000538	< 0.000608	#N/A	0							<0.000555	<0.000538						
4-Chlorophenol	3	< 0.000538	< 0.000538	< 0.000608	#N/A	0							<0.000555	<0.000538						
4-Chlorophenyl-phenylether	3	< 0.000108	< 0.000108	< 0.000122	#N/A	0							<0.000111	<0.000108						

B(a)P-S.A. - Benzo(a)pyrene used as surrogate for homologue PAH risks

Soil Analytical Results Screening Sheet

Site Name: Socotec - Biscuit Factory
Job Number: 70075582
Screening Criteria: Res No HG Veg 1% SOM

Determinant	No. Samples	Min mg/kg	Mean mg/kg	Max mg/kg	GAC mg/kg	# GAC Exceeds	TP411 0.8	TP413 0.8	WS12 1.8	WS13 0.4	WS13 0.8	BH4A 2	BH6 3.5	BH6 5.5	WS8 2	WS8 2.6	WS5 0.4	WS5 0.9	BH13 0.8	BH11 0.4
4-Nitroaniline	3	< 0.000645	< 0.000645	< 0.00073	#N/A	0							<0.000666	<0.000645						
4-Nitrophenol	3	< 0.000538	< 0.000538	< 0.000608	#N/A	0							<0.000555	<0.000538						
Anthracene	3	< 0.000108	0.00	0.000572	B(a)P-S.A.	0							0.000572	<0.000108						
Benzo(a)anthracene	3	< 0.000215	< 0.000215	< 0.000243	B(a)P-S.A.	0							<0.000222	<0.000215						
Benzo(a)pyrene	3	< 0.000215	< 0.000215	< 0.000243	1.7	0							<0.000222	<0.000215						
Benzo(b)fluoranthene	3	< 0.000215	< 0.000215	< 0.000243	B(a)P-S.A.	0							<0.000222	<0.000215						
Benzo(ghi)perylene	3	< 0.000538	< 0.000538	< 0.000608	B(a)P-S.A.	0							<0.000555	<0.000538						
Benzo(k)fluoranthene	3	< 0.000215	< 0.000215	< 0.000243	B(a)P-S.A.	0							<0.000222	<0.000215						
Benzoic Acid	3	< 0.000538	< 0.000538	< 0.000608	#N/A	0							<0.000555	<0.000538						
Benzyl alcohol	3	< 0.000538	< 0.000538	< 0.000608	#N/A	0							<0.000555	<0.000538						
Biphenyl	3	< 0.000108	< 0.000108	< 0.000122	308	0							<0.000111	<0.000108						
bis(2-Chloroethoxy)methane	3	< 0.000108	< 0.000108	< 0.000122	#N/A	0							<0.000111	<0.000108						
bis(2-Chloroethyl)ether	3	< 0.000108	< 0.000108	< 0.000122	#N/A	0							<0.000111	<0.000108						
bis(2-Chloroisopropyl)ether	3	< 0.000538	< 0.000538	< 0.000608	#N/A	0							<0.000555	<0.000538						
bis(2-Ethylhexyl)phthalate	3	< 0.000222	< 0.000222	< 0.215	#N/A	0							<0.000222	<0000.215						
Butylbenzylphthalate	3	< 0.000215	< 0.000215	< 0.000243	#N/A	0							<0.000222	<0.000215						
Chrysene	3	< 0.000108	0.00	0.000158	B(a)P-S.A.	0							0.000158	<0.000108						
Coronene	3	< 0.000323	< 0.000323	< 0.000365	#N/A	0							<0.000333	<0.000323						
Dibenzo(ah)anthracene	3	< 0.000538	< 0.000538	< 0.000608	B(a)P-S.A.	0							<0.000555	<0.000538						
Dibenzofuran	3	< 0.000108	0.00	0.000425	#N/A	0							0.000	<0.000108						
Diethylphthalate	3	< 0.000108	< 0.000108	< 0.000122	#N/A	0							<0.000111	<0.000108						
Dimethylphthalate	3	< 0.000108	< 0.000108	< 0.000122	#N/A	0							<0.000111	<0.000108						
Di-n-butylphthalate	3	< 0.000108	< 0.000108	< 0.000122	#N/A	0							<0.000111	<0.000108						
Di-n-octylphthalate	3	< 0.000215	< 0.000215	< 0.000243	#N/A	0							<0.0002 22	<0.0002 15						
Diphenyl Ether	3	< 0.000108	< 0.000108	< 0.000122	#N/A	0							<0.000111	<0.000108						
Fluoranthene	3	< 0.000215	< 0.000215	< 0.000243	B(a)P-S.A.	0							<0.000222	<0.000215						
Fluorene	3	< 0.000215	0.00	0.00143	B(a)P-S.A.	0							0.00143	<0.000215						
Hexachlorobenzene	3	< 0.000108	< 0.000108	< 0.000122	3.3	0							<0.000111	<0.000108						
Hexachlorobutadiene	3	< 0.000108	< 0.000108	< 0.000122	0.35	0							<0.000111	<0.000108						
Hexachlorocyclopentadiene	3	< 0.000108	< 0.000108	< 0.000122	#N/A	0							<0.000111	<0.000108						
Hexachloroethane	3	< 0.000108	< 0.000108	< 0.000122	0.31	0							<0.000111	<0.000108						
Indeno(123-cd)pyrene	3	< 0.000538	< 0.000538	< 0.000608	B(a)P-S.A.	0							<0.000555	<0.000538						
Isophorone	3	< 0.000108	< 0.000108	< 0.000122	#N/A	0							<0.000111	<0.000108						
Naphthalene	3	< 0.000108	0.00	0.000169	2.3	0							0.000169	<0.000108						
Nitrobenzene	3	< 0.000538	< 0.000538	< 0.000608	#N/A	0							<0.000555	<0.000538						
N-Nitroso-di-n-propylamine	3	< 0.000968	< 0.000968	< 0.001095	#N/A	0							<0.000999	<0.000968						
N-Nitrosodiphenylamine	3	< 0.000108	< 0.000108	< 0.000122	#N/A	0							<0.000111	<0.000108						
Pentachlorophenol	3	< 0.000538	< 0.000538	< 0.000608	15	0							<0.000555	<0.000538						
Phenanthrene	3	< 0.000108	0.00	0.00256	B(a)P-S.A.	0							0.00256	<0.000108						
Phenol	3	< 0.000108	< 0.000108	< 0.000122	280	0							<0.000111	<0.000108						
Pyrene	3	< 0.000215	< 0.000215	< 0.000243	B(a)P-S.A.	0							<0.000222	<0.000215						
1,1,1,2-Tetrachloroethane	4	< 0.0011	< 0.0011	< 1.1	1.5	0					<0.0014		<0001.1	<0.0011						
1,1,1-Trichloroethane	4	< 0.0011	< 0.0011	< 0.0014	22	0					<0.0014		<0.0011	<0.0011						
1,1,2,2-Tetrachloroethane	4	< 0.0011	< 0.0011	< 0.0014	3.9	0					<0.0014		<0.0011	<0.0011						
1,1,2-Trichloroethane	4	< 0.0011	0.00	0.0055	1.2	0					<0.0014		0.0055	<0.0011						
1,1-Dichloroethane	4	< 0.0011	< 0.0011	< 0.0014	3.6	0					<0.0014		<0.0011	<0.0011						
1,1-Dichloroethene	4	< 0.0011	< 0.0011	< 0.0014	0.33	0					<0.0014		<0.0011	<0.0011						
1,1-Dichloropropene	4	< 0.0011	< 0.0011	< 0.0014	#N/A	0					<0.0014		<0.0011	<0.0011						
1,2,3-Trichlorobenzene	4	< 0.0014	< 0.0014	< 0.0036	1.5	0					<0.0014		<0.0033	<0.0032						
1,2,3-Trichloropropane	4	< 0.0011	0.00	0.0011	#N/A	0					<0.0014		0.00110	<0.0011						
1,2,4-Trichlorobenzene	4	< 0.0014	< 0.0014	< 0.0036	2.6	0					<0.0014		<0.0033	<0.0032						
1,2,4-Trimethylbenzene	4	< 0.0011	< 0.0011	< 0.0014	0.58	0					<0.0014		<0.0011	<0.0011						
1,2-Dibromo-3-chloropropane	4	< 0.0011	< 0.0011	< 0.0014	#N/A	0					<0.0014		<0.0011	<0.0011						
1,2-Dibromoethane	4	< 0.0011	< 0.0011	< 0.0014	#N/A	0					<0.0014		<0.0011	<0.0011						
1,2-Dichlorobenzene	4	< 0.0011	< 0.0011	< 0.0014	24	0					<0.0014		<0.0011	<0.0011						
1,2-Dichloroethane	4	< 0.0011	< 0.0011	< 0.0014	0.0092	0					<0.0014		<0.0011	<0.0011						
1,2-Dichloropropane	4	< 0.0011	< 0.0011	< 0.0014	0.034	0					<0.0014		<0.0011	<0.0011						
1,3,5-Trimethylbenzene	4	< 0.0011	< 0.0011	< 0.0014	#N/A	0					<0.0014		<0.0011	<0.0011						
1,3-Dichlorobenzene	4	< 0.0011	< 0.0011	< 0.0014	0.44	0					<0.0014		<0.0011	<0.0011						
1,3-Dichloropropane	4	< 0.0011	< 0.0011	< 0.0014	#N/A	0					<0.0014		<0.0011	<0.0011						
1,4-Dichlorobenzene	4	< 0.0011	< 0.0011	< 0.0014	6.6	0					<0.0014		<0.0011	<0.0011						
2,2-Dichloropropane	4	< 0.0011	< 0.0011	< 0.0014	#N/A	0					<0.0014		<0.0011	<0.0011						
2-Chlorotoluene	4	< 0.0011	< 0.0011	< 0.0014	#N/A	0					<0.0014		<0.0011	<0.0011						
4-Chlorotoluene	4	< 0.0011	< 0.0011	< 0.0014	#N/A	0					<0.0014		<0.0011	<0.0011						
Benzene	4	< 0.0011	< 0.0011	< 0.0014	0.38	0					<0.0014		<0.0011	<0.0011						
Bromobenzene	4	< 0.0011	< 0.0011	< 0.0014	1.3	0					<0.0014		<0.0011	<0.0011						
Bromochloromethane	4	< 0.0011	< 0.0011	< 0.0014	#N/A	0					<0.0014		<0.0011	<0.0011						
Bromodichloromethane	4	< 0.0011	< 0.0011	< 0.0014	0.027	0					<0.0014		<0.0011	<0.0011						
Bromoform	4	< 0.0011	< 0.0011	< 0.0014	7.3	0					<0.0014		<0.0011	<0.0011						
Bromomethane	2	< 0.0011	< 0.0011	< 0.0011	#N/A	0							<0.0011	<0.0011						
Carbon Tetrachloride	2	< 0.0011	< 0.0011	< 0.0011	0.4	0							<0.0011	<0.0011						
Chlorobenzene	2	< 0.0011	< 0.0011	< 0.0011	0.63	0							<0.0011	<0.0011						
Chloroethane	2	< 0.0022	< 0.0022	< 0.0022	12	0							<0.0022	<0.0022						
Chloroform	2	< 0.0011	< 0.0011	< 0.0011	1.2	0							<0.0011	<0.0011						
Chloromethane	2	0.0032	0.00	0.0032	0.012	0							<0.0033	0.0032						
cis 1,2-Dichloroethene	2	< 0.0054	< 0.0054	< 0.0055	0.17	0							<0.0055	<0.0054						
cis 1,3-Dichloropropene	2	< 0.0011	< 0.0011	< 0.0011	#N/A	0							<0.0011	<0.0011						
Dibromochloromethane	2	< 0.0011	< 0.0011	< 0.0011	#N/A	0							<0.0011	<0.0011						
Dibromomethane	2	< 0.0011	< 0.0011	< 0.0011	#N/A	0							<0.0011	<0.0011						
Dichlorodifluoromethane	2	< 0.0011	< 0.0011	< 0.0011	#N/A	0							<0.0011	<0.0011						
Ethylbenzene	2	< 0.0022	< 0.0022	< 0.0022	83	0							<0.0022	<0.0022						
Hexachlorobutadiene	2	< 0.0022	< 0.0022	< 0.0022	0.35	0							<0.0022	<0.0022						
iso-Propylbenzene	2	< 0.0011	0.03	0.0533	17	0							0.05330	<0.0011						

B(a)P-S.A. - Benzo(a)pyrene used as surrogate for nonvolatile PAH risks

Groundwater Analytical Results Screening Sheet

Site Name: Bermondsey - Ramboll - Main Site
Job Number: 0
Screening Criteria: Groundwater/Aquifer (DWS or equivalent)

Determinant	No. Samples	Min µg/L	Mean µg/L	Max µg/L	DWS µg/L	Source/ Notes	# DWS Exceeds	BH5	BH6	BH13	BH4A
Ammoniacal Nitrogen as N	0	< 0	< 0	< 0	No GAC	#N/A	0				
Arsenic (diss.filt)	**4**	0.001	0.0015	0.003	10		0	<0.001	0.003	<0.001	0.001
Boron (diss.filt)	**4**	0.06	0.08	0.11	1000		0	0.08	0.11	0.06	0.07
Chromium (diss.filt)	**4**	< 0.001	< 0.001	< 0.001	50	Assumes Cr6	0	<0.001	<0.001	<0.001	<0.001
Copper (diss.filt)	**4**	< 0.001	< 0.001	< 0.001	2000		0	<0.001	<0.001	<0.001	<0.001
Lead (diss.filt)	**4**	< 0.001	< 0.001	< 0.001	10		0	<0.001	<0.001	<0.001	<0.001
Manganese (diss.filt)	**4**	0.006	0.08925	0.251	50		0	0.008	0.251	0.006	0.092
Nickel (diss.filt)	**4**	0.001	0.0035	0.011	20		0	0.001	0.001	0.001	0.011
Vanadium (diss.filt)	0	< 0	< 0	< 0	No GAC		0				
Zinc (diss.filt)	**4**	0.002	0.002	0.002	No GAC		0	0.002	0.002	0.002	0.002
Sulphate (diss.filt)	**4**	32	55	74	No GAC	#N/A	0	61	32	53	74
Chloride	0	< 0	< 0	< 0	No GAC		0				
Iron (diss.filt)	**4**	0.06	1.1775	4.39	200		0	0.18	4.39	0.08	0.06
pH	**4**	7.1	7.375	7.6	6.5<pH<10		0	7.1	7.6	7.4	7.4
Magnesium (diss.filt)	**4**	5	5.5	6	#N/A	#N/A	0	6	6	5	5
Selenium (diss.filt)	**4**	0.001	0.00225	0.004	10		0	0.004	<0.001	0.002	0.002
Benzo(a)pyrene	**4**	< 0.001	< 0.001	< 0.001	0.01		0	<0.001	<0.001	<0.001	<0.001
Naphthalene	**4**	0.01	0.0375	0.12	No GAC		0	<0.01	0.12	<0.01	<0.01
Chloroform	**4**	1	3	5	No GAC		0	5	<1.0	5	<1.0
Aliphatics >C8-C10	**4**	0.001	0.004	0.013	300		0	<0.001	<0.001	<0.001	0.013
Aliphatics >C16-C21	**4**	0.01	0.01525	0.031	90	#N/A	0	<0.01	0.031	<0.01	<0.01
Aliphatics >C21-C35	**4**	0.01	0.01075	0.013	90	#N/A	0	<0.01	0.01	0.013	<0.01
Aromatics >EC10-EC12	**4**	0.01	0.01	0.01	94		0	<0.01	0.01	<0.01	<0.01
Aromatics >EC12-EC16	**4**	0.01	0.01475	0.029	#N/A	#N/A	0	<0.01	0.029	<0.01	<0.01
Aromatics >EC16-EC21	**4**	0.01	0.0175	0.04	#N/A	#N/A	0	<0.01	0.04	<0.01	<0.01
Aromatics >EC21-EC35	**4**	0.01	0.01475	0.029	#N/A	#N/A	0	<0.01	0.029	<0.01	<0.01

Groundwater Analytical Results Screening Sheet

Site Name: Bermondsey - Ramboll - Main Site
Job Number: 0
Screening Criteria: Surface Waters (EQS or equivalent) - Freshwater

Determinant	No. Samples	Min µg/L	Mean µg/L	Max µg/L	EQS µg/L	Source/ Notes	# EQS Exceeds	BH5	BH6	BH13	BH4A
Ammoniacal Nitrogen as N	0	< 0	< 0	< 0	noGAC	#N/A	0				
Arsenic (diss.filt)	**4**	0.001	0.00	0.003	50		0	<0.001	0.003	<0.001	0.001
Boron (diss.filt)	**4**	0.06	0.08	0.11	2000		0	0.08	0.11	0.06	0.07
Chromium (diss.filt)	**4**	< 0.001	< 0.001	< 0.001	3.4	Assumes Cr6	0	<0.001	<0.001	<0.001	<0.001
Copper (diss.filt)	**4**	< 0.001	< 0.001	< 0.001	1	worst-case bioavailabilty assumed	0	<0.001	<0.001	<0.001	<0.001
Lead (diss.filt)	**4**	< 0.001	< 0.001	< 0.001	1.2	worst-case bioavailabilty assumed	0	<0.001	<0.001	<0.001	<0.001
Manganese (diss.filt)	**4**	0.006	0.09	0.251	123	worst-case bioavailabilty assumed	0	0.008	0.251	0.006	0.092
Nickel (diss.filt)	**4**	0.001	0.00	0.011	4	worst-case bioavailabilty assumed	0	0.001	0.001	0.001	0.011
Vanadium (diss.filt)	0	< 0	< 0	< 0	20		0				
Zinc (diss.filt)	**4**	0.002	0.00	0.002	11.9	worst-case bioavailabilty assumed	0	0.002	0.002	0.002	0.002
Sulphate (diss.filt)	**4**	32	55.00	74	noGAC	#N/A	0	61	32	53	74
Chloride	0	< 0	< 0	< 0	250000		0				
Iron (diss.filt)	**4**	0.06	1.18	4.39	1000		0	0.18	4.39	0.08	0.06
pH	**4**	7.1	7.38	7.6	6.5<pH<9		0	7.1	7.6	7.4	7.4
Magnesium (diss.filt)	**4**	5	5.50	6	#N/A	#N/A	0	6	6	5	5
Selenium (diss.filt)	**4**	0.001	0.00	0.004	No GAC		0	0.004	<0.001	0.002	0.002
Benzo(a)pyrene	**4**	< 0.001	< 0.001	< 0.001	0.00017		0	<0.001	<0.001	<0.001	<0.001
Naphthalene	**4**	0.01	0.04	0.12	2		0	<0.01	0.12	<0.01	<0.01
Chloroform	**4**	1	3.00	5	2.5	0	**2**	**5**	<1.0	**5**	<1.0
Aliphatics >C8-C10	**4**	0.001	0.00	0.013	No GAC		0	<0.001	<0.001	<0.001	0.013
Aliphatics >C16-C21	**4**	0.01	0.02	0.031	#N/A	#N/A	0	<0.01	0.031	<0.01	<0.01
Aliphatics >C21-C35	**4**	0.01	0.01	0.013	#N/A	#N/A	0	<0.01	0.01	0.013	<0.01
Aromatics >EC10-EC12	**4**	0.01	0.01	0.01	2	CL:AIRE 2017	0	<0.01	0.01	<0.01	<0.01
Aromatics >EC12-EC16	**4**	0.01	0.01	0.029	2	#N/A	0	<0.01	0.029	<0.01	<0.01
Aromatics >EC16-EC21	**4**	0.01	0.02	0.04	0.1	#N/A	0	<0.01	0.04	<0.01	<0.01
Aromatics >EC21-EC35	**4**	0.01	0.01	0.029	0.00017	#N/A	**1**	<0.01	**0.029**	<0.01	<0.01

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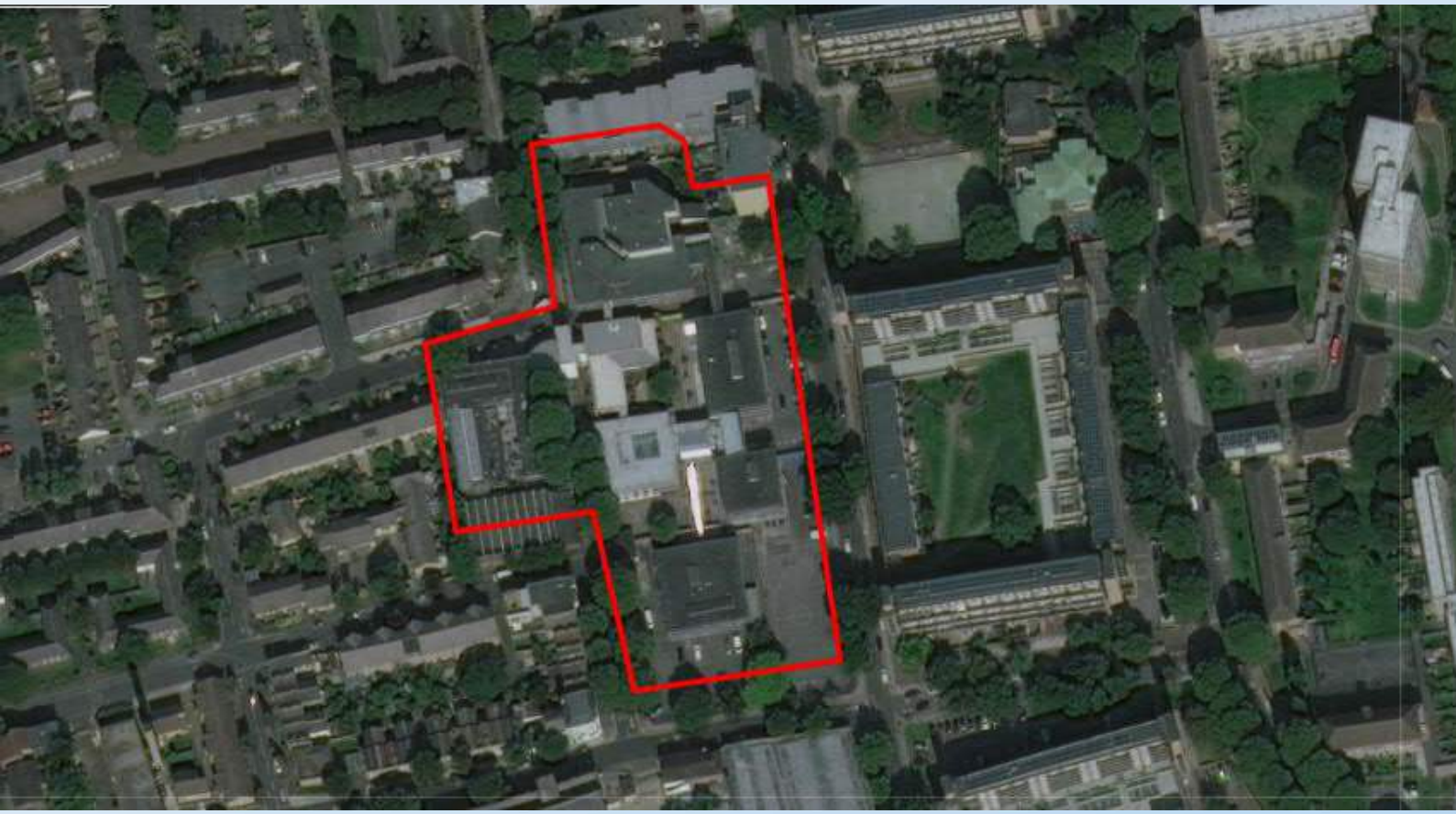
Keltbray Remediation

BERMONDSEY BISCUIT FACTORY - CAMPUS SITE

Outline Remediation Strategy



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OCTOBER 2020

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Keltbray Remediation

BERMONDSEY BISCUIT FACTORY - CAMPUS SITE

Outline Remediation Strategy

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PROJECT NO. 70075582

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DATE: OCTOBER 2020

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QUALITY CONTROL

Issue/revision	First issue	Revision 1	Revision 2	Revision 3	Revision 4
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Prepared by	A. Jeffery	R. Gohel	R. Gohel	R. Gohel	R. Gohel
Signature					
Checked by	R. Gohel	R. Gohel	R. Gohel	R. Gohel	R. Gohel
Signature					
Authorised by	Dr R. Hares	Dr R. Hares	Dr R. Hares	Dr R. Hares	Dr R. Hares
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CONTENTS

TABLES

APPENDICES

1 INTRODUCTION

1.1 AUTHORISATION

WSP was commissioned by Keltbray Remediation (the Client) to prepare a Remediation Strategy for the proposed development at the Bermondsey Biscuit Factory, 100 Drummond Road, Bermondsey, London, SE16 4DG (the Site). The Campus part of the Site is located at Compass School Southwark, Drummond Road, Bermondsey, London, SE16 2BT as shown on **Figure 1** and **Figure 2** included within **Appendix A.**

The following report is for the 'Campus' section of the wider development area only. A separate Remediation Strategy has been prepared for the main Biscuit Factory part of the Site (Ref: 70075882 001).

The Kelbray scope of works include remediation works in line with this strategy, enabling works and basement excavation. This will be verified and reported as one phase. Any ground gas protection measures, topsoil verification works or piling risk assessment will be undertaken by follow on contractors, therefore, will be verified separately at a later stage.

This work has been conducted in line with current good practice, including that detailed in the Environment Agency (EA) document CLR 11, Model Procedures for the Management of Land Contamination.

This assessment has been undertaken to assist with discharge of Contaminated Land Planning Condition 9b within Planning Application No. 17/AP/4088. Planning Condition 9b states the following:

In the event that contamination is present, a detailed remediation strategy to bring the site to a condition suitable for the intended use by removing unacceptable risks to human health, buildings and other property and the natural and historical environment shall be prepared and submitted to the Local Planning Authority for approval in writing. The scheme shall ensure that the site will not qualify as contaminated land under Part 2A of the Environmental Protection Act 1990 in relation to the intended use of the land after remediation. The approved remediation scheme (if one is required) shall be carried out in accordance with its terms as part of the development . The Local Planning Authority shall be given two weeks written notification of commencement of the remediation scheme works.

This report provides a review and a summary of the historical ground investigation works undertaken on the Site. There is an updated risk assessment included within this document but reference should be made to the historical reports for further information.

1.2 PROPOSED DEVELOPMENT

It is understood that the proposed development on the Site comprises residential end use and a school.

A copy of the emerging Masterplan is presented in **Appendix A** as **The Bermondsey Project – Design & Access Statement – Part C Masterplan**.

Copies of the Enabling & Demolition Works including proposed formation levels are included in **Appendix A** as Drawings **BER-ARP-BC03A-XX-SK-D-82001** and **BER-ARP-BC03A-XX-SK-D-82002**. The proposed remediation works will be undertaken down to formation level by Keltbray Remediation details of which are shown within the above drawings.

Indicative formation levels provided at this stage show that the site levels will be reduced on average between 1 m and 2 m. There is also a basement proposed in the eastern part of the Site which will result in the removal of 3 m to 4 m of material within this area.

The proposed development will be phased as shown on Drawing No's. 2607-KPF-MPLN-XX-DR-PLN A-0015, 2607-KPF-MPLN-XX-DR-PLN A-0016, 2607-KPF-MPLN-XX-DR-PLN A-0017 and 2607-KPF-MPLN-XX-DR-PLN A-0018 (Appendix A).

It should be noted that this report has been prepared based on the masterplan provided at the time of writing the report (included within **Appendix A**). Any changes to the plans provided would require a re-assessment of the required remediation measures for the proposed development.

1.3 OBJECTIVES

Based on the findings of the historical ground investigation reports, the following objectives have been identified:

- Prepare a Remediation Strategy in accordance with CLR 11 to address the pollutant linkages identified across the Site and provide a site suitable for use under Part 2A of the Environmental Protection Act 1990. The Remediation Strategy will include:
  - Review of background information;
  - Summary of relevant pollutant linkages as identified through development of a Conceptual Site Model (CSM) and the GQRA;
  - Remediation Objectives and Requirements;
  - Remedial Strategy; and,
  - Remediation Validation Requirements

The objective of the remediation is to provide a site that is suitable for use under Part 2A of the Environmental Protection Act 1990 for re-development for residential end use and for a school.

1.4 SOURCES OF INFORMATION

The following contamination assessment reports have been referred to in the design and the preparation of the Remediation Strategy:

- Arup (2017) Project Bermondsey Desk Based Asbestos in Soils Appraisal. 237092-RP-CP-001.
- Hydrock (2018) *The Bermondsey Project – Phase 1 Stage 1 Asbestos in Soil Ground Investigation, Southwark Nominee 1 Limited and Southwark Nominee 2 Limited*. TBP-HYD-S1-GI-RP-GE-1001 July 2018;
- Arup (2018) *The Bermondsey Project – Phase 1 Stage 1 Asbestos in soil investigation Interim Investigation Report, Grosvenor Britain & Ireland*. 237092-CL-RP-001, August 2018;
- Socotec (2018) *The Bermondsey Project, London – Factual Report on Site Investigation, Southwark GP Nominee 1 Limited and Southwark GP Nominee 2 Limited*. D8004-18, September 2018;
- Ramboll (2018) Technical Note - *Assessment of Results Obtained to Date from the First Stage of the Phase II Environmental Site Investigation at Bermondsey Biscuit Factory - Gardiner & Theobald LLP on behalf of Southwark GP Nominee 1 Ltd. and Southwark GP Nominee 2 Ltd*. TNUK11-24348_Stage 1; and,

- Ramboll (2019) *Bermondsey Biscuit Factory – Phase II Environmental Site Assessment: Investigation Stage 1*. UK11-24348, February 2019

1.5 CONFIDENTIALITY & LIMITATIONS

This report is addressed to and may be relied upon by Keltbray Remediation.

This assessment has been prepared for the sole use and reliance of the above-named parties. This report has been prepared in line with the WSP proposal and associated notes. This report shall not be relied upon or transferred to any other parties without the express written authorisation of WSP. No responsibility will be accepted where this report is used, either in its entirety or in part, by any other party.

This report needs to be read and used in full. General limitations of the assessment are included in **Appendix B.**

2 SUMMARY OF SITE INFORMATION

2.1 SITE LOCATION & SITE DESCRIPTION

The Site Location Plan and Site Layout Plans are provided as **Appendix A**.

Table 2-1 provides details of the site obtained from a review of Ordnance Survey (OS) mapping, online aerial photography and key observations made during historical ground investigation works.

Table 2-1 – Summary of Site Details

Details	Description
Name and Address of Site	Compass School Southwark, Drummond Road, Bermondsey, London, SE16 2BT.
Location and Grid Reference	The Site is located in the northern part of the London Borough of Bermondsey at approximately NGR 534604, 179270
Site Description and Current Use	The Site is irregular in shape and approximately 1.7 hectares (Ha) in size located to the west of Drummond Road and to the north of Clements Road. The Site currently comprises the Compass School Southwark. The Site resides in the northern part of the London Borough of Bermondsey and is located approximately 500 metres (m) south of the River Thames. The Site is currently predominantly occupied by school buildings with limited hardstanding for outdoor activities, parking and soft landscaped areas. Some of the buildings also appear to be available to be used by the general public such as the youth centre in the southern part of the Site.
Surrounding Site Area and Topography	The Site is surrounding by a mix of residential properties and commercial properties. The Site is bound to the north by residential flat with Tranton Road beyond. The Site is bound to the east by Drummond Road with a mix of residential properties and light commercial units beyond. The Site is bound to the south by Clements Road and by the existing Bermondsey Biscuit Factory which forms a part of the wider development area. The Site is bound to the west by several residential properties. The Site is generally flat with site levels ranging from approximately 2.7 metres Ordnance Datum (m OD) in the west and +3.0 m OD in the east of the Site.
Site History	The historical use of the 'Campus' part of the Site included terraced residential housing and a timber yard in the north in the late part of the 19th century. A school was present in the east of the Site by the end of the 19th century. A coffee factory was constructed in the centre of the Site after 1950. Historical Mapping indicates the Site was cleared of all existing buildings by 1960. By 1970, Scott Lidgett School, an open-air theatre and a youth centre were built and the Site has remained relatively unchanged until the present day however is now called the Compass School Southwark.

2.2 HITORICAL REPORTS / GROUND INVESTIGATION DATA

A historical exploratory hole location plan of the ground investigations completed on the Campus Site completed to date is included as **Figure 3** within **Appendix A** of this report.

An outline of the historical reports provided is summarised below and discussed in detail within **Section 2.3** onwards.

2.2.1 ARUP 2017

A desk based asbestos in soil appraisal was undertaken by Arup in 2017. A review of archive sources identified areas of the Site where there is a potential for buried asbestos and asbestos containing soils present associated the historical development.

Asbestos insulation board and lagging were noted on Plot 5.

The report recommended an asbestos focussed ground investigation the scope for which was included within the Hydrock 2018 works below.

2.2.2 HYDROCK 2018

Intrusive ground investigations were undertaken between 10 April and 22 June 2018. The investigation (inside the Campus area) comprised six mechanically excavated trial pits (TP701-TP704, TP801 and TP802).

The Hydrock report contained did not provide an assessment of the data and provided factual reporting only.

The findings of the ground investigation works were reported within the Hydrock report and are summarised in the sections below.

2.2.3 ARUP 2018

The 2018 Arup report provided an assessment of the results provided in the Hydrock 2018 report. The main purpose of the report was to assess the asbestos fibres present on the Campus Site and the wider area of the Biscuit Factory.

No visual evidence of Asbestos Containing Materials (ACMs) were identified during the GI in any of the six trial pits in the Campus area.

Asbestos was detected within four of the 17 samples taken from the Campus part of the Site at quantities of 0.0005 % w/w to 0.0158 % w/w.

The Arup report only assessed the geochemical testing for waste classification purposes. As such none of the samples from the Campus area were classified above non-hazardous. The human health assessment was completed by Ramboll and is summarised in the section below.

2.2.4 RAMBOLL 2018

The 2018 Ramboll Technical Note assessed the results as presented by the factual Socotec 2018 report. The main purpose of the report was to assess the environmental findings present on the Campus Site and the wider area of the Biscuit Factory.

The Ramboll Technical Note assess the soil results against the Ramboll GACs for residential land use criteria (without plant uptake).

The Ramboll report highlighted elevated soil lead levels in in 14 samples with concentrations ranging from 350 to 1362 mg/kg with respect to the GAC of 310 mg/kg.

No other concentrations were found to exceed the GAC from the Campus part of the Site.

2.2.5 RAMBOLL / SOCOTEC 2018

In 2018 Socotec was commissioned by Ramboll to undertake an intrusive ground investigation between 30 April and 13 July 2018. The investigation (inside the Campus area) comprised one cable percussion borehole (BH1B), two window(less) sample boreholes (WS2 & WS4) and one Super Heavy B Dynamic Probe (DP18).

Ramboll completed a Phase II Environmental Site Assessment following the ground investigation. The soil results were assessed against Ramboll GACs for residential land use criteria (without plant uptake). Lead exceedances were recorded in BH1B at 0.8 m bgl, WS2 at 0.9 m bgl and WS4 at 0.4 m bgl against GAC of 310 mg/kg.

A single groundwater sample was taken from BH1B. There were no exceedances of criteria for surface waters or groundwater.

2.2.6 ADDITIONAL GROUND INVESTIGATIONS

The following reports have been completed for the Campus Site and the wider Biscuit factory and are listed within the historical reports but have not been made available to WSP at the time of writing this report:

- Arup (December 2001) The Bermondsey Project, Phase 1 Asbestos in soils ground investigation specification, reference 23709232-SPEC-001 Issue 1;
- Albury SI (2000) Report of geotechnical investigation;
- Concept (2015) Biscuit Factory Plot 5 Ground Investigation, site investigation report; and,
- Soiltechnics (2017) Biscuit Factory, Building F, Foundation investigation and assessment report.

2.3 GEOLOGY

The information in the table below has been compiled from the British Geological Survey (BGS) and exploratory hole logs from the ground investigation works undertaken across the Site. A summary of the encountered ground conditions is presented in **Table 2-2.**

Table 2-2 – Geological Ground Model

Strata	General Description	Min Depth to Top (m)	Maximum Depth to Top (m)	Maximum Thickness (m)
Made Ground – Tarmacadam / Asphalt / Paving Slab	Black tarmacadam / asphalt	0.00	0.00	0.10
Made Ground – Cohesive / Granular	Sandy gravelly silt / sandy gravelly clay / clayey sandy gravel, locally with low cobble content. Gravel fractions are	0.05	0.10	2.05

Strata	General Description	Min Depth to Top (m)	Maximum Depth to Top (m)	Maximum Thickness (m)
	comprised of brick, concrete, clay tiles, clinker, flint and sandstone. Locally with thin layers of concrete.			
***Alluvium**	Soft and firm brown and greyish brown slightly sandy slightly gravelly clay / sandy clay. Gravel is comprised of flint.	0.60	1.50	0.85
Kempton Park Gravels	Medium dense brown and yellow very gravelly sand / Gravel. Gravel is comprised of flint.	0.70	2.35	5.10
Lambeth Group	Stiff and very stiff / very dense dark grey mottled brown, greyish brown and bluish brown, greenish grey, multicoloured silty clay / very sandy clay / sandy gravel / gravelly clayey sand. Locally with frequent shell fragments.	7.20	7.20	17.30
Thanet Formation	Very dense dark grey silty sand.	24.50	24.50	NP
****Lewes Nodular Chalk Formation, Seaford Chalk Formation and Newhaven Chalk Formation (undifferentiated)**	White chalk (not encountered in exploratory holes on Site)	NP	NP	NP

NP = Not proven
* BGS Maps indicate Alluvium is present locally but not present on Site. Alluvium not encountered in all exploratory hole locations.
** Not encountered in any exploratory hole locations on Site.

2.4 HYDROGEOLOGICAL MODEL

The Superficial deposits of the Kempton Park Gravels and the bedrock of the Lambeth Group and the Thanet Sands are all listed as Secondary A Aquifers respectively. The Lewes Nodular Chalk Formation, Seaford Chalk Formation and Newhaven Chalk Formation (undifferentiated) are classified as a Principal Aquifer.

The site is not located within an Environment Agency (EA) designated Source Protection Zone (SPZ).

Groundwater strikes were encountered at an average depth of 4.00 metres below ground level (m BGL) in the Kempton Park Gravels and at depths between 8.60 and 17.80 m bgl in the Lambeth Group.

Monitored standing ground water levels were measured between 4.09 to 4.16 m bgl in monitoring wells installed in the Kempton Park Gravels and between 11.27 to 11.94 m bgl in monitoring wells installed in the Lambeth Group.

2.5 HYDROLOGY

The closest named surface water feature to the Site is the River Thames located at approximately 500 m north of the Site. The nearest surface water feature is an unnamed lake located 470 m south east of the Site in Southwark Park. It is possible this is a manmade surface water feature. The Site is located within Flood Zone 3.

2.6 RISK ASSESSMENTS

WSP has not been provided with a compiled generic quantitative risk assessment (GQRA) for the Site. The majority of the recent reports are focused around the risks posed by asbestos fibres.

As such in order to develop an outline remediation strategy, WSP has re-screened the historical chemical data available within this section and outlined proposed mitigation measures associated with the risks identified within subsequent sections of this report.

2.6.1 HUMAN HEALTH RISK ASSESSMENT FROM SOILS

In the United Kingdom, the presence of contamination on a Site is generally only of concern if an actual or potentially unacceptable risk exists. Legislation and guidance on the assessment of contaminated Sites, consistent with the European Union best practice, acknowledges the need for a tiered risk based approach. This report represents a Generic Quantitative Risk Assessment (GQRA) being a comparison of Site contaminant levels against highly conservative standards and compliance criteria including an assessment of risk using the source-pathway-receptor model.

WSP has derived a set of Generic Assessment Criteria (GAC) for the CLEA generic land use scenarios using the CLEA Workbook v1.071 Excel modelling tool. The CLEA workbook does not currently have the capacity to derive criteria to assess risks from the inhalation of vapours resulting from contaminants dissolved in groundwater. Therefore, a set of groundwater GACs has also been derived using the Johnson & Ettinger (J&E) approach.

Where appropriate, exceedances of GACs are compared against published Category 4 Screening Levels (C4SLs) (Ref. 29). These are only applicable for six compounds, namely arsenic, benzene, benzo(a)pyrene, cadmium, chromium VI and lead. C4SL represent a level of acceptable risk in the context of Part IIA of the 1990 Environmental Protection Act i.e. soil concentration below C4SL limit are considered to be ‘definitely not contaminated’ and pose at most a ‘low level of toxicological concern’.

Further details on the assumptions and methodologies adopted by WSP are provided in **Appendix C.**

Five samples from the Socotec GI, six samples from the Hydrock GI and five samples from the Ramboll GI were assessed based on a residential end use with no plant uptake (1.0 % SOM) for the Site.

Tables 2-3 and 2-4 summarise the findings of this assessment and the full screening tables are included within **Appendix D**:

Table 2-3 - Summary of Soil Contamination Exceedances (GACs)

Analyte	GAC (mg/kg)	No. of Exceedances	Maximum Concentration (mg/kg)	Location and Depth of Elevated Concentrations (Report)
Lead	188	12	569.8	BH1B at 0.8 m bgl (Socotec)
			217.3	WS4 at 0.4 m bgl (Socotec)
			803	WS2 at 0.9 m bgl (Socotec)
			262.8	WS2 at 0.8 m bgl (Socotec)
			420	TP703 at 0.7 – 1 m bgl (Hydrock)
			400	TP801 at 0.5 – 1 m bgl (Hydrock)
			360	TP801 at 2.0 m bgl (Hydrock)
			400	TP801 at 0.2 m bgl (Arup)
			360	TP801 at 0.7 m bgl (Arup)
			569.8	BH1B at 0.8 m bgl (Ramboll)
			540.5	WS2 at 0.9 m bgl (Ramboll)
			617.3	WS4 at 0.4 m bgl (Ramboll)
Benzo(a)pyrene	1.7	3	3.22	WS2 at 0.9 m bgl (Socotec)
			3.90	TP703 at 0.1 – 0.3 m bgl (Hydrock)
			2.97	WS2 at 0.9 m bgl (Ramboll)

When assessed against the current GACs, elevated concentrations of lead and benzo(a)pyrene were reported.

The results of both the lead and the benzo(a)pyrene have been compared against C4SL values for a more pragmatic yet precautionary approach of the findings of which are outlined within **Table 2.4** below.

Table 2-4 - Summary of Soil Contamination Exceedances (C4SLs)

Analyte	C4SL (mg/kg)	No. of exceedances	Maximum Concentration (mg/kg)	Location and Depth of Elevated Concentrations (Report)
Lead	310	10	569.8	BH1B at 0.8 m bgl (Socotec)
			803	WS2 at 0.9 m bgl (Socotec)
			420	TP703 at 0.7 – 1 m bgl (Hydrock)
			400	TP801 at 0.5 – 1 m bgl (Hydrock)
			360	TP801 at 2.0 m bgl (Hydrock)
			400	TP801 at 0.2 m bgl (Arup)
			360	TP801 at 0.7 m bgl (Arup)
			569.8	BH1B at 0.8 m bgl (Ramboll)
			540.5	WS2 at 0.9 m bgl (Ramboll)
			617.3	WS4 at 0.4 m bgl (Ramboll)

Lead is still found to exceed in seven samples when compared against the C4SL target value of 310 mg/kg, however no samples exceeded the C4SL concentration for benzo(a)pyrene.

Chrysotile and amosite asbestos were detected in four of the samples screened during the Hydrock ground investigation. Asbestos fibres were not identified in the four samples screened form the Socotec GI. Asbestos quantification was undertaken on each set of samples the findings of which are presented in **Table 2.5** below.

Table 2-5 - Summary of Positive Asbestos Identifications

Location	Sample Depth (m bgl)	Presence	Quantification (%)	Comment
TP702	0.60	Amosite and Chrysotile	0.0158	Sheeting / board debris
TP703	0.70	Amosite and Chrysotile	0.0014	Loose fibres and loose fibrous debris
TP801	0.10	Chrysotile	0.0005	Loose fibres
TP801	0.50	Amosite and Chrysotile	0.0026	Hard / cement type material and loose fibres

Despite the low percentage of asbestos fibres, based on the variable nature of the Made Ground and the non-threshold nature of this contaminant (i.e. there is no identified safe minimum threshold of exposure), the material could pose a potential risk to human health.

With respect to the potential risk of exposure to asbestos containing materials (ACMs) to construction workers, risk should be mitigated through the use of appropriate PPE and RPE. WSP's approach to

this assessment encompasses current industry guidance including CIRIA C733 – "Asbestos in Soil and Made Ground – A guide for understanding and managing Risks" and the Joint Industry Working Group (JIWG) "Industry Guidance on Managing and Working with Asbestos in Soils in Construction and Demolition Materials". The JIWG Industry Guidance is specifically used in the consideration of consequence and probability in the exposure model as these documents provide practical advice in relation to the issues associated with asbestos within a soil matrix (as opposed to "original form" asbestos containing materials such as asbestos sheets, insulation boards and pipework lagging).

2.6.2 CONTROLLED WATERS RISK ASSESSMENT

The Site is underlain by three Secondary A Aquifers and one Principal Aquifer. To facilitate the assessment of risk posed by the ground to controlled waters groundwater analysis was undertaken on a single sample during the Ramboll ground investigation in September 2018. A single sample is not representative of the groundwater regime beneath the site. A controlled waters risk assessment against Drinking Water Standards (DWS) or against Environmental Quality Standards (EQS) has been undertaken but is not thought to be representative.

Based on the proposed formation levels comprising a general cut of 1 to 2 m across the Site, it is considered likely that any potentially contaminated Made Ground on the Site will be excavated and removed. As such, the source of any residual groundwater contamination will be reduced by the removal of the Made Ground source. There still remains a potential risk of contamination being present at formation level the risk for which would require mitigation as a part of the proposed development.

2.6.2.1 Controlled Waters Risk Assessment

The Controlled Waters risk assessment was conducted in accordance with the principles of EA 'Remedial Targets Methodology: Hydrogeological Risk Assessment for Land Contamination' 2006 (EA 2006) and the 'prevent and limit' approach of the Water Framework Directive (2000/60.EC). Generic Controlled Waters risk assessments compare directly measured concentrations with standard assessment criteria.

Appropriate Water Quality Standards (WQS) are selected based on both a hierarchy of relevance to the receptor. In this case, the Controlled Water receptors identified in the CSM were the underlying Secondary A Aquifers and Principal Aquifers.

Therefore, based on this the following WQS is considered to be appropriate:

- Environmental Quality Standards (EQS) from The Water Framework Directive (Standards and Classification) Directions (England and Wales) 2017; and,
- UK Drinking Water Standards.

Further details on the assumptions and methodologies adopted by WSP are provided in **Appendix C.**

The single sample obtained from BH1B identified no exceedances against EQS or DWS.

2.7 GROUND GAS RISK ASSESSMENT

The 2018 Socotec ground investigation included a total of six return visits undertaken from 27 August to 5 September 2018.

The maximum recorded positive flow rate was 0.1 l/hr over the six monitoring visits.

BH1B was installed into the Kempton Park Gravels where as WS4 was cross installed into the Made Ground and the Kempton Park Gravels. **Table 2.6** below presents a summary of the ground gas monitoring results.

Table 2-6 - Summary of Ground Gas Monitoring Results

Exploratory Hole	Max Flow Rate (l/hr)	Max Methane (% v/v)	Max Carbon Dioxide (% v/v)	Min Oxygen (% v/v)	Frequency of Flooding
BH1B	0.1	<0.1	6.5	12.40	0 of 6
WS4	0.1	<0.1	7.0	11.20	0 of 6

Based on the maximum methane and carbon dioxide and flow rate of 0.1l/hr the calculated GSV resulted in a Characteristic Situation 1 (Very Low Risk) site setting. However, a number of exceedances of 5% v/v of carbon dioxide (CO_2) were recorded on several occasions throughout the monitoring period and when wells were not flooded. Due to the higher carbon dioxide concentrations Gas Characterisation Situation 2 (Low Risk) is considered the most suitable to describe the Site's current gas regime.

Characteristic Situation 2 sites require the following consideration of the following mitigation measures:

- Reinforced concrete cast in situ floor slab (suspended or raft) with a gas resistant membrane* and underfloor venting; or
- Beam and block or precast concrete slab and reinforced gas membrane and underfloor venting;
- Under floor venting or pressurisation in combination with one of the above.
- During the installation of gas proof membrane all joints, penetrations of the gas proof membrane should be sealed, with service entries protected as appropriate. It is recommended that visual assessment of the workmanship is undertaken post laying and installation of the membrane.

** Gas resistant membrane must meet the following requirements in order to achieve a score of 2: sufficiently impervious to the gases with a methane gas transmission rate <40.0 ml/day/m2/atm (average) for sheet and joints (tested in accordance with BS ISO 15105-1 manometric method), sufficiently durable to remain serviceable for the anticipated life of the building and duration of gas emissions, sufficiently strong to withstand in-service stresses (e.g. settlement if placed below a floor slab), sufficiently strong to withstand the installation process and following trades until covered (e.g. penetration from steel fibres in fibre reinforced concrete, penetration of reinforcement ties, tearing due to working above it, dropping tools, etc), capable, after installation, of providing a complete barrier to the entry of the relevant gas and verified in accordance with CIRIA C735 [N1].*

The recommendation of any mitigation is beyond the scope of this document and risk assessment based on specific building and development design will be required.

Low-level readings of carbon monoxide (CO) and hydrogen sulphide (H_2S) typically in the range of <1 ppm, were recorded during the ground gas monitoring. The proposed development is therefore not considered at risk from the ingress of these gases within existing soils.

Only two readings of 0.5 ppm and <0.1 ppm of volatile organic compounds (VOCs) from each well were recorded across the six monitoring rounds which is not considered to be sufficient to give a representative view of the VOC concentrations.

Both of the monitoring wells are in the northern part of the Site where the proposed school is likely to be built and therefore the above results would not be considered to be representative of the entire Site.

3 CONCEPTUAL SITE MODEL

3.1 INTRODUCTION

This section summarises the findings of the GQRA and the key receptors identified in the CSM and provides the plausible linkages identified at the generic assessment level.

3.2 POTENTIAL CONTAMINATIVE SOURCES

Based on the site conditions and potential contaminant linkages, potential sources of contamination that may affect the development have been identified as follows:

- Made Ground;
- Former timber yard; and,
- Former coffee factory.

3.3 POTENTIAL RECEPTORS

Relevant potential receptors are considered to include the following in the context of the proposed development:

Human Health

- Construction workers
- Future site users
- Adjacent site users / adjacent residents

Controlled Waters

- Secondary A Aquifers – Kempton Park Gravels, Lambeth Group, Thanet Formation
- Principal Aquifer - Chalk Aquifer

Future development

- Buildings and services
- Neighbouring properties

The risk assessment by WSP identified a limited risk to surface waters (River Thames) based on the distance from the Site. However, groundwater will need to be managed during any earthworks if encountered.

3.4 PLAUSIBLE CONTAMINANT LINKAGES

Table 3.1 presents the Relevant Pollutant Linkages (RPL's) that were considered to be plausible following the site investigation, based on an evaluation of the potential sources and future receptors.

Table 3-1 - Relevant Pollutant Linkages that require Remedial Action

Relevant Pollutant Linkage	Source	Potential Pathways	Potential Receptors	Comments
RPL1	Asbestos	Inhalation of fibres on-site	Construction workers, Future site users Adjacent site users / residents	Asbestos fibres and Asbestos Containing Materials (ACM) were noted at several locations across the site. Consideration of further risk assessment and appropriate control measures must be undertaken if this material is to be re-used on site or disposed of off-site to a suitably licenced facility.
RPL2	Metals within the Made Ground soils	Direct contact / soil ingestion in unsealed areas	Construction workers, Future site users	Made Ground soil was found to pose a potential risk of harm to human health in unsealed areas. The risks posed by lead in Made Ground soil will require further assessment and mitigation through either further characterisation of soils (Discovery Strategy) and/or remedial measures based on the proposed development plans.
RPL3		Direct contact	Buildings and services	Contaminants within the Made Ground may impact proposed buildings and services. An assessment of concrete in aggressive ground may be required. Any pipe design should be subject to the appropriate soil testing in service trenches and agreed with the relevant statutory authority.
RPL4		Vertical migration to underlying Secondary A Aquifers and Principal Aquifer	Controlled Waters - Secondary A and Principal Aquifers	Future redevelopment will include a reduction in site levels and removal of a majority of the Made Ground on the Site. There is a potential risk of unidentified contamination being present within the soils below the cut level which may impact Controlled Waters underlying the Site. It is considered likely that the proposed development will be piling through the Made Ground on Site. Piled foundations may provide a preferential pathway for shallow contamination to reach the deeper groundwater bodies. A Piling Risk Assessment should be completed to prevent contamination of the Principal aquifer.

Relevant Pollutant Linkage	Source	Potential Pathways	Potential Receptors	Comments
RPL5	Made Ground: Active generation of ground gas (carbon dioxide, methane, low oxygen concentrations)	Vertical migration and accumulation in confined spaces in proposed development	Future site users Adjacent site users / residents	Ground gas measures will be required for new buildings in accordance with C665 for a low risk Characteristic Situation 2 site. Further GI may be considered to reduce the Gas Characterisation Situation.

3.5 GAPS WITHIN THE EXISTING DATA

Based on the limited coverage across the Campus Site, there are considered to be the following gaps within the existing data, however, based on the proposed development comprising a reduction in site levels by 1 to 2 m bgl, it is considered likely that most of the Made Ground soils present on the Site will be excavated and taken off site. It is recommended that further assessment and a watching brief by a suitably qualified person is maintained for the duration of these works in order to ensure that unidentified contamination is suitably identified and managed, if encountered.

It should be noted that an assessment of the available geotechnical data from historical ground investigations has not been included within this report.

4 REMEDIATION OBJECTIVES, CONSTRAINTS AND OPTIONS APPRAISAL

This section defines the remediation objectives and constraints and sets out the basis for selecting the most appropriate overall remediation option for the Site.

4.1 REMEDIATION OBJECTIVES

The objectives of the proposed remediation are as follows:

- Protection of human health and the environment;
- To provide a site suitable for the proposed end-use;
- Contributing to a sustainable development;
- Minimising adverse environmental impact on off-site locations; and,
- Best practical remediation measure.

The protection of human health from soil contamination will need to address:

  - Unacceptable risks to human health, and,
  - Potential risk to Controlled Waters

A summary of the remediation objectives per RPL is provided in **Table 4.1,** below. As outlined earlier within the strategy, the remediation works will be verified in two stages. The actions highlighted in red make reference to elements of the proposed remediation works that will require verification by subsequent contractors following the completion of the Keltbray works.

Table 4-1 - Summary of Remediation Objectives per RPL

RPL	Source	Aim / Requirements	Action
RPL1	Asbestos Fibres	Protection of construction workers, future site users and adjacent site users / residents	Control measures during earthworks and controlled removal of arisings generated. During groundworks appropriate PPE/RPE and mitigation methods as outlined within an Asbestos Management Plan are recommended to mitigate the risk against the release of airborne asbestos fibres (including air monitoring) are recommended. Provision of a pathway break in soft landscaped areas (pathway break to be completed and verified at a later stage by subsequent contractors).
RPL2	Metals within the Made Ground soils	Protection of construction workers and future site users	Control measures in line with CDM Regulation during earthworks and any other excavation works associated with basements and infrastructure. A watching brief by a suitably qualified person during bulk excavations is

RPL	Source	Aim / Requirements	Action
			recommended to observe potential unidentified contamination. Provision of a pathway break in soft landscaped areas (pathway break to be completed and verified at a later stage by subsequent contractors).
RPL3	Metals within the Made Ground soils	Protection of Buildings and services	Assessment of concrete in aggressive ground and potential requirement for barrier pipes (subject to agreement with relevant statutory authority).
RPL4	Metals within the Made Ground soils	Protection of Controlled Waters - Secondary A and Principal Aquifers	A Watching brief by a suitably qualified person during bulk excavation works to observe potential unidentified contamination during the works. Further assessment of risk to Controlled Waters if potential contaminants of concern are identified at formation level. A Piling Risk Assessment to be completed at a later stage by others when piling design known.
RPL5	Ground Gas	Protection of future site users	Control measures during excavation works and prevention of gas migration through the use of suitable gas protection measures as a part of the proposed development. Alternatively, further sampling and re-assessment of risk.

5 REMEDIATION OPTIONS APPRAISAL

An appraisal has been undertaken taking into consideration technical, logistical and financial aspects of the remediation technology/options and incorporates the staged approach as defined in CLR 11 (2004).

The remedial options available to manage unacceptable risks will either:

- Manage (remove, destroy, modify or immobilise) the source,
- Interrupt the pathway; or,
- Modify the receptor or the behaviour of the receptor.

The most appropriate approach is considered to be a combination of source treatment and removal / modification of the migration pathway.

The assessment of chemical data indicates that there are areas of lead and asbestos containing materials present on the Site.

The proposed options are designed to manage the source of contamination or interrupt the pathway. Modifying receptor or receptor behaviour has not been considered in this instance. Source management may involve the removal, destruction, stabilisation, or transformation of the source. Pathway interruption may involve either the blocking of the pathway or the destruction or removal of contaminants moving along a pathway.

Feasible remedial techniques for the Site include in-situ and ex-situ civil engineering based, process based solutions and planning based solutions.

5.1 EXCAVATION AND DISPOSE (CIVIL ENGINEERING BASED SOLUTION)

This technique simply involves excavating the source of contaminated material. It has the advantage that it is an observational technique and contaminated material identified by visual and olfactory means may be removed with some confidence. The disposal option is an expensive and environmentally unsustainable solution, requiring disposal of the contaminated material to a suitable disposal facility, a source of chemically suitable material to backfill the excavation and transport of the waste and fill materials. Any excavation and disposal works should be undertaken in line with materials management of the soils in accordance with waste management guidance as outlined within **Section 6.8**.

5.2 EXCAVATE AND REMOVAL TO SOIL TREATMENT FACILITY (CIVIL ENGINEERING BASED SOLUTIONS)

This technique involves excavating the source of contaminated material. This is an observational technique based on visual / olfactory evidence of contamination which will be confirmed by validation testing. This material will then be disposed of off-site to a registered Soil Treatment Facility (STF) for treatment and re-use off-site. This may prove to be a more cost-effective approach than treatment on site, however, segregation should be undertaken to ensure that this is cost effective.

5.3 MATERIALS MANAGEMENT AND COVER SYSTEMS / BARRIERS (CIVIL ENGINEERING BASED SOLUTION)

This technique introduces an appropriate barrier, removing the pathway to the receptor. Import of clean materials or onsite management of appropriate materials is required for construction of the barrier. Systems range from simple cover layers to provide a reduction of the hazard to human health and to provide a suitable medium for plant growth; through to engineered systems designed to provide a complete separation of the receptor from the hazard and to perform a number of functions including limiting upward migration of contaminants due to capillary rise and controlling the downward infiltration of water.

5.4 SELECTIVE DEVELOPMENT ZONING (PLANNING BASED SOLUTION)

This method divides the site into different development zones whereby the exceedances of contaminants will be compared against different land-use scenarios and the masterplan for the site will be developed accordingly. This method may not be appropriate as a Master Plan has already been developed.

5.5 PREFERRED REMEDIATION OPTIONS

Based upon the proposed formation levels, literature review, consultation with a number of specialist contractors, and from direct experience on sites of similar complexity, it is considered that an appropriate and cost-effective approach can be adopted is a mixture of excavation and dispose / removal to soil treatment facility and materials management and cover systems / barriers.

It should be noted that the Piling Risk Assessment, gas protection measures and clean cover elements of this strategy will be undertaken by other contractors so the Remediation works will require verification in two stages. This is discussed in more detail within Section 6.

Based on the available data the preferred remedial option comprises the following:

5.5.1 HUMAN HEALTH

5.5.1.1 Metals – Lead

Residual risks to human health associated with contaminated soils within the upper 600 mm of the final finished formation levels will be mitigated for lead contamination, through the removal of Made Ground to achieve the formation levels and the covering of most of the site with buildings and hardstanding where Made ground may still be present following earthworks. In small areas of proposed soft landscaping residual human health risks will be mitigated for lead contaminated soil, through the import or re-use of a 600 mm clean cover system which is chemically compliant with the end-use of the Site. This element of the proposed remediation works that will require verification by subsequent contractors following the completion of the Keltbray works.

5.5.1.2 Asbestos

For asbestos contaminants, this should be managed as a part of the construction works under an Asbestos Management Plan. The Asbestos Management Plan will be produced by Keltbray one month prior to commencing works for their package of works. This document should be updated by subsequent contractors who will be continuing construction. As general Site Management good practice, earthworks operatives should be given a toolbox talk on potential contaminated land risks in

particular the possibility of encountering Asbestos Containing Material (ACM) prior to excavation. If suspected ACM is identified then the following is required:

I. Stop works in the vicinity of the suspected location;

II. Inform Site Manager;

III. Inform the environmental consultant;

IV. Operatives to be provided with appropriate PPE;

V. Damp and cover the location to prevent release of asbestos fibres;

VI. Fence off the area to prevent tracking of fibres across the Site by vehicle / people movements;

VII. Collection of soil sample for asbestos quantification testing;

VIII. If the sample is negative for asbestos (i.e. non-detect or <0.001%) no further works are required;

IX. If the sample records asbestos at >0.001% or is in an area of soft landscaping then the material must be excavated in accordance with the procedure described below (for the remediation of identified contamination RPL1); and,

X. If the sample records asbestos at <0.1% and is below an area of hardstanding or within the building footprint then the material can remain, provided that a woven geotextile membrane (terram hi viz) and 200 mm of clean validated material is placed over the soil to minimise the spread / release of asbestos fibres during construction phase; or excavated to a temporary covered stockpile for placement below a hardstand area at a later time. If ACMs are identified and the Contractor opts to allow the material to remain in place (after providing cover layer) the extent must be surveyed and recorded on an as built drawing and retained in the Health and Safety File.

Risks to human health will be mitigated across the majority of the Site through the covering of the Site with buildings and hardstanding. Within the small areas of soft landscaping, a 600 mm clean cover will be imported (or site re-won) and placed as a part of the proposed development. Where development is to be undertaken in stages, sufficient interim cover (minimum 150 mm) should be placed across the site to protect construction workers and other site users.

5.5.2 CONTROLLED WATERS

Based on the proposed excavation and removal of the majority of the Made Ground across the Site, any potential sources of contamination are considered likely to be removed. There may be potential areas of unidentified contamination present at formation level following the earthworks which could pose a risk to Controlled Waters.

A watching brief by a suitably qualified person is also recommended during earthworks in order to identify any potential areas of concern at formation level which may require further assessment during the works in order to ensure that there is a low risk to Controlled Waters.

5.5.3 BUILDINGS

5.5.3.1 Ground Gases

The potential presence of elevated ground borne gas (indicating a CS2 classification - Low Risk) should be reconsidered upon completion of the remedial works.

It is understood that the Site levels will be reduced across the Site and the current available data only covers the northern part of the Site. It is recommended that the proposed gas protection measures outlined above are confirmed based on the final formation levels on the Site and the proposed locations of the buildings.

Insufficient data has been provided of volatile organic compounds recorded by the Photo Ionisation Detector for soils. As such the risk from the ingress of volatile organic compounds within existing soils cannot be ruled out at this time. However, based on the proposed removal of the majority of the Made Ground on the Site, the potential source of contamination would be removed.

It should be noted that this element of the proposed remediation works will be completed by subsequent contractors following the completion of the Keltbray works.

5.5.3.2 Foundations

If elevated concentrations of sulphate are noted, the concrete foundations for the buildings will require appropriate design of concrete classification.

5.5.3.3 Services

Based on UK Water Industry Research 'Guidance for the Selection of Water Supply Pipes to be used in Brownfield Sites' and the available data, an indicative assessment has been undertaken on the type of water supply pipes that may be suitable for the Site. The assessment suggests that barrier pipes may be required. Once the proposed locations of the potable water supply pipes have been confirmed; appropriate soil testing should be agreed with the relevant statutory authority.

It should be noted that the water supply company's bespoke threshold concentrations take precedence over the UKWIR guidance, therefore, this should be confirmed prior to construction.

6 REMEDIATION STRATEGY

6.1 PROPOSED DEVELOPMENT

The Site is being assessed for residential development with no plant uptake and a new school with some landscaping areas.

It is currently proposed that the indicative formation levels for the Site are likely to be between 1.80 and -0.5 m AOD with a proposed cut of between 1 to 2 m across the majority of the Site and up to 4 m in the east for a proposed basement.

Ground levels may be subject to change to provide alternative development platforms. Based on the above it is anticipated that some of the Made Ground will likely be excavated from the Site and some of the underlying natural soils may also be excavated in some areas.

It is anticipated that the re-use of on-site soils and import / transfer of materials will be carried out under the CL:AIRE Code of Practice to facilitate the re-use and treatment of on-site material that might otherwise be classified as waste.

6.2 CONSTRAINTS AND CONSIDERATIONS

The following are a number of Site specific factors that are likely to affect the choice of remediation solution. These are summarised below:

- The assessment undertaken is based on the outline masterplan available at the time of writing this report. It is understood that this may be subject to change as the development progresses in which case this assessment and strategy should be re-assessed.
- The piling risk assessment, ground gas protection measures and clean cover verification elements of the remediation works will be undertaken by subsequent contractors following the completion of the Keltbray works. The Keltbray works will be verified as one stage and the outstanding elements will require verification by subsequent contractors at a later stage.
- The proposed buildings are likely to be piled through the Alluvium and the Kempton Park Gravels thus potentially creating vertical pathways into the underlying aquifer. Consideration of the environmental impacts associated with the piling works should be considered in a piling risk assessment that should be conducted in accordance with NC/99/73 Piling and penetrative ground improvement methods on land affected by contamination: guidance on pollution prevention dated 2001. The piling design is currently unknown and the piling element of the proposed construction will be completed by subsequent contractors and will be verified following the completion of the Keltbray works. When confirmed, the Piling Risk Assessment will be completed by the Piling contractor and submitted one month prior to commencing piling works.
- It is understood that the site is relatively flat, however, the levels on the Site will be reduced from 1 m to 2 m. It is anticipated at this stage that all materials excavated will be removed from Site, however, some of the material generated could potentially be re-used on the Site subject to chemical and geotechnical suitability. Any material re-use should be undertaken under a Materials Management Plan in line with the CLAIRE Code of Practice.

- At this stage, design plans for locations of potable water supply have not been finalised. Some soils may pose a risk to below ground potable water pipes constructed from copper within areas of Made Ground on the Site.
- It is understood that groundwater was recoded at between 4.09 and 4.16 m bgl in the northern part of the Site. Based on the maximum cut of 4.00 m bgl groundwater may be encountered. If dewatering is required during the construction process it will be undertaken by a Design and Build Contractor. It is understood that they would be responsible for specific discharge consents, abstraction licence (if required), and ensure the works are in line with appropriate legislative frameworks (the Water Act 2003, for example) and guidance. It is considered possible that the water within excavations may require treatment prior to discharge. This should be considered as a part of the proposed development. If visual / olfactory evidence of contamination is identified during the works, the environmental consultant shall be informed and a sample will be obtained for testing in order to assess the risks associated with contamination within the groundwater.

6.3 SITE CLEARANCE

Various existing buildings will need to be demolished and cleared prior to the start of the construction phase on Site.

6.4 REMOVAL OF GRASS / TOPSOIL / SUBSOIL

When removing the grass / topsoil / subsoil from the Site, these materials should be segregated from the Made Ground deposits.

It is understood that there may be some areas of landscaping proposed on the Site. If topsoil / subsoil materials are required for the proposed landscaping areas, these materials will require testing for chemical suitability in line with the requirements of **Table 6.4.**

Geotechnical suitability will also need to be assessed in line with BS3882 for Topsoil.

If the material is found to be chemically / geotechnically unsuitable, these materials would need to be taken off site for disposal.

6.5 REDUCTION IN GROUND LEVEL

The Site is likely to be cut on average by between 1.0 and 2.0 m below existing ground levels. The proposed remediation works will be undertaken down to formation level by Keltbray Remediation, details of which are shown on Drawing numbers **BER-ARP-BFXXX-XX-SK-D-82002** and **BER-ARP-BFXXX-XX-SK-D-82003** (**Appendix A**).

6.5.1 SEGREGATION AND TREATMENT OF SOILS

Based on the historical use of the Site and the variable nature of the soils underlying the Site, segregation and potential re-use of soils is possible. Segregation and further classification and assessment of soils would inform the most cost effective and sustainable option for disposal and re-use of soils.

All material re-use should be in line with the CL:AIRE Code of Practice and the chemical and geotechnical suitability should be assessed in line with the requirements of this Remediation Strategy and any subsequent Remediation Implementation Plan provided by the contractor.

6.6 EXCAVATIONS FOR DEVELOPMENT AND SERVICES

Based upon the works undertaken on the site, excavations for foundations and services should be possible in the Made Ground using normal hydraulic plant.

Based upon the findings of the ground investigation, shallow seepages of perched water may occur locally. Sump pumping should be sufficient to remove water from excavations. Appropriate consents will be required to pump the perched water to sewer or, where chemically suitable, to be discharged off-site. If not suitable, the perched water may require collection for treatment with a suitable Mobile Treatment Permit or be tanked off-site to a treatment facility.

Excavations may not remain stable in the short term within some parts of the site, even to shallow depth, and may require support or battering back. The base of all excavations should be blinded in order to prevent the deterioration of the cohesive materials.

Elevated concentrations of carbon dioxide and depleted levels of oxygen were recorded within isolated areas of the site; this should be considered when risk assessments are undertaken for work in excavations and other confined spaces.

6.7 VISUAL INSPECTION AND ANALYSIS

It is proposed that a system of appropriate inspection and assessment is implemented during the excavation of all Made Ground as part of the planned works. This role will be performed by a suitably experienced Engineer who is able to provide an appropriate level of specialist technical advice in relation to the presence of contamination or otherwise.

The Engineer shall ensure that all material is correctly inspected, stockpiled, tested and classified. The Engineer will have primary responsibility for the inspection of arisings and excavation of any suspected contaminated material.

The Engineer will direct the contractor as to how arisings are to be managed, including the requirements for the segregation, stockpiling and subsequent testing.

In addition, during the excavation works and disposal of the asbestos impacted soils the chosen contractor should retain the services of an asbestos consultant to provide guidance on works, to include methodologies for mitigating fibre release, providing toolbox talks to staff and undertaking personnel and verification monitoring.

In order to maximise the quantity of material that can be retained on site for re-use, the segregation of different material types should be completed.

6.8 WASTE MANAGEMENT

It is understood that significant volumes of materials will be generated during the reduced dig across the Site. Any crushed concrete or brick could be temporarily used as a piling mat or re-used as a sub-base under pavements and roads. If re-used on site however, a materials management plan (MMP) should be considered if the backfill materials are being generated from the site or if the materials generated from the works are considered to be suitable for re-use on the Site under the CL:AIRE Code of Practice.

A ‘Qualified Person’ as defined under the CoP will review the development of the Materials Management Plan, Risk Assessments and Remediation Strategy/Design Statement together with documentation relating to Planning and Regulatory issues will sign a Declaration which is forwarded

to the Environment Agency and which confirms compliance with the CoP. Any need for the disposal of material off site will require appropriate pre-classification and pre-treatment to minimise the waste volume. It is the strategy of the site however to maximise re-use of materials where possible.

The Contractor should provide a works materials management statement that sets out the circumstances and criteria for which materials are to be classified as waste or non-wastes.

The Contractor is required to provide method statements illustrating how compliance with waste management legislation is to be achieved for those materials classified as waste, to include but not limited to:

- Use of imported material;
- Criteria for assessing of the suitability of imported materials;
- Management of material that arises during the works and is classified as waste;
- Waste streams are appropriately classified prior to offsite disposal;
- Audit process for the selection of waste management contractors to include the collection and assessment of licences, permits and registrations; and,
- Audit process and record keeping.

In addition, all documents required if a waste recovery permit is required.

Where imported material is from a virgin source or the material has been demonstrated to have been produced in accordance with the WRAP Quality Protocol and is used Below the 600mm Capping Layer the sampling and testing of the material would not be required. A visual / olfactory assessment of the material once imported onto Site would however be required.

6.9 SAMPLING AND TESTING FOR SUITABILITY OF USE

Sampling and testing of any backfill materials will be required in order to demonstrate suitability of use.

Materials under the proposed marker layer for the clean cover can be remain in-situ without testing on the basis that the potential residual contamination has been assessed as suitable to remain in place at depth.

Sampling frequency and strategy is detailed below:

Table 6-1 – Sampling Frequency

Activity	Testing Frequency	Testing Suite
Stockpiled materials for disposal	Testing frequency as required by the receiver of the waste	Waste acceptable criteria (WAC) analysis if being taken to a landfill or a full testing suite for metals, inorganics and organics if being taken to another site or a Soil Treatment Facility (subject to the requirements of the receiver site).
Validation of clean cover materials for soft landscaped areas	One sample every 250 m^3. This should be tested and verified in-situ.	Suite including TPH-CWG, asbestos, metals and PAHs.

Activity	Testing Frequency	Testing Suite
Material used for backfilling of excavations	One sample every 500 m^3.	Suite including TPH-CWG, asbestos, metals and PAHs. Testing results will be for information purposes and re-use of materials will be on a risk based approach in line with the Definition of Waste: Code of Practice.
Validation of Unexpected Contamination	TBC and submitted to regulators if identified.	TBC and submitted to regulators if identified.

The materials being used for the validation of clean cover would be assessed for suitability by comparison to the Generic Screening Criteria (GACs) for residential end-use with no plant uptake and Residential Public Open Space for 1.0 % soil organic matter (SOM) are presented within the table below.

Table 6-2 - GACs for Residential End Use with No Plant Uptake

Analyte	GAC	Units	Analyte	GAC	Units
Asbestos	None Detected	%	TPH Aliphatic C16-C35	800*	mg/kg
Arsenic	35	mg/kg	TPH Aliphatic C35-C44	800*	mg/kg
Cadmium	87	mg/kg	TPH Aromatic C7-C8	853	mg/kg
Chromium III	1,590	mg/kg	TPH Aromatic C8-C10	47	mg/kg
Copper	1000**	mg/kg	TPH Aromatic C10-C12	248	mg/kg
Lead	188	mg/kg	TPH Aromatic C12-C16	800*	mg/kg
Mercury	56	mg/kg	TPH Aromatic C16-C21	800*	mg/kg
Nickel	181	mg/kg	TPH Aromatic C21-C35	800*	mg/kg
Selenium	430	mg/kg	TPH Aromatic C35-C44	800*	mg/kg
Zinc	1,000**	mg/kg	Benzo(a)pyrene	1.7	mg/kg
TPH Aliphatics C5-C6	42	mg/kg	Naphthalene	2.3	mg/kg
TPH Aliphatics C6-C8	104	mg/kg	Benzene	0.38	mg/kg
TPH Aliphatics C8-C10	27	mg/kg	Ethylbenzene	83	mg/kg
TPH Aliphatics C10-C12	132	mg/kg	Toluene	868	mg/kg
TPH Aliphatics C12-C16	1,000*	mg/kg	Xylene M & O	79	mg/kg

* - NOTE: Values with an * have been reduced to 800 mg/kg as a proxy value. This is a professional judgement value as the actual values for hydrocarbons within a residential without plant end use are considered to be too high for the betterment of Controlled Waters.

Values with an ** have been reduced to 1,000 mg/kg as a proxy value. This is a professional judgement value as the actual values for Copper and Zinc within a residential without plant end use are considered to be too high for the betterment of Controlled Waters.

Table 6-3 - GACs for Residential Public Open Space End Use

Analyte	GAC	Units	Analyte	GAC	Units
Asbestos	None detected	%	TPH Aliphatic C16-C35	800*	mg/kg
Arsenic	79	mg/kg	TPH Aliphatic C35-C44	800*	mg/kg
Cadmium	120	mg/kg	TPH Aromatic C7-C8	800*	mg/kg
Chromium III	2,140	mg/kg	TPH Aromatic C8-C10	800*	mg/kg
Copper	1,000*	mg/kg	TPH Aromatic C10-C12	800*	mg/kg
Lead	375	mg/kg	TPH Aromatic C12-C16	800*	mg/kg
Mercury	124	mg/kg	TPH Aromatic C16-C21	3,790	mg/kg
Nickel	305	mg/kg	TPH Aromatic C21-C35	3,790	mg/kg
Selenium	1,140	mg/kg	TPH Aromatic C35-C44	3,790	mg/kg
Zinc	1,000*	mg/kg	Benzo (a) pyrene	5.2	mg/kg
TPH Aliphatics C5-C6	800*	mg/kg	Naphthalene	4,890	mg/kg
TPH Aliphatics C6-C8	800*	mg/kg	Benzene	72	mg/kg
TPH Aliphatics C8-C10	800*	mg/kg	Ethylbenzene	800*	mg/kg
TPH Aliphatics C10-C12	800*	mg/kg	Toluene	800*	mg/kg
TPH Aliphatics C12-C16	800*	mg/kg	Xylene M & O	800*	mg/kg

* - NOTE: Values with an * have been reduced to 800 mg/kg as a proxy value. This is a professional judgement value as the actual values for hydrocarbons within a residential without plant end use are considered to be too high for the betterment of Controlled Waters.

Values with an ** have been reduced to 1,000 mg/kg as a proxy value. This is a professional judgement value as the actual values for Copper and Zinc within a residential without plant end use are considered to be too high for the betterment of Controlled Waters.

6.10 CLEAN COVER SYSTEM

The placement of clean cover systems will be undertaken following the completion of the Keltbray element of the construction works. These works will be completed by subsequent contractors

appointed by the developer. It will be the responsibility of the developer who should appoint a suitably qualified environmental consultant to independently verify that imported cover materials meet the required standard and the cover systems are constructed in accordance with the requirements set out below.

In areas of proposed soft landscaping and public open space, where Made Ground remains in place, there is the potential for residual contamination to be present which, although has been assessed as suitable to remain in place, may pose an increased risk to sensitive human receptors if it is brought to the surface due to maintenance work, or other activities such as gardening. As such it is recommended that a minimum cover is designed to mitigate residual risks and a marker layer such as orange terram or similar is required. In addition, soft landscaping will require suitable growing medium for cultivation.

The capping thicknesses are shown below to be a required minimum across soft landscaped areas. The clean cover layer will be placed in the sequence as shown below by the developer during the construction phase. It is considered that areas of public open space will be managed by companies who can take appropriate mitigation measures to limit exposure to their workforce.

Such a cover barrier would need to be agreed with the Contaminated Land officer at the Local authority and will be dependent on the final development layout and levels.

It is noted that the proposed capping of certain failures across the site will in a majority of cases exceed that set out below in **Table 6.4**.

Table 6-4 – Capping Thickness

AREA ON-SITE	GEOTEXTILE MARKER LAYER	SUB-SOIL (mm)	TOPSOIL (mm)	TOTAL THICKNESS (mm)
Public Open Space / landscaping areas	Yes	400	200	600

The chemical requirements for the landscaping areas are outlined within **Tables 6.2 and 6.3** and geotechnical requirements of subsoil and topsoil are as outlined within BS 8601:2013 and BS 3882:2015, respectively.

The capping layer should be verified in-situ by a suitably qualified person following placement.

6.11 MANAGEMENT OF ASBESTOS

6.11.1 REVIEWING ASSESSMENTS

Further assessment of risks associated with the presence of asbestos containing materials within the Made Ground would need to be considered as a part of the proposed development when assessing risks to construction workers and future site users. Based on the uncontrolled filling the presence of asbestos within the ground cannot be dismissed and should be considered as a part of the proposed development and an Asbestos Management Plan should be compiled in line with CIRIA C733 – “Asbestos in Soil and Made Ground – A guide for understanding and managing Risks” and the Joint Industry Working Group (JIWG) “Industry Guidance on Managing and Working with Asbestos in Soils in Construction and Demolition Materials” and, implemented as a part of the development works. The Asbestos Management Plan will be produced by Keltbray one month prior to commencing works for their package of works. This document should be updated by subsequent contractors who will be continuing construction.

If asbestos is identified during the excavations on the site, this material will require careful management in accordance with Control of Asbestos Regulations 2012. Asbestos exposure risk assessment, mitigation such as dust suppression and air monitoring would be required.

The Principal Contractor should review risk assessments as part of the ongoing management of their health and safety systems to make sure they are still relevant and reflect any lessons learned site from activities. A competent person should conduct the review. A specific review should take place if:

- methods used to control fibre release change;
- there is doubt about the efficiency of control measures;
- there is a significant change in the type of work, amount of asbestos or method of work; and,
- the results of air monitoring indicate the exposure levels to be higher than previously assessed.

Where monitoring of exposure levels, or other information gathered during the course of work indicates that the initial assessment requires revision with regards to either the duration of the task or nature of the materials, the following tasks should be undertaken:

- immediately review the assessment and control measures and whether the nature;/extent of the exposure means that the work should be done using different methods and equipment;
- review whether the work needs to be done by a licensed contractor; and,
- record any changes made to the risk assessment (the revised assessment must be available on site at all times).

6.11.2 PLANS OF WORK (METHOD STATEMENT) - COMPLIANCE WITH REGULATION 7 OF CAR 2012

The Plan is the record of how senior managers/directors require the job to be undertaken. The main purpose of the Plan is to guide site work. An up-to-date copy of the Plan must always be on site. It also demonstrates that the contractor has considered the significant risks and how these will be addressed.

Work must not take place unless a copy of the Plan of Work is readily available on site. Employees must be informed of the contents of the Plan and be instructed on the work methods and controls to use. A copy should also be kept at the head office, so management can effectively monitor performance. Access to general procedures should also be available at site, either as paper copies or electronically. The plan should be kept updated to reflect any subsequent changes to the work.

The Plan of Work must also be shown to anyone who needs to see it, including those carrying out inspections of the works and/or air monitoring. It should also be available on request to employees, safety representatives and other elected representatives of employee health and safety, as well as others who may be affected by the work.

In order for a Plan of Work to be deemed suitable and sufficient it must include, as a minimum:

- the nature and probable duration of the work;
- the number of people involved in the work;
- the address and location where the work is to be carried out;

- the methods to be used to prevent or reduce exposure to asbestos, e.g. prevention and control measures and arrangements for the handling and disposal of asbestos waste;
- the type of equipment, including PPE and RPE, used for:
- protecting and decontaminating those carrying out the work;
- protecting other people present at or near the worksite.
- the nature and probable duration of works;
- the method(s) to be used to prevent or reduce exposure to asbestos, permit to dig etc;
- the supervision & monitoring of the works;
- type of equipment used for protection and decontamination of those employees carrying out works and the equipment used;
- detailed excavation/soil disturbance techniques;
- detailed site layout showing location of ACMs, location of welfare and any areas of restricted access and/or respirator zones, site access/egress controls, and traffic routes; and,
- a full list of organisations, contacts and telephone numbers.

The Principal Contractor shall ensure, so far as is reasonably practicable, that the work to which the plan of work relates is carried out in accordance with that plan of work and any subsequent written changes to it.

6.11.3 LICENSING OF WORK WITH ASBESTOS - COMPLIANCE WITH REGULATION 8 OF CAR

Before any work on Licensed ACMs commences an employer must hold a HSE licence for working with asbestos. This must be in line with the application and notification requirements.

It may be judged at the outset that the site works will fall under the Notifiable Non-Licensed Works category and therefore a Licence to work with asbestos is not required. However, a Licensed asbestos removal contractor may be engaged during specific phases of the works to provide additional competence.

A Licensed Contractor must be engaged at the site should a review of existing risk assessments and working methods indicate a change of work category from NNLW to Licensable work, triggers for this may include the following:

- Higher than expected airborne fibre levels generated when making proper use of control measures, i.e. the Control Limit or STEL is likely to be breached;
- When bulk ACM in the form of Coatings are encountered; and,
- When bulk ACM are discovered that include, Insulation or Insulating Board in anything other than very small quantities.

6.11.4 NOTIFICATION OF WORK WITH ASBESTOS – COMPLIANCE WITH REGULATION 9 OF CAR

Prior to undertaking licensed work, the appropriate enforcing authority must be notified with details of the proposed work at least 14 days before work starts. This enables the enforcing authority to assess the proposals for carrying out work with asbestos and, if appropriate, to inspect the site either before or during the work.

Although the requirement is to notify the relevant enforcing authority office in writing at least 14 days before any licensed work begins, the enforcing authority may allow a shorter period, e.g. in an emergency where there is a serious risk to the health and safety of any person. This shorter period is known as a 'waiver' or ‘dispensation’.

It is highly unlikely, however, that waivers would be granted for most types of activities on soil and C&D materials contaminated with asbestos covered by this guidance. Such activities are usually longer-term, well-planned activities. Waivers would probably only be considered by the enforcing authority in exceptional circumstances, e.g. or emergency clear up after a flood, clear up of unintended releases of ACMs.

Since most, if not all, of the types of activities on soil and C&D materials contaminated with asbestos covered by this guidance would be classed under the category ‘construction’ which includes remediation, the relevant enforcing authority will be the Health and Safety Executive.

The Licensed Asbestos Removal Contractor must inform the enforcing authority in writing if there are changes to the work that might affect the particulars of the notification.

Normally each individual licensed job should be notified to the enforcing authority. However, a single notification of licensed asbestos work may be submitted to the enforcing authority for work likely to be regularly repeated on the same site. If there are several distinct sites, a separate notification is required for each of them. Any other subsequent work not covered in the original notification will need to be separately notified.

For Notifiable Non-Licensed Work - Employers who plan to carry out NNLW must notify the work using the online notification form for notifying HSE. Notification must be made before the work begins.

Notifications must only be made using the online notification form ASB NNLW1 at:

https://extranet.hse.gov.uk/lfserver/external/asbnnlw1

NOTES

- there is no stipulated minimum prior notice period, but they should notify before work starts;
- work may proceed once notification has been submitted, no permission for work to proceed is required;
- an acknowledgment PDF copy of your notification will be provided electronically and should be kept with other documentation (such as the Plan of Work) relating to the activity;
- for a long-term project of work involving multiple jobs in one localised area the whole project should be notified once;
- Licensed asbestos contractors are required to notify both licensed and NNLW work; and,

there is further guidance on the online notification form itself.#

6.12 OTHER CONSIDERATIONS

6.12.1 MANAGING UNEXPECTED CONTAMINATION AND WATCHING BRIEF

Excavations should be undertaken with an appropriately skilled banksman overseeing excavation works. The banksman should be aware of the different types of material ‘expected’ and ‘not expected’ on this Site. In the event that unexpected contamination is encountered then the following action is proposed.

Immediately stop excavations to assess the immediate risks to the environment to include:

- Inhalation of hazardous dust such as asbestos;
- Inhalation of vapour or gas; and,
- Spread of liquid contamination such as liquids / oils leaking from pipes or tanks.

If there is an immediate risk to human health and construction workers then evacuate to a safe distance and follow site emergency procedures.

If no immediate risk to human health then undertake an assessment to determine:

- The source of contamination; and,
- Appropriate method of containment.

A specialist Environmental Consultant must be appointed to further assess the risks and develop an appropriate unidentified contamination method statement. With assistance from the specialist consultant, a risk based assessment and strategy will be developed to assess the potential source / pathway / receptor pollutant linkages. If a significant pollutant linkage that requires supplementary remediation works is identified then notification will be made to the Local Planning Authority along with the mitigation approach for managing the identified contamination risk.

In addition to the above, it is recommended that a watching brief by a suitably qualified person be carried out during all major earth works including basement excavation, slab removal. All site personnel will be briefed on the potential areas of concern, contamination risks and observations to be made during the works. The engineer shall ensure:

- Observations of all excavations during the works and any potential contamination is noted and addressed in accordance with Table 6-5;
- A photographic record is kept during the key stages of the development and key occurrences of the works;
- All contamination observations are addressed in accordance with this Outline Remediation Strategy; and,
- All of the findings will be reported within the Verification Report.

The procedure for assessing unexpected contamination will be a risk based assessment and will follow the following the procedure outlined in **Table 6-5**. The level of risk assessment will dependant on the identified pollutant linkage and the severity of the unexpected contamination.

Table 6-5 - Flow Chart Showing Procedures for Assessing and Managing Unexpected Contamination

Step	Actions
Identify Pollutant Linkage	Review the Conceptual Site Model to identify any relevant Pollutant Linkages
Conduct Risk Assessment	Undertake a Quantitative Risk Assessment to determine if the level of risk is acceptable
Remediation Options Appraisal	If the level of risk is not acceptable then review the options to select the most cost-effective option to either break or remove the pollutant linkage
Determine Remediation Strategy	Finalise and present the Strategy for regulatory approval
Submit to Regulator for approval	In the event that regulatory approval is not obtained then revisit the Remediation Options Appraisal and Remediation Strategy to meet regulatory requirements
Implement Strategy	Implement Remediation in accordance with the agreed strategy
Verification	Undertake verification works and report in a final Validation Report

6.12.2 WATER SUPPLY PIPES

Prior to commencement of the construction works, the statutory water authority should be consulted to determine the most suitable form of water supply pipes. Residual organic contamination is expected within site soils generally within the area of the proposed school and on this basis ductile iron water supply pipes are likely to be required.

6.12.3 DRAINAGE

Drainage design relying on infiltration drainage will not be suitable without further detailed risk assessment to define risks to controlled waters. The Environment Agency should be consulted prior to finalisation of the proposed drainage strategy for the development.

6.12.4 GAS AND VAPOUR PROTECTION

Ground gas risks should be confirmed by subsequent contractors based on the final formation levels.

The vapour / gas protection measures should be confirmed with the regulators and this should include details and specification of the specifications, how they will be fitted and the locations in relation to the foundations.

Verification of the vapour / gas protection measures should be undertaken and provided to the regulators prior to the foundation works.

7 ENVIRONMENTAL MONITORING AND CONTROL MEASURES

As part of construction works at the Site there will be a requirement for environmental controls and monitoring.

Typical considerations will focus on perched groundwater, air, noise and vibration and odour. The requirement for detailed information on the methodologies and controls will be detailed in a Construction Environmental Management Plan or Construction Code of Practice document.

7.1 DUST AND PARTICULATES

Dust and particulates can potentially be generated during excavation and haulage activities. The haulage requirements should be minimised and haulage routes kept free from mud where possible and sufficiently dampened down to minimise dust generation.

It is recommended that dust generation should be monitored on a visual basis and potential dust and asbestos fibres should also be monitored via frisbee gauges on the boundary of the Site at agreed locations. Damping down is recommended to be undertaken where any excessive dust was observed or where monitored dust levels exceed a value of 200 mg/m^3.

7.2 VAPOURS AND ODOURS

Vapours and odours are expected to be released during the excavation, transport and treatment of hydrocarbon impacted soil. The works should be monitored constantly by the Environmental Specialist with the aid of a portable photo-ionisation detector (PID). It is anticipated that vapours will rapidly disperse and that measurable concentrations will not extend beyond the dig boundary and treatment area. Should measurable concentrations (>1 ppm total VOC's) be found outside the dig area limits or the treatment area it is recommended that works should cease pending assessment.

Within the excavation area respiratory protection for organic vapours that conforms to the European Product Directive (CE) should be available for personnel exposed to odours/vapours.

This should be worn should 'ambient' vapours be detected (and specific site risk assessment shall be undertaken to define trigger vapour concentrations warranting cessation and reassessment of this procedure). The type of respiratory protection required may be determined based on observed site conditions. Whilst the Site is not currently operational or occupied by other users, on-going monitoring within and at the Site boundary on the basis of proximate commercial properties, together with along on-site transport routes shall be undertaken, both of recordable vapours and odour. Should excessive vapours or odours be generated the works shall be temporarily suspended and reassessed. The findings of all monitoring will be clearly communicated to other site users.

7.3 WATER INGRESS AND CONTROL

It is anticipated that some of the excavations will encounter groundwater (perched or otherwise). Water ingress has the potential to be contaminated and will require management through either dewatering and/or disposal under Duty of Care or discharge via consent to foul sewer. Similarly, buried pipelines or underground structures may contain contaminated liquids. Measures should be taken to ensure that when emptying and/or excavating such structures, contaminated liquids do not contaminate the surrounding soil or other materials or enter groundwater or any surface water feature.

8 HEALTH, SAFETY AND ENVIRONMENTAL CONSIDERATIONS

The health and safety management scheme operated during remediation, earthworks and validation operations should take into account all relevant health and safety documentation, policy and methodology applicable to such works. The works should also comply with the Construction Design Management Regulations (CDM) 2015.

8.1 CONTAMINATION

Construction workers or maintenance staff involved in excavations at the Site will be exposed to concentrations of contamination in soils that are likely to present a low to moderate risk to human health. It will be necessary to ensure that construction workers are adequately protected and that a suitable health and safety management scheme is operated during construction and remediation activities.

As a minimum the health and safety plan should address the following potential health and safety issues:

- Potential for vapours in excavations;
- Dermal contact;
- Ingestion; and,
- Dust and (asbestos) fibre inhalation.

Earthworks and construction contractors should be aware of the potential for asbestos containing materials in soils and be vigilant to its presence. If potential asbestos containing materials are identified during redevelopment professional advice should be sought.

8.2 ENVIRONMENTAL CONTROLS

The Contractor should be responsible for the provision of all necessary environmental controls during the remediation works. These measures will include:

- Protection of surface water drains and catchments of surface run-off to reduce the risk of contaminated run-off and high-suspended solids moving off-site;
- Management of stockpiles of recycled (crushed) construction aggregates and contaminated soils awaiting off-site disposal and/or on-site treatment to minimise the potential for generation of contaminated run-off and dust;
- Use of dust and odour suppression techniques during development to minimise off-site impacts; and,
- Storage of all fuels, oils and chemicals will be stored in appropriate containers within bunded compounds.

Guidelines presented within the Environment Agency document, “Pollution Prevention Guidance 6 – Working at Construction and Demolition Sites” should be adhered to and all relevant licences obtained.

9 VERIFICATION REPORTING

All relevant information shall be collected during the remediation works and a verification report compiled by suitably qualified persons at Keltbray Remediation (or other suitably qualified persons, identified by Keltbray, on completion. The report shall take account of the recommendations in CLR11 and comprise as a minimum:

- A summary of the information contained in the risk assessment reports along with the agreed redevelopment strategy and objectives;
- Details of all parties involved in the works;
- Laboratory validation test certificates if unexpected contamination encountered;
- Details and quantities of excavated soils and soils re-used on site or disposed of off Site;
- Records of all earthworks, excavations and sorting including as built drawings, photographs, quantities of materials exported and imported;
- An annotated photographic record showing sides and base of the excavation during the drainage infrastructure works. Photographs should include details of the location and date and as built survey showing the base of excavation;
- Inclusion of information from an asbestos specialist providing a summary of the asbestos removal works completed which as minimum should include Consignment Notes, Air Monitoring Records and an account of the works completed;
- Verification of backfill materials on completion of the enabling works in order to confirm suitability of re-use;
- As built drawings; and,
- Waste classification and management documentation (including consignment note, waste carrier licenses and waste management licence).

It is envisaged that the site Health and Safety File will include all information pertaining to the areas affected by ground contamination.

It should be noted that the piling risk assessment, ground gas protection measures and clean cover verification works will be verified by subsequent contractors therefore these elements of the works will require verification reporting on completion.

Appendix A

FIGURES & DRAWINGS

Date Modified: 15/07/2020 15:05

Drawn By: UKAIJ001

File: Created using iGIS, WSP's Online Mapping System

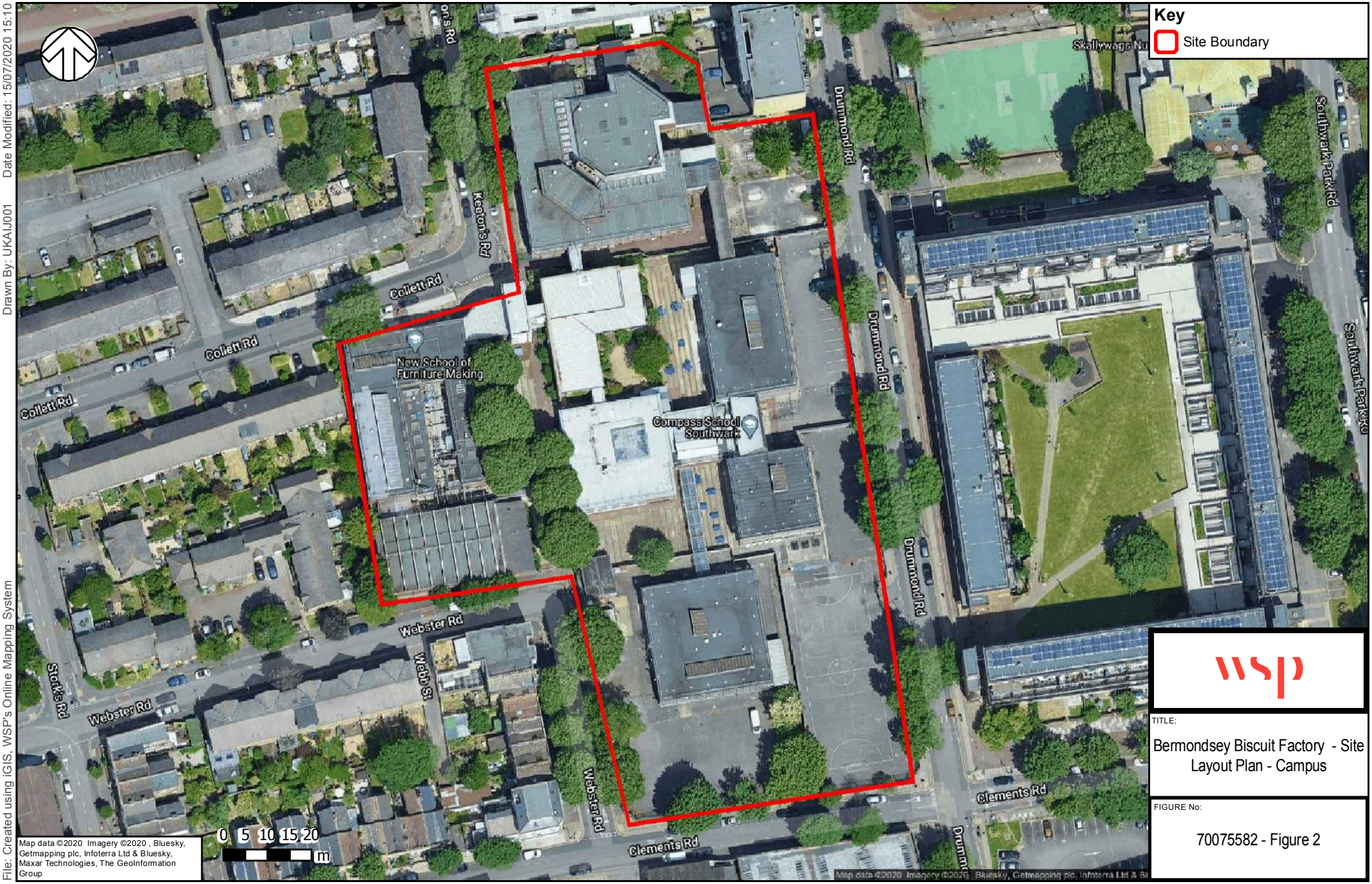
wsp

TITLE:

Bermondsey Biscuit Factory - Site Location Plan - Campus

FIGURE No:

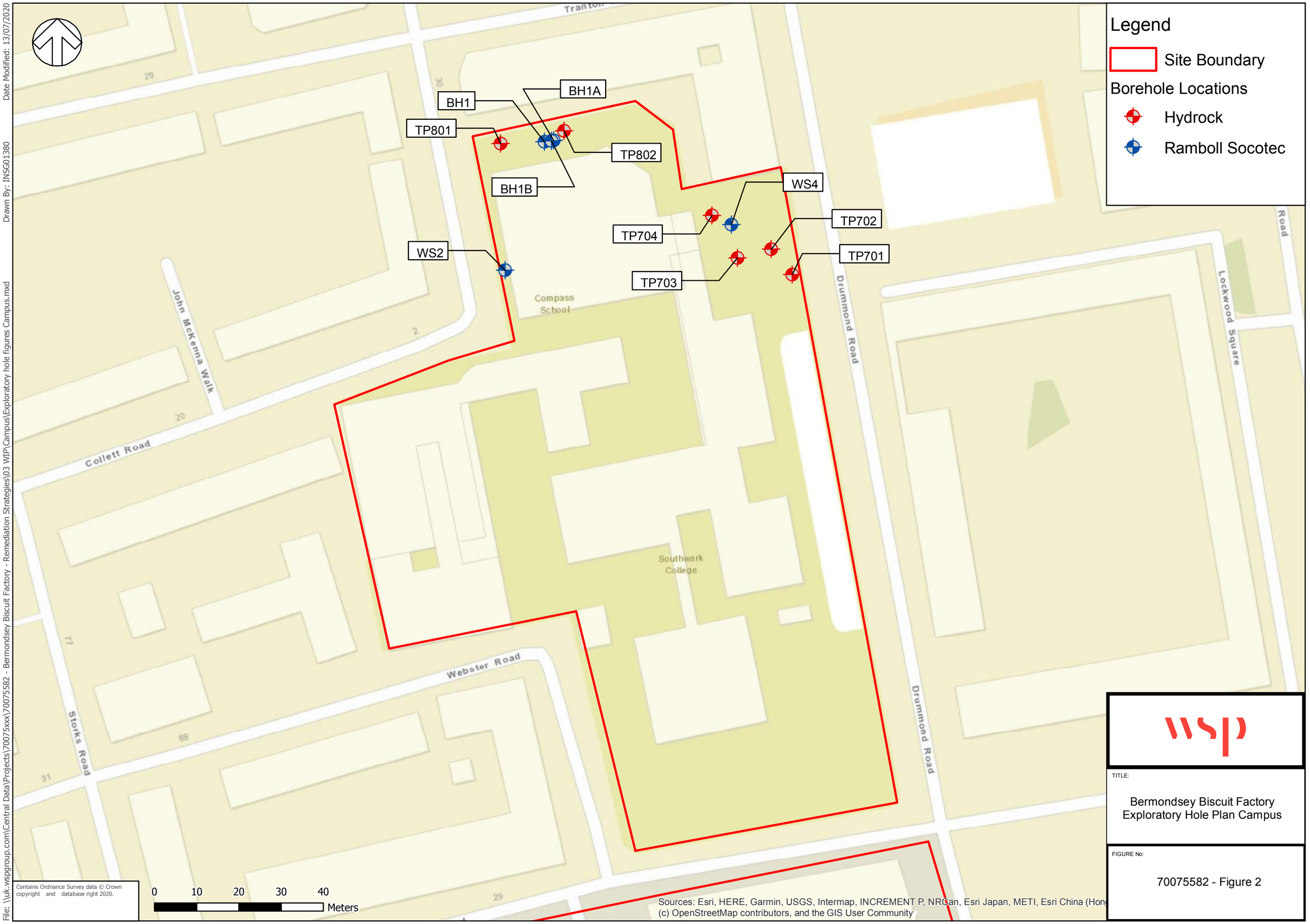
70075582 - Figure 1



File: Created using iGIS, WSP's Online Mapping System
Drawn By: UKAIJ001
Date Modified: 15/07/2020 15:10

TITLE:
Bermondsey Biscuit Factory - Site Layout Plan - Campus

FIGURE No:
70075582 - Figure 2



Date Modified: 13/07/2020
Drawn By: INSG01380
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wsp

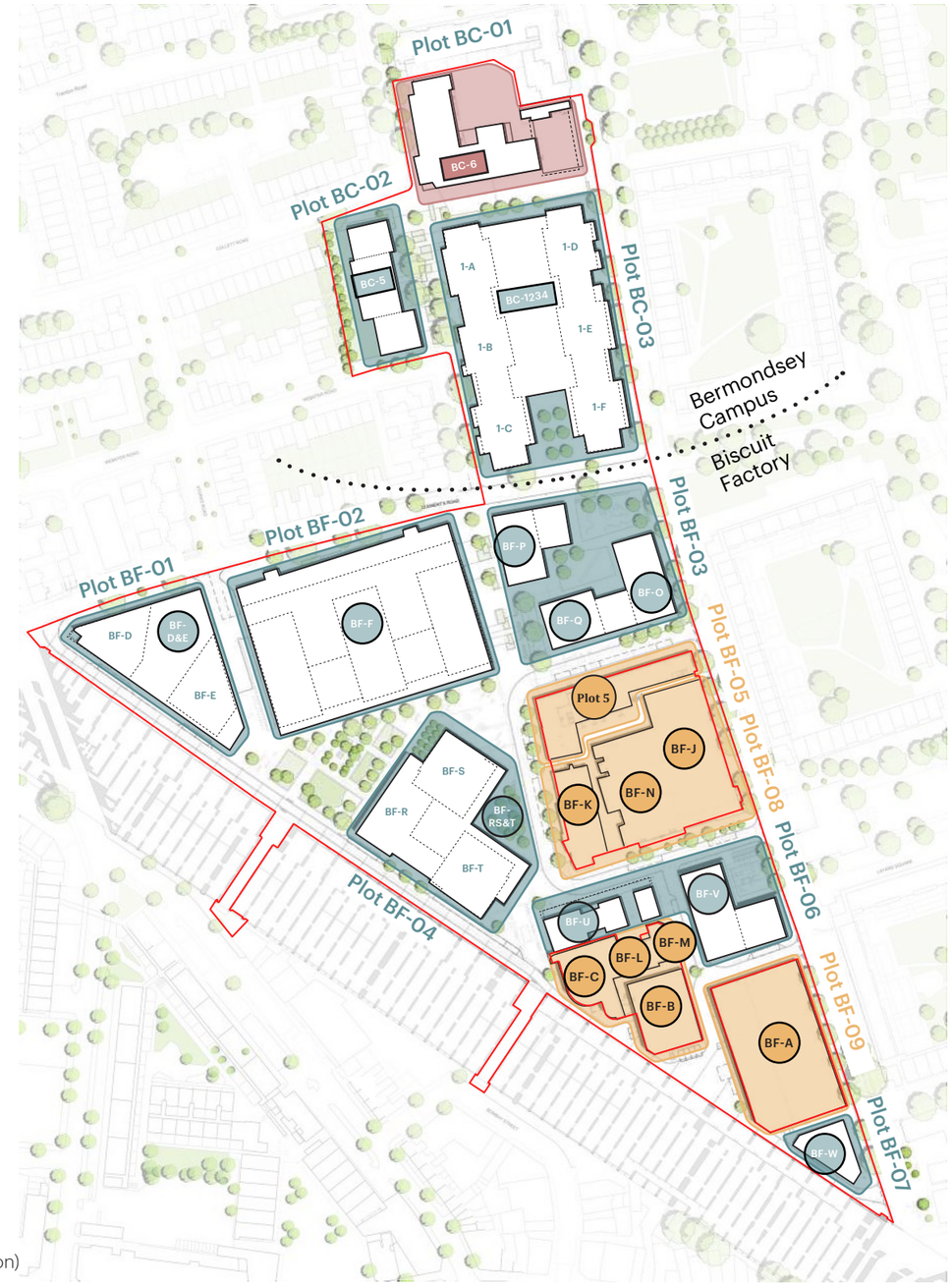
TITLE:

Bermondsey Biscuit Factory
Exploratory Hole Plan Campus

FIGURE No:

70075582 - Figure 2

Part C: Masterplan



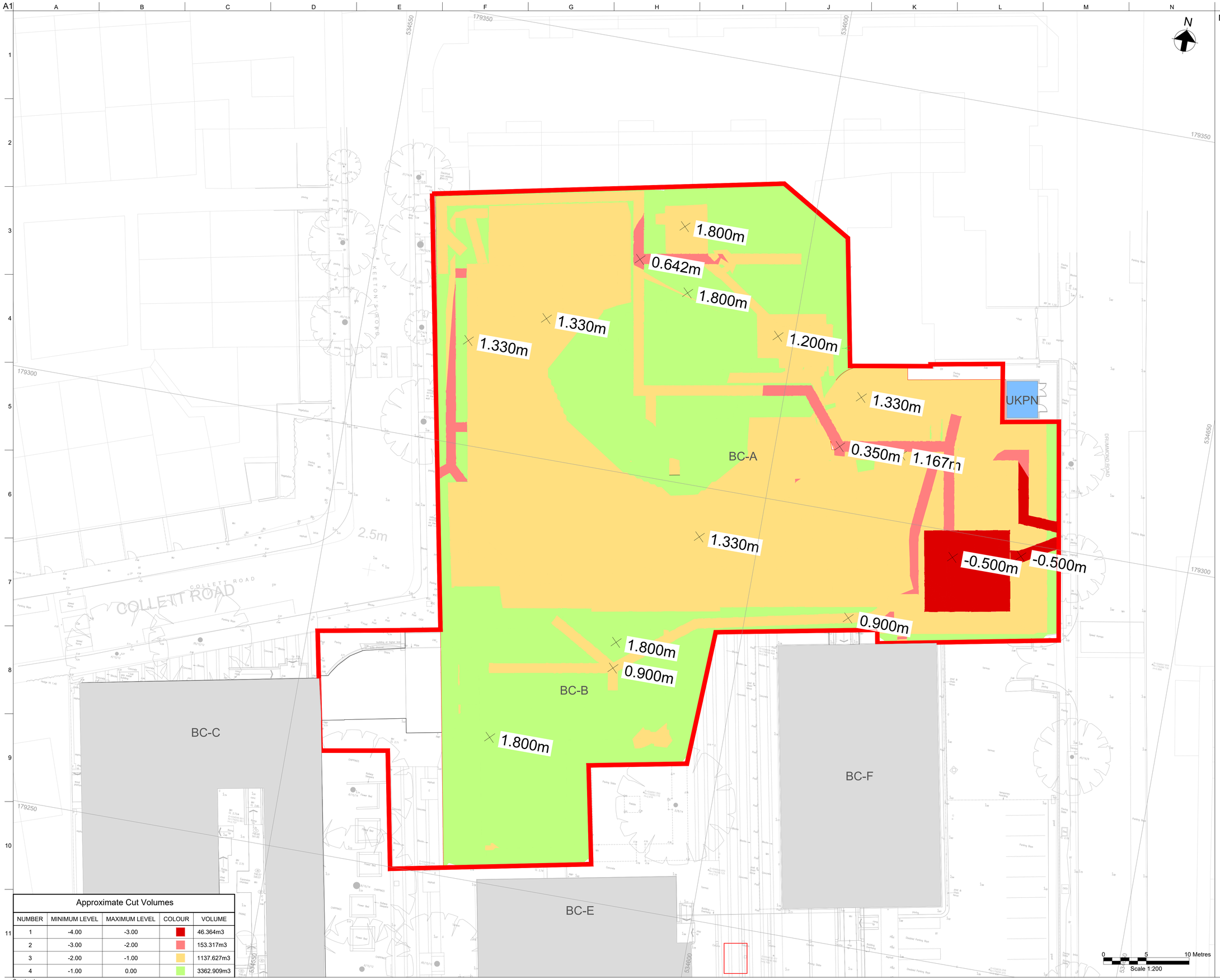
Masterplan application boundary

School Plot

Grosvenor building plots

Workspace plots (do not form part of the application)

A1



Notes

1. This drawing is for information purposes only and is subject to design development in future design stages.
2. This drawing compares proposed formation levels with estimated existing to give an indication of earthworks required to achieve proposed scheme.
3. Bulk excavation levels do not allow for localised pit excavation. It is assumed this will be undertaken under a different contract.
4. Please refer to WSP drawing BER-WSP-BCXXX-00-DR-S-00030 for indicative pile mat levels
5. The volumes provided on this drawing are for are indicative and are information only. The volumes have been produced from assumptions on existing and proposed levels. It is expected that the Contractor confirm and validate all excavation volumes.

Approximate Cut Volumes

NUMBER	MINIMUM LEVEL	MAXIMUM LEVEL	COLOUR	VOLUME
1	-4.00	-3.00		46.364m3
2	-3.00	-2.00		153.317m3
3	-2.00	-1.00		1137.627m3
4	-1.00	0.00		3362.909m3

Do not scale

Issue	Date	By	Chkd	Appd
P01	18/11/19	CM	CM	RR
For Information				

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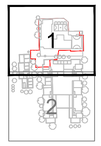
Client
Grosvenor Group

Job Title
The Bermondsey Project
Campus - Phase 1
Enabling and Demolition Works

Key Plan



Drawing Title
Campus School
External Areas Earthworks
Indicative Formation Levels
Isopac

Scale at A1 1:200

Discipline Civil

Job No **237092-00**

Drawing Status **For Information**

Drawing No **BER-ARP-BC03A-XX-SK-D-82001**

A1

Notes

1. This drawing is for information purposes only and is subject to design development in future design stages.
2. This drawing compares proposed formation levels with estimated existing to give an indication of earthworks required to achieve proposed scheme.
3. Bulk excavation levels do not allow for localised pit excavation. It is assumed this will be undertaken under a different contract.
4. Please refer to WSP drawing BER-WSP-BCXXX-00-DR-S-00030 for indicative pile mat levels
5. The volumes provided on this drawing are for are indicative and are information only. The volumes have been produced from assumptions on existing and proposed levels. It is expected that the Contractor confirm and validate all excavation volumes.

Issue	Date	By	Chkd	Appd
P01	18/11/19	CM	CM	RR
For Information				

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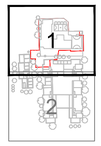
Client
Grosvenor Group

Job Title
The Bermondsey Project
Campus - Phase 1
Enabling and Demolition Works

Key Plan



Drawing Title
Campus School
External Areas Earthworks
Indicative Formation Levels
Contours

Scale at A1 1:200

Discipline Civil

Job No **237092-00**

Drawing Status **For Information**

Drawing No
BER-ARP-BC03A-XX-SK-D-82002

Do not scale

Appendix B

GENERAL LIMITATIONS

REPORT LIMITATIONS - GROUND RISK AND REMEDIATION

GENERAL

1. WSP UK Limited has prepared this report solely for the use of the Client and those parties with whom a warranty agreement has been executed, or with whom an assignment has been agreed and outlined in the body of the report.

2. Unless explicitly agreed otherwise, in writing, this report has been prepared under WSP UK Limited standard Terms and Conditions as included within our proposal to the Client.

3. Project specific appointment documents may be agreed at our discretion and a charge may be levied for both the time to review and finalise appointments documents and also for associated changes to the appointment terms. WSP UK Limited reserves the right to amend the fee should any changes to the appointment terms create an increase risk to WSP UK Limited.

4. The report needs to be considered in the light of the WSP UK Limited proposal and associated limitations of scope. The report needs to be read in full and isolated sections cannot be used without full reference to other elements of the report and any previous works referenced within the report.

PHASE 1 GEO ENVIRONMENTAL AND PRELIMINARY RISK ASSESSMENTS

Coverage: *This section covers reports with the following titles or combination of titles: phase 1; desk top study; geo environmental assessment; development appraisal; preliminary environmental risk assessment; constraints report; due diligence report; geotechnical development review; environmental statement; environmental chapter; project scope summary report (PSSR), program environmental impact report (PEIR), geotechnical development risk register; and, baseline environmental assessment.*

5. The works undertaken to prepare this report comprised a study of available and easily documented information from a variety of sources (including the Client), together with (where appropriate) a brief walk over inspection of the Site and correspondence with relevant authorities and other interested parties. Due to the short timescales associated with these projects responses may not have been received from all parties. WSP UK Limited cannot be held responsible for any disclosures that are provided post production of our report and will not automatically update our report.

6. The opinions given in this report have been dictated by the finite data on which they are based and are relevant only for the purpose for which the report was commissioned. The information reviewed should not be considered exhaustive and has been accepted in good faith as providing true and representative data pertaining to site conditions. Should additional information become available which may affect the opinions expressed in this report, WSP UK Limited reserves the right to review such information and, if warranted, to modify the opinions accordingly.

7. It should be noted that any risks identified in this report are perceived risks based on the information reviewed. Actual risks can only be assessed following intrusive investigations of the site.

8. WSP UK Limited does not warrant work / data undertaken / provided by others.

REPORT LIMITATIONS - GROUND RISK AND REMEDIATION

INTRUSIVE INVESTIGATION REPORTS

Coverage: *The following report titles (or combination) may cover this category of work: geo environmental site investigation; geotechnical assessment; GIR (Ground Investigation reports); preliminary environmental and geotechnical risk assessment; and, geotechnical risk register.*

9. The investigation has been undertaken to provide information concerning either:

- **i.** The type and degree of contamination present at the site in order to allow a generic quantitative risk assessment to be undertaken; or
- **ii.** Information on the soil properties present at the site to allow for geotechnical development constraints to be considered.

10. The scope of the investigation was selected on the basis of the specific development and land use scenario proposed by the Client and may be inappropriate to another form of development or scheme. If the development layout was not known at the time of the investigation the report findings may need revisiting once the development layout is confirmed.

11. For contamination purposes, the objectives of the investigation are limited to establishing the risks associated with potential contamination sources with the potential to cause harm to human health, building materials, the environment (including adjacent land), or controlled waters.

12. For geotechnical investigations the purpose is to broadly consider potential development constraints associated with the physical property of the soils underlying the site within the context of the proposed future or continued use of the site, as stated within the report.

13. The amount of exploratory work, soil property testing and chemical testing undertaken has necessarily been restricted by various factors which may include accessibility, the presence of services; existing buildings; current site usage or short timescales. The exploratory holes completed assess only a small percentage of the area in relation to the overall size of the Site, and as such can only provide a general indication of conditions.

14. The number of sampling points and the methods of sampling and testing do not preclude the possible existence of contamination where concentrations may be significantly higher than those actually encountered or ground conditions that vary from those identified. In addition, there may be exceptional ground conditions elsewhere on the site which have not been disclosed by this investigation and which have therefore not been taken into account in this report.

15. The inspection, testing and monitoring records relate specifically to the investigation points and the timeframe that the works were undertaken. They will also be limited by the techniques employed. As part of this assessment, WSP UK Limited has used reasonable skill and care to extrapolate conditions between these points based upon assumptions to develop our interpretation and conclusions. The assumption made in forming our conclusions is that the ground and groundwater conditions (both chemically and physically) are the same as have been encountered during the works undertaken at the specific points of investigation. Conditions can change between investigation points and these interpretations should be considered indicative.

16. The risk assessment and opinions provided are based on currently available guidance relating to acceptable contamination concentrations; no liability can be accepted for the retrospective

effects of any future changes or amendments to these values. Specific assumptions associated with the WSP UK Limited risk assessment process have been outlined within the body or associated appendix of the report.

17. Additional investigations may be required in order to satisfy relevant planning conditions or to resolve any engineering and environmental issues.

18. Where soil contamination concentrations recorded as part of this investigation are used for commentary on potential waste classification of soils for disposal purposes, these should be classed as indicative only. Due consideration should be given to the variability of contaminant concentrations taken from targeted samples versus bulk excavated soils and the potential variability of contaminant concentrations between sampling locations. Where major waste disposal operations are considered, targeted waste classification investigations should be designed.

19. The results of the asbestos testing are factually reported and interpretation given as to how this relates to the previous use of the site, the types of ground encountered and site conceptualisation. This does not however constitute a formal asbestos assessment. These results should be treated cautiously and should not be relied upon to provide detailed and representative information on the delineation, type and extent of bulk ACMs and / or trace loose asbestos fibres within the soil matrix at the site.

20. If costs have been included in relation to additional site works, and / or site remediation works these must be considered as indicative only and must be confirmed by a qualified quantity surveyor.

EUROCODE 7: GEOTECHNICAL DESIGN

21. On 1st April 2010, BS EN 1997-1:2004 (Eurocode 7: Geotechnical Design – Part 1) became the mandatory baseline standard for geotechnical ground investigations.

22. In terms of geotechnical design for foundations, slopes, retaining walls and earthworks, EC7 sets guidance on design procedures including specific guidance on the numbers and spacings of boreholes for geotechnical design, there are limits to methods of ground investigation and the quality of data obtained and there are also prescriptive methods of assessing soil strengths and methods of design. Unless otherwise explicitly stated, the work has not been undertaken in accordance with EC7. A standard geotechnical interpretative report will not meet the requirements of the Geotechnical Design Report (GDR) under Eurocode 7. The GDR can only be prepared following confirmation of all structural loads and serviceability requirements. The report is likely to represent a Ground Investigation Report (GIR) under the Eurocode 7 guidance.

DETAILED QUANTITATIVE RISK ASSESSMENTS AND REMEDIAL STRATEGY REPORTS

23. These reports build upon previous report versions and associated notes. The scope of the investigation, further testing and monitoring and associated risk assessments were selected on the basis of the specific development and land use scenario proposed by the Client and may not be appropriate to another form of development or scheme layout. The risk assessment and opinions provided are based on currently available approaches in the generation of Site Specific Assessment Criteria relating to contamination concentrations and are not considered to represent a risk in a specific land use scenario to a specific receptor. No liability can be accepted for the retrospective effects of any future changes or amendments to these values, associated models or associated guidance.

REPORT LIMITATIONS - GROUND RISK AND REMEDIATION

24. The outputs of the Detailed Quantitative Risk Assessments are based upon WSP UK Limited manipulation of standard risk assessment models. These are our interpretation of the risk assessment criteria.

25. Prior to adoption on site they will need discussing and agreeing with the Regulatory Authorities prior to adoption on site. The regulatory discussion and engagement process may result in an alternative interpretation being determined and agreed. The process and timescales associated with the Regulatory Authority engagement are not within the control of WSP UK Limited. All costs and programmes presented as a result of this process should be validated by a quantity surveyor and should be presumed to be indicative.

GEOTECHNICAL DESIGN REPORT (GDR)

26. The GDR can only be prepared following confirmation of all structural loads and serviceability requirements. All the relevant information needs to be provided to allow for a GDR to be produced.

MONITORING (INCLUDING REMEDIATION MONITORING REPORTS)

27. These reports are factual in nature and comprise monitoring, normally groundwater and ground gas and data provided by contractors as part of an earthworks or remedial works.

28. The data is presented and will be compared with assessment criteria.

Appendix C

2020 WSP RISK ASSESSMENT METHODOLOGY

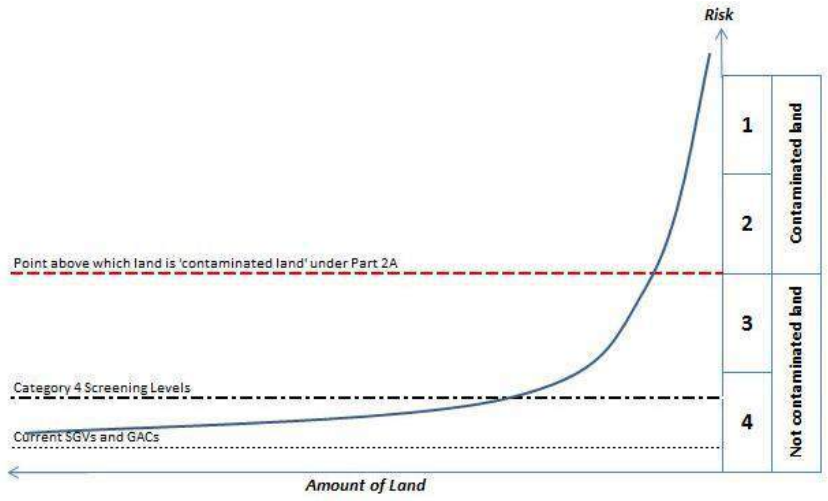
METHODOLOGY FOR THE DERIVATION OF GENERIC QUANTITATIVE ASSESSMENT CRITERIA TO EVALUATE RISKS TO HUMAN HEALTH FROM SOIL & GROUNDWATER CONTAMINATION

UK APPROACH

In the UK, the potential risks to human health from contamination in the ground are usually evaluated through a generic quantitative risk assessment (GQRA) approach. This allows generic and conservative exposure assumptions to be readily applied to risk assessments, and can be a useful tool for rapidly screening data and to identify those contaminants or scenarios that could benefit from further investigation and/or site-specific detailed quantitative risk assessment (DQRA). Current industry good practice is to use the approach presented in the Environment Agency (EA) publications SR2[1] and SR3[2]. This approach allows the derivation of Generic Assessment Criteria (GACs), primarily for chronic exposure.

In April 2012, the Department of Environment, Food and Rural Affairs (Defra) published updated statutory guidance[3] which introduced a four category approach to determining whether land in England and Wales is contaminated or not on the grounds of significant possibility of significant harm (SPOSH). **Figure 1** presents a graphical representation of the categories.

Figure 1: Four Categories for Determining if Land Represent a SPOSH



Cases classified as Category 1 are considered to be SPOSH based on actual evidence or an unacceptably high probability of harm existing. Category 4 cases are those where there is no risk, or a low risk of SPOSH.

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[1] Environment Agency '*Human Health Toxicological Assessment of Contaminants in Soil',* Report SC050021/SR2. January 2009.
[2] Environment Agency '*Updated Technical Background to the CLEA Model*,' Report SC050021/SR3. January 2009.
[3] Defra '*Environmental Protection Act 1990: Part 2A Contaminated Land Statutory Guidance'.* April 2012.

GACs represent a minimal risk level, well within Category 4. A 2014 publication by Contaminated Land: Applicatons in Real Environments (CL:AIRE),SP1010[4] and endorsed by Defra[5] provided an approach to determine Category 4 Screening Levels (C4SLs) which are higher than the GACs whilst being "more pragmatic but still strongly precautionary". It also provided C4SLs for six contaminants of concern. Although the C4SLs were designed to support Part 2A assessments to determine 'contaminated land' they are specifically mentioned, along with reference to the Part 2A statutory guidance, by the Department for Communities and Local Government (DCLG) for use in a planning context[6].

An updated version the Contaminated Land Exposure Assessment (CLEA) Workbook (v1.071) was released by the EA in September 2015 to take into account the publication of SP1010. The updates comprised: additional toxicity data for the six chemicals for which C4SLs were derived; two new public open space land use scenarios; updated exposure parameters; options to run the model using C4SL exposure assumptions; and increased functionality. There were no changes to algorithms, so it is still possible to replicate the withdrawn SGVs using the input parameters held within v1.071.

It should be noted that the four category approach has not been adopted in Scotland under Part 2A or the planning regime. The Part 2A statutory guidance applicable in Scotland (Paper SE/2006/44 dated May 2006) does not reflect the changes introduced by Defra in April 2012 which allow for the use of C4SLs within Part 2A risk assessments. Additionally, it is considered that the principal of 'minimal risk' should still apply under planning in Scotland, based on current guidance.

WSP APPROACH

Following the withdrawal of the SGVs, and in the absence of an industry-wide, accepted set of GACs it is down to individual practitioners to derive their own soil assessment criteria. WSP has used the approach provided within SR2, SR3, SP1010, CLEA Workbook v1.071 and SR4[7] to produce a set of minimal risk GACs. The chemical-specific data within two key publications were considered during their production: CL:AIRE 2010[8] and LQM 2015[9]. Both documents provide comprehensive sets of GACs for different contaminants of concern.

The LQM Suitable For Use Levels (S4ULs) have selected exposure parameters consistent with the C4SL exposure scenarios. This approach was rejected by WSP as not representing minimal risk. However, the LQM S4UL document was critically reviewed and the approach and chemical input parameters were utilised where considered to be appropriate.

An industry-led C4SL Working Group is in the process of deriving a larger set of C4SLs in the near future, for approximately 20 contaminants. This will include a critical review of the chemical input data for all selected substances, and may therefore lead to further amendments to the chemical input data used in the WSP in-house screening values. It is considered likely that the contaminant list will

[4] CL:AIRE *'Development of Category 4 Screening Levels for Assessment of Land Affected by Contamination'* SP1010, Final Project Report (Revision 2). September 2014.
[5] Defra 'SP1010: *Development of Category 4 Screening Levels for Assessment of Land Affected by Contamination – Policy Companion Document'*. December 2014.
[6] DCLG Planning Practice Guidance '*Land Affected by Contamination'*, particularly Paragraphs 001 and 007. Ref IDs: 33-001-20140306 & 33-007-20140612.
[7] Environment Agency '*CLEA Software (Version 1.05) Handbook (and Software)',* Report SC050021/SR4. September 2009.
[8] CL:AIRE 'The EIC/AGS/CL:AIRE *Soil Generic Assessment Criteria for Human Health Risk Assessment'.* ISBN 978-1-05046-20-1. January 2010.
[9] Nathanail et al '*The LQM/CIEH S4ULs for Human Health Risk Assessment'*, Land Quality Press, ISBN 978-0-9931084-0-2. 2015.

crossover with the 2009 EIC/AGS/CL:AIRE GACs. As such, this document was not critically reviewed by WSP.

WSP's current approach to the assessment of risks to human health is to continue to evaluate minimal risk through the use of in-house derived GACs, and to use the published C4SLs as a secondary tier of assessment until such time as additional C4SLs are published and/or in-house values are derived.

EXPOSURE MODELS

LAND USES

WSP has largely adopted the exposure assumptions of the generic land use scenarios included within SR3, with two additional public open space scenarios included from within SP1010 and two bespoke exposure scenarios (highways):

- Residential with homegrown produce consumption;
- Residential without homegrown produce consumption;
- Allotments;
- Commercial;
- Public open space near residential housing (POS_{resi});
- Public park (POS_{park});
- Highways (surface soils); and
- Highways (subsurface soils).

Exceptions are described in the following Sections.

SOIL PROPERTIES

SR3 assumes a sandy loam soil with a pH of 7 and a Soil Organic Matter (SOM) content of 6% for its generic land uses, based on the geographical spread of topsoils in the UK. WSP has adopted these default values. In addition, GACs based on an SOM of 1% and 2.5% have been derived, based on common experience of the nature of Made Ground and lack of topsoil on many brownfield sites.

RECEPTOR CHARACTERISTICS AND BEHAVIOURS

SP1010 provides some updated exposure parameters for long-term inhalation rates[10] and the consumption rates for homegrown produce[11] compared to those provided in SR3. This data was used to derived WSP's GACs.

The changes in inhalation rates do not apply to the allotment generic land use scenario, as these are based on the breathing rates for short-term exposure of light to moderate intensity activity which were derived from a study that was not updated in USEPA 2011, so the SR3 rates were retained.

[10] USEPA, National Centre for Environmental Assessment '*Exposure Factors Handbook: 2011 Edition*' EPA/600/R-09/052F. September 2011.
[11] National Diet and Nutrition Survey 2008/2009 to 2010/2011.

HIGHWAYS EXPOSURE SCENARIOS

Human health GAC for a Highways exposure scenario have been derived. The site area is defined by publicly accessible land adjacent to highways, comprising both hard and soft landscaped areas. Exposure is considered to be largely transitory.

There are no publicly available GAC for this exposure scenario. Consequently, WSP have derived GAC for the following exposure scenarios:

- à Highways (surface soils); and
- à Highways (sub-surface soils).

Surface soils GAC are for soil at ground level and within 300mm of the surface. Conversely, subsurface GAC are for soils at a depth exceeding 0.3m bgl. These GAC are not to be used as import criteria.

The critical receptor is a young female child, CLEA age classes 4-9. This is consistent with the critical receptor for the POS(resi) exposure scenario, and considered to be appropriate for a child potentially playing outside without direct adult supervision.

For all GAC, a sandy loam soil and a soil organic matter content of 1% is assumed. There is no building on site.

Exposure scenarios for surface and subsurface soils are detailed below. These are considered to be conservative estimtes, due to the mostly transitory use of publically accessible lands adjacent to highways.

HIGHWAYS GAC (SURFACE SOILS)

The relevant exposure pathways include direct soil and dust ingestion, dermal contact (outdoors) and the inhalation of outdoor dust and vapour.

The exposure frequency is 170 days per annum, and the occupancy period outdoors is 1 hour per day (as per the POS (resi) exposure scenario). The soil and dust ingestion rate has been set at 50 mg/day, consistent with a POS(park) exposure scenario.

HIGHWAYS GAC (SUBSURFACE SOILS)

The single relevant exposure pathway is the inhalation of outdoor vapour. Direct exposure pathways are not viable due to the depth of the soils below ground level.

The exposure frequency is 170 days per annum, and the occupancy period outdoors is 1 hour per day (as per the POS (resi) exposure scenario). The soil and dust ingestion rate has been set to zero, as direct exposure pathways to soils at this depth are not viable.

CHEMICAL DATA

PHYSICO-CHEMICAL PARAMETERS

Physico-chemical properties for the contaminants for which GACs have been derived have been obtained following critical review of the following hierarchy of data sources:

1. Environment Agency/Defra SGV reports where available;
2. Environment Agency '*Compilation of Data for Priority Organic Pollutants for Derivation of Soil Guideline Values*', Report SC050021/SR7, November 2008; and
3. Published fate and transport reviews within Nathanail et. al 2015 and CL:AIRE 2010.

Where appropriate, and where sufficient data is available, values were adjusted to reflect a UK soil temperature of 10ºC (e.g. K_{aw}).

TOXICOLOGICAL DATA

Toxicological data for the derivation of minimal risk Health Criteria Values (HCV) for each contaminant was selected with due regard to the approach presented in SR2. Where appropriate, the following hierarchy of data sources was used:

1. UK toxicity reviews published by authoritative bodies including:
   - EA;
   - Public Health England (PHE);
   - Committee on Toxicity of Chemicals in Food, Consumer Products and the Environment (COT); and
   - Committee on Carcinogenicity of Chemicals in Food, Consumer Products and the Environment (COC).
2. Authoritative European sources such as European Food Standards Agency (EFSA)
3. International organisations including:
   - World Health Organisation (WHO); and
   - Joint FAO/WHO Expert Committee on Food Additives (JECFA).
4. Authoritative country-specific sources including:
   - United States Environmental Protection Agency (USEPA);
   - US Agency for Toxic Substances and Disease Registry (ATSDR);
   - US Integrated Risk Information System (IRIS); and
   - Netherlands National Institute for Public Health and the Environment (RIVM).

Factors such as the applicability of the data to human health (e.g. epidemiological vs. animal studies), the quality of the data, the level of uncertainty in the results and the age of the data were also taken into account in the final selection. Details for specific substances are available on request.

MEAN DAILY INTAKES

Estimations of background exposure for each threshold substance have been updated. In line with the SR2 approach, the exposure from non-threshold substances in the soil does not take into account exposure from other sources, and as such GACs were derived without consideration of the Mean Daily Intake (MDI) for those substances.

The data published by the EA in its series of TOX reports between 2002 and 2009 was evaluated to determine whether the values were considered to remain valid today. Values from these current UK published sources were not amended unless they were considered to be significantly different so that the GACs remained as comparable as possible with the revoked SGVs.

ORAL MEAN DAILY INTAKES

Oral MDI were generally estimated as the sum of exposure via the ingestion of food and drinking water using the default adult physiological parameters presented in Table 3.3 of SR2.

Data on the exposure of substances from food ingestion was generally obtained from UK Total Diet Studies (TDS) published by the Food Standards Agency (FSA) and its predecessor the Ministry of Agriculture, Fisheries and Food (MAFF) and from studies commissioned by COT. Where no UK-specific data was available, MDI were derived from the European Food Safety Authority (EFSA), Health Canada and US sources. This was a rare occurrence, and in these instances, the data was evaluated to determine its applicability to the UK.

Data on the concentrations of substances in tap water was obtained from a variety of sources. UK data was used where available, with preference given to Drinking Water Inspectorate (DWI) 2014 data from water company tap water testing (LOD, 1st and 99th percentile data is available). Where the substance was not included in tap water testing, other UK sources of information were considered including:

- à DWI data from water company tap water testing from previous years;
- à COT; and
- à FSA.

Where UK data was not available, a number of other data sources were considered, largely WHO International Programme on Chemical Safety (IPCS) Concise International Chemical Assessment Documents (CICADs) and background documents for the development of Guidelines for Drinking Water Quality, using professional judgement on the relevance of the data to the UK. The final decision on the MDI from drinking water was made using professional judgement on the balance of relevance and probability, taking into account the detection limit where not detected, Koc and solubility, reduction in use of the substance, banned substances, tight controls (e.g. on explosives) and with due consideration to the SR2 instruction that “if no data or information in background exposure are available, background exposure should be assumed to be negligible and the MDI set to zero….”.

Data from other countries was generally not used because it was considered that the hydrogeology of these countries along with industrial practices were unlikely to be reflective of the UK.

INHALATION MEAN DAILY INTAKES

Inhalation MDIs were based on estimates of average daily exposure by the inhalation pathway and calculated using the default adult physiological parameters presented in Table 3.3 of SR2.

The inhalation MDIs were generally estimated using background exposure data from the UK, derived from Defra's UK-AIR: Air Information Resource[12], which provides ambient air quality data from a number of sites forming a UK-wide monitoring network. The MDIs for heavy metals were based on rolling annual average metal mass concentration data from Defra's UK Heavy Metals Monitoring Network from the period October 2009 to September 2010[13].

Information for some substances was obtained from UK sources including Environment Agency TOX reports and data from the UK Expert Panel on Air Quality Standards (EPAQS). Where recent UK data was not available, data was sourced from the International Programme on Chemical Safety (IPCS), the World Health Organisation (WHO), the Agency for Toxic Substances and Diseases Registry (ATSDR), Health Canada, and various other peer-reviewed sources summarised by LQM/CIEH[14].

For other substances, where no data or information on background exposure was available, background exposure was assumed to be negligible and the MDI set at 0.5*TDI in accordance with guidance in SR2.

PLANT UPTAKE

Soil to plant concentration factors are available in CLEA v1.071 for arsenic, cadmium, hexavalent chromium, lead, mercury, nickel and selenium. For all remaining inorganic chemicals, concentration factors were obtained using the PRISM model. Substance-specific correction factors have been selected in accordance with the guidance established within SR3. This is consistent to the approach utilised in the derivation of the LQM S4UL and the EIC/AGS/CL:AIRE GAC.

Where there is a lack of appropriate data to enable the derivation of specific soil to plant concentrations factors for organic chemicals, plant uptake was modelled within CLEA v1.071 using the generic equations recommended within SR3, as follows:

- Green Vegetables – Ryan et al. (1988);
- Root Vegetables – Trapp (2002);
- Tuber Vegetables – Trapp et al. (2007); and
- Tree Fruit – Trapp et al. (2003).

There are no suitable models available for modelling uptake for herbaceous fruit or shrub fruit. Exposure is considered negligible.

[12] Crown 2016 copyright Defra via uk-air.defra.gov.uk, licenced under the Open Government Licence (OGL).
[13] Defra, 2013 Spreadsheet of historic data for multiple years for the Metals network. Available online at: http://uk-air.defra.gov.uk/data/metals-data. [Accessed 13/03/2016].
[14] LQM/CIEH, 2015. The LQM/CIEH S4ULs for Human Health Risk Assessment.

SOIL SATURATION LIMITS

GACs are not limited to their theoretical soil saturation within CLEA, although where either the aqueous or the vapour-based saturation is exceeded, this is highlighted within the Workbook (compared with the lower of the two values). This affects pathways which depend on partitioning calculations so in reality this only affects the vapour pathways and is relevant to organic substances and other substances, such as elemental mercury, that have a significant volatile component. However, the Workbook highlights saturation for direct contact pathways to indicate to the user where further qualitative consideration of free phase contamination at the surface may be required.

Where the lower of the two saturation limits is exceeded and the vapour pathway is the only exposure route being considered, the chronic risks to human health are likely to be negligible. Further evaluation could be undertaken using an alternative model suitable for evaluating non-aqueous phase liquids (NAPLs), such as the Johnson & Ettinger (J&E) approach described in USEPA 2003. However, WSP considers that if NAPLs are suspected, given the known limitations and over-simplifications of J&E, soil vapour monitoring is a more accurate way of assessing potential risks.

Where the lower saturation limit is exceeded for the vapour pathway and a number of exposure routes are being considered, then the contribution from the NAPL via vapour inhalation to the overall exposure can be evaluated using the procedure provided in SR4. WSP would evaluate this as part of a DQRA process or through soil vapour monitoring on-site to determine site-specific soil vapour concentrations.

CHEMICAL SPECIFIC ASSUMPTIONS

CYANIDES

Cyanide has high acute toxicity, and short term exposure is an important consideration when assessing the risks from soils contaminated with cyanide. The primary risk to human receptors from free cyanide in soils is an acute risk.

There is no current UK guidance available for calculating acute risks from free cyanide. Consequently, GAC for acute exposure were derived using the algorithms presented in MADEP 1992[15] and assuming a one-off ingestion of 10g of soil (this conservative value has been taken as an upper bound estimate for a one-off soil ingestion rate amongst children). Receptor body weights have been selected according to the critical receptor for each exposure scenario. The lowest of the chronic and acute GAC for each land use scenario were adopted by WSP.

LEAD

The SGV for lead was withdrawn by the EA in 2009, and in 2011 the EA withdrew their published TOX report in light of new scientific evidence. The C4SL for lead was derived using the latest scientific evidence from a large human dataset. As such, no chemical-specific margin was applied in the derivation of the C4SL for lead. It may be possible for WSP to derive a GAC for lead using the same dataset and applying a chemical-specific margin, but the value is likely to be lower than UK natural background concentrations. Therefore, WSP has adopted the toxicological data used to derive the C4SLs in deriving the GAC for lead until such time as alternative GACs are published by an authoritative body. The relative bioavailability was set at 100% in line with the approach taken for other GACs, whereas the C4SL assumes 60% for soil and 64% for airborne dust. Thus, the WSP GAC are lower than the C4SLs.

[15] MADEP '*Background Documentation for the Development of an "Available Cyanide" Benchmark Concentration'* 1992. http://www.mass.gov/dep/toxics/cn_soil.htm

POLYCYCLIC AROMATIC HYDROCARBONS

WSP's approach to the assessment of polycyclic aromatic hydrocarbons (PAHs) uses the surrogate marker approach. BaP was used as a surrogate marker for all genotoxic PAHs in line with the Health Protection Agency 2010[16] recommendations and SP1010. This assumes that the PAH profile of the data is similar to that of the coal tars used in the Culp *et al* oral carcinogenicity study from which the toxicity data for BaP was produced. In reality, this profile has been shown by HPA to be applicable on the majority of contaminated sites based on assessment of sites across the country.

The alternative is the Toxic Equivalency Factor (TEF) approach which uses a reference compound and assigns TEFs for other compounds based on estimates of potency. Key uncertainties with this approach include the assumption that all compounds have the same toxic mechanism of action within the body and that no compounds with a greater potency than the reference compound are present. It is considered by the HPA that the TEF approach is likely to under predict the true carcinogenicity of PAHs and therefore favours the surrogate marker approach.

For these reasons, WSP considers that the adoption of BaP as a surrogate marker for genotoxic PAHs, as opposed to the TEF approach, is reasonable. In rare cases where the PAH profile may differ from the wide definitions of the Culp *et al* study the user should discuss their project with an experienced risk assessor. In addition, WSP has derived a GAC for naphthalene, which is commonly a risk driver due to its high volatility, relative to other PAH compounds.

TRIMETHYLBENZENES

The GAC for trimethylbenzenes can be used for the assessment of any individual isomer (1,2,3-trimethylbenzene, 1,2,4-trimethylbenzene or 1,3,5-trimethylbenzene), or a mixture of the three isomers.

CHEMICAL GROUPS

For a number of chemical groups, the available toxicity data is for combinations of chemicals. Given that the physico-chemical parameters may differ between the chemicals, the GACs for the chemicals within the groups have been calculated and then the lowest GAC selected to represent the entire group. This was the approach taken by the EA for m-, o- and p-xylenes, and has also been adopted by WSP for:

- 2-chlorophenol, 2,4-dichlorophenol, 2,4,6-trichlorophenol and 2,3,4,6-tetrachlorophenol;
- 2-, 3- and 4-methylphenol (total cresols);
- aldrin and dieldrin; and
- α- and β-endosulphan.

[16] HPA Contaminated Land Information Sheet '*Risk Assessment Approaches for Polycyclic Aromatic Hydrocarbons (PAHs)* 2010

EXPOSURE TO VAPOURS

INHALATION OF MEASURED VAPOURS

WSP has derived a set of soil vapour GACs (GAC_{sv}) that allow for the assessment of measured site soil vapour concentrations, using J&E, in order to establish potential risks via indoor inhalation of vapours. This methodology enables a more robust assessment of exposure via the inhalation of soil vapours indoors than using CLEA-derived soil GAC, as it is based upon measured soil vapour concentrations beneath the site. It also allows for the assessment of vapours from all source terms (i.e. groundwater, soil or NAPL). Outdoor inhalation was not included. WSP considers that the indoor inhalation pathway is the significantly dominant risk-driver.

The generic land use scenarios within CLEA (residential and commercial) that were used to derive the soil GAC were used to define the receptor and building characteristics for the soil vapour GAC. Only residential and commercial generic land use scenarios include the indoor inhalation of vapours pathway.

The GAC_{sv} were derived for three different soil types; sand, sandy loam and clay, reflecting the importance of this parameter within the J&E model. A depth to contamination of 0.85 m below the base of the building foundation was assumed (i.e. 1 m below ground level). This differs from the depth assumed for the soil GAC (0.5 m bgl), but was selected by WSP as a reasonable worst case scenario.

It is acknowledged that the J&E commonly over-predicts indoor vapour concentrations. In particular, it will significantly over-predict vapour concentrations for suspended floor slabs, which many new builds are constructed with, it does not take into account lateral migration and assumes an infinite source of contamination at steady state conditions. In addition, it is common for soil gas/vapour wells to be installed with at least 1 m of plain riser at the surface and this equates to a total depth of 0.85 m below the building foundation plus a 0.15 m thick foundation, and so is more representative of the depth that samples will be taken from.

The TDSIs and IDs for each substance were converted from $\mu gkg^{-1}_{bw}day^{-1}$ to μgm^{-3} using the standard conversions quoted in Table 3.3 of SR2, thereby replacing the need to model C_{air} in the equation:

$$C_{air} = \alpha . C_{vap} . 1{,}000{,}000 cm^3 m^{-3}$$

Where:

C_{air} is the concentration of vapours within the building, mg^{-3}
α is the steady state attenuation coefficient between soil and indoor air, dimensionless
C_{vap} is the soil vapour concentration, $mgcm^{-3}$

The target concentrations within indoor air for each substance (C_{air}) are a function of receptor inhalation rates and occupancy periods, as defined by the site conceptual exposure model (assuming standard CLEA occupancy periods and receptors).

The attenuation factor was calculated using J&E (Equation 10.4 in SR3) and the resulting C_{vap} is equivalent to the GAC_{sv} for the modelled exposure scenario.

Where reported soil vapour concentrations exceed the relevant saturated vapour concentration, free product may occur, and the user should discuss their project with an experienced risk assessor.

INHALATION OF GROUNDWATER-DERIVED VAPOURS

WSP has derived a set of groundwater GACs (GAC_{gw}) to evaluate the potential risks through the indoor inhalation of groundwater-derived vapours by first applying the approach described above for the derivation of the WSP GAC_{sv} to determine the acceptable concentration in soil vapour directly above the water table.

The depth to groundwater was assumed to be 1 m bgl (i.e. 0.85 m below the base of the building foundation). This depth was considered to be more representative of commonly encountered groundwater conditions than the 0.5 m below the base of the building foundation (i.e. 0.65 m bgl) that is used by CLEA for an unsaturated source present in the overlying soil.

The GAC_{gw} was then back-calculated from the GAC_{sv} using the air-water partition coefficient (K_{aw}) for each substance.

The WSP Groundwater Vapour GAC are protective against a dissolved phase contaminant source only. If the presence of NAPL is suspected, the risks from this source will need to be assessed. Where reported groundwater concentrations exceed the relevant solubility limit, free product may occur, and the user should discuss their project with an experienced risk assessor.

Appendix D

SCREENING TABLES

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Pick HH GAC from drop-down list below
HH GAC: **Res No HG Veg 1% SOM**

Soil Analytical Results Screening Sheet

Site Name: Bermondsey Biscuit Factory
Job Number:
Screening Criteria: Res No HG Veg 1% SOM

Determinant	No. Samples	Min mg/kg	Mean mg/kg	Max mg/kg	GAC mg/kg	# GAC Exceeds	TP703 0.10 - 0.30	TP703 0.70 - 1	TP801 0.50 -1	TP801 2
pH units	0	< 0	< 0	< 0	No GAC	0				
Arsenic	**32**	< 0	16.26	28	35	0	12	18	18	17
Cadmium	**32**	< 0.2	0.24	0.8	87	0	<0.2	<0.2	<0.2	<0.2
Chromium	**32**	< 0	26.19	50	No GAC	0	27	24	27	26
Copper	**32**	< 0	97.22	310	7520	0	29	27	100	120
Lead	**32**	< 0	411.16	1900	188	**19**	78	**420**	**400**	**360**
Mercury	**29**	#REF!	#REF!	13	56	0	<0.3	1.6	3.4	2.1
Nickel	**32**	< 0.3	20.14	31	181	0	18	20	25	27
Selenium	0	< 0	< 0	< 0	430	0				
Vanadium	0	< 0	< 0	< 0	1170	0				
Zinc	**32**	< 0	200.56	1000	40400	0	75	140	290	210
Barium	0	< 0	< 0	< 0	1350	0				
Beryllium	0	< 0	< 0	< 0	1.7	0				
Chromium, Hexavalent	**32**	< 1.2	1.20	1.3	4.5	0	<1.2	<1.2	<1.2	<1.2
Cyanide(Complex)	0	< 0	< 0	< 0	No GAC	0				
Cyanide (Free)	0	< 0	< 0	< 0	15	0				
Cyanide(Total)	**19**	< 1	< 1	< 1	15	0	<1	<1	<1	<1
Aliphatics >C8-C10	**19**	< 0.001	< 0.001	< 0.001	27	0	<0.001	<0.001	<0.001	<0.001
Aliphatics >C10-C12	**20**	< 1	1.20	4.9	132	0	<1.0	<1.0	<1.0	<1.0
Aliphatics >C12-C16	**20**	< 0.2	4.32	20	1030	0	7.2	8.8	<2.0	<2.0
Aliphatics >C35-C44	**20**	< 8.4	24.71	93	89100	0	53	27	<8.4	38
Aromatics >EC8-EC10	**20**	< 0.001	< 0.001	< 0.001	47	0	<0.001	<0.001	<0.001	<0.001
Aromatics >EC10-EC12	**20**	< 1	1.23	2.8	248	0	2.8	<1.0	1.7	2.3
Aromatics >EC12-EC16	**20**	< 0.2	3.55	16	1430	0	16	4.3	3.1	6
Aromatics >EC16-EC21	**20**	< 10	18.40	73	1340	0	73	21	<10	18
Aromatics >EC21-EC35	**20**	< 10	78.70	430	1340	0	200	95	47	130
Aromatics >EC35-EC44	**20**	< 8.4	46.11	190	1340	0	96	110	33	110
Ethylbenzene	**19**	< 0.001	< 0.001	< 0.001	83	0	<0.001	<0.001	<0.001	<0.001
Toluene	**19**	< 0.001	< 0.001	< 0.001	868	0	<0.001	<0.001	<0.001	<0.001
p/m-Xylene	**19**	< 0.001	< 0.001	< 0.001	79	0	<0.001	<0.001	<0.001	<0.001
Xylenes	0	< 0	< 0	< 0	No GAC	0				
Acenaphthene	**32**	< 0.05	0.09	0.65	B(a)P-S.A.	0	0.65	<0.05	<0.05	<0.05
Acenaphthylene	**32**	< 0.05	0.06	0.21	B(a)P-S.A.	0	0.21	<0.05	<0.05	<0.05
Anthracene	**32**	< 0.05	0.17	1.5	B(a)P-S.A.	0	1.5	<0.05	<0.05	<0.05
Benzo(a)Anthracene	**32**	< 0.05	0.79	4.7	B(a)P-S.A.	0	4.7	0.83	0.46	1.1
Benzo(a)pyrene	**32**	< 0.05	0.81	5.1	1.7	**3**	**3.9**	0.78	0.53	0.98
Benzo(b)fluoranthene	**32**	< 0.05	0.95	5.8	B(a)P-S.A.	0	4.7	1.1	0.66	1.3
Benzo(g,h,i)perylene	**32**	< 0.05	0.52	3.8	B(a)P-S.A.	0	1.9	0.43	0.35	0.57
Benzo(k)fluoranthene	**32**	< 0.05	0.41	2.3	B(a)P-S.A.	0	1.7	0.4	0.27	0.46
bis (2-ethylhexyl) phthalate	**2**	< 0.05	< 0.05	< 0.05	2720	0				
Chrysene	**32**	< 0.05	0.71	4	B(a)P-S.A.	0	4	0.83	0.47	1.1
Dibenzo(a,h)anthracene	**32**	< 0.05	0.08	0.5	B(a)P-S.A.	0	0.31	<0.05	<0.05	<0.05
Dibenzofuran	**10**	< 0.0002	< 0.0002	< 0.05	#N/A	0				
Fluoranthene	**32**	< 0.05	1.40	10	B(a)P-S.A.	0	10	1.4	0.76	2.4
Fluorene	**31**	< 0.05	0.08	0.43	B(a)P-S.A.	0	0.37	<0.05	<0.05	<0.05
Indeno(1,2,3-cd)pyrene	**32**	< 0.05	0.41	2.8	B(a)P-S.A.	0	1.5	0.41	0.25	0.43
Naphthalene	**32**	< 0.05	0.09	0.88	2.3	0	<0.05	<0.05	<0.05	<0.05
Phenanthrene	**30**	#REF!	#REF!	6.9	B(a)P-S.A.	0	6.9	0.6	0.33	0.8
Pyrene	**30**	#REF!	#REF!	9	B(a)P-S.A.	0	9	1.3	0.77	2.2
p-Isopropyltoluene	**7**	< 0.001	< 0.001	< 0.001	No GAC	0				
Styrene	**7**	< 0.001	< 0.001	< 0.001	50	0				
1,2-Dichloroethane	**7**	< 0.001	< 0.001	< 0.001	0.0092	0				
Trichloroethene (TCE)	**7**	< 0.001	< 0.001	< 0.001	0.017	0				
1-Methylnaphthalene	0	< 0	< 0	< 0	No GAC	0				
2-Methylnaphthalene	0	< 0	< 0	< 0	No GAC	0				
Phenol Index.(AR)	0	< 0	< 0	< 0	No GAC	0				
Coronene	0	< 0	< 0	< 0	No GAC	0				
Methyl tertiary butyl ether (MTBE)	**19**	< 0.001	< 0.001	< 0.001	104	0	<0.001	<0.001	<0.001	<0.001
Total PCB Congeners ICES 7	0	< 0	< 0	< 0	0.44	0				
Speciated Total EPA-16 PAHs	**32**	< 0.8	8.38	51.4	#N/A	0	51.4	8.08	4.85	11.4
PCB Congener 077	**29**	< 0.001	< 0.001	< 0.001	#N/A	0	<0.001	<0.001	<0.001	<0.001
PCB Congener 081	**28**	#REF!	#REF!	#REF!	#N/A	0	<0.001	<0.001	<0.001	<0.001
PCB Congener 105	**29**	< 0.001	< 0.001	< 0.001	#N/A	0	<0.001	<0.001	<0.001	<0.001
PCB Congener 114	**29**	< 0.001	< 0.001	< 0.001	#N/A	0	<0.001	<0.001	<0.001	<0.001
PCB Congener 118	**30**	< 0.001	< 0.001	< 0.001	#N/A	0	<0.001	<0.001	<0.001	<0.001
PCB Congener 123	**29**	< 0.001	< 0.001	< 0.001	#N/A	0	<0.001	<0.001	<0.001	<0.001
PCB Congener 126	**29**	< 0.001	< 0.001	< 0.001	#N/A	0	<0.001	<0.001	<0.001	<0.001
PCB Congener 156	**29**	< 0.001	< 0.001	< 0.001	#N/A	0	<0.001	<0.001	<0.001	<0.001
PCB Congener 157	**29**	< 0.001	< 0.001	< 0.001	#N/A	0	<0.001	<0.001	<0.001	<0.001
PCB Congener 167	**29**	< 0.001	< 0.001	< 0.001	#N/A	0	<0.001	<0.001	<0.001	<0.001
PCB Congener 169	**29**	< 0.001	< 0.001	< 0.001	#N/A	0	<0.001	<0.001	<0.001	<0.001
PCB Congener 189	**29**	< 0.001	< 0.001	< 0.001	#N/A	0	<0.001	<0.001	<0.001	<0.001
Total PCBs	**29**	< 0.012	< 0.012	< 0.012	#N/A	0	<0.012	<0.012	<0.012	<0.012
Phenol	**32**	< 1	< 1	< 1	280	0	<1.0	<1.0	<1.0	<1.0
Aliphatic >EC5 - EC35	**21**	< 10	75.67	460	#N/A	0	170	75	<10	38

B(a)P-S.A. - Benzo(a)pyrene used as surrogate for nonvolatile PAH risks

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Pick HH GAC from drop-down list below
HH GAC: **Res No HG Veg 1% SOM**

Soil Analytical Results Screening Sheet

Site Name: Bermondsey Biscuit Factory
Job Number:
Screening Criteria: Res No HG Veg 1% SOM

Determinant	No. Samples	Min mg/kg	Mean mg/kg	Max mg/kg	GAC mg/kg	# GAC Exceeds	TP703 0.10-0.30	TP703 0.70-1.00	TP801 0.20	TP801 0.70
pH units	0	< 0	< 0	< 0	No GAC	0				
Arsenic	**32**	< 0	16.26	28	35	0	12	18	18	17
Cadmium	**32**	< 0.2	0.24	0.8	87	0	< 0.2	< 0.2	< 0.2	< 0.2
Chromium	**32**	< 0	26.19	50	No GAC	0	27	24	27	26
Copper	**32**	< 0	98.63	310	7520	0	29	72	100	120
Lead	**32**	< 0	411.16	1900	188	**19**	78	**420**	**400**	**360**
Mercury	**32**	< 0.3	1.98	13	56	0	< 0.3	1.6	3.4	2.1
Nickel	**32**	< 0	21.74	31	181	0	18	20	25	27
Selenium	0	< 0	< 0	< 0	430	0				
Vanadium	0	< 0	< 0	< 0	1170	0				
Zinc	**32**	< 0	200.56	1000	40400	0	75	140	290	210
Barium	0	< 0	< 0	< 0	1350	0				
Beryllium	0	< 0	< 0	< 0	1.7	0				
Chromium, Hexavalent	**32**	< 1.2	1.20	1.3	4.5	0	< 1.2	< 1.2	< 1.2	< 1.2
Cyanide(Complex)	0	< 0	< 0	< 0	No GAC	0				
Cyanide (Free)	0	< 0	< 0	< 0	15	0				
Cyanide(Total)	0	< 0	< 0	< 0	15	0				
Aliphatics >C8-C10	**32**	< 0.001	< 0.001	< 0.001	27	0	< 0.001	< 0.001	< 0.001	< 0.001
Aliphatics >C10-C12	**32**	< 1	1.12	4.9	132	0	< 1.0	< 1.0	< 1.0	< 1.0
Aliphatics >C12-C16	**32**	< 2	3.51	20	1030	0	7.2	8.8	< 2.0	< 2.0
Aliphatics >C35-C44	**32**	< 8.4	18.59	93	89100	0	53	27	< 8.4	38
Aromatics >EC8-EC10	**32**	< 0.001	< 0.001	< 0.001	47	0	< 0.001	< 0.001	< 0.001	< 0.001
Aromatics >EC10-EC12	**32**	< 1	1.14	2.8	248	0	2.8	< 1.0	1.7	2.3
Aromatics >EC12-EC16	**32**	< 2	3.02	16	1430	0	16	4.3	3.1	6
Aromatics >EC16-EC21	**32**	< 10	15.41	73	1340	0	73	21	< 10	18
Aromatics >EC21-EC35	**32**	< 10	54.13	430	1340	0	200	95	47	130
Aromatics >EC35-EC44	**32**	< 8.4	31.97	190	1340	0	96	110	33	110
Ethylbenzene	0	< 0	< 0	< 0	83	0				
Toluene	0	< 0	< 0	< 0	868	0				
p/m-Xylene	0	< 0	< 0	< 0	79	0				
Xylenes	0	< 0	< 0	< 0	No GAC	0				
Acenaphthene	**32**	< 0.05	0.08	0.65	B(a)P-S.A.	0	0.65	< 0.05	< 0.05	< 0.05
Acenaphthylene	**32**	< 0.05	0.07	0.21	B(a)P-S.A.	0	0.21	< 0.05	< 0.05	< 0.05
Anthracene	**17**	#REF!	#REF!	1.5	B(a)P-S.A.	0	1.5	< 0.05	< 0.05	< 0.05
Benzo(a)Anthracene	**32**	< 0.05	0.79	4.7	B(a)P-S.A.	0	4.7	0.83	0.46	1.1
Benzo(a)pyrene	**32**	< 0.05	0.81	5.1	1.7	**3**	**3.9**	0.78	0.53	0.98
Benzo(b)fluoranthene	**17**	< 0.05	0.99	4.7	B(a)P-S.A.	0	4.7	1.1	0.66	1.3
Benzo(g,h,i)perylene	**32**	< 0.05	0.52	3.8	B(a)P-S.A.	0	1.9	0.43	0.35	0.57
Benzo(k)fluoranthene	**32**	< 0.05	0.64	5.8	B(a)P-S.A.	0	1.7	0.4	0.27	0.46
bis (2-ethylhexyl) phthalate	0	< 0	< 0	< 0	2720	0				
Chrysene	**32**	< 0.05	0.70	4	B(a)P-S.A.	0	4	0.83	0.47	1.1
Dibenzo(a,h)anthracene	**32**	< 0.05	0.08	0.5	B(a)P-S.A.	0	0.31	< 0.05	< 0.05	< 0.05
Dibenzofuran	0	#REF!	#REF!	#REF!	#N/A	0				
Fluoranthene	**32**	< 0.05	0.89	10	B(a)P-S.A.	0	10	1.4	0.76	2.4
Fluorene	**32**	< 0.05	0.60	0.43	B(a)P-S.A.	0	0.37	< 0.05	< 0.05	< 0.05
Indeno(1,2,3-cd)pyrene	**32**	< 0.05	0.41	2.8	B(a)P-S.A.	0	1.5	0.41	0.25	0.43
Naphthalene	**32**	< 0.05	0.09	0.88	2.3	0	< 0.05	< 0.05	< 0.05	< 0.05
Phenanthrene	**32**	< 0.05	0.73	6.9	B(a)P-S.A.	0	6.9	0.6	0.33	0.8
Pyrene	**32**	< 0.05	1.28	9	B(a)P-S.A.	0	9	1.3	0.77	2.2
p-Isopropyltoluene	0	< 0	< 0	< 0	No GAC	0				
Styrene	0	< 0	< 0	< 0	50	0				
1,2-Dichloroethane	0	< 0	< 0	< 0	0.0092	0				
Trichloroethene (TCE)	0	< 0	< 0	< 0	0.017	0				
1-Methylnaphthalene	0	< 0	< 0	< 0	No GAC	0				
2-Methylnaphthalene	0	< 0	< 0	< 0	No GAC	0				
Phenol Index.(AR)	0	< 0	< 0	< 0	No GAC	0				
Coronene	0	< 0	< 0	< 0	No GAC	0				
Methyl tertiary butyl ether (MTBE)	0	< 0	< 0	< 0	104	0				
Total PCB Congeners ICES 7	0	< 0	< 0	< 0	0.44	0				
Speciated Total EPA-16 PAHs	**32**	< 0.8	8.38	51.4	#N/A	0	51.4	8.08	4.85	11.4
PCB Congener 077	**31**	< 0.001	< 0.001	< 0.001	#N/A	0	< 0.001	< 0.001	< 0.001	< 0.001
PCB Congener 081	**31**	< 0.001	< 0.001	< 0.001	#N/A	0	< 0.001	< 0.001	< 0.001	< 0.001
PCB Congener 105	**31**	< 0.001	< 0.001	< 0.001	#N/A	0	< 0.001	< 0.001	< 0.001	< 0.001
PCB Congener 114	**31**	< 0.001	< 0.001	< 0.001	#N/A	0	< 0.001	< 0.001	< 0.001	< 0.001
PCB Congener 118	**32**	< 0.001	< 0.001	< 0.001	#N/A	0	< 0.001	< 0.001	< 0.001	< 0.001
PCB Congener 123	**31**	< 0.001	< 0.001	< 0.001	#N/A	0	< 0.001	< 0.001	< 0.001	< 0.001
PCB Congener 126	**31**	< 0.001	< 0.001	< 0.001	#N/A	0	< 0.001	< 0.001	< 0.001	< 0.001
PCB Congener 156	**31**	< 0.001	< 0.001	< 0.001	#N/A	0	< 0.001	< 0.001	< 0.001	< 0.001
PCB Congener 157	**31**	< 0.001	< 0.001	< 0.001	#N/A	0	< 0.001	< 0.001	< 0.001	< 0.001
PCB Congener 167	**31**	< 0.001	< 0.001	< 0.001	#N/A	0	< 0.001	< 0.001	< 0.001	< 0.001
PCB Congener 169	**31**	< 0.001	< 0.001	< 0.001	#N/A	0	< 0.001	< 0.001	< 0.001	< 0.001
PCB Congener 189	**31**	< 0.001	< 0.001	< 0.001	#N/A	0	< 0.001	< 0.001	< 0.001	< 0.001
Total PCBs	**31**	< 0.012	< 0.012	< 0.012	#N/A	0	< 0.012	< 0.012	< 0.012	< 0.012
TPH-CWG - Aliphatic (EC5 - EC44)	**32**	< 10	65.72	550	#N/A	0	170	75	< 10	53
TPH-CWG - Aromatic (EC5 - EC44)	**32**	< 10	92.47	700	#N/A	0	380	240	92	260

B(a)P-S.A. - Benzo(a)pyrene used as surrogate for nonvolatile PAH risks

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Pick HH GAC from drop-down list below
HH GAC: **Res No HG Veg 1% SOM**

Soil Analytical Results Screening Sheet

Site Name: Socotec - Biscuit Factory
Job Number: 70075582
Screening Criteria: Res No HG Veg 1% SOM

Determinant	No. Samples	Min mg/kg	Mean mg/kg	Max mg/kg	GAC mg/kg	# GAC Exceeds	BH1B 0.8	BH1B 2.5	WS4 0.4	WS2 0.9	WS2 1.8
pH units	**19**	7.6	8.88	11.3	No GAC	0	8.2	9.1	9.1	8.8	8.6
Arsenic	**19**	< 0	14.28	25	35	0	25	7.89	11.4	20.0	8
Cadmium	**19**	< 0.2	0.25	0.55	87	0	0.37	<0.20	<0.20	0.3	<0.2
Chromium	**19**	< 0	22.06	30.4	1590	0	21.6	20.64	20.3	16	23.1
Copper	**19**	< 0	67.73	293	7520	0	293.0	18.62	135.0	89.6	13.9
Lead	**19**	< 0	334.91	1360	188	**10**	**569.8**	24.08	**217.3**	**803**	**262.8**
Mercury	**19**	< 0.5	1.09	3.26	56	0	1.93	<0.51	0.66	1.09	<0.5
Nickel	**19**	< 0	21.60	29.7	181	0	29.7	18.01	29.7	21	16.3
Selenium	**19**	< 0.5	15.39	1	430	0	0.8	<0.51	<0.5	<0.5	<0.5
Zinc	**17**	#REF!	#REF!	1130	40400	0	253.1	25.19	1130	193.1	50
Hexavalent Chromium	**17**	< 0.1	0.32	0.3	4.5	0	<0.1	<0.1	<0.1	<0.1	<0.1
Boron	**13**	#REF!	#REF!	7	10500	0			0.7	1.8	1.8
Aliphatics >C8-C10	**15**	< 0.217	1.27	15.3	27	0	0.352	0.302	<0.217	<0.244	<0.243
Ethylbenzene	**13**	< 0.0102	0.02	0.094	83	0	<0.0130	<0.01045	<0.0108	<0.0102	<0.0122
Toluene	**13**	< 0.01045	< 0.01045	< 13	868	0	<13.0	<0.01045	<0.0108	<0.0122	<0.0122
p/m-Xylene	**11**	#REF!	#REF!	0.243	79	0	<0.0260	<0.02090	<0.0217	<0.0244	<0.0243
Xylenes	**12**	#VALUE!	#VALUE!	0.243	No GAC	0	<0.03.0	<0.03135	<0.0325	<0.0365	<0.0365
Acenaphthene	**19**	< 0.08	0.12	0.566	B(a)P-S.A.	0	<0.10	<0.084	<0.09	0.10	<0.10
Acenaphthylene	**19**	< 0.08	0.11	0.35	B(a)P-S.A.	0	<0.10	<0.084	<0.09	0.35	<0.10
Anthracene	**19**	< 0.08	0.21	1.57	B(a)P-S.A.	0	<0.10	<0.084	<0.09	1.57	<0.10
Benzo(a)Anthracene	**19**	< 0.08	0.33	3.2	B(a)P-S.A.	0	0.26	<0.084	<0.09	3.20	<0.10
Benzo(a)pyrene	**19**	< 0.08	0.33	3.22	1.7	**1**	0.29	<0.084	<0.09	**3.22**	<0.10
Benzo(b)fluoranthene	**19**	< 0.08	0.39	3.95	B(a)P-S.A.	0	0.43	<0.084	<0.09	3.95	<0.10
Benzo(g,h,i)perylene	**19**	< 0.08	0.22	1.81	B(a)P-S.A.	0	0.23	<0.084	<0.09	1.81	<0.10
Benzo(k)fluoranthene	**19**	< 0.08	0.19	1.5	B(a)P-S.A.	0	0.17	<0.084	<0.09	1.50	<0.10
bis (2-ethylhexyl) phthalate	0	< 0	< 0	< 0	2720	0					
Chrysene	**19**	< 0.08	0.36	3.68	B(a)P-S.A.	0	0.40	<0.084	<0.09	3.68	<0.10
Dibenzo(a,h)anthracene	**17**	#REF!	#REF!	0.46	B(a)P-S.A.	0	<0.10	<0.084	<0.09	0.46	<0.10
Dibenzofuran	**2**	< 0.084	< 0.084	< 0.1	#N/A	0					
Fluoranthene	**19**	< 0.08	0.58	6.61	B(a)P-S.A.	0	0.56	<0.084	<0.09	6.61	<0.10
Fluorene	**19**	< 0.08	0.17	1.33	B(a)P-S.A.	0	<0.10	<0.084	<0.09	0.17	<0.10
Indeno(1,2,3-cd)pyrene	**19**	< 0.08	0.22	1.78	B(a)P-S.A.	0	0.23	<0.084	<0.09	1.78	<0.10
Naphthalene	**19**	< 0.08	0.11	0.27	2.3	0	<0.10	<0.084	<0.09	<0.10	<0.10
Phenanthrene	**19**	< 0.08	0.48	3.46	B(a)P-S.A.	0	0.38	<0.084	<0.09	3.46	<0.10
Pyrene	**19**	< 0.08	0.51	5.71	B(a)P-S.A.	0	0.49	<0.084	<0.09	5.71	<0.10
Phenol Index.(AR)	**19**	< 0.5	< 0.5	< 0.7	No GAC	0	<0.7	<0.52	<0.5	<0.6	<0.6
Coronene	0	< 0	< 0	< 0	No GAC	0					
Methyl tertiary butyl ether (MTBE)	**6**	< 0.0209	< 0.0209	< 0.0296	104	0	<0.026	<0.0209			
Total PCB Congeners ICES 7	0	< 0	< 0	< 0	0.44	0					
Aliphatics >C7-C8	**2**	#REF!	#REF!	#REF!	853	#REF!	<0.260	<0.2090	<0.217	<0.244	<0.243
Aliphatics >C5-C6	**2**	#REF!	#REF!	#REF!	42	#REF!	<0.260	<0.2090	<0.217	<0.244	<0.243
Total PAH (Sum of USEPA 16)	**13**	< 0.215	< 0.215	< 37.6	#N/A	0	<4.07	<1.338	<1.39	<37.6	<1.56
Cyanide (Free)	**19**	< 0.5	< 0.5	< 0.7	15	0	<0.7	<0.52	<0.5	<0.6	<0.6
TPH Ali Band >C10-C12	**19**	< 1.5	6.15	35.6	132	0	<5.20	<4.180	<4.40	<4.90	<4.89
TPH Ali Band >C12-C16	**17**	< 4.18	24.66	339	1030	0	<5.20	<4.180	<4.40	<4.90	<4.89
TPH Ali Band >C16-C21	**19**	< 1.2	32.39	526	#N/A	0	<5.20	<4.180	<4.40	<4.90	<4.89
TPH Ali Band >C21-C35	**19**	< 1.5	18.73	148	#N/A	0	<11.39	<9.154	<9.64	<10.72	<10.71
TPH Ali Band >C8-C10	**19**	< 3.4	4.87	7.51	27	0	<5.20	<4.180	<4.40	<4.90	<4.89
TPH Ali Band >C8-C40	**19**	< 0.9	77.96	1060	#N/A	0	<26.0	<20.90	<22.0	<24.5	<24.5
TPH Aro Band >C10-C12	**17**	< 4.18	5.08	9.12	248	0	<5.20	<4.180	<4.34	<4.87	<4.87
TPH Aro Band >C12-C16	**19**	< 0.5	14.66	199	1430	0	<5.20	<4.180	<4.34	<4.87	<4.87
TPH Aro Band >C16-C21	**19**	< 0.6	22.94	347	1340	0	5.99	<4.180	<4.34	12.7	<4.87
TPH Aro Band >C21-C35	**19**	< 1.4	22.38	142	1340	0	26.9	<9.154	<9.50	59.8	<10.66
TPH Aro Band >C8-C10	**17**	< 4.18	7.54	14.3	47	0	<5.20	<4.180	5.84	10.34	13.3
TPH Aro Band >C8-C40	**17**	< 20.9	72.81	715	#N/A	0	41.2	<20.90	<21.7	88.2	<24.3
Total Organic Carbon	**10**	< 0	3.81	8.7	#N/A	0	7.9	0.263			
o-Xylene	**11**	< 10.8	< 10.8	< 14.8	#N/A	0			<10.8	<12.2	<12.2
GRO (>C8 - C10)	**2**	< 0.231	< 0.231	< 0.296	#N/A	0					
Cyanide (Total)	**13**	< 0.5	< 0.5	< 0.7	#N/A	0				<0.6	<0.6
Benzene	**2**	#REF!	#REF!	#REF!	0.38	0	<0.0130	<0.01045	<0.0108	<0.0122	<0.0122
Soil Organic Matter	**7**	< 0	5.21	22.1	#N/A	0			0.98	7.94	0.86
1,2,4-Trichlorobenzene	**3**	< 0.000108	< 0.000108	< 0.000122	2.6	0					<0.000122
1,2-Dichlorobenzene	**3**	< 0.000108	< 0.000108	< 0.000122	24	0					<0.000122
1,3-Dichlorobenzene	**3**	< 0.000108	< 0.000108	< 0.000122	0.44	0					<0.000122
1,4-Dichlorobenzene	**3**	< 0.000108	< 0.000108	< 0.000122	6.6	0					<0.000122
1-Methylnaphthalene	**3**	< 0.000108	0.00	0.00266	#N/A	0					<0.000122
2,4,5-Trichlorophenol	**3**	< 0.000108	0.00	0.000112	#N/A	0					<0.000122
2,4,6-Trichlorophenol	**3**	< 0.000108	0.00	0.00012	#N/A	0					<0.000122
2,4-Dichlorophenol	**3**	< 0.000108	< 0.000108	< 0.000122	#N/A	0					<0.000122
2,4-Dimethylphenol	**3**	< 0.000108	< 0.000108	< 0.000122	281	0					<0.000122
2,4-Dinitrophenol	**3**	< 0.000538	< 0.000538	< 0.000608	#N/A	0					<0.000608
2,4-Dinitrotoluene	**3**	< 0.000215	< 0.000215	< 0.000243	169	0					<0.000243
2,6-Dinitrotoluene	**3**	< 0.000538	< 0.000538	< 0.000608	81	0					<0.000608
2-Chloronaphthalene	**3**	< 0.000108	< 0.000108	< 0.000122	5.4	0					<0.000122
2-Chlorophenol	**3**	< 0.000108	< 0.000108	< 0.000122	49	0					<0.000122
2-Methylnaphthalene	**3**	< 0.000108	< 0.000108	< 0.000122	#N/A	0					<0.000122
2-Methylphenol	**3**	< 0.000108	< 0.000108	< 0.000122	#N/A	0					<0.000122
2-Nitroaniline	**3**	< 0.000538	< 0.000538	< 0.000608	#N/A	0					<0.000608
2-Nitrophenol	**3**	< 0.000108	< 0.000108	< 0.000122	#N/A	0					<0.000122
3- & 4-Methylphenol	**3**	< 0.000108	< 0.000108	< 0.000122	#N/A	0					<0.000122
3-Nitroaniline	**2**	#VALUE!	#VALUE!	#VALUE!	#N/A	0					<0.017.6
4,6-Dinitro-2-methylphenol	**3**	< 0.000215	< 0.000215	< 0.000243	#N/A	0					<0.000243
4-Bromophenyl-phenylether	**3**	< 0.000108	< 0.000108	< 0.000122	#N/A	0					<0.000122
4-Chloro-3-methylphenol	**3**	< 0.000108	< 0.000108	< 0.000122	#N/A	0					<0.000122
4-Chloroaniline	**3**	< 0.000538	< 0.000538	< 0.000608	#N/A	0					<0.000608
4-Chlorophenol	**3**	< 0.000538	< 0.000538	< 0.000608	#N/A	0					<0.000608
4-Chlorophenyl-phenylether	**3**	< 0.000108	< 0.000108	< 0.000122	#N/A	0					<0.000122
4-Nitroaniline	**3**	< 0.000645	< 0.000645	< 0.00073	#N/A	0					<0.000730
4-Nitrophenol	**3**	< 0.000538	< 0.000538	< 0.000608	#N/A	0					<0.000608
Anthracene	**3**	< 0.000108	0.00	0.000572	B(a)P-S.A.	0					<0.000122
Benzo(a)anthracene	**3**	< 0.000215	< 0.000215	< 0.000243	B(a)P-S.A.	0					<0.000243
Benzo(a)pyrene	**3**	< 0.000215	< 0.000215	< 0.000243	1.7	0					<0.000243
Benzo(b)fluoranthene	**3**	< 0.000215	< 0.000215	< 0.000243	B(a)P-S.A.	0					<0.000243
Benzo(ghi)perylene	**3**	< 0.000538	< 0.000538	< 0.000608	B(a)P-S.A.	0					<0.000608
Benzo(k)fluoranthene	**3**	< 0.000215	< 0.000215	< 0.000243	B(a)P-S.A.	0					<0.000243
Benzoic Acid	**3**	< 0.000538	< 0.000538	< 0.000608	#N/A	0					<0.000608
Benzyl alcohol	**3**	< 0.000538	< 0.000538	< 0.000608	#N/A	0					<0.000608
Biphenyl	**3**	< 0.000108	< 0.000108	< 0.000122	308	0					<0.000122
bis(2-Chloroethoxy)methane	**3**	< 0.000108	< 0.000108	< 0.000122	#N/A	0					<0.000122
bis(2-Chloroethyl)ether	**3**	< 0.000108	< 0.000108	< 0.000122	#N/A	0					<0.000122
bis(2-Chloroisopropyl)ether	**3**	< 0.000538	< 0.000538	< 0.000608	#N/A	0					<0.000608
bis(2-Ethylhexyl)phthalate	**3**	< 0.000222	< 0.000222	< 0.215	#N/A	0					<0.000243
Butylbenzylphthalate	**3**	< 0.000215	< 0.000215	< 0.000243	#N/A	0					<0.000243

B(a)P-S.A. - Benzo(a)pyrene used as surrogate for non-volatile PAH risks

Soil Analytical Results Screening Sheet

Site Name: Socotec - Biscuit Factory
Job Number: 70075582
Screening Criteria: Res No HG Veg 1% SOM

Determinant	No. Samples	Min mg/kg	Mean mg/kg	Max mg/kg	GAC mg/kg	# GAC Exceeds	BH1B 0.8	BH1B 2.5	WS4 0.4	WS2 0.9	WS2 1.8
Chrysene	3	< 0.000108	0.00	0.000158	B(a)P-S.A.	0					<0.000122
Coronene	3	< 0.000323	< 0.000323	< 0.000365	#N/A	0					<0.000365
Dibenzo(ah)anthracene	3	< 0.000538	< 0.000538	< 0.000608	B(a)P-S.A.	0					<0.000608
Dibenzofuran	3	< 0.000108	0.00	0.000425	#N/A	0					<0.000122
Diethylphthalate	3	< 0.000108	< 0.000108	< 0.000122	#N/A	0					<0.000122
Dimethylphthalate	3	< 0.000108	< 0.000108	< 0.000122	#N/A	0					<0.000122
Di-n-butylphthalate	3	< 0.000108	< 0.000108	< 0.000122	#N/A	0					<0.000122
Di-n-octylphthalate	3	< 0.000215	< 0.000215	< 0.000243	#N/A	0					<0.000243
Diphenyl Ether	3	< 0.000108	< 0.000108	< 0.000122	#N/A	0					<0.000122
Fluoranthene	3	< 0.000215	< 0.000215	< 0.000243	B(a)P-S.A.	0					<0.000243
Fluorene	3	< 0.000215	0.00	0.00143	B(a)P-S.A.	0					<0.000243
Hexachlorobenzene	3	< 0.000108	< 0.000108	< 0.000122	3.3	0					<0.000122
Hexachlorobutadiene	3	< 0.000108	< 0.000108	< 0.000122	0.35	0					<0.000122
Hexachlorocyclopentadiene	3	< 0.000108	< 0.000108	< 0.000122	#N/A	0					<0.000122
Hexachloroethane	3	< 0.000108	< 0.000108	< 0.000122	0.31	0					<0.000122
Indeno(123-cd)pyrene	3	< 0.000538	< 0.000538	< 0.000608	B(a)P-S.A.	0					<0.000608
Isophorone	3	< 0.000108	< 0.000108	< 0.000122	#N/A	0					<0.000122
Naphthalene	3	< 0.000108	0.00	0.000169	2.3	0					<0.000122
Nitrobenzene	3	< 0.000538	< 0.000538	< 0.000608	#N/A	0					<0.000608
N-Nitroso-di-n-propylamine	3	< 0.000968	< 0.000968	< 0.001095	#N/A	0					<0.001095
N-Nitrosodiphenylamine	3	< 0.000108	< 0.000108	< 0.000122	#N/A	0					<0.000122
Pentachlorophenol	3	< 0.000538	< 0.000538	< 0.000608	15	0					<0.000608
Phenanthrene	3	< 0.000108	0.00	0.00256	B(a)P-S.A.	0					<0.000122
Phenol	3	< 0.000108	< 0.000108	< 0.000122	280	0					<0.000122
Pyrene	3	< 0.000215	< 0.000215	< 0.000243	B(a)P-S.A.	0					<0.000243
1,1,1,2-Tetrachloroethane	4	< 0.0011	< 0.0011	< 1.1	1.5	0					<0.0012
1,1,1-Trichloroethane	4	< 0.0011	< 0.0011	< 0.0014	22	0					<0.0012
1,1,2,2-Tetrachloroethane	4	< 0.0011	< 0.0011	< 0.0014	3.9	0					<0.0012
1,1,2-Trichloroethane	4	< 0.0011	0.00	0.0055	1.2	0					<0.0012
1,1-Dichloroethane	4	< 0.0011	< 0.0011	< 0.0014	3.6	0					<0.0012
1,1-Dichloroethene	4	< 0.0011	< 0.0011	< 0.0014	0.33	0					<0.0012
1,1-Dichloropropene	4	< 0.0011	< 0.0011	< 0.0014	#N/A	0					<0.0012
1,2,3-Trichlorobenzene	4	< 0.0014	< 0.0014	< 0.0036	1.5	0					<0.0036
1,2,3-Trichloropropane	4	< 0.0011	0.00	0.0011	#N/A	0					<0.0012
1,2,4-Trichlorobenzene	4	< 0.0014	< 0.0014	< 0.0036	2.6	0					<0.0036
1,2,4-Trimethylbenzene	4	< 0.0011	< 0.0011	< 0.0014	0.58	0					<0.0012
1,2-Dibromo-3-chloropropane	4	< 0.0011	< 0.0011	< 0.0014	#N/A	0					<0.0012
1,2-Dibromoethane	4	< 0.0011	< 0.0011	< 0.0014	#N/A	0					<0.0012
1,2-Dichlorobenzene	4	< 0.0011	< 0.0011	< 0.0014	24	0					<0.0012
1,2-Dichloroethane	4	< 0.0011	< 0.0011	< 0.0014	0.0092	0					<0.0012
1,2-Dichloropropane	4	< 0.0011	< 0.0011	< 0.0014	0.034	0					<0.0012
1,3,5-Trimethylbenzene	4	< 0.0011	< 0.0011	< 0.0014	#N/A	0					<0.0012
1,3-Dichlorobenzene	4	< 0.0011	< 0.0011	< 0.0014	0.44	0					<0.0012
1,3-Dichloropropane	4	< 0.0011	< 0.0011	< 0.0014	#N/A	0					<0.0012
1,4-Dichlorobenzene	4	< 0.0011	< 0.0011	< 0.0014	6.6	0					<0.0012
2,2-Dichloropropane	4	< 0.0011	< 0.0011	< 0.0014	#N/A	0					<0.0012
2-Chlorotoluene	4	< 0.0011	< 0.0011	< 0.0014	#N/A	0					<0.0012
4-Chlorotoluene	4	< 0.0011	< 0.0011	< 0.0014	#N/A	0					<0.0012
Benzene	4	< 0.0011	< 0.0011	< 0.0014	0.38	0					<0.0012
Bromobenzene	4	< 0.0011	< 0.0011	< 0.0014	1.3	0					<0.0012
Bromochloromethane	4	< 0.0011	< 0.0011	< 0.0014	#N/A	0					<0.0012
Bromodichloromethane	4	< 0.0011	< 0.0011	< 0.0014	0.027	0					<0.0012
Bromoform	4	< 0.0011	< 0.0011	< 0.0014	7.3	0					<0.0012
Bromomethane	2	< 0.0011	< 0.0011	< 0.0011	#N/A	0					
Carbon Tetrachloride	2	< 0.0011	< 0.0011	< 0.0011	0.4	0					
Chlorobenzene	2	< 0.0011	< 0.0011	< 0.0011	0.63	0					
Chloroethane	2	< 0.0022	< 0.0022	< 0.0022	12	0					
Chloroform	2	< 0.0011	< 0.0011	< 0.0011	1.2	0					
Chloromethane	2	0.0032	0.00	0.0032	0.012	0					
cis 1,2-Dichloroethene	2	< 0.0054	< 0.0054	< 0.0055	0.17	0					
cis 1,3-Dichloropropene	2	< 0.0011	< 0.0011	< 0.0011	#N/A	0					
Dibromochloromethane	2	< 0.0011	< 0.0011	< 0.0011	#N/A	0					
Dibromomethane	2	< 0.0011	< 0.0011	< 0.0011	#N/A	0					
Dichlorodifluoromethane	2	< 0.0011	< 0.0011	< 0.0011	#N/A	0					
Ethylbenzene	2	< 0.0022	< 0.0022	< 0.0022	83	0					
Hexachlorobutadiene	2	< 0.0022	< 0.0022	< 0.0022	0.35	0					
iso-Propylbenzene	2	< 0.0011	0.03	0.0533	17	0					

B(a)P-S.A. - Benzo(a)pyrene used as surrogate for nonvolatile PAH risks

Soil Analytical Results Screening Sheet

Site Name: Bermondsey - Ramboll - Campus
Job Number:
Screening Criteria: Res No HG Veg 1% SOM

Determinant	No. Samples	Min mg/kg	Mean mg/kg	Max mg/kg	GAC mg/kg	# GAC Exceeds	BH1B 0.8	BH1B 2.5	WS2 0.9	WS2 1.8	WS4 0.4
pH units	0	< 0	< 0	< 0	No GAC	0					
Arsenic	**5**	< 0	16.88	25	35	0	25	7.89	14.2	19.3	18
Cadmium	**5**	< 0.2	0.27	0.37	87	0	0.37	<0.2	0.22	0.23	0.35
Chromium	**5**	< 0	26.01	43	No GAC	0	21.6	20.64	22.5	43	22.3
Copper	**5**	< 0	166.90	393.4	7520	0	293	18.62	88.1	41.4	393.4
Lead	**5**	< 0	378.92	617.3	188	**3**	**569.8**	24.08	**540.5**	142.9	**617.3**
Mercury	**5**	< 0.54	1.36	1.93	56	0	1.93	1.93	1.09	<0.54	1.31
Nickel	**5**	< 0	26.54	32.7	181	0	29.7	18.1	21.9	32.7	30.3
Selenium	**5**	< 0.5	0.56	0.8	430	0	0.8	<0.51	<0.5	<0.5	<0.5
Vanadium	0	< 0	< 0	< 0	1170	0					
Zinc	**5**	< 0	285.18	887	40400	0	253.1	25.19	167.2	93.4	887
Barium	0	< 0	< 0	< 0	1350	0					
Beryllium	0	< 0	< 0	< 0	1.7	0					
Chromium, Hexavalent	0	< 0	< 0	< 0	4.5	0					
Cyanide(Complex)	0	< 0	< 0	< 0	No GAC	0					
Cyanide (Free)	0	< 0	< 0	< 0	15	0					
Cyanide(Total)	0	< 0	< 0	< 0	15	0					
Aliphatics >C8-C10	0	< 0	< 0	< 0	27	0					
Aliphatics >C10-C12	**2**	< 0	0.33	0.352	132	0	0.352	0.302			
Aliphatics >C12-C16	0	< 0	< 0	< 0	1030	0					
Aliphatics >C35-C44	0	< 0	< 0	< 0	89100	0					
Aromatics >EC8-EC10	0	< 0	< 0	< 0	47	0					
Aromatics >EC10-EC12	0	< 0	< 0	< 0	248	0					
Aromatics >EC12-EC16	0	< 0	< 0	< 0	1430	0					
Aromatics >EC16-EC21	0	< 0	< 0	< 0	1340	0					
Aromatics >EC21-EC35	0	< 0	< 0	< 0	1340	0					
Aromatics >EC35-EC44	0	< 0	< 0	< 0	1340	0					
Ethylbenzene	0	< 0	< 0	< 0	83	0					
Toluene	0	< 0	< 0	< 0	868	0					
p/m-Xylene	0	< 0	< 0	< 0	79	0					
Xylenes	0	< 0	< 0	< 0	No GAC	0					
Acenaphthene	0	< 0	< 0	< 0	B(a)P-S.A.	0					
Acenaphthylene	0	< 0	< 0	< 0	B(a)P-S.A.	0					
Anthracene	0	< 0	< 0	< 0	B(a)P-S.A.	0					
Benzo(a)Anthracene	0	< 0	< 0	< 0	B(a)P-S.A.	0					
Benzo(a)pyrene	**2**	< 0	1.63	2.97	1.7	**1**	0.29		**2.97**		
Benzo(b)fluoranthene	0	< 0	< 0	< 0	B(a)P-S.A.	0					
Benzo(g,h,i)perylene	0	< 0	< 0	< 0	B(a)P-S.A.	0					
Benzo(k)fluoranthene	0	< 0	< 0	< 0	B(a)P-S.A.	0					
bis (2-ethylhexyl) phthalate	0	< 0	< 0	< 0	2720	0					
Chrysene	0	< 0	< 0	< 0	B(a)P-S.A.	0					
Dibenzo(a,h)anthracene	0	< 0	< 0	< 0	B(a)P-S.A.	0					
Dibenzofuran	0	< 0	< 0	< 0	#N/A	0					
Fluoranthene	0	< 0	< 0	< 0	B(a)P-S.A.	0					
Fluorene	0	< 0	< 0	< 0	B(a)P-S.A.	0					
Indeno(1,2,3-cd)pyrene	0	< 0	< 0	< 0	B(a)P-S.A.	0					
Naphthalene	0	< 0	< 0	< 0	2.3	0					
Phenanthrene	0	< 0	< 0	< 0	B(a)P-S.A.	0					
Pyrene	0	< 0	< 0	< 0	B(a)P-S.A.	0					
p-Isopropyltoluene	0	< 0	< 0	< 0	No GAC	0					
Styrene	0	< 0	< 0	< 0	50	0					
1,2-Dichloroethane	0	< 0	< 0	< 0	0.0092	0					
Trichloroethene (TCE)	0	< 0	< 0	< 0	0.017	0					
1-Methylnaphthalene	0	< 0	< 0	< 0	No GAC	0					
2-Methylnaphthalene	0	< 0	< 0	< 0	No GAC	0					
Phenol Index.(AR)	0	< 0	< 0	< 0	No GAC	0					
Coronene	0	< 0	< 0	< 0	No GAC	0					
Methyl tertiary butyl ether (MTBE)	0	< 0	< 0	< 0	104	0					
Total PCB Congeners ICES 7	0	< 0	< 0	< 0	0.44	0					

B(a)P-S.A. - Benzo(a)pyrene used as surrogate for nonvolatile PAH risks

Groundwater Analytical Results Screening Sheet

Site Name: Bermondsey - Ramboll - Campus
Job Number: 0
Screening Criteria: Surface Waters (EQS or equivalent - Salt water

Determinant	No. Samples	Min µg/L	Mean µg/L	Max µg/L	EQS µg/L	Source/ Notes	# EQS Exceeds	BH1B
Ammoniacal Nitrogen as N	0	< 0	< 0	< 0	noGAC	#N/A	0	
Fluoride	0	< 0	< 0	< 0	noGAC	#N/A	0	
Arsenic (diss.filt)	**1**	0.002	0.00	0.002	25		0	0.002
Boron (diss.filt)	**1**	0.14	0.14	0.14	2000		0	0.14
Chromium (diss.filt)	**1**	< 0.001	< 0.001	< 0.001	3.4	Assumes Cr6	0	<0.001
Copper (diss.filt)	**1**	0.001	0.00	0.001	3.76		0	0.001
Lead (diss.filt)	**1**	< 0.001	< 0.001	< 0.001	1.3		0	<0.001
Manganese (diss.filt)	**1**	0.029	0.03	0.029	123		0	0.029
Nickel (diss.filt)	**1**	0.002	0.00	0.002	8.6		0	0.002
Vanadium (diss.filt)	0	< 0	< 0	< 0	20		0	
Zinc (diss.filt)	**1**	0.002	0.00	0.002	6.8		0	0.002
Sulphate (SO4)	**1**	135	135.00	135	noGAC	#N/A	0	135
Chloride	**1**	115	115.00	115	250000		0	115
Iron (diss.filt)	**1**	0.12	0.12	0.12	1000		0	0.12
pH	**1**	7.1	7.10	7.1	6.5<pH<9		0	7.1
Potassium	**1**	18	18.00	18	#N/A	#N/A	0	18
Cyanide Total	**1**	< 0.02	< 0.02	< 0.02	#N/A	#N/A	0	<0.02
Benzo(a)pyrene	**1**	< 0.001	< 0.001	< 0.001	0.00017		0	<0.001
Pyrene	**1**	0.06	0.06	0.06	No GAC		0	0.06

Groundwater Analytical Results Screening Sheet

Site Name: Bermondsey - Ramboll - Campus
Job Number: 0
Screening Criteria: Groundwater/Aquifer (DWS or equivalent)

Determinant	No. Samples	Min µg/L	Mean µg/L	Max µg/L	DWS µg/L	Source/ Notes	# DWS Exceeds	BH1B
Ammoniacal Nitrogen as N	0	< 0	< 0	< 0	No GAC	#N/A	0	
Fluoride	0	< 0	< 0	< 0	No GAC	#N/A	0	
Arsenic (diss.filt)	**1**	0.002	0.002	0.002	10		0	0.002
Boron (diss.filt)	**1**	0.14	0.14	0.14	1000		0	0.14
Chromium (diss.filt)	**1**	< 0.001	< 0.001	< 0.001	50	Assumes Cr6	0	<0.001
Copper (diss.filt)	**1**	0.001	0.001	0.001	2000		0	0.001
Lead (diss.filt)	**1**	< 0.001	< 0.001	< 0.001	10		0	<0.001
Manganese (diss.filt)	**1**	0.029	0.029	0.029	50		0	0.029
Nickel (diss.filt)	**1**	0.002	0.002	0.002	20		0	0.002
Vanadium (diss.filt)	0	< 0	< 0	< 0	No GAC		0	
Zinc (diss.filt)	**1**	0.002	0.002	0.002	No GAC		0	0.002
Sulphate (SO4)	**1**	135	135	135	No GAC	#N/A	0	135
Chloride	**1**	115	115	115	No GAC		0	115
Iron (diss.filt)	**1**	0.12	0.12	0.12	200		0	0.12
pH	**1**	7.1	7.1	7.1	6.5<pH<10		0	7.1
Potassium	**1**	18	18	18	#N/A	#N/A	0	18
Cyanide Total	**1**	< 0.02	< 0.02	< 0.02	#N/A	#N/A	0	<0.02
Benzo(a)pyrene	**1**	< 0.001	< 0.001	< 0.001	0.01		0	<0.001
Pyrene	**1**	0.06	0.06	0.06	No GAC		0	0.06

Mountbatten House
Basing View
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RG21 4HJ

wsp.com

Appendix D Mobile Treatment Permit and Issue Letter

To the Company Director and/or Secretary
Keltbray Environmental Materials
Management Limited
St Andrews House
Portsmouth Road
Esher
K10 9TA

Our ref: CB3902KF/W0035

Date: 30th March 2021

Dear Sir

Environmental Permitting (England and Wales) Regulations 2016

Deployment ref: CB3902KF/W0035
Permit holder: Keltbray Environmental Materials Management Limited
Location of the deployment: Bermondsey Project, Drummond Road, Bermondsey, London, SE16 4DG,

Following assessment of your deployment notification reference number CB3902KF/W0035 I can confirm that we have agreed your deployment form and you may now start to operate.

This deployment lasts for one year from the date the activity starts on site. If you wish to continue beyond this one year period you must re-notify.

You must comply with your permit and carry out the activities in accordance with the requirements of the agreed deployment form and:

- further information including revised form and supporting information encompassing the whole Bermondsey Project received by us on 30/03/21.

You must seek written permission from us if any of the details provided in the deployment form change.

This approval letter is associated with the mobile plant permitting regime only. As the operator, it is your responsibility to agree other authorisations, for example, planning permission, remedial strategy, abstraction or discharge consents with the relevant regulatory authority.

Please note that operating under your Mobile Plant Permit / Mobile Treatment Licence does not imply that the remediation processes used will be suitable for meeting any remediation objectives specified. These issues must be considered separately by the developer/consultant and our local area Groundwater and Contaminated Land team. These must be defined in the site remedial strategy which sets out the remediation options to reduce or control the risks from pollution linkages associated with the site as a whole. You may need to carry out further remediation if an unacceptable risk to the environment remains at the site.

Please notify us at least seven days prior to starting the remediation activities, at psc@environment-agency.gov.uk & southlondonwaste@environment-agency.gov.uk.

If you have any queries about this matter please contact us by telephone on 03708 506 506 or email us at enquiries@environment-agency.gov.uk quoting your deployment application reference CB3902KF/W0035.

Yours faithfully

Grant Wilson
Team Leader,
National Permitting Service

DEPLOYMENT FORM SUPPORTING INFORMATION

Bermondsey Project, Drummond Road, Bermondsey, London, SE16 4DG

Tel: 0207 643 1000
Address: St Andrews House, Portsmouth Road, Esher, KT10 9TA

Document Control

Project Name: Bermondsey Project
Project Number: DC1220
Document Title: KREM_DC1220_TECH_MTP_01_A

Approvals

The signatures below certify that this plan has been reviewed and accepted, and demonstrates that the signatories are aware of all the requirements contained herein and are committed to ensuring their provision.

	Name	Signature	Position	Date
Prepared by	Eugenie Henderson		Rem. Scientist	16/02/2021
Reviewed by	Dafni Varthali		Rem. Scientist	16/02/2021
Approved by	Tom Simpson		Snr. Rem. Scientist	17/02/2021

Amendment Record

This Supporting Information Form for Mobile Treatment Permit (MTP) deployment is reviewed to ensure its continuing relevance to the project. A record of contextual additions or omissions is given below:

Page No.	Context	Revision	Date
NA	Original Issue	00	16/02/2021
01, 04 & 27	Amendments following EA comments received on 25.03.2021	01	29/03/2021

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Drawings

Tables

Appendices

1. INTRODUCTION

1.1 Keltbray Group (KR) proposes to deploy mobile plant for the treatment of contaminated soils at Bermondsey Project, a triangular plot of land located in South Bermondsey, London, SE164DG (the 'Site'). A Site Layout Plan is included within **Appendix A**, indicating the specific area of the wider Site where KR will operate to undertake the works detailed in this document (the 'Operating Site').

1.2 The Operating Site is located at National Grid reference TQ 34600 79055 (534600E, 179055N), covering approximately 7.2 hectares.

1.3 The Site was previously occupied by residential properties and a series of industrial premises with the Biscuit Factory occupying majority of the site.

1.4 The Operating Site is divided into the 'Biscuit Factory' and the 'Campus site' at the north of Clement's road. The proposed works on the Biscuit Factory site are intended for residential and commercial purposes and will include a basement dig down to 4 meter below ground level (m bgl), along with soft landscaping, tree pits, utility excavations and piling works. Works on the Campus site will include the development of the school and associated access routes and service corridors.

1.5 Contaminants identified at the Operating Site include Total Petroleum Hydrocarbons (TPH), heavy metals and asbestos.

1.6 Regulatory approval was received as part of Planning Application process (17/AP/4088) for remediation strategies (70075582-Bermondsey Main Site-Outline Rem Start_Oct20 Rv4 and 70075882-Bermondsey Campus-Outline Rem Start_Oct20 Rev4) outlining mitigation measures to render the site suitable for future use and safe for follow on trade workers. Risks to human health and controlled waters will be managed through the removal of potential contamination sources by removal of majority of Made Ground soils including, a system of inspection, analysis, placement of clean cover systems and validation hence breaking the source – pathway – receptor model.

1.7 This document fulfils the requirements of the Deployment Form submitted to the Environment Agency (the 'Agency') as Stage 2 of the Environmental Permitting (EP) Regime. Information required to complete the Deployment Form has been transferred to this document. The Agency Proforma MPP2 is attached in **Appendix B**.

1.8 This document has been prepared by KR for the sole purpose described above and no extended duty of care to any third party is implied or offered. Third parties making reference to this report should consult KR to the extent to which the findings may be appropriate for their use.

2. LICENCE HOLDER

2.1 The license holder: Keltbray Remediation Limited

2.2 EP reference number: EPR/CB3902KF

2.3 Address details of licence holder:

i. St Andrews House, Portsmouth Road, Esher, KT10 9TA

ii. Contact name: Dafni Varthali

iii. Office telephone number: 020 643 1000

iv. Mobile number: 07525277299

v. Email: dafni.varthali@keltbray.com

2.4 The Operating Site will be supervised by suitably qualified staff including a relevant WAMITAB licence holder. Details are provided in Section 5.4 below and in **Appendix C**.

3. THE OPERATING SITE

3.1. Site plans can be found in Figures 1-4, Appendix A within this document. The site plans include the following details:

i. Site boundary and Operating Site boundary;

ii. Security and access arrangements

iii. Areas of contaminated material, substances or products for remediation by the mobile plant;

iv. Location / siting of principal plant and equipment;

v. Process treatment and storage area;

vi. Proposed location of pollution control measures;

vii. Proposed location of monitoring facilities; and

viii. Potential receptors (e.g. neighbouring residents)

A 2.2m height site boundary fence line to be erected and managed by KR.

The site working hours are 08:00 to 18:00, Monday to Friday. In the event that there will be a requirement to work on Saturdays, the working hours will be 09:00 to 14:00. It is not anticipated that there will be any working undertaken out of the hours specified above.

Site access will be through Clement's Road. Security access is provided by KR to effectively manage entry in and out of site and monitor contractors' attendance.

4. PROTECTED SITES

4.1 The land uses in the area surrounding the Operating Site comprise the following:

North: Residential area

East: Residential area and commercial area directly adjacent to Biscuit Factory (southeast)

West: Railway line and Residential area beyond

South: Residential area

Refer to **Figure 2, Appendix A** for further details.

4.2 Information available on the Defra (Magic) website (ref; http://magic.defra.gov.uk/MagicMap.aspx, accessed on the 15/02/2021) indicates the site is not within a Source Protection Zone.

4.3 The nearest surface watercourse is the River Thames, located over 500m from the site. The nearest surface water feature is unnamed lake located 350 m east of the site in Southwark Park. It is possible this is a manmade surface water feature. The site is located within Flood Zone 3.

4.4 The Defra (Magic) website (ref; http://magic.defra.gov.uk/MagicMap.aspx, accessed on the 15/02/2021) indicates that there are no Ramsar sites, Special Areas of Conservation, Special Protection Areas, National Nature Reserves, Marine Nature Reserves, Areas of Special Protection for Birds, or any other potential sensitive statutory land-based designations are located within 1 km of the Operating Site.

5. MANAGEMENT SUPERVISION

5.1 The deployment is expected to last for up to 12 months, **starting on March 2021**.

5.2 The following staff will be in attendance:

i. Technically Competent Person (1 day during the setup of the treatment area and monthly visit);

ii. Project Manager (5 days a week);

iii. Site Manager (full time);

iv. Foreman / supervisor(s) (full time);

v. Remediation Scientist (full time);

vi. Operators for excavators, screeners, crushers and other plant (full time);

vii. Asbestos picking operative(s) (full time during picking operations); and

viii. Labourers and banksman(s)

5.3 It is thought that a combination of the above will total between 10 to 20 operatives.

5.4 The named Technically Competent Persons (TCPs) for Keltbray Remediation sites are;

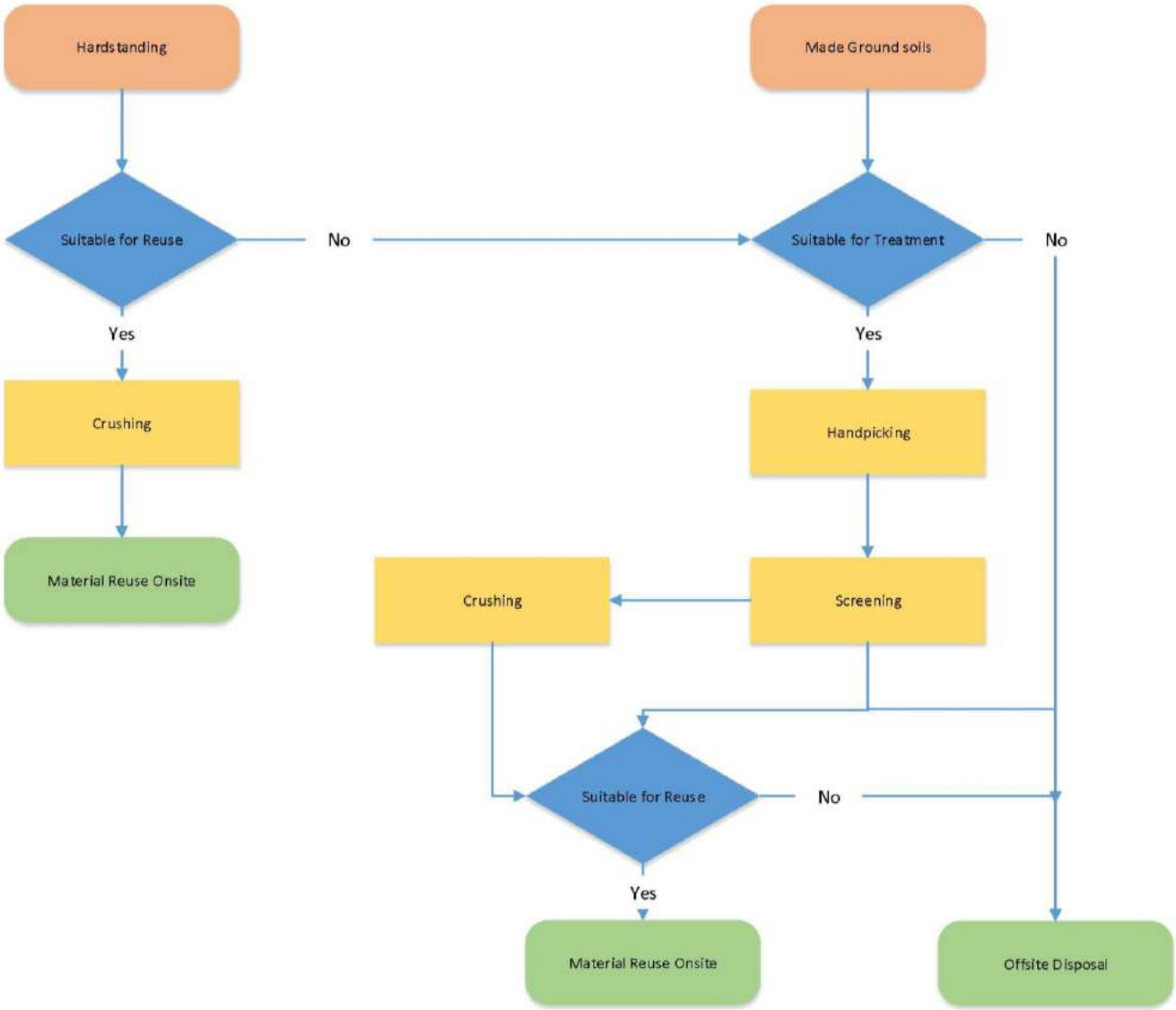
- Claire Bourgouin (Continuing Competence expires January 2022)
- Jack Holliday (Continuing Competence expires January 2022)
- Tom Simpson (Continuing Competence expires December 2021)
- Tim Ridley (Continuing Competence expires June 2021)

5.5 KR believe that due to competence of the site team and nature of the works, TCM visits can be limited to 1 day during the treatment area setup and monthly during the treatment activities. A competent Environmental / Remediation scientist will be onsite for the duration of the works. The scientist responsibilities include the materials and compliance / environmental testing, reporting back the results and any findings to the KR technical team which includes TCMs (via WAMITAB). The aforementioned project team structure alongside KRs Environmental Health Safety and Quality Management Software (into which WAMITAB audits have been integrated) means the project manager and TCM are nearly immediately alerted to any non-compliances. In the event of breach the assigned TCM(s) will be able to action, provide advice to the site team or visit site.

5.6 Anticipated periodic breaks: **Bank Holidays and Christmas period**.

6. TREATMENT ACTIVITIES AND ACCEPTANCE PROCEDURES

6.1 Treatment Activity Summary Flow Diagram



6.2 Material Acceptance Procedures

Each stage of the treatment process (detailed below) will have the following controls in place to ensure those materials that are treatable, with the specified technology, and are suitability assessed for their anticipated end use (either re-used on site or disposed off-site).

a) Excavation on-site for construction purposes

To enable future redevelopment works, a significant proportion of the Made Ground soils will be removed across site thus removing majority of contamination previously identified within the soils. Risks to human health will be mitigated through covering with buildings and hard standing and a clean cover system at areas of soft landscaping. Risks to controlled water will be managed through the removal of potential sources of contamination. The specific treatment methods are detailed in Section 6.6 below.

b) Supervision by suitably qualified operatives

The excavation and treatment of excavated soils will be supervised by a suitably qualified person(s). A watching brief will be completed during earthworks in order to identify any potential areas of concern at formation level, which may require further assessment during the works in order to ensure that there is no remaining risk to controlled waters.

c) Assessment of likely contamination status at excavation face or material reception area

The suitably qualified person(s) will be responsible for examining material as it is excavated and at its reception into the treatment area to direct the material to the appropriate stockpiles as detailed below and in Section 6.1:

- Concrete;
- Asphalt;
- Mixture - Brick, Ceramics and Concrete;
- Soils and Stone;
- Soils and Stone – impacted with ACM;
- Soils and Stone – potentially impacted with ACM;
- Soils and Stone – impacted with metals/hydrocarbons;
- Contamination present other than that detailed in Section 1.4.

Note:
'ACM'; asbestos containing material

d) Material reception of incoming spoil directed to relevant bays

Upon reception, material will be further visually inspected.

Each stockpile will be properly labelled clearly identifying the materials characteristics.

Should unexpected contamination be encountered than the material will be quarantined ready for inspection and/or field analysis before being directed to the relevant stockpile.

e) Input into suitable treatment train as follows

Based on KR stockpile management methodology, materials from the stockpiles will be input into the suitable treatment train as shown in Section 6.1.

f) Onward Use

Treated soils will be either sent of site for disposal, following appropriate waste classification or reused on site under the site MMP. Material reused onsite will be subject to testing as per the site Remediation Strategy.

6.3 Quarantine Areas

Due to the resolution of the investigation data and the site history KR do not anticipate unknown / unidentified materials. Materials to construct a bunded quarantine area including 1000 gauge impermeable membrane will be stored onsite. However, KR will not construct or designate a Quarantine area unless required due to any location needing to be relocated as the wider enabling works progress.

The minimum construction of a quarantine area (if required) would consist an impermeable membrane overlaying a flattened area of the site. Site won materials will be used to create berm into which the membrane will keyed. If not stored in containers, quarantined materials would be covered with an impermeable membrane to prevent water ingress.

Material not suitable for treatment will be sent to a suitably licensed facility.

6.4 Commissioning, Operating and Maintenance

The first week of operations (prior to commencement of demolition works) were treated as an enabling period. During this time air emissions and other baseline environmental monitoring were recorded as per Section 11.

6.5 Quantity Measurement Systems

Measurement method:

- Volumetric records of treated material; and
- Volumetric records of placed and disposed material.

Conversion factor to be used: 1.8 tonnes per cubic metre (a typical excavated soil density).

6.6 Permitted Technologies

a) Treatment plant for blending, mixing, bulking, screening, shredding, particle size reduction and /or particle separation in order to facilitate remedial action.

The materials will be screened by mechanical methods such as being passed through a riddle bucket to separate soils and to remove the large (oversize) material from the onward process. The soil will be passed over a box-screener or a 2 / 3-way screener to separate the soils according to separate fractions. This process will remove large (oversize) materials from the onward process and fines will be similarly segregated, as will ‘mid-size’ materials should a 3-way screener be employed.

Suitably oversized materials will be recovered by passing through a crusher with the jaws set to produce a desired grading of crushed product to enable re-use of material on site or off-site recovery, subject to confirmatory analytical results. Passing material will be re-used on site as applicable and in accordance with a Materials Management Plan (MMP).

Oversize materials will recovered by passing through a crusher with the jaws set to produce a desired grading of crushed product.

b) Perched Ex-situ treatment of pumped groundwater (chemical treatment, biological treatment, air stripping, filtration, carbon adsorption).

In the event of perched groundwater is encountered during the excavation works will be assessed visually for contaminants. The groundwater will pass through a settlement tank prior to discharge to the foul sewer under Thames Water Discharge Permit.

The system would be set up in a labelled and clearly marked section of the site to ensure no damage from any plant movements on site. The system will be bunded and have a minimum capacity of 10% greater than tank capacity to prevent any unintended spillage and retain to avoid a cross-contamination.

6.7 Other Construction Activities

Due to the nature of KR's contracts and works, the remedial works set out in this deployment application form part of a wider enabling/engineering phase of works. Therefore it is likely plant required to undertaken remedial activities will be present onsite undertaken non permitted works both before and after the deployment period.

7. WASTE TYPES AND QUANTITIES

7.1. The following table lists the waste types and quantities including the six-digit code from the European Waste Catalogue (EWC) that will be treated at the Operating Site:

Table 1: Waste Types and Quantities

Waste type	EWC code	Quantity (m^3)	Medium (solid, water, sludge, gas)
Concrete	17 01 01	Anticipated: 15,000	Solid
Mixtures of concrete, bricks, tiles and ceramics containing hazardous substances	17 01 06*	Anticipated: 2,000	Solid
Mixtures of concrete, bricks, tiles and ceramics other than those mentioned in 17 01 06	17 01 07	Anticipated: 3,000	Solid
Bituminous mixtures other than those mentioned in 17 03 01	17 03 02	Anticipated: 1,000	Solid
Soil & Stones containing dangerous substances	17 05 03*	Anticipated:12,000	Solid
Soil & Stones other than those mentioned in 17 05 03	17 05 04	Anticipated: 35,000	Solid
Aqueous liquid wastes and aqueous concentrates from groundwater remediation containing hazardous substances	19 13 07*	Anticipated: 10	Liquid
Aqueous liquid wastes and aqueous concentrates from groundwater remediation other than those mentioned in 19 13 07	19 13 08	Anticipated: 100	Liquid

Notes:

i. *The above listed waste have been based on Keltbray's contract and available information at the time of application;*

ii. *Keltbray has made every effort to appropriately classification the EWC codes of the waste streams entering the treatment process. Keltbray reserves the right to change the classification and thereby the EWC of materials entering the treatment process based on site conditions to ensure compliance with Waste Guidance and Legislation.*

iii. *Volumes associated to perched or groundwater ingress into engineered / excavations during works will be revised as required once actual ingress rates can be monitored.*

7.2. KR will accurately record treated waste quantities on a weekly basis (as a minimum) thereby allowing any increase in the volumes of waste for treatment will be predicted in good time. KR will inform the

Agency as soon as is reasonably practicable to request any modifications to the estimated quantity of treated material detailed in the Deployment Form.

7.3. Rainwater entering any excavations will be pumped to sewer through the water treatment plant; this is subject to discharge consent.

8. CONCEPTUAL SITE MODEL

The potential source-pathway-receptor linkages have been identified based on the expected ground conditions and receptors surrounding the Operating Site, as detailed in **Table 2** below.

Source The agent or process with potential to cause harm	Receptor What is at risk? What do I wish to protect?	Harm The harmful consequences if things go wrong	Pathway How the receptor might come into contact with the source	Probability of exposure Severity of the consequences if this occurs	Risk on the receptor	Risk Management How can I best manage the risk to reduce the magnitude	Residual Risk Magnitude of the risk after management
Made Ground soils including known contamination ACM, Metals, TPH	Site works / neighbouring site user / future site users	Health problems	Direct ingestion of soil and dust, inhalation of particulates and dermal contact	High	Effect on human health	Site security. Restrict area of premises. Appropriate H&S protocols and personal / respiratory protective equipment required. Hygiene practices. Covering / dampening down of stockpiles when required i.e. not required if natural mitigation measures are present e.g. raining, wet ground. Proposed remediation of made ground by KR	Low
Made Ground soils including known contamination ACM, Metals, TPH	Underlying Aquifer	Environmental problems	Vertical Migration	High	Effect on groundwater quality	Proposed remediation of made ground by KR	Low
Asbestos contaminated materials (ACM's)	Site works / neighbouring site user	Health problems	Direct ingestion of soil and dust, inhalation of particulates and dermal contact	High	Effect on human health	Correct H&S practices and use of appropriate PPE using the Joint Industry Working Group Decision Tool for CAR2012 Work Categories Suitable asbestos air monitoring (see Section 11.2.2) background and personal as required.	Low

Source The agent or process with potential to cause harm	Receptor What is at risk? What do I wish to protect?	Harm The harmful consequences if things go wrong	Pathway How the receptor might come into contact with the source	Probability of exposure Severity of the consequences if this occurs	Risk on the receptor	Risk Management How can I best manage the risk to reduce the magnitude	Residual Risk Magnitude of the risk after management
Excavated Made Ground and separated materials which have been stockpiled awaiting re-use, disposal or recovery	Site workers / neighbouring site users	Health problems	Direct ingestion of soil and dust, and dermal contact	High	Effect on human health	Site Security. Restricted treatment area. PPE and hygiene practices. Damping down of stockpiles / site as appropriate. Off-site controls – cover material, keep roads clean and moistened; HGVs – use jet wash where necessary. Qualitative and quantitative dust and odour monitoring around treatment area/Site. Material storage away from site boundaries.	Low
Dust from stockpiles, vehicle movements, picking, screening and / or crushing activities	Site workers / neighbouring site users	Health problems	Inhalation	High	Effect on Human Health	Qualitative and quantitative dust monitoring around treatment area/site. Damping dust by water spray to the stockpiles Water bowsers H&S controls to all site workers.	Low

Source The agent or process with potential to cause harm	Receptor What is at risk? What do I wish to protect?	Harm The harmful consequences if things go wrong	Pathway How the receptor might come into contact with the source	Probability of exposure Severity of the consequences if this occurs	Risk on the receptor	Risk Management How can I best manage the risk to reduce the magnitude	Residual Risk Magnitude of the risk after management
Volatile emission and odours – due to unknown / unexpected contamination	Site workers / neighbouring site users	Health problems	Direct ingestion of soil & dust, and dermal contact	Medium	Effect on human health	Restrict area of exposed contamination. Appropriate monitoring. PPE (site workers).	Low
Noise from machines	Site workers / neighbouring site users	Health problems; complaints from residents	Machine noise level exceed the appropriate H&S levels	Medium	Effect on human health; time and cost implications for the project	Monitoring. PPE (site workers). Ensure machines are places away from sensitive boundaries where possible. Only work during agreed hours of operations.	Low
Potential fuel leaks and spillages or recovered free phase contamination	Site workers / neighbouring site users / environment	Health problems / environmental damage	Direct ingestion, inhalation and / or dermal contact; vertical and lateral migration within the ground	Moderate to low	Effect on human health and environmental damage	Perform appropriate investigation and remediation in response to the spill, including deploying spill kit immediately. PPE (site workers). Monitoring.	Low

9 RISK ASSESSMENT

9.1 The following potential source-pathway-receptor linkages have been identified from the expected conditions and surrounding receptors to the Operating Site.

9.2 Sources – the potential sources at the Operating Site in relation to the soil treatment area include:

i. Excavation, stockpiling, storage, treatment, and transport of Made Ground soils and concrete;
ii. ACM's, including the hand-picking of these materials from the Made Ground;
iii. Operating screening / crushing plant within the treatment area;
iv. Potential fuel leaks / spillages; and
v. Tracking of soils by vehicle movements.

9.3 Pathways – the potential pathways include release mechanisms such as:

i. Direct contact;
ii. Ingestion;
iii. Vertical migration;
iv. Volatile emissions via air:
v. Dust and asbestos fibre release to air;
vi. Noise; and
vii. Vehicle movement within and around the site.

9.4 Receptors – receptors principally include:

i. Site employees and visitors; and
ii. Neighbouring site users;
iii. Future occupants; and
iv. Effect on quality on groundwater.

9.5 The nearest human receptors are site construction staff and workers/ visitors at residential and industrial units in the vicinity of the site.

9.6 On-site human receptors include all operatives and office staff, including visiting drivers, contractors and regulators.

9.7 The main potential environmental receptors are the underlying Secondary A Aquifer and Principal Aquifer.

9.8 In the context of a secure construction site the potential human exposure routes to receptors are:

i. Air inhalation – respiratory inhalation including particulates, asbestos air fibres, aerosols, vapours and gases;

ii. Dermal contact – skin contact from airborne or deposited particulates, soils and liquids; and

iii. Soil / dust ingestion – dermal contact resulting in the absorption and / or ingestion of solids / liquids.

10. EMISSION CONTROL

Remedial works set out in this deployment application will form part of a wider enabling/engineering phase of works. As such a detailed noise, dust and vibration monitoring plan has been prepared to effectively minimise the effects on surrounding receptors and reduce the risk of environmental nuisance on the adjacent neighbours. The monitoring plan for the Main site and Campus are included in **Appendix D.**

10.1 Dust Control

The abatement of dust generated during the site works will be achieved by the dampening of soil by spraying water onto the stockpiled materials to be treated. Roadways within the site will be kept damp by water bowser. Additionally, the drop distance from excavator bucket to stockpile / process plant will be kept as short as reasonably practicable.

An initial baseline dataset of local atmospheric dust conditions will be collected to establish background environmental conditions prior to the start of the works.

In the event that dust generation exceeds site trigger values during the remediation works, greater efforts will be made to keep dust levels to a minimum. These will include:

i. Increased damping down;

ii. Review of housekeeping methods and work practices; and

iii. Site manager to enforce dust abatement measures more rigorously and ensure staff at the Operating Site take heed;

iv. Reduction of operation on site to limit dust generation.

Note: Additional construction and enabling activities will be ongoing during the treatment works, emissions from these activities will be able to distinguished from the treatment activities.

10.2 Asbestos Control

Where ACMs are visually identified or detected by laboratory analysis, the workforce will be informed via daily task briefings. Key operatives involved in the handling of ACMs will be suitably trained with the correct medicals as required.

Prior to any works involving ACMs the following procedures will be followed:

i. The site foreman / workforce will be informed;

ii. The material will be carefully excavated under suitable controls to minimise any asbestos fibres becoming airborne;

iii. The material will then be placed in segregated stockpile prior to undergoing further treatment;

iv. Any picked ACMs will be double bagged in red and clear asbestos bags and placed in a locked skip in an area secured by Heras fencing to await removal from site by a specialist contractor; and

v. Once the material has been hand-picked, one soil sample per 250 m3 of stockpiled material will be collected for characterisation purposes in order to ascertain onward use.

Whilst all practicable measures (as described elsewhere) will be taken to physically remove the known ACM (visible) fragments from the 'ACM free' soils, there remains a limited possibility that in isolated incidences visible ACM fragments may be missed by the picking / sorting / processing methods (for example, if a small ACM fragment is 'balled' within clayey soils it may not be observed, unless the soil dries and fragments to reveal the previously un-observed fragment).

Should visible ACM fragments be identified in either treated soils on-site or at a designated receiving facility (that is not appropriately permitted to receive these materials), the following actions will be completed:

i. Treatment activities temporarily suspended while a causal investigation is completed;

ii. Pending the findings of the causal investigation, improvement to be implemented prior to re-commencement of works (to the approval of the COTC holder);

iii. Any receiving sites that may have inadvertently received ACM fragments to be notified regarding a potential (inadvertent) breach of their Permit;

iv. All identified ACM fragments (at site or at receiving sites) to be subject to a rigorous picking exercise and a 'close-out' report produced, demonstrating compliance with the relevant Permit;

v. Any picked ACM to be completed in accordance with CAR 2012 and the Duty of Care Regulations; and

10.3 Odours / VOCs

Where any potential nuisance odours are detected, abatement measures will be applied. Measures to control odours will include:

i. The spraying of odorous materials with an approved odour suppressant; and

ii. The covering of odorous materials with plastic sheeting.

Should the PID detect any volatile organic compound (VOC) concentrations in excess of 1 part per million then the Site operation will be temporarily suspended and the working method reviewed. VOC abatement will take the form of covering stockpiles with non-VOC contaminated soil or plastic sheeting or the application of VOC suppressant spray.

Note: Additional construction and enabling activities will be ongoing during the treatment works, emissions from these activities will be able to distinguished from the treatment activities.

10.4 Noise

Throughout the duration of works at the Site, measures will be implemented and maintained to control noise. Noise will be monitored as outlined in Section 11. An initial baseline will be undertaken to establish thresholds levels prior to the start of the works. The main receptors to noise will be the operatives at the Site and as such the emphasis of noise protection will be focused at on-site areas.

All plant will be operated in accordance with manufacturer's instructions to minimise noise generation and ear protection will be worn in accordance with the machinery operating instructions. Monitoring will be undertaken at the eight boundary positions **Figure 3 and Figure 4, Attachment A** throughout the works.

Note: Additional construction and enabling activities will be ongoing during the treatment works, emissions from these activities will be able to distinguished from the treatment activities.

10.5 Vibration

Given the specific features of the site and its's surrounding, with respect to the treatment activities, it is not thought that vibrations to the outside environment from the treatment works will have a significant impact.

10.6 Groundwater

The main contaminant of concern is asbestos, with the treatment activities associated to this deployment primarily being utilised to segregate hardcore and concrete from the excavated made ground, therefore the risk to Groundwater from the treatment activities is deemed low.

In the event that a water treatment system is deployed, storage vessels will be self-bunded or contained within a bunded areas to prevent any potential spillage contaminating the surround areas. Bunds will contain 110% of the largest vessel or 25% of the total volume contained, whichever is greater.

Spillcare products such as absorbent nappies and spill kits are deployed on site, to contain leaks and spills from plant/equipment on site and during refueling activites.

11. EMISSIONS MONITORING PLAN

11.1 Monitoring Programme

KR are responsible for the monitoring of environmental impacts where remedial activities are to be carried out. Continuous-automated monitoring will be completed at four semi fixed location at each of the sites as shown in **Figure 3 and Figure 4, Appendix A**.

11.2 Baseline Monitoring Programme

Baseline monitoring will be carried out prior to commencement of works for the following environmental issues:

i. Dust;

ii. Asbestos;

iii. Odour / VOCs;

iv. Noise; and

v. Vibration

11.2.1 Dust (Air Quallity)

Air quality will be monitored using automated equipment capable of notifying exceedances in real time. The units will establish PM10 and other variables. The use of a weather station will assist with understanding the wind speed and directions while works are ongoing.

The dust monitors will record PM10 1 Hour average and the trigger value will be set at 190 mg/m3, in accordance with the guidelines given in the '*Guidance on Monitoring in the Vicinity of Demolition and Construction Sites'* published by IAQM in October 2018.

11.2.2 Asbestos Air Monitoring

Asbestos reassurance monitoring will be performed daily for the duration of the treatment works). 6 no. pumps will be placed and tested by the analyst. The asbestos monitoring points are subject to with the activities planned on the required day.

The trigger values for recorded respirable fibre concentrations (time-weighted average) are based on the limit of detection as recommended in Table 5.2 of HSG248 - Asbestos: The analysts' guide for sampling, analysis and clearance procedures and in accordance with CAR2012. These are as follow:

- Fibres/ml for background reassurance monitoring performed within the defined 'Dirty Area' to assess any potential fibres being released beyond the defined boundaries; and
- 0.24 fibres/ml for air monitoring directly recorded on site personal carrying out the works (ie: personal sampling) for a minimum period of 10-minutes or a minimum of 40 Litres of air onto 25mm diameter filter.

Any monitoring results exceeding the above trigger values, will trigger the below Emission Action Plan:

- Review of site conditions, works activities, control measures and other potential external factors (ie: pollen deposition, dust originating from adjacent sites etc…);
- A change of working procedures will be assessed and implemented to further reduce dust/fibre emissions, with dust suppression measures repeated until monitoring confirms working conditions to have returned below Trigger levels and that amended procedures are deemed efficient and sufficient.
- If necessary, the frequency of reassurance air testing shall increase following the exceedance event until such time additional control measures are proven effective and no further testing is anticipated to exceed Trigger levels;
- Optional: Elevated sample(s) to be sent for SEM analysis to review the nature of the fibres identified.

11.2.3 Noise Monitoring

Real-time noise monitoring will be undertaken at the proposed locations, using Class 1 sound level meters. KR trigger values set out for noise will act as a limit any exceedances will involve a review of activity and potential mitigation action deployed. The trigger levels are site specific and will be in line with Local Authority and as outlined in the Section 61 Consent.

The source of noise will be recorded and impact assessment reviewed if noise level are identified above 5dBa above baseline noise records.

11.2.4 Vibration

Vibration monitoring is being undertaken as part of the earthworks / construction scheme, however, as treatment activities associated to this deployment will not generate significant vibrations, the monitoring is considered outside of the scope of this deployment.

11.2.5 If Required Quantitative Odours / VOCs Monitoring

Odours will be assessed on an olfactory basis by daily inspections of all site boundaries. VOC emissions will be monitored using a PID in the event that any potential nuisance odours are detected.

12. REPORTING OF MONITORING RESULTS

12.1 All data from monitoring activities will be recorded and communicated on an agreed monthly reporting period and included on the Mobile Treatment Permit Folder. Monitoring results will be available to the Agency on request.

13. Environment Agency Comments

13.1 Comments received from David Powell on 25th March 2021. Keltbray responses are provided in blue.

i. Clarification over site boundary that forms part of this deployment assessment

Some information has been provided for another site called 'The Bermondsey Campus'. 'The Bermondsey Campus' does not form part of this deployment assessment and as such no determination or assessment of any information in relation to the site has been assessed. If you have not already done so, you will need to submit another deployment application for 'The Bermondsey Campus'.

This permit application is subject to the wider Bermondsey Project which is divided into two sites; the Former Biscuit Factory and adjoining Campus site. The MMP2 Form has been updated to reflect the site boundary of the wider development. In addition Figure 1, 2 and 5 have been updated to include the wider site boundary of Bermondsey Project.

ii. MPP2 Form

B2.3 - Does the site form part of a cluster project? -Can you provide an answer to this question?

The project does not form part of a hub and cluster project. We only propose for material to be re-use at site of origin under an MMP and in accordance with the Remediation Strategy. The MMP2 Form has been updated.

iii. Site plan for the proposed treatment area

Please note the requirement for the following points are detailed within the MPP2 Form section B1.2.

Can you provide a site plan for the proposed treatment area? The plan must contain the following:

- Storage area(s) – this should include the waste and where any oil/fuel is stored.
- Contaminated area(s)
- Quarantine area(s) (should it be required)
- Location of plant material (for both technologies)

The site layout plan has been revised to include all requested information, as per Section B1.2 of the MMP2 Form. Please note that this is a proposed layout and it is likely to change as works progress.

iv. Drainage Plan

Can you provide a drainage plan and the location of the surface water discharge (should it be required). Can you confirm if the site has sealed drainage?

Drainage plans have been included in Appendix A, Figure 7 and Figure 8. The discharge locations are identified within the provided drawings and have been agreed with Thames Water under the relevant discharge consents.

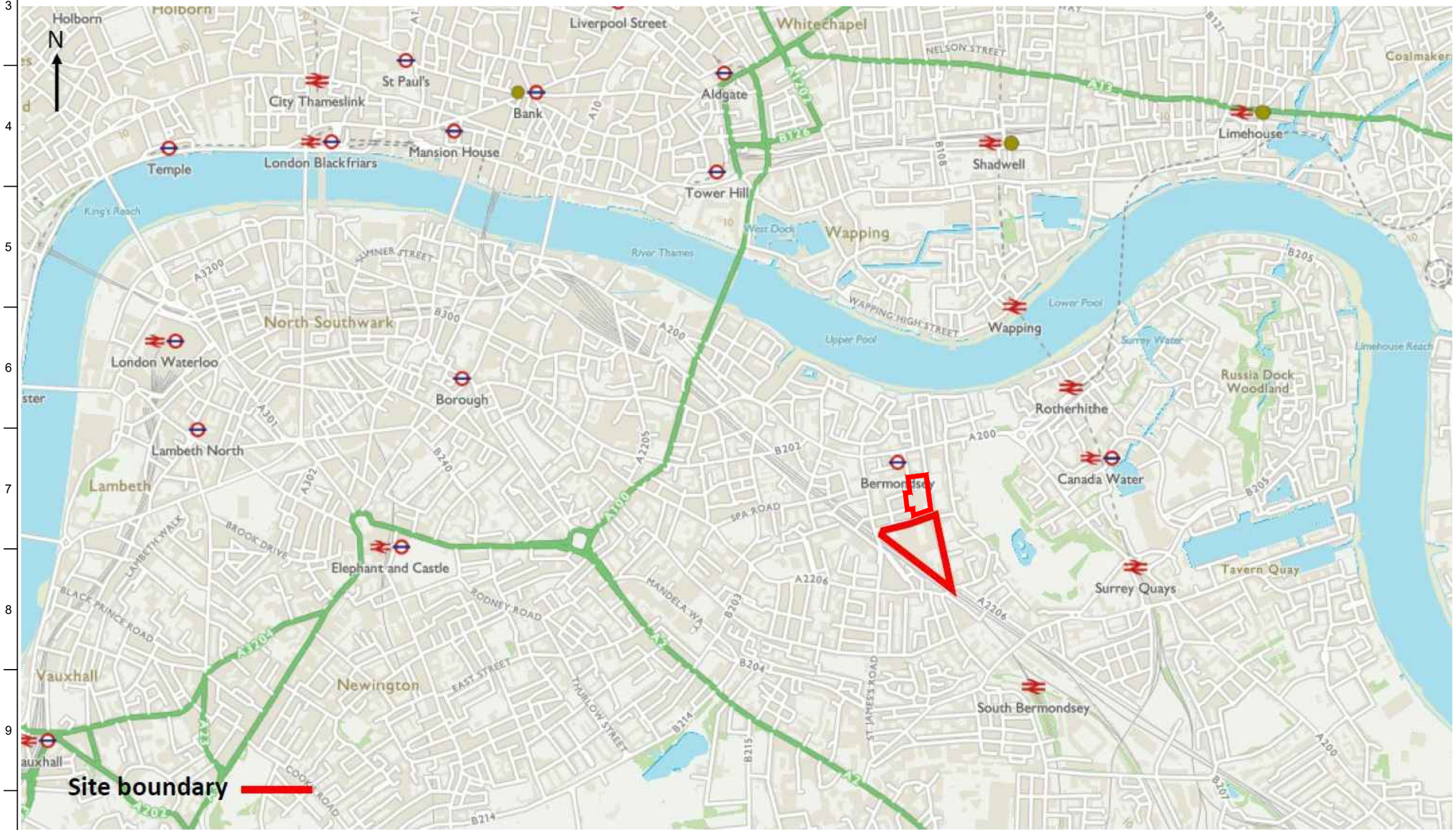
We can confirm that all drains have been sealed. Any drainage that is to be removed to facilitate the reduce dig excavation will be sealed at the point of entry/exit.

APPENDIX A

A3

Drawing Control This drawing is based on the following source information			
Component	Company	Drwg/Model Ref.	Date/Issue
-	-	-	-

Safety, Health and Enviromental Information
This drawing is for information purposes only. Exact dimensions and area designations to be confirmed on site.



NOTES:

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7. Any discrepancies in the information provided should be immediately reported to the Engineer prior to the commencement of work.

Rev	Date	By	Chkd	Appd
P01	29.03.2021	MP	29.03.2021	DV
FIRST FOR REVIEW				

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Client

GROSVENOR

Project Title

BERMONDSEY BISCUIT FACTORY

Key Plan

Drawing Title

SITE LOCATION PLAN

Scale at A3

1:2000

Role

X - SUBCONTRACTOR

Suitability

S2 - FOR INFORMATION

Keltbray Remediation Job No

T6347

Rev

P01

Name

BFX-KRE-X-000-XX-DR-CE-0008

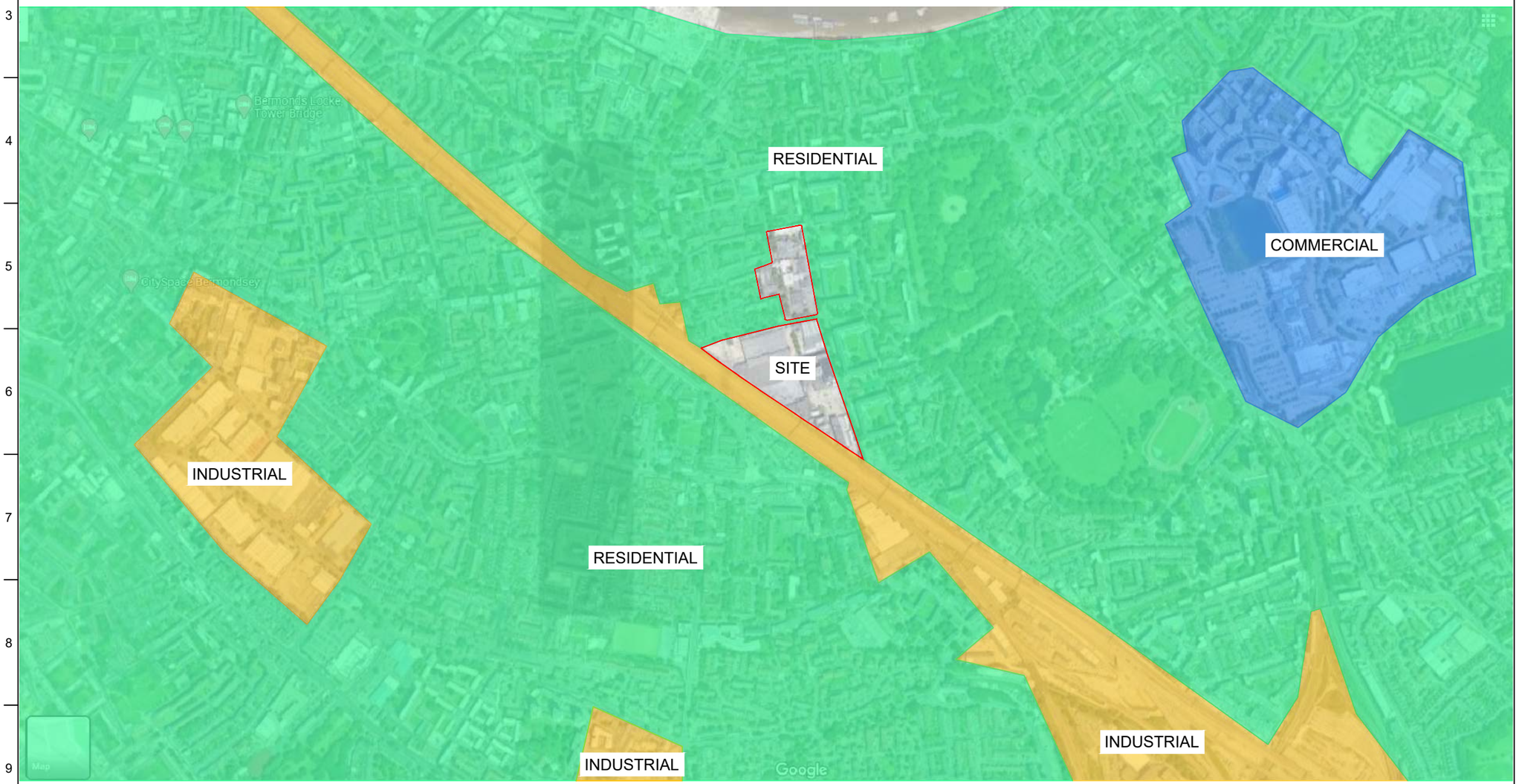
Phase - Originator - Role - Zone - Level - Type - Element - Number

Do not scale

A3

KEY

- Site boundary
- Residential area
- Industrial area
- Commercial area



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Drawing Control

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Component	Company	Drwg/Model Ref.	Date/Issue
-	-	-	-

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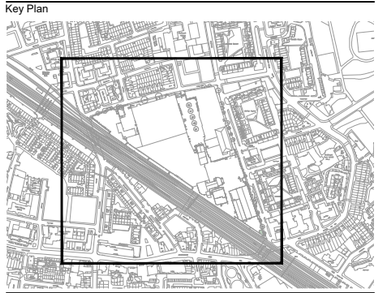
Client

GROSVENOR

Project Title

BERMONDSEY BISCUIT FACTORY

Key Plan



Drawing Title

SITE RECEPTORS PLAN

Scale at A3

1:2000

Role

X - SUBCONTRACTOR

Suitability

S2 - FOR INFORMATION

Keltbray Remediation Job No	Rev
T6347	P01

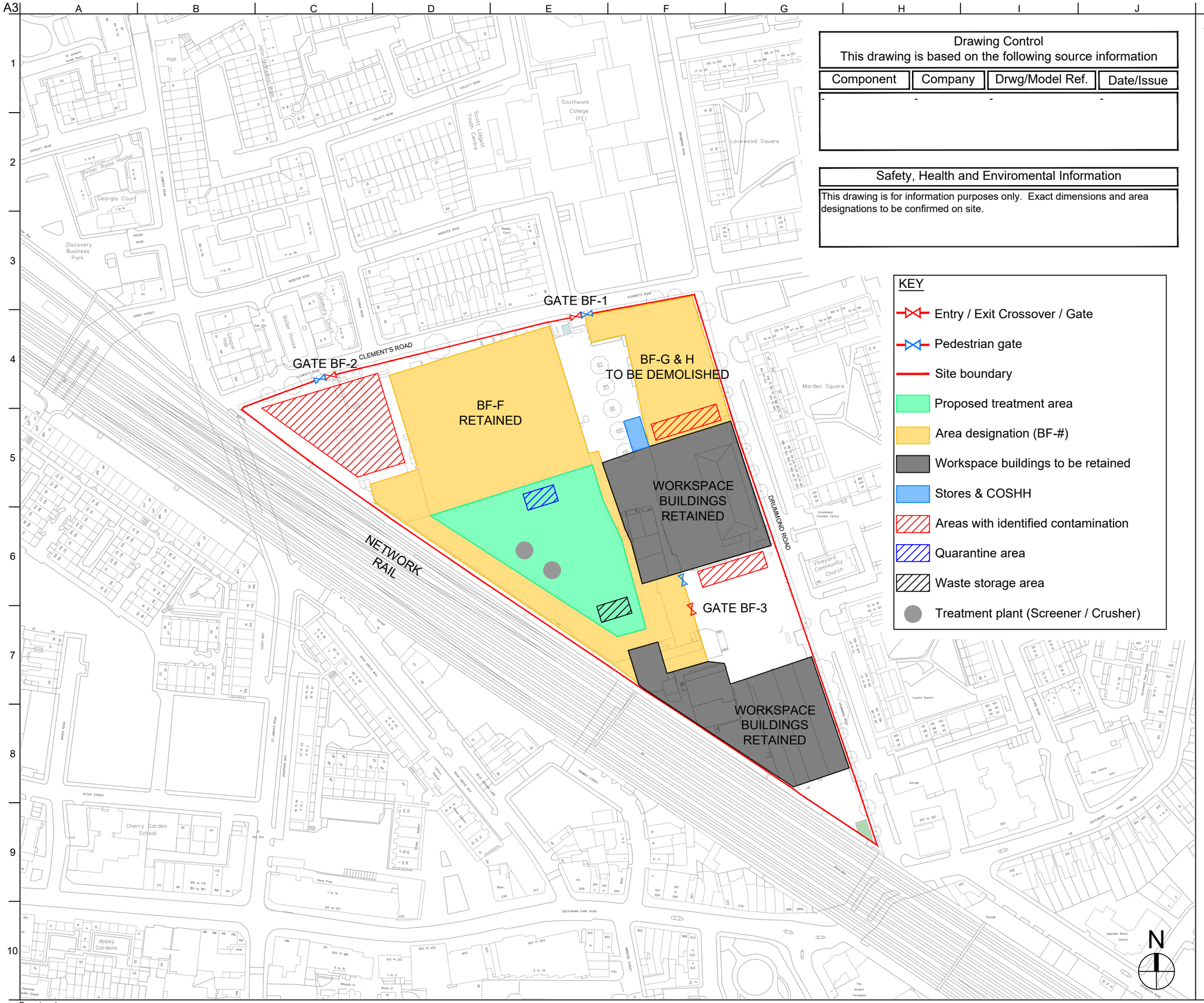
Name

BFX-KRE-X-000-XX-DR-CE-0007

Phase - Originator - Role - Zone - Level - Type - Element - Number

Do not scale

A3



KEY

- Entry / Exit Crossover / Gate
- Pedestrian gate
- Site boundary
- Proposed treatment area
- Area designation (BF-#)
- Workspace buildings to be retained
- Stores & COSHH
- Areas with identified contamination
- Quarantine area
- Waste storage area
- Treatment plant (Screener / Crusher)

Drawing Control

This drawing is based on the following source information

Component	Company	Drwg/Model Ref.	Date/Issue
-	-	-	-

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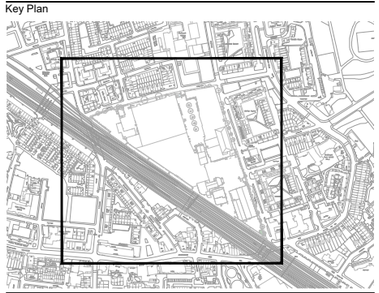
Key Plan



Drawing Title

MAIN SITE LAYOUT PLAN

Scale at A3

1:2000

Role

X - SUBCONTRACTOR

Suitability

S2 - FOR INFORMATION

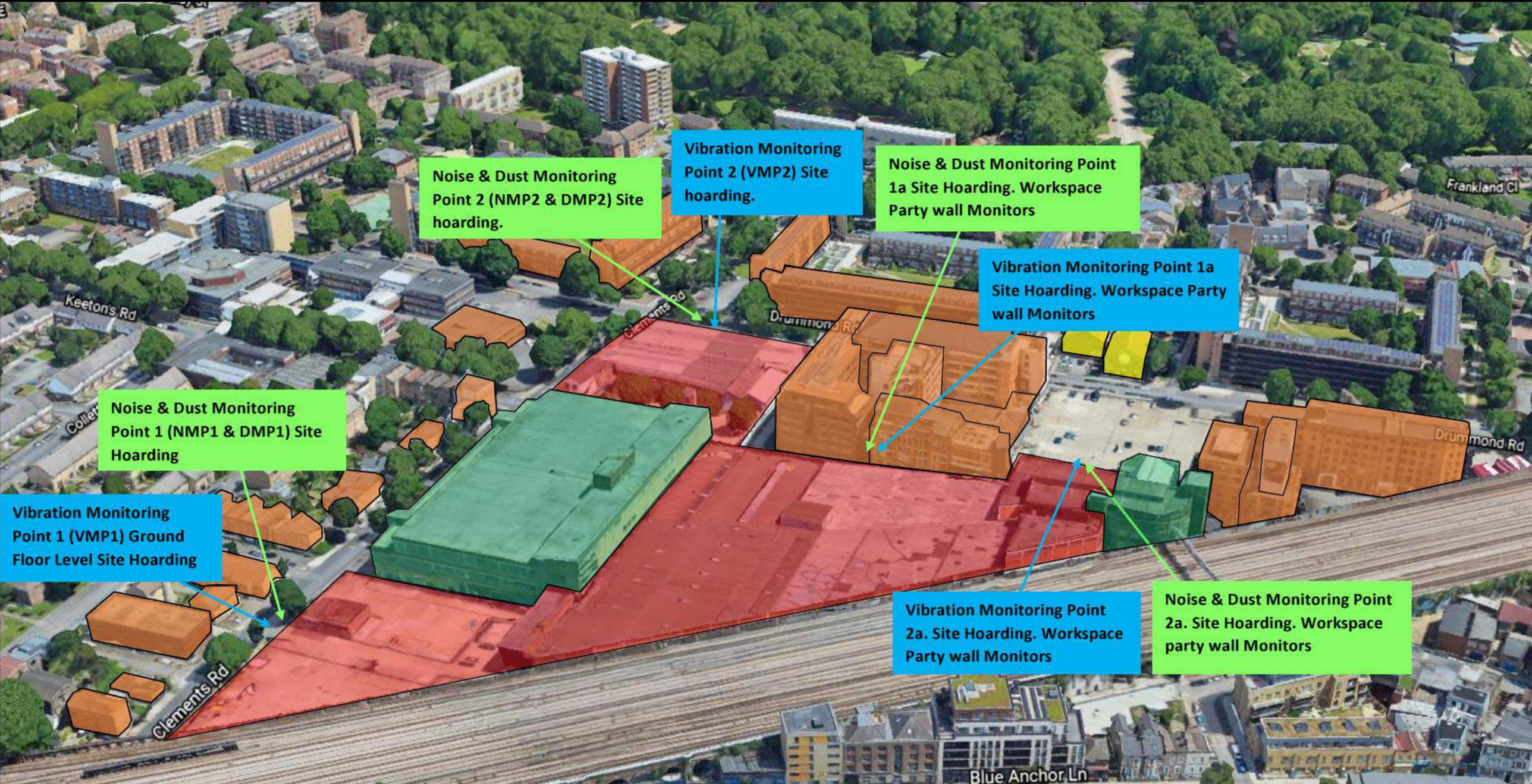
Keltbray Remediation Job No	Rev
T6347	P01

Name

BFX-KRE-X-000-XX-DR-CE-0006

Phase - Originator - Role - Zone - Level - Type - Element - Number

Do not scale


Noise & Dust Monitoring Point 2 (NMP2 & DMP2) Site hoarding.
Vibration Monitoring Point 2 (VMP2) Site hoarding.
Noise & Dust Monitoring Point 1a Site Hoarding. Workspace Party wall Monitors
Vibration Monitoring Point 1a Site Hoarding. Workspace Party wall Monitors
Noise & Dust Monitoring Point 1 (NMP1 & DMP1) Site Hoarding
Vibration Monitoring Point 1 (VMP1) Ground Floor Level Site Hoarding
Vibration Monitoring Point 2a. Site Hoarding. Workspace Party wall Monitors
Noise & Dust Monitoring Point 2a. Site Hoarding. Workspace party wall Monitors
Keetons Rd
Clements Rd
Drummond Rd
Frankland Cl
Blue Anchor Ln

14.2 Appendix A1 – Proposed NDV monitoring stations

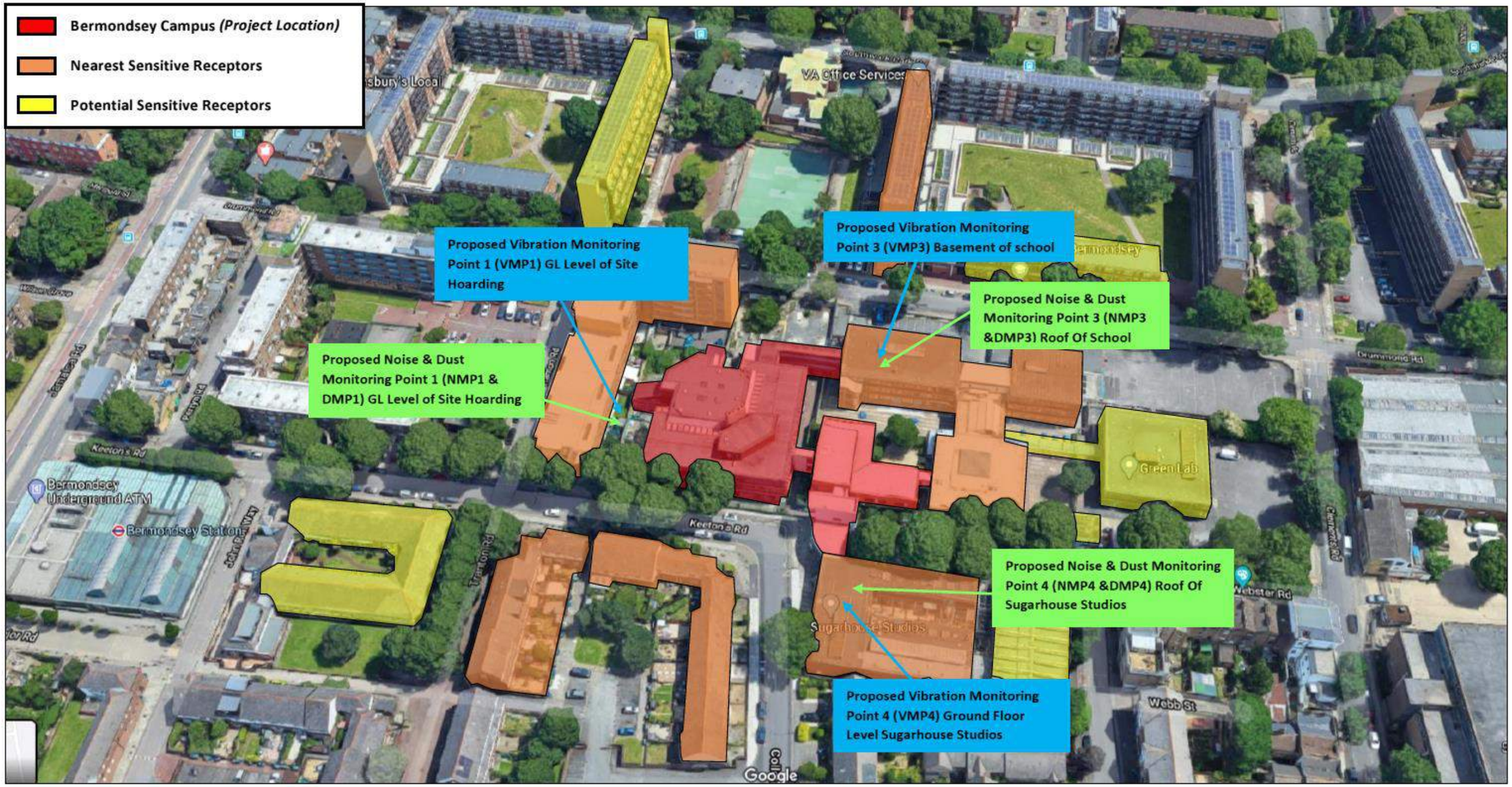
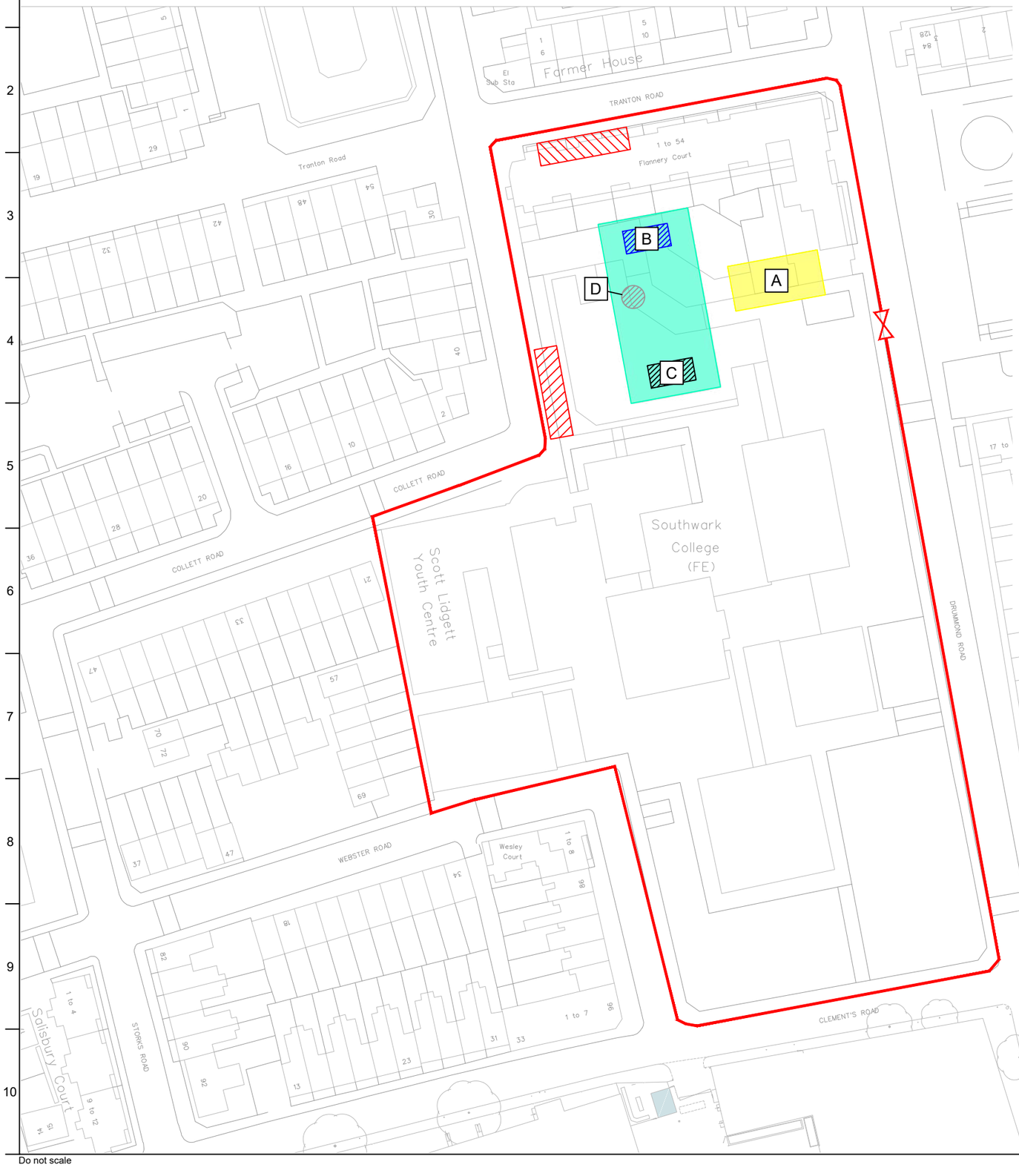


Figure 14.2: Proposed NDV monitoring stations

A3



Drawing Control

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Component	Company	Drwg/Model Ref.	Date/Issue
-	-	-	-

Safety, Health and Enviromental Information

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KEY

- Site boundary
- Entry / Exit
- A — Stores / COSHH
- Treatment area
- B — Storage of waste
- C — Quarantine area
- D — Treatment plant
- Area of identified contamination

NOTES:

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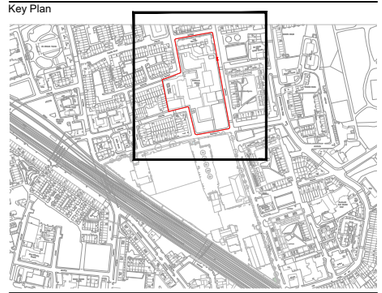
Project Title

BERMONDSEY BISCUIT FACTORY

Key Plan



Drawing Title

CAMPUS SITE PLAN

Scale at A3

1:1000

Role

X - SUBCONTRACTOR

Suitability

S2 - FOR INFORMATION

Keltbray Remediation Job No	Rev
T6347	P01

Name

BFX-KRE-X-000-XX-DR-CE-0004

Phase - Originator - Role - Zone - Level - Type - Element - Number

Do not scale

A1

Clements Road

Proposed Trade Effluent & sampling point

BF-1

BF-F

BF-G

BF-H

Plot 5

BF-E

BF-J

BF-K

BF-N

Shard Walk

Proposed Trade Effluent & sampling point

BF-D

BF-C

Drummond Road

BF-B

BF-A

Sheet not issued as part of Phase 1 Enabling Works

Sheet not issued as part of Phase 1 Enabling Works

0 5 10 20 50 Metres

Scale 1:1000

Notes

1. For general notes refer to drawing BER-ARP-BFXXX-XX-DR-D-00001.
2. Reference to be made to combined drainage layouts presented in the following drawing series; BER-ARP-BFXXX-XX-DR-D-22000
3. It is assumed that the buildings will be demolished in their entirety prior to any external drainage infrastructure being abandoned and/or removed.

Legend

Existing Utilities - To be retained
- Foul / Combined Drainage
- Surface Water Drainage
- Underground Chamber

Existing Utilities - Plot 5 As-Built - To be retained
- Foul / Combined Drainage
- Surface Water Drainage

Existing Utilities - Abandoned / Disconnected
- Foul / Combined Drainage
- Surface Water Drainage
- Underground Chamber

Proposed - Diversions
- Surface Water Diversion
- Foul Drainage Diversion

Buildings
- Existing Building - Retained
- Existing Building - Demolished
- Existing Building - Internal Stripout
- Plot Boundary

Issue	Date	By	Chkd	Appd
P02	14/10/19	MR	CM	RR
Tender Addendum				
P01	23/02/18	BK	CM	RR
Tender Issue 01				

ARUP

13 Fitzroy Street
London W1T 4BQ
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www.arup.com

Client
Grosvenor Group

Job Title
The Bermondsey Project
Biscuit Factory - Phase 1
Enabling and Demolition Works

Key Plan

Drawing Title
Biscuit Factory
Abandoned / Diverted Utilities
Combined Drainage
Key Plan

Scale at A1 1:1000

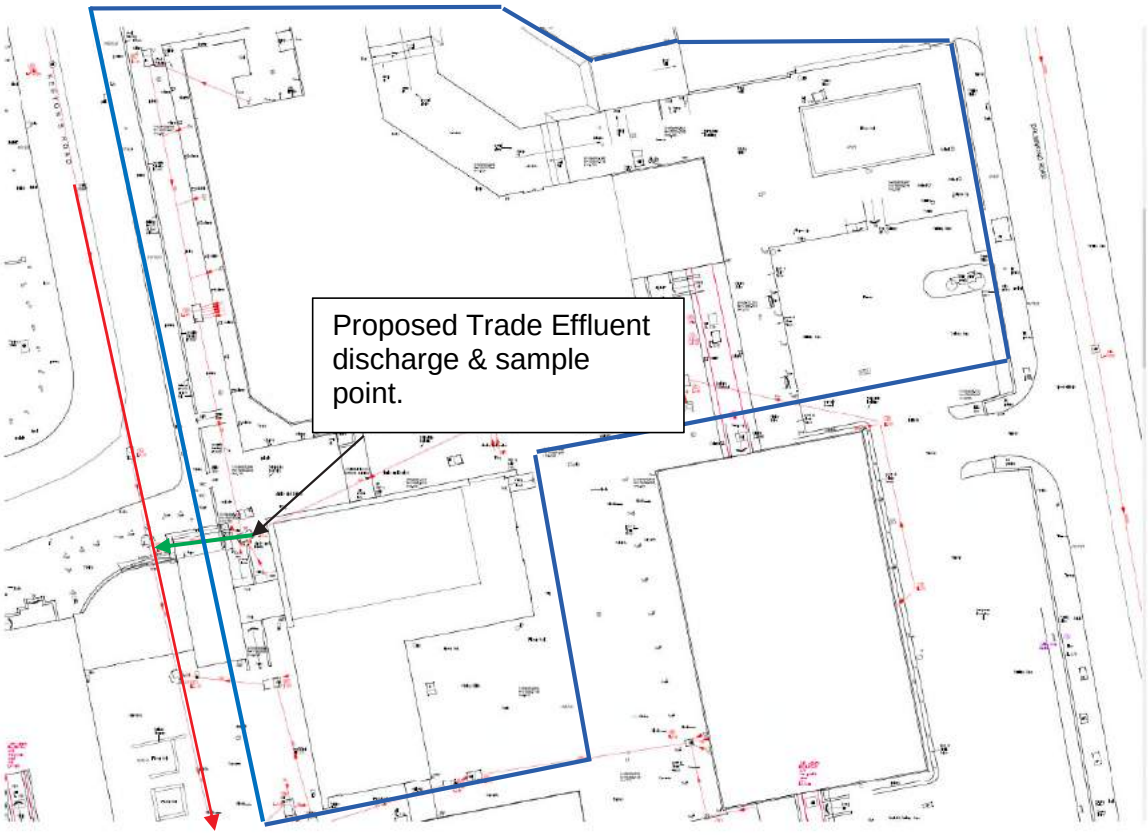
Discipline Civil

Job No **237092-00**

Drawing Status **Suitable for Tender**

Drawing No **BER-ARP-BFXXX-XX-DR-D-22000**

Do not scale



Key:

- Red - Sewer network
- Green - Trade Effluent (Proposed)
- Blue - On-site surface water

APPENDIX B
Deployment Form MPP2

Deployment form for land and groundwater remediation

Form MPP2: Deployment form

You will need to fill in this form if you are applying for a mobile plant permit deployment for land and/or groundwater remediation activities.

This form may only be used for deployments where the operator holds a permit referring to:

- **SR2008 No 27: mobile plant for the treatment of waste soils and contaminated material, substances or products**
- **bespoke permits for land and groundwater remediation**

The form can be:

1) **saved onto a computer and then filled in**
2) **printed off and filled in by hand. Please write clearly in the answer spaces**

You need to complete all sections of this form.

If any of the questions do not apply to you, please write "not applicable" and give a justification. If you leave anything out, we may need to get in touch with you for the information and our decision may be delayed.

If you are applying to extend your deployment, you must complete this deployment form and give your previous deployment reference number. You will also need to provide evidence as to why the treatment period needs to be extended and information on any changes that may have occurred at the site during the approved period of your operation. See the guidance on deployments and mobile plant permits on GOV.UK for more information.

It should take about one hour to fill in this form.

Where you see the term 'document reference' on the form, give the document references and send the documents with the application form when you've completed it.

Contents

Section A About you

A1 Contact details

A1.1 Your customer number, if applicable

It is always one letter and nine numbers for example, A 12345 6789. If you do not have a customer number, leave this blank. If you are extending your deployment please provide your previous deployment number.

Customer number

Previous deployment number, if relevant

A1.2 Discussions before your deployment application

If you have had discussions with us before your deployment application please give the case reference or details on a separate sheet. Tell us the reference you have given this extra sheet.

Pre-application reference

A1.3 Contact details for this deployment application

Please provide details of the person who will be the contact for queries about the information in this deployment form. This could be the operator or a person acting on behalf of the operator such as a consultant. They must be able to answer queries about any of the information in the form or additional information such as the risk-assessments. We may also need to speak to you if any information or the fee is missing or incorrect. This will help us to ensure that the agreement of the deployment form is not unduly delayed.

Title (Mr, Mrs, Miss and so on)

First name

A1 Contact details, continued

Last name

Organisation

Address

Postcode

Contact numbers, including the area code

Telephone

Mobile

Email

A1.4 Your preferred method of contact if we need more information

Please note we may also have to write to you as part of our assessment.

Email ☐

Phone ☐

A2 Your permit details

A2.1 Permit under which this deployment is taking place

Please provide the EPR permit number under which the deployment is being made. A deployment cannot be agreed unless a relevant permit is in force.

Permit number

A2.2 Name and address of permit holder (Operator)

Please give details of the operator or the company, individual or organisation who holds the permit.

Name of the operator

Address

Postcode

Section B Deployment details

B1 About the operating site

B1.1 Site address

Please give a general address for the site where the treatment is to take place and a 12 figure Grid Reference of the centre of the site. For information on how to get a grid reference please go to www.gridreferencefinder.com.

Address

Postcode

Grid reference (for example, ST 12345 67890)

B1 About the operating site, continued

B1.2 Attach a site plan showing area of land where the treatment will take place

You must provide an accurate and detailed site plan or plans. Please give the plan(s) a unique reference number so that when we agree to your deployment it can refer to the approved plan(s). Please show all the information listed below. We cannot accurately assess your application without this information.

- **operating site boundary** clearly outlined in red
- **security and access arrangements** including additional details where alternative security, other than that specified in the permit is to be provided for example, containerised unit and buried pipework or where others are responsible for site security and you are relying on that security for your plant
- **areas of waste soils and contaminated material, substances or products for remediation by the mobile plant**
- **location/siting of principle plant and equipment**
- **process treatment and storage areas** including any buildings, bays and fixed tanks, quarantine areas, areas of hardstanding, impermeable pavement and sealed drainage – where it is not possible to clearly draw these, include text which confirms that all potentially polluting materials will be deposited, stored, treated or otherwise handled in an area of the site where an engineered containment and drainage system has been provided
- **drainage systems** for the operating site, including all interceptors, sumps and discharge points
- **proposed location of boundary monitoring points and pollution control units** for example, for noise, dust and VOC emissions
- **potential receptors** for example, housing– identify all land uses immediately surrounding the site on the site plan including any areas of public open space
- **protected sites** – only special areas of conservation (SACs), special protection areas (SPAs), Ramsar sites and sites of special scientific interest (SSSIs) within 1 kilometre of the operating site need to be identified on the site plan

Reference number

B1.3 Is your operating site located within a site covered by another environmental permit?

Provide the name of the holders and the reference details of the existing permit. Check the existing permit for conditions, especially emission limits for compliance. If the proposed activity is operated in a way that it is a 'directly associated activity' to the existing permit, then the existing permit would have to be varied to include the proposed activity.

No ☐

Yes ☐ Please provide details below

Operator name

Permit number

Contact details

B2 Specified activities to be carried out at the site

It is quicker to assess your application if we have details of all of the contaminants and the likely daughter products resulting from the remedial action, the remediation method and the operating techniques proposed.

B2.1 Provide a brief summary of the contaminants to be treated

B2 Specified activities to be carried out at the site, continued

B2.2 Provide a list of the authorised treatment technology or technologies and a description of the operations that are to be carried out at this site and place them in context with other things that might be happening at this site

Provide a brief description of the planned activities and explain how they are connected to one another. List the technologies that you want to use. These must match those in your permit. We cannot approve a deployment application if it includes technologies that are not in the permit. You will either have to remove these technologies from your deployment application or apply to vary your permit. We will not be able to agree your deployment application until the variation is complete.

B2.3 Does the site form part of a cluster project?

This is where two or more sites use a shared permitted treatment facility (a hub site) to help them recover and reuse materials.

For more information see CL:AIRE Definition of waste: Development industry code of practice which can be found at www.claire.co.uk.

No ☐

Yes ☐

B3 Duration of this deployment

B3.1 What is the duration (specified period) that this deployment form is required for the operating site?

You must tell us how long you want the deployment to last for. We usually expect deployments to last for a maximum of 12 months (52 weeks). If you think that your deployment will last for more than 12 months, you must provide adequate justification with your application at the point of initial approval.

One deployment form must be completed even when it is anticipated that there may be several distinct phases to the remediation activities that may be separated in time. Operators must have regard to any activities that will be carried out in relation to 'rebound' associated with the technology.

If you are applying to extend your deployment, you must complete the deployment form and give your previous deployment reference number. You will also need to provide evidence as to why the treatment period needs to be extended and information on any changes that may have occurred at the site during the approved period of your operation. Please refer to the guidance on deployments and mobile plant permits on GOV.UK for further information on the allowable duration of an approved deployment operation.

What is the specified period you anticipate this deployment is required for? ⌊_____⌋ weeks

Provide details of reasons for why your deployment will last for more than 52 weeks

B4 Management supervision

B4.1 Please provide the name and contact details and/or the award certificate for the technically competent manager who will oversee this deployment

We may need to contact the technical competent manager (TCM) during any compliance inspections of the site, therefore we need to know who will be the TCM for this deployment. We will also need either the full name and date of birth of your TCM and/or a copy of their award certificate in order to confirm their competence.

Name of TCM ⌊_____⌋

Date of birth (DD/MM/YYYY) ⌊_____⌋

B4 Management supervision, continued

Contact details

Title (Mr, Mrs, Miss and so on)

First name

Last name

Organisation

Address

Postcode

Contact numbers, including the area code

Telephone

Mobile

Email

B4.2 Provide information on the site supervision plan for your TCM

Specify what treatment methods can be operated unsupervised and provide a justification as to why this needs to be the case

This might include treatment processes where automated and telemetric systems are in use. There is a minimum requirement for attendance which is 1 hour per week. Site supervision for treatment methods that could be operated unsupervised will be agreed on case by case basis.

B5 Waste types and quantities

B5.1 Specify waste types and quantities that you will be treating at the operating site, including the six digit code from the European Waste Catalogue (EWC)

Fill in details of the type, code, quantity and nature of the contaminated material, products or substances that you want to treat. You must use the appropriate six-digit waste code and describe the waste using its common description and name.

Some examples of the waste types (including the six digit EWC code) that are typically included in a deployment application are listed below. This is not a definitive list. You can apply to treat other wastes. Guidance on helping you to classify your waste and a copy of the European Waste Catalogue can be found at www.gov.uk/how-to-classify-different-types-of-waste.

For example:

- soil, contaminated soil, stones and dredging spoil – EWC codes 17 05 03 to 17 05 08
- other construction and demolition wastes – EWC codes 17 09 01 to 17 09 04
- wastes from soil and groundwater remediation – EWC codes 19 13 01 to 19 13 08

B5 Waste types and quantities, continued

An asterisk after a waste code means it is hazardous.

Waste type	EWC six digit code	Quantity (m^3)	Medium Solid/gas/water/sludge

B6 Acceptance procedures

B6.1 Please supply details of the procedures to be adopted at the site to ensure that only those materials that are treatable with the specified technology will be treated

You must provide details of the measures that you will take to ensure that only the waste soil, contaminated material or contaminated groundwater that can be treated by the technologies you are planning to deploy will be treated. Your waste acceptance procedure must be robust enough to prevent unacceptable waste being brought on-site. You may have already provided some of this information in the environment management system for your permit. You may refer back to this document and use this section to provide information on any additional, site specific procedures you will use.

Provide a supporting document reference if needed

B6.2 Detail how residual materials or waste which cannot be treated by the specified technology are to be handled at the site

It must also cover what you intend to with any materials or waste on site which cannot be treated. How these will be identified and the methods that you will use to ensure that they are kept separate from those materials/waste that can be treated.

Provide a supporting document reference if needed

B6.3 Specify the maximum capacities of quarantine facilities to be used for the storage of contaminated materials destined for re-testing, re-processing or off-site disposal

Include details of any containment you will be putting in place to prevent or minimise pollution. Please clearly indicate the locations of any quarantine areas on the site plan.

Provide a supporting document reference if needed

B7 Conceptual model (CM) and risk assessment

Use this section to outline the likely impact of your operations on the environment.

At the deployment assessment stage we are only concerned with how your treatment activities will impact on the receptors in and around your site and the local environment. You do not have to provide details of why the treatment is needed.

This is not the same as a conceptual site model and risk assessment that you may have completed to produce a remediation strategy for the site. This form must not detail why the treatment is needed. A remediation strategy is usually agreed prior to deployment. See Land contamination risk management for more details:
https://www.gov.uk/guidance/land-contamination-how-to-manage-the-risks

It would be useful for us to know if you have submitted a remediation strategy to us.

No ☐
Yes ☐

B7.1 Please provide a CM which identifies all plausible pollution linkages (source-pathway-receptor relationships) and potential impacts to the local environment which could arise as a result of the proposed treatment activities

The CM needs to consider the following.

All potential sources of pollution including:

- the contaminants
- daughter products resulting from the remedial action
- waste residues generated during the remedial action for example, waste waters
- emissions such as dust, fibres, particulates, vapours, gases, aerosols, odour, noise, vibration and volatile organic carbons (VOCs)
- reagents used
- the final treated material
- storage of fuel oil or chemicals

List all site-specific pathways that exist without control measures for example, engineered containment system in place. This might include dermal contact, inhalation, migration through groundwater and fractured rocks and surface water run-off.

Identify the actual receptors surrounding the site that may be at risk including information on any special habitat sites that are likely to be affected. You must include SPAs, SACs, Ramsar site and SSSIs within 1 kilometre of the site.

You can choose the format of your CM. However, your application will be easier to assess if you present the CM using the template below. Please cross reference any conditions in your permit, where applicable, that require appropriate pollution control measures to be in place.

The risk assessment must be site specific and directly relevant to the activity being carried out at the location. It must identify all pollution linkages relating to the operation that could result in pollution to the environment or harm to human health, including information on the risk management option to mitigate identified risks. Additional guidance on groundwater risk assessment can be found at www.gov.uk/guidance/groundwater-risk-assessment-for-your-environmental-permit.

Use the template below. Provide a supporting document reference if additional information is included.

Source The agent or process with potential to cause harm	**Receptor** What is at risk? What do I wish to protect?	**Harm** The harmful consequences if things go wrong	**Pathway** How the receptor might come into contact with the source	**Probability of exposure** Severity of the consequences if this occurs	**Consequence** Severity of the consequences if this occurs	**Magnitude of risk** The overall magnitude of risk	**Justification for Magnitude** Basis of my judgement	**Risk Management** How can I best manage the risk to reduce the magnitude	**Residual Risk** Magnitude of the risk after management
Example:									
Contaminant	Groundwater and stream	Damage of waters	Direct run off	Medium	Medium	Medium	Effect of contaminant on stream wildlife	Impermeable pavement with sealed drainage	Low

B8 Pollution control

For noise, dust, particulates, fibres, aerosols, odour, VOCs, vapours, gases, fuel, oil / or chemical storage, vibration and pests.

B8.1 Provide details of any site specific measures needed to control or minimise emissions, and prevent pollution of the environment and harm to human health resulting from your treatment activities

Provide details of the control measures that you will put in place to minimise risks or impacts identified in your risk assessment that you completed as part of question B7.1.

For example:

- how you are going to collect, treat and contain any dusts, fibres and particulates from the treatment process to prevent pollution and harm to human health
- how you are going to minimise any noise and vibration at the site, for example strategic site layout, screening, temporary bunding.
- how odours and VOC emissions are to be controlled at the operating site
- if the nature of the material that is to be stored and treated is such that it will contain substances that will attract pests or scavengers or is likely to release litter, how these will be managed and controlled
- how groundwater and surface water contamination will be prevented or minimised

Provide a supporting document reference if needed

B9 Emission monitoring plans

B9.1 Provide a site specific monitoring plan for any emissions that may be generated by the proposed treatment activities.

Such monitoring plans must include information on all of the following, if applicable to your process:

- **groundwater**
- **surface water**
- **soil gases and vapours**
- **air emissions**
- **noise**
- **vibration**
- **odour**
- **VOCs**

Specify the indicator parameters you propose to use for each of the emissions being monitored and provide a justification on why they are the most appropriate parameters to detect impact and prevent pollution. Depending upon your technology the plan needs to include both point source and wider (fugitive) emissions monitoring.

You must provide a site specific monitoring plan that is appropriate for the proposed activity. Where your risk assessment has shown there is an emissions risk which requires control, you must monitor to determine the emissions and the effectiveness of any abatement systems. For example, stockpiling at a site surrounded by residential properties would require air monitoring for dusts and VOCs both close to the stockpile and at boundaries depending on location of receptors. The level of monitoring would depend on the risks involved but as a standard rule, daily visual and olfactory monitoring need to be considered.

Your monitoring plans need to include the following:

- pollutants to be monitored
- emission limits and trigger levels for each pollutant
- number and location of point source emission points:
  - point source emission include stack emissions, off-gasses from exhaust, effluent from water treatment plants
  - these must be monitored or sampled prior to discharge
  - the environmental media into which they are being discharged (air, surface and groundwater) must also be monitored (usually at site boundaries) to ensure environmental quality standards (EQS) are maintained
- influent and effluent details – only use this if there is no emission limits for a particular hazardous air pollutant, a 95% removal rate must be maintained at all times

B9 Emission monitoring plans, continued

- monitoring protocol which includes frequency of monitoring, type of equipment, calibration, accreditation, sample collection and procedure
- the experience and qualifications of personnel carrying out the monitoring and the personnel responsible for interpreting and acting upon the results of monitoring
- emissions action plan – the action to be taken if an agreed trigger level is exceeded
- a baseline monitoring programme might be required where other emission sources similar to the proposed activity already exist
    - background levels would act as a reference level for the relevant parameter(s) that would be monitored
    - this will alert you to an increase or decrease in emissions

For boundary air quality monitoring, a trigger level for each parameter for example, between 80% and 90% of air quality criterion must be provided. Relevant trigger levels must be protective of each environmental medium or human health. For point source emissions such as stack emissions after scrubbing, oxidation, and so on, you need to provide a quantitative assessment using Air emissions risk assessment for your environmental permit.

If a monitoring plan has already been completed for the operating site for other purposes, for example development control then any parts of it that you wish to use to demonstrate no impact from your activities may simply be incorporated into this deployment form.

As a minimum we would expect to see trigger levels for:

- noise
- dust
- VOCs

Use the examples and template below on how to set these. See further information in the guidance on deployments and mobile plant permits on GOV.UK.

Type of Pollution	Trigger Levels
Example: Noise	Normally, not more than 5dB above background noise level according to British Standard
Example: Dust	200mg/m^3 – TGN M17 guidance
Example: Trigger level VOCs based on the indicator parameter	Consult the air emissions guidance for relevant trigger level for the indicator parameter you have chosen. Where emission limits are not available in the air emissions guidance for the VOCs compounds being monitored, available limits on the EH40 guidance may be accepted. Limits in the EH40 might need further adjustment in line with air emissions guidance methodologies where sensitive receptors are likely to be exposed over periods greater than 8 hours.

Extra Information about noise monitoring

The aim of noise monitoring must be to ensure that there is no reasonable cause for annoyance to persons beyond the operating boundary. Trigger levels based on the health and safety of on-site employees are not appropriate. Proposals for noise trigger levels that take into account background noise levels at the site boundary in line with BS4142: 2014 Methods for assessing industrial and commercial sound are considered, more appropriate. Please refer to the regulation of noise at waste management facilities at www.gov.uk/government/publications/environmental-permitting-h3-part-2-noise-assessment-and-control.

Provide a supporting document reference if needed

B10 Record keeping – commissioning, operating and maintenance

B10.1 Provide details of commissioning, operating and maintenance health

You must provide details of your commissioning, operating and maintenance procedures including documentation and record keeping to show that emissions from your treatment processes are not causing pollution or harm to human health.

Extra guidance in relation to commissioning

Only the materials necessary to complete commissioning are allowed to be treated until a validation report, prepared by a suitably qualified person (for example, engineer or microbiologist, dependent upon the technology) has been provided to the Environment Agency demonstrating that commissioning has been successfully achieved. The operator must comply with the conditions of the permit during commissioning operations.

Provide a supporting document reference if needed

B11 Checklist of supporting documents

Please ensure that you include the following relevant documents with your deployment application:

Site plan, question B1.2 ☐

Management supervision, question B4.1 ☐

Acceptance Procedures, question B6.1 and B6.2 ☐

Conceptual model and risk assessment, question B7.1 ☐

Pollution control, question B8.1 ☐

Monitoring plans, question B9.1 ☐

Record keeping, question B10.1 ☐

Section C Fee

You have to submit an application fee with your deployment form. For details see deployment fees in the deployments and mobile plant permits on GOV.UK.

This section must be completed for all deployments. Indicate the payment method you will use.

Credit or debit card ☐

Cheque or postal order ☐

Electronic transfer (for example, BACS) ☐

How to pay

Credit or debit card payment

To pay by debit or credit card, call us on:

- 03708 506 506
- Telephone from outside the UK (Monday to Friday, 8am to 6pm GMT) +44 (0) 114 282 5312
- Minicom (for the hard of hearing) 03702 422 549

We can accept payments by Visa, MasterCard or Maestro card only.

Alternatively you may give a contact telephone number in the box below and we will call you to take payment details.

Telephone

Mobile

Paying by cheque or postal order

You should make cheques or postal orders payable to 'Environment Agency' as appropriate and make sure they have 'A/c Payee' written across them if it is not already printed on.

Section C Fee, continued

Please write the name of your company and your permit reference number on the back of your cheque or postal order. We will not accept cheques with a future date on them.

Cheque made payable to

Cheque number

Amount £

Paying by electronic transfer for example, BACS

Use the following information to make your payment by electronic transfer.

Company name:	Environment Agency
Company address:	SSCL (Environment Agency), PO Box 797, Newport Gwent, NP10 8FZ
Bank:	RBS/NatWest
Address:	London Corporate Service Centre, CPB Services, 2nd Floor, 280 Bishopsgate, London EC2M 4RB
Sort code:	60-70-80
Account number:	10014411
Account name:	EA RECEIPTS

You need to create your own reference number. It must be in the format: **PSCDEPXXXXXYYY**

Your reference number should:

- begin with PSDEP to reflect that the application is for a deployment
- include the first five letters of your company name replacing the X's in the above reference number
- a unique numerical identifier replacing the Y's in the above reference number

The reference number that you supply will appear on our bank statements.

You also need to email your payment details and reference number to ea_fsc_ar@sscl.gse.gov.uk.

If you are making your payment from outside the United Kingdom, it must be in sterling. Our IBAN number is GB23NWK60708010014411 and our SWIFTBIC number is NWBKGB2L.

If you do not quote your reference number, there may be a delay in processing your payment and application.

Section D Privacy notice

The Environment Agency runs the environmental permit application service.

We are the data controller for this service. A data controller determines how and why personal information is processed.

Our personal information charter explains:

- your rights
- what we do with your personal information

We're allowed to process your personal information because we have official authority as the environmental regulator. We need this information to carry out a task in the public interest that is set out in law. As the data controller, when you apply for an environmental permit, we have a legal obligation to process your personal data under the Environmental Permitting Regulations. The second lawful basis for processing your personal data is to comply with this legal obligation.

We need your personal information to process your environmental permit application. If you do not give us this information we cannot issue a permit to you. After we've issued a permit to you, we use your personal information:

- to check that you're complying with your permit
- during any potential enforcement action

What personal information we collect

If you're the individual applicant, director or company secretary of a company applying or a technically competent manager we need your:

- name
- address
- email address

If you're the agent, consultant, employee responsible for the activity or the employee responsible for billing and invoicing we need your:

- name

Section D Privacy notice, continued

- address
- email address

If you're the applicant we need details of any:

- convictions
- bankruptcy

We also collect any questions or feedback you leave, including your email address if you contact us.

Your responsibility with other people's personal information

If you've included personal information about other people on your application, you must tell them. You must provide them with a copy of this privacy notice so that they know how their personal information will be used.

What we do with your personal information

We use your personal information to help us decide whether to issue you with a permit.

The information is available online on our consultation website during the consultation period. This website is available to everyone so your information may be seen outside the European Economic Area.

After consultation we put all the information you give us in your application on our public register.

If you can demonstrate that any information you send us is commercially or industrially confidential, we'll consider withholding that information from our public register.

If you think that the information you'll send us may be a threat to national security you must contact the Secretary Of State before you apply. You must still send us that information with your application. We will not include this information on our public register unless the Secretary of State decides it can be included.

See the environmental permitting guidance for guidance on national security.

We may use your email address to contact you for user research to improve our service. You don't have to take part in the research.

Where your personal information is processed and stored

We store and process your personal information on servers in the UK. We will not host your personal information outside the European Economic Area.

We do not use your personal information to make an automated decision or for automated profiling.

How long we keep your personal information

We keep your personal information while your permit is in use and for 7 years after you surrender your permit. If the permit is for a landfill site, we keep the data for 10 years after surrender.

Removing personal information from the public register

We will remove your personal information from the public register if:

- you withdraw your application
- we refuse your application and the time limit for appealing the decision has expired or an appeal is dismissed
- the information is no longer relevant for public participation purposes under the Environmental Permitting Regulations

Contact

Our Data Protection Team gives independent advice. They monitor how the Environment Agency uses your personal information.

If you have questions or concerns about how we process personal information, or to make a complaint or request relating to data protection, please contact:

Address: Data Protection Team
Environment Agency
Horizon House
Deanery Road
Bristol
BS1 5AH

Email: dataprotection@environment-agency.gov.uk

You can also make a complaint to the Information Commissioner's Office (ICO).

The ICO is the supervisory authority for data protection legislation.

The ICO website has a full list of your rights under data protection legislation.

Now read Section E below.

Section E Confidentiality and national security

We will normally put all the information in your application on a public register of environmental information. However, we may not include certain information in the public register if this is in the interests of national security, or because the information is confidential.

You can ask for information to be made confidential by enclosing a letter with your application giving your reasons. If we agree with your request, we will tell you and we will not include the information in the public register. If we do not agree with your request, we will let you know how to appeal against our decision, or you can withdraw your application.

Only tick the box below if you are certain that you wish information to be confidential. This may delay your application.

Please treat the information in my application as confidential ☐

You can tell the Secretary of State that you believe that including information on a public register would not be in the interests of national security. You must enclose a letter with your application telling us that you have told the Secretary of State and you must still include the information in your application. We will not include the information in the public register unless the Secretary of State decides that it must be included.

You cannot apply for national security via this application.

Section F Declaration

The application contact must tick the declaration section. The application contact must be the operator or their agent. A person knowingly or recklessly making a statement which is false or misleading when providing information to us commits an offence under regulation 38 of the Environmental Permitting (England and Wales) Regulations 2016.

If you make a false or misleading statement:

- we may prosecute you
- if you are convicted, you are liable to a fine or imprisonment (or both)

I declare that the information provided both on the form and in the supporting documentation which has been supplied with this form is true to the best of my knowledge and belief ☐

Section G How to contact us

If you need help filling in this form, please contact the person who sent it to you or contact us as shown below.

Telephone: 03708 506 506 (Monday to Friday, 8am to 6pm)

Telephone from outside the UK: +44 (0) 114 282 5312 (Monday to Friday, 8am to 6pm GMT)

Minicom (for the hard of hearing): 03702 422 549

Email: enquiries@environment-agency.gov.uk

Website: www.gov.uk/government/organisations/environment-agency

If you are happy with our service, please tell us. It helps us to identify good practice and encourages our staff. If you're not happy with our service, please tell us how we can improve it, or you would like us to review a decision we have made, please let us know. More information on how to do this is available at: www.gov.uk/government/organisations/environment-agency/about/complaints-procedure.

Please tell us if you need information in a different language or format (for example, in large print).

Section H Where to send your form

Send your deployment form, fee and supporting documents by email to PSC@environment-agency.gov.uk

Or by post to:

Environment Agency Permitting and Support Centre
Environmental Permitting Team
Quadrant 2
99 Parkway Avenue
Parkway Business Park
Sheffield
S9 4WF

Do you want all information to be sent to you by email?

Please tick this box if you wish to have all communication about this application sent via email (we will use the details provided in part A1.3) ☐

Feedback

You don't have to answer this part of the form, but it will help us improve our forms if you do.

We want to make our forms easy to fill in and our guidance notes easy to understand. Please use the space below to give us any comments you may have about this form or the guidance notes that came with it.

How long did it take you to fill in this form?

We will use your feedback to improve our forms and guidance notes, and to tell the government how regulations could be made simpler.

Would you like a reply to your feedback?

Yes please ☐

No thank you ☐

For Environment Agency use only

Date received (DD/MM/YYYY)

Our reference number

Payment received?

No ☐

Yes ☐ Amount received

£

APPENDIX C
WAMITAB Certificates

Continuing Competence Certificate

This certificate confirms that

Jack Holliday

Has met the relevant requirements of the Continuing Competence scheme for the following award(s) which will remain current for two years from 15/01/2020

TMH	Treatment - Hazardous Waste
CLR	Contaminated Land Remediation

Expiry Date: 15/01/2022

Verification date: 09/01/2020

Authorised:

WAMITAB Chief Executive Officer

Learner ID: 27288

Certificate No.: 5158121

Date of Issue: 15/01/2020

CIWM Chief Executive Officer

The Chartered Institution of Wastes Management

00129450

Certificate No: 13918

CERTIFICATE OF TECHNICAL COMPETENCE

This Certificate confirms that

Jack Holliday

Has demonstrated the standard of technical competence required for the management of a facility of the type set out below

Facility Type

Level 4 in Waste Management Operations -

Managing Treatment Hazardous Waste (4TMH)

Authorising Signatures:

Chief Executive Officer

Director:

Date of issue: 06 January 2016

00021104

Certificate No. OCC6485

Operator Competence Certificate

Title:

Managing Physical & Chemical Treatment - Hazardous Waste - 4MPTH

This Certificate is awarded to

Jack Holliday

Awarded: 06/01/2016

Authorised

WAMITAB Chief Executive Officer

CIWM Chief Executive Officer

The Chartered Institution of Wastes Management

This certificate is jointly awarded by WAMITAB and the Chartered Institution of Wastes Management (CIWM) and provides evidence to meet the Operator Competence requirements of the Environmental Permitting (EP) Regulations, which came into force on 6 April 2008.

00100083

wamitab

Qualification Title:

WAMITAB Level 4 Diploma in Waste Management Operations : Managing Physical & Chemical Treatment - Hazardous Waste - 4MPTH

Qualification Accreditation Number:

600/0331/5

This Certificate is awarded to

Jack Holliday

Awarded: 06/01/2016

Serial No:27288/4MPTH/1

Authorised

Ray Burberry
Qualifications Manager, WAMITAB

Regulated by Ofqual

For more information see http://register.ofqual.gov.uk

Corff dyfarnu cydnabyddedig
CYMWYSTERAU CYMRU QUALIFICATIONS WALES
Recognised awarding body

The qualifications regulators logos on this certificate indicate that the qualification is accredited only for England, Wales and Northern Ireland.

00100096

Credit certificate
This certificate determines credit awarded to:
Jack Holliday

Units gained:

		Credit Value	Credit Level
Y6015875	Monitor procedures to safely control work operations	4	3
K6009711	Manage physical resources	3	4
M6009712	Manage the environmental impact of work activities	5	4
Y6021501	Control work activities on a waste management facility	9	3
A6021670	Manage the movement, sorting and storage of waste	7	3
K6021423	Procedural compliance	6	4
M6021424	Manage and maintain effective systems for responding to emergencies	19	4
D6021435	Control maintenance and other engineering operations	13	4
K6021504	Manage improvements to waste management operations	7	4
F6021606	Manage the reception of hazardous waste	15	4
H6021646	Manage site operations for the treatment of hazardous waste	22	4
J6021672	Manage the transfer of outputs and disposal of residues from hazardous waste treatment and recovery operations	13	4

Awarded: 06/01/2016

Serial No.: 27288/HSS3/1

Authorised

Ray Burberry
Qualifications Manager, WAMITAB

Regulated by Ofqual

For more information see http://register.ofqual.gov.uk

Corff dyfarnu cydnabyddedig
Cymwysterau Cymru Qualifications Wales
Recognised awarding body

The qualifications regulators logos on this certificate indicate that the qualification is accredited only for England, Wales and Northern Ireland.

00100091

Certificate No. CCC15977

Continuing Competence Certificate

This certificate confirms that

Jack Holliday

Has met the relevant requirements of the Continuing Competence scheme for the following award(s) which will remain current for two years from 23/01/2018

TMH	Treatment - Hazardous Waste
CLR	Contaminated Land Remediation

Awarded: 23/01/2018

Expiry Date: 23/01/2020

Authorised

WAMITAB Chief Executive Officer

CIWM Chief Executive Officer

The Chartered Institution of Wastes Management

00097359

Certificate No: 13918

CERTIFICATE OF TECHNICAL COMPETENCE

This Certificate confirms that

Jack Holliday

Has demonstrated the standard of technical competence required for the management of a facility of the type set out below

Facility Type

Level 4 in Waste Management Operations -

Managing Treatment Hazardous Waste (4TMH)

Authorising Signatures:

Chief Executive Officer

Director:

Date of issue: 06 January 2016

00021104

Certificate No. CCC15977

Continuing Competence Certificate

This certificate confirms that

Jack Holliday

Has met the relevant requirements of the Continuing Competence scheme for the following award(s) which will remain current for two years from 23/01/2018

TMH	Treatment - Hazardous Waste
CLR	Contaminated Land Remediation

Awarded: 23/01/2018

Expiry Date: 23/01/2020

Authorised

WAMITAB Chief Executive Officer

CIWM Chief Executive Officer

The Chartered Institution of Wastes Management

00097359