Wickside, Hepscott Road, London

Remediation Strategy

GB Card & PARTNERS

Client:

CJ O'Shea and Company Limited

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1. INTRODUCTION

GB Card & Partners ("GBCP") are instructed by C J O'Shea and Company ("The Client") to provide geotechnical and geo-environmental engineering advice in relation to the development of the site at Wickside, off Hepscott Road, Hackney Wick, London. The site has had a varied history, consisting of a predominantly industrial use, most recently as a materials recycling facility. The development proposals are for a residential led scheme, with building units up to eight storeys in height. A basement will be located in the western part of the site.

A desk study[1] and an intrusive ground investigation[2] were previously undertaken for the site by Card Geotechnics Limited ("CGL"). To obtain further information on the ground and groundwater conditions, including ground contamination beneath the site and to target areas that were previously not investigated, a supplementary investigation was also undertaken by Oakley Soils and Concrete Engineering Limited ("Oakleys") under the direction GBCP in two phases, between 27 April and 5 May 2020 and between 14 September and 1 October 2020.

The findings from both phases of the investigation and an updated conceptual site model ("CSM") and risk assessment with respect to the ground conditions identified is presented in the GBCP *Site Investigation Interpretive Report*[3] ("SIIR"). Furthermore, GBCP have carried out a Detailed Quantitative Risk Assessment[4] (DQRA) to further assess the potential impacts from hydrocarbons in shallow soils and groundwater on the water environment and to calculate the remediation targets.

This *Remediation Strategy* report has been prepared to ensure that the ground contamination risks are adequately managed and to provide information relevant to material management. The Remediation Strategy comprises the method statement for (i) the excavation of the basement, (ii) the removal of gross ground contamination, (iii) decommissioning of the deep boreholes, and (iv) the verification plan required to ensure that the remediation works has been completed and are in compliance with the remediation targets. Detailed

[1] Card Geotechnics Limited (July 2014). *McGrath Site B, Fish Island North. Desk Study.*
[2] Card Geotechnics Limited (August 2016). *McGrath Site, Wickside, London. Geotechnical and Geo-Environmental Interpretive Report.*
[3] GBCP (2021) Wickside, Hepscott Road, London. *Site Investigation Interpretative Report*. Ref. GB620-SIIR-DEC-2021-REV3, dated December 2021.
[4] GBCP (2021) Wickside, Hepscott Road, London. *Detailed Quantitative Risk Assessment for controlled waters*. Ref. GB620-DQRA-DEC-2021-REV1, dated December 2021.

information is provided on the ground conditions and distribution of contaminants in soil and groundwater in accordance with Environment Agency's (EA) guidance document Land Contamination: Risk Management[5] (LCRM).

Geotechnical issues associated with the basement construction, such as temporary works, ground stability etc., are not part of this Remediation Strategy. These items will be addressed in a separate assessment and design report.

This Remediation Strategy report is produced in support of the associated planning conditions for the site (discharge of Condition 11 "*Contamination - Site Characterisation*" of planning permission 16/00451/OUT, dated 21 January 2020) and should be submitted to the London Legacy Development Corporation (LLDC) for approval.

[5] Environment Agency (5 June 2019). *Land Contamination: Risk Management* [online]. URL: www.gov.uk/guidance/land-contamination-how-to-manage-the-risks.

2. SITE SETTING

2.1 Site location

The site is located to the east of Wansbeck Road and west of Hepscott Road in Hackney Wick, London. The National Grid reference for the approximate centre of the site is 537097, 184322. The site location plan is presented in Figure 1, below.

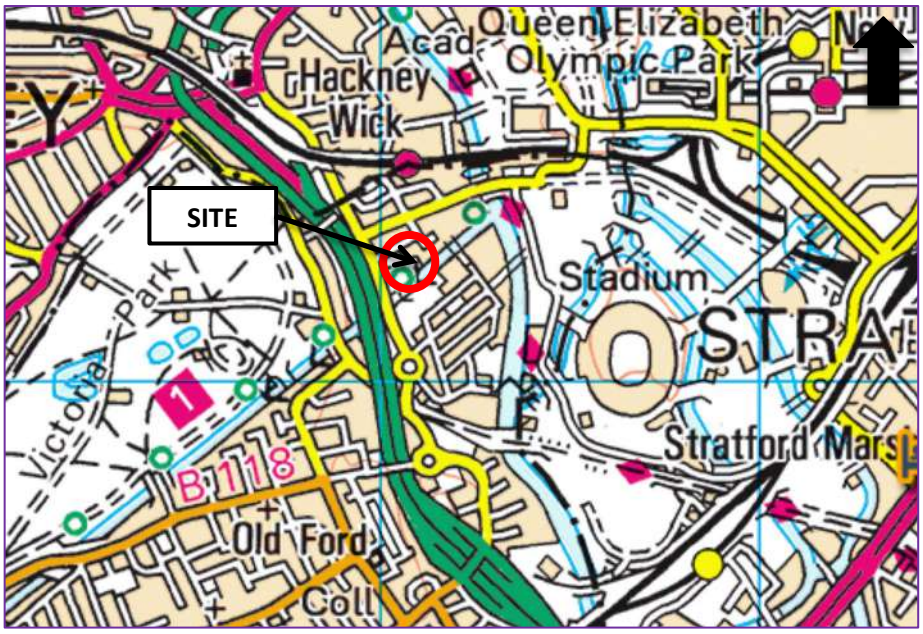

Figure 1: Site location

2.2 Site description

The site is irregular in shape and covers an approximate area of 2.9ha. The main access is from Wansbeck Road in the west and Hepscott Road in the north-east. The site is currently vacant but was until recently, occupied by a waste transfer and recycling facility and vehicle repair garage. The only building currently present on the western half of the site is a large open fronted concrete frame and steel clad unit on the western boundary. It is understood that the building was used for storage and recycling of waste. In addition, a small rectangular brick structure, believed to be a former weighbridge office, is located adjacent to the Wansbeck Road entrance, also near the western boundary.

Several buildings are present on the eastern half of the site. These include a three-storey former office building adjacent to the Hepscott Road site entrance. A further three buildings (all former warehouses/ workshops) and an electricity sub-station are present near the centre of the site and one other building (also a former warehouse/workshop) on the south-eastern site boundary. Based on the observations made during the site visit the buildings in the central area of the site were previously occupied by the vehicle repair garage. The entire site is covered with concrete hardstanding. The ground level in this area of the site is currently at approximately 6.5m to 7.0m above Ordnance Datum (AOD).

A potential drainage interceptor and an underground storage tank were identified in the north-western part of the site (for approximate locations see the topographic survey presented in Appendix A). In addition, a Thames Water sewer traverses the south-western corner of the site, beyond the footprint of the basement but potentially within the zone of influence of the construction (to be confirmed).

The Hertford Union Canal is present along the southern boundary whilst to the west is Wansbeck Road and the A12 highway embankment.

2.3 Proposed development

The Client intends to redevelop the site for mixed residential and commercial uses, Outline Planning Application No. 16/00451/OUT. The proposed scheme involves retention and refurbishment of the Victorian buildings currently present in the eastern part of the site, demolition of all the other existing buildings and construction of a series of apartment building units up to 8-storeys in height and associated amenity spaces. A basement will be constructed in the western part of the site. The proposed development is described in more detail in Appendix B.

3. ENVIRONMENTAL SETTINGS

3.1 Summary of ground conditions

Based on the British Geological Survey (BGS) map for the area[6], the superficial deposits beneath the site comprise Alluvium over Kempton Park Gravel. The mapping indicates that Alluvium is absent immediately to the west of the site. The superficial deposits are underlain by the solid geology of the Lambeth Group, Thanet Sand and the Chalk. The ground conditions encountered during the intrusive ground investigations at the site (CGL 2016 investigation and GBCP 2020) are summarised in Table 1.

Table 1: Summary of ground conditions

Stratum	Depth to Surface (m bgl)	Thickness (m)
Concrete hardstanding present across the site. The only exception is the north-eastern part of the site where the hardstanding comprises asphalt. **[Concrete/ Asphalt Hardstanding]**	GL	0.08 to 0.70
Variable in composition comprising both fine and coarse-grained soils. The granular soils were typically encountered directly beneath the hardstanding and comprised predominantly grey and brown slightly clayey/silty sandy gravel and variably clayey/silty, gravelly sand. The cohesive soils were typically present beneath the granular soils and comprised soft to firm brown and grey variably sandy slightly gravelly clay. A layer of Re-Worked Alluvium was present beneath the Made Ground in some exploratory locations. These soils comprised very soft to firm dark brown, grey and black clay or slightly gravelly clay. **[Made Ground and Re-worked Ground/Alluvium]**	0.08 to 0.70	1.98 to 5.13
Fine-grained soils typically comprising very soft to firm orange-brown, grey green and black mottled CLAY and slightly sandy to sandy CLAY. Traces of decayed roots and/or plant remains. Rare/ occasional flint gravel and shells locally present. **[Alluvium]**	2.20 to 5.40	0.50 to 3.30
Medium dense yellow, grey and orange-brown gravelly SAND or slightly clayey variably sandy fine to coarse angular to rounded GRAVEL. **[Kempton Park Gravel]**	3.50 to 6.7	2.8 to 4.0

[6] British Geological Survey (1993). *North London. England and Wales Sheet 256. Solid and Drift Geology. 1:50,000.*

Stratum	Depth to Surface (m bgl)	Thickness (m)
Firm becoming stiff, very stiff brown, dark grey, becoming pale grey/white silty, sandy, slightly gravelly CLAY with occasional to frequent shell fragments. **[Lambeth Group – Woolwich & Reading Formation]**	8.3 to 9.8	4.9 to 6.3
Reddish brown sandy slightly gravelly CLAY/SILT, and very dense greenish grey slightly clayey silty fine SAND. Occasional fine to coarse well-rounded flint. Occasionally clayey. **[Lambeth Group - Upnor Formation]**	14.6 to 14.7	4.8 to 6.9
Stiff dark grey to brown silty, sandy to very sandy, slightly gravelly CLAY, becoming very dense dark grey silty fine SAND. Occasional fine to coarse well-rounded flint. **[Thanet Formation]**	19.5 to 21.5	12.9 to 16.5
Dark grey slightly clayey, coarse angular to subrounded GRAVEL and stiff dark greyish green sandy to very sandy CLAY/SILT. **[Bullhead Bed]**	33.7 to 36.0	0.2 to 0.5
CHALK, recovered as white gravelly sandy silt with occasional nodular flints. Intact chalk is low density. **[SEAFORD AND NEWHAVEN CHALK FORMATION]**	33.9 to 36.5	Proven to >40.5mbgl

In general, the findings of the intrusive investigations confirm the published geology. Exploratory hole logs and plans are provided in the GBCP interpretative report SIIR[3].

3.2 Hydrogeology

The Environment Agency (EA) has classified Alluvium as Secondary Undifferentiated aquifer. The underlying Kempton Park Gravel, Lambeth Group and Thanet Sands are all classified as *Secondary A* aquifers. The Chalk is classified as a *Principal aquifer*. The eastern part of the site lies within a groundwater *Source Protection Zone 2* (SPZ2). A groundwater SPZ1 is identified within the *Principal Aquifer* at 260m south-east of the site. The designation relates to potable groundwater abstractions located within the vicinity of the site.

3.2.1 Groundwater levels

The historical groundwater levels recorded by CGL in 2016 were encountered either at or near the boundary between the Alluvium and Kempton Park Gravel at depths between 4.3m and 6m bgl (0.8m to 1.6m AOD). During the subsequent monitoring the groundwater levels in the wells, which had response zones within the Kempton Park Gravels, were reported to range from 2.09m to 4.66m bgl. The rest groundwater levels were within the Alluvium.

The groundwater levels in the monitoring well that had a response zone within the Thanet Sands were reported to range from 24.38m to 25.45m bgl, although during later monitoring visits this well was reported to be dry.

Based on the information in the CGL reports[1,2], the groundwater flow direction in both the shallow gravel aquifer and deep Chalk aquifer is towards the east. Furthermore, from the review of publicly available information on the ground investigation data acquired for the development of the Olympic Park and the surrounding area, the groundwater flow direction within the shallow and deep aquifers beneath the site is assumed to be generally south eastwards and southwards, respectively.

The groundwater levels measured in the Kempton Park Gravel and in the Chalk during the most recent groundwater monitoring undertaken in July 2021 by Oakleys are aligned with the previous information. The groundwater levels in the Kempton Park Gravel are recorded 2.68mbgl and 4.09mbgl (2.46mOD and 2.54mOD). The groundwater levels in the Chalk are recorded 24.73mbgl and 27.32mbgl (-15.88mOD and -20.5mOD). The groundwater levels of both aquifer appears to be higher around the north-western portion of the site, with levels decreasing moving towards southeast, confirming previously identified flow directions. Hydraulic gradient in the Kempton Park Gravels aquifer is approximately 0.0003. In the Chalk, hydraulic gradients are between 0.0013 and 0.002.

The geochemical data of both aquifers report a substantial dissolved oxygen content which is indicative of aerobic conditions, favourable to degradation of organic contaminants.

The groundwater in the Kempton Park Gravel is limited at the base of the stratum by the cohesive layers of the upper horizon of the Lambeth Group,

which comprises the firm sandy slightly gravelly clay of the Woolwich & Reading Formation. Evidence of the presence of the cohesive layer of the Woolwich & Reading Formation is encountered sitewide. At large scale, the superficial aquifer may be hydraulically connected to the main hydrographic net and particularly to the River Lea some 450m east of the site.

3.3 Hydrology

The Hertford Union Canal aligns in the east-west direction along the southern site boundary. It is understood that the canal is lined with sheet piles and concrete. The canal meets the River Lee Navigation (Hackney Cut) some 100m east of the site, which is also understood to be lined. The nearest river, the River Lea, is situated some 450m east of the site.

The site lies within the Environment Agency designated 'Zone 2 Medium Probability' and 'Zone 3 High Probability' of flooding from river. The site area which lies within Zone 3 is reported to benefit from flood defences. These protect the area against a river flood with a 1% chance of happening each year.

3.4 Overview of ground investigations

Two ground investigations have been undertaken at the site to date, the extent of which is provided in Figure 2. The investigations are summarised below.

The first investigation was undertaken by CGL in 2016 and comprised the drilling of four cable percussion boreholes (BH01 to BH04) to a maximum depth 40m bgl and eleven shallow window sample boreholes (WS01, WS03 to WS07, WS10, WS12 to WS16 and WS16E) to a maximum depth of 5.0m bgl. Dual standpipes were placed in all the cable percussion boreholes and single standpipes within window sample boreholes WS1, WS4 and WS16E to facilitate gas and groundwater monitoring.

A second ground investigation was conducted by GBCP in 2020. Four rota-sonic boreholes (BH101 to BH104A) were advanced to depths of up to 40m below ground level with the purpose of installing groundwater monitoring wells within the chalk to confirm groundwater levels and water quality. Ten shallow groundwater and ground gas monitoring wells were installed using a windowless sampling rig in WS108, WS112, WS115A, WS116, WS119, WS120, WS121, WS123, WS125 and WS127. The locations were selected to target areas of

potential concern which were identified from the review of the previous investigation data.

Full details of the scope and findings of the ground investigation works are provided in the GBCP SIIR[3].

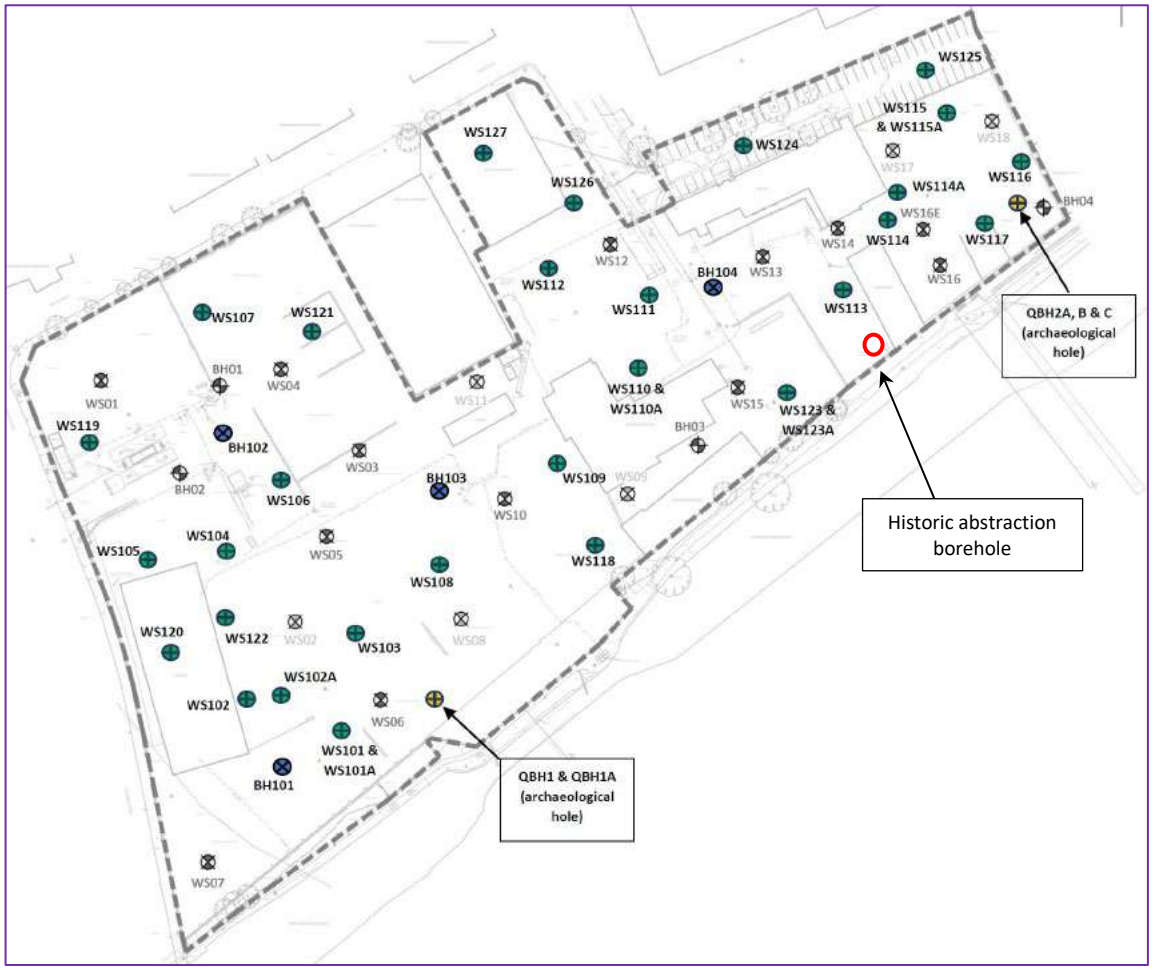

Figure 2: Exploratory hole location plan

3.5 Summary of contamination

3.5.1 Soil contamination

The results from the laboratory analyses revealed elevated concentrations of heavy metals (mainly lead and arsenic) in the Made Ground across the site when compared to the Generic Assessment Criteria (GAC) for residential with home-grown produce land use. Locally elevated concentrations total petroleum hydrocarbons (TPH) and 1,2-4-trimethylbenzene were reported within the Made Ground in the western and south-eastern parts of the site. Asbestos containing

materials and fibres (chrysotile, amosite and crocidolite) were also present in the Made Ground.

Locally elevated concentrations of heavy metals, polyaromatic hydrocarbons (PAHs), mainly naphthalene, and TPH were also reported in the underlying Alluvium and Kempton Park Gravels. The most significant hydrocarbon contamination (PAH and TPH) was noted in the in the south-eastern and in the south-western areas of the site.

The results confirm that contamination exceeding the generic assessment criteria for hydrocarbons (particularly BTEX and aromatic fractions of TPH) was mainly recorded in the Made Ground in the eastern portion of the site in WS16 (0.8m bgl), WS116 (0.5m - 0.6m bgl), WS117 (1.0m - 2.0m bgl) and WS115A at 1.5m bgl. Deeper samples collected at the same locations in WS116A (3.5m – 4.0m bgl), WS117 (2.5m – 2.70m bgl) and WS115A (3.0 m bgl) returned results significantly lower than the concentrations recorded in the shallow samples, with most results compliant to the screening assessment criteria. This shows how the majority of the contamination encountered in the Made Ground is vertically limited, with very rare hydrocarbons exceedances recorded in the natural soils. The soil screening assessment of the samples that returned exceedances of the GAC is reported in Appendix C.

3.5.2 Groundwater contamination

The previous investigation undertaken on the site by CGL[1,2] identified elevated concentrations of heavy metals, phenols, PAHs and TPH in the shallow aquifers associated with Alluvium and Kempton Park Gravel and also in the deep aquifer associated with the Chalk.

Following GBCP investigations, two rounds of groundwater monitoring were carried out in October 2020 and in July 2021. Laboratory testing of groundwater included metals (Arsenic, Barium, Beryllium, Boron, Cadmium, Chromium, Copper, Lead, Mercury, Nickel, Selenium, Vanadium and Zinc), inorganics such as sulphate and cyanide, total petroleum hydrocarbons (TPH), polyaromatic hydrocarbons (PAHs) and phenols.

The groundwater results in the Kempton Park Gravel have been compared to screening criteria for the protection of surface waters, where available, such as

Environmental Quality Standards (EQS) values. The contaminant concentrations recorded in the Chalk were assessed against the drinking water values (DWV).

Where EQS values have been exceeded for metals (namely copper, zinc and nickel), site specific 'Predicted No Effect Concentrations' (PNECs) have been determined using the Metal Bioavailability Assessment Tool (M-BAT)[7]. This assessment utilises physio-chemical parameters measured in the laboratory including pH value and Dissolved Organic Carbon (DOC) to derive the PNECs. The screening assessment against the relevant Water Quality Standards is reported in Appendix D.

Kempton Park Gravel aquifer

The monitoring rounds undertaken by Oakleys confirm that the presence of contamination in the superficial groundwater is localised in the eastern portion of the site. Concentrations of phenols, aromatic TPH comprising naphthalene and benzene are recorded in BH04B, WS115A and WS116 within the Kempton Park Gravel aquifer (Figure 2). Concentrations of hydrocarbons exceeding the solubility limits for the classes aromatics C5–C7 (Benzene) and aromatics C8-C10 are confirmed in the monitoring well with response zone within the Alluvium WS16E where the presence of free phase was observed during the site investigation[3].

Concentrations of chromium(III) slightly exceeding the water quality standards are recorded sitewide. Concentrations of chromium(VI) are not detected. The recorded presence of chromium(III) is not considered to pose a risk to the identified superficial water receptor.

M-BAT[7] is used to assess the presence of copper, nickel, zinc and lead. Two localised exceedances of the PNECs for copper are recorded in WS116 and WS16E in eastern part of the site. Localised marginal exceedances for nickel and copper are found in WS127 and WS102, in the central and western portion of the site.

Chalk aquifer

Concentrations of aromatic hydrocarbons with C>12 banding are recorded in the Chalk aquifer in BH02, BH103 and BH104 (western and central area of the site).

[7] Water Framework Directive UK Technical Advisory Group (July 2014) Metal Bio-Availability Assessment Tool.

Benzene concentration is recorded to be lower than the detection limits in BH102, where a concentration of 34µg/l was recorded in October 2020.

TPH are lower than the detection limits in the eastern area of the site where the gross contamination is located (BH04D).

M-BAT[7] reports no exceedance of the PNECs for copper, nickel, zinc and lead. The presence of chromium is lower than the relevant DWV (50µg/l).

4. CONCEPTUAL SITE MODEL AND RISK ASSESSMENT

The conceptual site model (CSM) and risk assessment for the site updated on the basis of the results presented on the SIIR[3] and the DQRA[4] is described in Table 2.

Risks to future site users, visitors, maintenance and construction workers for the whole site area are deemed to be **high** in relation to inhalation of contaminated dusts/fibres, vapours (from soil and groundwater) and contact/ingestion of contaminated soils/dusts especially within the source of contamination located in the eastern part of the site.

Risks to neighbours during the groundworks phase of the remediation works are considered to be **high** in relation to dusts, vapours and odours. However, the risk can be revised to 'Low/Moderate' if control and mitigation measures are adopted. An *Acute and sub-chronic vapour risk assessment*[8] ("ASVRA") has been carried out by GBCP to assess the impacts on the neighbouring human receptors from vapour risks and unacceptable odour nuisance potentially generated by the excavation of the identified source of contamination.

A **Moderate** risk to controlled waters is considered for the site area with regard to the presence of hydrocarbon contamination in the superficial gravel aquifer. Based on the findings of the DQRA[4], ground remediation is considered necessary to protect surface waters from the contamination encountered in the groundwater in the Kempton Park Gravel and more specifically in the eastern portion of the site where gross contamination was identified particularly in the shallow alluvial deposits. Remediation targets protective of the quality of the superficial and deep aquifers, the identified human receptors and the buildings of the new development (with regard to exposure to contamination vapours) have been identified in the DQRA[4] and are described in Appendix E.

A **Moderate to Low** risk is identified to the Chalk aquifer and to the SPZ1 identified 260m south-east of the site based on the DQRA[4] results. No remediation of the Chalk aquifer is, therefore, recommended. It is, however recommended that the historic deep monitoring wells are decommissioned, with borehole BH02 decommissioned as a priority.

[8] GBCP (2021) Wickside, Hepscott Road, London. *Acute and sub-chronic vapour risk assessment*. Ref. GB620-ASCVRA-DEC-2021, dated November 2021.

Table 2: Conceptual site model (CSM)

Source	Receptor	Pathway	Severity of Consequence	Likelihood of occurrence	Summary of linkage	Risk Classification
Contaminants present within the near surface soils derived from former site uses. These include lead, arsenic, beryllium, several PAHs, TPH, 1,2,4-trimethylbenzene and asbestos Potential presence of underground storage tanks and associated pipework and associated contamination Elevated concentrations of ground gases associated with the Made Ground Alluvium. Presence of benzene vapours associated with localised organic contamination.	Future site users, visitors, maintenance workers	Inhalation, ingestion and dermal contact with contaminants in soil and soil-derived dust	Severe	Likely	Significantly elevated contaminant concentrations have been reported in the shallow soils beneath the site. Future site users have the potential to come into direct contact with contamination and physical hazards (including asbestos) present in soft landscaped areas of the future development. Remediation measures will be required.	High
		Infiltration of contaminants into drinking water supply pipes, followed by ingestion.	Severe	Likely	Contamination could be present at concentrations, which could impact water supply pipes. Such contaminants may include hydrocarbons related to historical land uses. Remediation measures will be required (e.g., use of lined service trench with VOC resistant barrier).	High
	Construction workers	Inhalation, ingestion and dermal contact with contaminants in soil and soil-derived dust.	Severe	Likely	Construction workers are likely to come in close direct contact with contamination present in the soils (including asbestos) during below ground earthworks. Appropriate health and safety measures and personal protective equipment (PPE) will be required to mitigate such risks to acceptable levels.	High
		Migration of gases and vapours through permeable soils into confined spaces such as deep excavations	Severe	Likely	Elevated gas concentrations have the potential to accumulate in confined spaces and pose an asphyxiation hazard. Appropriate health and safety measures and personal protective equipment (PPE) will be required to mitigate such risks to acceptable levels.	High

Source	Receptor	Pathway	Severity of Consequence	Likelihood of occurrence	Summary of linkage	Risk Classification
	Neighbours (commercial and residential)	Ingestion of dust and inhalation of particulates and fibres, contamination vapours and odour nuisance	Severe	Low	The neighbouring commercial, industrial and residential land users can become exposed to contamination present beneath the site via contamination vapours, odour nuisance and wind-blown dust particularly during the earthworks phase of the development. An *acute and sub-chronic vapour risk assessment* has been prepared to support the implementation of an adequate monitoring plan and protection measures for the identified neighbouring receptors from contamination vapours and odour nuisance.	High
	Buildings and Services	Direct contact with substances deleterious to building materials	Severe	Likely	Chemically aggressive ground conditions including hydrocarbon contamination are present which may pose a risk to below ground structures including foundations of new buildings. Remediation measures will be required (e.g. appropriate concrete design).	High
		Migration of ground gases and vapours via permeable soils and construction gaps into confined spaces within buildings	Severe	Likely	Locally significantly elevated concentrations of methane carbon dioxide and benzene have been reported. The ground gases and vapours have the potential to migrate and accumulate in poorly ventilated areas of the buildings, posing a risk of explosion or asphyxiation. Remediation measures will be required.	High
	Groundwater within the shallow gravel aquifer	Vertical migration and leaching of soluble contaminants within the near surface soils (mainly Made Ground). Migration of contamination via preferential pathways e.g. existing wells, services and piled foundations	Medium	Likely	The EA has classified the Kempton Park Gravel as a *Secondary A* aquifer. The results from the site investigation and monitoring undertaken to date indicate that the contamination present within the shallow soils have impacted the gravel aquifer. The DQRA[4] indicates that remediation measures will be required in the eastern area of the site to protect the quality of the superficial water and prevent the generation of contamination vapours.	Moderate/High

Source	Receptor	Pathway	Severity of Consequence	Likelihood of occurrence	Summary of linkage	Risk Classification
Presence of groundwater contamination as a result of historic site uses and storage of chemicals. Based on the previous site investigation undertaken on the site elevated concentrations of following contaminants are present in the shallow groundwater; - PAHs - BTEX compounds - TPH - Phenol - Heavy metals	Deeper aquifers associated with Lambeth Group, Thanet Sand, Chalk and SPZ1 (190m south-east of the site)	Vertical migration of contaminants present within the shallow groundwater	Medium	Likely	The cohesive layers of the Lambeth Group are likely to limit potential vertical migration of contamination present in the shallow groundwater. However, preferential pathways may exist, which allow vertical migration of contamination. The site investigation and monitoring undertaken at the site has identified some localised contamination within the deep Chalk aquifer. It is considered this is due to a compromised monitoring installation which is localised in the western part of the site at 260m for the boundary of the SPZ1. The DQRA[4] has confirmed that no significant risk to the Principal Aquifer is identified from the superficial hydrocarbon impaction.	Moderate/Low
		Migration of contamination via preferential pathways e.g. new services, piled foundations	Medium/High	Likely	There is the potential that the contamination present within the shallow soils and aquifers could pollute the Chalk Aquifer if the piled foundations of the redevelopment are installed into the Thanet Sands or Chalk. The principal aquifer identified in the Chalk geology is observed to be in hydraulic continuity with the sandy lower beds of the Thanet Formation (sub-artesian condition). The risk of migration of contamination via preferential pathways without remedial measures is assessed as Moderate to high. A *Piling Method Statement* will be required to address the identified risk.	Moderate/High
	Hertford Union Canal & River Lee Navigation (Hackney Cut)	Lateral migration of contaminants within the shallow groundwater	Medium	Unlikely	The information available indicates that both the Hertford Union Canal and River Lee Navigation (Hackney cut) are lined and therefore potential impact from lateral migration of groundwater contamination is likely to be negligible.	Low Risk
	Construction workers	Accidental ingestion and dermal contact with contaminants present in the groundwater	Medium/High	Likely	Construction workers are likely to come into close contact with contamination present in the groundwater beneath the site during the earthworks phase of the development. Appropriate health and safety measures and personal protective equipment (PPE) will be required to mitigate such risks to acceptable levels.	Moderate/High

5. REMEDIATION OPTIONS APPRAISAL

The identification of feasible remediation options and the options appraisal is undertaken in accordance with the requirements set out in Stage 2 'Options appraisal' of the EA Land Contamination Risk Management Guidance (LCRM)[5].

The **High** and **Moderate/High** risks identified in the SCM represent the unacceptable risks to the identified receptors and will require appropriate remedial actions to mitigate these risks. These unacceptable risks have been fully characterised on the basis of the findings of the ground investigations described in GBCP SIIR[3] and the findings of the detailed risk assessment for controlled waters described in in GBCP DQRA[4]. These are identified as 'relevant pollution linkages' as reported in Table 3.

Table 3: Relevant contaminant linkages 'RPL'

RPL No.	Contaminant	Pathway	Receptor
RPL1	Contaminants present within the near surface soils derived from former site uses. These include lead, arsenic, beryllium, several PAHs, TPH, 1,2,4-trimethylbenzene and asbestos Potential presence of underground storage tanks and associated pipework and associated contamination Elevated concentrations of ground gases associated with the Made Ground Alluvium. Presence of benzene vapours associated with localised organic contamination Presence of groundwater contamination as a result of historic site uses and storage of chemicals (presence of free phase and elevated concentrations of PAHs, BTEX compounds, TPH and Phenol)	Inhalation, ingestion and dermal contact with contaminants in soil and soil-derived dust	Future site users, visitors, maintenance workers
RPL 2		Infiltration of contaminants into drinking water supply pipes, followed by ingestion.	Future site users, visitors, maintenance workers
RPL 3		Inhalation, ingestion and dermal contact with contaminants in soil and soil-derived dust.	Construction workers
RPL 4		Migration of gases and vapours through permeable soils into confined spaces such as deep excavations	Construction workers
RPL 5		Ingestion of dust and inhalation of particulates and fibres, contamination vapours and odour nuisance	Neighbours (commercial and residential)
RPL 6		Direct contact with substances deleterious to building materials	Buildings and Services
RPL 7		Migration of ground gases and vapours via permeable soils and construction gaps into confined spaces within buildings	Buildings and Services
RPL 8		Vertical migration and leaching of soluble contaminants within the near surface soils (mainly Made Ground).	Groundwater within the shallow gravel aquifer
RPL 9		Migration of contamination via preferential pathways e.g. existing wells, services and piled foundations.	Groundwater within the shallow gravel aquifer

5.1 Identification of feasible remediation options

Feasible remediation options are identified to prevent, minimise, remedy or mitigate the effects of the identified unacceptable risks. The remediation options are considered as 'feasible' if they can break the identified 'relevant contaminant linkages' described in Table 3. This objective can be achieved with the implementation of remedial actions capable of either:

a. Treating/ removing the source of contamination (e.g., source removal, in-situ treatment);

b. Breaking the active migration pathway (e.g., capping, gas membrane);

c. Managing the receptors (e.g., health and safety requirements for maintenance workers).

Feasible remediation options, type a.

The excavation of (i) the gross contamination localised in the superficial soils in the eastern area of the site and (ii) the hotspots of contamination identified in the western area of the site (including below and above ground storage tanks and interceptors) is considered to be a feasible remediation option. *In-situ* remediation is also considered feasible to treat the elevated concentrations of PAHs, BTEX, TPH and phenols localised within the superficial aquifer in the eastern area of the site. The enhancement of the natural biodegradation of the concentrations of contaminants recorded in groundwater can reduce the unacceptable risks to pollution of controlled waters and generation to contamination vapours. These remediation options will remove the source of contamination for the relevant contaminant linkage RPL1 to RPL9.

Feasible remediation options, type b.

The installation of a cover over contaminated material will break the critical pathways for the relevant contaminant linkage RPL1, RPL2, RPL6 and RPL7. This technique will comprise the installation of hardstanding ground cover within the footprint of buildings (including gas resistant membranes), roads and car parks, an engineered capping for soft landscaping areas and use of lined service trench with VOC resistant barrier. This option will also reduce the vertical migration of superficial contamination to groundwater (relevant contaminant linkage RPL8 and RPL9).

Feasible remediation options, type c.

The implementation of a monitoring plan and protection measures for the on-site groundworkers and neighbouring receptors from contamination vapours and odour nuisance is considered feasible to minimise the identified unacceptable risks (relevant contaminant linkage N. RPL3, RPL4 and RPL5). Furthermore, the use of appropriate health and safety measures and personal protective

equipment (PPE) is considered necessary to reduce the risks for groundworkers to acceptable levels risks (relevant contaminant linkage RPL3 and RPL4).

5.2 Remediation options appraisal

Consideration is being given to the identification of the remediation techniques which are (i) applicable to treat the identified contamination, (ii) effective in the encountered site conditions and future layout (iii) aligned with the construction programme of the proposed development and (iv) sustainable.

The following remediation techniques are shortlisted as feasible options:

1. *Capping* involves placing a cover over contaminated material such as contaminated soil. Such cover isolate contaminants and keep them in place to avoid the spread of contamination. This technique can comprise the installation of (i) hardstanding ground cover within the footprint of buildings, roads and car parks, (ii) an engineered capping for soft landscaping areas and (iii) gas resistant membranes. This can provide protection from inhalation, ingestion and dermal contact with contaminants in soil, soil-derived dust and gas/ vapour to the future site users and ingress into buildings.

    - ADVANTAGES: Very short treatment time; Effective on breaking the pathways via inhalation, ingestion and dermal contact with contaminants in soil; Applicable to the proposed development; Minimal disturbance to the neighbours; Minimal production of waste; Enable the re-use of suitable won material soils as backfill.

    - DISADVANTAGES: Capping do not destroy or remove contaminants; Long term risk to the quality of controlled waters may still be significant; Future maintenance works should preserve the integrity of the capping layers; Maintenance workers should be informed of the presence of contamination below the capping layers.

    This option is considered to be feasible, sustainable and compatible with the layout of the new development.

2. *Source removal and off-site disposal* can be undertaken to treat the contamination sources localised in the western and eastern area of the site. The removal of hotspots of contamination located in the western area

of the site (including the identified storage tanks) can be carried out as part of the redevelopment works to construct a basement. The grossly contaminated superficial soils identified in the eastern area of the site can be excavated and the superficial impacted perched water can be abstracted from the excavation and disposed off-site via tanker. The stream of waste generated by the source removal is disposed off-site to a licensed waste facility.

- ADVANTAGES: Very short treatment time; Effective on removing contamination from low permeable soils as alluvial soils; Shallow excavations are required to remove the identified superficial contamination; Substantial betterment to the quality of the superficial aquifer and reduction in risks to human receptors from inhalation of contamination vapours; The excavation of the western area of the site is part of the enabling works of the new development (basement construction); The excavation of the eastern area will comprise the removal of superficial obstructions recorded during the ground investigation.

- DISADVANTAGES: Relatively higher cost for off-site waste treatment and disposal; Significant production of waste; Generation of trucks traffic in the site area; Significant disturbance to neighbouring site is expected during the excavation of contaminated soil and abstraction of impacted groundwater; Excavation support or battering may still be required; Presence of underground services may limit the source removal.

Although this option is very effective to treat superficial gross contamination, it presents sustainability issues relating to the production of waste, generation of heavy plant traffic and disturbance to neighbours. The technique is, however, considered applicable to selected areas of the site as it is part of the enabling works of the redevelopment (construction of a basement and removal of obstructions). Although a limited short-term improvement of the quality of the Gravel aquifer is anticipated, long-term betterment can be expected from the removal of the superficial gross contamination in the eastern area of the site.

3. *On-site treatment* of excavated soil and abstracted groundwater can be carried out to remove the identified source of contamination. The

excavated material can be treated on-site to remove the organic contamination (using bio-piles, for instance). The abstracted groundwater can be treated using an oil-water separator, suspended solids and granular activated carbon filter beds. The treated discharge can be conveyed to the ground or to sewer in accordance with a discharge consent licence.

- ADVANTAGES: Medium to Low production of waste to be disposed off-site; Medium to short treatment time potentially compatible with the construction programme of the proposed development; Production of material suitable for re-use.

- DISADVANTAGE: Significant disturbance to neighbours during excavation, stockpiling and treatment phase; Limited effectiveness as only a limited volume of soils is identified as potentially treatable (localised gross contamination source); Minimum material deficit identified for the construction of the redevelopment; Relatively higher cost for the management of the on-site treatment system and the monitoring and mitigation measures; Limited influence of groundwater abstraction is expected within Made Ground and Alluvium;

The presence of localised superficial contamination, the absence of a plume of contamination extended sitewide makes this option not effectively applicable at the site. Furthermore, the expected significant nuisance to neighbouring receptors and the low deficit of materials makes the option not sustainable.

4. *In-situ treatment* can be carried out to remediate the contamination identified within the superficial saturated soils and the Kempton Park Gravel aquifer localised in the western and eastern areas of the site. The injection of selected reagents within the identified sources of contamination impacted with petroleum hydrocarbons can rapidly acclimate the aquifer for in-situ oxidation and aerobic bioremediation conditions, and provide a direct and rapid chemical route for treatment of the recorded concentrations of contaminants.

   - ADVANTAGES: Minimal production of waste; Minimal disturbance to neighbouring site as minimal groundworks are needed; Low costs for

waste disposal; Applicable to treat residual contamination in excavations.

- DISADVANTAGES: Limited effectiveness on the isolated hotspots identified in the western area of the site (generally low dissolved concentrations of hydrocarbon are recorded); Generally elevated injection effort required to treat the superficial perched waters located in the eastern area of the site due to the heterogeneity of superficial manmade soils (Made Ground) and the presence of layers with low hydraulic conductivity (Alluvium); Potential generation of corrosive by-product and heat when using in-situ oxidation which may be incompatible with the presence of underground infrastructure and neighbour buildings; Treatment time estimated to between 6 and 12 months (as a minimum) with relatively higher costs for monitoring.

The absence of a plume of contamination extended sitewide and the design of the proposed redevelopment makes this option not effective as stand-alone remedial technique. It can, however, be implemented to treat the contamination localised in the eastern area of the site.

5. A combination of the techniques presented in Items 1., 2. and 4. can be applied to (i) protect the future site users from inhalation, ingestion and dermal contact with contaminants in superficial soil, soil-derived dust and gas/ vapour, (ii) prevent ingress of gas/ vapour into buildings and (iii) treat the pollution to controlled waters. This can comprise the installation of a capping system (Item 1.), the removal of the localised hotspots of contamination identified in the western area of the site (Item 2.), the removal of the area impacted with gross contamination located within the superficial soils in the eastern of the site (Item 2.) and in-situ treatment of the residual dissolved contamination identified in the eastern area of the site via in-situ oxidation and/ or enhanced aerobic bioremediation (Item 4.).

   - ADVANTAGES: This option comprises a medium to short treatment time which is compatible with the construction programme of the proposed redevelopment; Substantial betterment to the quality of the superficial aquifer and reduction in risks to human receptors from inhalation of contamination vapours; The excavation of the western

area of the site is part of the enabling works of the new development (basement construction); Excavation supports and presence of live underground services is considered as part of the design of the basement; The excavation of the eastern area of the site can be optimised by using selected chemical oxidants and bioremediation products.

- DISADVANTAGE: The relatively higher cost for off-site waste treatment and disposal can be reduced as the excavation located in the eastern area of the site is limited to the superficial impacted Made Ground; Significant disturbance to neighbouring site is expected during the excavation of contaminated soil and abstraction of impacted groundwater and mitigation measures will be implemented; The selection of reagents and the injection points will be calibrated in order to maximise the treatment of each layer (deep Made ground, Alluvium and Gravel) and prevent the generation of corrosive by-product and heat.

5.3 Selection of the final remediation options

The remediation option described in Item 5 in Section 5.2 is identified as the final remediation option for the site. This option comprises a combination of remediation techniques which can provide both an effective and sustainable remedial action and enable the redevelopment of the site. The selected remediation option is (i) aligned with the layout of the new redevelopment and the construction programme (a sufficiently short treatment time is expected) and (ii) focused on the reduction of the significant risks via the removal / treatment of the identified source of contamination and breaking of the critical pathways. Furthermore, the selected remediation option limits the production of waste for off-site disposal to a practical minimum (given the layout of the redevelopment) and limit the impacts to neighbouring receptors by introducing *in-situ* treatment technologies where feasible.

6. REMEDIATION STRATEGY

A remediation strategy has been defined based on the findings of the ground investigation conducted at the site (presented in GBCP SIIR[3]) and the outcome of the DQRA[4] for controlled waters carried out by GBCP. The selection of the remediation options has been based on the most up to date SCM and risk assessment presented in Section 4 and it is considered appropriate to address the unacceptable risks to human health, controlled waters, buildings and infrastructures of the new development and to ensure that the development can be carried out safely without unacceptable risks to workers and neighbours. The recommended remedial actions include:

I. the excavation of the majority of the western area as part of the redevelopment works to construct a basement;

II. the removal of the superficial hydrocarbon contamination and obstructions identified within the Made Ground in the eastern area of the site;

III. the application of chemical oxidant to accelerate the degradation of the organic contaminants remaining within saturated soils and groundwater in the eastern area of the site;

IV. the decommissioning of the deep boreholes to prevent vertical migration of contamination to the deep aquifer.

V. the implementation of a monitoring plan and mitigation and protection measures for the identified neighbouring receptors from contamination vapours and odour nuisance;

VI. the installation of a capping system comprising hardstanding, the new building footprints and 'clean' backfill for the landscaped areas;

VII. the installation of gas protection membranes in all the buildings of the new development;

VIII. Provision of potable water supply requirements in accordance with service providers requirements.

A watching brief by GBCP (see Section 6.2) will be also maintained during the enabling works as part of a discovery strategy intended to investigate any indications of significant contamination.

6.1 Remediation objectives

Remediation targets have been calculated to protect (i) the quality of the superficial and deep aquifers, (ii) the identified human on-site receptors and (iii) the new buildings of the redevelopment as set out in the DQRA[4]. These are described in Appendix E and will be used to verify the remedial actions described in point I, II and III. Furthermore, these will be used as import criteria to ensure the use of a suitable material for the backfill of the excavation in the eastern area of the site and for the capping layers installed in the landscaping areas of the new development (point VI).

The design and verification of the decommissioning of deep borehole (point IV), the installation of capping layers (point VI) and gas membrane (point VII) will be carried out in accordance with the relevant guidance provided by EA, NHBC, British Standard and CIRIA EA and relevant evidence of the completion of the works will be collected.

Furthermore, an acute and sub-chronic vapour risk assessment 'AsCVRA'[8] has been prepared by GBCP to set out the threshold concentrations to protect the on-site workers and the neighbours from contamination vapours and odour nuisance (point V). Relevant records of the monitoring works and implemented mitigation measures will be collected at the completion of the works.

6.2 Remediation implementation and supervision

The remediations works will be supervised by an Environmental Consultant from GBCP who will act as 'Site Engineer (or Remediation Supervisor)[9]'. The Site Engineer will be a suitably qualified geo-environmental engineer with relevant competencies and experience in land quality as defined by the National Brownfield Skills Framework (NBSF) toolkit[10]. The inspection and verification of the remediations works will be undertaken by a suitably qualified engineer, with a minimum 3 years' experience of similar ground remediation.

[9] Designated title depending on form of contract for the remediation works.
[10] SiLC (2016). The National Brownfield Skills Framework. October 2016. Version. 3

The Site Engineer will liaise with the Remediation Contractor's Site Manager, to ensure the progress of the works in accordance with this remediation strategy and the relevant contractor specific method statements and risk assessments. The Site Engineer will be responsible for all environmental sampling detailed within this remediation strategy (soil, groundwater and vapour), although the Remediation Contractor may obtain additional groundwater samples to inform their assessment of the progress of the works.

The Site Engineer will be supported by a Project Manager (a principal environmental consultant with over 15 years' experience in the land contamination sector). The project team will be headed by the Project Director, a PhD, Chartered Geologist and Chartered Civil Engineer (CEng) with over 35 years of experience in providing geotechnical and environmental engineering solutions.

6.3 Phasing of the remediation works

The initial phase of the remediation works will comprise the ground and groundwater remediation. The remedial actions set out in the remediation strategy will be conducted in accordance with the following programme:

1) Decommissioning of the deep boreholes to prevent vertical migration of contamination to the deep aquifer;

2) Remediation of the western area of the site (removal of the identified contamination hotspots);

3) Excavation of a basement in the western part of the site (watch and brief);

4) Excavation of the eastern part of the site (removal of superficial gross contamination and obstructions);

5) Treatment of the source of contamination localised within the saturated soils in the eastern part of the site (application of reagents);

6) Completion of the enabling works sitewide including foundation works (watch and brief);

7) Implementation of a monitoring plan and mitigation and protection measures for the identified neighbouring receptors from contamination vapours and odour nuisance (this will cover the works from point 1 to 6).

The demolition works will be carried out prior to commencement of the remediation works to enable the access to the area as requiring remediation identified in western part of the site (point 2. And 3.)

The subsequent phase of remediation works (Phase 2) will be carried out during the construction phase and will comprise the installation of gas protection measures, engineered capping layers within the landscaped areas and appropriate potable water supply.

The following section of the report describes the implementation of the Phase 1 of the Remediation Strategy.

7. IMPLEMENTATION OF THE REMEDIATION STRATEGY – PHASE 1

The initial phase of the remediation works will comprise the remediation of the ground and groundwater contamination. The remediation works will be conducted in accordance with the following programme:

1) Decommissioning of the deep boreholes to prevent vertical migration of contamination to the deep aquifer;

2) Remediation of the western area of the site (removal of the identified contamination hotspots);

3) Bulk excavation of a basement in the western part of the site (watch and brief);

4) Excavation of the eastern part of the site (removal of superficial gross contamination and obstructions);

5) Treatment of the source of contamination localised within the saturated soils in the eastern part of the site (application of reagents);

6) Completion of the enabling works sitewide including foundation works (watch and brief).

A monitoring plan with mitigation and protection measures from inhalation of contamination vapours and odour nuisance will be implemented during the works from point 2 to 6. This is described in detail in Section 8.

7.1 Decommissioning of the existing deep monitoring wells

The decommissioning of the existing deep monitoring wells installed by CGL[2] and GBCP[3] is proposed to prevent vertical migration of contamination to the deep aquifer, the chalk aquifer namely. This activity should be completed prior to commencing with the proposed ground remediation and basement excavation.

The procedures that will be adopted to decommission the damaged and redundant monitoring wells located on site are based on the current guidance published by the Environment Agency[11,12].

Given the relatively low risk identified to the deep aquifer as identified from the investigation, all boreholes will be decommissioned using sealing methods. The procedure for decommissioning the existing monitoring wells is summarised as follows:

1. The well cover and/or headworks will be removed;

2. The groundwater level and depth of the borehole will be measured using a dip meter;

3. The standpipe casing will be excavated and cut to a depth of 1m below ground level;

4. The borehole standpipe and excavated void will be backfilled from the base to the underside of the concrete cap using slow swelling bentonite pellets that will form a low permeability clay seal when fully hydrated (the use of a tremie pipe is recommended);

5. A 300mm thick, 1m diameter mass concrete cap will be placed centrally over the borehole. This can be placed below ground level if required to avoid forming a future obstruction to development infrastructure.

The bentonite pellets will be placed in the borehole in a controlled manner to avoid potential bridging. The bentonite pellets will be placed in 1m layers. Water will then be added to hydrate the pellets before another layer of bentonite pellets is added. This is repeated until the well is backfilled to the cut-off level (1.0mbgl). The depth to the top of the sealing material will be measured regularly to ensure that it is not rising more quickly than expected. Bentonite will then be placed in layers and hydrated to the underside of the 300mm thick concrete cap.

A 1.0m diameter concrete cap will be placed flush with ground level or placed at depth to avoid future infrastructure. Each borehole should be checked for

[11] Environment Agency (October 2012). *Good Practice for Decommissioning Redundant Boreholes and Wells*.
[12] Environment Agency (2006). *Guidance on the design and installation of groundwater quality monitoring points*. Science Report SC020093.

settlement once a day after the decommissioning works have been completed. A schematic is provided below in Figure 3.

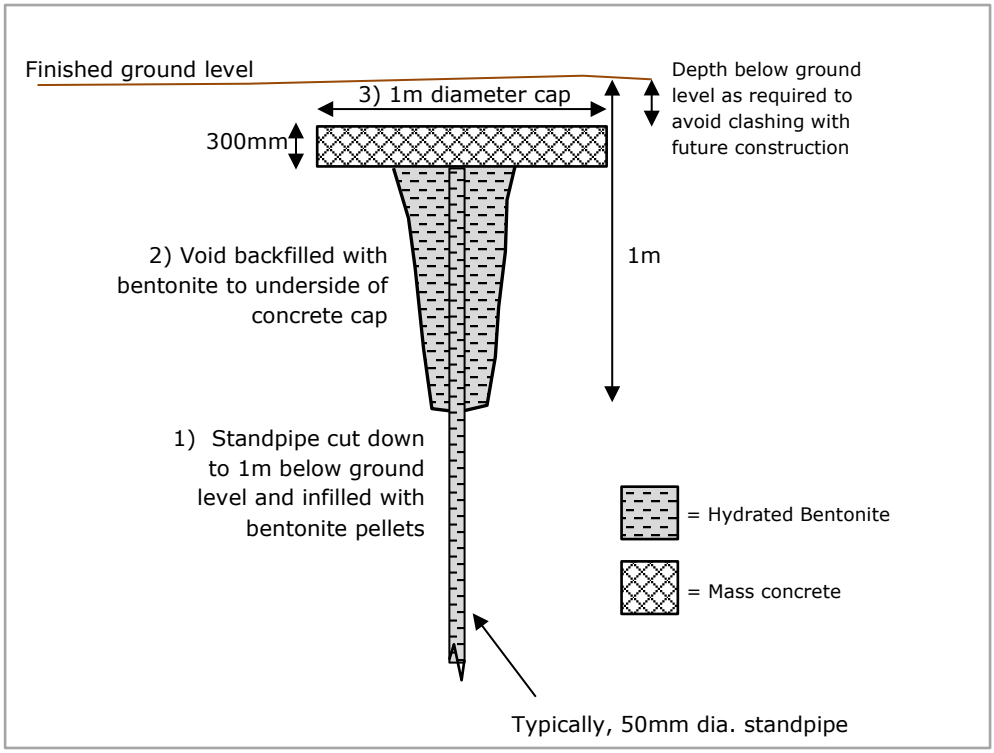

Figure 3 – Borehole decommissioning schematic (not to scale)

Deep and shallow boreholes will be properly decommissioned in order not to present an unacceptable risk to controlled waters during the groundworks of the remediation in accordance with the relevant EA guidance. If additional elements of risk to the quality of the deep aquifer are identified at certain locations (e.g., the damaged CGL[2] monitoring well 'BH02' and the historic abstraction borehole identified on site which is installed into the principal aquifer), further actions will be implemented. A drill rig might be used to remove the standpipe and annular filter prior to installing the sealing plug and/ or the injection of reagents might be undertaken to treat historic pollution.

A Health and Safety Risk Assessment Plan for the works should be produced by the Contractor undertaking the decommissioning based on the presented method statement.

7.2 Ground remediation and basement excavation - western area

This Section sets out the implementation of the remediation strategy in the area where the construction of a basement is designed as part of the redevelopment as described in Figure 4. The remediation works will comprise the removal of (i) the identified source of contamination and obstructions and (ii) the excavation of the potentially contaminated ground identified during the investigation works (SIIR[3] and DQRA[4]). The bulk excavation of the basement will be completed using the same approach set out for the excavation of the potentially contaminated ground as localised undiscovered ground contamination may still be present.

Figure 4: Basement location

It is anticipated that the basement excavation will require temporary support, which may also be incorporated into the permanent works. It is likely this will be formed via an embedded retaining wall, although it may be feasible to construct the eastern section in open cut by battering or benching the sides of the excavation. This will be addressed in a separate geotechnical assessment report. Any piling activities will require a separate *Foundation Works Risk Assessment*. For the purpose of this report, it is assumed piling activities will be designed and constructed such that there is no significant adverse impact on the groundwater environment.

7.2.1 Removal of primary sources and obstructions

A number of storage tanks have been identified the area of proposed excavation. These comprise a below ground diesel tank and an interceptor which are located in the northern area of the basement excavation. An above ground hydrocarbon storage tank was also reported to be present. These are shown in Figure 5.

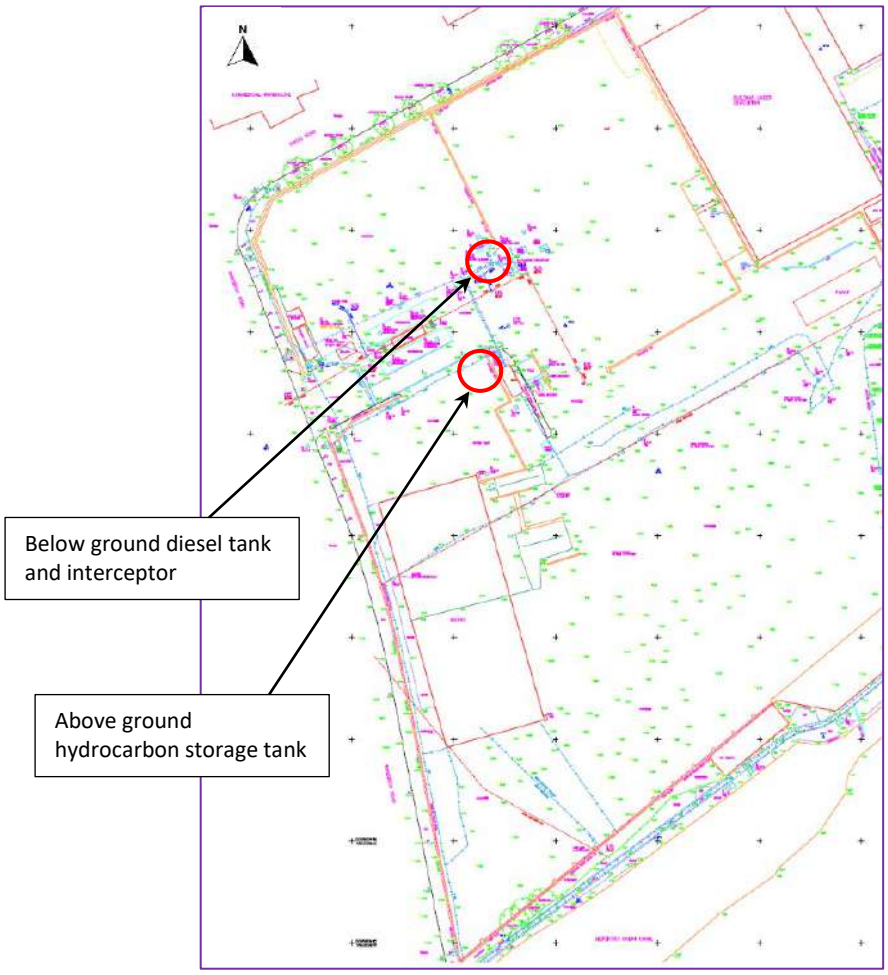

Figure 5: Tank locations

These structures may contain fuels, solvents, heating oils etc. which will need to be appropriately decommissioned. These structures may also contain below ground pipework and therefore care should be exercised during their removal to prevent damage and contamination of the underlying soils and groundwater. Impacted soils may be encountered around these structures during their removal. The decommissioning and the removal of the identified above and below ground storage tanks and connected pipework shall be conducted in

accordance with the relevant EA Guidance[13] and the APEA *Technical guidance and health and safety guidance on decommissioning tanks* ("Blue Book")[14]. The removal of these sub-structures and materials shall be undertaken under a watching brief by the appointed Site Engineer. The tank removal strategy is included in Appendix F.

Material that appears to be heavily contaminated based on visual observations and use of photo-ionisation detection (PID) screening, where suitable, shall be excavated directly into trucks for off-site disposal. Samples shall be taken from the soils exposed on the base and sides of the resultant excavation (where such soils are to remain and not removed as part of the bulk excavation) and compared against the remediation targets described in Appendix E.

An air quality monitoring plan including mitigation and protection measures will be implemented throughout the duration of the works to prevent the identified neighbouring receptors from the exposure to contamination vapours and odour nuisance as set out in Section 8 of the present report.

Where resultant voids require backfilling, these should be backfilled with clean fill materials. This could be site won suitably clean natural soils or imported. Any imported soil should be 'non-waste' soil imported from a known and reputable source. All material used to fill voids shall be tested and assessed against the remediation targets to confirm that the material poses a low risk for the intended use. Where such excavations are within the excavation level for the basement, the excavation may be temporarily left open, suitably protected (e.g., battered/benched, with fencing and signage etc.) pending the subsequent full basement excavation.

7.2.2 Excavation of potentially contaminated ground

Following the removal of the primary sources of contamination and other obstructions, the remainder of the bulk excavation for the basement may proceed. In addition to the tanks identified in the previous section, areas of elevated concentrations of contaminants are identified in several exploratory

[13] EA (2016). 'Prevent groundwater pollution from underground fuel storage tanks', https://www.gov.uk/guidance/prevent-groundwater-pollution-from-underground-fuel-storage-tanks/decommissioning-an-underground-storage-tank

[14] APEA. 'Guidance for Design, Construction, Modification, Maintenance and Decommissioning of Filling Stations'.

hole locations. These areas are highlighted in Figure 6 below, with additional information included in Table 4. These materials may pose a greater risk to health during excavation and may also be of a different classification for potential re-use and/or off-site disposal. It is recommended that these areas are identified and targeted as specific areas for excavation and segregation, either prior to the bulk excavation or as part of the bulk excavation with suitable management in place as described in Section 7.2.3 and Section 8. The contaminants identified in these specific areas include petroleum hydrocarbons, poly-aromatic hydrocarbons and asbestos fibres. The won materials from these areas shall be excavated directly into trucks for off-site disposal, if odorous contamination is detected.

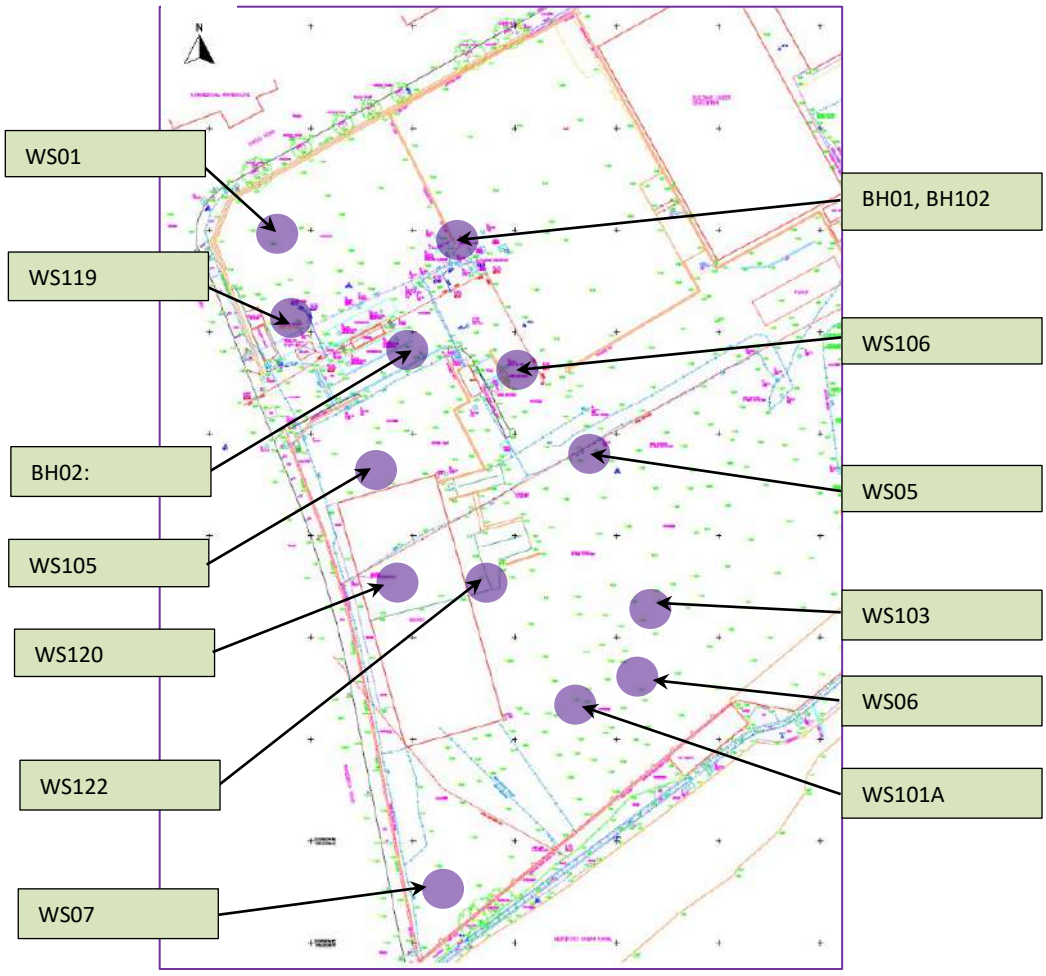

Figure 6: Areas of ground contamination – western area of the site

Table 4 provides a brief summary of the areas of contamination identified in Figure 6. For further information, reference should be made to the exploratory hole records and laboratory data included in the GBCP site investigation interpretative report (SIIR[3]) prepared for the site.

Table 4: Summary of areas elevated contamination

Exploratory hole reference	Coordinates	Depth range (mbgl)	Contaminants of concern
BH01	E 537010.7 N 184335.9	0.4 (MG)	Asbestos, benzo(a)pyrene, lead
BH102	E 537009.8 N 184325.2	1.5 (MG)	Benzo(a)pyrene
BH02	E 537014.3 N 184302.2	0.3-2.5 (MG)	Asbestos, TPH
WS01	E 536980.4 N 184,337.8	0.5 (MG)	Asbestos, Benzo(a)pyrene, lead
WS06	E 537050.9 N 184257.3	2.5 (Alluvium)	Benzo(a)pyrene, lead
WS07	E 537040.3 N 184297.9	0.4 (MG)	Asbestos, Benzo(a)pyrene, lead
WS101A	E 537057.6 N 184251.4	1.5 (MG)	Benzo(a)pyrene, lead
WS103	E 537052.4 N 184268.9	1.7-5.4 (MG)	Naphthalene, benzo(a)pyrene, lead, arsenic
WS105	E 536997.6 N 184288.9	1.5-1.6 (MG)	Naphthalene
WS106	E 537032.9 N 184310	0.7-0.8 (MG)	Benzo(a)pyrene
WS119	E 536982 N 184320.2	2.7-2.9 (MG)	Dibenz(a,h)anthracene, arsenic
WS120	E 537003.5 N 184264.2	0.8-1.0 (MG)	Benzo(a)pyrene
W122	E 537017.6 N 184273.6	0.4-0.5 (MG)	Asbestos, Benzo(a)pyrene, lead

7.2.3 Bulk excavation of the basement

The bulk excavation will encounter Made Ground and reworked/natural alluvial deposits which are likely to contain heavy metals (including lead), hydrocarbons and potential low concentrations/insignificant amounts of asbestos fibres. There still remains the potential for, as yet, undiscovered areas of ground contamination to exist. These areas are anticipated as being localised, if present, and not widespread given the spatial distribution of exploratory holes across the area of the basement.

Watch and brief duties will be carried out by the Site Engineer during this phase. In the event visibly contaminated or odorous materials, or suspected contaminated materials, are encountered, the arrangements described for the removal of the identified source of contamination will be adopted. The won materials with visible contamination and odorous evidence shall be excavated directly into trucks for off-site disposal. The air quality monitoring and mitigation measures will be applied as required to reduce any impacts or nuisance to the groundworkers and the identified neighbouring receptors (see Section 8).

Temporary stockpiling of soils (with no odorous and contamination evidence) may be undertaken during this phase of the excavation. This should be located away from the sides of the excavation so as not to surcharge the adjacent ground and from the most sensitive off-site receptor (residential users located 30m south of the site boundary and the commercial building adjacent to eastern boundary of the site). Monitoring and mitigation measures should be put in place to reduce dust/vapour/odours generation and potential leaching run-off as indicated in Section 8.

Laboratory analysis will be carried out on site won material to either assess the potential reuse on site as backfill (e.g. in the excavation of the eastern area of the site) and to characterise the waste prior to off-site disposal. It is noted that the chemical data presented in GBCP SIIR[3] confirm that the majority of the soil samples collected in western area are compliant with the Remediation Targets (Appendix E). Site won backfill will be subjected to validation testing at an estimated frequency of 1 sample per 100m^3. A Material Management Plan will be

set out in accordance with the Definition of Waste: Code of Practice[15] to enable the reuse of the site won material.

7.3 Removal of gross contamination – eastern area

The removal of the superficial gross ground contamination and the obstructions identified in the eastern area of the site will follow the remediation of the western area of the site described in Section 7.2. The *source removal* is intended to remove the superficial gross contamination and the obstructions localised in the eastern area of the site.

The location of the source of contamination identified in the eastern site area site and the future location of the basement in the western area is shown in Figure 7.

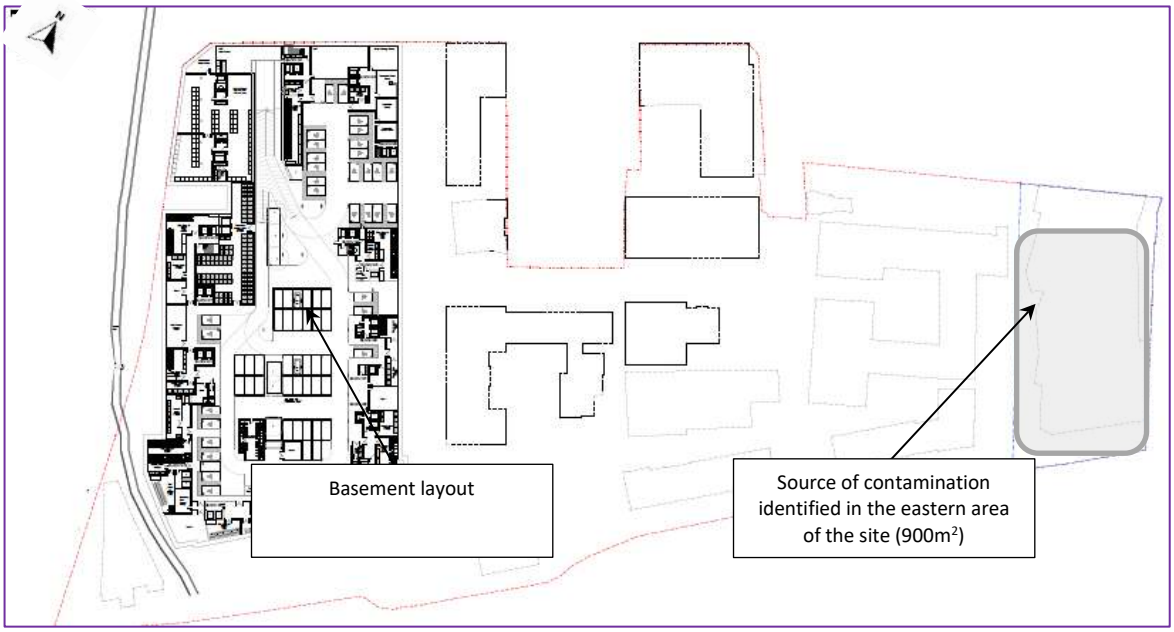

Figure 7: Location of the source of contamination identified in the eastern area of the site

The grossly contaminated soils removed from the excavations should be excavated directly into trucks, where suitable. Furthermore, stockpiling of odorous arisings on site should be limited to a minimum to reduce odour nuisance and vapour generation (see Section 7.2.1). Appropriate air monitoring and mitigation measures should be implemented as set out in Section 8.

[15] CL:AIRE (2011). *The Definition of Waste: Development Industry Code of Practice*. Version 2.

The excavation will be visually inspected for the presence of gross contamination arising and headspace testing will be undertaken using a photoionization detector (PID). Soil samples shall be taken of the base and sides of the resultant excavation. The chemical test results shall be compared to the remedial targets described in Appendix E. If the samples exceed these criteria, then the excavation shall be extended and the process repeated.

7.3.1 Removal of primary sources and obstructions

Table 5 below provides a brief summary of the areas of contamination identified in Figure 8. For further information, reference should be made to the exploratory hole records and laboratory data included in the site investigation interpretative report (SIIR[3]) prepared by GBCP.

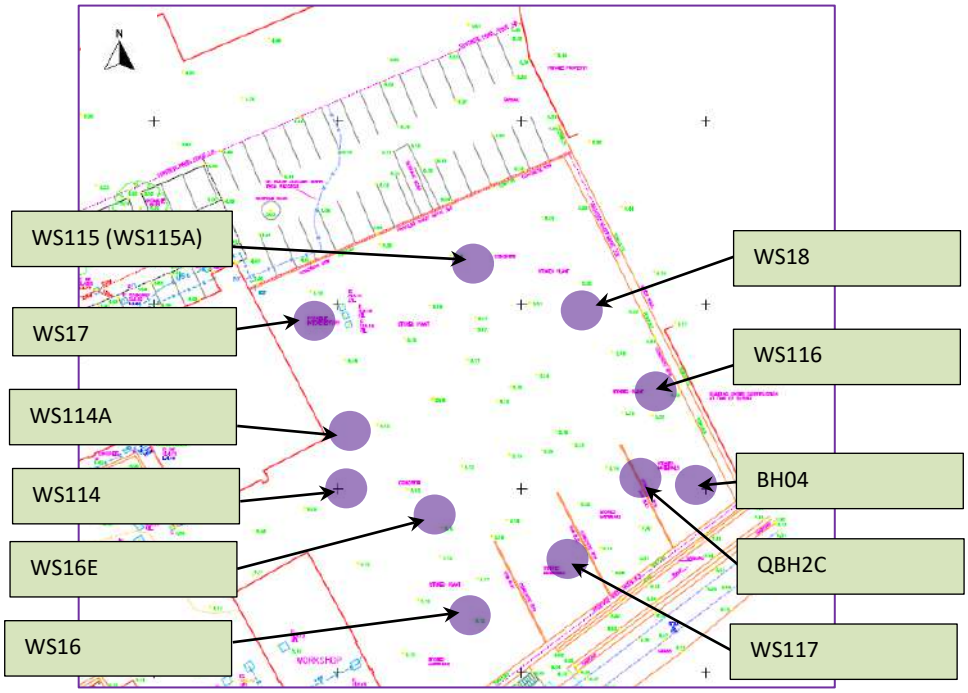

Figure 8: Location of hydrocarbon contamination and obstructions – eastern area of the site

Table 5: Contamination records and obstructions - eastern area of the site

Exploratory hole	Coordinates	Depth range (mbgl)	Contaminants of concern
BH04	E 537,218.2 N 184,381.4	1.0 (MG)	Naphthalene
WS16	E 537,192.1 N 184,366.9	0.8 (MG)	Naphthalene, obstruction
WS16E	E 537,187.8 N 184,375.9	0.5-3.0 (MG and Alluvium)	Benzene, naphthalene, oil sheen, asbestos
WS17	E 537196.0 N 184398.0	0.6 (MG)	Obstruction
WS18	E 537223.0 N 184405.9	0.6 (MG)	Obstruction
WS114	E 537194.9 N 184379.6	0.6 (MG)	Obstruction
WS114A	E 537197.2 N 184387.1	0.23 (MG)	Obstruction
WS115A	E 537210.9 N 184408.6	1.5-2.2 (MG)	Benzene, naphthalene, oil sheen
WS115	E 537198.2 N 184407.6	0.6 (MG)	Obstruction
WS116	E 537230.48 N 184395.3	0.5-2.4 (MG)	Benzene, naphthalene, asbestos
WS117	E 537221.1 N 184378.9	1.0-2.5 (MG)	Benzene, naphthalene, benzo(a)pyrene, asbestos
QB2C	E 537229.70 N 184384.4	0.6-1.8 (MG)	Hydrocarbons or solvents odour and oil sheen

The *source removal* is intended to remove the superficial gross contamination largely localised in WS16E, WS115A, WS116 and QB2C. Based on the groundwater monitoring records collected in BH04A, the depth of excavation is estimated between 1.5m and 1.8mbgl (3.67mOD to 3.47mOD).

Material that appears to be contaminated based on visual observations and use of photo-ionisation detection (PID) screening shall be excavated directly into trucks for off-site disposal. Furthermore, stockpiling of odorous arisings on site should be limited to a minimum to reduce odour nuisance and vapour generation and appropriate air monitoring and mitigation measures should be

implemented as set out in Section 8. Samples shall be taken from the soils exposed on the base and sides of the resultant excavation and compared against the remediation targets described in Appendix E.

Excavations will be kept open for the shortest time possible. The abstraction of water/product, if needed, will be limited in area (10m x 10m as a maximum), with odour neutralisation unit in close proximity (as detailed in Section 8). Sheeting will also be applied to minimise volatilisation / odours depending on the results of atmospheric monitoring. The backfill of the excavation will be carried out by re-using the suitable site-won material either produced by crushing the demolition arisings and/ or from the bulk excavation of the basement. Site won backfill will be subjected to validation testing at an estimated frequency of 1 sample per 100m^3. A Material Management Plan will be set out in accordance with the Definition of Waste: Code of Practice[15] to enable the reuse of the site won material.

7.4 Dewatering of excavations

The groundworks may encounter perched groundwater impacted with hydrocarbon and solvents contamination. This water will require pumping to achieve the required excavation depth in some areas. In this case, superficial perched water will be abstracted from the excavations and transferred to a treatment unit or to a temporary storage unit, prior to off-site disposal. Water abstraction will be achieved through pumping of the groundwater from sumps constructed via trenches, utilising excavations to remove soil contamination and/or well points. The use of a treatment unit will require a consent for the disposal to foul sewer. The use of absorbent mats or similar is recommended to remove the LNAPL floating on perched water prior to undertaking the abstraction.

As anticipated for the removal of the primary source of ground contamination, the abstraction of water/product, if needed, will be limited in area not wider than 10m by 10m, with odour neutralisation unit in close proximity (as detailed in Section 8). Sheeting will also be applied to minimise volatilisation / odours depending on the results of atmospheric monitoring.

7.5 Remediation of the superficial groundwater - eastern area

Following removal of grossly impacted soils, a programme of chemical oxidant application is proposed.

The application will be designed and undertaken by a specialist remediation contractor. This will comprise the injection of the selected reagents through dedicated borehole installations located across the eastern area of the site as described in Figure 9 and Table 6.

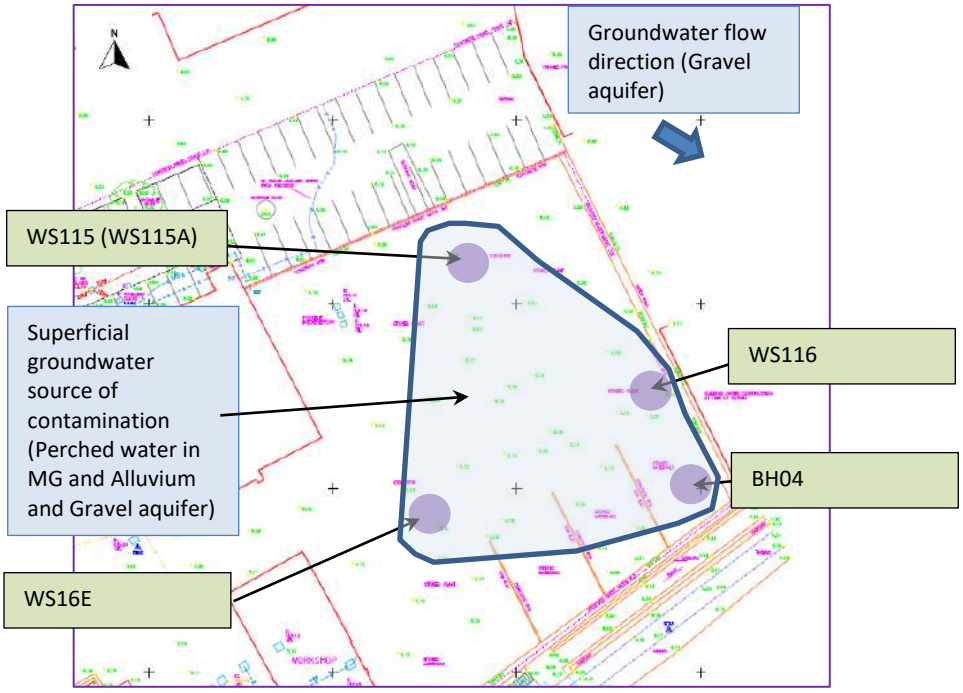

Figure 9: Location of hydrocarbon contamination in groundwater – eastern area of the site

Table 6: Summary of the contamination records in groundwater - eastern area of the site

Exploratory hole reference	Coordinates	Depth range (mbgl)	Contaminants of concern
BH04A	E 537,218.2 N 184,381.4	1.0-2.5 (MG)	Benzene, phenols
BH04B	E 537,218.2 N 184,381.4	4.8-5.8 (Gravel)	Phenols, aromatic TPH
WS16E	E 537,187.8 N 184,375.9	1.2-4.0 (MG and Alluvium)	Benzene, naphthalene, aromatic TPH, oil sheen,
WS115A	E 537210.9 N 184408.6	4.0-5.0 (Gravel)	Benzene, naphthalene, aromatic TPH, oil sheen
WS116	E 537230.48 N 184395.3	3.5-4.7 (Gravel)	Benzene, phenols, naphthalene, aromatic TPH

The objective of this phase of the remediation is to treat the superficial saturated soils and the dissolved contamination plume recorded at the site via in situ remediation (via injection wells). The injection of reagents in the excavations (e.g. oxidisers and /or surfactants) will be limited as far as feasible in order to reduce the potential impacts from contamination vapours and odour nuisance to the identified on and off site receptors. As anticipated, the excavations of the *source removal* phase will be kept open for the shortest period of time and the recovery of free phase product, if deemed necessary, will be limited in area to 10m by 10m, with odour neutralisation unit in close proximity. Sheeting will also be applied to minimise volatilisation / odours depending on the results of atmospheric monitoring.

The *in-situ* remediation of the superficial saturated soils and the Gravel aquifer will comprise:

I. The injection of an oxidising compound (equivalent to RegenOX®) in the superficial saturated Made Ground and Alluvium soils via injection wells to enhance the remediation of the recorded contaminants (aromatic TPH). This product will maximise in situ chemical oxidation (*ISCO*) performance through use of a oxidizing agents which is activated by a catalyst to rapidly and effectively destroys a range of target contaminants including petroleum hydrocarbons.

II. The injection of a suspension activated carbon and biostimulating electron acceptors (equivalent to PetroFix®) to create *Permeable Reactive Barrier* ("PRB"). This will prevent any further migration of pollution in the groundwater from the residual contamination localised within the less permeable alluvial soils which may not be treatable.

III. The application of oxygen release compound designed specifically for *enhanced in situ aerobic bioremediation* of petroleum hydrocarbons (equivalent to ORC®) in the saturated Made Ground and Alluvium soils and in the Gravel aquifer. Upon contact with groundwater, this product will produce a controlled release of oxygen to support aerobic biodegradation for periods of up to 12 months with a single application.

The injection wells will be installed to a selected depth range: 1.5m to 3.0m bgl (saturated Made Ground); 1.5m to 4.0m bgl (saturated Alluvium); 3.5m to 5.8m bgl (Gravel aquifer). The spacing between the injection wells will be designed in accordance with (i) the contamination level and (ii) estimated hydraulic conductivity of the identified layers of soil. The treatment area will cover the target area as described in Figure 8 (900m^2).

Monitoring wells will installed along with injection wells. The response zones of each monitoring point will be located to investigate a specific layer of soil. Groundwater monitoring rounds will be carried out to evaluate the progress of the remediation. Based on the results of the post-application sampling round, a further application round may be considered necessary. Based on the distribution of results, the second round may be specifically targeted to areas of persistent impact. A monitoring period of at least six months is proposed to monitor the quality of the groundwater following the remediation works. The chemical results will be screened against the Remediation Targets presented in Appendix E to confirm the completion of the remediation works.

7.6 Discovery strategy

The Discovery Strategy included as Appendix G will be adopted during the bulk excavation of the basement and the enabling works which will be carried out across the central area of the site. Watch and brief duties will be conducted by the Site Engineer. If ground conditions are encountered during the groundworks phase that are not consistent with those encountered during the intrusive investigations, or visual or olfactory evidence of contamination is noted, works should cease. The area should be segregated. The encountered visibly contaminated or odorous materials, or suspected contaminated materials, should be treated as set out for the removal of the identified source of contamination (Section 7.2.1). The won materials with visible contamination and odorous evidence, where feasible, shall be excavated directly into trucks for off-site disposal. Temporary stockpiling of soils (with odorous and contamination evidence) for testing should be limited of the excavation for waste characterisation testing. An air quality monitoring and mitigation measures should be applied as required to reduce any impacts or nuisance to the groundworkers and the identified neighbouring receptors (see Section 8).

7.7 Re-use of site won material

It is possible that demolition arisings will be crushed to provide a suitable backfill material and also that some clean some material excavated during the bulk excavation of the basement could be suitable for re-use (e.g., for general fill). The designated fill material will be chemically and geotechnically tested prior to placement. The most suitable mechanism for re-use is generally the Definition of Waste: Code of Practice[15]. A *Materials Management Plan* should be completed and submitted to the Environment Agency for approval. As an alternative, a suitable Environmental Permit should be obtained from the EA National Permitting Service (e.g. for crushing the demolition arisings).

7.8 Waste disposal

The excavation of the basement and the eastern area of the site will result in excess material and/or waste being generated at the site. All waste disposal activities should be carried out in accordance with the Waste (England & Wales) Regulations 2011 and other relevant waste legislation. Classification of surplus

arisings should be carried out in line with the requirements of Technical Guidance WM3[16].

All Duty of Care documentation and relevant records shall be maintained by the Contractor. This shall include all waste transfer/consignment notes and disposal certificates for each load of material removed from site to ensure an auditable trail of material movement can be maintained.

Consideration should be given to segregating arisings generated from the areas with contamination records as these materials may contain contaminant concentrations that could result in the material being classed as hazardous waste. These materials may require additional analyses to support classification.

7.9 Unexploded Ordnance

Based on the findings from the UXO Risk Assessment[17] previously undertaken for the site, the site is found to be located in an area that was subject to a moderate-high level of bombing and suffered bomb damage during the World War II with two high explosive bombs recorded within the site area. As a result, the risk from UXO has been assessed as medium across the area of the site where the basement is to be constructed. UXO clearance is required during the intrusive works associated with the remediation and foundations.

7.10 Underground services

A number of services are present across the site. Reference should be made to the service plans available for the site. Where services are to be removed, consideration should be given to plugging pipes and installing clay/concrete baffles to prevent any remaining sections of service pipe/trench acting as a potential pathway for contaminant migration.

Where services are to remain live and are beneath or adjacent to the excavations, risk assessment and method statement should be prepared by the

[16] EA, SEPA, NIEA, Natural Resources Wales (2015). *Waste classification - Guidance on the classification and assessment of waste*. Technical Guidance WM3. 1st edition dated May 2015.
[17] Trego Road, Hackney Wick. *Detailed Unexploded Ordnance (UXO) Risk Assessment*. DA1841-00. 1st Line Defence. 8th February 2016.

remediation contractor for each location. Such services should have their locations identified and adequately protected.

The contaminant concentrations recorded within some areas of the site could have a deleterious effect on services, including potable supply pipes. New services located in existing soils should therefore be placed in geotextile lined trenches backfilled with clean material to protect future maintenance workers. The geotextile layer will act as a marker between the clean trench fill and the surrounding soils.

7.11 Construction workers and neighbours

All site works should be undertaken in accordance with the guidelines prepared by the Health & Safety Executive[18] and by CIRIA[19]. During the remediation works excavation, precautions should be taken to minimise exposure of workers and the general public to potentially harmful substances. Attention should be paid to restricting possible off-site nuisances such as dust and odour which may be generated during the excavation. Precautions to reduce risks and nuisance should include but not be limited to:

a. During the works, the site should be secured to prevent any unauthorised access.

b. Suitably competent contractors with the necessary environmental permits shall be appointed to undertake the works.

c. Production of detailed health and safety risk assessments to be provided to all site personnel.

d. Appropriate personal hygiene, washing and changing procedures.

e. Use of personal protective equipment (PPE), which depending on the conditions encountered may include disposable overalls and respiratory protection for organic vapours and asbestos fibres.

f. Provision of suitable control mechanisms for noise, dust and odour during the groundworks. A monitoring plan including mitigation measures will be

[18] HSE (1991) *Protection of workers and the general public during the development of contaminated land.*
[19] CIRIA (1996) *A guide for safe working on contaminated sites.* R132.

implemented by the remediation contractor during the groundworks in order to reduce odour impacts on and off site as set out in Section 8.

Relevant guidance and regulations comprising the CAR[20] guidance (based on the current classification as notifiable non-licensed work – NNLW) and the CDM regulations 2015[21] should be followed.

[20] CL:AIRE. (2012). *Control of Asbestos Regulations 2012: Interpretation for Managing and Working with Asbestos in Soil and Construction & Demolition materials: Industry Guidance*
[21] HSE. (2015). *The Construction (Design and Management) Regulations 2015*.

8. MITIGATION MEASURES OF THE GROUNDWORKS - PHASE 1

8.1 Monitoring of acute risks from contamination vapours

Odour and vapour mitigation and management measures will be implemented by the remediation contractor during the groundworks in order to reduce odour impacts off site as set out in the *Acute and sub-chronic vapour risk assessment*[22] ("AsCVRA") carried out by GBCP.

Due the levels of potentially volatile contaminants reported within the soils to be removed and stockpiled on site, consideration must be given to minimising release of vapours and/or odours that may present a nuisance and a risk to site operatives and neighbouring site users as well as passing pedestrians.

It is proposed that no odorous stockpile will be retained on site for more than 24hours. As mentioned under the soil removal section, stockpiled soils will be covered with an impermeable membrane whenever possible to restrict the release of odours/volatiles while soils await removal from site. Stockpiled of odorous materials will be maintained on site for as short a time scale as possible before either replacement in the ground or off-site disposal to minimise the time frame for vapour or odour release.

Excavations kept open for the purposes of skimming product will be limited in area to 10m by 10m, as a maximum, with odour neutralisation unit in close proximity. Sheeting will also be applied to minimise volatilisation / odours depending on the results of atmospheric monitoring. Furthermore, the in-situ remediation techniques selected for the superficial saturated soils and will be focused on the minimisation of the treatment of open excavations (see Section 7.5).

The site is entirely surrounded by a high brick wall which will provide some mitigation for odours and vapours migrating off -site (over 2m approximately). The vehicle entry gates in use are not located near the area of the excavations.

In addition to the above, wherever feasible, works will be undertaken during favourable weather conditions which will naturally reduce the potential for

[22] GBCP (2021) Wickside, Hepscott Road, London. *Acute and sub-chronic vapour risk assessment*. Ref. GB620-ASVRA-NOV-2021, dated November 2021.

odours to reach nuisance levels; for example, undertaking excavation works during cold weather will reduce the rate of volatilisation.

8.2 Air monitoring system

An air monitoring system will be maintained to measure concentrations of volatiles during the works, to ensure that the measures adopted are effective and are suitably protective of on and off-site receptors.

This identified the following receptors at risk during ground disturbance:

- On site operatives;
- Neighbouring commercial site users;
- Neighbouring residential users;
- Passing members of the public.

Four air monitoring points (AMP1 – AMP4) are proposed at the site boundary, with a fifth monitoring location (AMP5) to be located on site and variably located in proximity to the working area. The boundary locations proposed for each remediation area are described in Figure 10 and Table 7.

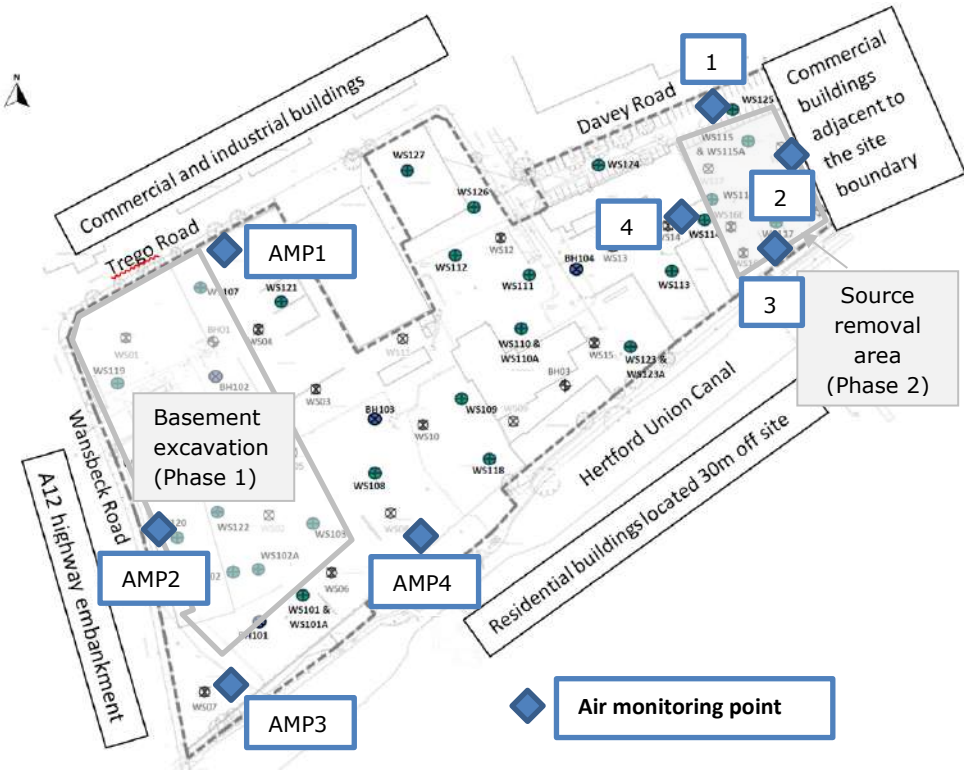

Figure 10: Location of the air monitoring points and the off-site receptors

Table 7: Air monitoring points

Ref.	Location (basement excavation)	Location (source removal eastern area of the site)	Sensitive receptor
AMP1	Northern boundary	Northern boundary	Commercial/Public
AMP2	Western boundary	Eastern boundary	Commercial/Public
AMP3	Southern boundary	Southern boundary	Residential/Public
AMP4	South-eastern boundary	Western boundary	Onsite workers / Residential/Public

Transportable ambient air VOC monitors (equivalent to AreaRAE®) will be installed at the boundary air monitoring points 'AMPx'. The VOC monitors will record concentrations of VOC to an accuracy of 0.1 parts per million (ppm), calibrated to benzene. Concentrations of VOC will be taken nominally every minute for the duration of the working hours, and the results will be transmitted to a laptop computer, with each daily record being retained in a suitable file format. The monitoring will provide early warning in real-time of any rise in concentrations with the potential to cause issues.

A site boundary threshold value of 0.5ppm and a notification threshold of 0.3ppm for a PID calibrated using benzene are proposed for the initial stages of the works. VOC boundary thresholds will be refined based on comparison of laboratory testing and VOC in air as recorded by PID as the works develop. This will ensure the identification of threshold for VOC at the site boundary which can be considered protective of human health and of significant nuisance odour/vapour. The initial threshold value of 0.5 ppm is still considered to be conservative. This is selected equal to the 50% of the Odour Threshold Criteria for benzene derived in the GBCP AsCVRA[8] (1ppm).

All VOC boundary thresholds will be lower than acute risk criteria (ART) for, as presented in the GBCP AsCVRA[8] and in Appendix H.

Where VOC boundary threshold (initially set to 0.5ppm) are exceeded the Site Engineer will immediately liaise with the Contractor such that works can be adjusted. Measures will be taken to reduce impact include postponing or stopping the excavation works, covering areas being worked, and increasing odour neutralisation at the working face, with inclusion of vapour screens to capture volatile enriched air and allow more focused use of vapour neutralisation. The extent of active works at any time will be monitored. The size of working areas will be reduced where concentrations of contaminants are relatively high (especially during the source removal of the eastern area of the site where significant presence of VOC is expected).

Where VOC boundary thresholds are exceeded, vapour cannister samples will be undertaken at the relevant monitoring point. The vacuum canister analysis will be accelerated depending on laboratory capacity and availability, to expediate results and facilitate early confirmation that ambient concentrations at receptor locations are acceptable. The results will be compared to the acute risk criteria (ART) and sub-chronic risk criteria (SCRC) as presented in the GBCP AsCVRA[8] and in Appendix H.

8.3 Odour nuisance monitoring

Observations of odours will reference the VDI[23] intensity scale detailed in the in the GBCP AsCVRA[8], and defined below:

- Level 0 – No odour/not perceptible: No odour when compared to the clean site
- Level 1 – Slight/very weak: There is probably some doubt as to whether the odour is actually present
- Level 2 – Slight/weak: The odour is present but cannot be described using precise words or terms
- Level 3 – Distinct: The odour character is barely recognisable
- Level 4 – Strong: The odour character is easily recognisable
- Level 5 – Very strong: The odour is offensive. Exposure to this level is considered undesirable
- Level 6 – Extremely strong: The odour is offensive. An instinctive reaction would be to mitigate further exposure.

The remediation strategy aims to limit odours to a general maximum of Level 2 on the above scale, with an acknowledgment that Level 3 and Level 4 may be unavoidable for periods of time. It would be expected that odours of Level 5 and above will not be generated if the proposed remediation strategy is implemented.

It should be noted that odours at Level 3 ("Distinct") and Level 4 ("Strong") may still lead to complaints from adjacent land users. Therefore, the remediation strategy should include measures to minimise odours to Level 2 as far as reasonably practical, with an acknowledgment that Level 3 and Level 4 may be unavoidable for periods of time.

Implementation of the odour monitoring will comprise the Site Engineer recording olfactory observations ('Sniff tests') at each Monitoring Point at the commencement of the daily work shift (ca 8am), at a mid-morning (ca 11.00

[23] VDI 3940: 1993, Determination of Odorants in Ambient Air by Field Inspection.

am), early afternoon (ca 2pm) and at the end of the working day (ca 4.30 pm). During each observation the odour observation (as per the VDI[23] intensity scale) will be noted, along with current weather conditions and prevailing wind direction.

Sniff testing will be carried out in compliance with the recommendations formulated by the EA in the *Environment Agency (March 2011) H4 Odour Management*[24]*.* Forms and advice for sniff testing are included in the guidance as well as health and safety advice. Potentially hazardous emissions may be present at the testing locations and on site PID measurements should be checked prior to conducting any sniff tests.

The above discussed vapour/odour mitigation measures should be implemented by the main contractor where applicable throughout the ground working phase of the remediation whenever a feasible risk of nuisance odour or vapour generation is identified.

8.4 Monitoring of sub-chronic risks from contamination vapours

Passive sorbent tube monitoring will be undertaken on a weekly basis at boundary monitoring location (AMP1- AMP4) to measure time-weighted average (TWA) concentrations of individual determinands of particular concern, including benzene and naphthalene, during ground disturbance works at the site. This monitoring will continue for the duration of the remedial excavation and product skimming phase, which is expected to last for a maximum of sixteen weeks, and will continue as long as ground is being disturbed at the site. Following sampling of the first round of passive monitoring, expedited testing will be undertaken to ensure that data is obtained with sufficient time to assess the sub-chronic risks and ensure any exceedances do not persist into a sub-chronic time frame.

Concentrations recorded by the passive sorbent tube monitoring will be compared against sub chronic human health threshold concentrations (SCRC) (for passive sampling) presented in the GBCP AsCVRA[8] and in Appendix H.

Odour suppression unit(s) will be present and operating in close proximity when impacted soils and groundwater are exposed. The suppression units consist of mobile rotary atomisers and through the addition of a neutralising additive,

[24] Environment Agency (March 2011) H4 Odour Management.

odour compounds are broken down and removed. Furthermore, where possible, open excavations will be limited to 10m by 10m to increase the efficiency of the odour suppression units. Excavations will not be left open overnight where at all possible.

It should be noted that the proposed units are designed to remove the odour causing contaminants from the air, rather than just mask them with a deodorising spray.

9. REMEDIATION IMPLEMENTATION – PHASE 2

9.1 Capping system

Hardstanding associated with parking, roads and the footprints of the new buildings will form a suitable barrier between ground and future site users across the site after the remediation works. No private gardens are proposed as part of the new development however, new open spaces, including private and communal amenity, public realm and associated landscaping are anticipated to be part of the new development scheme. An engineered capping layer will be placed to prevent exposure to underlying soils and restrict the vertical migration of contaminants within the areas of soft landscaping. Reducing infiltration across the site will retard leaching of potential residual contaminants from the unsaturated zone thereby reducing the contaminant loading on the underlying aquifer. The proposed capping layer construction for areas of landscaping is outlined in Table 8 and in Appendix I.

Table 8: Capping layer for landscaped areas (public open spaces)

Layer	Thickness
Topsoil growth medium	150mm*
Cohesive subsoil	450mm
Geotextile separator membrane	Y

*Or as required by landscape architect

The depth of the capping layer will be 600mm minimum. The width of the landscaped areas will be appropriate to the type of vegetation selected by the landscaped architects. The walls and the bottom of landscaped areas will be lined with a geotextile layer (for example, Terram© T1000 or equivalent approved). Topsoil and subsoil suitable for planting and compliant to BS 8601[25] and BS 3882[26] will be used as backfill.

The backfilling material for the landscaped areas should be 'non-waste' soil imported from a known and reputable source (e.g. from a commercial provider of manufactured top/subsoil). This will be analysed to verify that the

[25] BS 8601:2013. *Specification for subsoil and requirements for use.*
[26] BS 3882:2015. *Specification for topsoil*

concentrations of chemical contaminants are compliant to the remediation targets presented in Appendix E to enable the use on-site.

9.2 Appropriate design of underground structures

The use of plastic water supply pipes is unlikely to be permitted given the ground conditions. Water supply pipes should be designed in accordance with advice provided by the UK Water Industry Research and the local utility company.

The potential for long-term negative impacts on buried concrete from acidity, sulphur and sulphate salts, high phenol concentrations and aggressive conditions may be controlled through appropriate concrete mix design. Consultation will be required with the piling contractor regarding the potential need for coatings, casing or increasing the sacrificial layer of concrete.

Exposure of maintenance workers to underground infrastructure will be managed through the provision of geotextile lined dedicated service corridors backfilled with clean material.

9.3 Design of piled foundations

Due to the presence of a significant thickness of Made Ground and soft alluvial deposits, piled foundations formed within the Thanet Formation and potentially Chalk are likely to be required for the proposed development and anticipated structural loads. A *Foundation Works Risk Assessment* will be prepared to (i) identify the risks posed by the foundation works to the aquifers underlying the site (ii) to select the appropriate piling technique and (iii) to set out the control measures to minimise the potential impacts.

- Use of contaminant appropriate personal protective equipment (PPE) including overalls, gloves, goggles, respirators, dust masks etc. following site specific risk assessments undertaken by the remediation contractor;
- Implementation of measures to monitor and mitigate the impact on construction workers and neighbouring properties when piling in contaminated areas;

- Monitoring of groundwater quality to establish pre-construction conditions, monitor changes in quality during piling and record post construction changes.

9.4 Ground gas and vapour protection measures

Although the ground gas regimes recorded at the site comply with to a *Characteristic Situation 1* classification 'CS1' as specified BS8584:2015 guidance[27], gas protection measures consistent with Characteristic Situation 2 'CS2' will be implemented to reduce the risk for intrusion of vapour in the buildings of the future development. Gas and VOC resistant membranes will be installed in all the new and refurbished existing buildings sitewide as a precaution measure.

The design of the gas protection measures of the new buildings will be carried out in accordance with the BS8584[27] guidance. The gas protection measures of the retained existing building will be installed in accordance with the *Retrofitting ground gas protection measures in existing or refurbished buildings*[28] (C795).

Based on the ground gas information to date, however, a CS2 gas regime is identified for the new building. As described in Table 4 of BS8485[27], this comprises a scope of gas protection measures to provide a minimum score rating of 3.5 for a Mixed used Type B building which has been adopted based on the available design proposals.

Although no detailed designs of the ground floor slab have been made available at the time of the preparations of this report, it is understood by GCBP that the final design will comprise raft foundations on piles. The gas protection measures for the new buildings will, therefore, comprise a proprietary gas impermeable membrane which gives a score of 2 and a cast in situ reinforced suspended floor slab (with minimal penetrations) giving an additional score of 1.5.

These protection measures are compliant with BS8485[27] approach and should be readily achievable given the piled foundations solution proposed for the new buildings.

[27] British Standard BS 8485:2015+A1:2019 *Code of practice for the design of protective measures for methane and carbon dioxide ground gases for new buildings.*
[28] CIRIA (C795) Retrofitting ground gas protection measures in existing or refurbished building, December 2020.

The gas resistant membrane shall meet all of the following criteria:

a. Sufficiently impervious to 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).

b. Sufficiently durable to remain serviceable for the anticipated life of the building and duration of gas emissions.

c. Sufficiently strong to withstand the installation process and following trades until covered (e.g. penetration from steel fibres in fibre reinforced concrete, tearing due to working above it, dropping tools, etc).

d. Capable, after installation, of providing a complete barrier to the entry of the relevant gas and contamination vapours (VOCs and Petroleum hydrocarbons).

The floor slab and wall/edge details incorporating the gas membrane must be included in the structural/architectural drawings for approval by GBCP prior to construction. The choice of membrane can also act as the damp proof or waterproof membrane. Care should be taken that the membrane is not damaged from placement of steel reinforcement on top of the membrane.

An independent validation inspection should be undertaken by a specialist advisor following the installation of the gas membrane prior to casting the suspended slab to confirm that the measures have been suitably installed, in accordance with the requirements of CIRIA C735[29].

9.4.1 Gas protection measures of the retained buildings

The CIRIA guidance C795[28] '*Good practice on the testing and verification of protection systems for buildings against hazardous ground gases'* is used as a reference along with BS8485[27] to design the gas protection measures of the retained buildings of the new development. The recommended protection measure will protect the retained and refurbished from intrusion of gas and contamination vapours potentially generated by any residual soil and groundwater contamination localised beneath the buildings footprint.

[29] CIRIA (C735) Good practice on the testing and verification of protection systems for buildings against hazardous ground gases, August 2014.

It is recommended that all the retained and refurbished buildings will have a new cast-in-place ground bearing slab minimum thickness 100mm with steel reinforcement to minimise shrinkage and cracking and a gas proof membrane resistant to VOC.

This type of ground bearing slab can provide a score of 1.5 when it is built on a pressure relief layer (score 0.5) in accordance with BS8485[27] guidance. The pressure relief pathway will comprise low fines gravel or with a thin geocomposite blanket or strips terminating in a gravel trench external to the building.

As set out in CIRIA Report C795[28], the selected gas and VOC resistant membrane will meet the criteria described for the gas membrane of the new buildings in Section 9.4. The membrane will be installed as specified by approved installers and the verification and an independent validation inspection should be undertaken by a specialist advisor in accordance CIRIA Report C735[29]. The verification requirements are set out in the Verification Method Statement described in Section 10 and Appendix J.

10. VERIFICATION METHOD STATEMENT

A *Verification Method Statement* for the remediation works setting out the remediation tasks, roles and responsibilities of the organisations involved in the works is set out in Appendix J. The *Method Statement* also sets out the evidence/testing regime to be undertaken to demonstrate compliance with the requirements of the Remediation Implementation Phase 1 and 2.

On completion, a *Verification Report* will be prepared by GBCP detailing the remediation works undertaken, including any unforeseen contamination encountered during construction together with any specific remediation requirements to mitigate for unforeseen ground contamination. All compliance test data will be presented.

Verification Reports may be issued in a phased approach to align with construction programmes. All *Verification Reports* will be submitted to LLDC for approval and sign-off against the relevant planning conditions.

Appendix A

Topographic and Services Survey

GB Card
& PARTNERS


ST STEPHENS WAREHOUSE
COMMERCIAL WAREHOUSE
COMMERCIAL WAREHOUSE
COMMERCIAL WAREHOUSE
COMMERCIAL WAREHOUSE
REPAIR WORKSHOP
BUILDING UNDER DEMOLITION
OFFICES
REPAIR WORKSHOP
REPAIR WORKSHOP
HERTFORD UNION CANAL
HERTFORD UNION CANAL

Appendix B

Site development plans

GB Card
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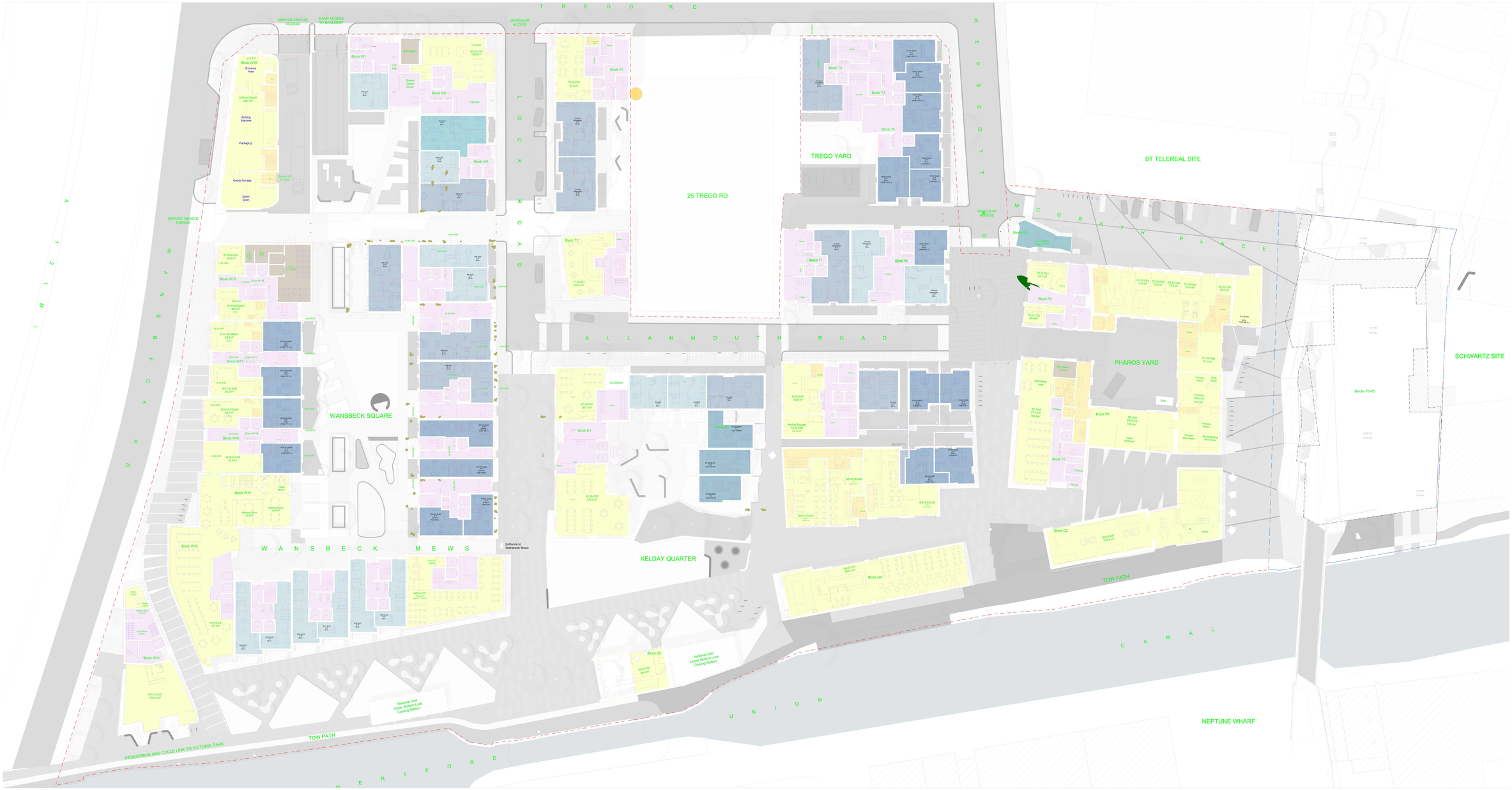

Notes

1. All dimensions are in millimetres.
2. All dimensions are to be checked on site and the Architect informed of any discrepancies before commencement of any work.
3. All references to drawings refer to the current revision of that drawing.
4. Structural and services information shown is diagrammatic only and is to be coordinated in detail by specialist consultants.
5. Refer to 'Wansbeck' building plans for storage, cycle parking and refuse provision for Wansbeck. Any construction changes to these plans will require planning consent.

KEY:

- Application Boundary
- Outline Area
- Block P3-P5 Minimum Parameter Boundary
- Block P3-P5 Maximum Parameter Boundary

- 1 bed Unit
- 2 bed Unit
- 3 bed Unit
- Duplex
- House
- Commercial Unit
- Residential circulation and storage
- Commercial circulation and storage
- Plant and Shared facilities

NOTE:

Refer to Drawing No. MCG-050 for Final Landscape Plan and Ground Levels

Commercial unit layouts indicative only.

0 2 4 6 8 10 15m

Rev	Description	Date	By	Chk
B	updates to unit layouts, amended substation, amended brewery plan	24 oct 18	KH	
A	updated to show connected bridge and changging unit G1M to commercial use	05 OCT 17	KH	

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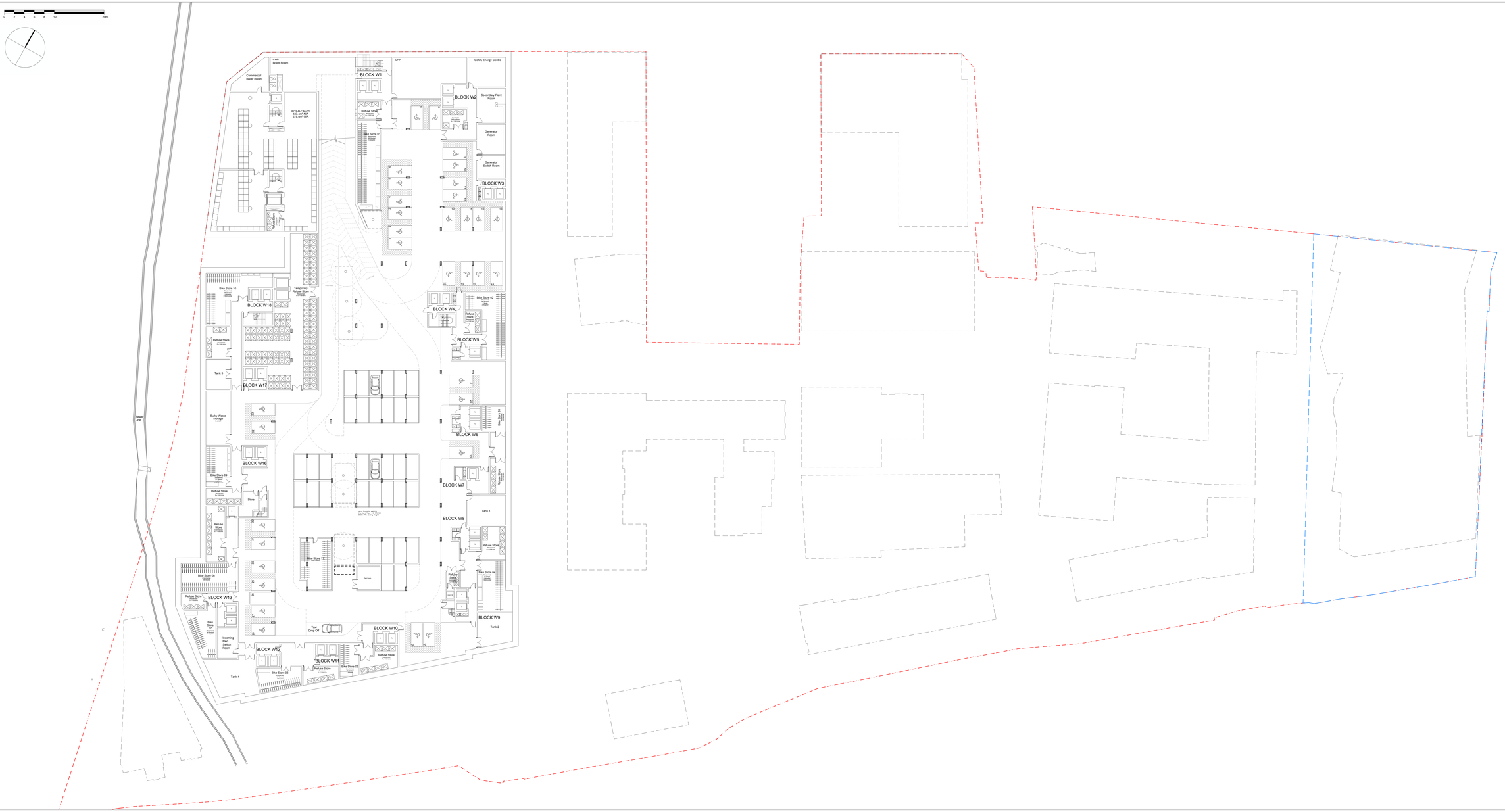
Job title
Wickside
Hepscott Road E9 5HH

Drawing title
Masterplan
Ground Floor Plan

Drawn by	Date	Scale @ A3 (Long Dim' x 1632mm)
CnT	OCT 2017	1:200
Checked	Date	Issued for
--	-	PLANNING

Job No.	Project Status	Block	Drawing No.	Revision
1186	PL	-	010	B



Notes

1. All dimensions are in millimeters.
2. All dimensions are to be checked on site and the Architect is to be informed of any discrepancies before construction commences.
3. All references to drawings refer to the current revision of that drawing.
4. Structural and services information shown is indicative only. Consultants drawings for details and setting out.

KEY:

- Full Application Ownership Boundary
- Outline Application Ownership Boundary

Rev	Description	Date	By	Chk
A	updated commercial refuse store, updated brewery plan	24 04 17	KH	

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Job title
Wickside
Hepscott Road E9 5HH

Drawing title
Masterplan
Basement Plan

Drawn by	Date	Scale @ A3 Long (841 x 1682mm)
-	March 2016	1:200

Checked	Date	Issued for
-	-	PLANNING

Job No.	Project Status	Block	Drawing No.	Revision
1186	PL	-	099	A

Appendix C

Screening assessment tables soils

GB Card
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Soil screening assessment

Lab Sample Number		Residential with Home Grown Produce SOM 2.5%	552142	552146	552145	552139	552138	552147	554485	554486	549574	1503347	1503348	1503349	1503313	1503314	1503381	1503318	1503379	1506672	1503316	1626829	1626834	1628729
Sample Reference			**WS1**	**WS4**	**WS5**	**WS6**	**WS7**	**BH101**	**BH102**	**BH102**	**BH103**	**WS103**	**WS103**	**WS105**	**WS106**	**WS106**	**WS108**	**WS120**	**WS119**	**WS121**	**WS122**	**WS101A**	**QBH1A**	**QBH2C**
Depth (m)			**0.50**	**0.70**	**0.30**	**0.60**	**0.40**	**0.40**	**0.30**	**2.50**	**0.50**	**1.70-1.80**	**5.30-5.40**	**1.50-1.60**	**0.70-0.80**	**2.60-2.70**	**1.50-1.70**	**0.80-1.00**	**2.70-2.90**	**0.40-0.60**	**0.40-0.50**	1.5	1.0	1.5
Date Sampled			10/03/2016	11/03/2016	11/03/2016	10/03/2016	10/03/2016	15/03/2016	23/03/2016	23/03/2016	03/09/2016	27/04/2020	27/04/2020	27/04/2020	28/04/2020	28/04/2020	29/04/2020	28/04/2020	29/04/2020	05/05/2020	28/04/2020	16/09/2020	16/09/2020	17/09/2020
Formation			MG	MG	MG	MG	MG	MG	MG	MG	MG	MG	MG	MG	MG	MG	MG	MG	MG	MG	MG	MG	MG	MG	MG
Site Area			**W**	**W**	**W**	**W**	**W**	**W**	**W**	**W**	**W**	**W**	**W**	**W**	**W**	**W**	**W**	**W**	**W**	**W**	**W**	**W**	**W**	**W**	**W**
Stone Content	%		< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	47	< 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
Moisture Content	%		9.5	15	23	13	13	9.1	3.9	24	16	38	30	23	9.2	25	39	19	34	10	17	11	13	12
Total mass of sample received	kg		1.0	0.99	1.1	0.96	0.95	0.94	1.0	0.95	2.0	1.1	1	1.2	1.4	1	1.2	1.5	1.2	1.5	1.5	1.1	1.3	2
Asbestos in Soil Screen / Identification Name	Type		Chrysotile	-	-	-	Chrysotile	Chrysotile & Crocidolite	-	-	Chrysotile & Amosite				-	-		-		-	Chrysotile - Loose Fibres				
Asbestos in Soil	Type		Detected	Not-detected	Not-detected	Not-detected	Detected	Detected	Not-detected	Not-detected	Detected	Not-detected	Not-detected	Not-detected	Not-detected	Not-detected	Not-detected	Not-detected	Not-detected	Not-detected	Detected	Not-detected	Not-detected	Not-detected
			< 0.001	-	-	-	< 0.001	< 0.001			< 0.001													
			< 0.001	-	-	-	< 0.001	< 0.001			< 0.001													
pH - Automated	pH Units	-	9.7	8.9	8.7	10.1	8.5	9.8	10.9	-	8.7	7.9	7.9	7.9	11.6	8	7.8	9	7.8	9.6	9.7	8.7	9.8	8.1
Total Cyanide	mg/kg		< 1	< 1	< 1	< 1	< 1	< 1	< 1	-	71	< 1	130	< 1	< 1	< 1	< 1	< 1	3	< 1	< 1	< 1	< 1	< 1
Total Sulphate as SO_4	mg/kg		3200	6900	9200	15000	9200	3600	7400	-	4000	950	2000	950	7000	2500	1200	4000	2300	11000	3600	1100	6900	1200
Organic Matter	%		2.1	2.1	2.9	0.6	3.5	1.7	1.5	-	1.7	7.2	18	4	1.2	5.2	5.7	2.6	11	2.4	2.1	2.4	1.7	2.2
Total Phenols (monohydric)	mg/kg		< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	-	< 1.0	< 1.0	1.7	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Naphthalene	mg/kg	5.6	2.5	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	0.54	-	< 0.05	8.4	**12000**	6	0.94	1.8	3.4	3.8	1.6	< 0.05	2.3	2.6	1.2	0.31
Acenaphthylene	mg/kg	420	0.92	< 0.10	< 0.10	< 0.10	0.77	0.40	< 0.10	-	0.56	1.4	130	< 0.05	< 0.05	< 0.05	0.6	0.24	< 0.05	< 0.05	< 0.05	0.92	0.3	< 0.05
Acenaphthene	mg/kg	510	6.3	0.40	0.83	< 0.10	2.70	0.64	< 0.10	-	0.57	4.1	**1400**	0.73	0.46	0.27	2.1	1.5	1.2	1.1	0.59	0.84	3.3	0.43
Fluorene	mg/kg	400	4.7	0.31	0.88	< 0.10	3.1	0.65	< 0.10	-	0.65	6.5	**1600**	0.81	0.56	0.33	2.7	1.4	1.6	1.3	0.69	1.6	3.3	0.54
Phenanthrene	mg/kg	220	31	3.0	5.9	0.76	15	5.9	5.1	-	8.7	44	**3400**	5.1	5.2	0.93	26	7.1	8.6	10	3.7	11	18	0.95
Anthracene	mg/kg	5400	6.2	0.81	1.5	0.20	3.8	1.4	0.76	-	2.0	11	960	0.84	1.1	0.21	5.8	1.6	2.4	2	0.79	4.3	3.8	0.53
Fluoranthene	mg/kg	560	30	4.5	7.3	1.7	19	9.9	3.6	-	18	57	**1200**	5.6	6.7	0.92	26	11	6.1	12	6.4	22	20	2
Pyrene	mg/kg	1200	24	3.9	6.5	1.4	16	8.7	3.1	-	15	48	900	4.8	8.9	0.76	23	9.7	5.6	9.8	5.9	18	16	1.7
Benzo(a)anthracene	mg/kg	11	12	2.3	4.0	0.64	7.9	6.5	1.9	-	9.8	24	**390**	2.4	4	0.68	12	4.4	2.6	5.4	3.1	13	7.6	0.99
Chrysene	mg/kg	22	10	2.0	2.8	0.65	7.2	4.1	1.2	-	8.1	21	**230**	2.3	2.9	0.5	10	4.1	2.3	3.7	2.8	10	6.4	0.72
Benzo(b)fluoranthene	mg/kg	3.3	12	2.0	3.2	0.83	7.6	6.7	1.9	-	10	25	**200**	2.9	3.5	0.87	12	5.5	2.8	4.1	4	11	6.4	0.73
Benzo(k)fluoranthene	mg/kg	93	4.5	1.3	2.0	0.35	4.5	2.4	0.45	-	4.5	12	**130**	1.9	1.4	0.26	6	1.8	1.8	2.1	1.6	5.1	2.7	0.31
Benzo(a)pyrene	mg/kg	2.7	8.6	1.7	2.7	0.59	6.5	4.7	1.3	-	8.1	21	**230**	2.5	2.8	0.52	9.9	4.3	2.3	4.3	3.5	8.4	5	0.57
Indeno(1,2,3-cd)pyrene	mg/kg	36	4.4	0.99	1.5	0.38	3.6	2.7	0.76	-	5.2	11	**75**	1.6	1.3	0.32	4.7	2.3	1.3	2.3	2	3.9	2.1	0.28
Dibenz(a,h)anthracene	mg/kg	0.28	1.1	0.18	0.29	< 0.10	0.81	0.74	0.22	-	1.9	3.3	**24**	0.46	0.38	< 0.05	1.5	0.74	0.48	0.64	0.58	1.3	0.62	< 0.05
Benzo(ghi)perylene	mg/kg	340	4.7	1.0	1.6	0.46	3.6	3.0	0.84	-	5.6	11	94	1.6	1.6	0.4	5.4	2.6	1.7	2.8	2.3	3.8	2.5	0.28
Coronene	mg/kg	-	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	-	< 0.05	3	< 0.05	< 0.05	< 0.05	< 0.05	2	< 0.05	< 0.05	0.59	< 0.05	1.5	0.91	< 0.05
Total WAC-17 PAHs	mg/kg		160	24	41	7.9	100	58	22	-	98	310	23000	39	42	8.8	150	62	42	62	40	120	101	10.4
Arsenic (aqua regia extractable)	mg/kg	37	13	11	11	160	16	14	10	-	26	38	340	47	20	64	85	13	44	13	17	21	23	18
Barium (aqua regia extractable)	mg/kg		130	170	140	46	350	160	160	-	190	320	190	430	130	650	520	160	180	140	200	100	160	73
Beryllium (aqua regia extractable)	mg/kg	1.7	0.8	0.7	0.9	0.4	3.1	0.9	0.6	-	1.1	1.6	1.3	1.1	0.67	3.7	1.6	0.92	1.4	0.86	1	0.96	0.91	0.71
Boron (water soluble)	mg/kg	290	2.4	3.4	7.8	13	7.6	2.8	3.9	-	0.3	3.1	6.1	3	2.4	4.4	5.6	10	3.5	5.9	16	0.9	3.3	1.2
Cadmium (aqua regia extractable)	mg/kg	22	< 0.2	0.5	0.4	0.2	0.2	0.2	< 0.2	-	< 0.2	0.5	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	0.4	< 0.2	< 0.2	0.4	< 0.2	< 0.2	< 0.2
Chromium (hexavalent)	mg/kg	21	< 1.2	< 1.2	< 1.2	< 1.2	< 1.2	< 1.2	< 1.2	-	< 1.2	< 4.0	< 4.0	< 4.0	< 4.0	< 4.0	< 4.0	< 4.0	< 4.0	< 4.0	< 4.0	< 4.0	< 4.0	< 4.0
Chromium (III)	mg/kg	910	25	26	31	15	27	23	38	-	26	51	300	29	29	35	110	60	29	26	36	28	30	24
Chromium (aqua regia extractable)	mg/kg		25	26	31	15	27	24	38	-	26	53	300	30	30	37	110	61	29	26	36	28	30	24
Copper (aqua regia extractable)	mg/kg	2400	56	120	100	26	65	230	52	-	120	200	200	220	58	570	170	70	160	56	76	100	56	28
Lead (aqua regia extractable)	mg/kg	200	540	140	160	40	260	270	130	-	440	670	800	930	120	1300	800	200	1100	160	290	210	250	140
Mercury (aqua regia extractable)	mg/kg	40	< 0.3	< 0.3	< 0.3	< 0.3	< 0.3	< 0.3	< 0.3	-	1.3	5.2	39	13	< 0.3	3.7	6.6	0.8	7.8	0.5	1	1.1	1	0.4
Nickel (aqua regia extractable)	mg/kg	130	19	20	37	15	21	24	29	-	27	35	23	24	17	65	32	23	27	19	25	26	20	22
Selenium (aqua regia extractable)	mg/kg	250	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	-	< 1.0	< 1.0	11	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Vanadium (aqua regia extractable)	mg/kg	410	38	40	49	26	57	41	44	-	56	77	55	53	33	83	74	48	55	40	47	48	49	42
Zinc (aqua regia extractable)	mg/kg	3700	130	200	170	53	200	160	85	-	180	460	430	390	130	840	410	170	320	110	190	130	420	51
Magnesium (water soluble)	mg/kg											-	-	14	-	-	-	-	-	-	-			
Magnesium (leachate equivalent)	mg/l											-	-	6.8	-	-	-	-	-	-	-			
Benzene	µg/kg	0.2	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	< 1.0	**11**	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	**35**
Toluene	µg/kg	290	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	< 1.0	36	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	65
Ethylbenzene	µg/kg	110	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.0097	<0.001	<0.001	< 1.0	**460**	< 1.0	< 1.0	< 1.0	< 1.0	4	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	14
p & m-xylene	µg/kg	130	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.012	<0.001	<0.001	< 1.0	**1000**	< 1.0	< 1.0	< 1.0	< 1.0	4.3	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	33
o-xylene	µg/kg	140	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.015	<0.001	<0.001	< 1.0	**550**	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	29
MTBE (Methyl Tertiary Butyl Ether)	µg/kg	84	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	< 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
TPH-CWG - Aliphatic >EC5 - EC6	mg/kg	78	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 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
TPH-CWG - Aliphatic >EC6 - EC8	mg/kg	230	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 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
TPH-CWG - Aliphatic >EC8 - EC10	mg/kg	65	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	0.2	0.5	< 0.1	< 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	0.17
TPH-CWG - Aliphatic >EC10 - EC12	mg/kg	330	3.8	1.3	2.0	< 1.0	< 1.0	< 1.0	11	270	< 1.0	6.2	**970**	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	12	1.9	< 1.0	< 1.0	2	3.5
TPH-CWG - Aliphatic >EC12 - EC16	mg/kg	2400	47	26	30	38	21	6.2	450	**3400**	11	19	1900	< 2.0	7.1	< 2.0	< 2.0	12	100	9.6	11	5.3	45	39
TPH-CWG - Aliphatic >EC16 - EC21	mg/kg	92000	63	84	78	30	42	24	770	6900	23	45	2000	< 8.0	30	< 8.0	< 8.0	41	210	25	44	15	89	27
TPH-CWG - Aliphatic >EC21 - EC35	mg/kg	92000	260	710	570	120	270	120	550	2600	68	61	1300	< 8.0	93	< 8.0	< 8.0	180	130	160	100	46	310	< 8.0
TPH-CWG - Aliphatic (EC5 - EC35)	mg/kg											130	6100	< 10	130	< 10	< 10	230	460	190	160	66	450	73
TPH-CWG - Aromatic >EC5 - EC7	mg/kg	140	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.001	0.011	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	0.035
TPH-CWG - Aromatic >EC7 - EC8	mg/kg	290	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.001	0.036	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	0.065
TPH-CWG - Aromatic >EC8 - EC10	mg/kg	83	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	6.6	4.8	< 0.1	< 0.001	9.6	< 0.001	< 0.001	< 0.001	< 0.001	0.008	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	0.076
TPH-CWG - Aromatic >EC10 - EC12	mg/kg	180	8.5	< 1.0	1.7	3.0	2.1	1.3	3.2	75	< 1.0	15	14000	7.1	4.7	2.2	5.9	4.3	2.8	< 1.0	5.3	19	11	4.4
TPH-CWG - Aromatic >EC12 - EC16	mg/kg	330	180	14	30	44	48	13	250	**2500**	10	28	**17000**	7.2	23	2.1	12	15	25	17	15	25	11	37
TPH-CWG - Aromatic >EC16 - EC21	mg/kg	540	360	88	110	51	180	89	530	**4400**	89	170	**12000**	18	71	< 10	100	51	100	74	48	72	58	46
TPH-CWG - Aromatic >EC21 - EC35	mg/kg	1500	570	480	410	150	500	310	300	**1400**	180	130	**5100**	52	140	15	160	170	140	230	110	91	34	27
TPH-CWG - Aromatic (EC5 - EC35)	mg/kg											340	47000	85	240	28	280	240	270	320	180	210	110	110

Soil screening assessment

Lab Sample Number		Residential with Home Grown Produce SOM 2.5%	552142	552146	552145	552139	552138	552147	554485	554486	549574	1503347	1503348	1503349	1503313	1503314	1503381	1503318	1503379	1506672	1503316	1626829	1626834	1628729
Sample Reference			**WS1**	**WS4**	**WS5**	**WS6**	**WS7**	**BH101**	**BH102**	**BH102**	**BH103**	**WS103**	**WS103**	**WS105**	**WS106**	**WS106**	**WS108**	**WS120**	**WS119**	**WS121**	**WS122**	**WS101A**	**QBH1A**	**QBH2C**
Depth (m)			**0.50**	**0.70**	**0.30**	**0.60**	**0.40**	**0.40**	**0.30**	**2.50**	**0.50**	**1.70-1.80**	**5.30-5.40**	**1.50-1.60**	**0.70-0.80**	**2.60-2.70**	**1.50-1.70**	**0.80-1.00**	**2.70-2.90**	**0.40-0.60**	**0.40-0.50**	1.5	1.0	1.5
Date Sampled			10/03/2016	11/03/2016	11/03/2016	10/03/2016	10/03/2016	15/03/2016	23/03/2016	23/03/2016	03/09/2016	27/04/2020	27/04/2020	27/04/2020	28/04/2020	28/04/2020	29/04/2020	28/04/2020	29/04/2020	05/05/2020	28/04/2020	16/09/2020	16/09/2020	17/09/2020
Formation			MG	MG	MG	MG	MG	MG	MG	MG	MG	MG	MG	MG	MG	MG	MG	MG	MG	MG	MG	MG	MG	MG
Site Area			**W**	**W**	**W**	**W**	**W**	**W**	**W**	**W**	**W**	**W**	**W**	**W**	**W**	**W**	**W**	**W**	**W**	**W**	**W**	**W**	**W**	**W**
VOCs																								
Chloromethane	µg/kg											-	< 1.0	-	-	-	-	-	-	-	-			< 1.0
Chloroethane	µg/kg											-	< 1.0	-	-	-	-	-	-	-	-			< 1.0
Bromomethane	µg/kg											-	< 1.0	-	-	-	-	-	-	-	-			< 1.0
Vinyl Chloride	µg/kg											-	< 1.0	-	-	-	-	-	-	-	-			< 1.0
Trichlorofluoromethane	µg/kg											-	< 1.0	-	-	-	-	-	-	-	-			< 1.0
1,1-Dichloroethene	µg/kg											-	< 1.0	-	-	-	-	-	-	-	-			< 1.0
1,1,2-Trichloro 1,2,2-Trifluoroethane	µg/kg											-	< 1.0	-	-	-	-	-	-	-	-			< 1.0
Cis-1,2-dichloroethene	µg/kg											-	< 1.0	-	-	-	-	-	-	-	-			< 1.0
MTBE (Methyl Tertiary Butyl Ether)	µg/kg											-	< 1.0	-	-	-	-	-	-	-	-			< 1.0
1,1-Dichloroethane	µg/kg											-	< 1.0	-	-	-	-	-	-	-	-			< 1.0
2,2-Dichloropropane	µg/kg											-	< 1.0	-	-	-	-	-	-	-	-			< 1.0
Trichloromethane	µg/kg											-	< 1.0	-	-	-	-	-	-	-	-			< 1.0
1,1,1-Trichloroethane	µg/kg											-	< 1.0	-	-	-	-	-	-	-	-			< 1.0
1,2-Dichloroethane	µg/kg											-	< 1.0	-	-	-	-	-	-	-	-			< 1.0
1,1-Dichloropropene	µg/kg											-	< 1.0	-	-	-	-	-	-	-	-			< 1.0
Trans-1,2-dichloroethene	µg/kg											-	< 1.0	-	-	-	-	-	-	-	-			< 1.0
Benzene	µg/kg	0.2										-	**11**	-	-	-	-	-	-	-	-			**35**
Tetrachloromethane	µg/kg											-	< 1.0	-	-	-	-	-	-	-	-			< 1.0
1,2-Dichloropropane	µg/kg											-	< 1.0	-	-	-	-	-	-	-	-			< 1.0
Trichloroethene	µg/kg											-	< 1.0	-	-	-	-	-	-	-	-			< 1.0
Dibromomethane	µg/kg											-	< 1.0	-	-	-	-	-	-	-	-			< 1.0
Bromodichloromethane	µg/kg											-	< 1.0	-	-	-	-	-	-	-	-			< 1.0
Cis-1,3-dichloropropene	µg/kg											-	< 1.0	-	-	-	-	-	-	-	-			< 1.0
Trans-1,3-dichloropropene	µg/kg											-	< 1.0	-	-	-	-	-	-	-	-			< 1.0
Toluene	µg/kg	290										-	**36**	-	-	-	-	-	-	-	-			**65**
1,1,2-Trichloroethane	µg/kg											-	< 1.0	-	-	-	-	-	-	-	-			< 1.0
1,3-Dichloropropane	µg/kg											-	< 1.0	-	-	-	-	-	-	-	-			< 1.0
Dibromochloromethane	µg/kg											-	< 1.0	-	-	-	-	-	-	-	-			< 1.0
Tetrachloroethene	µg/kg											-	< 1.0	-	-	-	-	-	-	-	-			< 1.0
1,2-Dibromoethane	µg/kg											-	< 1.0	-	-	-	-	-	-	-	-			< 1.0
Chlorobenzene	µg/kg											-	< 1.0	-	-	-	-	-	-	-	-			< 1.0
1,1,1,2-Tetrachloroethane	µg/kg											-	< 1.0	-	-	-	-	-	-	-	-			< 1.0
Ethylbenzene	µg/kg	110										-	**460**	-	-	-	-	-	-	-	-			**14**
p & m-Xylene	µg/kg	130										-	**1000**	-	-	-	-	-	-	-	-			**33**
Styrene	µg/kg											-	< 1.0	-	-	-	-	-	-	-	-			< 1.0
Tribromomethane	µg/kg											-	< 1.0	-	-	-	-	-	-	-	-			< 1.0
o-Xylene	µg/kg	140										-	**550**	-	-	-	-	-	-	-	-			**29**
1,1,2,2-Tetrachloroethane	µg/kg											-	< 1.0	-	-	-	-	-	-	-	-			< 1.0
Isopropylbenzene	µg/kg											-	**140**	-	-	-	-	-	-	-	-			< 1.0
Bromobenzene	µg/kg											-	< 1.0	-	-	-	-	-	-	-	-			< 1.0
n-Propylbenzene	µg/kg											-	**36**	-	-	-	-	-	-	-	-			< 1.0
2-Chlorotoluene	µg/kg											-	< 1.0	-	-	-	-	-	-	-	-			< 1.0
4-Chlorotoluene	µg/kg											-	< 1.0	-	-	-	-	-	-	-	-			< 1.0
1,3,5-Trimethylbenzene	µg/kg											-	**920**	-	-	-	-	-	-	-	-			< 1.0
tert-Butylbenzene	µg/kg											-	< 1.0	-	-	-	-	-	-	-	-			< 1.0
1,2,4-Trimethylbenzene	µg/kg											-	**1800**	-	-	-	-	-	-	-	-			< 1.0
sec-Butylbenzene	µg/kg											-	< 1.0	-	-	-	-	-	-	-	-			< 1.0
1,3-Dichlorobenzene	µg/kg											-	< 1.0	-	-	-	-	-	-	-	-			< 1.0
p-Isopropyltoluene	µg/kg											-	**77**	-	-	-	-	-	-	-	-			< 1.0
1,2-Dichlorobenzene	µg/kg											-	< 1.0	-	-	-	-	-	-	-	-			< 1.0
1,4-Dichlorobenzene	µg/kg											-	< 1.0	-	-	-	-	-	-	-	-			< 1.0
Butylbenzene	µg/kg											-	< 1.0	-	-	-	-	-	-	-	-			7.3
1,2-Dibromo-3-chloropropane	µg/kg											-	< 1.0	-	-	-	-	-	-	-	-			< 1.0
1,2,4-Trichlorobenzene	µg/kg											-	< 1.0	-	-	-	-	-	-	-	-			< 1.0
Hexachlorobutadiene	µg/kg											-	< 1.0	-	-	-	-	-	-	-	-			< 1.0
1,2,3-Trichlorobenzene	µg/kg											-	< 1.0	-	-	-	-	-	-	-	-			< 1.0

Soil screening assessment

Lab Sample Number		Residential with Home Grown Produce SOM 2.5%	552142	552146	552145	552139	552138	552147	554485	554486	549574	1503347	1503348	1503349	1503313	1503314	1503381	1503318	1503379	1506672	1503316	1626829	1626834	1628729
Sample Reference			**WS1**	**WS4**	**WS5**	**WS6**	**WS7**	**BH101**	**BH102**	**BH102**	**BH103**	**WS103**	**WS103**	**WS105**	**WS106**	**WS106**	**WS108**	**WS120**	**WS119**	**WS121**	**WS122**	**WS101A**	**QBH1A**	**QBH2C**
Depth (m)			**0.50**	**0.70**	**0.30**	**0.60**	**0.40**	**0.40**	**0.30**	**2.50**	**0.50**	**1.70-1.80**	**5.30-5.40**	**1.50-1.60**	**0.70-0.80**	**2.60-2.70**	**1.50-1.70**	**0.80-1.00**	**2.70-2.90**	**0.40-0.60**	**0.40-0.50**	1.5	1.0	1.5
Date Sampled			10/03/2016	11/03/2016	11/03/2016	10/03/2016	10/03/2016	15/03/2016	23/03/2016	23/03/2016	03/09/2016	27/04/2020	27/04/2020	27/04/2020	28/04/2020	28/04/2020	29/04/2020	28/04/2020	29/04/2020	05/05/2020	28/04/2020	16/09/2020	16/09/2020	17/09/2020
Formation			MG	MG	MG	MG	MG	MG	MG	MG	MG	MG	MG	MG	MG	MG	MG	MG	MG	MG	MG	MG	MG	MG
Site Area			**W**	**W**	**W**	**W**	**W**	**W**	**W**	**W**	**W**	**W**	**W**	**W**	**W**	**W**	**W**	**W**	**W**	**W**	**W**	**W**	**W**	**W**
SVOCs																								
Aniline	mg/kg											-	< 0.1	-	-	-	-	-	-	-	-			< 0.1
Phenol	mg/kg											-	< 0.2	-	-	-	-	-	-	-	-			< 0.2
2-Chlorophenol	mg/kg											-	< 0.1	-	-	-	-	-	-	-	-			< 0.1
Bis(2-chloroethyl)ether	mg/kg											-	< 0.2	-	-	-	-	-	-	-	-			< 0.2
1,3-Dichlorobenzene	mg/kg											-	< 0.2	-	-	-	-	-	-	-	-			< 0.2
1,2-Dichlorobenzene	mg/kg											-	< 0.1	-	-	-	-	-	-	-	-			< 0.1
1,4-Dichlorobenzene	mg/kg											-	< 0.2	-	-	-	-	-	-	-	-			< 0.2
Bis(2-chloroisopropyl)ether	mg/kg											-	< 0.1	-	-	-	-	-	-	-	-			< 0.1
2-Methylphenol	mg/kg											-	< 0.3	-	-	-	-	-	-	-	-			< 0.3
Hexachloroethane	mg/kg											-	< 0.05	-	-	-	-	-	-	-	-			< 0.05
Nitrobenzene	mg/kg											-	< 0.3	-	-	-	-	-	-	-	-			< 0.3
4-Methylphenol	mg/kg											-	< 0.2	-	-	-	-	-	-	-	-			< 0.2
Isophorone	mg/kg											-	< 0.2	-	-	-	-	-	-	-	-			< 0.2
2-Nitrophenol	mg/kg											-	< 0.3	-	-	-	-	-	-	-	-			< 0.3
2,4-Dimethylphenol	mg/kg											-	< 0.3	-	-	-	-	-	-	-	-			< 0.3
Bis(2-chloroethoxy)methane	mg/kg											-	< 0.3	-	-	-	-	-	-	-	-			< 0.3
1,2,4-Trichlorobenzene	mg/kg											-	< 0.3	-	-	-	-	-	-	-	-			< 0.3
Naphthalene	mg/kg	5.6										-	**12000**	-	-	-	-	-	-	-	-			0.31
2,4-Dichlorophenol	mg/kg											-	< 0.3	-	-	-	-	-	-	-	-			< 0.3
4-Chloroaniline	mg/kg											-	< 0.1	-	-	-	-	-	-	-	-			< 0.1
Hexachlorobutadiene	mg/kg											-	< 0.1	-	-	-	-	-	-	-	-			< 0.1
4-Chloro-3-methylphenol	mg/kg											-	< 0.1	-	-	-	-	-	-	-	-			< 0.1
2,4,6-Trichlorophenol	mg/kg											-	< 0.1	-	-	-	-	-	-	-	-			< 0.1
2,4,5-Trichlorophenol	mg/kg											-	< 0.2	-	-	-	-	-	-	-	-			< 0.2
2-Methylnaphthalene	mg/kg											-	**4800**	-	-	-	-	-	-	-	-			< 0.1
2-Chloronaphthalene	mg/kg											-	< 0.1	-	-	-	-	-	-	-	-			< 0.1
Dimethylphthalate	mg/kg											-	< 0.1	-	-	-	-	-	-	-	-			< 0.1
2,6-Dinitrotoluene	mg/kg											-	< 0.1	-	-	-	-	-	-	-	-			< 0.1
Acenaphthylene	mg/kg	420										-	**130**	-	-	-	-	-	-	-	-			< 0.05
Acenaphthene	mg/kg	510										-	**1400**	-	-	-	-	-	-	-	-			**0.43**
2,4-Dinitrotoluene	mg/kg											-	< 0.2	-	-	-	-	-	-	-	-			< 0.2
Dibenzofuran	mg/kg											-	**1300**	-	-	-	-	-	-	-	-			< 0.2
4-Chlorophenyl phenyl ether	mg/kg											-	< 0.3	-	-	-	-	-	-	-	-			< 0.3
Diethyl phthalate	mg/kg											-	< 0.2	-	-	-	-	-	-	-	-			< 0.2
4-Nitroaniline	mg/kg											-	< 0.2	-	-	-	-	-	-	-	-			< 0.2
Fluorene	mg/kg	400										-	**1600**	-	-	-	-	-	-	-	-			**0.54**
Azobenzene	mg/kg											-	< 0.3	-	-	-	-	-	-	-	-			< 0.3
Bromophenyl phenyl ether	mg/kg											-	< 0.2	-	-	-	-	-	-	-	-			< 0.2
Hexachlorobenzene	mg/kg											-	< 0.3	-	-	-	-	-	-	-	-			< 0.3
Phenanthrene	mg/kg	220										-	**3400**	-	-	-	-	-	-	-	-			**0.95**
Anthracene	mg/kg	5400										-	**960**	-	-	-	-	-	-	-	-			**0.53**
Carbazole	mg/kg											-	**230**	-	-	-	-	-	-	-	-			< 0.3
Dibutyl phthalate	mg/kg											-	< 0.2	-	-	-	-	-	-	-	-			< 0.2
Anthraquinone	mg/kg											-	**24**	-	-	-	-	-	-	-	-			< 0.3
Fluoranthene	mg/kg	560										-	**1200**	-	-	-	-	-	-	-	-			**2**
Pyrene	mg/kg	1200										-	**900**	-	-	-	-	-	-	-	-			**1.7**
Butyl benzyl phthalate	mg/kg											-	< 0.3	-	-	-	-	-	-	-	-			< 0.3
Benzo(a)anthracene	mg/kg	11										-	**390**	-	-	-	-	-	-	-	-			**0.99**
Chrysene	mg/kg	22										-	**230**	-	-	-	-	-	-	-	-			**0.72**
Benzo(b)fluoranthene	mg/kg	3.3										-	**200**	-	-	-	-	-	-	-	-			**0.73**
Benzo(k)fluoranthene	mg/kg	93										-	**130**	-	-	-	-	-	-	-	-			**0.31**
Benzo(a)pyrene	mg/kg	2.7										-	**230**	-	-	-	-	-	-	-	-			**0.57**
Indeno(1,2,3-cd)pyrene	mg/kg	36										-	**75**	-	-	-	-	-	-	-	-			**0.28**
Dibenz(a,h)anthracene	mg/kg	0.28										-	**24**	-	-	-	-	-	-	-	-			< 0.05
Benzo(ghi)perylene	mg/kg	340										-	**94**	-	-	-	-	-	-	-	-			**0.28**

Soil screening assessment

555965	560506	560507	552137	549577	549575	1504422	1504424	1506152	1504426	1504438	1504420	1626820	1626821	1626816	1626817	549572	552148	549571	562959	1506156	1506145	1506675	1506676	1506154	1506147	1506149	1628731	1628732
BH104	**BH104**	**BH104**	**WS10**	**WS12**	**WS15**	**WS109**	**WS109**	**WS110A**	**WS112**	**WS112**	**WS118**	**WS126**	**WS126**	**WS127**	**WS127**	**WS13**	**WS14**	**WS16**	**WS16E**	**WS113**	**WS116**	**WS117**	**WS117**	**WS123A**	**WS124**	**WS125**	**WS115A**	**WS115A**
0.40	**1.00**	**2.50**	**0.70**	**0.70**	**0.40**	**0.40-0.50**	**1.70-1.90**	**3.60-3.70**	**0.90-1.00**	**1.80-1.90**	**2.10-2.30**	1.0	2.0	1.0	2.0	**0.50**	**0.10**	**0.80**	**0.50**	**0.40-0.50**	**0.50-0.60**	**1.00-2.00**	**2.50-2.70**	**0.80-1.00**	**0.30-0.40**	**1.80-2.00**	1.5	3.0
42460	42586	42586	42439	42616	42616	30/04/2020	30/04/2020	01/05/2020	30/04/2020	30/04/2020	30/04/2020	15/09/2020	15/09/2020	14/09/2020	14/09/2020	42616	42438	42616	42475	01/05/2020	04/05/2020	05/05/2020	05/05/2020	01/05/2020	04/05/2020	04/05/2020	17/09/2020	17/09/2020
MG	MG	MG	MG	MG	MG	MG	MG	MG	MG	MG	MG	MG	MG	MG	MG	MG	MG	MG	MG	MG	MG	MG	MG	MG	MG	MG	MG	MG
C	**C**	**C**	**C**	**C**	**C**	**C**	**C**	**C**	**C**	**C**	**C**	**C**	**C**	**C**	**C**	**E**	**E**	**E**	**E**	**E**	**E**	**E**	**E**	**E**	**E**	**E**	**E**	**E**
< 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	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
12	16	43	17	18	16	18	23	25	23	44	24	23	21	14	36	18	-	32	14	13	27	24	24	24	16	13	14	36
0.85	1.0	0.18	1.1	0.85	1.1	1.5	1.5	1	1.5	1.5	1.5	0.9	0.9	0.9	0.9	0.93	-	0.97	1.0	1	1.2	1	1.2	1	1.2	1.2	2	2
-	-	-	Chrysotile	-	-	Amosite - Loose Fibres	-	-	-	-	-					-	-	-	Chrysotile & Crocidolite	-	Chrysotile-Loose Fibres	Amosite, Chrysotile-Loose Fibres	Chrysotile-Loose Fibres	-	-	-	Not-detected	Not-detected
Not-detected	Not-detected	Not-detected	Detected	Not-detected	Not-detected	Detected	Not-detected	Not-detected	Not-detected	Not-detected	Not-detected	Not-detected	Not-detected	Not-detected	Not-detected	Not-detected	Not-detected	Not-detected	Detected	Not-detected	Detected	Detected	Detected	Not-detected	Not-detected	Not-detected		
			0.097	-	-											-	-		0.004									
			0.097	-	-											-	-		0.004									
11.3	8.5	-	10.0	8.3	8.3	9.4	8.4	9.8	7.9	8.1	8.2	7.8	8.1	8	7.9	8.3	-	7.9	10.1	8.1	8.1	9.5	9	9	8.3	8	8.1	7.8
< 1	< 1	-	< 1	4	2	< 1	< 1	< 1	1	3	< 1	6	2	8	2	< 1	-	5	3	< 1	69	< 1	< 1	< 1	2	320	5	< 1
5300	1200	-	11000	1400	15000	23000	590	8700	1400	540	730	27000	3000	2500	2300	47000	-	6700	3000	970	7300	3000	650	5300	240	280	810	540
0.5	0.8	-	2.6	3.0	1.7	3.2	1.4	2.7	4.2	7.3	2.2	9.4	5.6	5.2	5.9	1.8	-	3.8	2.2	2.3	7.1	4.6	2.1	1.9	0.9	0.8	2.5	1.9
< 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	-	6.6	2.1	< 1.0	82	10	< 1.0	< 1.0	< 1.0	< 1.0	12	< 1.0
< 0.05	7.2	-	< 0.05	0.35	< 0.05	0.38	< 0.05	0.4	1.5	2.7	< 0.05	0.5	0.31	0.47	1.4	0.17	-	160	11	< 0.05	**860**	150	2.5	0.73	< 0.05	< 0.05	**120**	2.4
< 0.10	< 0.10	-	< 0.10	< 0.10	0.17	< 0.05	< 0.05	< 0.05	0.95	0.23	< 0.05	0.26	< 0.05	< 0.05	< 0.05	< 0.10	-	5.2	< 0.10	< 0.05	17	1.1	< 0.05	< 0.05	< 0.05	< 0.05	2	< 0.05
< 0.10	0.32	-	< 0.10	< 0.10	0.10	0.63	< 0.05	< 0.05	0.78	2.2	< 0.05	1.8	0.61	0.22	1.4	< 0.10	-	23	0.70	0.4	250	4.4	4.2	< 0.05	< 0.05	< 0.05	4.5	< 0.05
< 0.10	0.30	-	0.40	< 0.10	< 0.10	0.72	< 0.05	< 0.05	2.2	2.4	< 0.05	2.6	2.8	< 0.05	1.6	< 0.10	-	25	1.3	< 0.05	290	8.5	3.4	< 0.05	< 0.05	< 0.05	7.7	< 0.05
1.4	0.48	-	2.3	1.6	1.9	5.6	< 0.05	2.5	13	14	2	22	4.6	2.4	8.6	1.5	-	42	4.6	< 0.05	**850**	18	26	1.2	< 0.05	< 0.05	11	0.22
0.28	< 0.10	-	0.61	0.24	0.68	1	< 0.05	0.5	2.4	3.4	0.51	5.7	3	0.55	2.4	0.27	-	13	0.96	< 0.05	190	4.1	6.3	0.25	< 0.05	< 0.05	3.3	< 0.05
0.91	< 0.10	-	3.0	1.7	5.4	5.7	< 0.05	4.2	9.8	18	3.6	25	9.7	3.3	12	2.0	-	16	4.3	1.2	350	15	28	1.8	< 0.05	< 0.05	4	< 0.05
0.66	< 0.10	-	2.7	2.0	5.5	4.9	< 0.05	4.3	10	13	2.9	18	8.2	2.9	9.4	1.7	-	15	4.3	1.1	270	12	23	1.6	< 0.05	< 0.05	3.1	< 0.05
0.31	< 0.10	-	1.6	1.4	3.2	3.3	< 0.05	2.6	6.1	8.2	2.2	12	5.5	2	5.9	1.2	-	3.8	1.9	0.8	160	4.9	12	1.5	< 0.05	< 0.05	1.7	< 0.05
0.38	< 0.05	-	1.5	1.3	3.0	2	< 0.05	1.9	4	7.2	1.7	9.1	4	1.7	4.6	1.2	-	3.8	1.9	0.72	**98**	4.1	9.5	1.3	< 0.05	< 0.05	1.3	< 0.05
0.38	< 0.10	-	1.4	1.8	3.5	2.7	< 0.05	2.5	5.8	7.8	1.6	11	3.9	1.5	5.8	1.6	-	3.7	1.8	0.79	**160**	4.1	8.3	1.5	< 0.05	< 0.05	2	< 0.05
0.20	< 0.10	-	0.95	0.92	1.6	1.3	< 0.05	0.87	1.7	3.5	0.87	5.5	2	1.8	2.7	0.96	-	1.5	1.6	0.32	60	1.9	5.4	0.71	< 0.05	< 0.05	0.61	< 0.05
0.32	< 0.10	-	1.4	1.4	3.0	2.4	< 0.05	1.6	4.6	6.3	1.5	9.3	3.6	1.8	4.9	1.4	-	2.9	1.9	0.6	**140**	2.1	9.1	1.1	< 0.05	< 0.05	1.8	< 0.05
< 0.10	< 0.10	-	0.69	0.82	1.9	1.3	< 0.05	1.2	2.7	3.5	0.81	5.6	1.6	1	2.4	0.80	-	1.9	1.2	0.47	54	1.7	5.1	0.95	< 0.05	< 0.05	0.75	< 0.05
< 0.10	< 0.10	-	< 0.10	< 0.10	0.75	0.32	< 0.05	< 0.05	0.93	1.1	0.28	1.6	0.59	0.37	0.79	< 0.10	-	0.62	< 0.10	< 0.05	17	< 0.05	1.6	0.34	< 0.05	< 0.05	0.23	< 0.05
< 0.05	< 0.05	-	0.81	0.95	2.0	1.7	< 0.05	1.6	3.5	3.9	0.9	5.9	1.8	1.1	2.6	0.89	-	2.1	1.4	0.5	48	2.1	5.8	1.2	< 0.05	< 0.05	0.97	< 0.05
< 0.05	< 0.05	-	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	2.3	< 0.05	< 0.05	1	< 0.05	-	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	1.3	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
4.8	8.3	-	17	15	33	34	< 0.9	24	70	98	19	139	52.2	21.1	67.1	14	-	310	39	6.9	3800	230	150	14	< 0.85	< 0.85	167	2.6
18	21	-	11	30	15	16	19	19	41	76	17	51	29	51	64	36	-	39	40	23	51	21	11	19	15	7.3	17	33
120	81	-	180	440	190	230	120	200	510	160	130	260	270	400	140	150	-	270	440	64	110	230	53	120	77	7.3	110	270
1.0	1.1	-	0.7	2.0	0.7	0.86	1.7	1.2	1.5	1.4	1.3	1.7	1.1	1.9	1.4	1.6	-	1.9	1.8	0.97	1.3	1.1	1.1	1.3	1.4	0.16	0.91	2.4
2.1	4.2	-	5.3	0.8	5.5	1.9	1.1	3.6	1.6	8.2	3.2	2.9	3.8	9.5	4	6.6	-	5.0	7.4	2	2.9	6.7	2.5	4.2	1.2	0.3	1.1	1.1
0.4	< 0.2	-	0.3	0.3	0.3	0.4	< 0.2	< 0.2	1.3	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	0.4	-	0.6	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2
< 1.2	< 1.2	-	< 1.2	< 1.2	< 1.2	< 4.0	< 4.0	< 4.0	< 4.0	< 4.0	< 4.0	< 4.0	< 4.0	< 4.0	< 4.0	< 1.2	-	< 1.2	< 1.2	< 4.0	< 4.0	< 4.0	< 4.0	< 4.0	< 4.0	< 4.0	< 4.0	< 4.0
39	33	-	30	15	21	29	55	30	25	52	41	26	27	41	75	22	-	25	36	29	34	35	34	39	43	14	19	74
40	33	-	30	15	21	29	55	30	26	53	41	26	27	43	76	22	-	25	36	30	34	36	34	39	46	14	20	74
29	29	-	100	140	93	65	35	95	200	180	50	350	160	260	140	220	-	77	81	50	76	68	27	40	25	1.2	33	24
49	130	-	220	1000	220	930	140	220	2500	490	230	1300	1200	1100	470	1300	-	350	430	120	350	290	34	140	35	3.3	190	22
< 0.3	0.3	-	< 0.3	1.5	0.3	0.7	0.8	0.6	7.4	7.2	2.2	7.5	5	5	5.6	1.9	-	0.5	4.1	0.6	1.8	0.9	< 0.3	0.5	< 0.3	< 0.3	0.8	< 0.3
39	39	-	25	42	19	21	48	24	27	31	33	28	21	78	30	32	-	35	39	26	30	33	38	36	40	14	21	61
< 1.0	< 1.0	-	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	1.6	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	-	< 1.0	< 1.0	1.7	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
47	59	-	38	55	37	48	100	45	60	67	75	57	79	67	70	49	-	59	69	62	59	55	48	68	77	13	38	120
73	59	-	180	230	160	230	92	150	600	330	89	270	160	580	260	340	-	710	570	72	190	390	83	130	78	13	110	110
						-	-	-	-	-	-									-	-	-	-		-	-		
						-	-	-	-	-	-									-	-	-	-		-	-		
<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	<0.001	-	0.0026	0.36	< 1.0	**41000**	**6700**	13	< 1.0	7.3	< 1.0	**960**	53
<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	<0.001	-	0.033	1.10	< 1.0	**83000**	**23000**	5.1	< 1.0	20	< 1.0	**22000**	91
0.0032	<0.001	<0.001	<0.001	<0.001	<0.001	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	<0.001	-	0.08	5.90	< 1.0	**19000**	**18000**	9.1	< 1.0	5.7	< 1.0	**20000**	110
0.011	<0.001	<0.001	<0.001	<0.001	<0.001	2.7	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	<0.001	-	0.15	9.80	< 1.0	**75000**	**31000**	20	< 1.0	21	< 1.0	**34000***	370
0.0044	<0.001	<0.001	<0.001	<0.001	<0.001	1.5	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	<0.001	-	0.16	2.60	< 1.0	**29000**	**25000**	7.9	< 1.0	9	< 1.0	**34000***	120
<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	<0.001	-	<0.001	<0.001	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.1	-	< 0.1	< 0.1	< 0.001	< 0.001	1.5	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.1	-	< 0.1	0.8	< 0.001	< 0.001	15	< 0.001	< 0.001	< 0.001	< 0.001	1.9	< 0.001
< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	1.1	< 0.001	< 0.001	< 0.001	< 0.001	< 0.1	-	< 0.1	2.2	< 0.001	< 0.001	51	< 0.001	< 0.001	< 0.001	< 0.001	99*	0.11
< 1.0	3.0	9.3	7.5	< 1.0	< 1.0	< 1.0	9.2	4.3	< 1.0	< 1.0	11	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	-	250	18	< 1.0	57	98	4.7	< 1.0	< 1.0	< 1.0	75	< 1.0
4.8	17	6.9	88	4.1	11	24	140	13	< 2.0	< 2.0	57	< 2.0	11	< 2.0	2.2	2.1	-	2000	140	< 2.0	230	320	11	< 2.0	< 2.0	< 2.0	720	12
12	19	9.7	190	13	51	53	130	52	< 8.0	< 8.0	57	< 8.0	29	< 8.0	11	< 8.0	-	1800	140	< 8.0	300	380	21	< 8.0	< 8.0	< 8.0	260	< 8.0
66	14	< 8.0	1000	12	270	210	9.8	560	< 8.0	< 8.0	67	19	23	< 8.0	24	40	-	780	200	< 8.0	310	820	36	< 8.0	< 8.0	< 8.0	50	< 8.0
						290	290	630	< 10	< 10	190	19	63	< 10	37					< 10	900	1700	73	< 10	< 10	< 10	1200	13
< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.1	-	< 0.1	0.4	< 0.001	41	6.7	0.013	< 0.001	0.007	< 0.001	0.96	0.053
< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.1	-	< 0.1	1.1	< 0.001	83	23	0.005	< 0.001	0.02	< 0.001	22	0.091
< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	0.013	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.1	-	3.4	35	< 0.001	**160**	120	0.043	< 0.001	0.038	< 0.001	140*	0.85
< 1.0	7.5	3.9	3.6	< 1.0	< 1.0	< 1.0	4.6	< 1.0	4	5	3.7	< 1.0	< 1.0	< 1.0	2.4	< 1.0	-	**1000**	17	< 1.0	**1300**	370	10	< 1.0	< 1.0	< 1.0	180	< 1.0
6.2	13	2.1	87	< 2.0	15	15	140	6.1	15	6.2	21	6.8	8.8	< 2.0	7.3	< 2.0	-	**4100**	100	< 2.0	**3100**	450	23	7.8	< 2.0	< 2.0	310	< 2.0
21	18	< 10	200	20	95	47	130	39	39	49	29	77	31	13	30	< 10	-	**8400**	500	13	**4100**	**1000**	93	23	< 10	< 10	250	< 10
130	23	< 10	710	36	370	130	15	270	38	41	35	61	36	24	59	46	-	**3700**	310	23	1800	860	85	44	< 10	< 10	150	< 10
						190	290	310	95	100	88	140	76	36	99					36	11000	2900	210	74	< 10	< 10	1100	< 10

555965	560506	560507	552137	549577	549575	1504422	1504424	1506152	1504426	1504438	1504420	1626820	1626821	1626816	1626817	549572	552148	549571	562959	1506156	1506145	1506675	1506676	1506154	1506147	1506149	1628731	1628732
BH104	**BH104**	**BH104**	**WS10**	**WS12**	**WS15**	**WS109**	**WS109**	**WS110A**	**WS112**	**WS112**	**WS118**	**WS126**	**WS126**	**WS127**	**WS127**	**WS13**	**WS14**	**WS16**	**WS16E**	**WS113**	**WS116**	**WS117**	**WS117**	**WS123A**	**WS124**	**WS125**	**WS115A**	**WS115A**
0.40	**1.00**	**2.50**	**0.70**	**0.70**	**0.40**	**0.40-0.50**	**1.70-1.90**	**3.60-3.70**	**0.90-1.00**	**1.80-1.90**	**2.10-2.30**	1.0	2.0	1.0	2.0	**0.50**	**0.10**	**0.80**	**0.50**	**0.40-0.50**	**0.50-0.60**	**1.00-2.00**	**2.50-2.70**	**0.80-1.00**	**0.30-0.40**	**1.80-2.00**	1.5	3.0
42460	42586	42586	42439	42616	42616	30/04/2020	30/04/2020	01/05/2020	30/04/2020	30/04/2020	30/04/2020	15/09/2020	15/09/2020	14/09/2020	14/09/2020	42616	42438	42616	42475	01/05/2020	04/05/2020	05/05/2020	05/05/2020	01/05/2020	04/05/2020	04/05/2020	17/09/2020	17/09/2020
MG	MG	MG	MG	MG	MG	MG	MG	MG	MG	MG	MG	MG	MG	MG	MG	MG	MG	MG	MG	MG	MG	MG	MG	MG	MG	MG	MG	MG
C	**C**	**C**	**C**	**C**	**C**	**C**	**C**	**C**	**C**	**C**	**C**	**C**	**C**	**C**	**C**	**E**	**E**	**E**	**E**	**E**	**E**	**E**	**E**	**E**	**E**	**E**	**E**	**E**
< 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	< 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	< 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	-	-	< 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	-	< 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									-	< 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									-	**41000**	-	**13**	-	-	< 1.0	**960**	**53**
< 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	< 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	< 1.0	< 1.0
< 1.0						-	-	-	-	-	< 1.0									-	< 1.0	-	< 1.0	-	-	< 1.0	< 1.0	< 1.0
< 1.0						-	-	-	-	-	< 1.0									-	**83000**	-	**5.1**	-	-	< 1.0	**22000***	**91**
< 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	< 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	< 1.0	< 1.0
< 1.0						-	-	-	-	-	< 1.0									-	< 1.0	-	< 1.0	-	-	< 1.0	< 1.0	< 1.0
3.2						-	-	-	-	-	< 1.0									-	**19000**	-	**9.1**	-	-	< 1.0	**20000***	**110**
10						-	-	-	-	-	< 1.0									-	**75000**	-	**19**	-	-	< 1.0	**34000***	**370**
< 1.0						-	-	-	-	-	< 1.0									-	**12000**	-	< 1.0	-	-	< 1.0	< 1.0	< 1.0
< 1.0						-	-	-	-	-	< 1.0									-	< 1.0	-	< 1.0	-	-	< 1.0	< 1.0	< 1.0
4.4						-	-	-	-	-	< 1.0									-	**29000**	-	**7.9**	-	-	< 1.0	**34000***	**120**
< 1.0						-	-	-	-	-	< 1.0									-	< 1.0	-	< 1.0	-	-	< 1.0	< 1.0	< 1.0
< 1.0						-	-	-	-	-	< 1.0									-	**860**	-	< 1.0	-	-	< 1.0	**4300**	< 1.0
< 1.0						-	-	-	-	-	< 1.0									-	< 1.0	-	< 1.0	-	-	< 1.0	< 1.0	< 1.0
< 1.0						-	-	-	-	-	< 1.0									-	**1000**	-	< 1.0	-	-	< 1.0	**4600**	**8.9**
< 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
4.0						-	-	-	-	-	< 1.0									-	**8300**	-	**2.7**	-	-	< 1.0	**20000***	**63**
< 1.0						-	-	-	-	-	< 1.0									-	< 1.0	-	< 1.0	-	-	< 1.0	< 1.0	< 1.0
6.3						-	-	-	-	-	< 1.0									-	**16000**	-	**3.9**	-	-	< 1.0	**25000***	**180**
< 1.0						-	-	-	-	-	< 1.0									-	< 1.0	-	< 1.0	-	-	< 1.0	**820**	< 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	**3000**	< 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	< 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	-	-	< 1.0	< 1.0	< 1.0
< 1.0						-	-	-	-	-	< 1.0									-	< 1.0	-	< 1.0	-	-	< 1.0	< 1.0	< 1.0

Soil screening assessment

555965	560506	560507	552137	549577	549575	1504422	1504424	1506152	1504426	1504438	1504420	1626820	1626821	1626816	1626817	549572	552148	549571	562959	1506156	1506145	1506675	1506676	1506154	1506147	1506149	1628731	1628732
BH104	**BH104**	**BH104**	**WS10**	**WS12**	**WS15**	**WS109**	**WS109**	**WS110A**	**WS112**	**WS112**	**WS118**	**WS126**	**WS126**	**WS127**	**WS127**	**WS13**	**WS14**	**WS16**	**WS16E**	**WS113**	**WS116**	**WS117**	**WS117**	**WS123A**	**WS124**	**WS125**	**WS115A**	**WS115A**
0.40	**1.00**	**2.50**	**0.70**	**0.70**	**0.40**	**0.40-0.50**	**1.70-1.90**	**3.60-3.70**	**0.90-1.00**	**1.80-1.90**	**2.10-2.30**	1.0	2.0	1.0	2.0	**0.50**	**0.10**	**0.80**	**0.50**	**0.40-0.50**	**0.50-0.60**	**1.00-2.00**	**2.50-2.70**	**0.80-1.00**	**0.30-0.40**	**1.80-2.00**	1.5	3.0
42460	42586	42586	42439	42616	42616	30/04/2020	30/04/2020	01/05/2020	30/04/2020	30/04/2020	30/04/2020	15/09/2020	15/09/2020	14/09/2020	14/09/2020	42616	42438	42616	42475	01/05/2020	04/05/2020	05/05/2020	05/05/2020	01/05/2020	04/05/2020	04/05/2020	17/09/2020	17/09/2020
MG	MG	MG	MG	MG	MG	MG	MG	MG	MG	MG	MG	MG	MG	MG	MG	MG	MG	MG	MG	MG	MG	MG	MG	MG	MG	MG	MG	MG
C	**C**	**C**	**C**	**C**	**C**	**C**	**C**	**C**	**C**	**C**	**C**	**C**	**C**	**C**	**C**	**E**	**E**	**E**	**E**	**E**	**E**	**E**	**E**	**E**	**E**	**E**	**E**	**E**
< 0.1						-	-	-	-	-	< 0.1									-	< 0.1	-	< 0.1	-	-	< 0.1	< 0.1	< 0.1
< 0.2						-	-	-	-	-	< 0.2									-	< 0.2	-	< 0.2	-	-	< 0.2	< 0.2	< 0.2
< 0.1						-	-	-	-	-	< 0.1									-	< 0.1	-	< 0.1	-	-	< 0.1	< 0.1	< 0.1
< 0.2						-	-	-	-	-	< 0.2									-	< 0.2	-	< 0.2	-	-	< 0.2	< 0.2	< 0.2
< 0.2						-	-	-	-	-	< 0.2									-	< 0.2	-	< 0.2	-	-	< 0.2	< 0.2	< 0.2
< 0.1						-	-	-	-	-	< 0.1									-	< 0.1	-	< 0.1	-	-	< 0.1	< 0.1	< 0.1
< 0.2						-	-	-	-	-	< 0.2									-	< 0.2	-	< 0.2	-	-	< 0.2	< 0.2	< 0.2
< 0.1						-	-	-	-	-	< 0.1									-	< 0.1	-	< 0.1	-	-	< 0.1	< 0.1	< 0.1
< 0.3						-	-	-	-	-	< 0.3									-	< 0.3	-	< 0.3	-	-	< 0.3	< 0.3	< 0.3
< 0.05						-	-	-	-	-	< 0.05									-	< 0.05	-	< 0.05	-	-	< 0.05	< 0.05	< 0.05
< 0.3						-	-	-	-	-	< 0.3									-	< 0.3	-	< 0.3	-	-	< 0.3	< 0.3	< 0.3
< 0.2						-	-	-	-	-	< 0.2									-	< 0.2	-	< 0.2	-	-	< 0.2	< 0.2	< 0.2
< 0.2						-	-	-	-	-	< 0.2									-	< 0.2	-	< 0.2	-	-	< 0.2	< 0.2	< 0.2
< 0.3						-	-	-	-	-	< 0.3									-	< 0.3	-	< 0.3	-	-	< 0.3	< 0.3	< 0.3
< 0.3						-	-	-	-	-	< 0.3									-	< 0.3	-	< 0.3	-	-	< 0.3	5.7	< 0.3
< 0.3						-	-	-	-	-	< 0.3									-	< 0.3	-	< 0.3	-	-	< 0.3	< 0.3	< 0.3
< 0.3						-	-	-	-	-	< 0.3									-	< 0.3	-	< 0.3	-	-	< 0.3	< 0.3	< 0.3
< 0.05						-	-	-	-	-	< 0.05									-	**860**	-	**2.5**	-	-	< 0.05	**120**	**2.4**
< 0.3						-	-	-	-	-	< 0.3									-	< 0.3	-	< 0.3	-	-	< 0.3	< 0.3	< 0.3
< 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	< 0.1
< 0.1						-	-	-	-	-	< 0.1									-	< 0.1	-	< 0.1	-	-	< 0.1	< 0.1	< 0.1
< 0.2						-	-	-	-	-	< 0.2									-	< 0.2	-	< 0.2	-	-	< 0.2	< 0.2	< 0.2
< 0.1						-	-	-	-	-	< 0.1									-	**280**	-	1.2	-	-	< 0.1	**21**	**0.5**
< 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	< 0.1
< 0.10						-	-	-	-	-	< 0.05									-	17	-	< 0.05	-	-	< 0.05	**2**	< 0.05
< 0.10						-	-	-	-	-	< 0.05									-	**250**	-	**4.2**	-	-	< 0.05	**4.5**	< 0.05
< 0.2						-	-	-	-	-	< 0.2									-	< 0.2	-	< 0.2	-	-	< 0.2	< 0.2	< 0.2
< 0.2						-	-	-	-	-	< 0.2									-	250	-	**2**	-	-	< 0.2	5.1	< 0.2
< 0.3						-	-	-	-	-	< 0.3									-	< 0.3	-	< 0.3	-	-	< 0.3	< 0.3	< 0.3
< 0.2						-	-	-	-	-	< 0.2									-	< 0.2	-	< 0.2	-	-	< 0.2	< 0.2	< 0.2
< 0.2						-	-	-	-	-	< 0.2									-	< 0.2	-	< 0.2	-	-	< 0.2	< 0.2	< 0.2
< 0.10						-	-	-	-	-	< 0.05									-	**290**	-	**3.4**	-	-	< 0.05	**7.7**	< 0.05
< 0.3						-	-	-	-	-	< 0.3									-	< 0.3	-	< 0.3	-	-	< 0.3	< 0.3	< 0.3
< 0.2						-	-	-	-	-	< 0.2									-	< 0.2	-	< 0.2	-	-	< 0.2	< 0.2	< 0.2
< 0.3						-	-	-	-	-	< 0.3									-	< 0.3	-	< 0.3	-	-	< 0.3	< 0.3	< 0.3
1.4						-	-	-	-	-	**2**									-	**850**	-	**26**	-	-	< 0.05	**11**	**0.22**
0.28						-	-	-	-	-	**0.51**									-	**190**	-	**6.3**	-	-	< 0.05	**3.3**	< 0.05
< 0.3						-	-	-	-	-	< 0.3									-	**73**	-	**2.6**	-	-	< 0.3	**3.6**	< 0.3
< 0.2						-	-	-	-	-	< 0.2									-	< 0.2	-	< 0.2	-	-	< 0.2	< 0.2	< 0.2
< 0.3						-	-	-	-	-	< 0.3									-	< 0.3	-	**0.6**	-	-	< 0.3	< 0.3	< 0.3
0.91						-	-	-	-	-	**3.6**									-	**350**	-	**28**	-	-	< 0.05	**4**	< 0.05
0.66						-	-	-	-	-	**2.9**									-	**270**	-	**23**	-	-	< 0.05	**3.1**	< 0.05
< 0.3						-	-	-	-	-	< 0.3									-	< 0.3	-	< 0.3	-	-	< 0.3	< 0.3	< 0.3
0.31						-	-	-	-	-	**2.2**									-	**160**	-	**12**	-	-	< 0.05	**1.7**	< 0.05
0.38						-	-	-	-	-	**1.7**									-	**98**	-	**9.5**	-	-	< 0.05	**1.3**	< 0.05
0.38						-	-	-	-	-	**1.6**									-	**160**	-	**8.3**	-	-	< 0.05	**2**	< 0.05
0.20						-	-	-	-	-	**0.87**									-	**60**	-	**5.4**	-	-	< 0.05	**0.61**	< 0.05
0.32						-	-	-	-	-	**1.5**									-	**140**	-	**9.1**	-	-	< 0.05	**1.8**	< 0.05
< 0.10						-	-	-	-	-	**0.81**									-	**54**	-	**5.1**	-	-	< 0.05	**0.75**	< 0.05
< 0.10						-	-	-	-	-	**0.28**									-	**17**	-	**1.6**	-	-	< 0.05	**0.23**	< 0.05
< 0.05						-	-	-	-	-	**0.9**									-	**48**	-	**5.8**	-	-	< 0.05	**0.97**	< 0.05

Soil screening assessment

1503350	1503315	1503319	1506673	1503317	1626830	1626831	1626832	1626833	1626818	1626822	1504425	1506153	1504440	1506677	1506148	1503382	1503380	1506674	1630150	1504421	1626819	1626823	1506146	1506155	1506150	1640552	1640553
WS105	**WS106**	**WS120**	**WS121**	**WS122**	**WS101A**	**WS101A**	**WS101A**	**WS101A**	**WS127**	**WS126**	**WS109**	**WS110A**	**WS112**	**WS117**	**WS124**	**WS108**	**WS119**	**WS121**	**BH102**	**WS118**	**WS127**	**WS126**	**WS116**	**WS123A**	**WS125**	**BH104A**	**BH104A**
3.70-3.80	**4.70-5.00**	**4.60-4.70**	**3.80-3.90**	**2.80-2.90**	3.0	4.0	5.0	6.0	3.0	4.0	**4.70-4.80**	**4.60-4.70**	**3.70-3.90**	**3.50-3.70**	**2.40-2.50**	**5.50-5.70**	**5.10-5.50**	**5.50-5.90**	8.00-8.30	**5.50-5.70**	6.0	5.0	**3.50-4.00**	**5.50-6.00**	**3.60-4.00**	7.30-7.50	8.00-8.30
27/04/2020	28/04/2020	28/04/2020	05/05/2020	28/04/2020	16/09/2020	16/09/2020	16/09/2020	16/09/2020	14/09/2020	15/09/2020	30/04/2020	01/05/2020	30/04/2020	05/05/2020	04/05/2020	29/04/2020	29/04/2020	05/05/2020	22/09/2020	30/04/2020	14/09/2020	15/09/2020	04/05/2020	01/05/2020	04/05/2020	30/09/2020	30/09/2020
ALL	ALL	ALL	AL	ALL	ALL	ALL	ALL	ALL	ALL	ALL	ALL	ALL	ALL	AL	ALL	KPG	KPG	KPG	KPG	KPG	KPG	KPG	KPG	KPG	KPG	KPG	KPG
W	**W**	**W**	**W**	**W**	**W**	**W**	**W**	**W**	**C**	**C**	**C**	**C**	**C**	**E**	**E**	**W**	**W**	**W**	**W**	**C**	**C**	**C**	**E**	**E**	**E**	**E**	**E**
< 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	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
32	38	24	22	37	12	24	23	17	31	31	25	32	41	21	41	16	10	9.5	33	7.7	8.1	7.4	17	9.2	13	6.9	7.1
1	1	1.3	1.5	1.1	1.2	0.7	1.1	1.2	0.9	0.9	1.5	1	1.5	1.1	1.2	1.5	1.5	1.3	0.38	1.5	0.9	0.9	1.2	1.2	1.2	1.3	1.3
	-	-	-	-	Not-detected	Not-detected	Not-detected	Not-detected	Not-detected	Not-detected	-	-	-	-	-			-	Not-detected	-	Not-detected	Not-detected	-	-	-	Not-detected	Not-detected
-	-	-	-	-							-	-	-	-	-	-	-	-		-			-	-	-		
8	8.3	8.1	7.5	7.8	8.5	8.1	8.1	9.1	7.8	8.4	7.1	7.6	7.8	9.1	7.1	8.1	8	7.6	7.5	8.2	8.5	8.5	9.1	8	7.7	8.2	8.2
< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	4	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1
1100	860	350	860	560	310	1100	600	770	3300	920	190	19000	540	640	200	370	510	330	1700	680	340	570	760	2700	330	330	430
4.2	2.3	1.5	1.2	3	0.6	0.4	2	1	6.5	1.9	1.2	6.9	2.2	1.3	1.3	0.6	1.1	1	7.6	0.8	0.3	0.6	1.2	0.5	3	0.4	0.8
< 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	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
4.1	1.6	4.7	< 0.05	4.3	< 0.05	< 0.05	< 0.05	< 0.05	0.52	< 0.05	< 0.05	3.4	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	7.6	< 0.05	**33**	< 0.05	< 0.05
< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	0.3	< 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
0.61	< 0.05	0.59	< 0.05	0.46	< 0.05	< 0.05	< 0.05	< 0.05	0.39	< 0.05	< 0.05	0.76	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	2.4	< 0.05	< 0.05	< 0.05	3.7	< 0.05	3.5	< 0.05	< 0.05
0.69	0.32	0.64	< 0.05	0.5	< 0.05	< 0.05	< 0.05	< 0.05	0.83	< 0.05	< 0.05	0.81	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	0.23	< 0.05	< 0.05	< 0.05	4.2	< 0.05	3	< 0.05	< 0.05
1.7	1.1	1.3	< 0.05	1.3	< 0.05	< 0.05	< 0.05	0.32	5.8	< 0.05	< 0.05	3.2	< 0.05	2.3	< 0.05	< 0.05	4.9	< 0.05	< 0.05	< 0.05	< 0.05	0.52	13	< 0.05	6.4	< 0.05	< 0.05
0.36	0.25	0.39	< 0.05	0.3	< 0.05	< 0.05	< 0.05	< 0.05	1.6	< 0.05	< 0.05	0.64	< 0.05	0.57	< 0.05	< 0.05	1.5	< 0.05	< 0.05	< 0.05	< 0.05	0.23	1.7	< 0.05	0.48	< 0.05	< 0.05
0.77	1	0.63	< 0.05	0.67	< 0.05	< 0.05	< 0.05	0.37	7.2	< 0.05	< 0.05	2.8	< 0.05	4.5	< 0.05	< 0.05	2.3	< 0.05	< 0.05	< 0.05	< 0.05	0.39	5.1	< 0.05	1.2	< 0.05	< 0.05
0.68	0.87	0.48	< 0.05	0.55	< 0.05	< 0.05	< 0.05	0.31	5.9	< 0.05	< 0.05	2.4	< 0.05	4	< 0.05	< 0.05	2	< 0.05	< 0.05	< 0.05	< 0.05	0.35	3.8	< 0.05	0.8	< 0.05	< 0.05
0.21	0.51	< 0.05	< 0.05	0.23	< 0.05	< 0.05	< 0.05	< 0.05	4.2	< 0.05	< 0.05	1.8	< 0.05	2.1	< 0.05	< 0.05	1.3	< 0.05	< 0.05	< 0.05	< 0.05	0.29	1.5	< 0.05	< 0.05	< 0.05	< 0.05
0.23	0.3	< 0.05	< 0.05	0.17	< 0.05	< 0.05	< 0.05	< 0.05	3.3	< 0.05	< 0.05	1.2	< 0.05	1.8	< 0.05	< 0.05	1.1	< 0.05	< 0.05	< 0.05	< 0.05	0.28	1.3	< 0.05	< 0.05	< 0.05	< 0.05
< 0.05	0.49	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	4.5	< 0.05	< 0.05	2.2	< 0.05	1.7	< 0.05	< 0.05	1.4	< 0.05	< 0.05	< 0.05	< 0.05	0.35	0.89	< 0.05	< 0.05	< 0.05	< 0.05
< 0.05	0.3	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	2	< 0.05	< 0.05	0.63	< 0.05	1.1	< 0.05	< 0.05	0.42	< 0.05	< 0.05	< 0.05	< 0.05	0.16	1	< 0.05	< 0.05	< 0.05	< 0.05
< 0.05	0.43	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	3.7	< 0.05	< 0.05	1.6	< 0.05	1.9	< 0.05	< 0.05	0.94	< 0.05	< 0.05	< 0.05	< 0.05	0.26	0.83	< 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	2.1	< 0.05	< 0.05	1.3	< 0.05	1	< 0.05	< 0.05	0.49	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	0.48	< 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	0.69	< 0.05	< 0.05	0.38	< 0.05	0.37	< 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	< 0.05	< 0.05	< 0.05	2.1	< 0.05	< 0.05	1.4	< 0.05	1.3	< 0.05	< 0.05	0.55	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	0.57	< 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	0.3	< 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
9.4	7.2	8.7	< 0.9	8.5	< 0.85	< 0.85	< 0.85	1	45.1	< 0.85	< 0.9	25	< 0.9	23	< 0.85	< 0.9	17	< 0.9	2.6	< 0.9	< 0.85	2.83	45	< 0.85	48	< 0.85	< 0.85
13	22	11	7.7	8.3	7.7	14	13	8.3	61	13	25	120	20	9	18	12	21	14	35	12	6.5	7.9	11	48	11	7.5	6.7
160	360	42	37	200	26	130	130	53	270	220	170	340	310	38	170	15	58	9.8	77	27	21	39	55	210	45	72	48
1.5	2.7	0.89	1.1	2	0.5	1.4	1.6	0.88	1.2	1.7	1.9	4.5	2.8	0.68	1.7	0.35	0.43	0.25	0.92	0.33	0.28	0.37	0.58	2.4	0.49	0.31	0.28
8.8	12	1.1	2	4.8	0.4	1.6	1.5	0.4	5.7	5	1	3.4	3.7	2.1	2.1	0.4	1.3	0.3	2	0.5	0.5	0.8	3.4	9.8	0.6	< 0.2	0.3
1	0.7	< 0.2	< 0.2	0.6	< 0.2	0.4	0.5	0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2
< 4.0	< 4.0	< 4.0	< 4.0	< 4.0	< 4.0	< 4.0	< 4.0	< 4.0	< 4.0	< 4.0	< 4.0	< 4.0	< 4.0	< 4.0	< 4.0	< 4.0	< 4.0	< 4.0	< 4.0	< 4.0	< 4.0	< 4.0	< 4.0	< 4.0	< 4.0	< 4.0	< 4.0
49	75	26	33	58	22	43	57	31	44	54	55	33	92	23	42	15	28	12	26	20	20	23	32	71	33	16	12
50	75	26	33	59	22	43	57	31	44	54	55	33	92	24	42	15	28	12	28	21	21	23	33	71	33	16	12
48	36	20	27	34	6.4	33	19	15	190	24	3.4	760	23	12	< 1.0	3.8	31	6.2	20	9.6	9.4	15	11	40	14	4.7	6.4
62	110	22	15	35	14	44	17	14	1100	51	30	2300	31	19	13	6.6	110	8.5	13	17	11	59	45	85	8	8.6	12
0.8	< 0.3	< 0.3	< 0.3	< 0.3	< 0.3	< 0.3	< 0.3	< 0.3	12	< 0.3	< 0.3	5.1	< 0.3	< 0.3	< 0.3	< 0.3	1.2	< 0.3	< 0.3	< 0.3	< 0.3	0.3	< 0.3	1.9	< 0.3	< 0.3	< 0.3
36	61	27	41	39	16	40	43	23	26	37	38	59	48	24	31	19	17	14	32	19	15	17	23	44	25	17	14
< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	2.7	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	4.1	< 1.0	< 1.0	< 1.0
65	110	40	39	76	29	72	72	51	56	88	96	120	140	41	74	31	27	23	50	23	19	20	33	110	29	22	18
150	200	65	130	150	24	91	100	50	260	93	69	490	130	48	61	30	85	19	73	24	18	37	38	140	29	85	150
-	71	-	-	-							-	-	-	-	-	-	-	-		-			-		-		
-	36	-	-	-							-	-	-	-	-	-	-	-		-			-		-		
< 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	5	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	7.9	< 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	2.6	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	37	< 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	2.2	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	58	< 1.0	410	< 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	5.8	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	220	< 1.0	500	< 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	4	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	42	< 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	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
< 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	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	3.4	< 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	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	0.36	< 0.001	4.2	< 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	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	24	< 0.001	6.3	< 0.001	< 0.001
4.7	< 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	< 1.0	< 1.0	28	< 1.0	19	< 1.0	< 1.0
23	< 2.0	< 2.0	< 2.0	5	< 2.0	< 2.0	< 2.0	6.8	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	200	< 2.0	68	65	22
74	< 8.0	< 8.0	< 8.0	18	< 8.0	< 8.0	< 8.0	38	< 8.0	< 8.0	< 8.0	< 8.0	< 8.0	< 8.0	< 8.0	< 8.0	< 8.0	< 8.0	< 8.0	< 8.0	< 8.0	< 8.0	77	< 8.0	29	67	23
130	< 8.0	< 8.0	< 8.0	32	< 8.0	< 8.0	< 8.0	87	16	< 8.0	< 8.0	28	< 8.0	< 8.0	< 8.0	< 8.0	< 8.0	< 8.0	< 8.0	< 8.0	< 8.0	< 8.0	< 8.0	< 8.0	10	15	< 8.0
230	< 10	< 10	< 10	55	< 10	< 10	< 10	130	17	< 10	< 10	28	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	330	< 10	140	150	51
< 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	0.005	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	0.008	< 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	0.003	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	0.037	< 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	0.018	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	0.43	< 0.001	1.8	< 0.001	< 0.001
8.5	< 1.0	9.3	< 1.0	5.7	< 1.0	< 1.0	< 1.0	< 1.0	1.1	< 1.0	< 1.0	27	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	66	< 1.0	33	< 1.0	< 1.0
4.8	< 2.0	10	< 2.0	6.7	< 2.0	< 2.0	< 2.0	< 2.0	4.4	< 2.0	< 2.0	15	< 2.0	6.7	< 2.0	< 2.0	2.7	< 2.0	2.1	< 2.0	< 2.0	< 2.0	190	< 2.0	68	14	< 2.0
29	< 10	13	< 10	20	< 10	< 10	< 10	< 10	20	< 10	< 10	30	< 10	27	< 10	< 10	14	< 10	14	< 10	< 10	< 10	210	< 10	29	16	< 10
60	< 10	11	< 10	< 10	< 10	< 10	< 10	< 10	54	< 10	< 10	110	< 10	46	< 10	< 10	28	< 10	< 10	< 10	< 10	< 10	200	< 10	19	< 10	< 10
100	< 10	43	< 10	32	< 10	< 10	< 10	< 10	80	< 10	< 10	190	< 10	80	< 10	< 10	46	< 10	25	< 10	< 10	< 10	660	< 10	150	30	< 10

Soil screening assessment

1503350	1503315	1503319	1506673	1503317	1626830	1626831	1626832	1626833	1626818	1626822	1504425	1506153	1504440	1506677	1506148	1503382	1503380	1506674	1630150	1504421	1626819	1626823	1506146	1506155	1506150	1640552	1640553
WS105	**WS106**	**WS120**	**WS121**	**WS122**	**WS101A**	**WS101A**	**WS101A**	**WS101A**	**WS127**	**WS126**	**WS109**	**WS110A**	**WS112**	**WS117**	**WS124**	**WS108**	**WS119**	**WS121**	**BH102**	**WS118**	**WS127**	**WS126**	**WS116**	**WS123A**	**WS125**	**BH104A**	**BH104A**
3.70-3.80	**4.70-5.00**	**4.60-4.70**	**3.80-3.90**	**2.80-2.90**	3.0	4.0	5.0	6.0	3.0	4.0	**4.70-4.80**	**4.60-4.70**	**3.70-3.90**	**3.50-3.70**	**2.40-2.50**	**5.50-5.70**	**5.10-5.50**	**5.50-5.90**	8.00-8.30	**5.50-5.70**	6.0	5.0	**3.50-4.00**	**5.50-6.00**	**3.60-4.00**	7.30-7.50	8.00-8.30
27/04/2020	28/04/2020	28/04/2020	05/05/2020	28/04/2020	16/09/2020	16/09/2020	16/09/2020	16/09/2020	14/09/2020	15/09/2020	30/04/2020	01/05/2020	30/04/2020	05/05/2020	04/05/2020	29/04/2020	29/04/2020	05/05/2020	22/09/2020	30/04/2020	14/09/2020	15/09/2020	04/05/2020	01/05/2020	04/05/2020	30/09/2020	30/09/2020
ALL	ALL	ALL	AL	ALL	ALL	ALL	ALL	ALL	ALL	ALL	ALL	ALL	ALL	AL	ALL	KPG	KPG	KPG	KPG	KPG	KPG	KPG	KPG	KPG	KPG	KPG	KPG
W	**W**	**W**	**W**	**W**	**W**	**W**	**W**	**W**	**C**	**C**	**C**	**C**	**C**	**E**	**E**	**W**	**W**	**W**	**W**	**C**	**C**	**C**	**E**	**E**	**E**	**E**	**E**
-	-	-	-	-							-	-	-	-	-	-	-	-	< 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
-	-	-	-	-							-	-	-	-	-	-	-	-	< 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
-	-	-	-	-							-	-	-	-	-	-	-	-	< 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
-	-	-	-	-							-	-	-	-	-	-	-	-	< 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
-	-	-	-	-							-	-	-	-	-	-	-	-	< 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
-	-	-	-	-							-	-	-	-	-	-	-	-	< 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
-	-	-	-	-							-	-	-	-	-	-	-	-	< 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
-	-	-	-	-							-	-	-	-	-	-	-	-	< 1.0	-			-	-	< 1.0	< 1.0	< 1.0
-	-	-	-	-							-	-	-	-	-	-	-	-	< 1.0	-			-	-	410	< 1.0	< 1.0
-	-	-	-	-							-	-	-	-	-	-	-	-	< 1.0	-			-	-	500	< 1.0	< 1.0
-	-	-	-	-							-	-	-	-	-	-	-	-	< 1.0	-			-	-	< 1.0	< 1.0	< 1.0
-	-	-	-	-							-	-	-	-	-	-	-	-	< 1.0	-			-	-	< 1.0	< 1.0	< 1.0
-	-	-	-	-							-	-	-	-	-	-	-	-	< 1.0	-			-	-	42	< 1.0	< 1.0
-	-	-	-	-							-	-	-	-	-	-	-	-	< 1.0	-			-	-	< 1.0	< 1.0	< 1.0
-	-	-	-	-							-	-	-	-	-	-	-	-	< 1.0	-			-	-	92	< 1.0	< 1.0
-	-	-	-	-							-	-	-	-	-	-	-	-	< 1.0	-			-	-	< 1.0	< 1.0	< 1.0
-	-	-	-	-							-	-	-	-	-	-	-	-	< 1.0	-			-	-	54	< 1.0	< 1.0
-	-	-	-	-							-	-	-	-	-	-	-	-	< 1.0	-			-	-	< 1.0	< 1.0	< 1.0
-	-	-	-	-							-	-	-	-	-	-	-	-	< 1.0	-			-	-	< 1.0	< 1.0	< 1.0
-	-	-	-	-							-	-	-	-	-	-	-	-	< 1.0	-			-	-	150	< 1.0	< 1.0
-	-	-	-	-							-	-	-	-	-	-	-	-	< 1.0	-			-	-	< 1.0	< 1.0	< 1.0
-	-	-	-	-							-	-	-	-	-	-	-	-	< 1.0	-			-	-	550	< 1.0	< 1.0
-	-	-	-	-							-	-	-	-	-	-	-	-	< 1.0	-			-	-	< 1.0	< 1.0	< 1.0
-	-	-	-	-							-	-	-	-	-	-	-	-	< 1.0	-			-	-	< 1.0	< 1.0	< 1.0
-	-	-	-	-							-	-	-	-	-	-	-	-	< 1.0	-			-	-	32	< 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	< 1.0	< 1.0
-	-	-	-	-							-	-	-	-	-	-	-	-	< 1.0	-			-	-	< 1.0	< 1.0	< 1.0
-	-	-	-	-							-	-	-	-	-	-	-	-	< 1.0	-			-	-	< 1.0	< 1.0	< 1.0

Soil screening assessment

1503350	1503315	1503319	1506673	1503317	1626830	1626831	1626832	1626833	1626818	1626822	1504425	1506153	1504440	1506677	1506148	1503382	1503380	1506674	1630150	1504421	1626819	1626823	1506146	1506155	1506150	1640552	1640553
WS105	**WS106**	**WS120**	**WS121**	**WS122**	**WS101A**	**WS101A**	**WS101A**	**WS101A**	**WS127**	**WS126**	**WS109**	**WS110A**	**WS112**	**WS117**	**WS124**	**WS108**	**WS119**	**WS121**	**BH102**	**WS118**	**WS127**	**WS126**	**WS116**	**WS123A**	**WS125**	**BH104A**	**BH104A**
3.70-3.80	**4.70-5.00**	**4.60-4.70**	**3.80-3.90**	**2.80-2.90**	3.0	4.0	5.0	6.0	3.0	4.0	**4.70-4.80**	**4.60-4.70**	**3.70-3.90**	**3.50-3.70**	**2.40-2.50**	**5.50-5.70**	**5.10-5.50**	**5.50-5.90**	8.00-8.30	**5.50-5.70**	6.0	5.0	**3.50-4.00**	**5.50-6.00**	**3.60-4.00**	7.30-7.50	8.00-8.30
27/04/2020	28/04/2020	28/04/2020	05/05/2020	28/04/2020	16/09/2020	16/09/2020	16/09/2020	16/09/2020	14/09/2020	15/09/2020	30/04/2020	01/05/2020	30/04/2020	05/05/2020	04/05/2020	29/04/2020	29/04/2020	05/05/2020	22/09/2020	30/04/2020	14/09/2020	15/09/2020	04/05/2020	01/05/2020	04/05/2020	30/09/2020	30/09/2020
ALL	ALL	ALL	AL	ALL	ALL	ALL	ALL	ALL	ALL	ALL	ALL	ALL	ALL	AL	ALL	KPG	KPG	KPG	KPG	KPG	KPG	KPG	KPG	KPG	KPG	KPG	KPG
W	**W**	**W**	**W**	**W**	**W**	**W**	**W**	**W**	**C**	**C**	**C**	**C**	**C**	**E**	**E**	**W**	**W**	**W**	**W**	**C**	**C**	**C**	**E**	**E**	**E**	**E**	**E**
-	-	-	-	-							-	-	-	-	-	-	-	-	< 0.1	-			-	-	-	< 0.1	< 0.1
-	-	-	-	-							-	-	-	-	-	-	-	-	< 0.2	-			-	-	-	< 0.2	< 0.2
-	-	-	-	-							-	-	-	-	-	-	-	-	< 0.1	-			-	-	-	< 0.1	< 0.1
-	-	-	-	-							-	-	-	-	-	-	-	-	< 0.2	-			-	-	-	< 0.2	< 0.2
-	-	-	-	-							-	-	-	-	-	-	-	-	< 0.2	-			-	-	-	< 0.2	< 0.2
-	-	-	-	-							-	-	-	-	-	-	-	-	< 0.1	-			-	-	-	< 0.1	< 0.1
-	-	-	-	-							-	-	-	-	-	-	-	-	< 0.2	-			-	-	-	< 0.2	< 0.2
-	-	-	-	-							-	-	-	-	-	-	-	-	< 0.1	-			-	-	-	< 0.1	< 0.1
-	-	-	-	-							-	-	-	-	-	-	-	-	< 0.3	-			-	-	-	< 0.3	< 0.3
-	-	-	-	-							-	-	-	-	-	-	-	-	< 0.05	-			-	-	-	< 0.05	< 0.05
-	-	-	-	-							-	-	-	-	-	-	-	-	< 0.3	-			-	-	-	< 0.3	< 0.3
-	-	-	-	-							-	-	-	-	-	-	-	-	< 0.2	-			-	-	-	< 0.2	< 0.2
-	-	-	-	-							-	-	-	-	-	-	-	-	< 0.2	-			-	-	-	< 0.2	< 0.2
-	-	-	-	-							-	-	-	-	-	-	-	-	< 0.3	-			-	-	-	< 0.3	< 0.3
-	-	-	-	-							-	-	-	-	-	-	-	-	< 0.3	-			-	-	-	< 0.3	< 0.3
-	-	-	-	-							-	-	-	-	-	-	-	-	< 0.3	-			-	-	-	< 0.3	< 0.3
-	-	-	-	-							-	-	-	-	-	-	-	-	< 0.3	-			-	-	-	< 0.3	< 0.3
-	-	-	-	-							-	-	-	-	-	-	-	-	< 0.05	-			-	-	-	< 0.05	< 0.05
-	-	-	-	-							-	-	-	-	-	-	-	-	< 0.3	-			-	-	-	< 0.3	< 0.3
-	-	-	-	-							-	-	-	-	-	-	-	-	< 0.1	-			-	-	-	< 0.1	< 0.1
-	-	-	-	-							-	-	-	-	-	-	-	-	< 0.1	-			-	-	-	< 0.1	< 0.1
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-	-	-	-	-							-	-	-	-	-	-	-	-	< 0.1	-			-	-	-	< 0.1	< 0.1
-	-	-	-	-							-	-	-	-	-	-	-	-	< 0.2	-			-	-	-	< 0.2	< 0.2
-	-	-	-	-							-	-	-	-	-	-	-	-	< 0.1	-			-	-	-	< 0.1	< 0.1
-	-	-	-	-							-	-	-	-	-	-	-	-	< 0.1	-			-	-	-	< 0.1	< 0.1
-	-	-	-	-							-	-	-	-	-	-	-	-	< 0.1	-			-	-	-	< 0.1	< 0.1
-	-	-	-	-							-	-	-	-	-	-	-	-	< 0.1	-			-	-	-	< 0.1	< 0.1
-	-	-	-	-							-	-	-	-	-	-	-	-	< 0.05	-			-	-	-	< 0.05	< 0.05
-	-	-	-	-							-	-	-	-	-	-	-	-	2.4	-			-	-	-	< 0.05	< 0.05
-	-	-	-	-							-	-	-	-	-	-	-	-	< 0.2	-			-	-	-	< 0.2	< 0.2
-	-	-	-	-							-	-	-	-	-	-	-	-	< 0.2	-			-	-	-	< 0.2	< 0.2
-	-	-	-	-							-	-	-	-	-	-	-	-	< 0.3	-			-	-	-	< 0.3	< 0.3
-	-	-	-	-							-	-	-	-	-	-	-	-	< 0.2	-			-	-	-	< 0.2	< 0.2
-	-	-	-	-							-	-	-	-	-	-	-	-	< 0.2	-			-	-	-	< 0.2	< 0.2
-	-	-	-	-							-	-	-	-	-	-	-	-	0.23	-			-	-	-	< 0.05	< 0.05
-	-	-	-	-							-	-	-	-	-	-	-	-	< 0.3	-			-	-	-	< 0.3	< 0.3
-	-	-	-	-							-	-	-	-	-	-	-	-	< 0.2	-			-	-	-	< 0.2	< 0.2
-	-	-	-	-							-	-	-	-	-	-	-	-	< 0.3	-			-	-	-	< 0.3	< 0.3
-	-	-	-	-							-	-	-	-	-	-	-	-	< 0.05	-			-	-	-	< 0.05	< 0.05
-	-	-	-	-							-	-	-	-	-	-	-	-	< 0.05	-			-	-	-	< 0.05	< 0.05
-	-	-	-	-							-	-	-	-	-	-	-	-	< 0.3	-			-	-	-	< 0.3	< 0.3
-	-	-	-	-							-	-	-	-	-	-	-	-	< 0.2	-			-	-	-	< 0.2	< 0.2
-	-	-	-	-							-	-	-	-	-	-	-	-	< 0.3	-			-	-	-	< 0.3	< 0.3
-	-	-	-	-							-	-	-	-	-	-	-	-	< 0.05	-			-	-	-	< 0.05	< 0.05
-	-	-	-	-							-	-	-	-	-	-	-	-	< 0.05	-			-	-	-	< 0.05	< 0.05
-	-	-	-	-							-	-	-	-	-	-	-	-	< 0.3	-			-	-	-	< 0.3	< 0.3
-	-	-	-	-							-	-	-	-	-	-	-	-	< 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	-			-	-	-	< 0.05	< 0.05
-	-	-	-	-							-	-	-	-	-	-	-	-	< 0.05	-			-	-	-	< 0.05	< 0.05

Appendix D

Screening assessment tables groundwater

GB Card
& PARTNERS

Contaminants	EQS	DWS		WS119	WS108 EW1	WS108 EW1	WS112 EW1	BH04A	BH04A	WS120	WS120	WS123A	WS123A	WS16E	WS16E
	Freshwater (ug/l)[1]	UK (ug/l)[2,3]	WHO (ug/l)[4,5,6]												
Date				19/10/2020	19/10/2020	13/07/2021	19/10/2020	20/10/2020	14/07/2021	19/10/2020	13/07/2021	20/10/2020	13/07/2021	20/10/2020	14/07/2021
Response Zone				1-2.5	0.8-3.8	0.8-3.8	0.8-2.8	1.1-2.6	1.1-2.6	4.5-5.5	4.5-5.5	3.5-5	3.5-5	1-4	1-4
Aquifer				MG	MG	MG	MG	MG	MG	ALL	ALL	ALL	ALL	ALL	ALL
Site Area				W	C	C	C	E	E	W	W	E	E	E	E
Antimony		5	20												
Arsenic	50	10	10	4.54	8.54	21.6	4.14	50	10.3	16	17.4	23.5	14.3	21.1	13.5
Barium			700	110	23	110	150	230	240	67	81	360	340	96	110
Boron		1000	2400	1100	460	660	620	1600	1700	630	550	370	300	4400	5300
Cadmium (and its compounds)		5	3	0.02	0.02	< 0.02	0.02	0.02	< 0.02	0.02	< 0.02	0.02	< 0.02	0.02	< 0.02
Total Chromium		50	50	8	2.6	7.3	9.7	10	11	9.4	5.9	7.2	8.7	12	14
Copper (see also 2nd stage assessment)	1 (bioavailable)	2000	2000	7.2	5.3	5.5	2.6	2.7	2.4	2.7	1.1	1.9	5.4	2.6	2.4
Lead (see also 2nd stage assessment)	1.2 (bioavailable)	10	10	0.2	0.2	1.4	0.2	0.2	< 0.2	2.7	< 0.2	0.2	< 0.2	0.2	< 0.2
Mercury	0.07 (MAC)	1	6	0.05	0.05	< 0.05	0.05	0.05	< 0.05	0.1	0.05	0.05	< 0.05	0.05	< 0.05
Nickel (see also 2nd stage assessment)	4 (bioavailable)	20	70	24	16	11	10	3.8	2.2	6.7	4.3	19	8.3	8.8	3.2
Selenium		10	40	3.5	1.8	1.9	2.1	5.5	1.2	2.4	1.8	6.8	13	4	3.5
Vanadium				0.9	0.2	4.8	0.7	1.8	0.5	39	20	2.7	0.9	6.7	8
Zinc (see also 2nd stage assessment)	10.9 (bioavailable plus ambient background concentration dissolved)			9.4	1.2	5.5	7.3	2.3	3.5	2.9	3.6	3.7	13	6.2	1.5
Chromium III	4.7			8	2.6	7.3	9.7	10	11	9.4	5.9	7.2	8.7	U/S	14
Chromium VI	3.4														
pH				7.0	7.4	7.1	7.2	7	7.2	8.8	8.8	7	7.1	7.1	8.3
Sulphate		250000		662000	205000	88700	198000	471000	575000	600000	557000	93300	78600	29100	68800
Calcium				650	93	160	410		360.00	120	83		250.00		220.00
Dissolved Organic Carbon				17.3	20.1	24.1	17.6	31.4	37.2	25.2	21.6	41.3	37.8	103	111
Total hardness as CaCO3						499.00			1210.00		231.00		801.00		740.00
Phenols (total monohydric)	7.7			1	2.5	< 1.0	2.5	25	55	10	4.3	9.3	< 1.0	U/S	500
Naphthalene	2			0.01	0.01	0.01	0.01	0.01	0.01	0.01	2.01	0.01	0.01	732	2230
Acenaphthylene				0.01	0.01	0.01	0.01	0.01	0.01	0.01	< 0.01	0.01	0.01	3.64	2.13
Acenaphthene				0.01	0.01	0.01	0.01	0.01	0.01	0.01	1.81	0.01	0.01	15.2	8.21
Fluorene				0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.33	0.01	0.01	9.56	4.85
Phenanthrene				0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.4	0.01	0.01	12.7	4.89
Anthracene	0.1			0.01	0.01	0.01	0.01	0.01	0.01	0.01	< 0.01	0.01	0.01	1.49	0.56
Fluoranthene	0.0063			0.01	0.01	0.01	0.01	0.01	0.01	0.01	< 0.01	0.01	0.01	5.3	1.07
Pyrene				0.01	0.01	0.01	0.01	0.01	0.01	0.01	< 0.01	0.01	0.01	4.38	0.81
Benzo(a)anthracene				0.01	0.01	0.01	0.01	0.01	0.01	0.01	< 0.01	0.01	0.01	0.7	0.01
Chrysene				0.01	0.01	0.01	0.01	0.01	0.01	0.01	< 0.01	0.01	0.01	0.8	0.01
Benzo(b)fluoranthene	0.017 (MAC)			0.01	0.01	0.01	0.01	0.01	0.01	0.01	< 0.01	0.01	0.01	0.57	0.01
Benzo(k)fluoranthene	0.017 (MAC)			0.01	0.01	0.01	0.01	0.01	0.01	0.01	< 0.01	0.01	0.01	0.44	0.01
Benzo(a)pyrene	0.00017	0.01	0.7	0.01	0.01	0.01	0.01	0.01	0.01	0.01	< 0.01	0.01	0.01	0.31	0.01
Indeno(123cd)pyrene				0.01	0.01	0.01	0.01	0.01	0.01	0.01	< 0.01	0.01	0.01	0.01	0.01
Dibenzo(ah)anthracene				0.01	0.01	0.01	0.01	0.01	0.01	0.01	< 0.01	0.01	0.01	0.01	0.01
Benzo(ghi)perylene	0.0082 (MAC)			0.01	0.01	0.01	0.01	0.01	0.01	0.01	< 0.01	0.01	0.01	0.01	0.01
Coronene															
PAH (benzo(b)fluoranthene, benzo(k)fluoranthene, benzo(ghi)perylene and indeno(1,2,3-cd)pyrene)		0.1													
Benzene	10	1	10	1	1	1	1	462	496	3.7	15.6	1	1	23500*	25000*
Toluene	74		700	1	1	1	1	2.5	1	1	4.4	1	1	768	1180
Ethylbenzene			300	1	1	1	1	1	1	8.2	3.6	1	1	5190*	5040*
m/p xylene			500	1	1	1	1	1	1	6.4	3.9	1	1	12300	9830
o xylene				1	1	1	1	1	1	2.3	< 1.0	1	1	4730	3940
MTBE				1	1	1	1	1	1	1	< 1.0	1	1	1	1
TPH Aliphatic C5-6	See Note 7		15000	1	1	1	1	1	1	1	1	1	1	1	1
TPH Aliphatic C6-8			15000	1	1	1	1	1	1	1	1	1	1	210	1
TPH Aliphatic C8-10			300	1	1	1	1	1	1	1	1	1	1	150	1
TPH Aliphatic C10-12			300	10	10	10	10	10	10	10	10	10	10	10	100
TPH Aliphatic C12-16			300	10	10	10	10	10	10	10	10	10	10	10	130
TPH Aliphatic C16-21				10	10	10	10	10	10	10	10	10	10	10	10
TPH Aliphatic C21-35				10	10	10	10	10	10	10	10	10	10	10	10
TPH Aromatic C5-7		WV for benz	10	1	1	1	1	460	500	3.7	16	1	1	24000*	25000*
TPH Aromatic C7-8			700	1	1	1	1	2.5	1	1	4.4	1	1	770	1200
TPH Aromatic C8-10			300	1	1	1	1	1	1	20	7.4	1	1	25000*	22000*
TPH Aromatic C10-12			90	10	10	10	10	800	170	10	10	10	10	7700	3800
TPH Aromatic C12-16			90	10	10	10	10	800	730	10	10	10	10	1900	1600
TPH Aromatic C16-21			90	10	10	10	10	290	260	10	10	10	10	1000	620
TPH Aromatic C21-35			90	10	10	10	10	10	10	10	10	10	10	10	10

Sources:

1. The Water Framework Directive (Standards
2. The Water Supply (Water Quality) Regulations 2018 ((2018 No.647 (W.121))
3. Water Research Centre (February 2008). Survey of the Prevalence of Perfluoroactane Sulphonate (PFOS), Perfluorooctanoic Acid (PFOA) and Related compounds in Drinking Water and Their Sources. Reference: DEFRA 7585.
4. World Health Organisation (2011). Guidelines for Drinking-Water Quality. Fourth Edition.
5. World Health Organisation (2016). Perchlorate in Drinking-Water. Background Document for Development of WHO Guidelines for Drinking-water Quality. WHO/SDE/FWC/16.46
6. World Health Organisation (2008). Petroleum Products in Drinking Water. Background Document for Development of WHO Guidelines for Drinking-Water Quality. WHO/SDE/WSH/05.08/123
7. Petroleum product s must not form a visible film on water surface. At screening stage, it may be suitable (subject to the CSM) to consider using the laboratory detection limit of 10u/l to determine impact from TPH (C5-35). Consideration should also be

Terminology:

EQS = Environmental Environmental Quality Standard. Relates to long term mean for specific pollutants and annual average (AA-EQS) for priority substances unless otherwise indicated. The EQS relates to the total contaminant concentration unless statec
MAC = Maximum allowable concentration. Where AA_EQS is not available, maximum allowable concentration (MAC-EQS) has been used.
Bioavailable = Relates to the bioavailable fraction of the contaminant (Pb, Cu, Ni, Mn and Zn only). If exceedances of these metals are reported, further assessment must be undertaken to determine the bioavailable fraction of the contaminant in the wate

Contaminants	EQS	DWS		WS01	BH01(S)	BH01(S)	BH02 (S)	BH02 (S)	WS121	BH03(S)	WS127 EW1	WS127 EW1	BH04B	BH04B	WS115A	WS115A	WS116	WS116	WS125	WS125
	Freshwater (ug/l)[1]	UK (ug/l)[2,3]	WHO (ug/l)[4,5,6]																	
Date				19/10/2020	20/10/2020	13/07/2021	19/10/2020	13/07/2021	20/10/2020	19/10/2020	19/10/2020	13/07/2021	20/10/2020	14/07/2021	20/10/2020	13/07/2021	20/10/2020	14/07/2021	20/10/2020	13/07/2021
Response Zone				4-5	4.6-6.5	4.6-6.5	5-7	5-7	4.5-6	6-10	4.7-6	4.7-6	4.8-5.8	4.8-5.8	4-5	4-5	3.5-4.7	3.5-4.7	3.6-5	3.6-5
Aquifer				KPG	KPG	KPG	KPG	KPG	KPG	KPG	KPG	KPG	KPG	KPG	KPG	KPG	KPG	KPG	KPG	KPG
Site Area				W	W	W	W	W	W	C	C	C	E	E	E	E	E	E	E	E
Antimony		5	20																	
Arsenic	50	10	10	12.1	7.33	3.73	33.5	13	0.35	0.54	1.18	3.47	10.7	5.61	1.99	5.46	0.15	3.63	0.23	0.37
Barium			700	50	63	89	220	190	62	94	140	100	180	180	76	95	17	56	75	98
Boron		1000	2400	590	460	560	480	430	360	280	550	360	1200	1100	340	360	5300	4800	210	170
Cadmium (and its compounds)		5	3	0.02	0.02	< 0.02	0.02	< 0.02	0.02	0.02	0.52	2	0.02	< 0.02	0.02	< 0.02	0.02	0.03	0.02	< 0.02
Total Chromium		50	50	9.7	10	4.3	6.9	5.7	11	6	9	5.3	19	8.9	12	6.4	7	17	6.2	3.8
Copper (see also 2nd stage assessment)	1 (bioavailable)	2000	2000	6.1	1.2	1.7	4	2.1	1	2.8	3.4	2.5	2	2.9	1.3	2.9	2.5	7.9	1.1	1.9
Lead (see also 2nd stage assessment)	1.2 (bioavailable)	10	10	0.2	0.2	< 0.2	0.2	< 0.2	0.2	0.2	0.2	< 0.2	0.2	< 0.2	0.2	< 0.2	0.2	< 0.2	0.2	< 0.2
Mercury	0.07 (MAC)	1	6	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
Nickel (see also 2nd stage assessment)	4 (bioavailable)	20	70	9.4	10	4.8	9	4.7	7.9	4.4	12	24	12	2.4	7.5	3.1	1.7	3.6	6.3	2.2
Selenium		10	40	2.5	2.8	1.2	2.5	0.9	2.5	1.2	2.8	1.1	5.2	0.9	3	1.1	1.6	1.8	2	< 0.6
Vanadium				0.2	0.2	0.5	0.3	0.4	0.2	0.9	0.4	1.9	1.3	0.4	0.2	2.6	4.2	24	0.2	1
Zinc (see also 2nd stage assessment)	10.9 (bioavailable plus ambient background concentration dissolved)			1.7	3.9	8.5	1.5	3.1	1.2	2.5	6.1	17	3.6	2.3	1.4	5.5	4.9	< 0.5	2.2	3.9
Chromium III	4.7			9.7	10	4.3	6.9	5.7	11	6	9	5.3	19	8.9	12	6.4	7	17	6.2	3.8
Chromium VI	3.4																			
pH				7.0	7.3	7.6	7.2	7.5	7.3	7.6	7.4	7.0	7.1	7.6	7.5	7.3	7.7	8.1	7.6	7.7
Sulphate		250000		400000	185000	376000	203000	125000	74400	67000	82001	132000	235000	220000	16800	22700	25800	42000	42600	99400
Calcium				520		230.00	320	230		170	230	210		250.00		180.00		140.00		150.00
Dissolved Organic Carbon				14.1	6.43	14.3	16.4	10.9	8.22	10.1	8.47	4.06	24.6	19.6	35.7	48.7	106	95.2	8.2	9.04
Total hardness as CaCO3						632.00		639.00				577.00		792.00		505.00		564.00		412.00
Phenols (total monohydric)	7.7			1	1	< 1.0	1	< 1.0	1	2.8	2.2	< 1.0	8.3	10	360	240	640	640	1.7	< 1.0
Naphthalene	2			0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	70.6	97.1*	31.8	180	0.01	< 0.01
Acenaphthylene				0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.57	0.77	0.01	3.7	0.01	< 0.01
Acenaphthene				0.01	0.01	0.01	0.01	0.01	2.67	0.01	0.01	0.01	0.01	0.01	27.2	36.4	14.9	20	0.01	37.5
Fluorene				0.01	0.01	0.01	0.01	0.01	1.19	0.01	0.01	0.01	0.01	0.01	0.01	< 0.01	5.53	7.99	0.01	< 0.01
Phenanthrene				0.01	0.01	0.01	0.01	0.01	1.33	0.01	0.01	0.01	0.01	0.01	0.01	< 0.01	9.9	18	0.01	< 0.01
Anthracene	0.1			0.01	0.01	0.01	0.01	0.01	0.27	0.01	0.01	0.01	0.01	0.01	0.01	< 0.01	1.54	1.45	0.01	< 0.01
Fluoranthene	0.0063			0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	< 0.01	2.49	7.15	0.01	0.82
Pyrene				0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	< 0.01	2.18	5.47	0.01	0.43
Benzo(a)anthracene				0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	< 0.01	0.01	2.08	0.01	< 0.01
Chrysene				0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	< 0.01	0.01	1.07	0.01	< 0.01
Benzo(b)fluoranthene	0.017 (MAC)			0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	< 0.01	0.01	2.48	0.01	< 0.01
Benzo(k)fluoranthene	0.017 (MAC)			0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	< 0.01	0.01	0.96	0.01	< 0.01
Benzo(a)pyrene	0.00017	0.01	0.7	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	< 0.01	0.01	2.1	0.01	< 0.01
Indeno(123cd)pyrene				0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	< 0.01	0.01	1.08	0.01	< 0.01
Dibenzo(ah)anthracene				0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	< 0.01	0.01	0.01	0.01	< 0.01
Benzo(ghi)perylene	0.0082 (MAC)			0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	< 0.01	0.01	1.45	0.01	< 0.01
Coronene																				
PAH (benzo(b)fluoranthene, benzo(k)fluoranthene, benzo(ghi)perylene and indeno(1,2,3-cd)pyrene)		0.1																		
Benzene	10	1	10	1	1	1	1	1	1	1	1	1	1	1	1250	2940	49.9	1360	1	1
Toluene	74		700	1	1	1	1	1	1	1	1	1	1	1	289	322	1	406	1	1
Ethylbenzene			300	1	1	1	1	1	1	1	1	1	1	1	59	< 1.0	1	81.8	1	1
m/p xylene			500	1	1	1	1	1	1	1	1	1	1	1	171	431	145	315	1	1
o xylene				1	1	1	1	1	1	1	1	1	1	1	69.1	199	109	179	1	1
MTBE				1	1	1	1	1	1	1	1	1	1	1	1	< 1.0	1	1	1	1
TPH Aliphatic C5-6	See Note 7		15000	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
TPH Aliphatic C6-8			15000	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
TPH Aliphatic C8-10			300	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
TPH Aliphatic C10-12			300	10	10	10	10	10	10	10	-	10	10	10	10	10	10	10	10	10
TPH Aliphatic C12-16			300	10	10	10	10	10	10	10	-	10	10	10	57	10	10	10	10	10
TPH Aliphatic C16-21				10	10	10	10	10	10	10	-	10	10	10	10	10	10	10	10	10
TPH Aliphatic C21-35				10	10	10	10	10	10	10	-	10	10	10	10	10	10	10	10	10
TPH Aromatic C5-7		WV for benz	10	1	1	1	1	1	1	1	1	1	1	1	1200	2900	50	1400	1	1
TPH Aromatic C7-8			700	1	1	1	1	1	1	1	1	1	1	1	290	320	1	410	1	1
TPH Aromatic C8-10			300	1	1	1	1	1	1	1	1	1	1	1	320	660	270	640	1	1
TPH Aromatic C10-12			90	10	10	10	10	10	10	10	-	10	460	56	720	1600	3700	1600	10	30
TPH Aromatic C12-16			90	10	10	10	10	10	10	10	-	10	510	230	610	1900	1400	1300	10	120
TPH Aromatic C16-21			90	10	10	10	10	10	10	10	-	10	270	120	330	2300	320	260	10	10
TPH Aromatic C21-35			90	10	10	10	10	10	10	10	-	10	10	10	10	1600	10	380	10	10

Sources:

1. The Water Framework Directive (
2. The Water Supply (Water Quality) Regulations 2018 ((2018 No.647 (W.121))
3. Water Research Centre (February 2008). Survey of the Prevalence of Perfluoroactane Sulphonate (PFOS), Perfluorooctanoic Acid (PFOA) and Related compounds in Drinking Water and Their Sources. Reference: DEFRA 7585.
4. World Health Organisation (2011). Guidelines for Drinking-Water Quality. Fourth Edition.
5. World Health Organisation (2016). Perchlorate in Drinking-Water. Background Document for Development of WHO Guidelines for Drinking-water Quality. WHO/SDE/FWC/16.46
6. World Health Organisation (2008). Petroleum Products in Drinking Water. Background Document for Development of WHO Guidelines for Drinking-Water Quality. WHO/SDE/WSH/05.08/123
7. Petroleum product s must not form a visible film on water surface. At screening stage, it may be suitable (subject to the CSM) to consider using the laboratory detection limit of 10u/l to determine impact from TPH (C5-35). Consideration should also be given to particular compounds of concern within contaminant mixtures such as TPH.

Terminology:

EQS = Environmer Environmental Quality Standard. Relates to long term mean for specific pollutants and annual average (AA-EQS) for priority substances unless otherwise indicated. The EQS relates to the total contaminant concentration unless stated otherwise (for some metals EQS relates to the bioavailable fraction).

MAC = Maximum allowable concentration. Where AA_EQS is not available, maximum allowable concentration (MAC-EQS) has been used.

Bioavailable = Relates to the bioavailable fraction of the contaminant (Pb, Cu, Ni, Mn and Zn only). If exceedances of these metals are reported, further assessment must be undertaken to determine the bioavailable fraction of the contaminant in the water sample (see Tab 4)

Contaminants	EQS	DWS		BH01D	BH01D	BH02D	BH02D	BH101	BH101	BH102	BH102	BH103	BH103	BH104	BH104	BH04D	BH04D	BH03d
	Freshwater (ug/l)[1]	UK (ug/l)[2,3]	WHO (ug/l)[4,5,6]															
Date				21/10/2020	15/07/2021	20/10/2020	15/07/2021	21/10/2020	14/07/2021	21/10/2020	16/07/2021	21/10/2020	14/07/2021	21/10/2020	15/07/2021	20/10/2020	15/07/2021	21/10/2020
Response Zone				35-40	35-40	36-40	36-40	36.5-40.5	36.5-40.5	36.5-40.5	36.5-40.5	35-39	35-39	34-38	34-38	34-39	34-39	22-27
Aquifer				Chalk	Chalk	Chalk	Chalk	Chalk	Chalk	Chalk	Chalk	Chalk	Chalk	Chalk	Chalk	Chalk	Chalk	Thanet
Site Area				W	W	W	W	W	W	W	W	C	C	C	C	E	E	C
Antimony		5	20															
Arsenic	50	10	10	1.87	1.09	3.69	9.53	0.68	2.32	1.74	1.03	1.12	1.03	0.43	0.4	1.64	2.3	0.15
Barium			700	94	130	98	130	56	59	110	140	57	110	85	68	150	200	41
Boron		1000	2400	400	510	340	360	190	230	580	390	320	360	220	240	620	900	32
Cadmium (and its compounds)		5	3	0.02	0.02	0.02	< 0.02	0.02	< 0.02	0.02	< 0.02	0.02	< 0.02	0.02	< 0.02	0.02	< 0.02	0.02
Total Chromium		50	50	4.7	5	3.4	5.3	2.6	3.3	4.9	6.2	7.4	5.6	4.9	4.6	3.6	8.1	2.9
Copper (see also 2nd stage assessment)	1 (bioavailable)	2000	2000	4.4	4	2.3	0.6	3.9	3.2	1.9	1.6	0.9	1.3	2.4	< 0.5	2.9	2.7	1.7
Lead (see also 2nd stage assessment)	1.2 (bioavailable)	10	10	0.2	< 0.2	0.2	0.3	0.2	< 0.2	0.2	< 0.2	0.2	< 0.2	0.2	< 0.2	0.2	< 0.2	0.2
Mercury	0.07 (MAC)	1	6	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
Nickel (see also 2nd stage assessment)	4 (bioavailable)	20	70	7.7	11	4.1	2.9	5.6	6.4	5.8	3.4	5.6	2.7	3.3	2.3	4.8	9.7	5
Selenium		10	40	0.9	1.1	0.7	< 0.6	2.4	< 0.6	5.6	0.6	2	< 0.6	0.8	< 0.6	1.2	1	0.7
Vanadium				0.5	0.3	0.3	0.6	0.5	0.3	2.5	0.3	0.2	0.5	0.7	0.6	0.8	0.9	0.2
Zinc (see also 2nd stage assessment)	10.9 (bioavailable plus ambient background concentration dissolved)			11	11	16	4.4	20	5.3	6.4	1.6	2.2	1.3	9.5	< 0.5	2.9	3.9	85
Chromium III	4.7			4.7	5	3.4	5.3	2.6	3.3	4.9	6.2	7.4	5.6	4.9	4.6	3.6	8.1	2.9
Chromium VI	3.4			5	< 5.0	5	< 5.0	5	< 5.0	5	< 5.0	5	< 5.0	5	< 5.0	5	< 5.0	5
pH				7.3	7.3	7.2	7.3	7.5	8.2	7.2	7.2	7.5	7.6	7.7	7.6	7.3	7.3	7
Sulphate		250000		290000	331000	109000	66100	120000	151000	235000	163000	10000.1	39300	68700	7960	120000	138000	21000.3
Calcium					300.00		180.00		87.00		220.00		190.00		170.00		240.00	
Dissolved Organic Carbon				4.92	9.37	7.52	8.93	3.1	2.57	12.3	7.41	6.43	12	5.73	7.21	10.1	11.7	9.46
Total hardness as CaCO3				644	812	534	547		389.00		638.00		544.00	512	484	580	792	
Phenols (total monohydric)	7.7			1.6	< 1.0	3.3	5.6	1	< 1.0	2.9	< 1.0	4.6	< 1.0	4.8	19	3.5	< 1.0	1
Naphthalene	2			1.13	0.01	14.4	4.62	0.01	0.01	0.01	0.01	0.01	0.99	0.01	2.78	0.01	0.01	0.01
Acenaphthylene				0.01	0.01	0.23	1.68	0.01	0.01	0.01	0.01	0.01	0.01	0.1	0.44	0.01	0.01	0.01
Acenaphthene				0.38	0.01	1.63	3.67	0.01	0.01	0.01	0.01	0.01	13	18.3	19.1	0.01	0.01	0.01
Fluorene				0.3	0.01	2.46	8.25	0.01	0.01	0.01	0.01	0.01	0.01	0.25	1.32	0.01	0.01	0.01
Phenanthrene				0.37	0.01	1.2	21.7	0.01	0.01	0.01	0.01	0.01	0.01	1.62	0.41	0.01	0.01	0.01
Anthracene	0.1			0.01	0.01	0.18	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.17	0.22	0.01	0.01	0.01
Fluoranthene	0.0063			0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.58	0.01	0.01	0.01
Pyrene				0.01	0.01	0.23	5.79	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.31	0.01	0.01	0.01
Benzo(a)anthracene				0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
Chrysene				0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
Benzo(b)fluoranthene	0.017 (MAC)			0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
Benzo(k)fluoranthene	0.017 (MAC)			0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
Benzo(a)pyrene	0.00017	0.01	0.7	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
Indeno(123cd)pyrene				0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
Dibenzo(ah)anthracene				0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
Benzo(ghi)perylene	0.0082 (MAC)			0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
Coronene																		
PAH (benzo(b)fluoranthene, benzo(k)fluoranthene, benzo(ghi)perylene and indeno(1,2,3-cd)pyrene)		0.1																
Benzene	10	1	10	1	1	1	1	1	1	34	1	1	1	1	1	1	1	1
Toluene	74		700	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Ethylbenzene			300	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
m/p xylene			500	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
o xylene				1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
MTBE				1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
TPH Aliphatic C5-6	See Note 7		15000	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
TPH Aliphatic C6-8			15000	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
TPH Aliphatic C8-10			300	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
TPH Aliphatic C10-12			300	10	10	77	50	10	10	10	10	10	10	10	10	10	10	10
TPH Aliphatic C12-16			300	10	10	410	630	10	10	10	10	10	10	10	10	10	10	10
TPH Aliphatic C16-21				10	10	310	780	10	10	10	10	10	10	10	10	10	10	10
TPH Aliphatic C21-35				10	10	170	450	10	10	10	10	10	10	10	10	10	10	10
TPH Aromatic C5-7		WV for benz	10	1	1	1	1	1	1	34	1	1	1	1	1	1	1	1
TPH Aromatic C7-8			700	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
TPH Aromatic C8-10			300	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
TPH Aromatic C10-12			90	52	10	410	92	10	10	10	10	10	38	10	100	10	10	10
TPH Aromatic C12-16			90	80	10	750	670	10	10	10	10	10	150	19	200	10	10	10
TPH Aromatic C16-21			90	63	10	470	900	10	10	10	10	10	190	10	220	10	10	10
TPH Aromatic C21-35			90	10	10	280	640	10	10	10	10	10	10	10	10	10	10	10

Sources:

1. The Water Framework Directive (
2. The Water Supply (Water Quality) Regulations 2018 ((2018 No.647 (W.121))
3. Water Research Centre (February 2008). Survey of the Prevalence of Perfluoroactane Sulphonate (PFOS), Perfluorooctanoic Acid (PFOA) and Related compounds in Drinking Water and Their Sources. Reference: DEFRA 7585.
4. World Health Organisation (2011). Guidelines for Drinking-Water Quality. Fourth Edition.
5. World Health Organisation (2016). Perchlorate in Drinking-Water. Background Document for Development of WHO Guidelines for Drinking-water Quality. WHO/SDE/FWC/16.46
6. World Health Organisation (2008). Petroleum Products in Drinking Water. Background Document for Development of WHO Guidelines for Drinking-Water Quality. WHO/SDE/WSH/05.08/123
7. Petroleum product s must not form a visible film on water surface. At screening stage, it may be suitable (subject to the CSM) to consider using the laboratory detection limit of 10u/l to determine impact from TPH (C5-35). Consideration should also be given to particular compo

Terminology:

EQS = Environme Environmental Quality Standard. Relates to long term mean for specific pollutants and annual average (AA-EQS) for priority substances unless otherwise indicated. The EQS relates to the total contaminant concentration unless stated otherwise (for some metals t

MAC = Maximum allowable concentration. Where AA_EQS is not available, maximum allowable concentration (MAC-EQS) has been used.

Bioavailable = Relates to the bioavailable fraction of the contaminant (Pb, Cu, Ni, Mn and Zn only). If exceedances of these metals are reported, further assessment must be undertaken to determine the bioavailable fraction of the contaminant in the water sample (see Tab 4)

Metal Bioavailability Assessment Tool (M-BAT)

Back

Calculate

Clear Data

INPUT DATA											RESULTS (Copper)				RESULTS (Zinc)				RESULTS (Mn)				RESULTS (Ni)			
ID	Location	Waterbody	Date	Measured Cu Concentration (dissolved) (µg l-1)	Measured Zn Concentration (dissolved) (µg l-1)	Measured Mn Concentration (dissolved) (µg l-1)	Measured Ni Concentration (dissolved) (µg l-1)	pH	DOC	Ca	Site-specific PNEC Dissolved Copper (µg l-1)	BioF	Bioavailable Copper Concentration (µg l-1)	Risk Characterisation Ratio	Site-specific PNEC Dissolved Zinc (µg l-1)	BioF	Bioavailable Zinc Concentration (µg l-1)	Risk Characterisation Ratio	Site-specific PNEC Dissolved Manganese (µg l-1)	BioF	Bioavailable Manganese Concentration (µg l-1)	Risk Characterisation Ratio	Site-specific PNEC Dissolved Nickel (µg l-1)	BioF	Bioavailable Nickel Concentration (µg l-1)	Risk Characterisation Ratio
1	WS01	KPG	Oct-20	6.1			9.4	7	14.1	1	52.98	0.02	0.12	0.12	59.18	0.18			123.00	1.00			32.23	0.12	1.17	0.29
2	BH01(S)	KPG	Oct-20	1.2			10	7.3	6.43	632	30.04	0.03	0.04	0.04	29.55	0.37			851.26	0.14			20.10	0.20	1.99	0.50
3	BH01(S)	KPG	Jul-21	1.7			4.8	7.6	14.3	632	51.25	0.02	0.03	0.03	53.76	0.20			476.25	0.26			28.30	0.14	0.68	0.17
4	BH02 (S)	KPG	Oct-20	4			9	7.2	16.4	639	60.74	0.02	0.07	0.07	49.60	0.22			1031.09	0.12			36.13	0.11	1.00	0.25
5	BH02 (S)	KPG	Jul-21	2.1			4.7	7.5	10.9	639	48.94	0.02	0.04	0.04	42.25	0.26			577.98	0.21			24.60	0.16	0.76	0.19
6	WS121	KPG	Oct-20				7.9	7.3	8.22	1	35.75	0.03			37.27	0.29			123.00	1.00			20.59	0.19	1.53	0.38
7	BH03(S)	KPG	Oct-20	2.8			4.4	7.6	10.1	1	42.85	0.02	0.07	0.07	48.99	0.22			123.00	1.00			23.59	0.17	0.75	0.19
8	WS127 EW1	KPG	Oct-20	3.4			12	7.4	8.47	577	39.95	0.03	0.09	0.09	34.91	0.31			701.43	0.18			22.11	0.18	2.17	0.54
9	WS127 EW1	KPG	Jul-21	2.5	17		24	7	4.06	577	16.66	0.06	0.15	0.15	23.98	0.45	7.73	0.71	1521.55	0.08			10.64	0.19	4.87	1.22
10	BH04B	KPG	Oct-20	2			12	7.1	24.6	792	56.99	0.02	0.04	0.04	54.56	0.20			1253.75	0.10			42.42	0.09	1.13	0.28
11	BH04B	KPG	Jul-21	2.9				7.6	19.8	792	50.74	0.02	0.06	0.06	70.56	0.15			476.25	0.26			36.00	0.11		
12	WS115A	KPG	Oct-20	1.3			7.5	7.5	35.7	505	56.88	0.02	0.02	0.02	68.42	0.16			577.98	0.21			38.08	0.11	0.79	0.20
13	WS115A	KPG	Jul-21	2.9				7.3	48.7	505	62.00	0.02	0.05	0.05	61.49	0.18			851.26	0.14			40.57	0.10		
14	WS116	KPG	Oct-20	2.5				7.7	106	564	42.60	0.02	0.06	0.06	75.35	0.14			392.43	0.31			34.93	0.11		
15	WS116	KPG	Jul-21	7.9				8.1	95.2	564	57.1	0.1	1.4	1.4	85.74	0.13			180.91	0.68			26.54	0.15		
16	WS125	KPG	Oct-20	1.1			6.3	7.6	8.2	412	36.49	0.03	0.03	0.03	36.28	0.30			476.25	0.26			19.49	0.31	1.29	0.32
17	WS125	KPG	Jul-21	1.9				7.7	9.04	412	37.74	0.03	0.05	0.05	39.73	0.27			392.43	0.31			19.90	0.21		
18	WS120	ALL	Oct-20	2.7			6.7	8.8	25.2	231	1.00	1.00	2.74	2.74	85.74	0.13			123.00	1.00			4.04	1.00	4.04	1.01
19	WS120	ALL	Jul-21	1.1			4.3	8.8	21.6	231	1.00	1.00	1.00	1.00	85.74	0.13			123.00	1.00			4.04	1.00	4.04	1.01
20	WS123A	ALL	Oct-20	1.9			19	7	41.3	801	50.98	0.02	0.04	0.04	51.10	0.21			1521.55	0.08			43.12	0.09	3.76	0.44
21	WS123A	ALL	Jul-21	5.4			8.3	7.1	37.8	801	56.99	0.02	0.09	0.09	54.56	0.20			1253.75	0.10			42.42	0.09	0.78	0.20
22	WS16E	ALL	Oct-20	2.6			8.8	7.1	103	740	56.99	0.02	0.05	0.05	54.56	0.20			1253.75	0.10			42.42	0.09	0.83	0.21
23	WS16E	ALL	Jul-21	2.4				8.3	111	740	1.00	1.00	2.40	2.40	85.74	0.13			123.00	1.00			21.24	0.19		

Metal Bioavailability Assessment Tool (M-BAT)

Back

Calculate

Clear Data

INPUT DATA											RESULTS (Copper)				RESULTS (Zinc)				RESULTS (Mn)				RESULTS (Ni)			
ID	Location	Waterbody	Date	Measured Cu Concentration (dissolved) (µg l^{-1})	Measured Zn Concentration (dissolved) (µg l^{-1})	Measured Mn Concentration (dissolved) (µg l^{-1})	Measured Ni Concentration (dissolved) (µg l^{-1})	pH	DOC	Ca	Site-specific PNEC Dissolved Copper (µg l^{-1})	BioF	Bioavailable Copper Concentration (µg l^{-1})	Risk Characterisation Ratio	Site-specific PNEC Dissolved Zinc (µg l^{-1})	BioF	Bioavailable Zinc Concentration (µg l^{-1})	Risk Characterisation Ratio	Site-specific PNEC Dissolved Manganese (µg l^{-1})	BioF	Bioavailable Manganese Concentration (µg l^{-1})	Risk Characterisation Ratio	Site-specific PNEC Dissolved Nickel (µg l^{-1})	BioF	Bioavailable Nickel Concentration (µg l^{-1})	Risk Characterisation Ratio
1	BH01D	Chalk	Oct-20	4.4	11		7.7	7.3	4.92	644	22.36	0.04	0.20	0.20	26.48	0.41	4.53	0.42	851.26	0.14			17.83	0.22	1.73	0.43
2	BH01D	Chalk	Jul-21	4	11		11	7.3	9.37	812	44.31	0.02	0.09	0.09	35.81	0.30	3.35	0.31	851.26	0.14			24.52	0.16	1.79	0.45
3	BH02D	Chalk	Oct-20	2.3	16		4.1	7.2	7.52	534	35.11	0.03	0.07	0.07	30.95	0.35	5.63	0.52	1033.09	0.12			22.77	0.18	0.72	0.18
4	BH02D	Chalk	Jul-21					7.3	8.93	547	42.29	0.02			34.85	0.31			851.26	0.14			23.86	0.17		
5	BH101	Chalk	Oct-20	3.9	20			7.5	3.1	389	12.87	0.08	0.30	0.30	23.10	0.47	9.44	0.87	577.98	0.21			13.10	0.31		
6	BH101	Chalk	Jul-21	3.2				8.2	2.57	389	4.71	0.21	0.68	0.68	21.96	0.50			149.07	0.83			6.03	0.66		
7	BH102	Chalk	Oct-20	1.9				7.2	12.3	638	54.88	0.02	0.03	0.03	40.61	0.27			1033.09	0.12			29.96	0.13		
8	BH102	Chalk	Jul-21	1.6				7.2	7.41	638	34.57	0.03	0.05	0.05	30.74	0.35			1033.09	0.12			22.60	0.18		
9	BH103	Chalk	Oct-20					7.5	6.43	544	29.33	0.03			30.91	0.35			577.98	0.21			18.01	0.22		
10	BH103	Chalk	Jul-21	1.3				7.6	12	544	49.18	0.02	0.03	0.03	46.94	0.23			476.25	0.26			24.98	0.16		
11	BH104	Chalk	Oct-20	2.4				7.7	5.73	512	23.68	0.04	0.10	0.10	30.33	0.36			392.43	0.31			14.86	0.27		
12	BH104	Chalk	Jul-21					7.6	7.21	484	32.02	0.03			33.63	0.32			476.25	0.26			18.06	0.22		
13	BH04D	Chalk	Oct-20	2.9				7.3	10.1	580	47.51	0.02	0.06	0.06	37.42	0.29			851.26	0.14			25.62	0.16		
14	BH04D	Chalk	Jul-21	2.7				7.3	11.7	792	53.76	0.02	0.05	0.05	41.03	0.27			851.26	0.14			28.03	0.14		

Pb Screening Tool 1.0

Back

Calculate

Clear Data

INPUT DATA						RESULTS (Pb)			
ID	Location	Waterbody	Date	Measured Pb Concentration (dissolved) (µg l^{-1})	DOC	Site Specific PNEC Dissolved Pb (µg l^{-1})	BioF	Available Pb (µg l^{-1})	Risk Characterisation Ratio
1	WS108EW1	Perched wate	13/07/2021	1.40	**24.10**	24.00	0.05	0.07	0.06
2	WS120	Alluvium	19/10/2020	2.70	**25.20**	24.00	0.05	0.14	0.11

Appendix E

Remediation targets

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Appendix E - Remediation targets

Remediation Targets 'RT'	RT water (mg/l)	RT soil (mg/kg)	Notes
TPH aromatic C5-C7 (benzene)	0.03	0.2	(1)
TPH aromatic C7-C8 (toluene)	0.22	239	
TPH aromatic C8-C10 (Ethylbenzene and xylene)	0.88	110	(1)
TPH aromatic C10-C12	0.763	180	(1)
TPH aromatic C12-C16	0.763	214	
TPH aromatic C16-C21	0.763	540	(1)
TPH aromatic C21-C35	0.763	750	(1),(2)
TPH aliphatic C5-C6	0.95	78	(1),(3)
TPH aliphatic C6-C8	0.75	230	(1),(3)
TPH aliphatic C8-C10	0.06	65	(1),(3)
TPH aliphatic C10-C12	0.04	330	(1),(3)
TPH aliphatic C12-C16	0.06	600	(1),(4)
TPH aliphatic C16-C21	0.06	600	(1),(4)
TPH aliphatic C21-C35	0.06	600	(1),(4),(5)
Naphthalene	0.21	5.2	
Anthracene	0.09	1.45	
Fluoranthene	0.006	0.8	
Benzo(a)pyrene	0.002	1.2	

Appendix E - Remediation targets

Remediation Targets 'RT'	RT water (mg/l)	RT soil (mg/kg)	Notes
benzo(b)fluoranthene, benzo(k)fluoranthene, benzo(ghi)perylene and indeno(1,2,3-cd)pyrene	0.011	11.9	(6)
Phenol	0.473	1.73	
Arsenic	0.074	37	(1)
Cadmium	0.22	22	(1)
Nickel	0.26	130	(1)
Selenium	1.1	54.6	
Mercury	0.008	1.2	(1)
Lead	0.13	118	
Copper	4.64	465	
Chromium III	0.51	910	(1)
Chromium VI	0.37	6.71	
Zinc	1.2	45.7	
Boron	28.7	290	(1)
pH	>6		
Asbestos fibres in soil	<0.01%		(7)
Asbestos containing materials (ACM)	Absent		

Appendix E - Remediation targets

Notes:

(1) 'RTsoil' assumed equal to the human health assessment criteria as it is the lower one.
(2) 'RT' assumed equal to 50% of the human health assessment criteria (conservative assumption).
(3) RTwater' assumed equal to GACgwvap.
(4) 'RT' assumed equal to 25% of the human health assessment criteria for TPH Aliphatic C12-C16 (conservative assumption).
(5) The presence of free hydrocarbon product (NAPL) is not permitted. The maximum acceptable concentration of TPH CWG (as total) is 1,000mg/kg for imported materials.
(6) Generic Assessment Criteria for chronic human health risk for a residential with garden land use scenario based on S4UL values published by LQM/CIEH applies for Polyaromatic Hydrocarbons (PAH) not mentioned in the list. Speciated PAH should exceed 250 mg/kg in imported materials.
(7) Criteria for asbestos fibres in soil is based on laboratory detection limits.

Appendix F

Tank removal strategy

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1. OVERVIEW

Given the potential for underground tanks to be encountered during the site redevelopment works, the following procedures are set out for the remediation contractor to adhere to with regard to excavation below ground. The reason for setting out these procedures is that tanks, associated structures and surrounding soils are potential sources of on-going soil and groundwater contamination. Furthermore, the removal and the verification of these sources is required as part of the remediation strategy for the site.

2. POTENTIAL FOR UNDERGROUND TANKS

The Desk Study prepared by Card Geotechnics Limited ("CGL") in 2014 and Site Investigation Interpretative Report prepared by GBCP in 2021 ("SIIR") included the collection of various historical records for the site, which provide an indication of potential tank locations that might be an on-going source of soil and groundwater contamination. These records have been assessed and a drawing produced showing the potential locations of former tanks. However, it is noted that not all of these tanks may still remain in the ground, that some of the records may relate to above ground tanks and the contents in many cases is unknown. Therefore, whilst this drawing provides an indication of potential tank locations, the presence of tanks elsewhere across the site cannot be ruled out and the contractor should remain observant for potential underground tanks/pipework and other structures which may contain contaminating fluids.

3. PROCEDURE OUTLINE

The decommissioning and the removal of the above and below ground storage tanks and connected pipework shall be conducted in accordance with the relevant EA Guidance[1] and the APEA Technical guidance and health and safety guidance on decommissioning tanks ("Blue Book")[2]. The works will comprise:

[1] EA (2016). 'Prevent groundwater pollution from underground fuel storage tanks', https://www.gov.uk/guidance/prevent-groundwater-pollution-from-underground-fuel-storage-tanks/decommissioning-an-underground-storage-tank

[2] APEA. 'Guidance for Design, Construction, Modification, Maintenance and Decommissioning of Filling Stations'.

1. Removal of the residual product in tanks and pipelines, including residual vapours using appropriate methods that prevents loss of fuel to the ground;

2. Disposal of all residual liquid, sludge, tank and pipework using a registered waste carrier and a permitted waste facility.

A flow chart outlining the process to be followed upon encountering potential underground sources is presented in Figure 2 below.

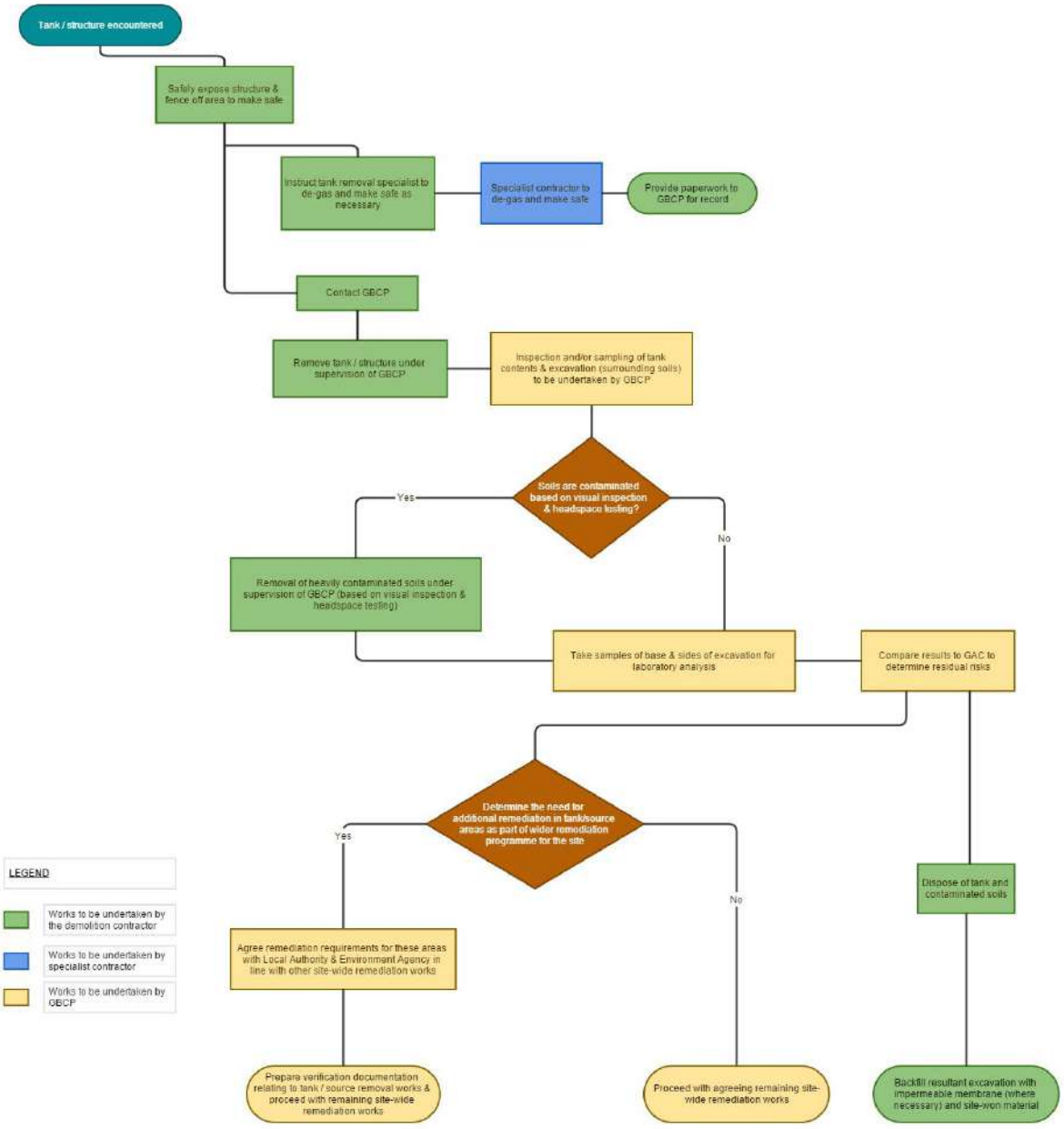

Figure 2: Process summary for underground tanks/structures

In summary, once a tank or underground structure has been encountered which might potentially represent a source of contamination, the contractor is required to contact GBCP and, if necessary, a tank removal specialist to make the structure safe and remove contents. Removal of the tank shall be undertaken under the supervision of GBCP to inspect the tank/structure, its contents and the potential for contamination of the surrounding soils and groundwater to have occurred.

The excavation shall be inspected visually for the presence of gross contamination arising from the tank/structure and shall be supported by headspace testing using a photoionization detector (PID). If the tank or structure is considered to have been a direct source of contamination, then the surrounding soils contaminated as a result of the leaking tank/structure will be removed by the contractor under the supervision of GBCP. It should be noted that there is a potential for soils adjacent to such structures to be contaminated as a result of other sources/historical use. It may be difficult to establish the boundary between gross contamination arising from the tank for removal and general 'site-wide' contamination. The aim of the works undertaken at this stage therefore is to remove the tank, its contents and any gross hydrocarbon contaminated soils (e.g. saturated with free product). It is likely that contaminated soils will remain following this work and further site-wide remediation to protect future site users and controlled waters may be required. This will be dealt with separately. However, as the basement excavation works extend below ground, it is considered practical to utilise this work to inspect and remove source areas as they are encountered. Soil and groundwater contamination across the site and the general risks arising as a result shall be dealt with separately.

Once the tank and associated contaminated soils have been removed, the contractor shall dispose of the material off-site at a suitably licensed facility and shall provide all Duty of Care records to GBCP for incorporation into the final Verification Report. It is likely that any soils removed will be considered hazardous waste and may require treatment prior to disposal. Treatment and subsequent disposal by a soil treatment centre may be required.

Soil samples shall be taken from the base and sides of the resultant excavation by GBCP and sent for laboratory analysis for a suitable suite of testing. Typically, this suite may include the following:

- Total petroleum hydrocarbons (TPHCWG);
- Polyaromatic hydrocarbons (speciated PAH EPA 16);
- Speciated phenols;
- Volatile organic compounds (VOC).

The final suite of testing for each sample shall be subject to the findings of visual observations during the excavation works.

The results shall be assessed to determine the residual risks posed to sensitive receptors, as identified in the site investigation reports. Any residual contamination in these areas shall be dealt with as part of the wider site remediation works.

The contractor should be aware of the potential for significant dust, vapours and odours to be generated when excavating below ground. In this regard, a monitoring has been set out as part of the Remediation Strategy to limit the generation of dust, vapours and odours during the initial phase of the ground remediation works. The monitoring plan has been based of the results of the an acute and sub-chronic vapour risk assessment 'AsCVRA' prepared by GBCP in 2021. This will describe the requirements of the air monitoring and the relevant management and mitigation measures to reduce any potential impacts. Dampening down (though significant flows of water should be minimised to prevent increased leaching in soils), minimising the exposed working face will comprise the mitigation measures for the generation of dust and vapours. If odours are considered to be a nuisance, then sorbent tubes will be employed to quantify the concentration of volatile contaminants as a result of the excavation work.

4. REPORTING

A detailed record of the tank removal works shall be maintained, including photographs, field records, contractor's records and laboratory results. This information shall be gathered by GBCP from field records and also obtained from the contractor, where relevant. These records will be contained within the final *Verification Report* for the site remediation works.

Appendix G

Discovery strategy

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A discovery strategy will be in place during the remediation and construction works by the Contractor and daily photographic records should be maintained by the Contractor.

Should any gross contamination, such as oily material, material of an unusual colour or odour, possible Asbestos Containing Materials (ACMs) and/or tanks or other structures, be encountered during excavation, the following strategy is recommended:

1. Work to cease in that area.
2. Notify geo-environmental engineer, to attend site and sample material. Notify the Contaminated Land Team at London Legacy Development Corporation (LLDC) if significant contamination is encountered and cannot be dealt with in accordance with the principles set out in the Remediation Strategy (e.g. licensable work in relation to asbestos; if a significant unidentified source is encountered).
3. If deemed necessary by initial sampling and/or risk assessment, a geo-environmental engineer/asbestos specialist shall supervise the excavation of impacted material. Impacted material should be excavated directly into trucks for off-site disposal in order to minimise the impacts to the groundworkers and the identified neighbouring receptors. Temporary stockpiling should be undertaken on site only with soils with no odorous and contamination evidence and in accordance with the air quality monitoring plan set out for the remediation works.
4. Soil samples should be obtained by the geo-environmental engineer from both the excavated material and the soils in the sides and base of the excavation to demonstrate that the full area of impacted material has been excavated (based on visual/olfactory evidence and/or use of in-situ monitoring e.g. PID).
5. On receipt of chemical test results, the soils may be appropriately classified for treatment or disposal, and dealt with accordingly.
6. Detailed records, including photographs and duty of care records, of the excavations, stockpile sizes, source and location should be kept and regularly updated to allow materials to be easily tracked from excavation until disposal off site.
7. Backfilling to be undertaken with material certificated as suitable for the proposed end land use.
8. Submission of appropriate plans, photographic records and chemical test results to LLDC, to be incorporated in relevant Verification Report.
9. Note that if works are deemed to be Notifiable Non-Licensed Works (NNLW) due to presence of asbestos, medical examinations and health records will be required (to be included in Verification Reports).

Appendix H

Acute Risk Criteria and sub-Chronic Risk Criteria

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Appendix H – Acute and sub-Chronic Risk Criteria

Table F-1: Acute Risk Thresholds (ART)

Contaminant	Acute Risk Criteria 'ARC' (ppm)	Odour Threshold Criteria 'OTC' (ppm)
Benzene	25	1
Toluene	67	2
Ethylbenzene	33	2
Xylenes	130	0.08
Naphthalene	15	0.08
Styrene	20	0.02
Isopropylbenzene	50	0.09
Propylbenzene	50	0.009
Trimethylbenzene	45	2.2
Tetrachloroethene	35	28
trans-1,2-Dichloroethene	140	17

Table F-2: Sub-chronic risk thresholds (4 weeks)

Contaminant	Sub-chronic risk thresholds 'SCRT' - groundworks duration 4 weeks (mg/m3)		
	Commercial receptors	Passing public receptors	Neighbouring residential receptors
Benzene	0.32	0.41	0.01
Toluene	322.25	413.72	12.31
Ethylbenzene	13.81	17.73	0.53
Xylenes	13.81	17.73	0.53
Naphthalene	0.20	0.25	0.01
Styrene	331.46	425.55	12.67
Isopropylbenzene	157.44	202.11	6.02
Propylbenzene	303.84	390.08	11.61
Trimethylbenzene	2.76	3.54	0.11
Tetrachloroethene	78.72	101.05	3.01
trans-1,2-Dichloroethene	23.48	30.14	0.90

Table F-3: Sub-chronic risk thresholds (8 weeks)

Contaminant	Sub-chronic risk thresholds 'SCRT' - groundworks duration 8 weeks (mg/m3)		
	Commercial receptors	Passing public receptors	Neighbouring residential receptors
Benzene	0.16	0.21	0.01
Toluene	161.13	206.86	6.16
Ethylbenzene	6.91	8.86	0.26
Xylenes	6.91	8.86	0.26
Naphthalene	0.10	0.13	0.004
Styrene	27.62	35.46	1.06
Isopropylbenzene	13.12	16.84	0.50
Propylbenzene	25.32	32.51	0.97
Trimethylbenzene	0.23	0.29	0.01
Tetrachloroethene	6.56	8.42	0.25
trans-1,2-Dichloroethene	1.96	2.51	0.07

Table F-3: Sub-chronic risk thresholds (12 weeks)

Contaminant	Sub-chronic risk thresholds 'SCRT' - groundworks duration 12 weeks (mg/m3)		
	Commercial receptors	Passing public receptors	Neighbouring residential receptors
Benzene	0.11	0.14	0.004
Toluene	107.42	137.91	4.10
Ethylbenzene	4.60	5.91	0.18
Xylenes	4.60	5.91	0.18
Naphthalene	0.07	0.08	0.003
Styrene	18.41	23.64	0.70
Isopropylbenzene	8.75	11.23	0.33
Propylbenzene	16.88	21.67	0.64
Trimethylbenzene	0.15	0.20	0.01
Tetrachloroethene	4.37	5.61	0.17
trans-1,2-Dichloroethene	1.30	1.67	0.05

Table F-4: Sub-chronic risk thresholds (16 weeks)

Contaminant	Sub-chronic risk thresholds 'SCRT' - groundworks duration 16 weeks (mg/m3)		
	Commercial receptors	Passing public receptors	Neighbouring residential receptors
Benzene	0.05	0.07	0.003
Toluene	53.71	68.95	3.08
Ethylbenzene	2.30	2.95	0.13
Xylenes	2.30	2.95	0.13
Naphthalene	0.03	0.04	0.002
Styrene	9.21	11.82	0.53
Isopropylbenzene	4.37	5.61	0.25
Propylbenzene	8.44	10.84	0.48
Trimethylbenzene	0.08	0.10	0.004
Tetrachloroethene	2.19	2.81	0.13
trans-1,2-Dichloroethene	0.65	0.84	0.04

Appendix I

Capping system

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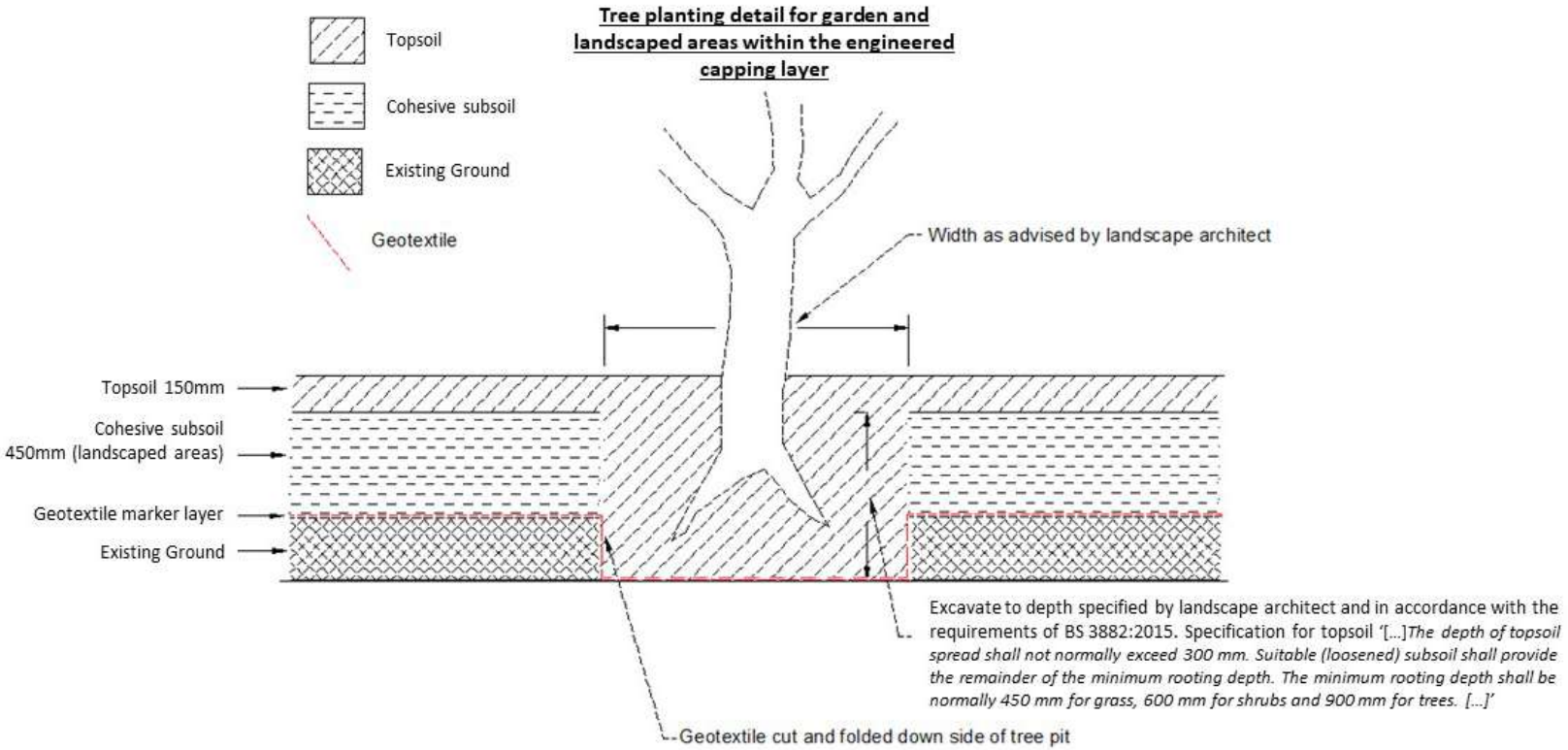
Tree planting detail for garden and landscaped areas within the engineered capping layer



Notes:

1. Do not scale from this figure.
2. For advice in interpretating this figure please contact GB Card & Partners.
3. Geotextile to be Terram T1000 or similar.

Rev	Comments:

Title: **Tree pit detail**

Project: **Wickside, Hepscott Road, London**

Fig No.: **GBC/620/1**
Drn: **AC** Chk: **GBC** Date**: 13/09/21**

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Appendix J

Verification Method Statement

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Section	Description	Item	Summary of Validation Requirements	Verification criteria	Verification evidence	Responsible party
7.1	Decommissioning of the existing deep monitoring wells and abstraction wells	a.	Removal of potential pathway to deep aquifer, formed by the existing deep boreholes.	Decommissioning in accordance with EA Guidance '*Environment Agency (October 2012). Good Practice for Decommissioning Redundant Boreholes and Wells*' and based on the method statement described in Section 7.1.	Site records and photographs per each borehole. Records describing the depth and height of the bentonite seal in each borehole.	Remediation / Drilling Contractor
7.2	Ground remediation and basement excavation – western area	a.	Removal of the identified above and below ground tank in accordance with the *implementation of the Remediation Strategy – Phase 1* set out in Section 7.2.1 and Appendix F. Air monitoring should be carried out as set out in Section 8.	The decommissioning and the removal of the above and below ground storage tanks and connected pipework shall be conducted in accordance with the EA Guidance '*Prevent groundwater pollution from underground fuel storage tanks*' the APEA Technical guidance '*Guidance for Design, Construction, Modification, Maintenance and Decommissioning of Filling Stations*' ("Blue Book") under the supervision of the Site Engineer.	Site records Photographs De-gas certificate Records of the removal of the contents of the identified tanks and pipelines	Remediation Contractor Specialist contractor GB Card & Partners

Section	Description	Item	Summary of Validation Requirements	Verification criteria	Verification evidence	Responsible party
7.2	Ground remediation and basement excavation – western area	b.	If the tank or contamination hotspots is considered to have been a direct source of contamination, then the surrounding soils contaminated will be removed by the contractor under the supervision of the Site Engineer. The works will be carried out in accordance with the *implementation of the Remediation Strategy – Phase 1* set out in Section 7.2.1 and Appendix F. Air monitoring should be carried out as set out in Section 8.	The excavation shall be inspected visually for the presence of gross contamination arising from the tank/structure and shall be supported by headspace testing using a photoionization detector (PID). The excavation of material shall be carried out until no visible gross contamination is recorded: - No visual evidence of contamination; - Slight/weak to Distinct odour (VDI Intensity scale); - Generally low PID readings (<50ppm).	Site records Photographs	Remediation Contractor GB Card & Partners
7.2	Ground remediation and basement excavation – western area	c.	Verification that contaminated soil removal is sufficient to meet the Remediation Targets (Appendix E). The works will be carried out in accordance with the *implementation of the Remediation Strategy – Phase 1* set out in Section 7.2.1 and Appendix F.	Sampling of the base and sides of excavated areas to confirm that the Remediation Targets set out in Appendix E of the *Remediation Strategy* are met. A minimum of one samples from the base of each excavations and one per each walls. Soil sampling for verification should be based on a 3x3m grid, as a minimum where the excavation area exceeds 10m2 and no evidence needing testing is observed.	Site records Sampling plans Photographs Chemical test results Screening assessment	Remediation Contractor GB Card & Partners

Section	Description	Item	Summary of Validation Requirements	Verification criteria	Verification evidence	Responsible party
7.2	Ground remediation and basement excavation – western area	d.	Off-site disposal of contaminated material at a suitable facility. Waste disposal will be carried out in accordance with the *implementation of the Remediation Strategy – Phase 1* set out in Section 7.8.	Appropriate disposal of soil has been undertaken. The grossly contaminated soils removed from the excavations should be excavated directly into trucks. Disposal of all residual liquid, sludge found in tanks shall be carried out by a registered waste carrier and a permitted waste facility.	Waste transfer notes Chemical test results Disposal records	Remediation Contractor
7.2	Ground remediation and basement excavation – western area	e.	Segregation of excavation material with no evidence of contamination for waste characterization or potential on site re-use. Air monitoring should be carried out as set out in Section 8.	Site won backfill will be subjected to validation/waste testing at an estimated frequency of 1 sample per 100m3. The chemical data will be screened against the Remediation Targets (Appendix E)/ hazardous waste assessment (e.g. using HazWaste® software). If the material is suitable for use, a tracking sheet will be used to record the volumes and areas of excavation, any stockpiling requirements and the location that materials are re-used. Note: site won material will only be used beneath a barrier e.g. hardstanding, capping etc.	Materials Management Plan Photographs Chemical test results Screening assessment	Remediation Contractor GB Card & Partners

Section	Description	Item	Summary of Validation Requirements	Verification criteria	Verification evidence	Responsible party
7.2	Ground remediation and basement excavation – western area	f.	Perched water encountered during excavation works has been treated and disposed of appropriately (Section 7.4). Air monitoring should be carried out as set out in Section 8.	Either disposal of perched water or treatment to meet discharge criteria for foul sewer.	Waste transfer notes Chemical test results Disposal records / Chemical test results Sewer discharge consent limits.	Remediation Contractor
7.3	Removal of gross contamination – eastern area	a.	Removal of the identified hotspots of contaminated soils and obstructions in accordance with the *implementation of the Remediation Strategy – Phase 1* set out in Section 7.3.1. Air monitoring should be carried out as set out in Section 8.	See 7.2 item a. and b.	See 7.2 item a. and b.	See 7.2 item a. and b.
7.3	Removal of gross contamination – eastern area	b.	Verification that contaminated soil removal is sufficient to meet the Remediation Targets (Appendix E).	See 7.2 item c.	See 7.2 item c.	See 7.2 item c.
7.3	Removal of gross contamination – eastern area	c.	Off-site disposal of contaminated material at a suitable facility.	See 7.2 item d.	See 7.2 item d.	See 7.2 item d.
7.3	Removal of gross contamination – eastern area	d.	Backfill of the excavation with suitably clean material.	Suitably clean site won materials will be used to backfill the excavation in the eastern area of the site. A geotextile will be placed at base of the excavation. A tracking sheet proforma will record from where the material has been excavated and where it will be re-used. After placement, sampling of the formation level will be conducted on the basis of a 10x10m grid. The chemical data will be screened against the Remediation Targets (Appendix E).	Materials Management Plan or Environmental Permit. Chemical test results. Screening assessment. Photographs.	Remediation Contractor GB Card & Partners

Section	Description	Item	Summary of Validation Requirements	Verification criteria	Verification evidence	Responsible party
7.3	Removal of gross contamination – eastern area	e.	Perched water encountered during excavation works has been treated and disposed of appropriately (Section 7.4). This should be carried out only if grossly contaminated and very superficial groundwater is found (depth <1mbgl) in order to limit the generation of contamination odour and vapours.	See 7.3 item c.	See 7.3 item c.	See 7.3 item c.
7.5	Remediation of the superficial groundwater - eastern area	a.	The objective of the remediation is to treat the superficial saturated soils and the dissolved contamination plume recorded at the site via in situ remediation (via injection wells).	Groundwater monitoring will be conducted from selected wells to confirm the treatment of the dissolved plume of contamination before and after the injections. A six month monitoring period will be carried out to confirm the completion of the remediation works. The chemical data will be screened against the Remediation Targets described in Appendix E.	Remediation records. Monitoring records. Chemical test results. Screening assessment.	Specialist Contractor / GB Card & Partners
7.7	Re-use of site won material	a.	Records of material movements and re-use.	A Materials Management Plan will be completed and submitted to the Environment Agency for approval. The processing of site-won demolition arisings will be undertaken under a suitable Environmental Permit. The sampling strategy for the depending recommended for the site won material will comprise one sample from the first 50m3. Then one every 100m3.	Materials Management Plan. (ensure records are kept for at least 2 years after the completion of the works). Environmental permit. Chemical data and screening assessment.	Principal Contractor or Groundworks/Remediation Contractor

Section	Description	Item	Summary of Validation Requirements	Verification criteria	Verification evidence	Responsible party
7.8	Waste disposal	a.	Duty of Care documentation	All waste disposal activities should be carried out in accordance with the Waste (England & Wales) Regulations 2011 and other relevant waste legislation. Classification of surplus arisings should be carried out in line with the requirements of Technical Guidance WM3[1].	Chemical analysis. Waste transfer and consignment notes and disposal certificates	Principal Contractor or Groundworks/Remediation Contractor
8	Monitoring Plan	a.	Monitoring of acute risks from contamination vapours.	An air monitoring system will be maintained along the site boundary to record the real-time concentrations of VOCs during the groundworks. An additional (mobile) monitoring point will be installed in the vicinity of the active excavation works.	Site monitoring plan. Record of real-time concentrations of VOCs during the groundworks.	Remediation Contractor / GB Card & Partners
8	Monitoring Plan	b.	Monitoring of acute risks from contamination vapours.	The concentrations of VOCs will be screened against the acute risk criteria (ART) described in Appendix H. Mitigation measures will be implemented if there is an exceedance of the VOC boundary threshold (initially set to 0.5ppm).	Screening assessment. Record of immediate mitigation measures.	Remediation Contractor / GB Card & Partners

[1] EA, SEPA, NIEA, Natural Resources Wales (2015). *Waste classification - Guidance on the classification and assessment of waste*. Technical Guidance WM3. 1st edition dated May 2015.

Section	Description	Item	Summary of Validation Requirements	Verification criteria	Verification evidence	Responsible party
8	Monitoring Plan	c.	Monitoring of acute risks from contamination vapours.	Where VOC boundary thresholds are exceeded, vapour cannister samples will be collected at the relevant monitoring point. The results will be compared to the acute risk criteria (ART) and sub-chronic risk criteria (SCRC) presented in Appendix H.	Chemical data. Screening assessment. Record of additional/ revised mitigation measures.	Remediation Contractor / GB Card & Partners
8	Monitoring Plan	d.	Monitoring of odours nuisance	The Site Engineer will carry out olfactory observations ('Sniff tests') at each Monitoring Point at the commencement of the daily work shift (ca 8am), at a mid-morning (ca 11.00 am), early afternoon (ca 2pm) and at the end of the working day (ca 4.30 pm). The (VOC) data collected during the *sniff tests* will be screened against the odour threshold (OT) presented in Appendix H. Odours above Level 3 of the VDI intensity scale will be reported to the site manager and mitigation measures will be implemented.	Site diary. Sniff testing will be carried out in compliance with the recommendations formulated by the EA in (March 2011) '*H4 Odour Management*'. Screening assessment. Record of immediate mitigation measures.	Remediation Contractor / GB Card & Partners

Section	Description	Item	Summary of Validation Requirements	Verification criteria	Verification evidence	Responsible party
8.	Monitoring Plan	e.	Monitoring of sub-Chronic risks from contamination vapours	Passive sorbent tube monitoring will be undertaken on a weekly basis at boundary monitoring location (AMP1- AMP4) during the groundworks at the site. Time-weighted average (TWA) concentrations of benzene and naphthalene will be determined and screened against the against sub chronic human health threshold concentrations (SCRC) described in Appendix H.	Chemical analysis of passive sorbent tubes. Screening assessment. Record of mitigation measures.	Remediation Contractor / GB Card & Partners
9.1	Capping system	a.	Quality and nature of capping layer soils.	Source of imported soils & pre-import quality. The chemical data will be screened against the Remediation Targets (Appendix E).	Provenance and pre-import chemical test data for imported soils. Screening assessment.	Principal Contractor GB Card & Partners
9.1	Capping system	b.	Layer thicknesses and in situ verification and geotextile presence	A minimum of one inspection pit per each landscaped area will be undertaken. Where areas are bigger that 100m2 additional inspection pits will be required. The testing/inspection frequency will be in accordance with NHBC guidance[2].	Photographs during installation and site inspection verification.	GB Card & Partners

[2] NHBC (2012). Technical Extra. *Verification of Cover Systems – testing criteria for subsoil and topsoil.*

Section	Description	Item	Summary of Validation Requirements	Verification criteria	Verification evidence	Responsible party
9.1	Capping system	c.	Quality and nature of capping layer soils	Soils sample will be collected from the inspection pits and chemical data will be screened against the Remediation Targets (Appendix E).	Chemical test results. Screening assessment.	GB Card & Partners
9.2	Service trenches	a.	Confirmation that appropriate protection has been afforded to water supply pipes as required by the utility company.	Details of trench backfill, pipework and protection measures. Evidence of dedicated geotextile lined oversized service corridors to be provided.	Specification for trench backfill & pipework. Construction drawings. Photographs.	Principal Contractor
9.3	Piled foundations and groundwater protection	a.	Piling methods should pose a low risk to controlled waters. A Foundation Works Risk Assessment will be prepared in accordance with the Environment Agency guidance[3] on *assessing risks from piling considers six potential pollutant linkages associated with the piling works*.	That appropriate piling methods have been used (CFA is recommended).	Piling method statement / records.	Piling Contractor
9.3	Piled foundations and groundwater protection	b.	Impact of piling on the quality of the underlying groundwater.	Groundwater monitoring records pre, during and post piling will be carried out. The monitoring criteria will be specified in the *Foundation Works Risk Assessment* report which will be sent to the EA for approval.	Chemical analysis. Screening assessment. Implementation of mitigation measures.	Principal Contractor GB Card & Partners

[3] Environment Agency (2001). *Piling and Penetrative Ground Improvement Methods on Land Affected by Contamination: Guidance on Pollution Prevention*. NC/99/73.

Section	Description	Item	Summary of Validation Requirements	Verification criteria	Verification evidence	Responsible party
9.4	Ground gas and vapour protection measures	a.	Presence of sub-floor pressure relief layer.	Design in accordance with the requirements set out in BS8485 Guidance and described in Section 9.4.	Detailed construction drawings, as-built drawings and photographs of construction.	Engineer/Architect assisted by gas protection specialist, as required. Principal Contractor/installer.
9.4	Ground gas and vapour protection measures	b.	Presence of an appropriate vapour/gas resistant membrane with sealing of joints and service penetrations that pass through the membrane.	Specification of gas membrane, tape and service detail (e.g. top hats etc.) and qualifications of chosen installer. Guidance of reference: BS8584[4] guidance (for new buildings) and CIRIA *Retrofitting ground gas protection measures in existing or refurbished buildings*[5] (C795).	Membrane specifications.	Principal Contractor. GB Card & Partners to check membrane suitability for the identified gas regime.
9.4	Ground gas and vapour protection measures	c.	Construction drawings (to be provided prior to installation).	Review and approval of the construction drawings.	Detailed construction drawings.	Architect/Structural Engineer assisted by GB Card & Partners, as required
9.4	Ground gas and vapour protection measures	d.	Installation of gas membrane	Photographs of installation at various stages through the installation process including; prior to laying the membrane showing the prepared slab, installation and sealing of joints and services. Photographic records to be taken for every building.	Photographs	Principal Contractor

[4] British Standard BS 8485:2015+A1:2019 *Code of practice for the design of protective measures for methane and carbon dioxide ground gases for new buildings.*
[5] CIRIA (C795) *Retrofitting ground gas protection measures in existing or refurbished buildings*, December 2020.

Section	Description	Item	Summary of Validation Requirements	Verification criteria	Verification evidence	Responsible party
9.4	Ground gas and vapour protection measures	e.	Inspection visit	Membrane inspection visits will be carried out in every building by specialist contractors.. The inspection will be undertaken immediately prior to the screed being placed.	Inspection records and gas membrane installation report in accordance with the requirements of CIRIA C735[6] and C795[5].	by GB Card & Partners /approved gas protection specialist

[6] CIRIA (C735) Good practice on the testing and verification of protection systems for buildings against hazardous ground gases, August 2014.

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